High-resolution, quantitative climate reconstruction over the past 1000 years and pollution history derived from lake sediments in Central Chile

Inauguraldissertation
der Philosophisch-naturwissenschaftlichen Fakultät
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vorgelegt von

Lucien von Gunten

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Leiter der Arbeit:

Prof. Dr. M. Grosjean

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Bern, 26.02.2009

Der Dekan:
Prof . Dr. U. Feller

Drop by drop, a whole lake becomes

Bulgarian Proverb

Drop by drop the lake is drained

Tamil Proverb

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Abbreviations

AD	Anno Domini
AMS	Accelerator Mass Spectrometry
BSi	Biogenic Silica
CE	Coefficient of Efficiency
CIC	Constant Initial Concentration
CFCS	Constant Flux / Constant Sedimentation
C/N	Carbon/Nitrogen
CRS	Constant Rate of Supply
CRU	Climatic Research Unit
DJF	December, January, February
ENSO	El Niño / Southern Oscillation
GISS	Goddard Institute for Space Studies
JJA	June, July, August
LIA	Little Ice Age
LOI	Loss On Ignition
MAM	March, April, May
MS	Magnetic Susceptibility
NFS	Nationaler ForschungsSchwerpunkt
NOAA	National Oceanic and Atmospheric Administration
PAH	Polycyclic aromatic hydrocarbons
PM	Particulate Matter
POP	Persistent organic pollutants
PP	Primary Production
RABD	Relative Absorption Band Depth
RE	Reduction of Error
RMSE	Root Mean Squared Error
SAB	Subtropical Anticyclone Belt
SAM	Southern Annular Mode
SCP	Spheroidal Carbonaceous Particle
SIT	Sediment Isotope Tomography
SOI	Southern Oscillation Index
SON	September, October, November
SPA	South Pacific Anticyclone
TOC	Total Organic Carbon
XRD	X-Ray Diffraction
XRF	X-Ray Fluorescence

Abstract

Quantitative, high-resolution climate and pollution reconstructions are essential for assessing the extent and variability of human impact on the environment. The knowledge, which comes from these reconstructions, is crucial for defining and evaluating the success of technological or regulatory measures which aim to reduce emissions and their negative impacts on ecosystems. In the perspective of climate change, long-term data are critical for placing modern climate warming into a long-term context, for assessing the sensitivity of the climate system to natural and anthropogenic forcings and thus for reducing the uncertainties about the magnitude and impact of future global climate change. In particular, the lack of adequate data series from the southern hemisphere must be overcome.

The aim of this study is to produce high-quality climate and pollutant deposition series using lake sediments from Central Chile. Ten lakes were analysed to assess their potential as environmental archives. After careful selection, sediment cores were dated, sampled and analysed at high temporal resolution. The resulting measurement data were interpreted as pollution indicators or were calibrated with meteorological data to reconstruct climate for the past 1000 years.

We used several new methods to improve the paleolimnological climate reconstructions. The most significant advances are: i) the generation of high-precision chronologies for the calibration period, ii) the use of statistical methods from tree-ring research on non-varved lake sediments to reconstruct and quantify climate variability and iii) the application of in-situ reflectance spectroscopy as a new high-resolution, non-destructive measurement method for lake sediment cores.

Three lakes (Laguna Aculeo, Negra and del Inca) were considered for climate reconstruction. Calibration of the sedimentary data with climate series showed, that in all lakes, primary production is highly significantly correlated with temperature (in particular austral summer temperature). Therefore, these lakes are well-suited to reconstruct the temperature variability of Central Chile. This is particularly significant because all other known natural climate archives in this area are sensitive to winter precipitation.

We chose Laguna Aculeo to reconstruct austral summer (DJF) temperature back to AD 850 on the basis of the good chronological control over the whole reconstruction period. This reconstruction provides insight into sub-decadal to centennial scale climate variability from Central Chile and provides quantitative evidence for the presence of a warm Medieval Climate Anomaly and a cool period synchronous to the "Little Ice Age". The structure of variability corresponds well to annually resolved tree-ring based warm-season temperature and river discharge reconstructions from northern Patagonia, hydrological changes in lake sediment records from Patagonia, and qualitative climate reconstructions from Andean glacier fluctuations. This is the first lake sediment record of its kind in terms of resolution, calibration quality, quantification and error estimation for South America.

The second aspect of this study was to provide quantitative high-resolution data for the history of airborne pollutants and eutrophication using lake sediments from Central Chile. Our data show that the lake sediment records of inert pollutants (here: Cu and SCPs) from five lakes are highly consistent and depict in great detail the local and regional history of urban, industrial and transportation history as reported in independent documentary sources and statistics. These results suggest that, unlike in Europe, local sources of pollutants are more important than the common regional (background) signal. A eutrophication signal is observed in all pristine high-Andean lakes since AD 1980-1990. However, this eutrophication trend is typically small to moderate suggesting that not nitrogen but phosphorus is the limiting factor for primary production.

Chapter 1

1. Introduction and outline

1.1 Motivation and scientific background

Human activities and their emissions of substances to the environment have resulted in significant and profound impacts on the Earth's climate, ecosystems and human health since the late 18th century (e.g. Rodhe et al. 1995; IPCC 2007; Smol 2008). To assess the exact extent and variability of human impact on the environment, quantitative, high-resolution climate and pollution reconstructions are needed (Bradley et al. 2003; Smol 2008). These data series are especially important today in the light of global climate change and rapidly growing economies in Asia and South-America, where emissions of greenhouse gases and other pollutants are escalating and pollution is becoming an increasingly serious environmental and health problem. Therefore, the goals of this thesis are to produce high-quality climate and pollutant deposition series derived from lake sediments from Central Chile.

Climate

Quantitative high-resolution global, hemispherical and regional climate reconstructions covering the past 1000 years are essential for placing modern climate warming into a long-term context, to assess the sensitivity of the climate system to natural and anthropogenic forcings, and thus to reduce uncertainty about the magnitude and impact of future global climate change (Hegerl et al. 2006).

Climate research has traditionally been focused on the northern hemisphere, leading to important advancements in the reconstruction methods and compilation of data sets in the northern regions (Mann et al. 1999; Luterbacher et al. 2004; Moberg et al. 2005; Lee et al. 2008). Alternatively, the southern hemisphere is largely devoid of adequate data. Mann and Jones (2003) found only five data sets from the southern hemisphere suitable for their work on surface temperature reconstructions for the past two millennia (Fig. 1-1). Only two of these data series are from South America: a tree-ring record from southern South America (Lara and Villalba 1993) with unknown preservation of the low-frequency component of climate variability, and the $\delta^{18}O$ record from the Quelccaya ice cap (Peru) where the suitability for temperature reconstruction is still under debate (Vimeux et al. in press and references therein). This lack of high-quality data sets for the southern hemisphere has been recognized as a serious limitation to global reconstructions and their interpretations (Bradley et al. 2003).

The main challenge in climate research is that most instrumental data only provide records of climate for the past 150 years. Therefore, proxy data derived from natural archives such as glacial ice, tree-rings, corals, speleothems, peat bogs or marine or lake sediments are commonly used to reconstruct past climate (see Bradley 1999 for a review). Lake sediments are particularly suited for climate reconstruction as both high- and low-frequency climate variability components are preserved in the sediments, and they can potentially provide long records (Moberg et al. 2005).

To our knowledge, no published lacustrine sedimentary record in South America fulfils the requirements (quantitative, high-resolution and well-calibrated) to be used for global and regional climate reconstructions. However, promising results obtained by Boës and Fagel (2008) from varved sediments of Laguna Puyehue (Chile), where varve thickness and annual (austral winter) precipitation (i.e. ENSO) were significantly correlated (correlation period: AD 1980-2000). Because the reconstructed ENSO variability relies on the spectral properties of varve thickness and not on a calibration-in-time procedure, no quantitative precipitation record was inferred. Studies from sites in Patagonia, including; Laguna Azul and Laguna Potrok Aike (Haberzettl et al. 2005), Laguna Las Vizcachas (Fey et al., in revision) and Lago Frias (Ariztegui et al. 2007), give important qualitative information about (multi-)decadal ENSO-related lake level variations, fluvial inputs to the lake or variable varve thickness of the past 1000-2000 years, but are not suited for global or regional climate reconstructions. Also noteworthy is the high-resolution

study by Rein et al. (2005) on a marine sediment core off Peru. The authors applied high-resolution reflectance spectroscopy to generate a temporally high-resolution (1-3 years) and well-dated record of ENSO variability for the past 20'000 years with a special focus on the last 2000 years. Again, proxy data were not calibrated in time and therefore were not converted into quantitative climate variables indices. All other lake sediment records from South America cover a much longer time span (usually the whole Holocene) and are analysed at lower temporal resolution.

In this context, a preliminary project (SNSF Project 200021-100289/1) to infer the potential of lake sediments as quantitative and high-resolution climate archives in Central Chile was carried out in AD 2004-2005. Field and laboratory results showed that the strategy for site selection was successful and that the sediments of the selected lakes had potential for high-resolution paleoclimate research. On the basis of these results, the project presented here (NF 200021-107598; AD 2005-2008) was initiated to produce a high-resolution and quantitative climate record for Central Chile.

An important objective of this study, besides producing data series for regional climate reconstructions, is to improve the paleolimnological methodology for reconstructing climate using non-varved lake sediments. Therefore, emphasis is placed on the sampling and radionuclide dating of the sediment cores, the use of statistic tools from tree-ring research and the test of in-situ reflectance spectroscopy as a rapid method for analysis of lake sediments.

Pollution

The other important aspect of this study is related to the pollution history of Central Chile. One of the fundamental problems regarding the study of past pollution emissions is, in many cases, the lack of long-term observational data (monitoring) which is invaluable for quantifying anthropogenic outputs. Consequently, it is very difficult to assess the natural background levels and undisturbed conditions, the magnitude and dynamics of anthropogenic impacts, and to evaluate the success or failure of regulatory measures and technological improvements which aim to reduce emissions and/or to restore ecosystem. This lack of monitoring data is especially pronounced in remote mountainous or Polar Regions, and in developing countries.

Lake sediments may provide quantitative historical records for most of the major types of pollutants (for reviews see Bennion and Battarbee 2007; Smol 2008). Furthermore, the high-precision chronologies established for the calibration-in-time of climate proxies are perfectly suited to date pollutant deposition and eutrophication at high-resolution and cover the period from the onset of industrialization in the end of the 19th century to the present.

Therefore, the second objective of this study to create a precise and comprehensive pollution history using lake sediments and to infer natural background values of the pollutants for the Region Metropolitana around the Chilean capital Santiago.

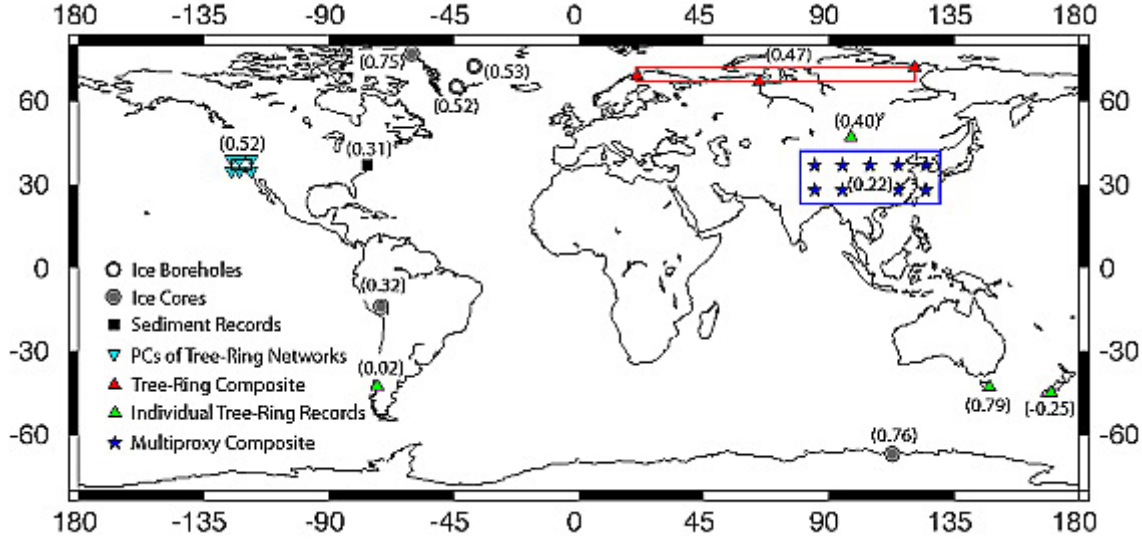

Fig. 1-1 Map showing the sites and archives used in the global and hemispheric temperature reconstructions by Mann and Jones (2003)

1.2 Outline

This thesis is structured as follows: after the introduction to the scientific topic in Chapter 1, the study site is described in Chapter 2. In this chapter, the significance of Central Chile for climate sciences is also discussed. Chapter 3 describes the methods used for this thesis and the independent climate series used for data calibration. In Chapter 4, all studied lakes are introduced and the reasons for which lakes were selected for climate and pollution reconstruction are discussed. In Chapter 5, the methodology and limits of radionuclide (^{210}Pb) based age modelling of non-varved lake sediments is discussed. Methodological improvements are suggested which can increase the precision of lake sediment chronologies. This chapter was accepted for publication (in press) in Journal of Paleolimnology. In Chapter 6, calibration of the measured sedimentological data against independent climate series is presented and the potential of the studied Central Chilean lakes as climate archives discussed. In Chapter 7, the well-dated sediment core of Laguna Aculeo is used to reconstruct austral summer temperatures quantitatively and at high resolutions for the past 1200 years. This chapter was submitted to The Holocene. In chapter 8, quantitative high-resolution data for the history of airborn pollutants and eutrophication from five lakes in Central Chile are presented. This chapter was submitted to Global and Planetary Change. Finally, in Chapter 9, the most significant achievements of this study are summarized and final conclusions are made.

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Chapter 2

2. Study site

The study area is located in the Central Region of Chile (32-34°S) on the windward side of the Andes. The Region Metropolitana around the capital Santiago is a strongly growing urban region with a population in AD 2006 of > 6 Mio inhabitants (42% of the total Chilean population). Since AD 1940, the population and area of the city has more than sextupled (Romero et al. 1999; Galetovic and Jordán 2006). Atmospheric conditions and the location of the city in a closed basin make the region very sensitive to air pollution. This has become a major problem for human health and the regional environment (e.g. Romo-Kröger et al. 1994; Romero et al. 1999; Gidhagen et al. 2002; Olivares et al. 2002; Godoy et al. 2003; Grass and Cane 2008).

2.1 Climate

Central Chile lies in the transition zone between the South Pacific Anticyclone (SPA) and the southern mid-latitude Westwind Drift. The synoptic climate of the region is related to changes in the strength and the latitudinal position of the SPA which controls the northward progression of the westerly wind belt. In summer, the frontal system of the Westerlies is blocked by a very stable SPA, leading to little precipitation. Alternatively, in the austral winter, northward displacement and weakening of the SPA allows northerly progression of frontal activity and cyclonic storms of the westerly wind belt, resulting in higher precipitation in Central Chile. Inter-annual variability in precipitation is related to ENSO: warm (cold) ENSO phases result in enhanced (reduced) precipitation (Aceituno 1988; Montecinos and Aceituno 2003; Latorre et al. 2007).

The resulting climate of Central Chile is Mediterranean-type with cool-humid winters and hot-dry summers and very high radiation. Annual precipitation is approximately 550 mm and occurs mainly in winter (generally in form of snow above 1000 m a.s.l.). Mean annual temperature is 14°C (average AD 1900-2000) with 7-10°C in winter and 18-20°C in austral summer (GISS 2008).

South to south-westerly winds predominate throughout the year (Miller 1976).

Central Chile is, due to its geographical position, a key region for understanding subtropical paleoclimate changes, including the evolution of ENSO. Furthermore, high-resolution correlation field analysis of South America (Fig. 2-1) (CRU TS_2.1, 0.5°x0.5°, Mitchell and Jones 2005, 33.75°S/70.75°W, AD 1901-2000) shows that seasonal temperature means for the Central Region of Chile are highly correlated with seasonal temperatures in large parts of southern South America (Chile and Argentina 20-45° S), parts of the northern Andes and Venezuela. Global correlation field analysis maps (Fig. 2-2) (HadCRUT3, 5°x5°, Brohan et al. 2006, 32.50°S/72.50°W, AD 1901-2000) additionally indicate a high correlation with a large area of the western and equatorial pacific. Thus, a temperature record from Central Chile can be a relevant predictor for temperature variability in subtropical and mid-latitude South-America, and parts of the western and equatorial Pacific Ocean.

2.2 Geomorphology and Geology

The Andes form the longest mountain chain in the world, extending over 7000 km from Colombia to the Chile triple junction (South American, Nazca and Antarctic Plate) along the western edge of the South American plate. Orogenesis is due to the subducting Nazca plate beneath the continental plate and its associated trench.

The Chilean Central Region consists of a well defined Central Valley separating the Main Cordillera and the Cordillera de la Costa (Chilean coastal range) in the west (Fig. 2-3). To the north, the Central Depression is poorly developed; therefore the Central valley appears to disappear (Fig. 4-1). This region contains the Nazca plate transition zone, where it changes from a normal dip of ~30° to a flat-slab subduction and back to normal dip (Cahill and Isacks 1992; Charrier et al. 2007), and is

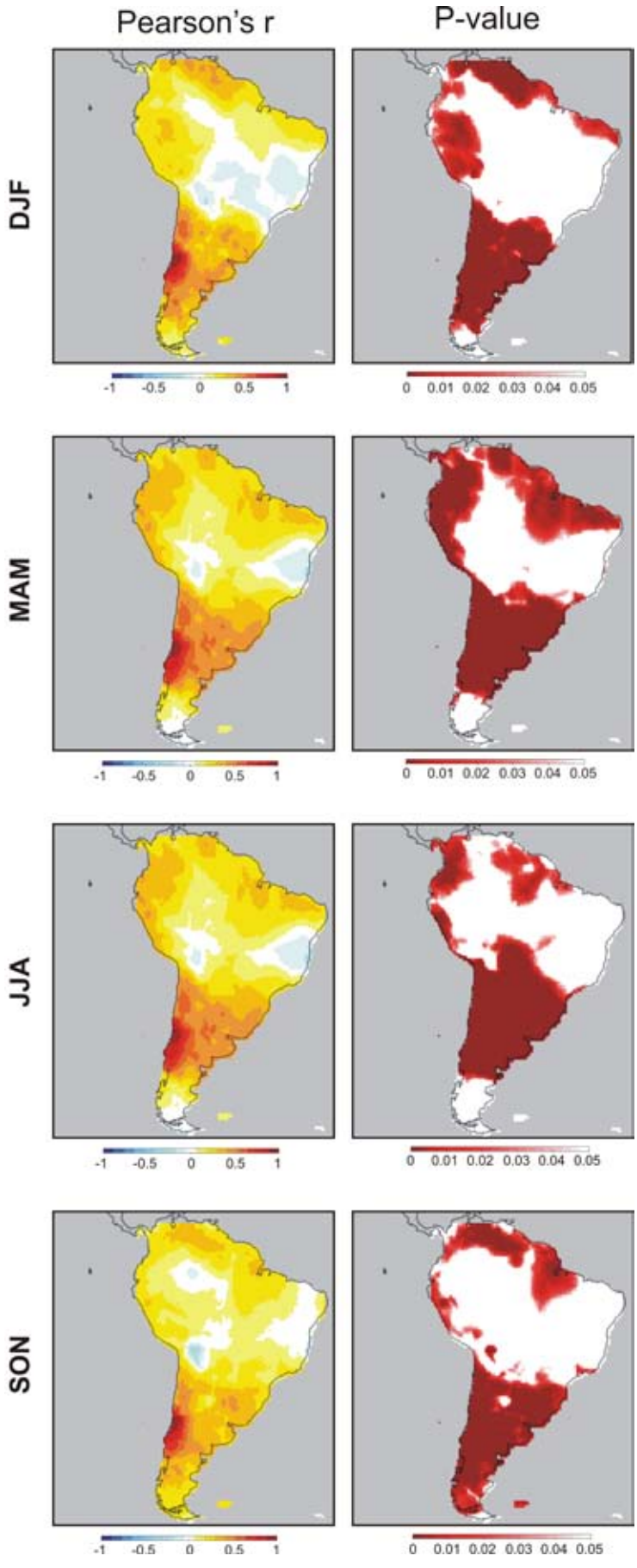

Fig. 2-1 Seasonal temperature Pearson correlation map between Central Chile and South America. Maps on the left show the Pearson correlation-coefficient r and maps on the right the corresponding P values

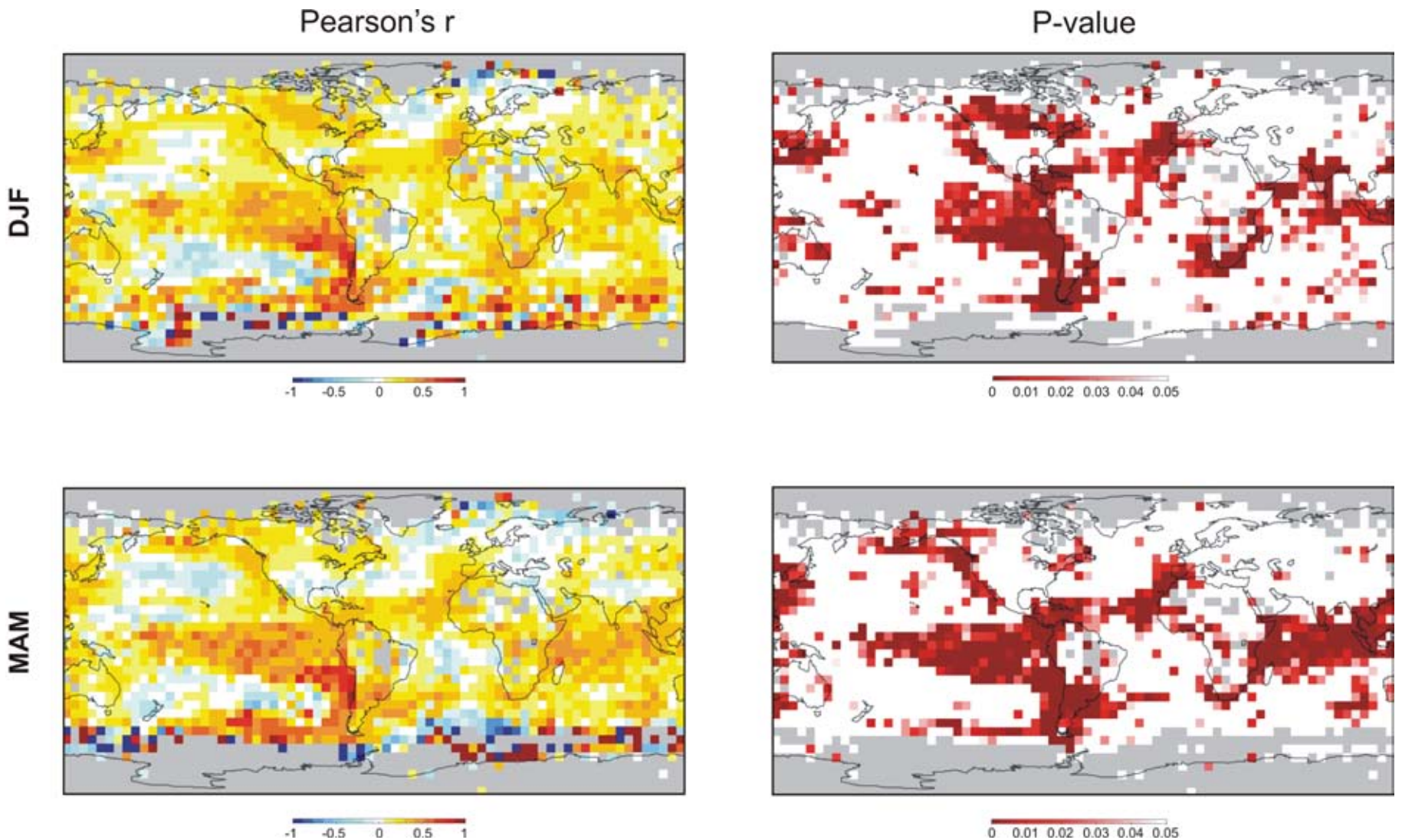

Fig. 2-2a Seasonal (DJF and MAM) graph temperature Pearson correlation map between Central Chile and the rest of the world. Maps on the left show the Pearson correlation-coefficient r and maps on the right the corresponding P values

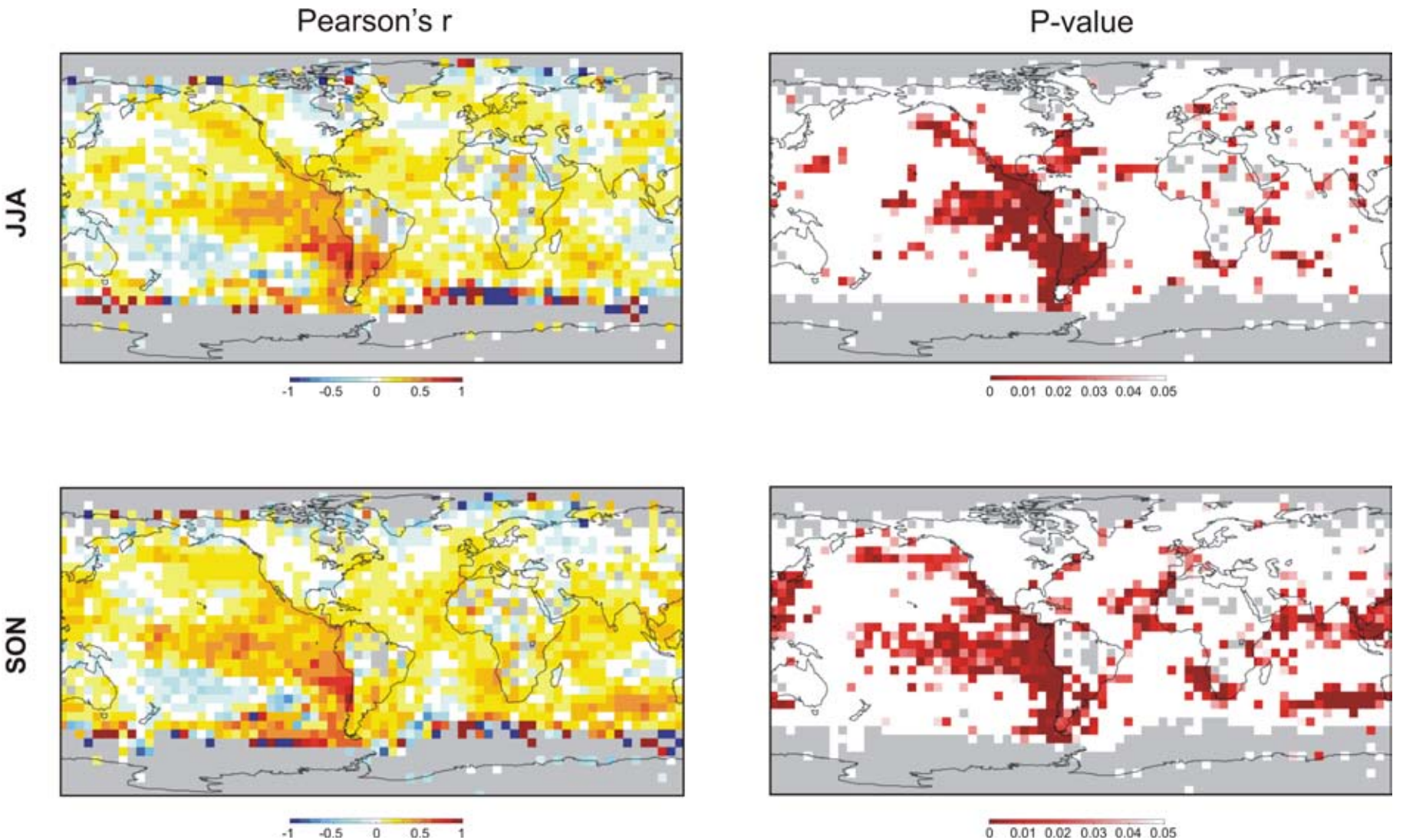

Fig. 2-2b Seasonal (JJA and SON) graph temperature Pearson correlation map between Central Chile and the rest of the world. Maps on the left show the Pearson correlation-coefficient r and maps on the right the corresponding P values

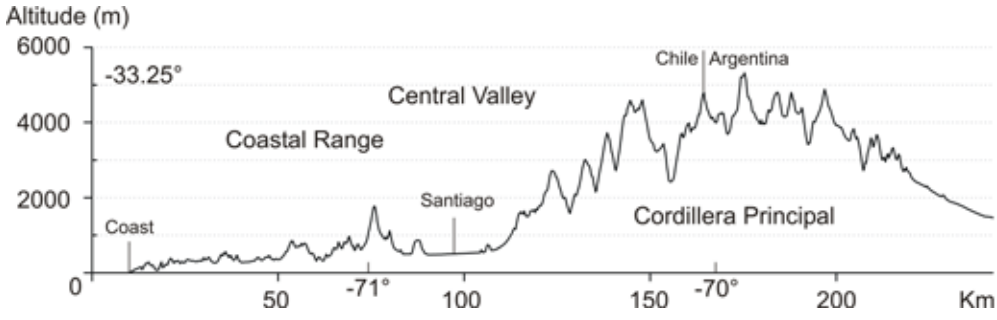

Fig. 2-3 Altitudinal transect at 33.25° S from the Pacific Ocean to the Main Cordillera of the Andes

characterized by a lack of volcanic activity (Stern et al. 2007).

The interaction of the Nazca, Antarctic, Scotia and South American plates in south-western South America makes Chile a seismically active country (Barrientos 2007). In Central Chile, several large (magnitude > 7.8 Ms) earthquakes have been recorded in the past ca. 400 years at an interval of 82±6 years (Barrientos 2007).

The Main Cordillera in the Central Region is mainly composed of Oligocene to Miocene volcanites and volcano-sedimentary sequences (mainly andesite to basalt, dacite). The Valle Central consists of Quaternary sedimentary rocks and is occupied by Pleistocene to Holocene colluvial, fluvial and volcanic deposits from the surrounding mountains. The Cordillera de la Costa is more heterogeneous and consists mainly of Carboniferous to Permian and Jurassic igneous rocks (mainly granite, granodiorite, tonalite diorite and monzodiorit) and phyllosilicate mineral (mainly hornblende and biotite) (SERNAGEOMIN 2003).

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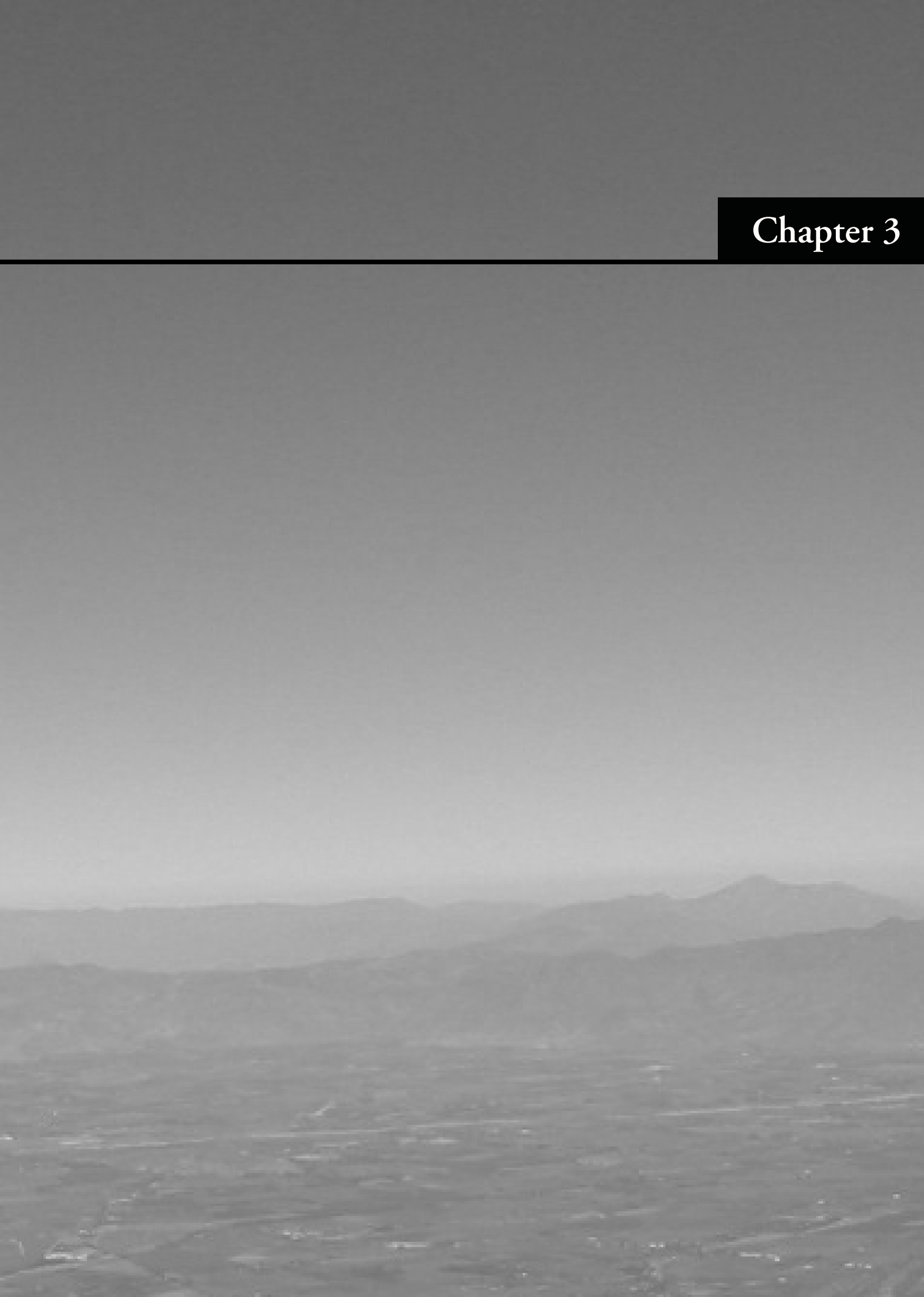
Chapter 3



3. Methods and climate data

3.1 Methods

Field methods

Echosounder (Garmin GPSMAP 178) surveys were carried out to derive detailed bathymetric maps of the lakes during fieldwork in AD 2005 and 2006. Water samples were taken from different depths and high-resolution water chemistry depth profiles (temperature, pH, Electrical conductivity and dissolved O_2) were measured in-situ with a Hydrolab Minisonde 4a Water Sonde. Conductivity, pH and water hardness were measured in the collected water samples shortly (max 5 hours) after collection. In two lakes, moorings with five/six thermistors (measurements taken every 30 min.) and two sediment traps were set for a period of over one year.

Short sediment cores were recovered with an UWITEC gravity corer equipped with an action hammer and a modified Livingstone piston corer. Surface sediment samples were taken from different depths along a transect with a bottom sampler. The choice of coring and surface sediment collection sites was based on bathymetric maps. Sediment cores were sealed and stored under cold (4°C) and dark conditions.

Laboratory methods

Prior to opening, whole cores were scanned with a multi-sensor core logger (MSCL, Geotek Ltd.) for density, p-wave velocity and magnetic susceptibility at ETH Zürich.

Cores were then opened, split, digitally photographed, and processed for Magnetic Susceptibility with a Bartington MS2 Magnetic Susceptibility System (MS2E high-resolution sensor) at EAWAG Kastanienbaum. In-situ reflectance spectrometry was carried out at 2 mm intervals on fresh un-oxidized split sediment cores with a Gretag-Spectrolino (GretagMcBeth, Switzerland) at GeoConsult Rein, Oppenheim, Germany.

Thin sections, for sedimentary microfacies analysis, were prepared following the method of Blass (2006, four component synthetic resin mixture: 64% NSA, 25% VCD, 10% DER and 1% DMAE) and processed at GeoForschungszentrum Potsdam (M. Köhler).

Cores were sampled at regular 0.2 or 0.5 cm, or irregular, intervals according to the sedimentary microfacies, and all samples were freeze-dried.

Total organic carbon (TOC) and nitrogen (N) were analysed using a Vario Macro Elemental Analyser (Elementar Analysen Systeme) on 100-200 mg sub-samples. Inorganic carbon was removed with HCl (10%) prior to analysis. Biogenic silica (BSi) was leached according to Ohlendorf and Sturm (2008) from organic free (30% H_2O_2) samples and measured on ICP-OES at PSI, Villigen (S. Köchli). BSi concentrations were corrected for inorganic silica derived from clay minerals using the Al-concentration in the leachate (Al: Si ratio of 2:1). Grain size analysis was performed on organic-, biogenic silica-, and diatom-free sediments on a Mastersizer 2000 laser grain sizer at ETH Zürich. Loss on ignition (LOI) was conducted on 100-500 mg sediment samples following standard procedures (Dean 1974; Heiri et al. 2001, 1h at 550°C and 2h at 1000°C).

X-ray fluorescence (XRF) element analysis was conducted on homogenized samples with a PANalytical MiniPal II Energy Dispersive X-ray Fluorescence (EDXRF) spectrometer (semi-quantitative). A subset of samples was analysed with a Philips PW2400 X-ray fluorescence spectrometer (quantitative, University of Fribourg). A calibration curve was then calculated (correlation coefficient of r>0.99 for all discussed elements) to convert all results into quantitative values ($\mu g\ g^{-1}$).

X-ray diffraction (XRD) was measured on smear slides between 4-60 2θ° on a Philips PW 1800 diffractometer with Cu K-α operating at 40 kV, 30 mA following the procedure used by Trachsel (2006) and Trachsel et al. (2008). A drop of ethylene glycol was added to the smear slides to prevent dehydration of clay minerals.

SCP samples were prepared (following the method by Renberg and Wik, 1985, H_2O_2 30% and HCl 10%) and counted under a stereo-microscope at 50x magnification by P. Grob (Grob 2008).

Ion chromatography was carried out on the collected water samples using a Dionex DX-120 (H.R. Wernli).

Dating

^{210}Pb, ^{137}Cs and ^{226}Ra were measured on Canberra low background, well-type GeLi detectors at EAWAG, Dübendorf (E. Grieder), Ortec HPGe GWL series well-type coaxial low background intrinsic germanium detectors at University of Liverpool (P.G. Appleby and G.T. Piliposian) and Ortec HPGe gamma detector, well type GWL Series at University of Bern (E. Vogel). Sections with rapid sedimentation (e.g. turbidites) were identified in thin sections and removed from the profiles. Unsupported ^{210}Pb was inferred from level-by-level subtraction of ^{226}Ra from total ^{210}Pb activity, and through subtraction of mean ^{226}Ra activity in instances where ^{226}Ra activity was partly below the detection limit. Multiple mathematical models were tested to convert unsupported ^{210}Pb activities to depth-age models. Models were supplemented by independent chronological marker horizons such as the ^{137}Cs bomb fallout peak, the start of the SCP profile and historical earthquakes. Refer to chapter 4 for a more detailed description of ^{210}Pb based sediment dating.

^{14}C AMS samples on bulk organic matter were measured at the Poznań Radiocarbon Laboratory (T. Goslar) and calibrated using the ShCal04 Southern Hemisphere calibration curve (McCormac et al. 2004).

Climate reconstruction

In order to synchronize the proxy data to the time-intervals of the meteorological data, the proxy data were first regularized (linear interpolation) to a 1-year interval and then smoothed with a triangular filter to account for regularization errors and dating uncertainties. Pearson's product-moment correlation coefficient was used and P values were corrected for the loss of degrees of freedom from data smoothing (after Trenberth 1984). For the calibration, meteorological data were treated with the same filter that was applied to the proxy data. The climate reconstruction is based on ordinary least square regression and scaling calibration (Cook et al. 1994; Esper et al. 2005). The quality of the reconstruction was assessed with cross-validation of split periods (calibration and verification periods) and with the entire period. In order to cover the full range of climate variability in the calibration period, we used the entire re-analysis period for calibration. Root Mean Squared Error (RMSE), the reduction of error (RE) and the coefficient of efficiency (CE) were calculated after Cook et al. (1994). Finally, 10-fold cross-validated root mean squared error (RMSE) was calculated over the entire calibration period to estimate the reconstruction error. Running decadal trends (10 years moving windows) and running variance on detrended 100-yr running intervals were calculated after Della-Marta et al. (2007).

3.2 Climate data

Homogenized meteorological station data from Pudahuel (Santiago airport) with monthly time resolution back to AD 1880 are available online at Goddard Institute for Space Science (temperature) and Royal Netherlands Meteorological Institute KNMI (precipitation). Relevant grids for the study site were extracted from the monthly HadCRUT3 (5°x5°, AD 1850-2006, Brohan et al. 2006) and CRU TS 2.1 (0.5°x0.5°, AD 1901-2000, Mitchell and Jones 2005) reanalysis datasets (both available online at Climatic Research Unit, CRU) and from the 2.5°x2.5° observed land surface precipitation dataset (AD 1901-1997, Dai et al. 1997). Monthly Southern Oscillation Index (SOI) data back to AD 1866 (Allan et al. 1991, CRU), tree-ring-based El Niño 3 Indices (yearly, AD 1408-1978, D'Arrigo et al. 2005), National Oceanic and Atmospheric Administration, NOAA), and Subtropical Anticyclone Belt position reconstructions (yearly, AD 1500-1975, Bradley 1992, NOAA) were further used for calibration.

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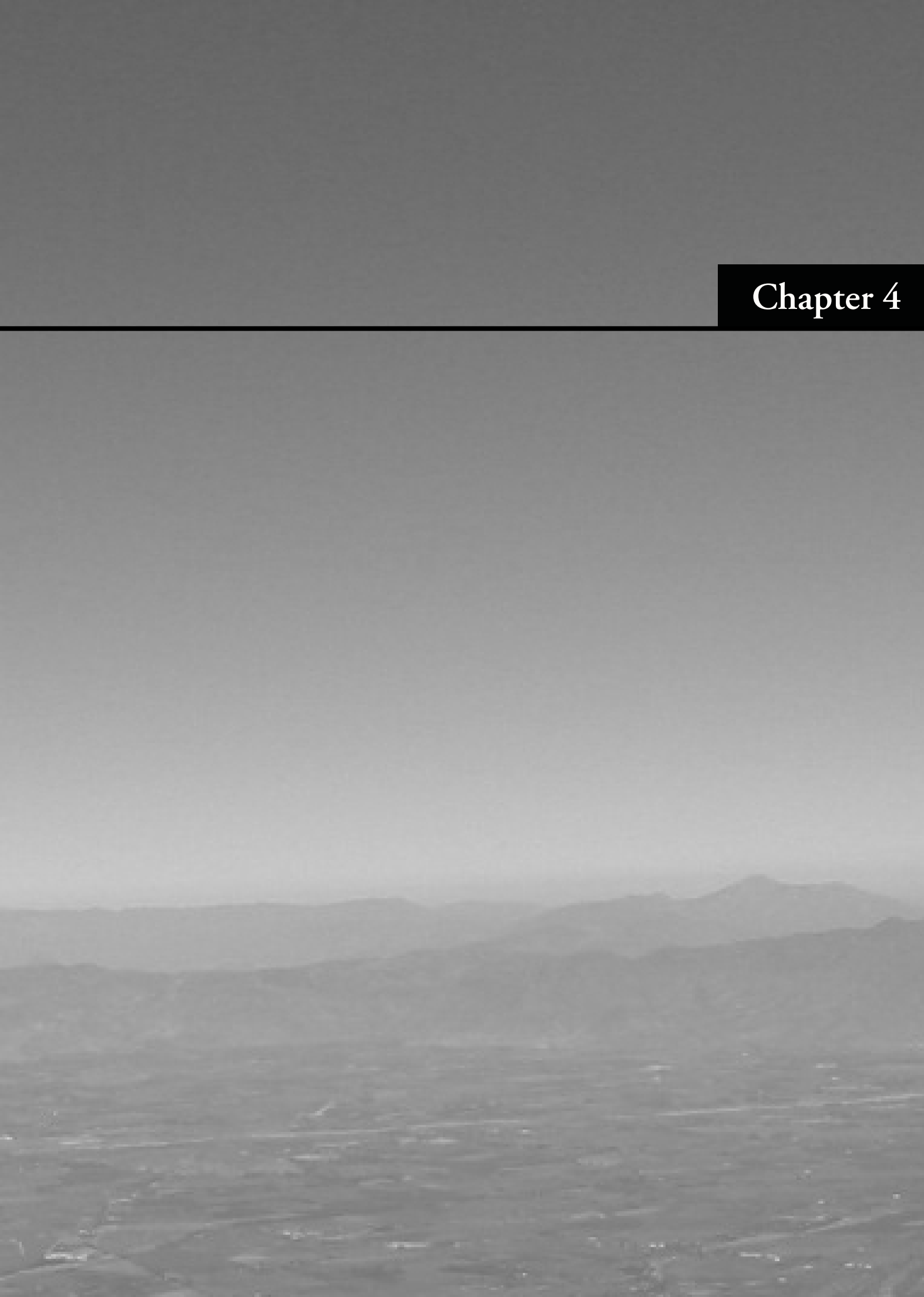

Chapter 4

4. Lakes description and selection

This chapter describes the selection of lakes for fieldwork, presents the lakes which were studied for this thesis, and discusses how lakes were chosen for further analyses.

Prior to fieldwork, we selected a set of lakes which, according to the results and data of the precursor project NF 20021-100289/1, had the greatest potential for environmental reconstruction. Within this precursor project, seven high-Andean lakes in Central Chile were explored and short cores were taken in March 2004. Some of these cores were described and one core (Laguna Encañado) was analyzed at high resolution by Salvetti (2006). We used the radionuclide (^{14}C, ^{210}Pb and ^{137}Cs) data from these cores to model depth-age curves and to infer the potential of these lakes for accurate dating. In addition to these lakes, several supplementary lakes, which were chosen for their geographical position, were visited during fieldwork campaigns in AD 2005 and 2006.

A full record of the collected sediment cores and samples, and processed analyses is shown in Appendix A1 and A2.

4.1 Lakes description

Laguna Aculeo (33°50'S/70°54'W, 355 m a.s.l, Fig. 4-1) is a warm, polymictic and eutrophic-to-hypertrophic lake of tectonic origin, located 50 km south-east of Santiago. Lake morphometry and water chemistry are described in Table 4-1, with bathymetry shown in Fig. 4-2. The bedrock geology of the catchment consists of Cretaceous to Tertiary andesites (SERNAGEOMIN 2003). Mountains in the north-west of the catchment reach 2280 m a.s.l. and are forested. The shallower sloped south-eastern area is used for agriculture and housing.

Six sediment cores (45-134 cm) were collected from Laguna Aculeo. One sediment core (Appendix A1) was dated with the ^{137}Cs AD 1964 peak and with stratigraphic layers from well-documented historical earthquakes. ^{210}Pb activities were too low to generate reliable age estimates. A detailed description of the methods and the results of the Laguna Aculeo chronology is given in Chapter 7.

Laguna Chepical (32°16'S/70°30'W, 3050 m a.s.l., Fig. 4-1) is a mesotrophic and polymictic lake, probably of glacial origin, situated 130 km north of Santiago. It has a maximum depth of 12.9 m, covers an area of 0.57 km^2, and has a total basin volume of 3.6 10^6 m^3. Water chemistry depth profiles are shown in Fig. 4-3, and bathymetry is shown in Fig. 4-4. The catchment originates from Miocene volcanism (lavas, breccias and pyroclastic rocks such as basaltic andesites to dacites) (SERNAGEOMIN 2003). Mountains in the catchment reach 3600 m a.s.l. Laguna Chepical has been dammed and outflow regulated since AD 1885 (Pers. comm. A. Espinoza).

Seven sediment cores (84-97 cm) were recovered from Laguna Chepical. One sediment core was selected for further analysis (Appendix A1) and ^{14}C dated. Resulting ages (Table 4-2 and Fig. 4-5) show that, if the result for the sample in 17.75 cm is excluded, a coherent chronology based on ^{14}C may be possible in Laguna Chepical.

Laguna Conchuca (32°05'S/70°35'W, 1918 m a.s.l., Fig. 4-1) is a shallow, oligo-mesotrophic and polymictic lake formed from a landslide. It is located 150 km north of Santiago. Lake morphometry and water chemistry are described in Table 4-3 and Fig. 4-6. A map of Laguna Conchuca and the catchment is shown in Fig. 4-7. The catchment topography contains evidence of the landslide responsible for the lake formation. The catchment consists of Miocene and Cretaceous volcanic (granodiorite, manzogranite, manzodiorite, manzonite, hornblende/biotite-diorite) and sedimentary (andesitic and basaltic lavas, volcanic tuff and breccia) bedrock (SERNAGEOMIN 2003). Mountains in the catchment reach 3500 m a.s.l. Vegetation in the catchment is scarce. However, wetlands to the south-west of the lake contain Cyperaceae (Fig. 4-7).

The recovered sediment core from Laguna Conchuca has a length of only 10 cm (Appendix A1) suggesting a relatively recent lake formation.

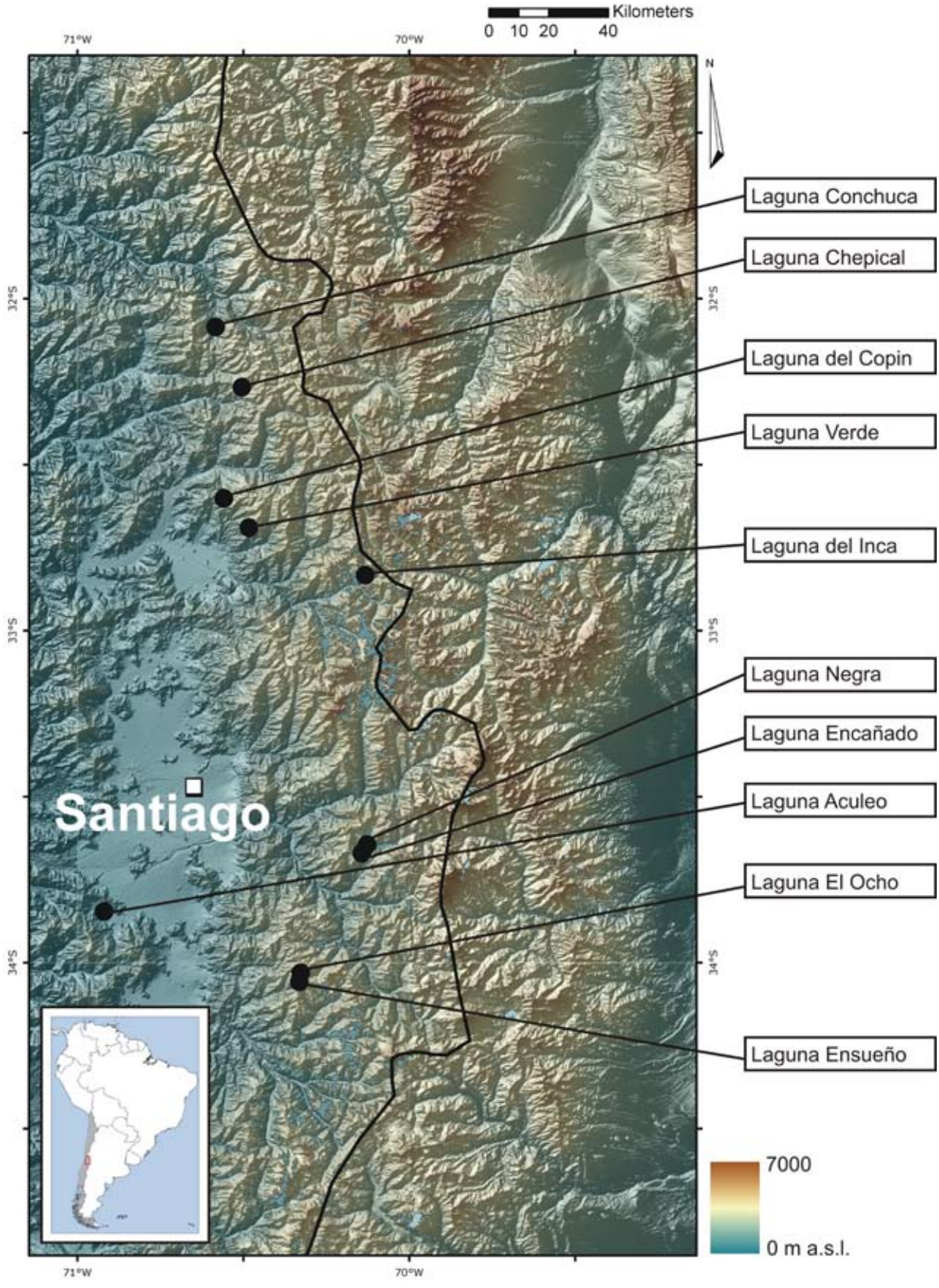

Fig. 4-1 Study area showing the Chilean capital Santiago and the studied lakes labelled by black dots. Inset: South America with the study area (box). Background images and digital elevation model from SRTM, USGS

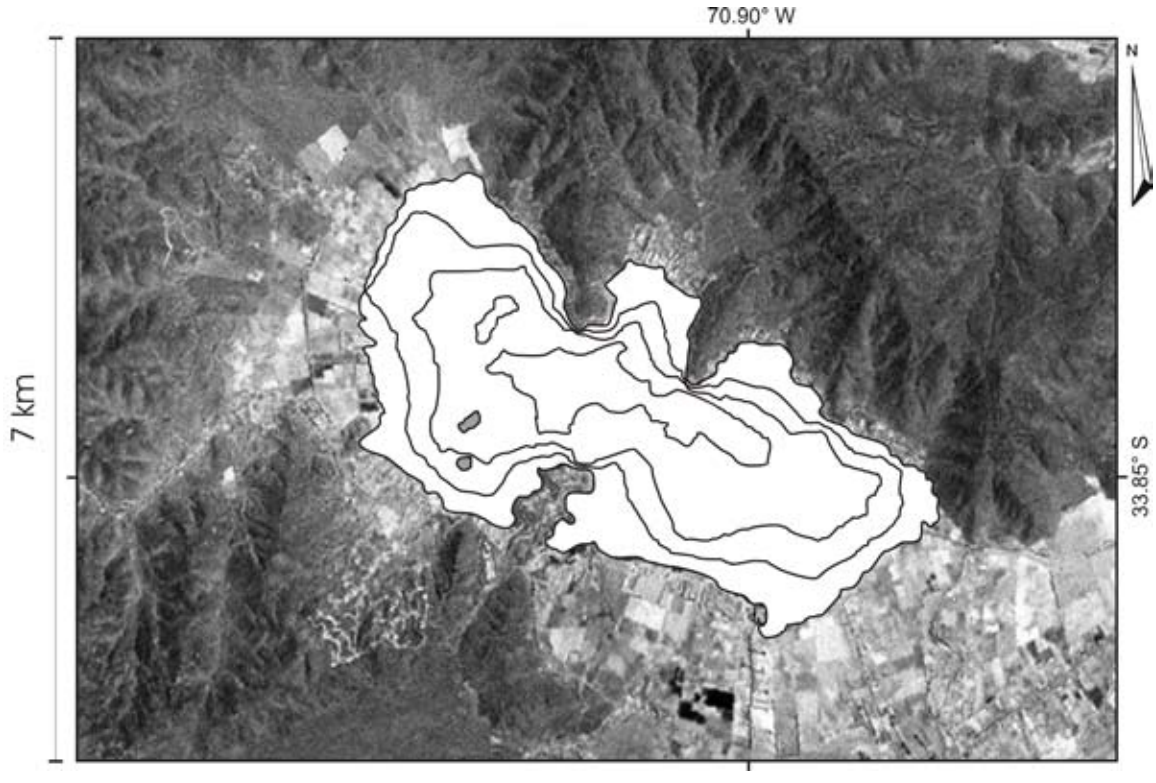

Fig. 4-2 Laguna Aculeo bathymetric map (Isolines: 2 m). Background image: Landsat ETM+, Global Land Cover Facility

Laguna del Copin (32°36'S/70°33'W, 2460 m a.s.l., Fig. 4-1) is an oligo-mesotrophic and polymictic lake, probably of glacial origin, located 100 km north of Santiago. Lake morphometry and water chemistry values are listed in Table 4-4, and a bathymetric map is shown in Fig. 4-8. The lake basin is topographically closed with an underground outflow. The catchment is underlain by Cretaceous sedimentary and volcanic bedrock (igneous and sedimentary breccia, andesitic lavas, ocoite, conglomerate and arenite) (SERNAGEOMIN 2003). Mountains in the catchment reach 3300 m a.s.l. Vegetation in the catchment is limited to a patch of macrophytes which grow along the north-east shore of the lake. Six sediment cores (18-34 cm) were taken from Laguna del Copin (Appendix A1).

Laguna Encañado (33°40'S/70°08'W, 2490 m a.s.l., Fig. 4-1) is an oligotrophic and monomictic lake, situated 50 km east of Santiago. It probably originated from a combination of mass-wasting and moraine formation. It has a maximum depth of 35.8 m, covers an area of 0.51 km^2, and has a total volume of 1.1 10^7 m^3. Lake water chemistry depth profiles are shown in Fig. 4-9, and a bathymetric map is provided in Fig. 4-10.

Laguna Aculeo	
Measurement date	23.10.2005
Lake morphometry	
Area (km^2)	11
Max depth (m)	7
Volume (10^6 m^3)	40-50
Water chemistry	
Temp (°C)	21.0
pH	7.5
Conductivity (μScm^{-1})	231
Dissolved O_2 (mgl^{-1})	8.9
Hardness (mgl^{-1})	122
F (mgl^{-1})	0.13
Cl (mgl^{-1})	5.54
NO_2 (mgl^{-1})	0.21
NO_3 (mgl^{-1})	0.01
PO_4 (mgl^{-1})	0.02
SO_4 (mgl^{-1})	13.1
Na (mgl^{-1})	14.3
NH_4 (mgl^{-1})	0.00
K (mgl^{-1})	2.10
Mg (mgl^{-1})	8.09
Ca (mgl^{-1})	17.32
Sr (mgl^{-1})	0.10

Table 4-1 Lake morphometry and water chemistry of Laguna Aculeo. Water samples were taken in the epilimnion.

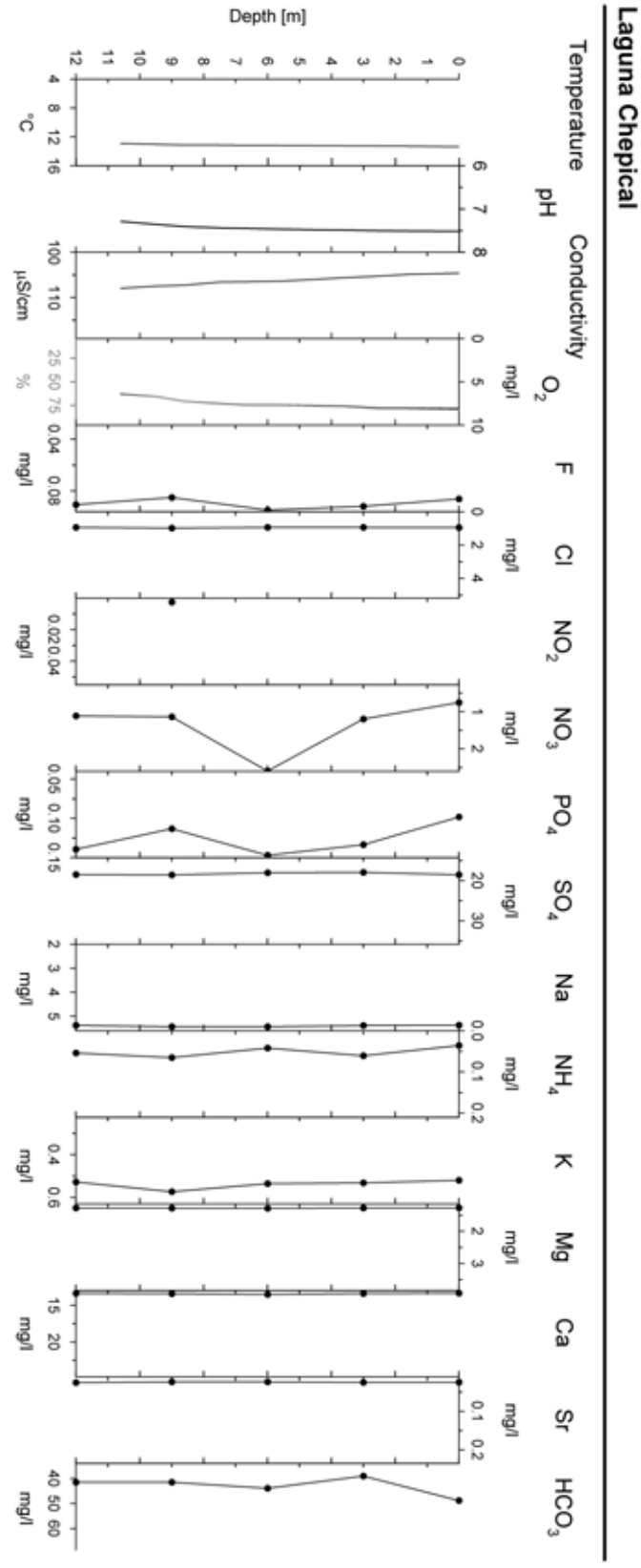

Fig. 4--3 Water chemistry profiles for Laguna Chepical (09.03.2006).

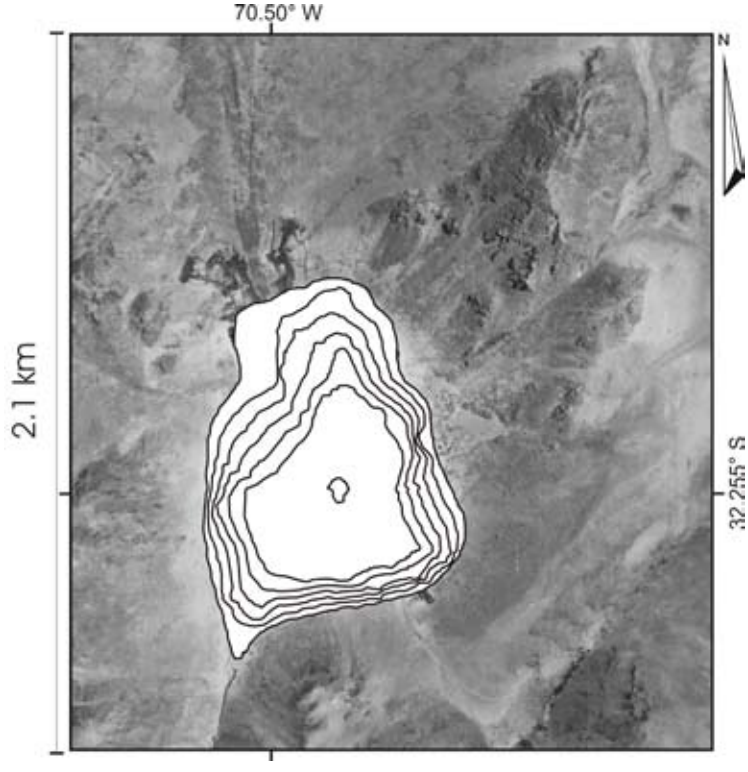

Fig. 4-4 Laguna Chepical bathymetric map (Isolines: 2 m). Background image: Aerial image, IGM Chile

Table 4-2 Radiocarbon dates of the Laguna Chepical core (CHEP 06/03). Poz: Poznań (AMS)

Laguna Chepical				
Sediment depth (cm)	Material	^{14}C yr BP ± 1σ	min–max age cal. BP	Lab code
17.75	bulk organic matter	1315±30	1174-1262	Poz-26625
29.75	bulk organic matter	1135±30	957-1002	Poz-26672
45.25	bulk organic matter	1990±30	1862-1903	Poz-26673
58.25	bulk organic matter	2465±30	2353-2472	Poz-20057
81.25	bulk organic matter	3030±35	3076-3216	Poz-20056

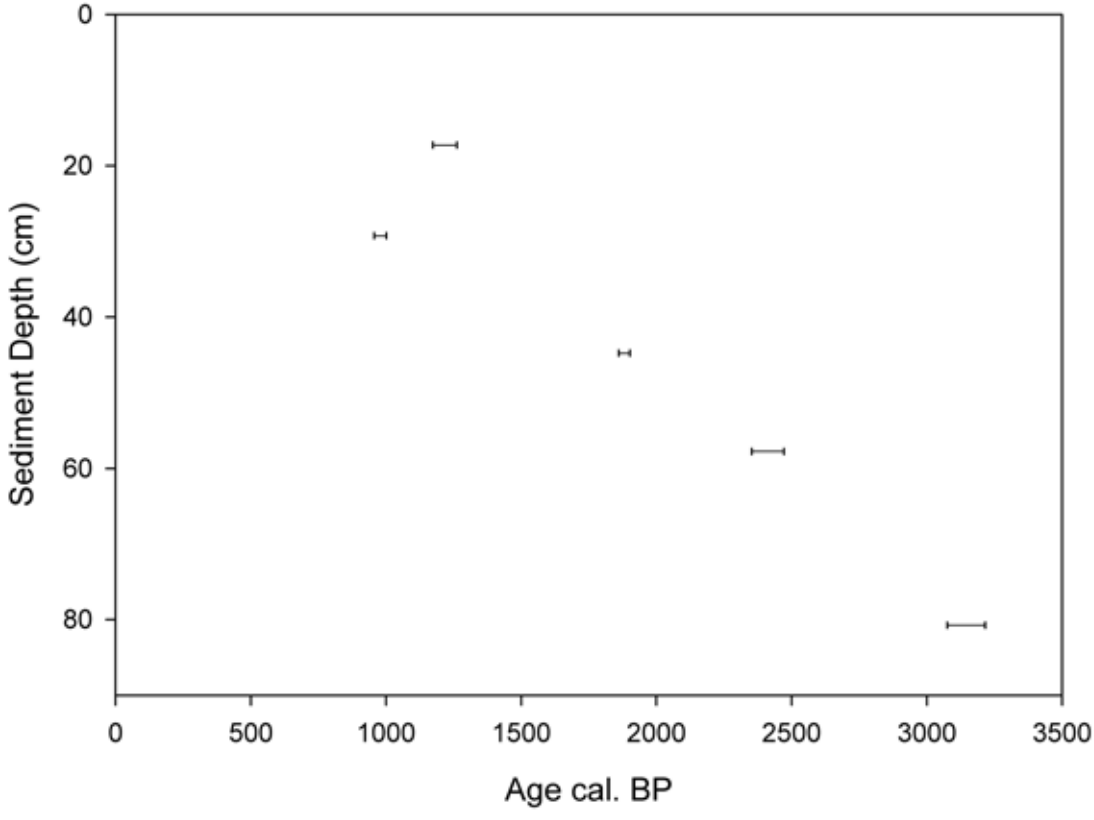

Fig. 4-5 Calibrated ^{14}C ages for Laguna Chepical sediments. Bars represent the 1σ max – min ages

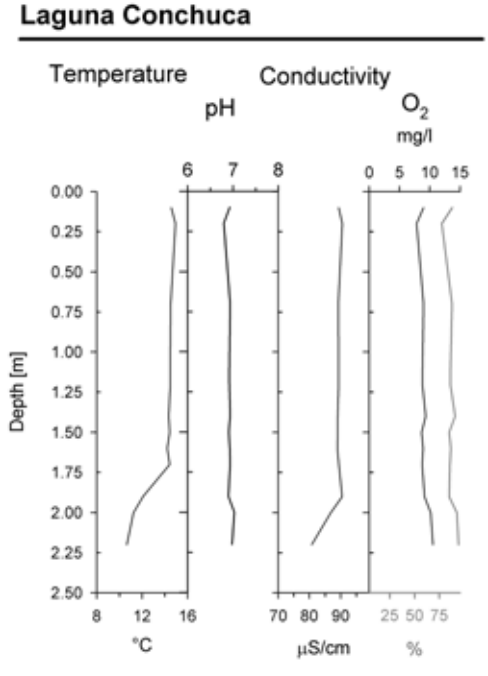

Fig. 4-6 Water chemistry profiles of Laguna Conchuca.

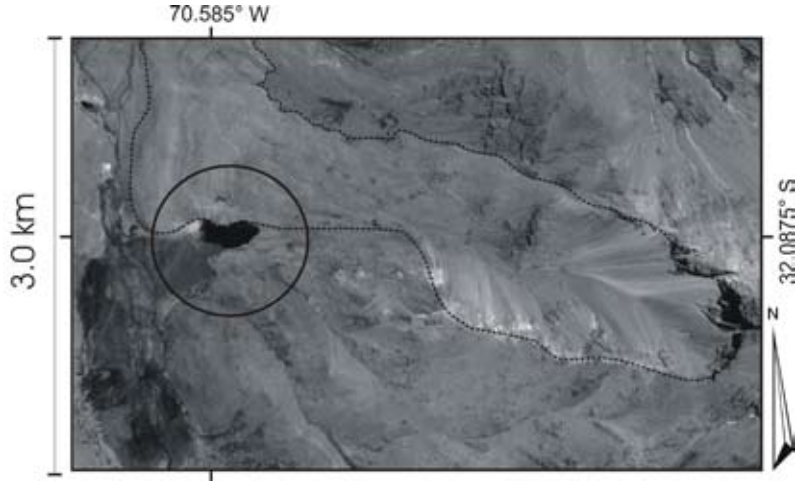

Fig. 4-7 Laguna Conchuca (circle) and the large landside trench to its right (dashed line). Background image: Google Earth

Figure 4-11 shows the record of thermistors which recorded lake water temperature at 30 minute intervals over > 1 year. The catchment consists of Oligocene to Miocene volcano-sedimentary sequences (basaltic to dacitic lavas, epiclastic and pyroclastic rocks) (SERNAGEOMIN 2003), with mountains reaching 4200 m a.s.l. Since AD 1955, the outflow of the lake has been regulated. Four sediment cores (65-96 cm) were taken from Laguna Encañado (appendix A1).

Laguna Ensueño (34°02'S/70°20'W, 3180 m a.s.l., Fig. 4-1) is a polymictic and oligo-mesotrophic lake of glacial origin, situated 80 km south-east of Santiago. Lake morphometry and water chemistry are described in Table 4-5 and bathymetry is shown in Fig. 4-12. The catchment consists mainly of volcanic Miocene rocks (andesites to basalt) (SERNAGEOMIN 2003) with mountains reaching 3650 m a.s.l. Approximately 50% of the lakeshore is occupied by macrophytes (partly Distychia bogs).

Four sediment cores (35-100 cm, Appendix A1) were recovered from Laguna Ensueño. Dating of the selected core was not possible as ^{210}Pb activities were too low for reliable age estimates (chapter 8).

Table 4-3 Lake morphometry and water chemistry of Laguna Conchuca. Water samples were taken in the epilimnion. b.d.l.: Below detection limit

	Laguna Conchuca
Measurement date	26.10.2005
Lake morphometry	
Area (km^2)	0.06
Max depth (m)	3.0
Volume (m^3)	-
Water chemistry	
Hardness (mgl^{-1})	51.24
F (mgl^{-1})	0.019
Cl (mgl^{-1})	0.66
NO_2 (mgl^{-1})	0.030
NO_3 (mgl^{-1})	0.91
PO_4 (mgl^{-1})	b.d.l.
SO_4 (mgl^{-1})	5.35
Na (mgl^{-1})	3.14
NH_4 (mgl^{-1})	0.0055
K (mgl^{-1})	0.41
Mg (mgl^{-1})	1.57
Ca (mgl^{-1})	10.70
Sr (mgl^{-1})	b.d.l.

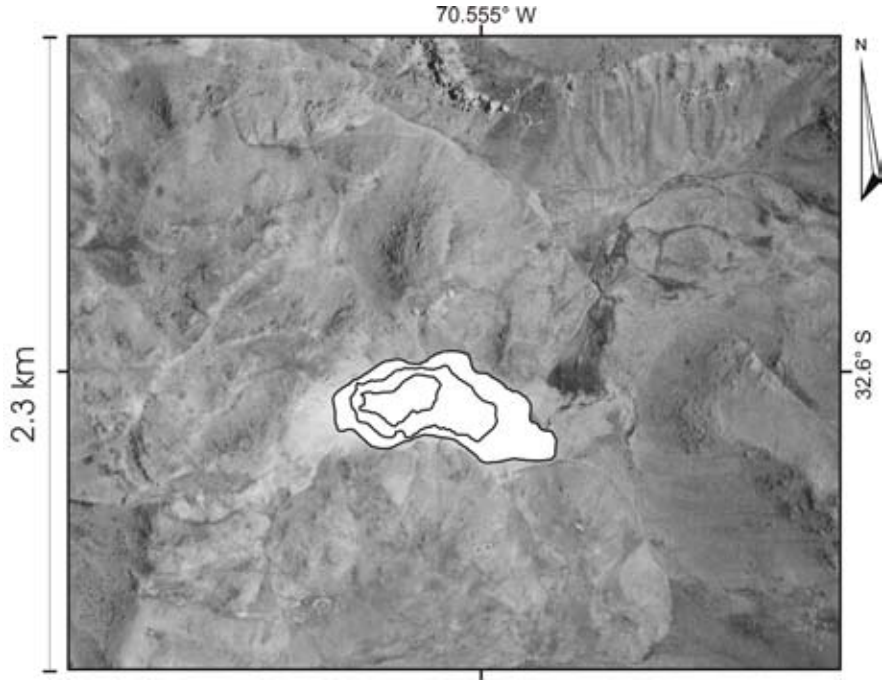

Fig. 4-8 Laguna del Copin bathymetric map (Isolines: 2 m). Background image: Aerial image, IGM Chile

Laguna Del Copin	
Measurement date	30.10.2005
Lake morphometry	
Area (km^2)	0.18
Max depth (m)	5.1
Volume (m^3)	$3.5\ 10^5$
Water chemistry	
Temp (°C)	12.0
pH	7.4
Conductivity (μScm^{-1})	71.7
Dissolved O_2 (mgl^{-1})	-
Hardness (mgl^{-1})	41.48
F (mgl^{-1})	0.039
Cl (mgl^{-1})	1.10
NO_2 (mgl^{-1})	0.015
NO_3 (mgl^{-1})	3.18
PO_4 (mgl^{-1})	0.085
SO_4 (mgl^{-1})	2.81
Na (mgl^{-1})	4.86
NH_4 (mgl^{-1})	b.d.l.
K (mgl^{-1})	1.67
Mg (mgl^{-1})	1.43
Ca (mgl^{-1})	5.70
Sr (mgl^{-1})	0.0579

Table 4-4 Lake morphometry and water chemistry of Laguna del Copin. Water samples were taken in the epilimnion. b.d.l.: Below detection limit.

Laguna El Ocho (34°02'S / 70°19'W, 3250 m a.s.l., Fig. 4-1), situated 80 km south-east of Santiago, is an oligotrophic and meromictic cirque lake with monomictic to dimictic water circulation in the mixolimnion. Lake morphometry and water chemistry values are described in Table 4-6 and Fig. 4-13, and bathymetry is shown in Fig. 4-14. The catchment has steep slopes, which peak at 3800 m a.s.l., and consists mainly of volcanic Miocene bedrock (andesites to basalt) (SERNAGEOMIN 2003). Vegetation is limited.

Four sediment cores (40-108 cm) were recovered from Laguna El Ocho (Appendix A1). One core was selected and dated by radionuclide ^{210}Pb modelling using the ^{137}Cs peak, the SCP profile and stratigraphic layers of well-documented historical earthquakes. A detailed description of the dating methods and the results of the chronology of Laguna El Ocho are given in Chapter 5.

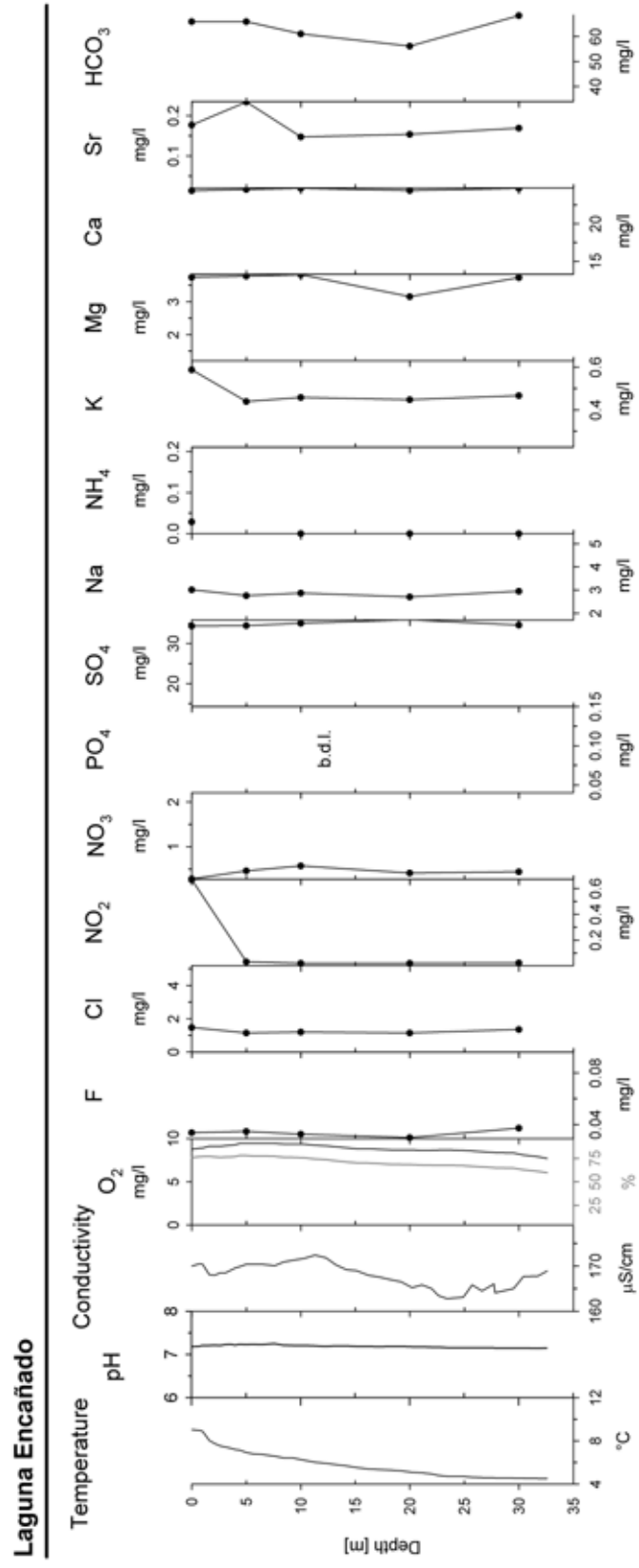

Fig. 4-9 Water chemistry profiles for Laguna Encañado (04.11.2005). b.d.l.: Below detection limit

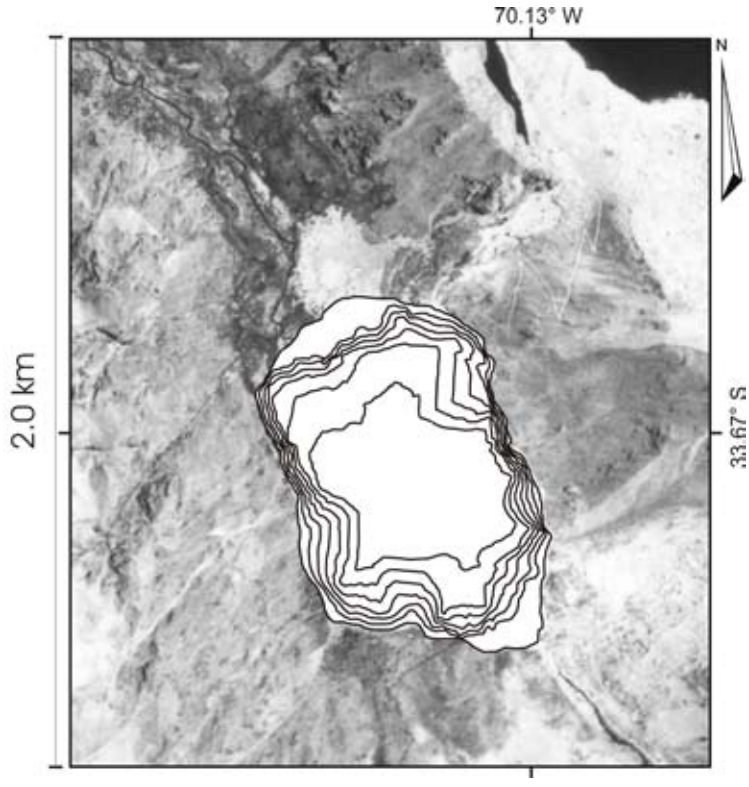

Fig. 4-10 Laguna Encañado bathymetric map (Isolines: 5 m). Background image: Aerial image, IGM Chile

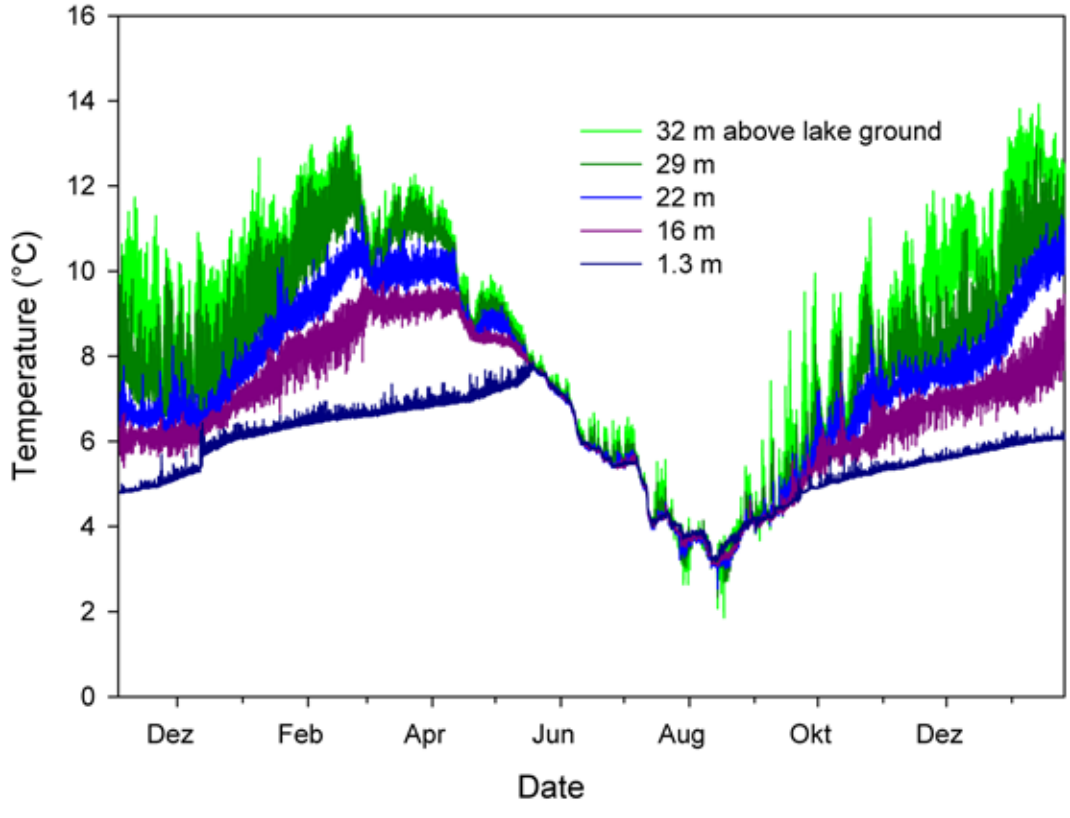

Fig. 4-11 Laguna Encañado themistors were attached to a mooring (S33°40.219'/W70°07.935) at five different depths (water depth at start: ca. 34m). Temperature measurements were taken every 30 minutes between 03.11.2005 and 26.01.2007

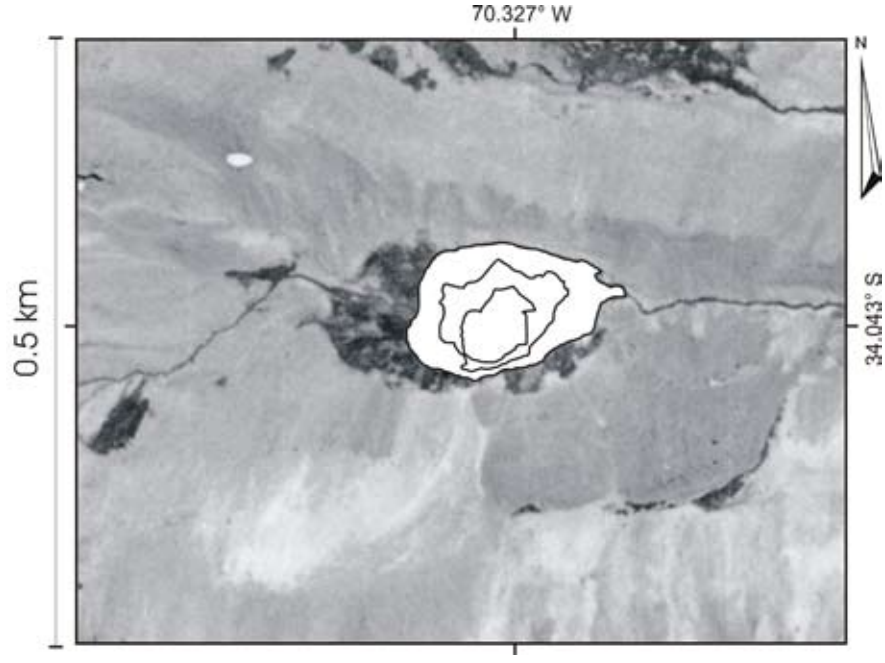

Fig. 4-12 Laguna Ensueño bathymetric map (Isolines: 2 m). Background image: Aerial image, IGM Chile

Table 4-5 Lake morphometry and water chemistry of Laguna Ensueño. Water samples were taken in the epilimnion. b.d.l.: Below detection limit.

Laguna Ensueño	
Measurement date	02.03.2006
Lake morphometry	
Area (km^2)	0.023
Max depth (m)	4.5
Volume (m^3)	$5.0\ 10^4$
Water chemistry	
Temp (°C)	5.0
pH	6.5
Conductivity (μScm^{-1})	71
Dissolved O_2 (mgl^{-1})	-
Hardness (mgl^{-1})	< 10
F (mgl^{-1})	0.12
Cl (mgl^{-1})	0.67
NO_2 (mgl^{-1})	b.d.l.
NO_3 (mgl^{-1})	0.40
PO_4 (mgl^{-1})	b.d.l.
SO_4 (mgl^{-1})	23.78
Na (mgl^{-1})	1.10
NH_4 (mgl^{-1})	0.044
K (mgl^{-1})	0.13
Mg (mgl^{-1})	0.86
Ca (mgl^{-1})	8.54
Sr (mgl^{-1})	0.022

Laguna del Inca (32°50'S / 70°08'W, 2840 m a.s.l., Fig. 4-1) is situated 90 km north-east of Santiago. It is a dimictic and oligotrophic lake, probably of glacial origin. It is deep (> 120 m) and has a surface area of 1.6 km^2. Lake morphometry and water chemistry profiles are shown in Fig. 4-15, and bathymetry is provided in Fig. 4-16. The catchment reaches over 4600 m a.s.l. and consists mainly of Oligocene to Miocene volcano-sedimentary sequences (basaltic to dacitic lavas, epiclastic and pyroclastic rocks) (SERNAGEOMIN 2003). Vegetation cover is very scarce (< 10%, grasses and small shrubs near the lake). Four sediment cores (63-80 cm) were taken from Laguna del Inca (Appendix A1). The chronology of the selected sediment core is presented in Chapter 8. The ^{210}Pb based model was constrained and validated using the ^{137}Cs peak, the SCP profile and the stratigraphic layer of a well-documented historical earthquake. ^{14}C dates of Laguna del Inca strongly overestimate sediment ages and are possibly subject to a radiocarbon-reservoir effect (Table 4-7 and Fig. 4-17). Therefore, ^{14}C measurements could not be used for reliable depth-age modelling in Laguna del Inca.

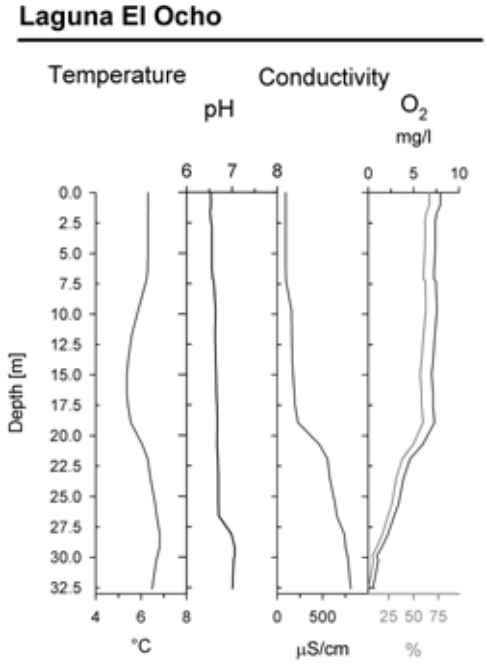

Fig. 4-13 Water chemistry profiles for Laguna El Ocho.

Table 4-6 Lake morphometry and water chemistry of Laguna El Ocho. Water samples were taken in the epilimnion. b.d.l.: Below detection limit

Laguna El Ocho	
Measurement date	02.03.2006
Lake morphometry	
Area (km^2)	0.15
Max depth (m)	45
Volume (10^6 m^3)	2.4
Water chemistry	
Hardness (mgl^{-1})	22.0
F (mgl^{-1})	0.094
Cl (mgl^{-1})	0.69
NO_2 (mgl^{-1})	b.d.l.
NO_3 (mgl^{-1})	0.45
PO_4 (mgl^{-1})	b.d.l.
SO_4 (mgl^{-1})	29.75
Na (mgl^{-1})	0.84
NH_4 (mgl^{-1})	0.031
K (mgl^{-1})	0.20
Mg (mgl^{-1})	0.54
Ca (mgl^{-1})	14.50
Sr (mgl^{-1})	0.027

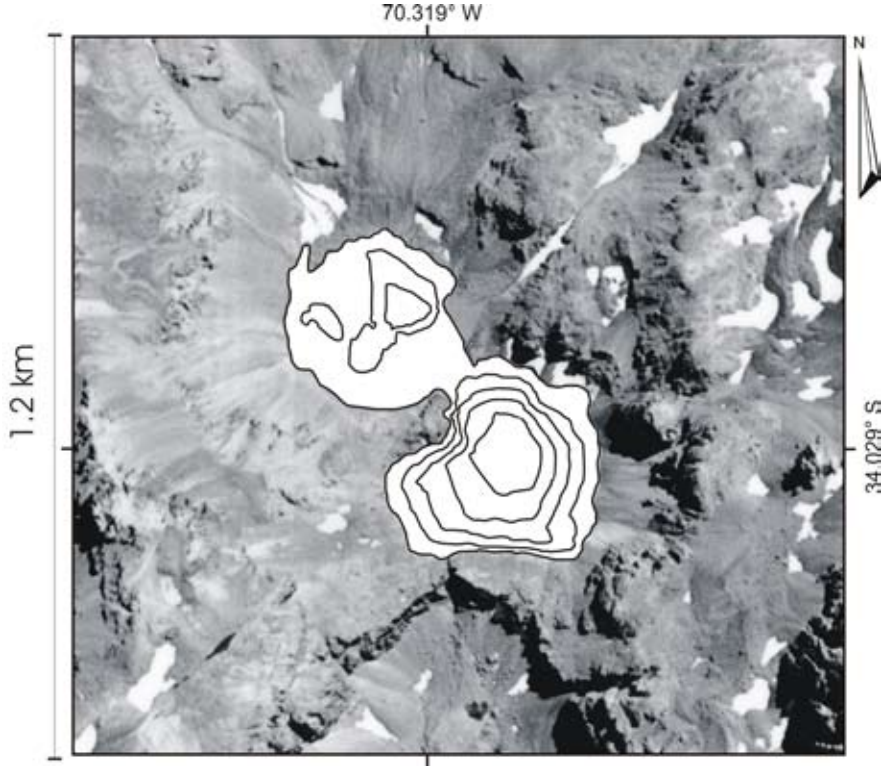

Fig. 4-14 Laguna El Ocho bathymetric map (Isolines: 10 m). Background image: Aerial image, IGM Chile

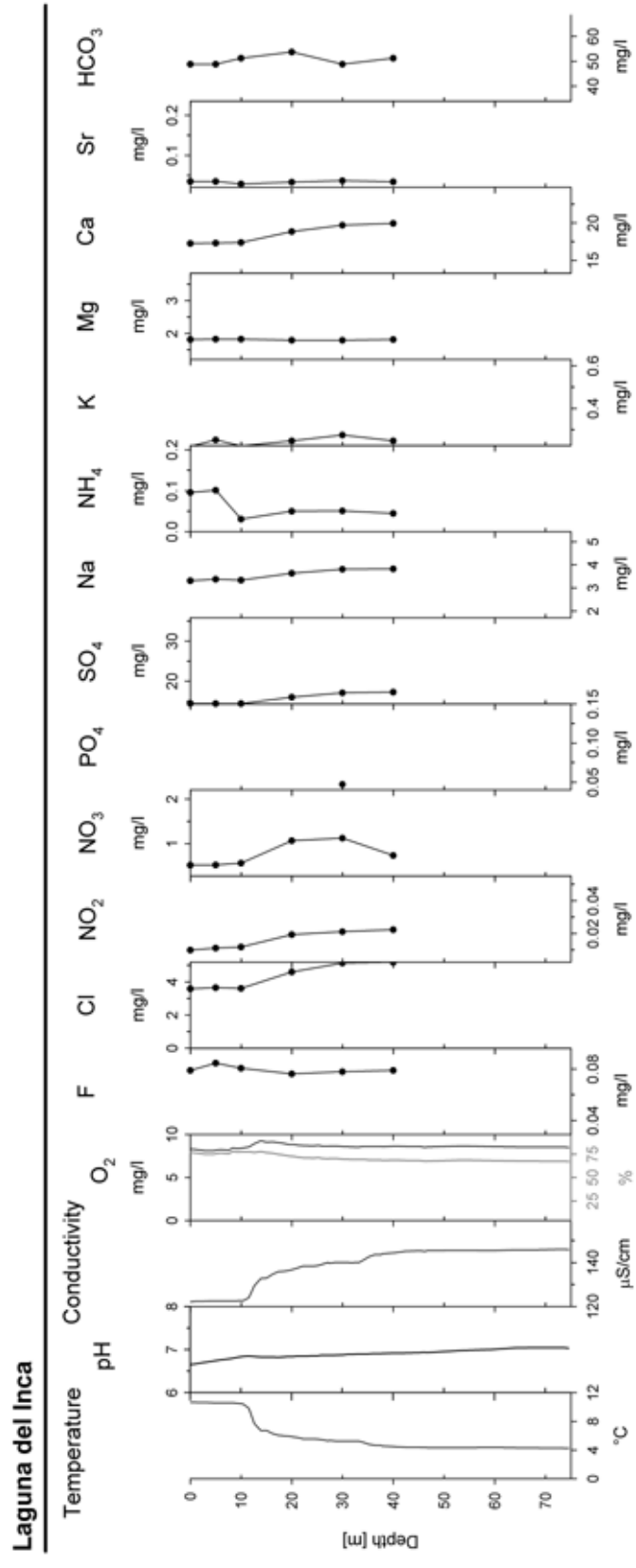

Fig. 4-15 Water chemistry profiles for Laguna del Inca (07.03.2006).

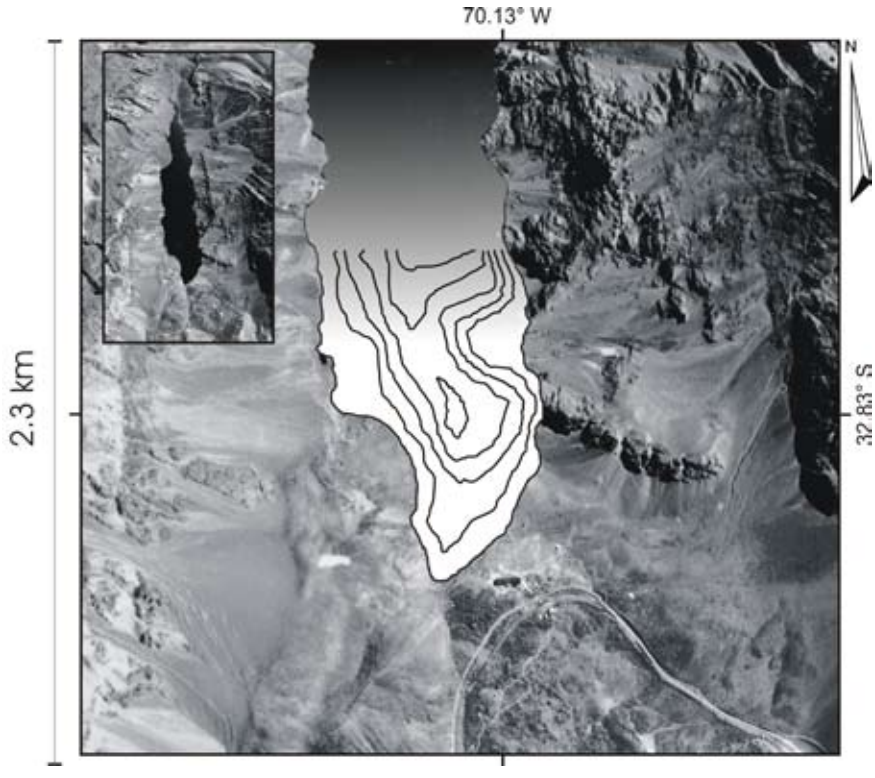

Fig. 4-16 Laguna del Inca bathymetric map (Isolines: 10 m). South of the lake is the Grand Hotel Portillo and the Paso Libertadores road. Background image: Aerial image, IGM Chile

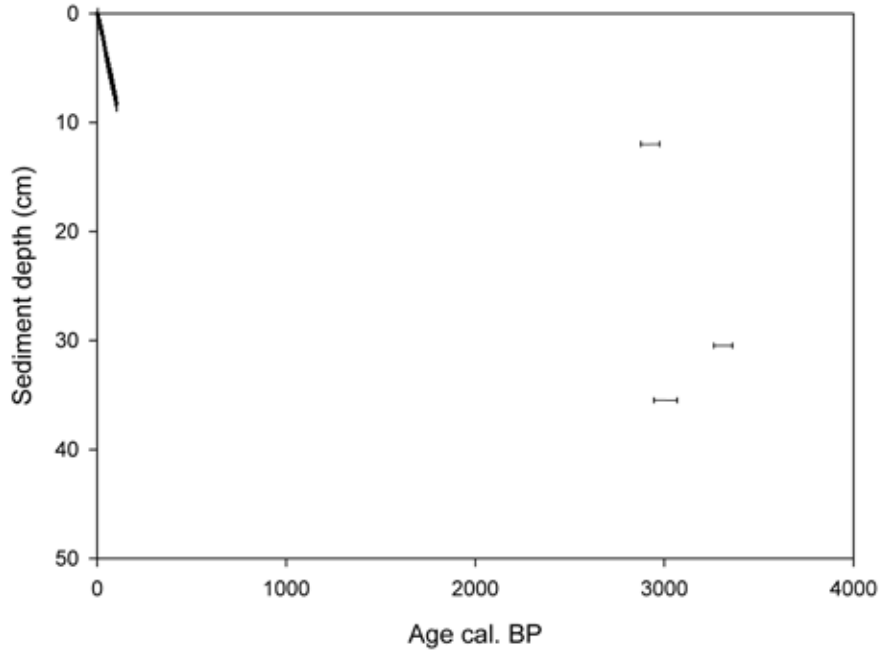

Fig. 4-17 Calibrated ^{14}C ages for Laguna del Inca sediments. Bars represent the ± 1σ ^{14}C ages and the black line the ^{210}Pb based depth-age model

Table 4-7 Radiocarbon dates of the Laguna del Inca core (INCA 06/01). Poz: Poznań (AMS)

Laguna del Inca

Sediment depth (cm)	Material	^{14}C yr BP ± 1σ	min–max age cal. BP	Lab code
12.25	bulk organic matter	2890±30	2876-2975	Poz-20656
30.75	bulk organic matter	3140±35	3262-3360	Poz-20054
35.75	bulk organic matter	2925±35	2945-3068	Poz-20055

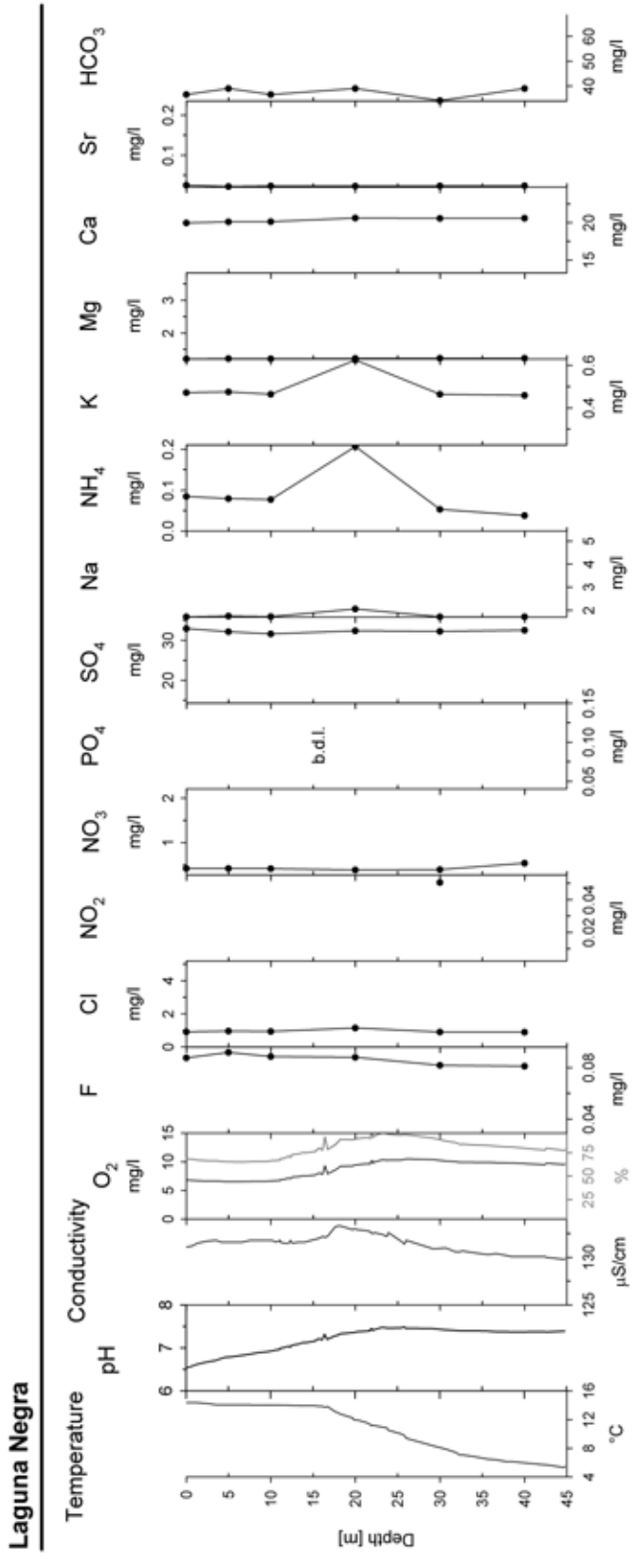

Fig. 4-18 Water chemistry profiles for Laguna Negra (04.03.2006).

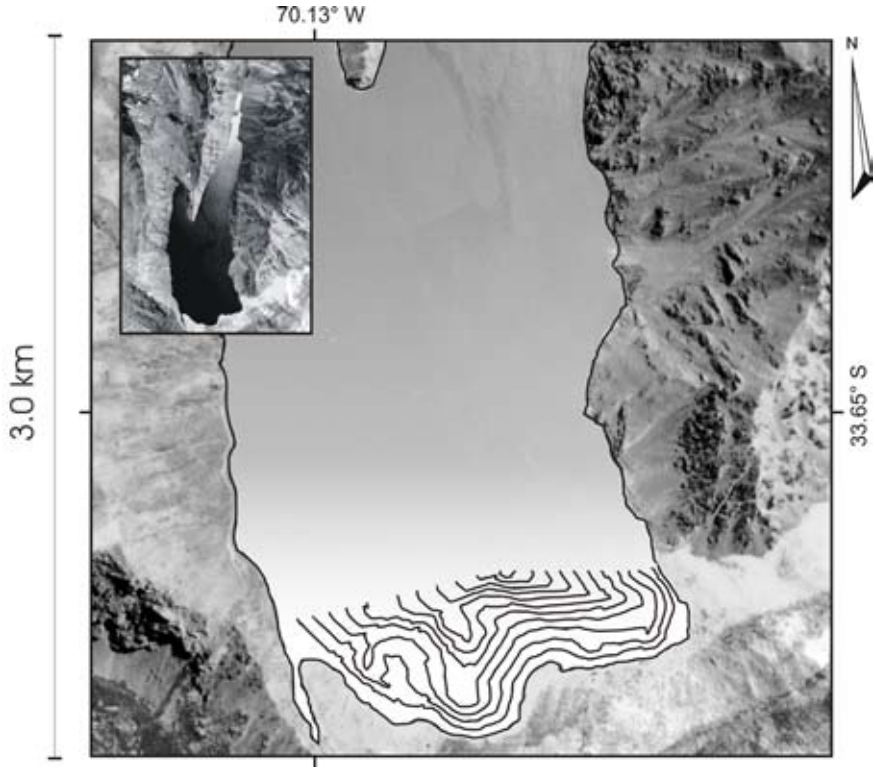

Fig. 4-19 Laguna Negra bathymetric map (Isolines: 10 m). Background image: Aerial image, IGM Chile

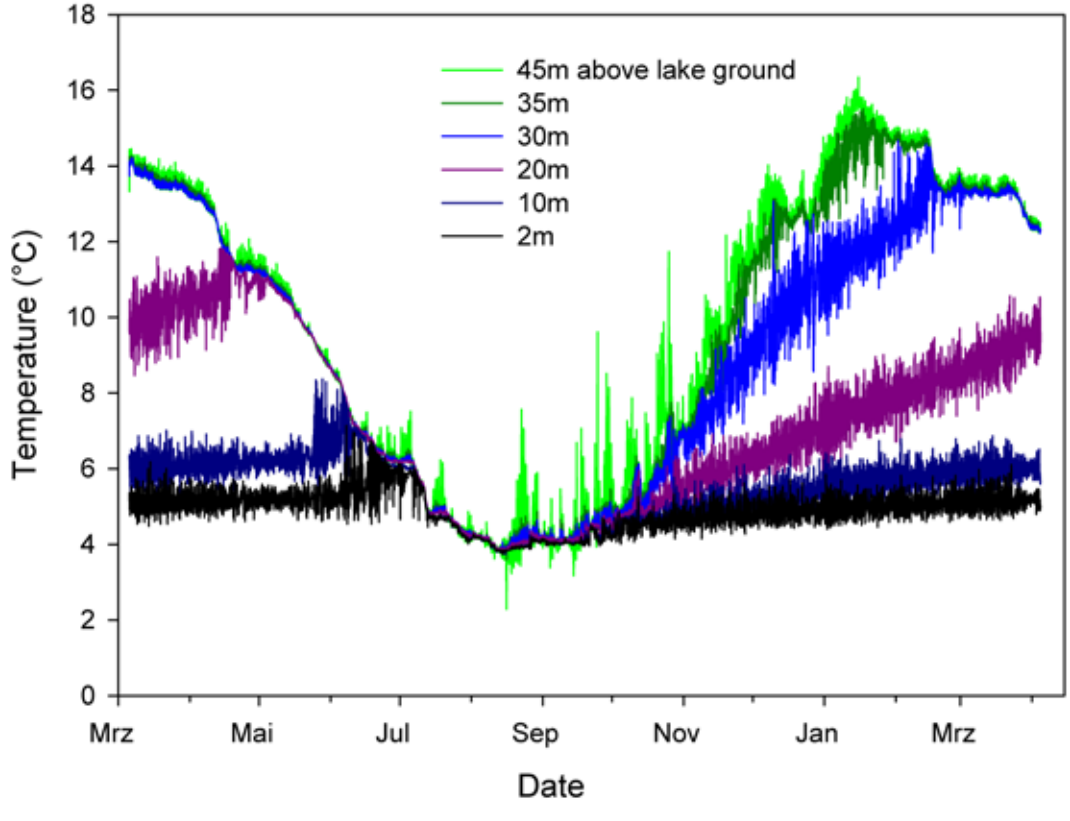

Fig. 4-20 Laguna Negra themistors were attached to a mooring (S33°39.452'/W70°07.663) at six different depths (water depth at start: ca. 50m). Temperature measurements were taken every 30 minutes between 05.03.2006 and 04.04.2007

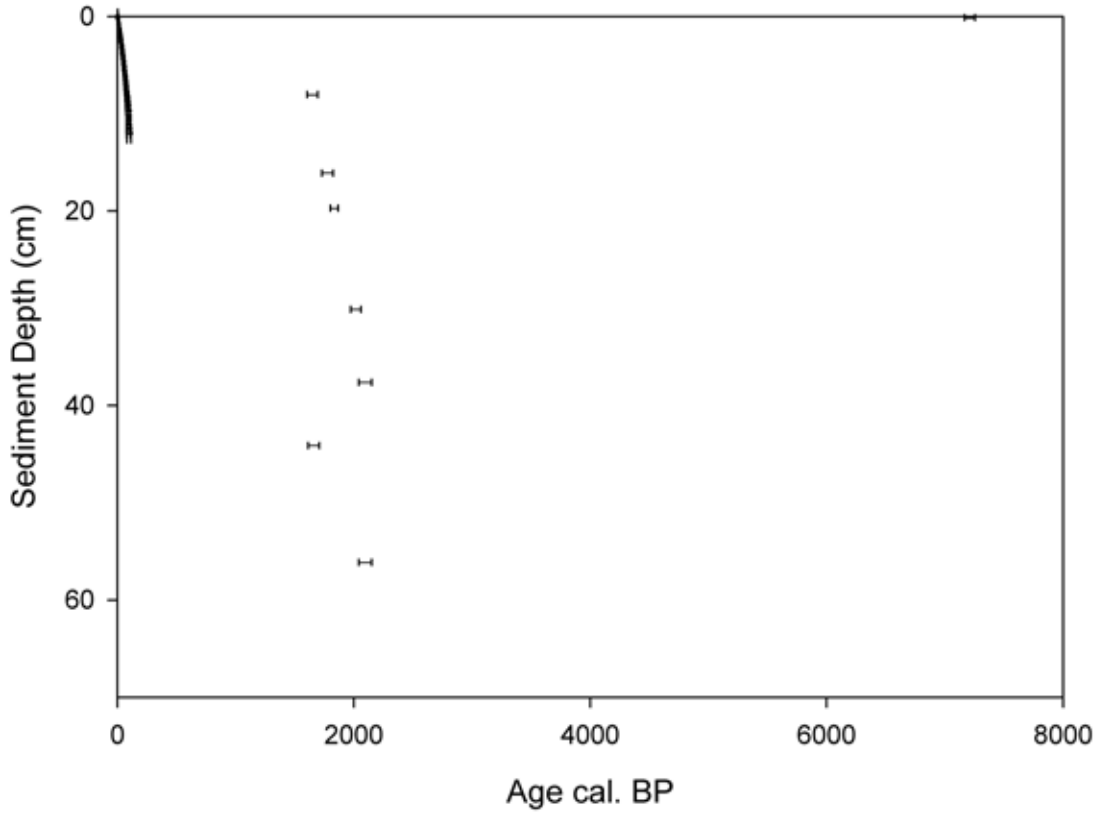

Fig. 4-21 Calibrated ^{14}C ages for Laguna Negra sediments. Bars represent the ±1σ ^{14}C ages and the black line the ^{210}Pb based depth-age model

Laguna Negra (33°38'S / 70°08'W, 2680 m a.s.l., Fig. 4-1) is a monomictic and oligotrophic lake which originated from a combination of glacial activity and mass-wasting, approximately 50 km east of Santiago. It is deep (>120 m) and has a surface area of 5.73 km^2. Water chemistry profiles are shown in Fig. 4-18 and bathymetry is provided in Fig. 4-19. Thermistors measurements data (half-hourly, > 1 year) are plotted in Fig. 4-20. The catchment reaches up to 4600 m a.s.l. and consists mainly of Oligocene to Miocene volcano-sedimentary sequences (basaltic to dacitic lavas, epiclastic and pyroclastic rocks) (SERNAGEOMIN 2003). Vegetation cover is very scarce (<10%, grasses and small shrubs).

Four sediment cores (63-111 cm) were recovered from Laguna Negra in the summer of 2006 (Appendix A1). ^{210}Pb dating of modern sediments (the past 100 years) for one core is described in detail in chapter 5. The ^{210}Pb model was validated and constrained by the ^{137}Cs peak, the SCP profile and the stratigraphic layer of a well-documented historical earthquake. Results of ^{14}C measurements are given in Table 4-8 and Fig. 4-21. ^{14}C ages in Laguna Negra are largely overestimated (Fig. 4-21), implying that there is a radiocarbon-reservoir effect of ca. 1500 years. For example, a sample from 8.7 cm sediment depth which was dated with both ^{210}Pb and ^{14}C, provided ages of AD $1913^{+22}/_{-3}$ and AD 255-345, respectively. The presence of SCPs from this depth invalidates the ^{14}C date. The radiocarbon-reservoir effect appears to be constant between 8.7 and 38 cm sediment depth, with calibrated ages in this section almost perfectly aligned (r^2>0.99). Reasons for the ^{14}C cal. age of 7167-7254 years at the sediment surface remain unclear. Consequently, ^{14}C could not be used for reliable sediment dating in Laguna Negra.

Table 4-8 Radiocarbon dates of the Laguna Negra core (NEGRA 06/02). Poz: Poznań (AMS)

Laguna Negra				
Sediment depth (cm)	Material	^{14}C yr BP ± 1σ	min–max age cal. BP	Lab code
0.25	bulk organic matter	6330±40	7167-7254	Poz-22637
8.7	bulk organic matter	1730±30	1605-1695	Poz-21355
16.5	bulk organic matter	1910±30	1730-1825	Poz-20659
20.1	bulk organic matter	1925±30	1802-1867	Poz-20660
30.5	bulk organic matter	2100±35	1975-2060	Poz-21354
38.0	bulk organic matter	2185±30	2042-2152	Poz-22638
44.5	bulk organic matter	1805±30	1614-1708	Poz-20056
56.5	bulk organic matter	2185±30	2042-2152	Poz-20057

Table 4-9 Lake morphometry and water chemistry of Laguna Verde. Water samples were taken in the epilimnion

Laguna Verde	
Measurement date	31.10.2005
Lake morphometry	
Area (m^2)	730
Max depth (m)	2.3
Volume (m^3)	562
Water chemistry	
Temp (°C)	7.0
pH	6.47
Conductivity (μScm^{-1})	186.5
Dissolved O_2 (mgl^{-1})	-
Hardness (mgl^{-1})	28.06
F (mgl^{-1})	0.22
Cl (mgl^{-1})	1.44
NO_2 (mgl^{-1})	0.033
NO_3 (mgl^{-1})	2.56
PO_4 (mgl^{-1})	0.037
SO_4 (mgl^{-1})	142.00
Na (mgl^{-1})	6.16
NH_4 (mgl^{-1})	0.077
K (mgl^{-1})	1.18
Mg (mgl^{-1})	4.79
Ca (mgl^{-1})	44.23
Sr (mgl^{-1})	0.16

Laguna Verde (32°41'S/70°29'W, 2740 m a.s.l., Fig. 4-1) is a cold, polymictic and oligotrophic lake with a thermokarst basin in the frontal area of a subfossil rock glacier. It is located 80 km north of Santiago. Lake morphometry and water chemistry values are provided in Table 4-9 and bathymetry is shown in Fig. 4-22. Laguna Verde lies in a geomorphologically and periglacially active area (Fig. 4-22). Bedrock geology of the catchment consists of Cretaceous sedimentary and volcanic rocks (igneous and sedimentary breccias, andesitic lavas, ocoite, conglomerate and arenite) (SERNAGEOMIN 2003) and is unvegetated. Mountains in the catchment reach 3500 m a.s.l. Eight sediment cores (18-62 cm) were collected from Laguna Verde (Appendix A1).

4.2 Lakes selection

The selection of lakes for climate and pollution reconstruction was based on the general lake characteristics (geological setting, lake morphometry, water chemistry, among other factors), sedimentological characteristics of the cores and surface sediments, and preliminary radionuclide (^{210}Pb, ^{137}Cs and ^{14}C) and geochemical measurements.

For climate reconstruction, Laguna Aculeo, Negra and del Inca were chosen because of the precise chronologies which were obtained from their sediments for the calibration period (past 100-150 yrs, chapter 5-7). Alternatively, lakes were chosen for the regional pollution history (Laguna Aculeo, Negra, del Inca, El Ocho and Ensueño; for more details see chapter 8) because of both precise chronologies and geographical location near large emission sources.

The potential of sediments from Laguna Encañado to be used as an environmental archive was tested by Salvetti (2006). Preliminary results showed that precise dating of the sediment cores of Laguna Encañado was impossible.

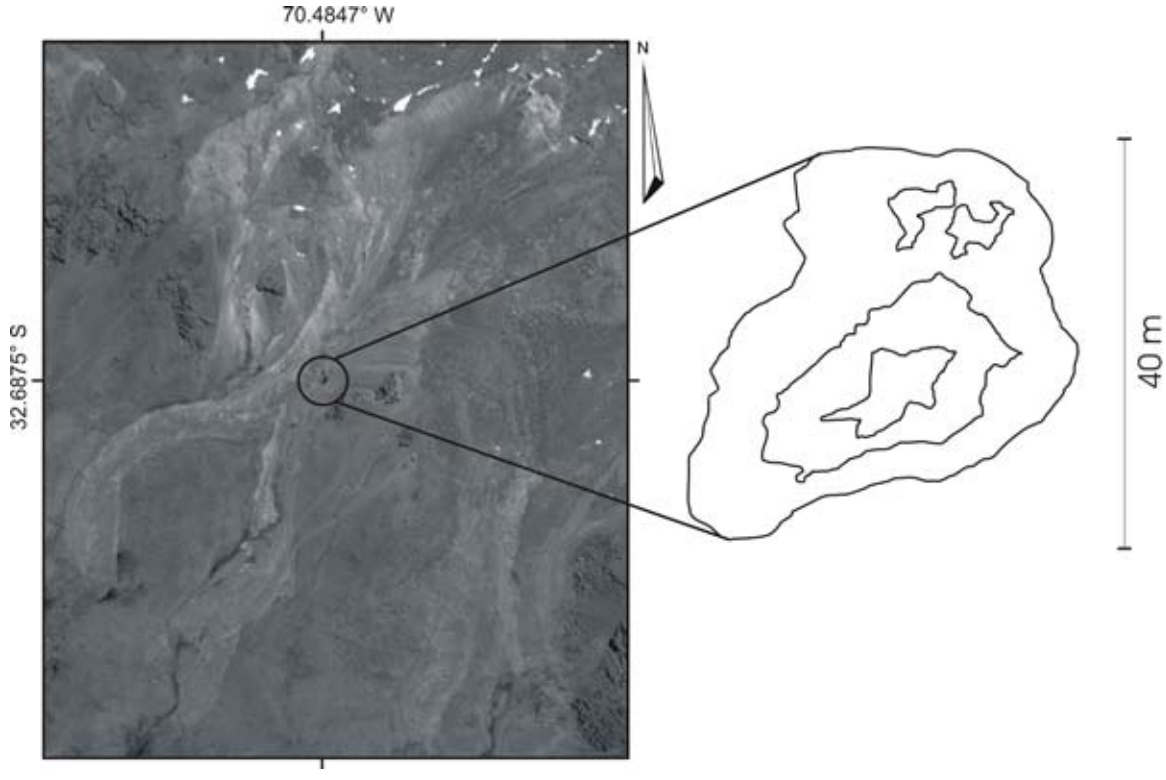

Fig. 4-22 Location of Laguna Verde (circle) within a periglacially active moraine field. The bathymetric map has 2 m isolines. Background image: Google Earth

Therefore, further analyses on the four sediment cores recovered in 2005 (Appendix A1) were not conducted. The sediment cores from Laguna del Copin and Conchuca were short (18-34 and 10 cm respectively, Appendix A1) and assumed to not cover the period of interest in this study. The Laguna Verde sediments were not used because of the location of the lake in a moraine field. Finally, Laguna Chepical was not considered for this study. However, preliminary dating results show that this lake may be used for sediment-based climate reconstructions.

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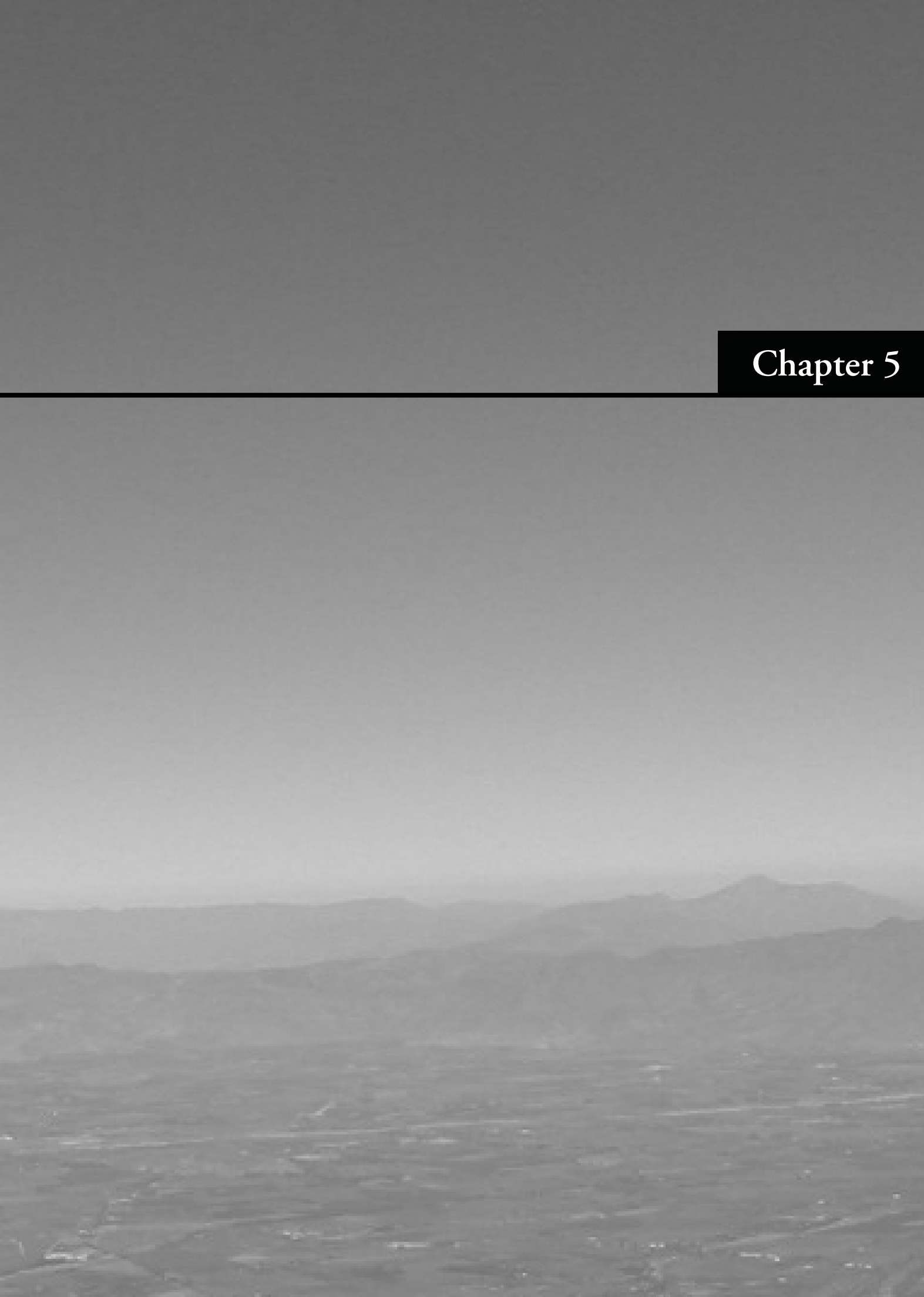
Chapter 5



5. Age modeling of young non-varved lake sediments: methods and limits. Examples from two lakes in Central Chile

L. von Gunten[1*], M. Grosjean[1,2], J. Beer[3], P. Grob[1], A. Morales[4], R. Urrutia[5]

1) University of Bern, Oeschger Centre for Climate Change Research and Institute of Geography, Erlachstrasse 9a, CH-3012 Bern, Switzerland

2) NCCR Climate, University of Bern, CH-3012 Bern, Switzerland

3) Swiss Federal Institute of Aquatic Science and Technology (EAWAG), Department of Surface Waters (SURF), CH-8600 Dübendorf, Switzerland

4) Superintendencia Geología-División El Teniente, Casilla, CODELCO, Chile

5) Universidad de Concepción, Centro EULA-Chile, Casilla, Concepción, Chile

*** Corresponding author. Email adress: lucien.vongunten@giub.unibe.ch, Phone: +41 31 6312092, Fax: +41 31 6318511**

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Abstract

High-resolution and highly precise age models for recent lake sediments (last 100 – 150 years) are essential for quantitative paleoclimate research. These are particularly important for sedimentological and geochemical proxies, where transfer functions cannot be established and calibration must be based upon the relation of sedimentary records to instrumental data. High-precision dating for the calibration period is most critical as it determines directly the quality of the calibration statistics.

Here, as an example, we compare radionuclide age models obtained on two high-elevation glacial lakes in the Central Chilean Andes (Laguna Negra: 33°38'S / 70°08'W, 2680 m a.s.l. and Laguna El Ocho: 34°02'S / 70°19'W, 3250 m a.s.l.). We show the different numerical models that produce accurate age-depth chronologies based on ^{210}Pb profiles, and we explain how to obtain reduced age-error bars at the bottom part of the profiles, i.e. typically around the end of the 19th century.

In order to constrain the age models, we propose a method with five steps: (i) sampling at irregularly-spaced intervals for ^{226}Ra, ^{210}Pb and ^{137}Cs depending on the stratigraphy and microfacies, (ii) a systematic comparison of numerical models for the calculation of ^{210}Pb-based age models: constant flux constant sedimentation (CFCS), constant initial concentration (CIC), constant rate of supply (CRS) and sediment isotope tomography (SIT), (iii) numerical constraining of the CRS and SIT models with the ^{137}Cs chronomarker of AD 1964 and, (iv) step-wise cross-validation with independent diagnostic environmental stratigraphic markers of known age (e.g. volcanic ash layer, historical flood and earthquakes). In both examples, we also use airborne pollutants such as spheroidal carbonaceous particles (reflecting the history of fossil fuel emissions), excess atmospheric Cu deposition (reflecting the production history of a large local Cu mine), and turbidites related to historical earthquakes.

Our results show that the SIT model constrained with the ^{137}Cs AD 1964 peak performs best over the entire chronological profile (last 100 – 150 years) and yields the smallest standard deviations for the sediment ages. Such precision is critical for the calibration statistics, and ultimately, for the quality of the quantitative paleoclimate reconstruction. The systematic comparison of CRS and SIT models also helps to validate the robustness of the chronologies in different sections of the profile.

Although surprisingly poorly known and under-explored in paleolimnological research, the SIT model has a great potential in paleoclimatological reconstructions based on lake sediments.

Keywords; *Sedimentology, Paleolimnology, radionuclides, Sediment Isotope Tomography, Calibration, South America*

5.1 Introduction

High-resolution (annual to sub-decadal), well-calibrated, climate-state variables from natural paleoclimatic archives are pre-requisites to establish robust climate reconstructions at regional to global scales (Jones and Mann 2004; Luterbacher et al. 2004; Moberg et al. 2005). Such variables are, ultimately, the scientific basis to quantitatively assess natural forced and unforced climate variability of the past, detect recent anthropogenic climate change, and evaluate statistics of extreme events. High-resolution paleoclimatic data with known and, ideally, small uncertainties help significantly to reduce uncertainties of future climate change (Hegerl et al. 2006).

Lake sediments are valuable paleoclimate archives, especially because of their potential to preserve both the high and the low frequency components of climate variability, and to provide very long records (Moberg et al. 2005). However, lake sediment records are rarely used

for quantitative regional, global, or inter-hemispherical comparisons (Jones and Mann 2004; Luterbacher et al. 2004; Moberg et al. 2005). Whereas tree-rings, documentary data (e.g., historical chronicles), ice core and coral data sets are widely used in such reconstructions, only very few lake-sediment data sets meet the quality requirements for such purposes. Lake sediments do not systematically provide: (i) seasonal to annual temporal resolution, (ii) significant correlation with instrumental data (precipitation, temperature…), (iii) known statistical uncertainties and reduced errors of the reconstructed variable, and (iv) well-dated, long records.

Typically, geochemical or taxonomic analysis of sedimentary constituents is very time-consuming. Millennial-long annually resolved time series could not be produced. However, new rapid non-destructive scanning techniques (Zolitschka et al. 2001) have the potential to generate large proxy data sets from lake sediments. However, it is often difficult to develop paleoclimate records from such proxies. For example, Transfer Functions ("calibration space for time", Birks 1998) cannot be applied to geochemical proxies because a modern training set cannot be established due to the heterogeneity of settings in different catchments. Therefore, "calibration in time", that is correlation with instrumental records, needs to be applied for geochemical sediment proxies if they are used for quantitative paleoclimate reconstructions. Obviously, high-precision dating of lake sediments during the time with instrumental meteorological data series (typically the last 100 – 150 years) is fundamental for such purposes. Often, the calibration period is limited by relatively short instrumental records, which is most critical if it needs to be split into two parts (calibration and cross-validation of the calibration) to estimate the error of the calibration statistics (Cook et al. 1994). That is the reason why the full range of the calibration period must be used. In consequence, high-precision dating is essential for the entire temporal range of the calibration, in particular for the beginning of the instrumental period (typically the end of the 19th century). Unfortunately, that is exactly the time when ^{210}Pb-based chronologies show the largest uncertainties.

In non-varved lake sediments younger than ca. 150 years, ^{210}Pb radiochronology (Krishnaswamy et al. 1971; Robbins 1978; Appleby 2000; Appleby 2001; Appleby 2008) is the common "dating" technique, often combined with discrete stratigraphic chronomarkers such as (i) ^{137}Cs peaks (AD 1963-64), and the Chernobyl AD 1986 peak (Pennington et al. 1973; Ritchie et al. 1973; Albrecht et al. 1998; Abril 2004), (ii) peaks of spheroidal carbonaceous particle (SCP) profiles (Renberg and Wik 1984; Renberg and Wik 1985; Rose et al. 1999), and (iii) historical flood, earthquake or volcanic ash layers (e.g. Arnaud et al. 2002; Blass et al. 2007; Chapron et al. 2007; Boës and Fagel 2008). These events are discrete chronostratigraphic markers and do not provide continuous chronologies, which is required for calibrations with instrumental records. Interpolation may not be appropriate for high-precision chronologies if sedimentation rates change in time.

In theory, radiometric ^{210}Pb activity profiles may provide continuous chronologies. Here the difficulty is that the ^{210}Pb activities have to be converted into numerical ages to obtain an age-depth model. Typically, one of the conceptual CFCS (constant flux constant sedimentation), CIC (constant initial concentration) or CRS (constant rate of supply) models (Appleby and Oldfield 1978; Robbins 1978; Appleby 2001; Appleby 2008) is used for this purpose. However, it is not a-priori known which of the models gives the best results. In most cases, variants of the CRS model are used. Usually, this model yields more realistic results than the CIC model (Oldfield et al. 1978; Appleby et al. 1979; Appleby 2008), although in some lakes the CIC model provides better results (e.g. Turner and Delorme 1996; Appleby 2001; Sonke et al. 2003). The model choice is often subjective and accepted if the result is consistent with the ^{137}Cs stratigraphic markers. Other than the CFCS and the CIC model, the CRS model can actually be constrained and forced through the AD 1964 peak (composite CRS model). Surprisingly, the pre-AD 1964 sediment ages are only very rarely validated, which is arguably not essential for many paleolimnological studies. But this is rather unfortunate as the lower part of the ^{210}Pb chronologies is often used to extrapolate sedimentation rates back to the beginning of the last millennium. This is the time when ^{14}C dating yields acceptable probability density functions for sediment ages (e.g., McCormac et al. 2004). Unfortunately, the time before the ^{210}Pb-dating range starts is precisely the period (Little Ice Age chronozone) with potentially the best chance to quantitatively assess natural climate variability (Bradley et al. 2003).

More recently, the inductive sediment isotope tomography model (SIT) has been introduced by Liu et al. (1991) to evaluate ^{210}Pb profiles in marine sediments. The SIT model has the advantage that it calculates sediment ages without a-priori assumption (such as CRS or CIC) and it can be applied when the sedimentation rate as well as the flux and the initial concentration of unsupported ^{210}Pb vary with time (Carroll et al. 1995; Carroll and Lerche 2003). Although tests with synthetic data have shown that the SIT model is a reliable alternative to the CRS and CIC models, it is surprisingly poorly recognized in the paleolimnological community and has, to our knowledge, only been used in a few limnological studies (Waugh et al. 1998; Carroll et al. 1999a; Carroll et al. 1999b).

In this paper we investigate two high-elevation proglacial lakes in the Central Chilean Andes and show how ^{210}Pb-based chronologies and their precision can

be assessed and improved by a systematic ^{210}Pb model comparison. First we tested the unconstrained models (without stratigraphic markers). Subsequently we constrained the CRS and SIT models with the ^{137}Cs peak of AD 1964 and verified the continuous ^{210}Pb-chronologies with further site-specific independent discrete stratigraphic markers of known age. Ideally, these chronomarkers are well distributed across the time range of interest (last 150 years).

5.2 Study area, lake sediments and stratigraphic markers

Laguna Negra and Laguna El Ocho are high-elevation lakes in the western (windward) Central Chilean Andes. The studied area is located in the transition zone between the temperate, semi-arid, summer-warm (Csb) and the dry-cool high-mountain (E) climate (classification Köppen-Geiger), which is seasonally under subtropical (austral summer) or westerly (austral winter) influence. South-westerly winds predominate throughout the year (Miller 1976). The boundary-layer winds in the Andes, however, are confined through the W-E orientation of the valleys. This observation is important with regard to the transport and dispersal of pollutants, including SCPs and excess atmospheric Cu fallout. Laguna Negra is directly influenced by the urban and industrial history of Santiago, while Laguna El Ocho carries the fingerprint of the nearby Cu mine El Teniente.

Seismically, many large (> Mw 7) historical earthquakes have been observed during the past 150 years in the region (Barrientos 2007; Servicio sismologico de Chile 2008). Three of them were exceptionally strong. including the Great Chilean earthquake of AD 1960 (Mw 9.5) with the epicentre to the south of the study area (39°5' S), the earthquake AD 1906 (Mw 8.2) to the north of the study area (33°0' S), and the earthquake AD 1985 (Mw 8.0). The earthquake AD 1850 was not particularly strong (Mw 7.3) but had its epicentre directly in the area of the lakes (33.8°S/70.2°W). These earthquakes produced diagnostic marker layers in lake sediments from Central Chile (Chapron et al. 2007; Moernaut et al. 2007).

Laguna Negra

Laguna Negra (33°38'S / 70°08'W, 2680 m a.s.l., Fig. 5-1), located east of the city of Santiago de Chile (6.3 million people in 2006), is a large (5.73 km^2) and deep (>120 m) monomictic lake of combined glacial/landslide-dammed origin. It is oligotrophic, neutral (mean pH = 7.0), has a mean electric conductivity of 131 µS cm^{-1} and is well oxygenated throughout the water column. Mean dissolved oxygen content was 8.2 mg l^{-1}, as measured along a 45 m profile on March 4, 2006. The catchment ranges up to 4600 m a.s.l. and consists mainly of Oligocene to Miocene volcanites (andesites to basalt, dacite). Vegetation cover is very scarce (<10%, grasses and small shrubs).

The sediment core of Laguna Negra consists of four sedimentary facies (Fig. 5-2). Facies A1 is composed of dark greyish brown (4/2 2.5Y), massive fine to coarse silt (terminology after Munsell Color 1994). Facies A2 is a dark greyish brown (4/2 10YR) massive fine to coarse silt. Facies B is a massive silty interlayer with high organic content (C_{org} 3-4 %) and macrofossil remains, mainly Fissidens water mosses. Facies C is a dark yellowish brown (4/6 10YR), massive, fine to coarse silt. Facies D is a gray (5/1 10YR), massive, fine to medium silt layer with fine to coarse stones.

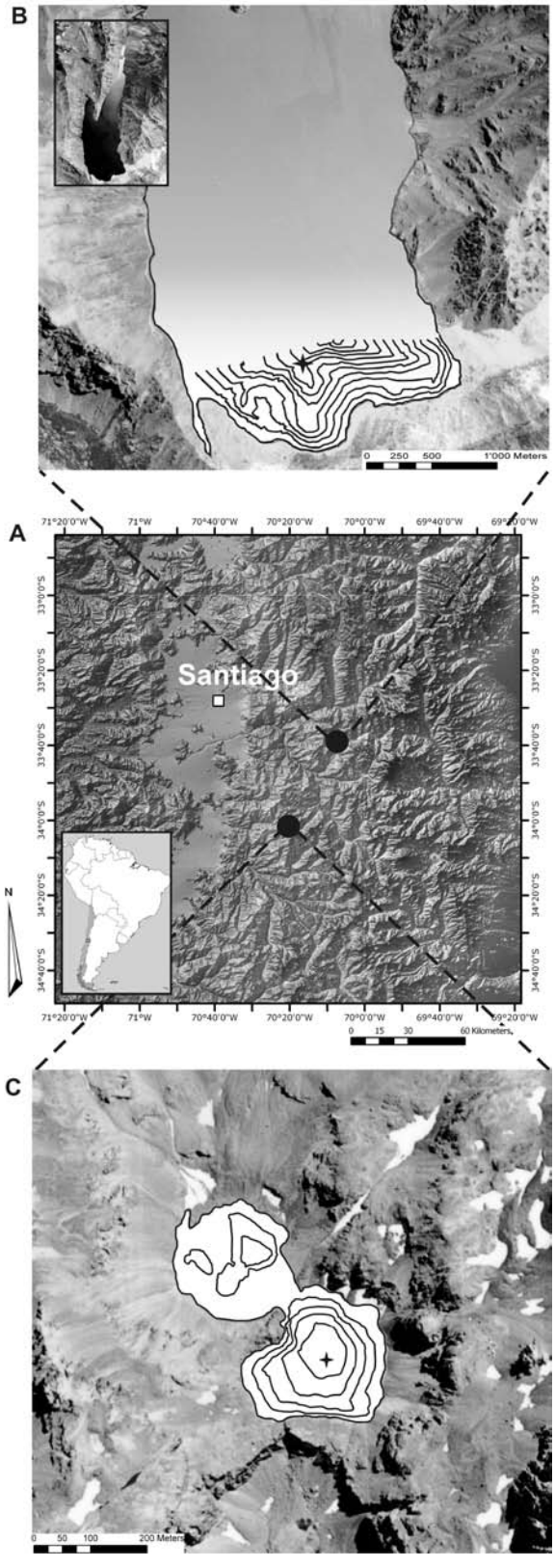
The atmospheric pollution history of Laguna Negra, as indicated by the SCP profile, is dominated by the urban and industrial history of windward Santiago. Because of modern industrialisation and urban growth of Santiago in the 1850's to 1860's (Rippy and Pfeiffer 1948; Mamalakis 1976; Ortega 1981), the occurrence of the first SCPs in the sediment profile is expected around that time. This is consistent with an SCP profile of Laguna Aculeo (33°50'S/70°54'W, 350 m a.s.l.) directly adjacent to Santiago, where the first SCPs have been dated to AD 1857 ± 6 (von Gunten et al. unpublished data).

Laguna El Ocho

Laguna El Ocho (34°02'S / 70°19'W, 3250 m a.s.l.), situated 80 km south-east from Santiago (Fig. 5-1), is a small (15 ha), 45-m deep meromictic cirque lake with monomictic to dimictic water circulation in the mixolimnion. It is oligotrophic and has in the mixolimnion a pH of 6.6, an electric conductivity of 133 µS cm^{-1} and a dissolved oxygen content of 7.4 mg l^{-1}. The monimolimnion has a pH of 7.0, an electric conductivity of 787 µS cm^{-1} and dissolved oxygen content of 0.9 mg l^{-1}. The catchment has very steep slopes, ranges up to 3800 m a.s.l., and consists mainly of volcanic Miocene rocks (andesites to basalt). The catchment is free of vegetation.

Four facies were identified in the sediment core of Laguna El Ocho (Fig. 5-3). Facies A consists of grayish brown and gray (5/2 10YR, 6/1 7.5YR), very finely laminated, very fine to medium silt. Bioturbation can be excluded. Facies B consists of greyish brown and gray (5/2 10YR, 6/1 7.5YR), fine to medium laminated very fine to medium silt. Facies C is composed of greyish brown and gray (5/2 10YR, 6/1 7.5YR), massive very fine to medium silt. Facies D is made of greyish brown to gray (5/2 10YR, 6/1 7.5YR), massive very fine to medium silt, with fine to medium stones.

The atmospheric pollution history of Laguna El Ocho is dominated be the local Cu mine El Teniente, the World's largest underground Cu mine, located windward



from the lake further down-valley. Due to the mean synoptic wind regime, the influence of the megacity Santiago to the NW is minimal. Industrial mining started at El Teniente in the late end of the 19th century. The first smelter operated from AD 1904 onwards, and large-scale smelting started AD 1907 and AD 1909 (Jara 2005). Thus, first continuous SCP deposition in Laguna El Ocho did not occur before the beginning of the 20th century but should be placed around AD 1907 or AD 1909. A diagnostic peak in excess atmospheric Cu deposition (indicated by Cu/Rb) was identified at 2.25 cm sediment depth (Fig. 5-3): the significant decrease (despite increasing Cu production) reflects precisely the commissioning of a new smelting technique and mineral dust recovery at El Teniente mine in the year AD 1977 (von Gunten et al. unpublished data).

5.3 Methods

In 2006, we retrieved short sediment cores with an UWITEC gravity corer equipped with action hammer in the deepest part of Laguna El Ocho (42 m water depth) and at 79 m water depth in Laguna Negra (Fig. 5-1). Cores were stored cold at 5°C until opened.

Prior to sampling for ^{210}Pb activity measurements, we prepared thin sections for sedimentary microfacies analysis using a four-component synthetic resin mixture (64% NSA, 25% VCD, 10% DER and 1% DMAE) in order to detect sections with rapid sedimentation (e.g. turbidites) that need to be removed from the ^{210}Pb activity profile (Arnaud et al. 2002). Subsequently, we used continuous sampling at irregular intervals according to the sedimentary microfacies for ^{210}Pb activity measurements. In Laguna Negra, we used a sampling interval between 0.4 - 0.7 cm, and in Laguna El Ocho, a sampling interval of 0.5 cm matched well with the limits of visible turbidites. This allowed us to precisely remove turbidite layers without loosing unsupported ^{210}Pb in the total activity of the profile.

Spheroidal carbonaceous particle (SCP) samples were prepared after Renberg and Wik (1985; H_2O_2 30% and HCl 10%), and were counted under a stereo-microscope at 50x magnification (Grob 2008).

Gamma-decay counts of ^{210}Pb (46.5 keV), ^{226}Ra (352 and 609 keV) and ^{137}Cs (662 keV) were collected for more than 20 hours using Canberra low background, well-type GeLi-detectors at EAWAG, Dübendorf. We calculated the unsupported ^{210}Pb activity with the level-by-level

Fig. 5-1 showing A) the study area with the location of both lakes and of the city Santiago de Chile B) Geographical setting, bathymetric map of Laguna Negra with the coring site; the bathymetric contour interval is 10 m C) Geographical setting, coring site and bathymetric map (isolines of 10 m) of Laguna El Ocho

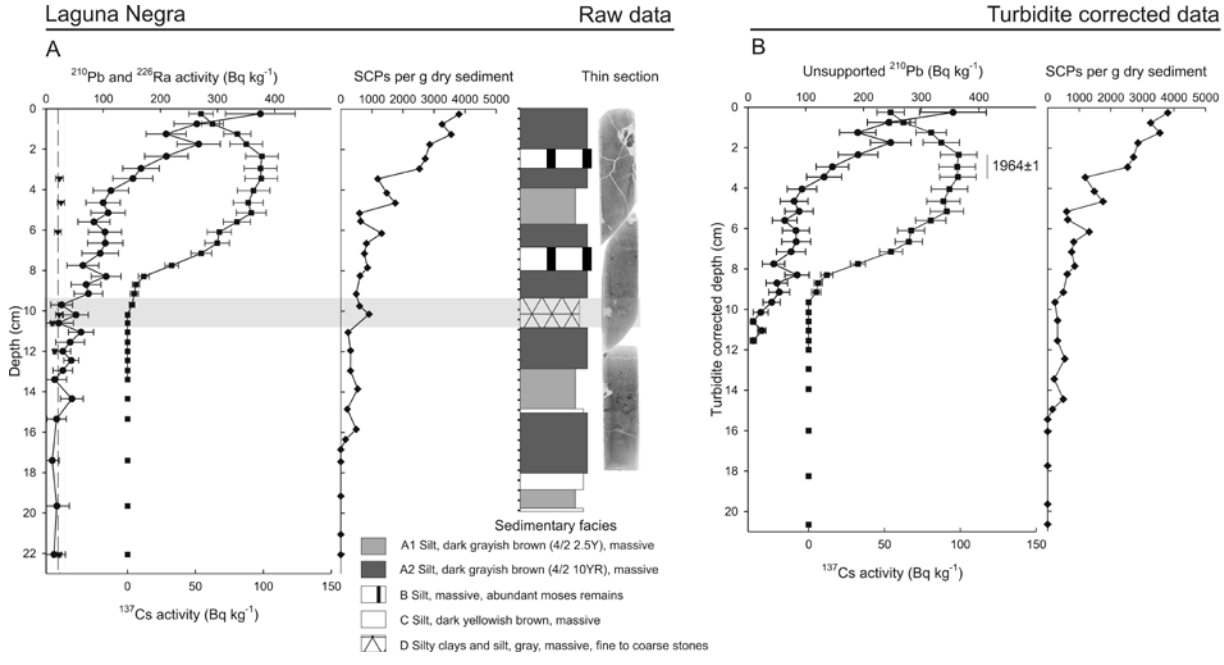


Fig. 5-2 showing A) total ^{226}Ra (triangles), ^{210}Pb (dots) and ^{137}Cs (squares) activity measurements, SCP concentrations and sediment facies of the short core from Laguna Negra. The turbidite is present between 9.4 and 10.8 cm of sediment depth. B) Turbidite-corrected profiles for unsupported ^{210}Pb (dots) and ^{137}Cs (squares) activity. The maximum ^{137}Cs activity is recorded between 2.0 and 3.7 cm depth

method from the ^{226}Ra activity (Appleby and Oldfield 1978; Appleby 2001) in Laguna El Ocho. In Laguna Negra, the mean ^{226}Ra activity (20.3 Bq kg^{-1}) was used to account for the supported ^{210}Pb activity (Krishnaswamy et al. 1971) as ^{226}Ra activities were partially below the detection limit.

We tested the CFCS, CIC, CRS and SIT models on the turbidite-corrected ^{210}Pb profiles. The CFCS model assumes that both the flux of unsupported ^{210}Pb to the sediment and the sedimentation rate are constant. The CIC model assumes that the surface sediment $^{210}Pb_{unsupp}$ activity (A0) is constant in time, and in consequence, the sedimentation rate may vary. The CRS model in contrast assumes that the flux of $^{210}Pb_{unsupp}$ to the sediment remains constant and sedimentation rate may vary in time. The SIT model (Carroll and Lerche 2003) does not have a priori assumptions.

The SIT model uses inverse numerical analysis techniques in combination with a predictive activity module to reproduce the $^{210}Pb_{unsupp}$ profile. Non-exponential changes in the $^{210}Pb_{unsupp}$ activity that are caused either by changes in the sedimentation rate and/or in ^{210}Pb source processes are modelled by Fourier series (Carroll et al. 1995; Carroll et al. 1999a). The values of the Fourier coefficients are determined for the measured data by inverse numerical analysis, which results in a mathematical expression that describes changes in the ^{210}Pb activity with sediment depth (Carroll et al. 1995; Carroll and Lerche 2003). The software for SIT calculation is documented in Carroll and Lerche (2003) (software kindly provided by J. Carroll, Polar Environmental Centre, Norway).

The CFCS, CIC and CRS model calculations were carried out as presented in Appleby (2001). When the CRS model was constrained with a time marker, we used the "composite CRS" method as described in Appleby (2001) and Appleby (pers. commun. 2007). Standard error calculation followed Appleby (2001) for the CRS model and Binford (1990) for the CIC model.

^{210}Pb age-depth models were first validated using the regional ^{137}Cs fallout peak of AD 1964±1 (The Environmental Measurements Laboratory 2008). As a second stratigraphic horizon, we used the first occurrence of anthropogenic SCP fallout to the sediments, which corresponds to the onset of industrial and urban fossil fuel burning in the area of the lakes (Rose 2001). The first appearance of SCPs in a sediment record mirrors the local-to-regional industrial and urban history because the atmospheric transport of larger SCPs is limited (Rose 2001).

A further stratigraphic marker for Laguna El Ocho comes from a diagnostic peak in excess atmospheric Cu fallout, which is related to the production and processing history of the local Cu mine El Teniente. Excess atmospheric Cu was calculated from the Cu/Rb ratios in the sediments. Pre-industrial values for the Cu/

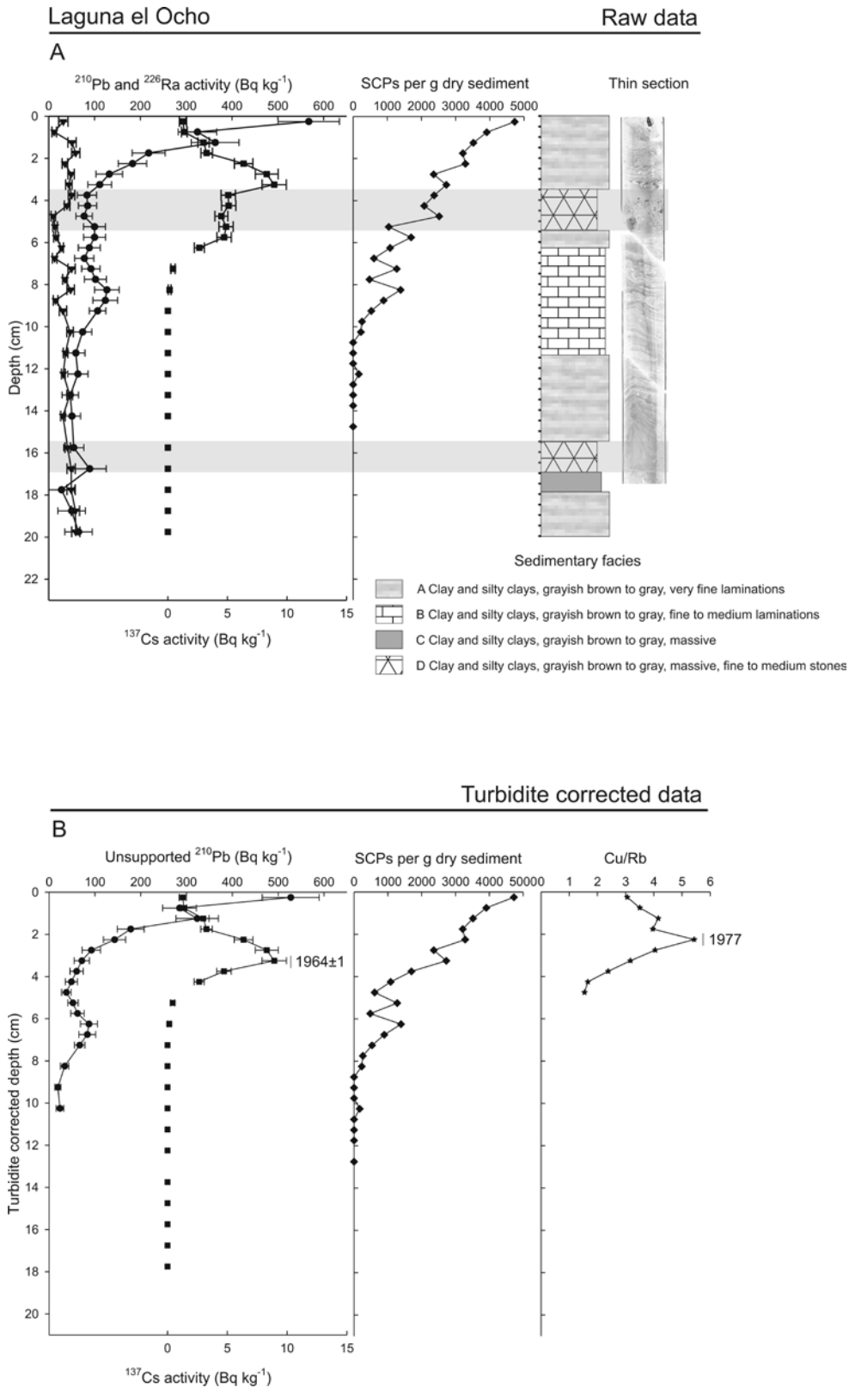


Fig. 5-3 showing A) total ^{226}Ra (triangles), ^{210}Pb (dots) and ^{137}Cs (squares) activity measurements, SCP concentrations and sediment facies of the short core from Laguna El Ocho. Two turbidites are present between 3.5 and 5.5 cm and 15.5 and 17.5 cm sediment depth. B) Turbidite corrected profiles for unsupported ^{210}Pb (dots) and ^{137}Cs (squares) activity. The maximum ^{137}Cs activity is recorded at 3.25 cm depth. First SCPs occur at 12.25 cm; the continuous record starts at 10.25 cm sediment depth. The peak in the Cu/Rb (excess atmospheric Cu deposition) record at 2.25 cm sediment depth corresponds to the year AD 1977

Rb ratio were considered as natural background, and Rb is used as a proxy for allochthonous siliciclastic input to the sediments. Cu and Rb were measured with X-ray fluorescence (von Gunten et al. unpublished). Turbidites and seismites were used as precise stratigraphic markers for historical earthquakes (Chapron et al. 2007).

5.4 Results and interpretation

Laguna Negra

Sedimentological characterization and thin sections showed the occurrence of a turbidite between 9.4 and 10.8 cm (Facies D, Fig. 5-2). Total ^{210}Pb reached equilibrium with ^{226}Ra at 12.0 cm sediment depth. ^{137}Cs showed highest values between 2.0 and 3.7 cm, and comprises the chronomarker horizon of AD 1964±1.

As expected, the different models provided substantially different chronologies (Fig. 5-4). The CFCS, the un-constrained CRS and un-constrained SIT models yielded much younger ages and were not consistent with the ^{137}Cs peak. These models had to be rejected. The CIC model exhibited multiple large age inversions and is also rejected.

The constrained CRS and the constrained SIT models (both forced through the ^{137}Cs marker AD 1964) gave internally consistent results between AD 2006 and AD 1910 but diverged significantly (between 20 and 40 years) in the 2nd half of the 19th century (Fig. 5-4B).

First SCPs appeared at 16.4 cm (Fig. 5-2), which corresponds to a maximum age of AD 1857±6 (see Section 5-3). The age of AD 1854 ± 9 at 12 cm depth, as suggested by the constrained CRS model is, therefore, much too old. Linear extrapolation of the lowermost three data points would suggest an unrealistic age of ca. AD 1730 for the first appearance of SCPs at 16.4 cm depth. The constrained CRS model overestimates sediment ages for the bottom part of the profile. This effect is not visible, however, if the CRS model is verified with the AD 1964 ^{137}Cs peak only. The constrained SIT model provides plausible ages for the bottom part of the profile (AD $1894^{+30}/_{-4}$ at 12 cm depth). Linear extrapolation of the constrained SIT ages places the first occurrence of SCPs at AD $1853^{+30}/_{-4}$, which is consistent with the urban history of Santiago.

The constrained SIT (constrained CRS) model assigns an age of AD $1906^{+25}/_{-4}$ (AD 1891±9) to the turbidite at 9.4 - 10.8 cm depth. The constrained SIT age for the turbidite is consistent with the earthquake of AD 1906 (Mw 8.2), while the constrained CRS model overestimated the age of the turbidite. No large earthquake was observed in that region between AD 1850 (Mw 7.3) and AD 1906 (Barrientos 2007; Servicio sismologico de Chile 2008).

Laguna El Ocho

Sedimentological characterization and thin sections show the occurrence of two turbidites between 3.5 and 5.5 cm, and between 15.5 and 17.5 cm (Facies D, Fig. 5-3). Total ^{210}Pb activity reaches equilibrium with ^{226}Ra activity at 13.5 cm total sediment depth. ^{137}Cs activity peaks sharply at 3.25 cm, which corresponds to the AD 1964±1 chronomarker. The first SCPs are observed at 12.25 cm sediment depth, and continuous SCP records are found above 10.25 cm.

Both the CFCS and CIC model ages are not consistent with the ^{137}Cs AD 1964-bomb peak (Fig. 5-5A), and the CIC chronology shows multiple age inversions. Both models need to be rejected. The un-constrained CRS model yields ages for the ^{137}Cs (AD 1964) marker that are approximately 6 years too old. The un-constrained SIT model reproduces the ^{137}Cs bomb peak at AD 1964 very well and yields very consistent ages with the constrained SIT model (forced through AD 1964) over the entire dating period (AD 1890 – AD 2006). However, the constrained SIT model shows much smaller dating uncertainties (± 1σ is approximately 50% reduced compared with the un-constrained SIT model).

Both SIT models and the constrained CRS model yield consistent chronologies for the middle section of the profile (between AD 1930 and AD 1964). In the upper part of the profile, the constrained CRS model shows approximately 10 years older ages compared with the SIT models (Fig. 5-5B). In the lower part of the profile, however, the constrained CRS model is up to 45 years older than ages obtained with the SIT model.

For the bottom part of the profile prior to AD 1930, model validation with SCPs shows that both the un-constrained and the constrained CRS models overestimate the age of the onset of SCP fallout at Laguna El Ocho (AD 1844±21 at 12 cm sediment depth, Fig. 5-5B). Both SIT models gave a plausible age for a first contamination with SCPs at 12.25 cm sediment depth (AD $1889^{+9}/_{-1}$) and for the continuous SCP record at 10.25 cm sediment depth (AD $1909^{+6}/_{-1}$), which corresponds in time with the onset of large-scale mining when smelters were put into operation.

For the top part between AD 1964 and AD 2006, the diagnostic Cu/Rb peak of AD 1977 clearly validates the SIT models (Fig. 5-5B) and reveals that the composite CRS model has a systematic offset of up to 10 years in this section.

Because the turbidite at 3.5-5.5 cm sediment depth in Laguna El Ocho is stratigraphically very close to the ^{137}Cs AD 1964 peak at 3.25 cm depth, it is not surprising that the constrained models (SIT and CRS) produce an age of AD 1960 for the turbidite that corresponds to the Great Chilean Earthquake of Valdivia (Barrientos 2007). The

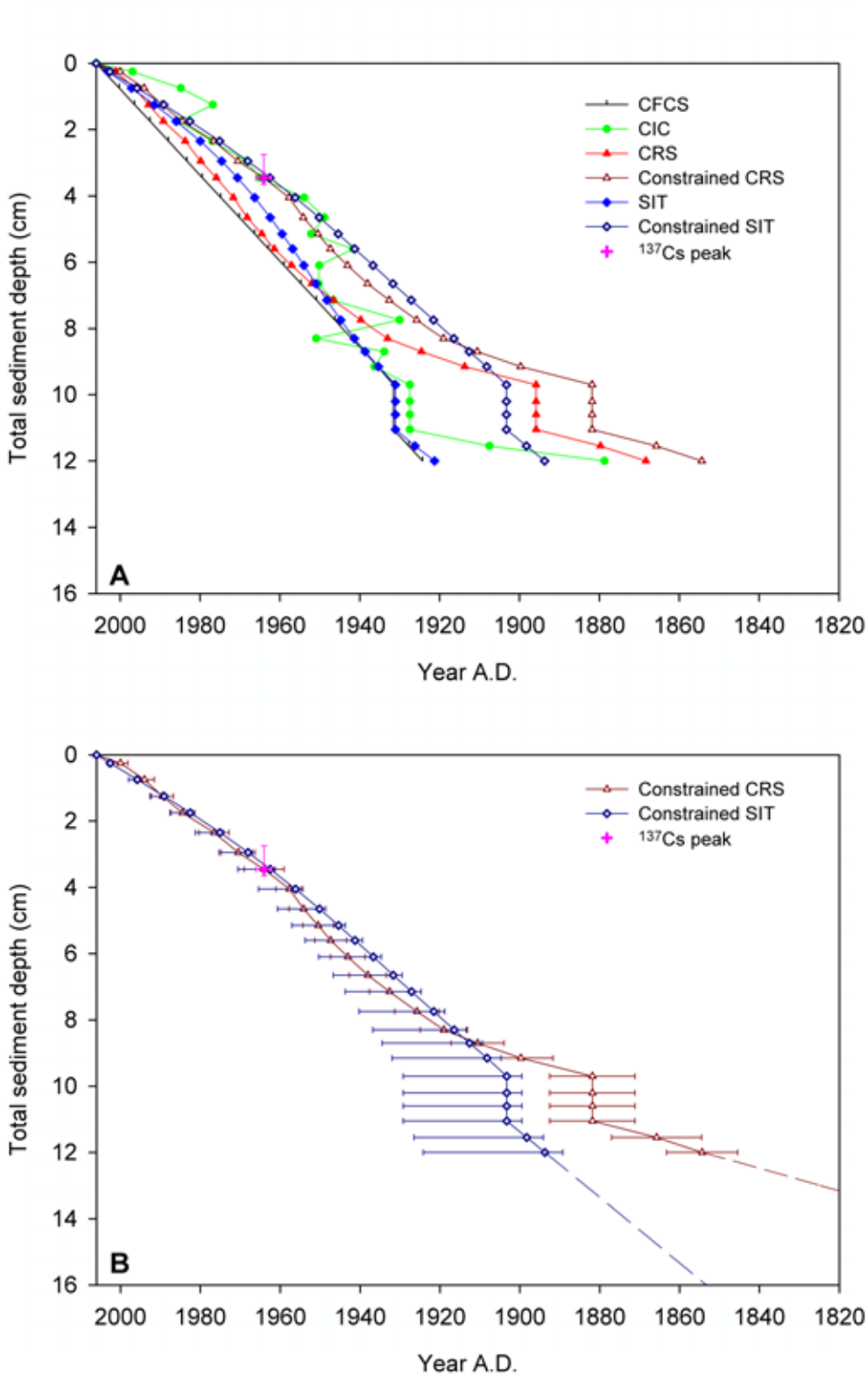


Fig. 5-4 shows the comparison of the ^{210}Pb-based depth-to-age models for Laguna Negra. A) Shows the mean values for all tested models (error bars are not given to enhance the readability). B) Shows the ^{137}Cs-AD1964-constrained CRS and constrained SIT models with the dating uncertainty

age of the turbidite at 15.5 – 17.5 cm sediment depth is more diagnostic for assessing the model choice. While the SIT models place this event into the AD 1850s, which corresponds to the 7.3 Mw historical earthquake of AD 1850, the CRS model suggests much older ages (mid-18th century).

5.5 Discussion

Our results show that there are significant differences between the ^{210}Pb-based chronologies. This finding is consistent with former studies (Appleby 2008), and it is influenced by the model applied and by cross-validation with independent chronostratigraphic markers.

As in many other studies, the bomb peak of ^{137}Cs is an important validation for the year AD 1964±1 and helps constrain the models where this is numerically possible (CRS and SIT). Unfortunately, the AD 1986 ^{137}Cs peak is not present in the southern hemisphere, which implies that the section of the ^{210}Pb profile younger than AD 1964 cannot be validated with ^{137}Cs. The same is the case for the section prior to AD 1964 to the beginning of the ^{210}Pb profiles (end of the 19th century) where no radiochemical markers are available except, theoretically, ^{14}C wiggle matching (Blaauw et al. 2003). The long period prior to the ^{137}Cs AD 1964 peak (ca. $^{2}/_{3}$ of the profile) is most important when long instrumental and observational data series (e.g. meteorological data) must be used for calibration and cross-validation of the lake sediment proxies.

Our results show that the SCP profiles in the sediments of Laguna Negra and Laguna El Ocho provide an objective criterion to detect inconsistencies and thus to reject the (constrained) CRS model, and to accept the (constrained) SIT model results. The first occurrence of SCPs in the sediment is an unambiguous indication that the sediment sample cannot be older than the onset of industrial activity in the region of the lake. In most parts of the World, the beginning of fossil fuel consumption and SCP deposition falls largely into the lower part of the ^{210}Pb chronologies. Thus we recommend that SCPs should be systematically investigated in the section of the sediment core, where unsupported ^{210}Pb disappears.

In both lakes, the CFCS and CIC models did not provide consistent results, which is in agreement with previous studies because in most lakes, the fundamental model assumptions are not met (Appleby 2001). The CIC model resulted in large time inversions because the ^{210}Pb profile is non-monotonic.

The unconstrained CRS model failed to reproduce the correct age for the ^{137}Cs bomb peak (AD 1964±1) in both lakes and had to be constrained using the composite CRS method. In both lakes, the ages of the lowest samples calculated with the composite CRS model were grossly overestimated, which resulted in unrealistically old ages for the onset of regional SCP deposition. Overestimation of the CRS ages at the bottom of ^{210}Pb profiles has been observed before (e.g., McCall et al. 1984; Turner and Delorme 1996; Carroll and Lerche 2003). This finding is particularly critical for climate reconstructions because calibration or cross-validation over the early period would significantly jeopardize the calibration or verification statistics, and ultimately result in very large errors of prediction for the down-core reconstructions (RMSEP, Cook et al. 1994).

In Laguna El Ocho, the composite CRS model overestimates sediment ages in the top 4 cm of the sediment core (stratigraphically above the ^{137}Cs AD 1964 peak) by as much as 10 years. This shows that independent validation of the topmost part is also very critical even if the model is constrained by the ^{137}Cs AD 1964 peak. This is especially true as the AD 1986 ^{137}Cs peak is missing in the Southern Hemisphere. An offset by 10 years is not acceptable for calibration with instrumental records because erroneous statistics would result for the most important frequency bands of decadal and multi-annual climate variability, such as the El Niño Southern Oscillation.

Whereas in Laguna Negra the SIT model had to be constrained using the ^{137}Cs AD 1964 peak to get a realistic chronology, both the un-constrained and constrained SIT model revealed plausible chronologies in Laguna El Ocho. In both lakes, validation with the SCP data showed that the constrained SIT model yielded plausible ages over the entire dating period, i.e. also for the bottom samples of the ^{210}Pb profile. The age of the bottom samples are in agreement with the regional and local industrial/urban history. In Laguna Negra, when sediment ages are extrapolated to a depth of 16.4 cm, the first occurrence of SCPs in the sediment is estimated to AD $1853^{+30}/_{-4}$, which is consistent with the data from Laguna Aculeo (AD 1857±6, von Gunten et al. unpublished data), and the historical data for the onset of the industrial activity in the region of Santiago (AD 1850-1870). Although the cumulative probability distribution for sediment ages (P(10) to P(90)) of the SIT model is relatively large (Fig. 5-4B), the proximity of the most probable age P(68) to the P(90) limit implies little uncertainty at the 90% confidence value (Carroll and Lerche, 2003).

Constraining the SIT model with the ^{137}Cs AD 1964 marker horizon resulted in reduced standard deviations of the model sediment ages. Reducing the standard deviation is critically important for correlation with instrumental records since the time series of proxy data needs to be smoothed to account for dating errors before calibration with independent (meteorological) data is possible (Koinig et al. 2002). The minimum smoothing factor is determined by the largest standard deviation of the age model. This explains why the standard deviation

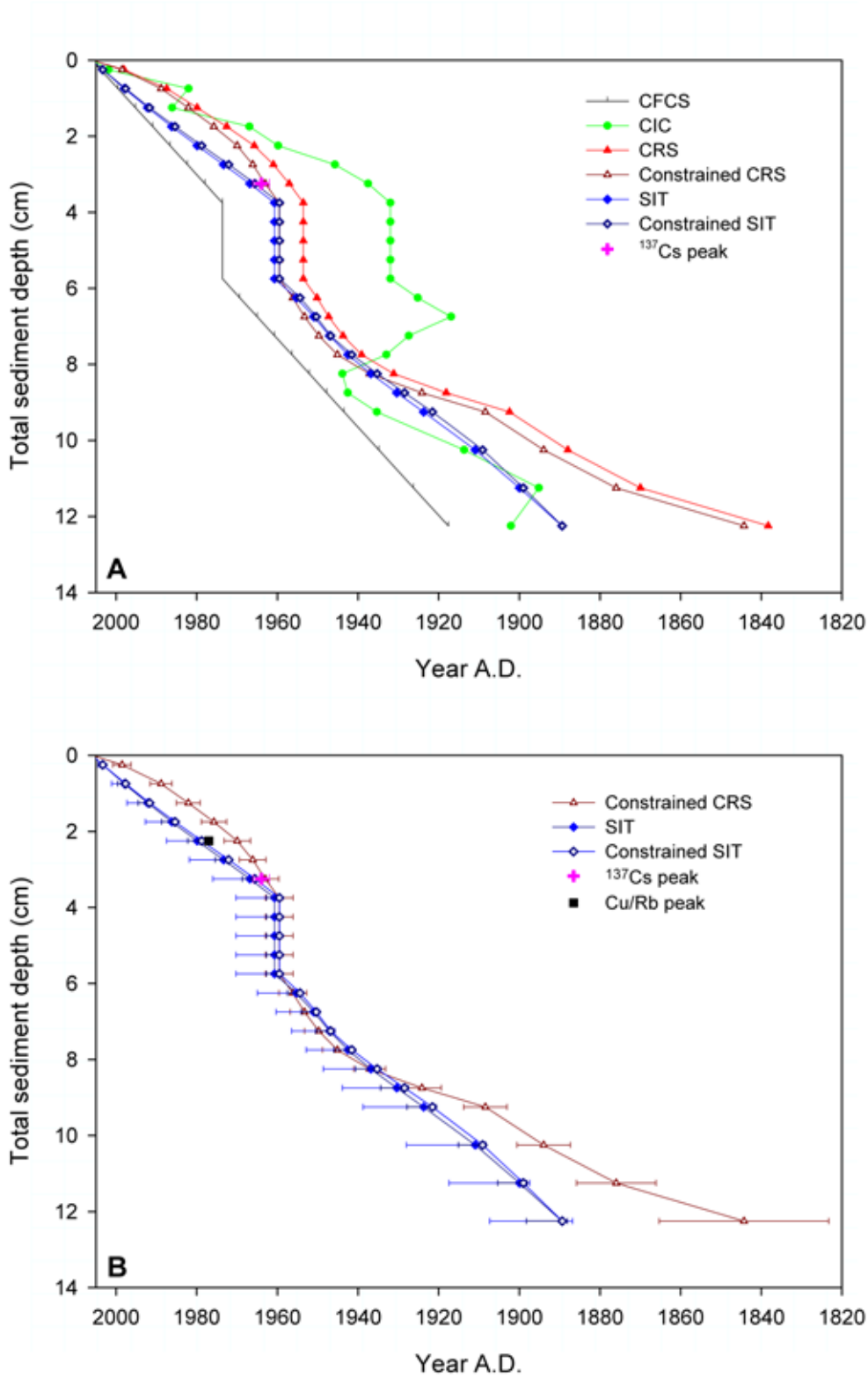


Fig. 5-5 shows the comparison of the ^{210}Pb-based depth-to-age models for Laguna El Ocho. A) Shows the mean values for all tested models (error bars are not given to enhance the readability). B) Shows the ^{137}Cs-AD1964-constrained CRS and the constrained SIT models with the dating uncertainty

of the calibration chronology is directly related to the maximum temporal resolution of the calibration and reconstruction. This is most critical if decadal or inter-annual climate variability (e.g., ENSO) is the target of the research. In consequence, constraining the SIT model should always be applied. It is noteworthy that the numerical design and the software of the SIT model allow easily for the assimilation of additional chronological information with individual uncertainties.

Systematic testing of the models reveals which sections of chronologies are most robust. Largest discrepancies between the CRS and SIT model in Laguna Negra and Laguna El Ocho occur in the bottom part of the profile (late 19th century), while the chronologies are consistent and very robust in the middle (Laguna El Ocho AD 1930-1964) or upper part of the profile (Laguna Negra AD 1964 – 2006).

5.6 Conclusions

We investigated how high-precision, well-validated chronologies with reduced uncertainty of young (last 100 – 150 years) non-varved lake sediments can be achieved. Our approach included (i) irregularly-spaced sampling for ^{226}Ra, ^{210}Pb and ^{137}Cs activity counting, (ii) a systematic comparison of numerical models for the calculation of ^{210}Pb-based chronologies (CFCS, CIC, CRS and SIT), (iii) constraining the CRS and SIT models with the ^{137}Cs marker of AD 1964 and (iv) step-wise cross-validation with independent diagnostic environmental stratigraphic markers of known age. Stratigraphic markers in this study included airborne pollutants such as SCPs, excess atmospheric Cu deposition, and turbidites related to historical earthquakes. In other settings, other types of chronomarkers, such as flood or tephra layers, seismites or turbidites, pollen of invasive species, charcoal from historical forest fires, etc., could be used. These chronomarkers help to evaluate the different model chronologies and to select the best model for a given lake. In general, much more emphasis should be placed on such independent markers.

Our results from two high-elevation lakes in the Central Chilean Andes show that the ^{137}Cs (AD 1964)-constrained SIT model performs significantly better than the CFCS, CIC and CRS models. Our results also confirm that the CRS model tends to overestimate sediment ages in the lower part of the ^{210}Pb profile (beginning of the 20th century, end of the 19th century), which is particularly critical if long periods of instrumental data need to be covered for calibration and cross-validation purposes.

Reducing the standard deviations (SD) of chronology is important because the SD of sediment ages is proportional to the temporal resolution at which sedimentary proxy data can be calibrated in time. Very small SDs are absolutely critical if inter-annual climate phenomena, such as e.g. ENSO, are quantitatively studied from lake sediment data.

We recommend systematic testing to confirm the general validity of our conclusions in a wide variety of lakes, sediment types, and catchment configurations.

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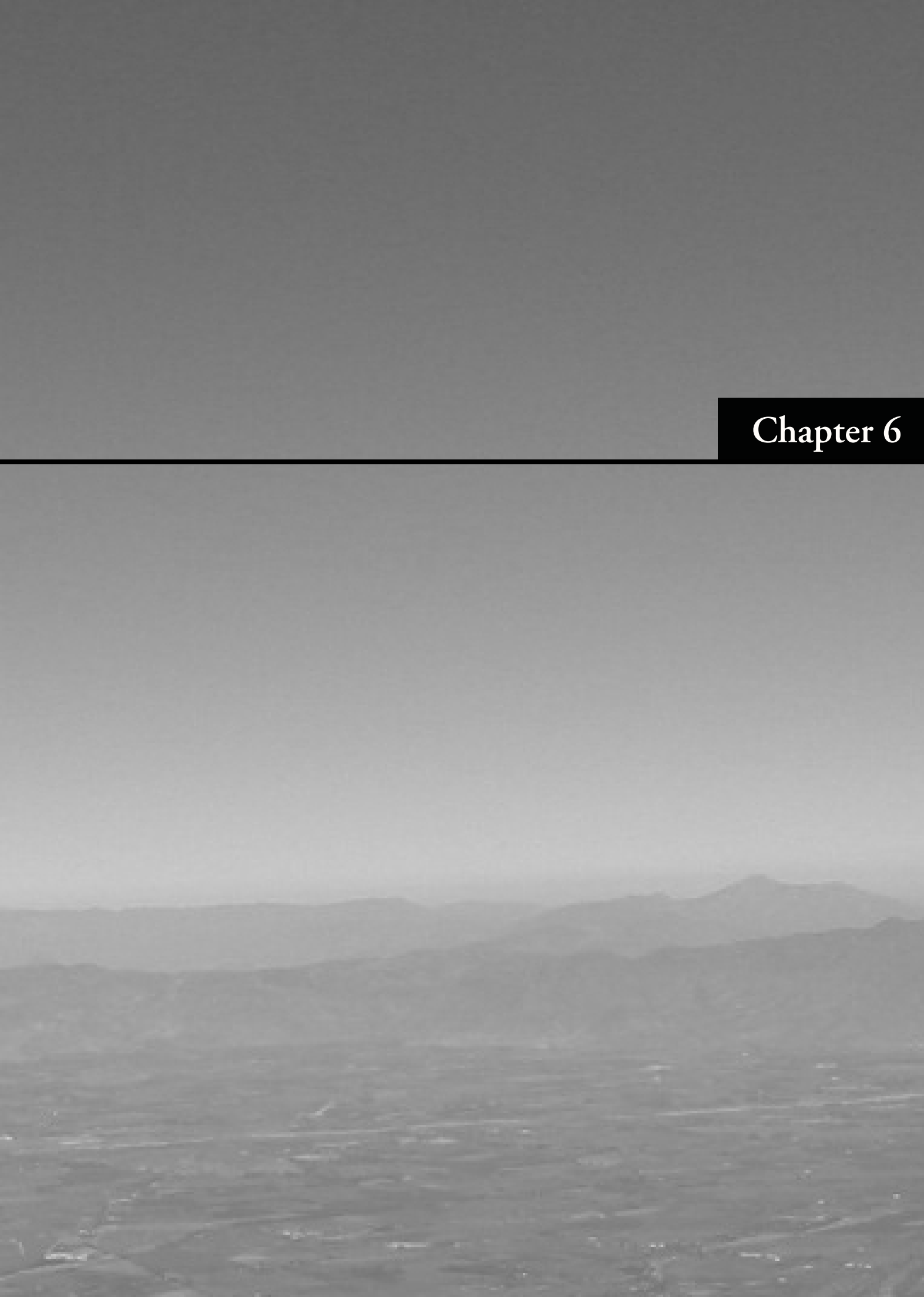

Chapter 6

6. Climate proxy comparison

6.1 Introduction

In order to reconstruct climate variables quantitatively and with error estimation, proxy data have to be calibrated against climate data. However, transfer functions ("space for time calibration", Birks 1998) can not be applied for geochemical lake sediment proxies, because a modern training set cannot be developed due to the heterogeneity of lake catchments. Therefore, a "calibration in time" needs to be applied to all geochemical sediment proxies if they are to be used for quantitative paleoclimate reconstructions.

In this chapter, sediment parameters of three lakes are compared to time series of climate data to infer their suitability as climate proxy. First, the meteorological data and applied statistical methods are described. Then, the results are presented and discussed. Finally, conclusions are drawn.

6.2 Study sites

Laguna Aculeo, Negra and del Inca sediments were considered for climate proxy calibration because of their precise chronologies for the calibration period. Characteristics of these lakes are presented in chapter 4. Chronologies of the sediments are described in chapters 5 (Laguna Negra), 7 (Laguna Aculeo) and 9 (Laguna del Inca).

6.3 Methods

To calibrate the lake sediment proxies against meteorological data, grids were used which cover the lake location from the 0.5° x 0.5° monthly temperature and precipitation reanalysis data set AD 1901-2000 (CRU TS 2.1) of Mitchell and Jones (2005), from the 5° x 5° HadCRUT3 (AD 1901-2005) dataset (Brohan et al. 2006) and from the 2.5° x 2.5° observed land surface precipitation dataset (AD 1901-1997, Dai et al. 1997). Correlation to the monthly Southern Oscillation Index (SOI) (Allan et al. 1991) and tree ring based El Niño 3 Index (yearly, D'Arrigo et al. 2005) and Subtropical Anticyclon Belt (SAB) position reconstructions (yearly, Bradley 1992) were also tested.

Laboratory methods are described in chapter 3. The sedimentological proxies used in this study include in-situ light reflectance, nitrogen (N), total organic carbon (TOC), biogenic silica (BSi) and grain-size. Light reflectance derived total diagenetic choloropigments (chlorins) was determined by the relative absorption band depth (RABD) centred in 660-670 nm $RABD_{660;670}$ following the methods and algorithms in Rein and Sirocko (2002). As a second proxy, we used the ratio $Reflectance_{660nm}/Reflectance_{670nm}$ $R_{660nm/670nm}$, which describes the shape of the absorption peak between 660-670 nm and thus reflects the degree of diagenesis and the variety of diagenic products. The main source of chloropigments in lake sediments is algae and phototrophic bacteria. TOC, BSi and N can be used as proxies for primary production in the lake (Conley and Schelske 2001; Meyers and Teranes 2001). Fluxes were calculated using the sedimentation rate inferred from the depth-age models. Grain-size uniformity is a measure for the degree of sorting of the particles (i.e. for the magnitude of the standard deviation of the size distribution).

In order to synchronize the resultant data series to the time-intervals of the meteorological data, the proxy data are regularized to a 1-year interval and smoothed (triangular filter, 3-9 years) to account for regularization and dating error. Pearson's product-moment correlation coefficients are applied with P values corrected for the loss of degrees of freedom due to data smoothing (after Trenberth 1984). Meteorological data were treated with the same smoothing filter that was applied to the proxy data.

The most recent sediments (AD 1997-2005) of Laguna Aculeo were excluded for two reasons: the disturbed and waterlogged sediments at the sediment-water interface are difficult to sample, and the C/N ratios

Table 6-1 Pearson correlation coefficients matrix of Laguna Aculeo. Statistical significant correlation are marked with (*) are statistically significant (P<0.05) and with (**) are highly significant (P<0.01). R values that are not marked are either tending toward statistical significance (0.05<P<0.1) or not statistically significant (P>0.1). df: degrees of freedom (corrected degrees of freedom). P: P-value

			$R_{660nm/670nm}$	$RABD_{660;670}$	N%	TOC%	BSi (µg g^{-1})
Non-filtered	HadCRUT3	DJF temperature	0.58** df: 94 P: $4.6\ 10^{-10}$	0.56** df: 94 P: $2.1\ 10^{-9}$	0.49** df: 94 P: $4.1\ 10^{-7}$	0.45** df: 94 P: $3.7\ 10^{-6}$	-0.43** df: 94 P: $1.2\ 10^{-5}$
		Annual mean temperature	0.55** df: 94 P: $5.5\ 10^{-9}$	0.54** df: 94 P: $1.1\ 10^{-8}$	0.49** df: 94 P: $4.3\ 10^{-7}$	0.45** df: 94 P: $3.6\ 10^{-6}$	-0.38** df: 94 P: $1.2\ 10^{-4}$
	CRU TS 2.1	DJF temperature	0.62** df: 94 P: $2.5\ 10^{-11}$	0.56** df: 94 P: $2.6\ 10^{-9}$	0.47** df: 94 P: $1.6\ 10^{-6}$	0.45** df: 94 P: $4.9\ 10^{-6}$	-0.41** df: 94 P: $3.2\ 10^{-5}$
		Annual mean temperature	0.55** df: 94 P: $7.4\ 10^{-9}$	0.55** df: 94 P: $4.8\ 10^{-8}$	0.27** df: 94 P: $7.9\ 10^{-3}$	0.27** df: 94 P: $7.6\ 10^{-3}$	-0.22* df: 94 P: 0.027
3-year filtered	HadCRUT3	DJF temperature	0.74** df: 93 (14) P: $9.8\ 10^{-4}$	0.73** df: 93 (14) P: $1.2\ 10^{-3}$	0.61** df: 93 (15) P: $9.1\ 10^{-3}$	0.57* df: 93 (14) P: 0.021	-0.56* df: 93 (13) P: 0.029
		Annual mean temperature	0.68** df: 93 (13) P: $5.5\ 10^{-3}$	0.67** df: 93 (13) P: $6.7\ 10^{-3}$	0.59* df: 93 (14) P: 0.019	0.54* df: 93 (12) P: 0.046	0.68 df: 93 (12) P: 0.084
	CRU TS 2.1	DJF temperature	0.77** df: 93 (15) P: $3.3\ 10^{-4}$	0.72** df: 93 (15) P: $1.0\ 10^{-3}$	0.58* df: 93 (16) P: 0.012	0.56* df: 93 (14) P: 0.024	-0.52* df: 93 (14) P: 0.037
		Annual mean temperature	0.67** df: 93 (11) P: 0.01	0.69** df: 93 (11) P: $8.9\ 10^{-3}$	0.33 df: 92 (12) P: 0.25	0.33 df: 93 (10) P: 0.30	-0.28 df: 93 (10) P: 0.37
5-year filtered	HadCRUT3	DJF temperature	0.80* df: 92 (6) P: 0.016	0.80* df: 92 (6) P: 0.017	0.66* df: 92 (8) P: 0.039	0.62 df: 92 (6) P: 0.10	-0.61 df: 92 (6) P: 0.11
		Annual mean temperature	0.74* df: 92 (6) P: 0.036	0.73* df: 92 (6) P: 0.040	0.63* df: 92 (9) P: 0.039	0.59 df: 92 (7) P: 0.096	-0.53 df: 92 (7) P: 0.14
	CRU TS 2.1	DJF temperature	0.84** df: 92 (6) P: $9.1\ 10^{-3}$	0.81* df: 92 (6) P: 0.015	0.64* df: 92 (9) P: 0.036	0.62 df: 92 (7) P: 0.076	-0.57 df: 92 (6) P: 0.14
		Annual mean temperature	0.74 df: 92 (5) P: 0.058	0.77* df: 92 (5) P: 0.044	0.36 df: 92 (8) P: 0.30	0.36 df: 92 (6) P: 0.38	-0.31 df: 92 (5) P: 0.50
7-year filtered	HadCRUT3	DJF temperature	0.84 df: 92 (3) P: 0.078	0.83* df: 92 (4) P: 0.039	0.68* df: 92 (7) P: 0.043	0.64 df: 92 (5) P: 0.12	-0.63 df: 92 (4) P: 0.18
		Annual mean temperature	0.78 df: 92 (4) P: 0.068	0.77 df: 92 (4) P: 0.075	0.66 df: 92 (7) P: 0.051	0.63 df: 92 (5) P: 0.13	-0.57 df: 92 (5) P: 0.18
	CRU TS 2.1	DJF temperature	0.88* df: 92 (3) P: 0.049	0.86 df: 92 (3) P: 0.061	0.66 df: 92 (6) P: 0.073	0.65 df: 92 (4) P: 0.16	-0.59 df: 92 (3) P: 0.30
		Annual mean temperature	0.77 df: 92 (3) P: 0.13	0.81 df: 92 (3) P: 0.099	0.39 df: 92 (6) P: 0.35	0.39 df: 92 (4) P: 0.45	-0.33 df: 92 (3) P: 0.58

Table 6-1 (continued) Pearson correlation coefficients matrix of Laguna Aculeo. Statistical significant correlation are marked with (*) are statistically significant (P<0.05) and with (**) are highly significant (P<0.01). R values that are not marked are either tending toward statistical significance (0.05<P<0.1) or not statistically significant (P>0.1). df: degrees of freedom (corrected degrees of freedom). P: P-value

			$R_{660nm/670nm}$	$RABD_{660;670}$	N%	TOC%	BSi (µg g^{-1})
9-year filtered	HadCRUT3	DJF temperature	0.84 df: 91 (2) P: 0.16	0.83 df: 91 (2) P: 0.17	0.69 df: 91 (6) P: 0.058	0.66 df: 91 (4) P: 0.15	-0.65 df: 91 (3) P: 0.24
		Annual mean temperature	0.79 df: 91 (3) P: 0.11	0.76 df: 91 (3) P: 0.13	0.68 df: 91 (6) P: 0.062	0.66 df: 91 (4) P: 0.16	-0.61 df: 91 (4) P: 0.20
	CRU TS 2.1	DJF temperature	0.90 df: 91 (1) P: 0.29	0.89 df: 91 (2) P: 0.11	0.67 df: 91 (5) P: 0.096	0.66 df: 91 (3) P: 0.22	-0.60 df: 91 (3) P: 0.29
		Annual mean temperature	0.79 df: 91 (2) P: 0.21	0.83 df: 91 (2) P: 0.17	0.40 df: 91 (5) P: 0.37	0.40 df: 91 (3) P: 0.50	-0.35 df: 91 (3) P: 0.57

of these sediments have anomalously high values (molar C/N >15) which suggest the presence of a non-aquatic source of sedimentary organic matter during the past 7-8 years. In Laguna del Inca, sediments younger that AD 1980 were excluded because a strong eutrophication trend was detected in the sediments since that time (Chapter 8).

6.4 Results

Highly significant (P<0.01) correlations between climate and measured sedimentary data were found in all investigated lakes. Complete correlation matrixes can be found in Appendix A3-A17, and selected Pearson correlation coefficients are given in Table 6-1 to 6-3.

In all lakes, the highest correlation values are related to warm season temperature. Conversely, no highly significant correlations were calculated in relation to precipitation, SOI, SAB or El Niño 3 indexes.

In Laguna Aculeo, reflectance spectrometry proxies ($RABD_{660;670}$ and $R_{660nm/670nm}$), N%, TOC% and BSi (µg g^{-1}) are mostly correlated to austral summer (DJF) temperatures and annual temperature means (Table 6-1). Similarly, in Laguna Negra highly significant correlations are observed for temperature, with highest values to the annual means. Again, reflectance spectrometry pigment data (e.g. $RABD_{660;670}$), TOC and N flux values (g cm^{-2} yr^{-1}) yield the highest correlation (Table 6-2). In Laguna del Inca, BSi (µg g^{-1}), TOC%, N% and grain-size uniformity are anticorrelated to austral summer temperature, especially to January temperature (Table 6-3).

6.5 Discussion

Analysed proxies which show the most significant correlations to temperature are directly or indirectly related to primary biological production in the lakes (Table 6-1 to 6-3). This relationship is logical from an ecological perspective for an undisturbed oligotrophic lake and has been described before in the Alps (Blass et al. 2007) and in the Arctic (Mckay et al. 2008). In eutrophic Laguna Aculeo, a positive correlation is also plausible as nutrient availability is not the limiting factor for primary production; The modern eutrophic state has been established ca. 2000 years ago (Jenny et al. 2002, see chapter 7).

However, significant differences are apparent between the lakes. While Laguna Aculeo and Negra show a similar (positive) response to temperature, this relationship is negative in Laguna Del Inca.

The reasons for this difference could be related to a negative influence of high solar irradiation (UV) on algal growth (Wetzel 2001) in Laguna del Inca due to its high water transparency, or related to different thermal lake characteristics (Laguna Del Inca is ice covered in winter, but not Laguna Aculeo nor Negra). The duration of ice-coverage of Laguna del Inca is probably driven by air temperature. Catalan et al. (2002) have shown that algal growth can be favoured by a prolonged clear-ice cover period in high-mountain lakes. In this regard, a negative relationship between primary production and temperature is also plausible.

Another reason for the negative correlation between

Table 6-2 Pearson correlation coefficients matrix of Laguna Negra. Statistical significant correlation are marked with (*) are statistically significant (P<0.05) and with (**) are highly significant (P<0.01). R values that are not marked are either tending toward statistical significance (0.05<P<0.1) or not statistically significant (P>0.1). df: degrees of freedom (corrected degrees of freedom). P: P-value

		$RABD_{660;670}$	TOC_{Flux}	N_{Flux}
Non-filtered	HadCRUT3 Mean annual temperature	0.67** df: 92 P: $2.0\ 10^{-13}$	0.50** df: 79 P: $1.5\ 10^{-5}$	0.45** df: 79 P: $2.4\ 10^{-5}$
	CRU TS 2.1 Mean annual temperature	0.42** df: 87 P: $4.7\ 10^{-5}$	0.58** df: 75 P: $7.0\ 10^{-8}$	0.58** df: 75 P: $4.5\ 10^{-8}$
3-year filtered	HadCRUT3 Mean annual temperature	0.77** df: 90 (14) P: $4.9\ 10^{-4}$	0.76** df: 74 (10) P: $4.3\ 10^{-3}$	0.77** df: 74 (11) P: $2.3\ 10^{-3}$
	CRU TS 2.1 Mean annual temperature	0.49 df: 85 (11) P: 0.092	0.61* df: 77 (10) P: 0.034	0.55 df: 77 (11) P: 0.051
5-year filtered	HadCRUT3 Mean annual temperature	0.80** df: 88 (7) P: $9.0\ 10^{-3}$	0.65 df: 75 (4) P: 0.17	0.59 df: 75 (5) P: 0.17
	CRU TS 2.1 Mean annual temperature	0.51 df: 83 (5) P: 0.24	0.83* df: 72 (5) P: 0.022	0.84* df: 72 (5) P: 0.018
7-year filtered	HadCRUT3 Mean annual temperature	0.82* df: 86 (5) P: 0.025	0.65 df: 73 (3) P: 0.23	0.59 df: 73 (3) P: 0.29
	CRU TS 2.1 Mean annual temperature	0.52 df: 81 (5) P: 0.37	0.85* df: 70 (4) P: 0.031	0.87* df: 70 (4) P: 0.024

primary production and summer temperature in Laguna del Inca could be the varying clastic input from the glaciated catchment. In Laguna del Inca, the primary production proxies that are not corrected for changing sedimentation rates (concentration and %) are highly significantly correlated to temperature, whereas corrected data (e.g. fluxes) are not. Therefore, temperature-driven glacial melt could indirectly control organic matter and BSi concentration in the sediments. This hypothesis is supported by the high anticorrelation of grain-size uniformity (and sorting) data with summer temperature: higher amounts of clastic material transported by glacier melt water reduce grain-size uniformity in the deposited sediments. A similar relation between grain-size and glacial activity (and temperature) has also been observed in the Swiss Alpine lakes Sils and Silvaplana (Blass 2006).

It is worth mentioning the effect of time series smoothing when creating a calibration. Data must be smoothed prior to correlation to account for dating and re-sampling errors, as well as for sediment mixing (e.g. bioturbation). However, although Pearson's r values increase with smoothing span, P-values (and thus level of non-significance) also increase dramatically due to the loss of degrees of freedom. This effect can be observed in the correlation matrices of the studied lakes (Tables 6-1 to 6-3). Although correlations are highly significant with non-, 3- or 5-year smoothed data, they are at best only statistically significant after a 7-year smoothing and hardly significant after a 9-year smoothing. Therefore, it is important to choose the optimal degree of smoothing.

Consequently, we suggest to first define the minimum smoothing span (i.e. the highest meaningful temporal resolution) for paleoclimate reconstructions (see Chapter 7). As the significance of the correlation decreases with increasing smoothing, this lowest meaningful span is usually the most statistically significant.

Table 6-3 Pearson correlation coefficients matrix of Laguna del Inca. Statistical significant correlation are marked with (*) are statistically significant (P<0.05) and with (**) are highly significant (P<0.01). R values that are not marked are either tending toward statistical significance (0.05<P<0.1) or not statistically significant (P>0.1). df: degrees of freedom (corrected degrees of freedom). P: P-value

			BSi (µg g^{-1})	TOC%	N%	Grain size Uniformity
Non-filtered	CRU TS 2.1	January temperature	-0.52** df: 69 P: 2.7 10^{-6}	-0.47** df: 69 P: 3.5 10^{-5}	-0.49** df: 69 P: 1.6 10^{-5}	-0.52** df: 69 P: 3.5 10^{-6}
		DJF temperature	-0.62** df: 69 P: 6.1 10^{-9}	-0.45** df: 69 P: 8.2 10^{-5}	-0.50** df: 69 P: 6.7 10^{-6}	-0.61** df: 69 P: 1.6 10^{-8}
3-year filtered	CRU TS 2.1	January temperature	-0.73** df: 67 (16) P: 6.5 10^{-4}	-0.66** df: 67 (18) P: 1.6 10^{-3}	-0.66** df: 67 (18) P: 1.4 10^{-3}	-0.70** df: 67 (15) P: 1.6 10^{-3}
		DJF temperature	-0.75** df: 67 (9) P: 7.6 10^{-3}	-0.60* df: 67 (12) P: 0.022	-0.63* df: 67 (11) P: 0.022	-0.72* df: 67 (9) P: 0.013
5-year filtered	CRU TS 2.1	January temperature	-0.85** df: 65 (8) P: 1.8 10^{-3}	-0.77** df: 65 (9) P: 5.8 10^{-3}	-0.74** df: 65 (9) P: 8.9 10^{-3}	-0.80** df: 65 (7) P: 9.9 10^{-3}
		DJF temperature	-0.83* df: 65 (5) P: 0.020	-0.70* df: 65 (6) P: 0.050	-0.69 df: 65 (6) P: 0.060	-0.78* df: 65 (5) P: 0.038
7-year filtered	CRU TS 2.1	January temperature	-0.91* df: 65 (4) P: 0.011	-0.82* df: 65 (5) P: 0.022	-0.79* df: 65 (5) P: 0.033	-0.86* df: 65 (4) P: 0.027
		DJF temperature	-0.87 df: 65 (3) P: 0.053	-0.77 df: 65 (4) P: 0.075	-0.74 df: 65 (4) P: 0.089	-0.82 df: 65 (3) P: 0.088

6.6 Conclusions

In this chapter, the sensitivity of primary production in Central Chilean lakes to temperature, especially in austral summer, is shown. This relationship is observed in the two oligotrophic lakes in high Anden environment (Laguna Negra and del Inca), as well as in the eutrophic to hypertrophic Laguna Aculeo.

The results of this study show that temperature reconstructions using the calibration-in-time technique are possible for the studied lakes. This is important because all the other known natural climate archives in this area are sensitive to winter precipitation.

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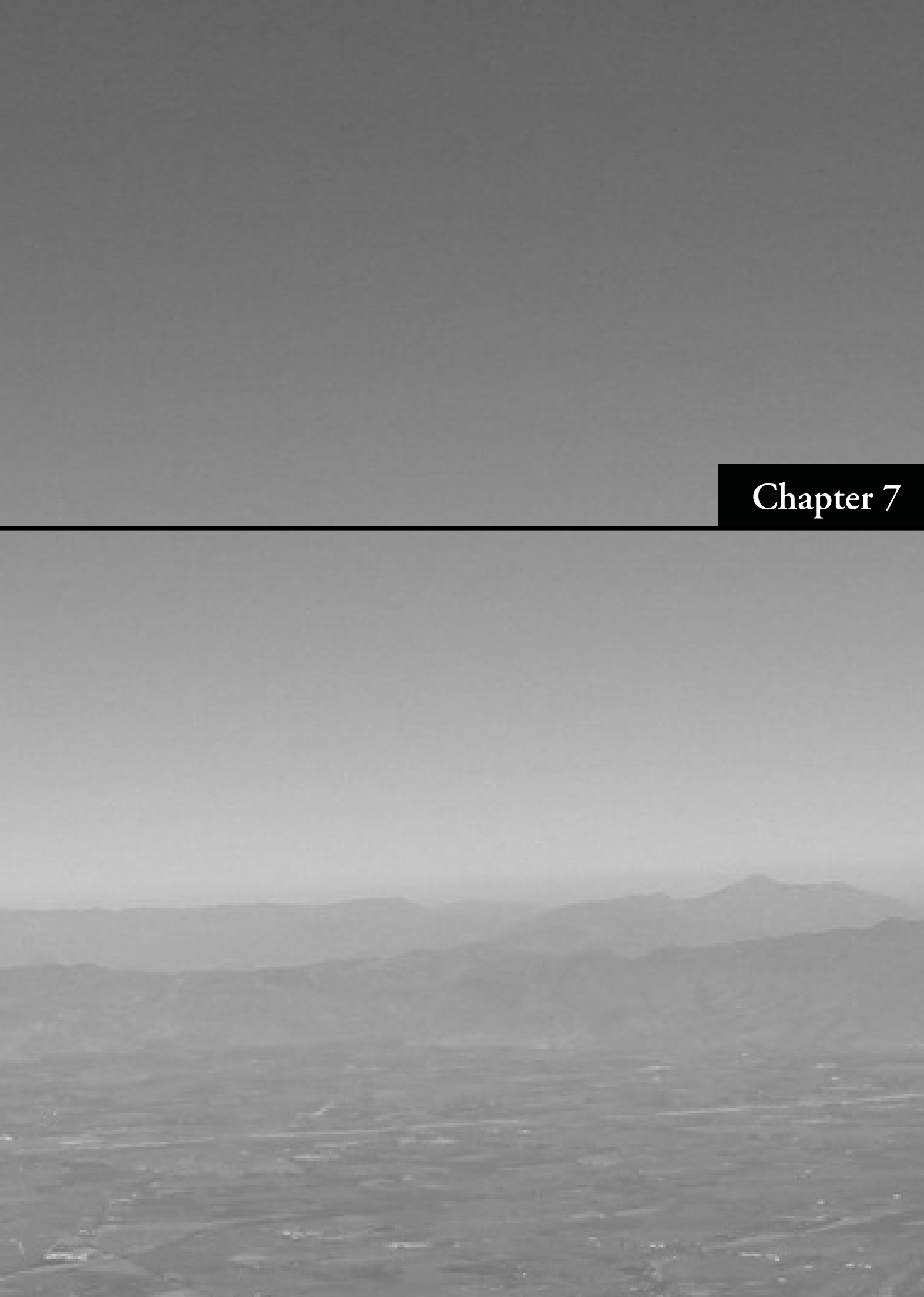

Chapter 7

7. A quantitative high-resolution summer temperature reconstruction based on sedimentary pigments from Laguna Aculeo, Central Chile, back to AD 850

L. von Gunten[1*], M. Grosjean[1,2], B. Rein[3], R. Urrutia[4], P. Appleby[5]

1) University of Bern, Oeschger Centre for Climate Change Research and Institute of Geography, Erlachstrasse 9a, CH-3012 Bern, Switzerland

2) NCCR Climate, University of Bern, CH-3012 Bern, Switzerland

3) University of Mainz, Institute for Geosciences, Becherweg 21, Mainz, 55099 and GeoConsult Rein, Katharinenblick 5, Oppenheim, 55276 Germany

4) Universidad de Concepción, Centro EULA-Chile, Concepción, Chile

5) University of Liverpool, Departement of Mathematical Sciences, Liverpool L69 3BX, UK

*** Corresponding author. Email adress: lucien.vongunten@giub.unibe.ch, Phone: +41 31 6312092, Fax: +41 31 6318511**

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Abstract

We present a pigment-based quantitative high-resolution (five years) austral summer DJF (December to February) temperature reconstruction for Central Chile back to AD 850. We used non-destructive in-situ multi-channel reflection spectrometry data from a short sediment core of Laguna Aculeo (33°50'S/70°54'W, 355 m a.s.l., Central Chile). Calibration-in-time (period AD 1901 – 2000, cross-validated with split periods) revealed robust correlations between local DJF temperatures and total sedimentary chlorin (relative absorption band depth (RABD) centred in 660-670 nm $RABD_{660:670}$: r=0.79, p<0.01; five-years triangular filtered) and the degree of pigment diagenesis ($R_{660nm/670nm}$: r=0.82, p<0.01; five-years triangular filter). Root Mean Squared Error values are small (between 0.24 and 0.34°C) suggesting that most of the reconstructed decadal-scale climate variability is significant.

Our data provide quantitative evidence for the presence of a Medieval Climate Anomaly (in this case: warm summers between 1150 and 1350 AD; ΔT = +0.27 to +0.37°C wrt 20th century) and a very cool period synchronous to the "Little Ice Age" starting with a sharp drop between AD 1350 and AD 1400 (-0.3 °C / 10 yr, decadal trend) followed by constantly cool (ΔT = -0.70 to -0.90°C wrt 20th century) summers until AD 1750.

The structure of variability compares in great detail with annually-resolved tree-ring based warm-season temperature and river discharge reconstructions from northern Patagonia (42°S) for the past 400 years, with qualitative climate reconstructions from Andean glacier fluctuations, and with hydrological changes in Patagonian lake sediment records.

Keywords; *Climate change, lake sediments, geochemistry, reflectance spectrometry, Little Ice Age, South America*

7.1 Introduction

Quantitative high-resolution global, hemispherical and regional climate reconstructions covering the last millennium are fundamental to place modern climate warming into a long-term context, to assess the sensitivity of the climate system to natural and anthropogenic forcings and thus to reduce uncertainty about the magnitude and impact of future global climate change (Hegerl et al., 2006). While significant advancements have been made in the reconstruction methods and compilation of data sets for the northern hemisphere (Mann et al., 1999; Luterbacher et al., 2004; Moberg et al., 2005; Lee et al., 2008), the southern hemisphere is largely 'terra incognita' and devoid of adequate data. For the entire southern hemisphere, Mann and Jones (2003) considered only five data sets suitable for their work on surface temperature reconstructions for the past two millennia. Only two of these data series are from South America: a tree-ring record from southern South America (Lara and Villalba, 1993) with unknown preservation of the low-frequency component of climate variability, and the $\delta^{18}O$ record from the Quelccaya ice where the temperature signal is arguably putative at best (Vimeux et al., in press and references therein).

The lack of high-quality data sets at an adequate spatial distribution in the southern hemisphere has been recognized as the bottleneck to assess and diagnose forced

or unforced climate variability during the Little Ice Age and the Medieval Climate Anomaly chronozones (Bradley et al., 2003). The IGBP-PAGES research initiative LOTRED-SA (Long-term climate reconstruction and diagnosis in South America) has been initiated in 2006 to fill this gap (Grosjean and Villalba, 2006).

In this context, we present a continuous high-resolution (1-3 years sampling interval, 5-yrs filtered reconstruction) quantitative austral summer DJF (December to February) temperature reconstruction based on sedimentary pigments from Laguna Aculeo, Central Chile, back to AD 850. Besides the tree-ring records, our lake sediment record is the first of its kind in terms of resolution, calibration quality, quantification and error estimation for South America. While the generation of quantitative high-resolution time series from biogeochemical and biological lake sediment proxies is typically very time-consuming and expensive we used here in-situ multi-channel reflectance spectroscopy techniques to measure total early diagenetic chloropigments (chlorins) in the lake sediments. Although this technique is very rapid, non-destructive and, therefore most suitable for long continuous high-resolution records, it has surprisingly rarely been explored in lake sediments. In marine sediments, the potential of this technique has been demonstrated in the pioneering work on ENSO variability for the last 20,000 years (Rein et al., 2005).

First we describe the method used for the pigment proxies in the lake sediments. Second, we discuss the chronology of the lake sediments with a particular focus on the last 100 years, which is arguably the most fundamental period for the calibration of near-annually resolved non-varved lake sediment proxies against meteorological data series (calibration in time; here AD 1901 – 1996). Third, we extend the statistical calibration model back in time to AD 850 (beginning of our sediment record) and discuss the DJF temperature reconstruction for Central Chile in the regional context. This temperature record from Laguna Aculeo is particularly important for climate change research because the site is a very good predictor for DJF temperatures in large parts of southern South America (Chile and Argentina 25 – 45°S), the northern Andes and Venezuela (Figure 7-1). This is the first quantitative temperature reconstruction for Central Chile for the last millennium; all the other reconstructions from that area (mainly tree-ring series; Le Quesne et al. (2006) and references therein) are sensitive to precipitation.

7.2 Study area

Laguna Aculeo (33°50'S/70°54'W, 355 m a.s.l.) is a warm polymictic, eutrophic to hypertropic, neutral (pH = 7.2) lake of tectonic origin located on the eastern boundary of the Coastal Range 50 km south-east of Santiago de Chile. This lake is one of the largest natural lakes in this region (area 11 km^2, max depth 7 m; Figure 7-1). Due to very high primary production, the transparency of the lake water is low and the photic zone is shallow (Secchi depth 1-1.5 m). The bedrock geology in the catchment consists of Cretaceous to Tertiary andesites; the mountains of the catchment range up to 2281 m a.s.l. (Jenny et al., 2002). Approximately 3200 cal yr B.P. the lake developed from a shallow brackish lake to the modern freshwater lake, and current climatic conditions were established. Diatom taxa suggest that the modern trophic state has been reached ca 2000 years ago (Jenny et al., 2002): massive diatomaceous organic-rich (10-15% C_{org}) ooze forms the anoxic sediments, which is a favourable depositional environment to preserve pigments from further post-sedimentary diagenesis such as chemical- or photo-oxidation (Villanueva and Hastings, 2000; Korhola et al., 2002).

Central Chilean climate is mediterranean with cool-humid winters and hot-dry summers with very high radiation. Annual precipitation (predominantly winter precipitation) is on the order of 550 mm and mainly driven by the strength and latitudinal position of the southern mid-latitude Westwind Drift and the southeast Pacific anticyclone which is, ultimately, related to ENSO (Aceituno, 1988): warm (cold) ENSO phases lead to enhanced (decreased) winter precipitation. Mean annual temperature is 14°C (average AD 1900 – 2000) with 7-10°C in winter and 18-20°C in austral summer (GISS, 2008).

The correlation field analysis (Figure 7-1, CRU_TS 2.1, Mitchell and Jones (2005), 33.75° S / 70.75° W, AD 1901-2000) shows that DJF temperatures at Laguna Aculeo are highly correlated with DJF temperatures in large parts of southern South America (Chile and Argentina 25 – 45° S), parts of the northern Andes and Venezuela. Thus, a DJF temperature record from Laguna Aculeo is relevant and an excellent predictor for subtropical and mid-latitude South America. A temperature record form Laguna Aculeo is not expected to be a good predictor for the Southern Annular Mode SAM (Gillett et al., 2006).

7.3 Material, methods and data

100 cm long lake sediment cores were collected in 2005 from the deepest part of Laguna Aculeo (7 m water depth, coring site in Figure 7-1) using a modified Livingstone piston corer. The sediments were sealed in the coring liners to keep redox conditions stable and stored under dark and cool (4°C) conditions. Prior to analysis, the core was split and one half was covered with a transparent polyethylene foil to prevent oxidation and to protect the sensor of the photospectrometer during high-resolution logging. The other half-core was used to establish the chronology, to describe sedimentary

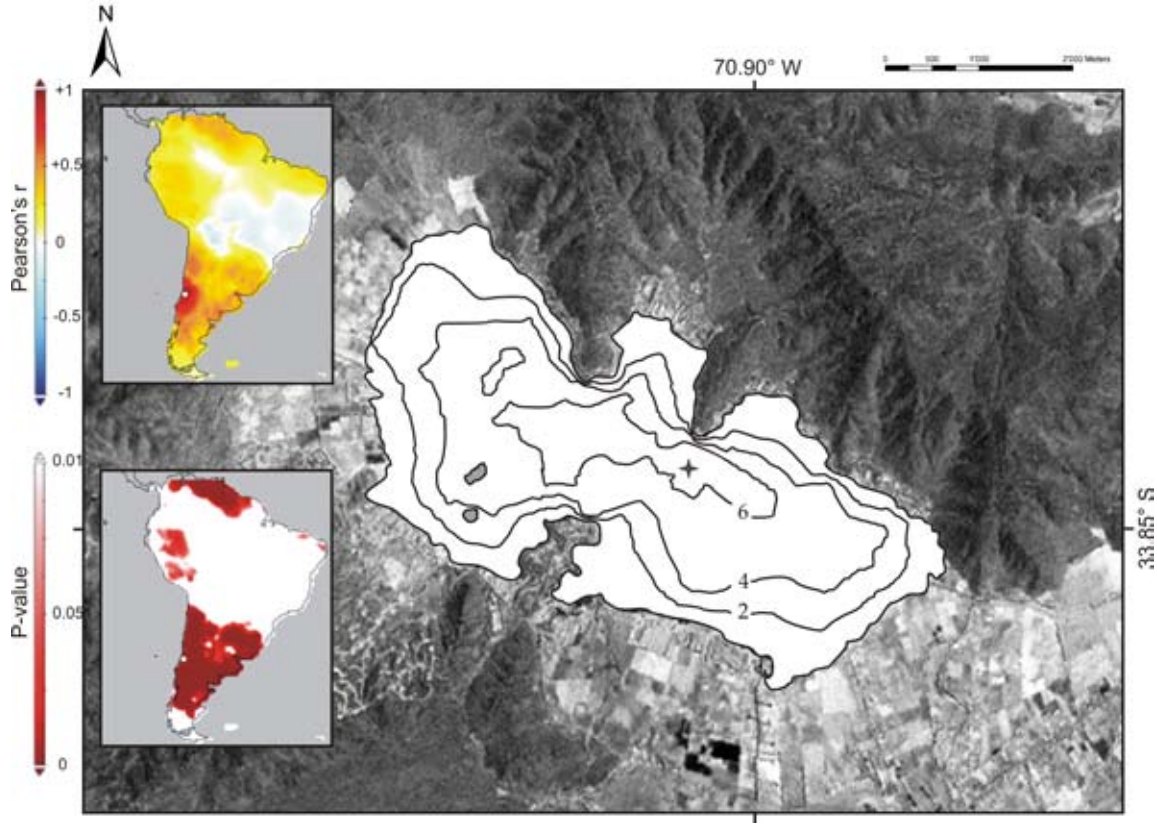

Figure 7-1 Geographical setting of the study area and summer temperature teleconnections between the study area and South America. The large map shows the Location of Laguna Aculeo, and the bathymetric map (Background image: Landsat ETM+, Global Land Cover Facility); the coring site is marked by the star. Inset: Summer temperature (DJF) Pearson correlation map between Laguna Aculeo (white dot) and South America. The upper map shows the Pearson correlation-coefficient r and the lower map the corresponding P values (values <0.01 are coloured in red)

facies, measure particle grain size distributions and to identify seismites (or sismo-slumps; classification and identification after Montenat et al. (2007). Seismites are diagnostic sedimentary features formed by liquefaction of water-saturated surface sediments, overpressured water and, finally, rearrangement of the sediment sorting and mode of particle size distributions. In Laguna Aculeo, seismites are visible by eye (light mm- to cm-scale layers) and have a diagnostic rapid change of the grain size mode in the basal stratum (Figure 7-2). Seismites in lake sediments have been used to record the succession of earthquakes in Chile and elsewhere (Moernaut et al., 2007; Montenat et al., 2007). Grain size analysis was performed on continuous 0.5 cm sample intervals (equivalent to 2-9 years resolution) on the organic matter-free (30% H_2O_2) and diatom- and biogenic silica-free (1 M NaOH leaching) sediment fraction on a Mastersizer 2000 laser grain sizer.

The chronology of the sediment core (Figure 7-2) is based on multiple techniques. Gamma decay of ^{210}Pb, ^{226}Ra and ^{137}Cs were measured at the Liverpool University Environmental Radioactivity Laboratory with Ortec HPGe GWL series well-type coaxial low background intrinsic germanium detectors. ^{14}C AMS samples on bulk organic matter were measured at the Poznań Radiocarbon Laboratory and calibrated using the ShCal04 Southern Hemisphere Calibration curve (McCormac et al., 2004). A radiocarbon-reservoir effect is not present in the lake (Jenny et al., 2002). The radiometric chronology was refined with the seismite stratigraphy (criteria based on the grain size mode; mega-seismites are visible by eye) and the record of historical earthquakes in that region (Barrientos, 2007). The final depth-age model and model uncertainties (Figure 7-2) were calculated following the mixed-effect regression procedure (Heegaard et al., 2005) using all age markers.

The main sources of chloropigments in lake sediments are algae and phototrophic bacteria. Most of the sedimentary chloropigments are degradation products of instable chlorophyll. In particular, the more stable early diagenetic chlorins (Dunning, 1963) have been used in paleolimnological studies (Leavitt and Hodgson, 2001). Typically pigments are extracted in a convoluted procedure, measured and specified with RP-HPLC or

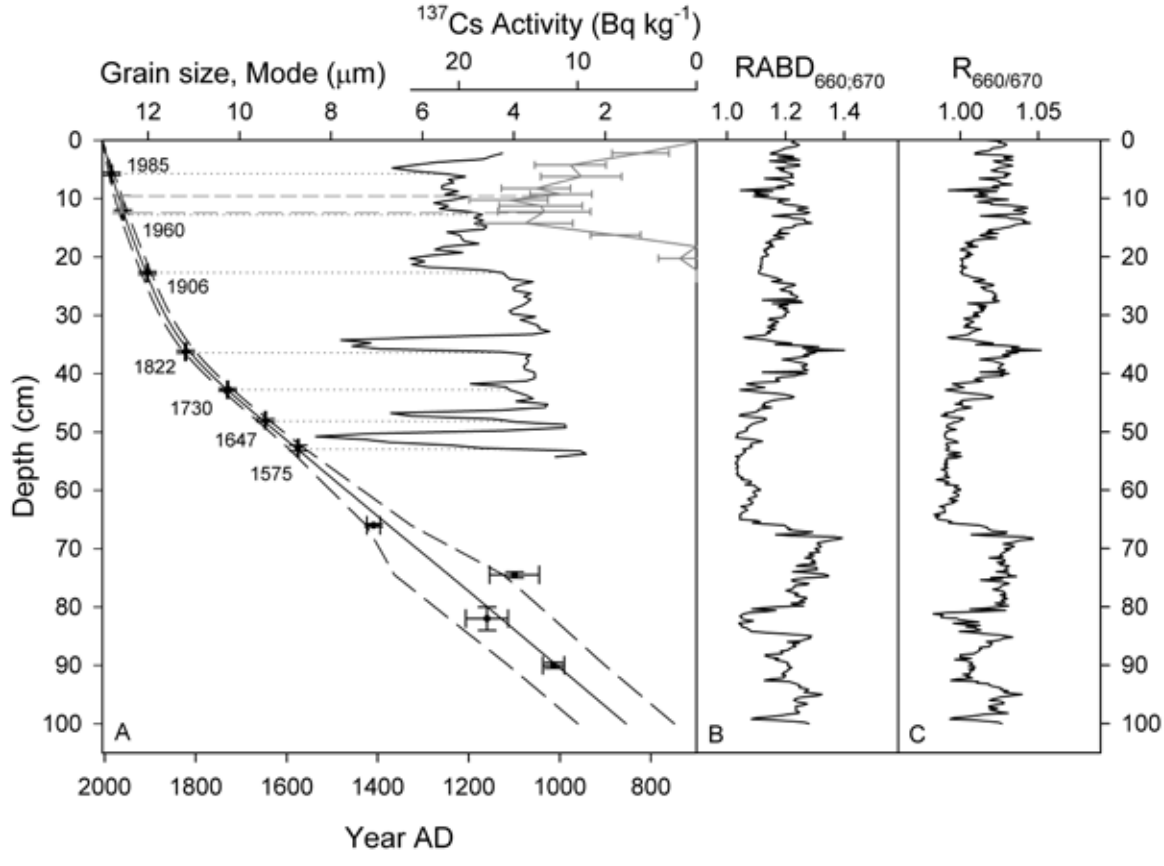

Figure 7-2 A. Depth to age model with grain size mode and ^{137}Cs activity, B. Reflectance spectrometry data $RABD_{660;670}$ and C. $Reflectance_{660nm}/Reflectance_{670\ nm}$

HPLC-MS, which limits the number of samples that can be processed. Here we measured total early diagenetic chloropigments (chlorin) on the fresh un-oxidized split sediment cores by in-situ reflectance spectrometric logging at 2 mm intervals with a Gretag-Spectrolino (GretagMcBeth, Switzerland). Calibrated reflectance spectra were measured at 10 nm intervals between 380 nm and 730 nm, and total chlorin was determined by the relative absorption band depth (RABD) centred in 660-670 nm $RABD_{660;670}$ following the methods and algorithms in Rein and Sirocko (2002). In order to account for the degree of diagenesis, for the variety of diagenetic products and the concomitant shift of the absorption peak to shorter wavelengths (Dunning, 1963), we used as a second proxy the ratio $Reflectance_{660nm}/Reflectance_{670\ nm}$ $R_{660nm/670nm}$ (Figure 7-2), which describes the shape of the absorption peak between 660-670 nm. Both proxies, the degree of diagenesis $R_{660nm/670nm}$ and the total chlorin concentration $RABD_{660;670}$ are highly correlated (Pearson's correlation coefficient: 0.92, df: 559, P: 2.2 10^{-16}) and thus very robust.

In this study, we excluded the most recent sediments (AD 1997 – 2005) for two reasons: the very soft sediment at the sediment-water interface is very difficult to sample and disturbed, and the C/N ratios of the top sediments shows anomalously high values (molar C/N >15) which points to a significant non-aquatic source of sedimentary organic matter during the past 7-8 years.

For the calibration of the lake sediment proxy data with meteorological data, we used the grid point 33.75° S / 70.75° W from the 0.5° x 0.5° monthly temperature reanalysis data set AD 1901 – 2000 (CRU TS 2.1) of Mitchell and Jones (2005). These data are highly correlated with the observational data from nearby Pudahuel-Santiago station (Pearson r=0.79, $P<1e^{-15}$, Spearman ρ=0.81, $P<1e^{-15}$, AD 1901-1985) which is, unfortunately, discontinuous (data gap from AD 1986 to 1992).

Raw spectral reflectance data were obtained at 2 mm resolution which corresponds to an average sampling resolution of 0.6-1.1 years during the calibration period. In order to synchronize the proxy data to the time-intervals of the meteorological data, we first re-sampled (linear interpolation) the proxy data to a 1-year interval and then smoothed the re-sampled data with a three-years and five-years triangular filter (ie, larger than the

original sampling resolution) to account for re-sampling errors, dating uncertainties and possible bioturbation in the surface sediments of the lake. Bioturbation would remove the signal of inter-annual climate variability in the sediments, which leads to a bias in the autocorrelation of the proxy data series.

We used Pearson's product-moment correlation coefficients; P values were corrected for the loss of degrees of freedom according to the data smoothing. For the calibration, meteorological data were treated with the same filter that was applied to the pigment data. The climate reconstruction back to AD 850 is based on ordinary least square regression and scaling calibration (Cook et al., 1994; Esper et al., 2005). The quality of the reconstruction was assessed with cross-validation of split periods (calibration – verification periods AD 1901 – 1948 and AD 1949 – 1996) and with the entire period from AD 1901 to 1996. In order to cover the full range of climate variability in the calibration period we used finally the entire re-analysis period for calibration (AD 1901 – 1996). Root Mean Squared Error (RMSE), the reduction of error (RE) and the coefficient of efficiency (CE) were calculated after Cook et al. (1994). Finally, we calculated the 10-fold cross-validated root mean squared error (RMSE) over the entire calibration period (AD 1901–1996) to estimate the reconstruction error. Running decadal trends (10 years moving windows) and running variance on detrended 100-yrs running intervals are calculated after Della-Marta et al. (2007).

7.4 Results and interpretation

Chronology

The chronology of the sediment core is shown in Figure 7-2, ^{14}C dates are shown in Table 7-I. Due to the vicinity of the Pacific Ocean and weak emissions of the precursor ^{226}Ra, unsupported ^{210}Pb activity barely exceeded ^{226}Ra-derived background levels and could, therefore not be used for dating. ^{137}Cs shows a relatively well-defined activity peak between 9.5 – 10.5 cm sediment depth which corresponds to the AD 1963 – 1965 southern hemisphere fallout maximum (The Environmental Measurements Laboratory 2008).

The four mega-seismites that are clearly visible by eye and show the diagnostic shifts in the grain size mode in the basal sediment strata at 36, 43, 48 and 53 cm sediment depth correspond to the four largest historical regional earthquakes in AD 1575 (7.3 Ms Richter surface Magnitude), AD 1647 (8.5 Ms), AD 1730 (8.7 Ms) and AD 1822 (8.5 Ms) (Barrientos, 2007). The marked shifts of the grain size mode in the upper part of the core correspond with two additional seismites attributed to the earthquakes 1906 (7.9 Ms) and 1985 AD (7.8 and 7.5 Ms). The 1575 AD earthquake was closest to Laguna Aculeo with the epicentre at a distance of only 60 km. The AD 1960 'Great Chilean Earthquake' (9.5 Ms) had its epicentre further to the south (39.5°S); a large impact would not be expected. However, a further shift in the grain size mode (seismite) is found immediately below the AD 1963-65 ^{137}Cs peak.

The overall chronology is consistent and shows smooth sedimentation without significant changes in the sedimentation rate. This feature is fundamental for the study presented here, because the discrete chronological marker points need to be converted into a continuous chronology for the purpose of "calibration in time". Precise chronostratigraphic markers such as seismites help to reduce the chronological uncertainties (Heegaard et al., 2005; von Gunten et al., in press). The high precision of the chronology during the calibration period (20th century) is independently confirmed by a high resolution spheroidal carbonaceous particle (SCP) profile from the same core. The SCP profile reproduces in great detail the industrial history of Santiago (von Gunten et al., in review).

Calibration of the reflectance-based proxies

Both of the measured proxies ($RABD_{660;670}$ and $R_{660nm/670nm}$) show very high correlations with austral summer DJF temperatures AD 1901-1996 (Figure 7-3): total chlorins $RABD_{660;670}$ correlate with r=0.72 (r=0.81) for the three-years (five-years) smoothed data (both P>0.01) and for $R_{660nm/670nm}$ correlations were even higher r=0.77 (r=0.84) for the three-years (five-years) smoothed data (both P>0.01) (Figure 7-3). Unsmoothed $RABD_{660;670}$

*Table 7-I Radiocarbon dates of the Laguna Aculeo core (ACU-05/02A). Poz = Poznań (AMS), Uppsala (AMS), *^{14}C depth/age stratigraphically correlated from core LACU3 (Jenny et al. 2002)*

Sediment depth (cm)	Material	^{14}C yr BP	min – max age cal. AD	Lab code
66.75	bulk organic matter	585 ± 30	1395 - 1424	Poz-17004
74.5	bulk organic matter	975 ± 30	1045 - 1154	Poz-21308
82*	small wooden branch, charcoal	920 ± 65	1132 - 1225	Ua-15089
90	bulk organic matter	1060 ± 30	990 - 1037	Poz-21340

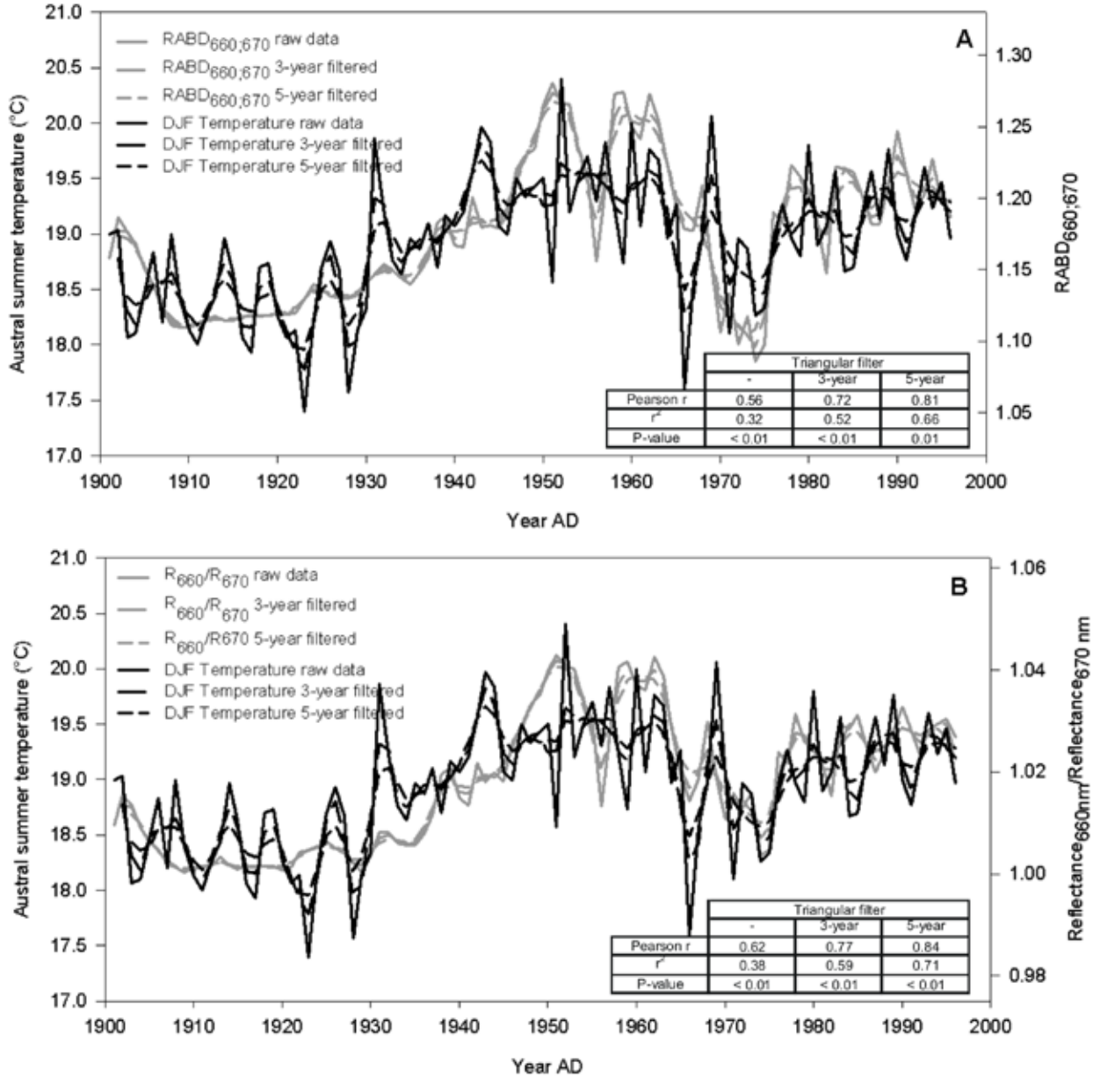

Figure 7-3 Calibration of the reflectance spectrometry proxies against the reanalysis summer (DJF) temperature data of Mitchell and Jones (2005). A. $RABD_{660;670}$ B. $R_{660/670}$. Solid lines represent the raw data, long dashed lines 3-year smoothed and short dashed lines 5-year smoothed curves. Pearson product moment correlation coefficients are given in the embedded Tables

($R_{660nm/670nm}$) series revealed surprisingly high correlation coefficients of r=0.56 (r=0.62), which points to the very high precision of the chronology during the calibration period. Given the similarity of the proxies and to simplify matters, we focus on $R_{660nm/670nm}$ for the calibrations statistics and reconstructions.

Calibration and verification analysis showed that both, the scaling and regression methods yield very high RE (0.71 – 0.94) and CE (0.45 – 0.63); RMSE range between 0.24 and 0.34°C, whereby the 5-year smoothed linear regression model attained the smallest error (Table 7-2). This suggests that most of the sub-decadal-scale and lower-frequency variability in the reconstruction is significant.

It appears from Figure 7-3 that the high-frequency variability in the meteorological time series is much greater (autocorrelation is much smaller) than in the proxy time series. This observation is made both for the raw and the 3-years filtered data, while for the 5- and 7-years filtered data (corresponding to 1.5-2.1 cm sediment thickness), the autocorrelation reaches similar values for both the meteorological and the proxy data: autocorrelation are for 3 (5) [7]-years triangular filtered meteodata = 0.85 (0.93) [0.97] and for the proxy data = 0.95 (0.97) [0.98]. Indeed, bioturbation of the surface sediments results in sediment mixing, which smoothes out high-frequency variability that might potentially be recorded in the sediment archive.

Climate reconstruction

The reconstructed summer temperatures back to AD 850 are shown in Figure 7-4. All models (linear regression and scaling with raw data, three- and five-years triangular filters, respectively) result in very similar curves with a mean range of 0.13°C between the models. This suggests that the model choice is not critical. As expected (Esper et al., 2005) the scaling method produces larger amplitudes. With a few exceptions of the cold and warm extremes, the reconstructed temperatures range within the amplitude that is covered during the calibration period.

Our DJF temperature reconstruction suggest relatively mild summers from AD 860 to AD 1350 (-0.04 to +0.06°C wrt 20th century) that were interrupted by multi-decadal cooler periods AD 970 – 1040 (ΔT = -0.40 to -0.51°C wrt 20th century) and AD 1080-1140 (ΔT =

Table 7-II Calibration statistics for 3- (5)-years triangular filtered data series and linear regression (scaling). RE (Reduction of Error), CE (Coefficient of Efficiency), MSE (Mean Squared Error), RMSE (Root Mean Squared Error)

RE and CE	**Linear regression**	**5-year filtered**		**Pearson r**	**r^2**	**RE**	**CE**
		calibration	**1949-1996**	0.80	0.64	0.79	0.56
		verification	**1903-1948**	0.81	0.66		
		3-year filtered		**Pearson r**	**r^2**	**RE**	**CE**
		calibration	**1949-1996**	0.66	0.44	0.71	0.45
		verification	**1903-1948**	0.73	0.54		
	Scaling	**5-year filtered**		**Pearson r**	**r^2**	**RE**	**CE**
		calibration	**1949-1996**	0.80	0.64	0.75	0.54
		verification	**1903-1948**	0.81	0.66		
		3-year filtered		**Pearson r**	**r^2**	**RE**	**CE**
		calibration	**1949-1996**	0.66	0.44	0.94	0.63
		verification	**1903-1948**	0.73	0.54		
10-fold cross validation				**Pearson r**	**r^2**	**MSE**	**RMSE**
RMSE	**linear regression**		**5-year filtered**	0.83	0.69	0.06	0.24
			3-year filtered	0.75	0.57	0.10	0.31
	scaling		**5-year filtered**	0.83	0.70	0.06	0.25
			3-year filtered	0.76	0.57	0.11	0.34

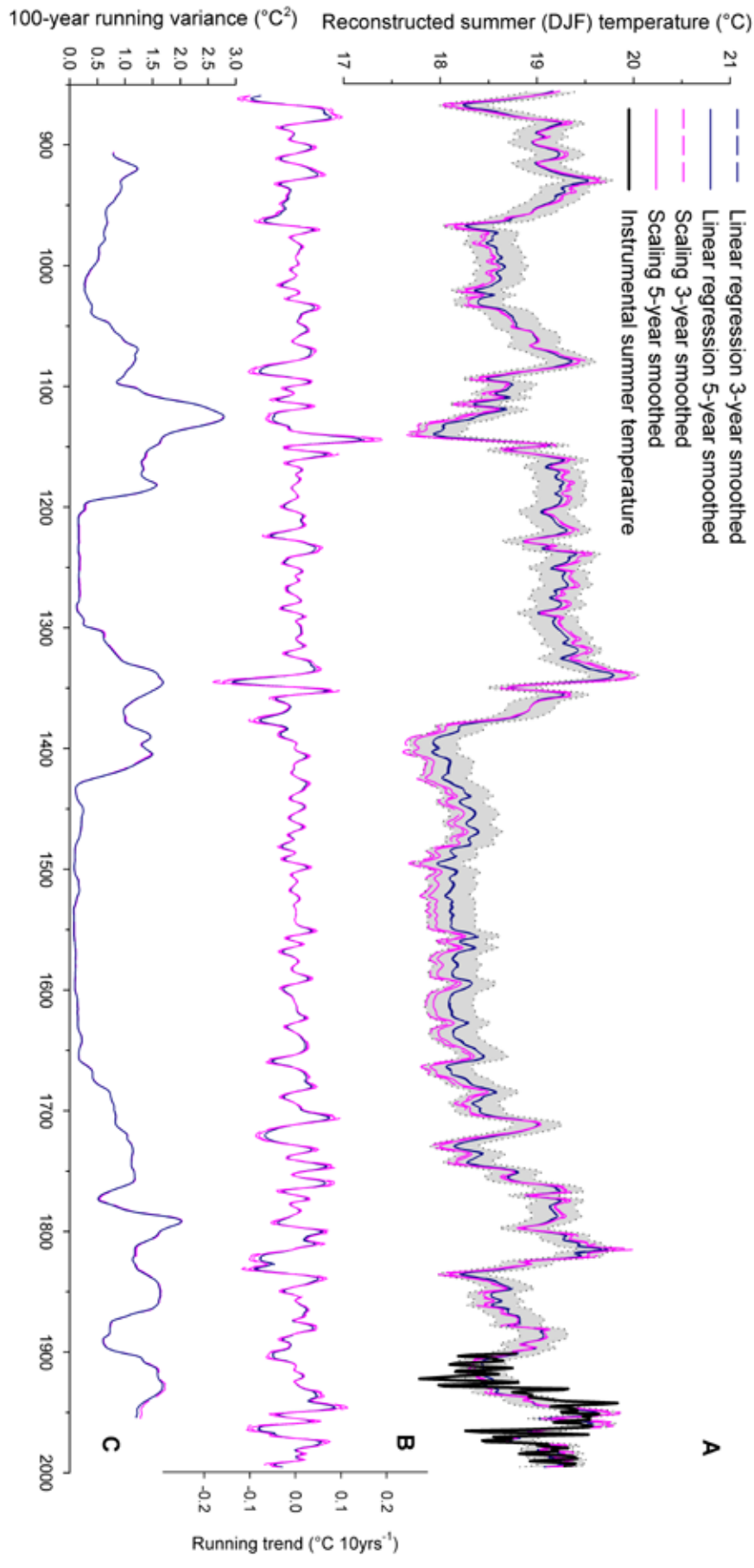

Figure 7-4 Reconstructed austral summer (DJF) temperatures. A. Reconstructions curves back to AD 850 in °C. RMSE of 5-year smoothed linear regression reconstruction is given by the grey area between the dotted lines. 3-year smoothed reanalysis temperature data during calibration period are drawn in black. B. 10-years running trend curves. C. 100-years running variance

-0.48 to -0.63°C wrt 20th century. The warmest period was found AD 1150 - 1350 (ΔT = +0.27 to +0.37°C wrt 20th century). A sharp drop in DJF temperatures is observed between AD 1350 and AD 1400 (-0.3 °C / 10 yr, decadal trend) which was followed by constantly cool (ΔT = -0.70 to -0.90°C wrt 20th century) summers until AD 1750. After AD 1750 summer temperatures show higher variability at decadal scales until the beginning of the 20th century. Between AD 1750 and 1820 warm summers prevailed before summer temperature dropped again until AD 1880.

The analysis of decadal temperature trends (10-years running trends; Figure 7-4b) shows that warming and cooling rates (ΔT/ 10 yrs) during the reconstruction period hardly exceed the rates that are observed during the instrumental period: > 99% of all data points between AD 850 and 1900 are within the range observed AD 1901 – 1996. Two exceptions are noted with a strong warming around AD 1150 and a rapid cooling around AD 1350.

The running variance (Figure 7-4c) shows for most of the periods that subdecadal variability is on the order of 20th century values or smaller. Exceptions are the constantly warm 13th century and the constantly cold period AD 1400 – 1750 when decadal-scale variability seems to be reduced.

None of the three time-series in Figure 7-4 shows a multi-century- to millennial-scale trend which might be related to non-climatic causes such as long-term ecosystem evolution or others. In summary it is suggested that the original chlorin (climate) signal is well preserved in the sediments and that neither high- nor low-frequency variability of the proxy (climate) signal was lost due to postsedimentary diagenetic processes.

7.5 Discussion

The austral summer DJF temperature reconstruction presented here is of high accuracy and quality. However, a number of steps and procedures are fundamental to optimize the sampling and laboratory methods for the purpose of this type of study, and rigorous statistical testing is important.

A highly precise chronology of the lake sediments during the calibration period and sampling at near-annual resolution are critically important prerequisites for calibrating sediment proxy data series with meteorological data series (calibration in time). As it appears from the re-sampling and subsequent aggregation procedure of the proxy data (which is necessary for the calibration in time) the original sampling interval must be much smaller that the final temporal resolution of the climate reconstruction envisaged. The final temporal resolution is, in principle, determined by three different effects: (i) the technical/analytical resolution, (ii) processes internal to the system dynamics of the paleoclimate archive under consideration (here, eg, bioturbation) and (iii) the uncertainties of the chronology during the calibration period, which decides upon the degree of data smoothing required for the calibration statistics (Koinig et al., 2002). In this context, highly precise stratigraphic markers such as seismites and SCP profiles (potentially also tephra layers, flood deposits, etc.) are fundamental to improve and validate the calibration chronology (von Gunten et al., in press).

What is the highest-possible temporal resolution of the paleoclimate reconstruction? Bioturbation of the surface sediments results in sediment mixing, which smoothes out the high-frequency signal of climate variability preserved in lake sediments. Since the depth of bioturbation in the surface sediments (ie, the degree of temporal smoothing) is very difficult to assess, the bioturbation bias may lead to erroneous interpretations of paleoclimate variability, trends and extremes. The statistical analysis of the running trends and running variance (Figure 7-4) may serve as a first plausibility test. In addition, the comparison of the autocorrelation of both, the meteorological and the proxy time series, stepwise smoothed, may also be indicative. In Laguna Aculeo, the bioturbation bias disappears at a smoothing of 5 to 7 years (corresponds to 1.5 to 2.1 cm sediment depth disturbed by bioturbation), when both time series show a similar autocorrelation. This degree of smoothing marks the upper limit of temporal resolution that is, from a climatological point of view, meaningful for a paleoclimatic interpretation. A high ratio between the resolution of the final climate reconstruction (here 5 years) and the resolution of the sampling/analysis (here 0.6 – 3 years) minimizes artefacts due to inhomogeneous sampling intervals and re-sampling procedures, and makes paleoclimatic data series more robust.

How robust are the reflectance spectrometry-based sedimentary photopigment (chlorin) data as warm-season temperature proxies in Laguna Aculeo? The analytical technique for the proxies used ($RABD_{660;670}$ and $R_{660nm/670nm}$) and algorithms applied are well established and have been experimentally tested and verified (Rein and Sirocko, 2002; Rein, 2003). Less clear are the processes that govern chlorophyll formation, embedding and preservation of diagenetic products in lake sediments. Villanueva and Hastings (2000) showed that diagenetic products of photopigments (chlorin) in anoxic sediments can be used as an indicator of paleo-primary productivity in lakes. More precisely, Carpenter et al. (1986) and Korhola et al. (2002) argue that, in fact, anoxic conditions in the sediments are the crucial point regarding pigment preservation. Such conditions are given in Laguna Aculeo suggesting that its sediments are in a favourable environment for fossil pigment analysis. Could eutrophication play a role? McGowan et al. (2005) found that, in a hypertrophic lake, total

phosphorus explained only insignificant amounts of the variance of chlorophyll production. Much more important for algal growth in the hypertrophic lake were aquatic macrophytes, which points to the role of light penetration and solar radiation, and ultimately to cloud-free skies and related high summer temperatures. It is indeed surprising that Laguna Aculeo does not show any signal of eutrophication during the recent past: the diatom communities show a similar trophic state since approximately the last 2000 years (Jenny et al., 2002), and total C and biogenic Si flux to the lake sediments do not show a positive tend during the 20th century (von Gunten et al., in review). It appears that nutrients are not the limiting factor for primary production in that lake, suggesting that indeed the climatic signal (here warm season temperature) may be very sensitive and well preserved in the lake sediments. This finding is very much supported by the calibration statistics that are, after rigorous testing, very robust.

The calibration period and the calibration statistics reveal a number of features that are fundamental with regard to the long-term climate reconstruction. The reconstruction error (0.24 - 0.34°C °C) is very small compared with the amplitude of the decadal-scale variability, suggesting that most of the temperature changes in the reconstruction are significant. The meteorological time series of that area shows pronounced decadal-scale variability, which allows for slightly greater dating uncertainties during the calibration period (and smoothing up to 5 years): the decadal-scale climate variability can still be captured. The calibration period features a very large range of temperatures from very cool conditions (AD 1900 – 1920) to very warm conditions (AD 1940 – 1960) with strong positive and negative decadal temperature trends (eg, positive between AD 1930 – 1940, between 1970 and 1980; negative between 1950 and 1970). It appears from the proxy data series that the calibration period (AD 1901 – 1996) encompasses most of the variability (both in terms of decadal-scale amplitudes and decadal-scale trends) the climate-lake system has experienced during the past 1200 years. In this case, the problem of extrapolating a statistical calibration model outside the calibration range is not an issue; from the statistical point of view, the reconstruction presented here is robust.

Our data provide quantitative evidence for the presence of a Medieval Climate Anomaly (in this case a "warm period" between AD 1150 and 1350) and a very cool period synchronous to the "Little Ice Age" starting AD 1380 and ending AD 1750 (or 1880). Is this structure reproduced in other regional paleoclimatic archives? In the following, we focus on decadal-scale phenomena and variability as observed in regional proxy archives. Inter- to multi-annuals events such as, eg, impacts of volcanic forcing or ENSO signals are not expected to be detected in our data series. On purpose, we do not speculate about the underlying causes because a careful review of model experiments would be required. This goes beyond the scope of this article.

Direct comparison with regional paleoclimatic evidence is difficult mostly because there are only a very few data series available that reconstruct warm season temperature. Most of the tree-ring, glacier or lake sediment archives from southern South America are sensitive to precipitation, and the dynamic link between temperature and precipitation fields across large distances for different seasons of the year is poorly understood.

The tree-ring based DJF temperature reconstruction for the northern Patagonian Andes (41°S) back to AD 1640 (Villalba et al., 2003) is the most suitable data series for comparison since the instrumental summer temperatures show high correlations between both areas (Figure 1). Both reconstructions show surprisingly high consistency in the structure: the cold AD 1660-1680, the warmth around AD 1700, the warmth around AD 1800 (during the Dalton Minimum), and the cold in the mid-19th century until the beginning of the 20th century. The comparison of the same climate variable for the same season for the last 400 years shows that both reconstructions are consistent and reproducible, and that teleconnections between both areas were stable over that time.

More difficult is the comparison between our record and the tree-ring series for June – December precipitation in Central Chile back to AD 1200 (Le Quesne et al., 2006). Although the low-frequency (centennial) precipitation variability is likely not represented in the tree ring series, the relative positive anomalies of June-December precipitation coincide with warm DJF temperatures at AD 1250-1280 1320, 1350, 1440-1470, 1560, 1590, 1660, around 1700, 1800-1810, 1840, 1880-1900. This positive teleconnection between DJF temperatures and June-December precipitation among the study sites is also observed in the meteorological data (mean r=0.2, P=0.1, AD 1901 – 2000). Similarly, comparison with tree ring - based stream flow reconstructions in southern Chile (42°S) back to AD 1600 (Lara et al., 2008) reveals that negative stream flow anomalies coincide with negative DJF temperature anomalies at Laguna Aculeo (AD 1680, 1740, 1830, 1900-1920) which is, again, consistent with observed variability of instrumental meteorological data in the 20th century (r=0.3, P<0.01, AD 1901 – 2000). This also implies stable teleconnections for the last 400 years.

The Laguna Aculeo record is well supported by the history of regional glacier fluctuations which operate, however, at much lower temporal resolution: LIA maximum advances in the Andes at 35°S are reported between AD 1550 and 1720, with a re-advance around AD 1830 (Espizua and Pitte, accepted). Further to the south between N-Patagonia (41°S) and the Cordillera Darwin (55°S), glacier advances started in the mid-13th

century (Koch and Kilian, 2005) which is somewhat earlier compared with the sharp temperature drop at Laguna Aculeo. Later glacier advances were observed in the 16th century and from the 2nd half of the 19th century into the 20th century. In the Fitz Roy area at 49°S, major advances are reported between AD 1590 – 1650, between AD 1730 – 1750 and during the 19th century (Masiokas et al., in press and references therein). The glacier data support the sustained cold conditions between the early 15th and the beginning of the 20th century as found in Laguna Aculeo.

The Medieval Climate Anomaly (ca. AD 800 – 1250) has also been found in lake records of southern Patagonia, Argentina (Stine, 1994). Depending on the location, the MCA appears as a wet anomaly followed by drier conditions during the LIA (Laguna Las Viszcachas, Fey et al., in review), whereas more to the east, the MCA appears as a dry anomaly followed by more humid conditions (Laguna Potrok Aike, Haberzettl et al. (2005), for review see Fey et al., in review).

Also paleoclimatic archives in the tropical Andes are consistent with the Laguna Aculeo record: A review of 14 glaciers in the Cordillera Blanca of Peru shows glacier advances clustering between AD 1440 and 1880 (Solomina et al., 2007), with the coldest and wettest period AD 1590 – 1720. In Venezuela, glaciers did not exist in the catchment of Laguna Micubaji between AD 750 and 1100, and Laguna Blanca experienced a marked shift to more humid conditions around AD 1250 (Polissar et al., 2006). Much more detailed insight is provided by a new NH_4-based quantitative high-resolution temperature reconstruction from Illimani glacier, Bolivia: besides the general agreement regarding the warmth of the 11th – 13th centuries and the LIA cold, the very rapid cooling in the 14th century is strikingly similar (Kellerhals et al., in review).

7.6 Conclusions

Here we presented a quantitative, well-calibrated high-resolution (five years triangular filtered) sedimentary pigment-based warm-season temperature reconstruction for Central Chile back to AD 850. We high-light both, the methodological approach and the paleoclimatic results:

The technique used (high-resolution in-situ multichannel reflectance spectrometry) yields for the proxy measured (total sedimentary chlorin as determined by $RABD_{660;670}$ and $R_{660nm/670nm}$) very robust results. The analytical technique and the algorithms applied are well established and have been experimentally tested and verified. The advantage of this technique is that large data sets can be generated very rapidly and at minimal costs, which is a precondition for longer high-resolution paleoclimatic records. This technique has a great (yet grossly unexplored) potential. However, systematic tests need to be carried out in different lake and sedimentary environments to assess the potential and limits of this method.

The calibration-in-time has been rigorously tested and cross-validated: the statistics attest the good quality of the calibration, reconstruction errors are small. The meteorological time series during the calibration period encompasses large amplitudes of (sub)decadal-scale variability and strong decadal trends. These features are very important to test the quality of the calibration, the significance of the proxy used for the paleoclimate reconstruction and, ultimately, to assess the quality of the reconstruction per se. Almost the entire range of variability in the proxy time series for the past 1200 years has been observed during the calibration period, which makes the reconstruction robust, at least from the statistical point of view.

Obviously, a highly precise chronology of the lake sediment record is fundamental, particularly for the calibration period. Additional stratigraphic markers (here: seismites) help to reduce dating uncertainties, which is critical in terms of the minimum temporal resolution (smoothing) that can be envisaged in the procedure of calibration in time. Also the sampling interval (temporal resolution of data pints) is most critical and needs to be smaller (rule of thumb 3-5 times) than the final temporal resolution envisaged for the paleoclimatic reconstruction. Or overstating the argument: the study of high-resolution paleoclimatic archives should actually start with a spectral analysis of the local meteorological time series to assess the significant frequency bands of local climate variability. This determines the minimum technical sampling resolution required, the maximum dating uncertainties of the chronology allowed, and the maximum smooth ("filtering" due to systems dynamics of the archive, here: bioturbation) permitted in the archive. The "real" temporal resolution of climate variability recorded in the archive may not be identical with the technical/analytical resolution. This is a complex optimization process but determines whether or not a paleoclimate reconstruction from a given archive at a given site at an envisaged temporal resolution is meaningful and successful.

Our DJF temperature reconstruction provides insight into sub-decadal- to centennial-scale climate variability from Central Chile, a site that is a good predictor for warm-season temperatures for large parts of southern South America. This site is not a good predictor for ENSO and SAM. Our data provide quantitative evidence for the presence of a Medieval Climate Anomaly (in this case: warm summers between AD 1150 and 1350) and a very cool period synchronous to the "Little Ice Age" starting AD 1380 and ending AD 1750 (or 1880). The structure of variability compares in great detail with tree-

ring based warm-season temperature reconstructions from northern Patagonia (41°S) for the past 400 years, indicating that teleconnections in southern South America remained stable over that time. The millennial-long temperature reconstruction from Central Chile shows a dynamically consistent picture with qualitative climate reconstructions from regional and continental fluctuations of Andean glaciers and hydrological changes in Patagonian lake sediment records. The underlying forcings and mechanisms still need to be assessed.

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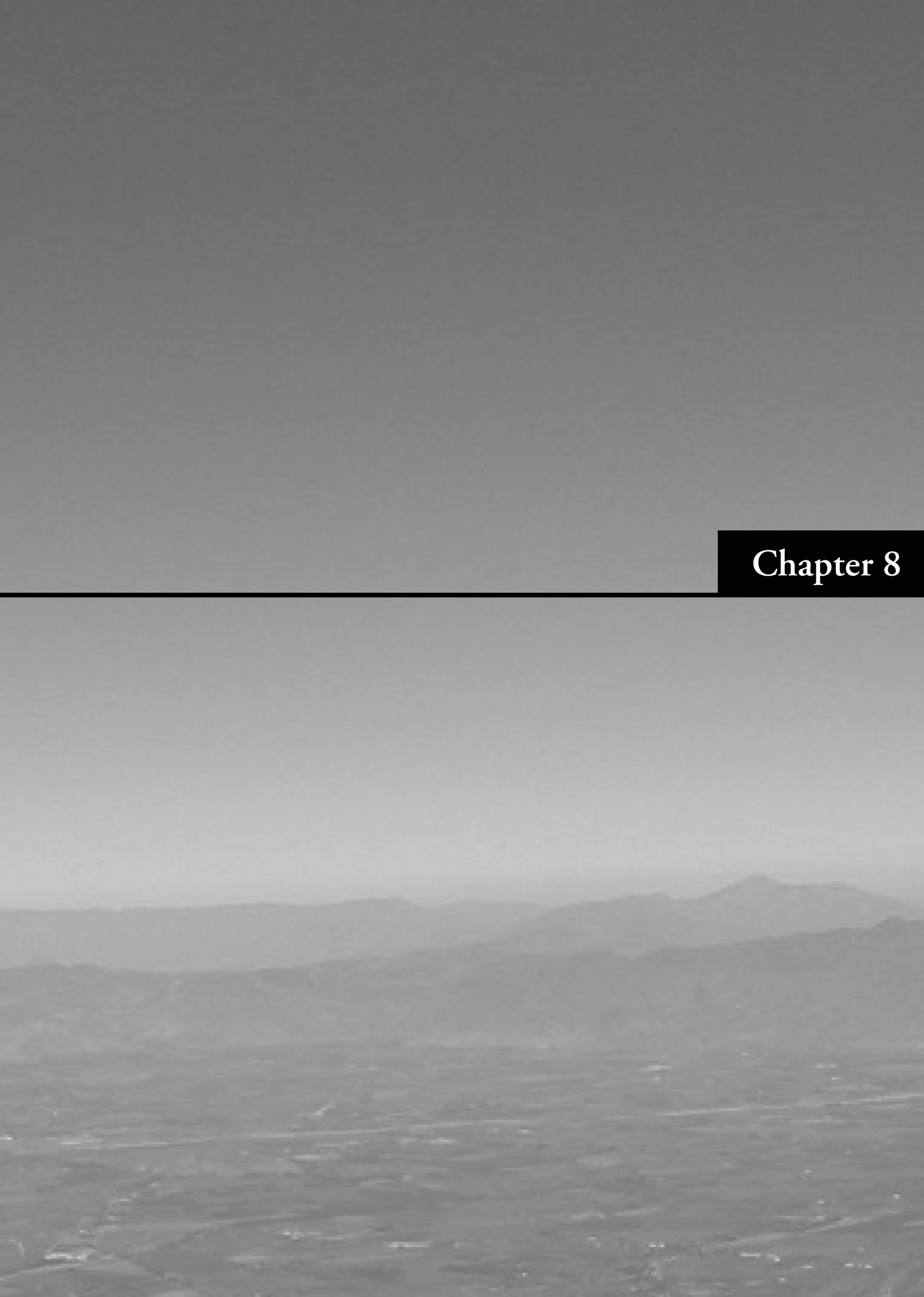

Chapter 8

8. Pollution and eutrophication history AD 1800 - 2005 as recorded in sediments from five lakes in Central Chile

L. von Gunten[1*], M. Grosjean[1,2], U. Eggenberger[3], P. Grob[1], R. Urrutia[4], A. Morales[5]

1) University of Bern, Oeschger Centre for Climate Change Research and Institute of Geography, Erlachstrasse 9a, CH-3012 Bern, Switzerland

2) Oeschger Centre for Climate Change Research and NCCR Climate, University of Bern, CH-3012 Bern, Switzerland

3) Institute of Geological Sciences, University of Bern, Baltzerstrasse 1-3, CH-3012 Bern, Switzerland

4) Universidad de Concepción, Centro EULA-Chile, Casilla, Concepción, Chile

5) Superintendencia Geología-División El Teniente, Casilla, CODELCO, Chile

*** Corresponding author. Email adress: lucien.vongunten@giub.unibe.ch, Phone: +41 31 6312092, Fax: +41 31 6318511**

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Abstract

Since the late 18th century, anthropogenic activities and emissions of substances into the environment have significantly altered bio-geochemical cycles and ecosystems from local to global scales. One of the fundamental problems to quantify past impact is that long series of observational data for pollutant immissions and changes in the nutrient cycling of ecosystems (eutrophication) are often not available. In consequence it is very difficult to assess pre-disturbance background levels or to evaluate the success of technological or regulatory measures that have been imposed in order to reduce emissions of pollutants and negative impacts on ecosystems. Lake sediments may provide suitable archives to decipher the history of local and regional pollution and eutrophication.

Here we provide quantitative high-resolution data for the history of airborne pollutants and eutrophication from sediments of five lakes in Central Chile between ca. AD 1800 - 2006. For that purpose, we have selected one lake in the vicinity of the metropolitan area of Santiago de Chile, two lakes adjacent to a very large copper mine, one lake next to a major international transandean road (Paso Libertadores), and one remote lake – the potable water reservoir for Santiago - in the high Andes. We use spheroidal carbonaceous particles (SCPs) from fossil fuel combustion and excess atmospheric Cu deposition from mining activities as a proxy for atmospheric deposition. Organic carbon and nitrogen flux rates to the sediments and C/N ratios are used as a proxy for aquatic primary production and eutrophication.

We show that the lake sediment SCP and Cu records are highly consistent and depict in great detail the local and regional history of urban, industrial and transportation history as reported in independent documentary sources and statistics. The pre-industrial and pre-1950 background concentrations (and flux rates) of the substances can be quantified. We can also show that technical measures taken in the early 1980s to trim down Cu emissions from the copper mines reduced the excess atmospheric Cu fallout to the lakes by about 50%.

Eutrophication of the lakes did not start before ca. 1980. Prior to that time, warm season temperatures explain most of the variance in TOC and N flux to the sediments. The three dimictic lakes show only moderate eutrophication responses to enhanced N supply (as atmospheric fallout; enrichment factors for TOC and N 1.1 – 2.6), suggesting that mainly phosphorus controls aquatic primary production. The meromictic lake, where phosphorus recycling is likely, shows the largest response (enrichment factors for TOC and N between 9 – 20).

While all five lakes show overall consistent and similar trends for the pollution history during the 19th and 20th century, there are significant differences in the details of the individual profiles. This suggests that local sources are highly important and the common regional (background) signal is relatively marginal. This is very different from Europe.

Keywords; *spheroidal carbonaceous particles, TOC, limnology, metal pollution, South America, Andes*

8.1 Introduction

Anthropogenic activities and emissions of substances to the environment have resulted in significant and profound impacts on the Earth's climate, on ecosystems and on humans since the late 18th century (e.g., Rodhe et al., 1995; IPCC, 2007; Smol, 2008). Crutzen and Stoermer (2000) coined the term 'Anthropocene' for this most recent period of the Earth's history.

While the concept of the "Anthropocene" has mainly emerged in the light of greenhouse gas emissions, global warming and land cover changes, many other potentially toxic substances and, in particular nutrients have substantially modified bio-geochemical cycles and ecosystem functioning from local to global scales (e.g., Nriagu 1996, Smith et al. 2006).

On the local to regional scale, air pollution and eutrophication of freshwater systems continue to have strong impacts: pollution with stable, toxic and ubiquitous organic compounds (e.g., PAHs or POPs), particulate matter (e.g., PM_{10}, nanoparticles) or heavy metals (e.g., Cu or Pb) has direct negative effects on health and ecosystems (e.g., Nriagu, 1980; Grass and Cane, 2008; Millman et al., 2008; Smol, 2008). Well documented are also indirect negative effects on terrestrial and aquatic ecosystems through acidification (e.g., SO_4/H_2SO_4 or NO_3/HNO_3) or enhanced flux of nutrients (active nitrogen or phosphorus) (Rodhe et al., 1995; Galloway, 1995; Kuylenstierna et al., 2001; Galloway et al., 2008; Schindler et al., 2008; Smol, 2008). Globally, C, N and P cycles, but also metal cycles have accelerated; this is most delicate for freshwater systems such as rivers and lakes which play a pivotal role in the transport, removal or mobilization of these substances to or from the sediments (Beusen et al., 2005; Seitzinger et al., 2005; da Cunha et al., 2007). In consequence, management guidelines and regulatory directives had to be set in place (e.g. European water management: European Framework Directive WFD 2000/60/EC; European Council, 2000).

From the scientific, but also from the ecosystem management and legislative perspective, one of the fundamental problems in this context is the fact that, in many cases, long observational immission data (monitoring) are not available to quantify the historical dimensions of anthropogenic contamination. In consequence it is very difficult to assess the natural background levels and undisturbed conditions, the magnitude and dynamics of anthropogenic impacts, and to evaluate success or failure of regulatory measures and technological improvements that are taken for emissions reductions and/or ecosystem restoration. This lack of monitoring data is especially critical in remotes mountainous or Polar Regions, and in developing countries.

Lake sediments are powerful environmental archives and may provide quantitative historical records for most of the major types of pollutants (for review see Bennion and Battarbee, 2007; Smol, 2008). Lake sediments have been used to document atmospheric deposition of Cu, Pb and other metals since pre-historic times (e.g., Shotyk, 1996; Abbott and Wolfe, 2003; Cooke and Abbott, 2008), deposition of acids (e.g., Charles and Whitehead, 1986; Battarbee et al., 1990; Battarbee, 1994), fossil fuel use (e.g., Rose et al., 1999; Rose, 2001 and references therein) or eutrophication in lakes (e.g., Bennion et al., 2004; Räsänen et al., 2006; Bigler et al., 2007). While most of these studies on pollution history were conducted in Europe or North America, data from remote mountainous regions, from Asia, from the tropics and the southern hemisphere are particularly scarce. This is most critical in Asia and South America, where the economies are rapidly growing, emissions are boosting, and pollution is increasingly of serious environmental concern.

Here, we present a detailed history of selected atmospheric pollutants and indicators of eutrophication from sediments of five lakes in Central Chile since 1800 AD. The Metropolitan Region around Santiago de Chile is currently among the most dynamic areas of urban and industrial transformation. In order to assess the significance of local and regional sources and to evaluate the different ranges and mechanisms of pollutant transport, we have carefully selected five lakes in specific settings: one lakes near the fast growing city of Santiago, two lakes near a very large copper mine but on the windward side of Santiago, one lake near the largest international transandean transport route between Chile and Argentina, and one lake (the potable water reservoir for Santiago) in a remote area of the Andes but on the lee side of Santiago. We use spheroidal carbonaceous particle (SCP) flux to the lake sediments to infer the history and intensity of fossil fuel combustion (Rose, 2001) and excess Cu as an indicator of emissions from mining activities (e.g., Shotyk, 1996). Both, total organic carbon (TOC) and N flux to the lake sediments are taken as indicators of aquatic primary production (PP) and proxy for eutrophication (Meyers and Teranes, 2001).

We show that the pollution records as derived from the lake sediments are consistent with the documented individual environmental histories of the specific sites. The pre-disturbance background levels ("natural baseline") of the investigated substances can be quantified. Our results suggest that, for the area of Central Chile on the mid-latitude west coast of the continent, the local signals are very important while the regional background loadings of contaminants are subordinate. Documented technological measures to reduce air pollution from a copper mine (here changes in the smelting techniques) result in a demonstrated improvement and reduction of atmospheric fallout flux of Cu.

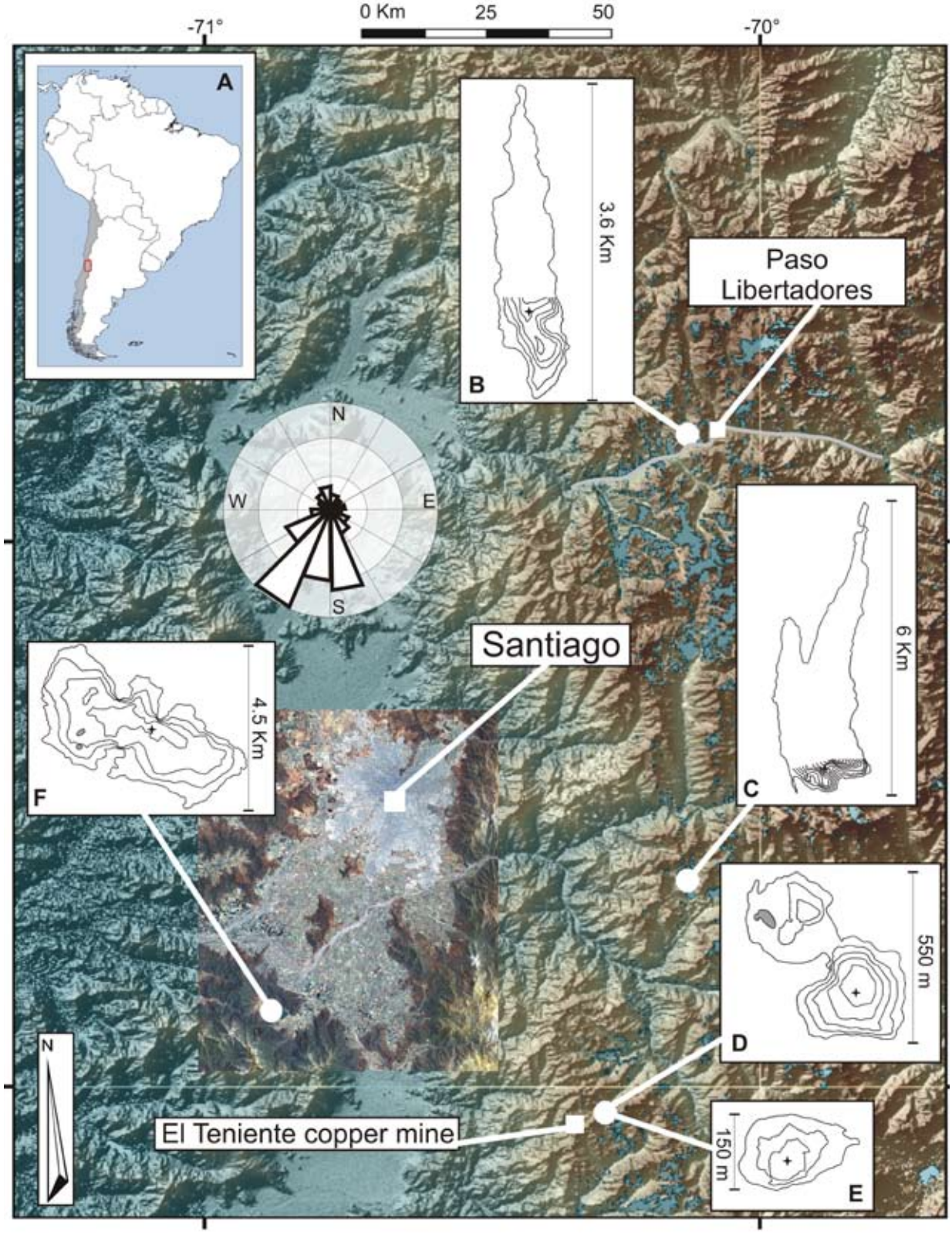


Fig. 8-1 Study site with the Chilean capital Santiago, the El Teniente copper mine and the Paso Libertadores (marked by the light grey line). The embedded wind rose shows that the wind direction is predominantly from the south-southwest. Insets: A) South America with the study area (box); B) Laguna del Inca: Bathymetric map with 10 m isolines; C) Laguna Negra: Isolines 10 m; D) Laguna El Ocho: Isolines 10 m; E) Laguna Ensueño: Isolines 2 m; F) Laguna Aculeo: Isolines 2 m. All coring sites are represented by a star. Background composite image from Landsat ETM+, Global Land Cover Facility and SRTM, USGS

8.2 Sites and sites selection

The area of investigation is located in the Región Metropolitana, the greater area around Santiago de Chile in the longitudinal valley of Central Chile. The lakes were chosen in the foot zone of the Coastal Range to the west and in the Cordillera de los Andes to the east of the city.

Central Chilean climate is mediterranean with cold-humid winters and hot-dry summers with very high solar radiation. Mean annual precipitation is on the order of 550 mm, mainly driven by the southern mid-latitude Westwind Drift and the southeast Pacific anticyclone (Aceituno, 1988). Mean annual temperatures at Santiago (520 m a.s.l.) are about 14°C (average AD 1900-2000) with 7-10°C in winter and 18-20°C in the summer (GISS 2008). South to south-westerly wind prevails throughout the year (Fig. 8-1, mean wind direction at Pudahuel International Airport, AD 1988-1996, Grass and Cane, 2008). The boundary-layer climatology in the longitudinal valley and in Andes is, however, strongly confined by topography and the W-E orientation of the valleys.

The Región Metropolitana is a very fast growing urban region with a population of > 6 Mio inhabitants in 2006 (i.e., 42% of the population in Chile). Since AD 1940, the population and the area of the city have grown by a factor of more than six (Romero et al., 1999; Galetovic and Jordán, 2006). The combination of atmospheric and topographic features produces frequent inversion layers, which makes the city very sensitive to air pollution. This has become a major problem for human health and the regional environment (e.g., Romo-Kröger et al., 1994; Romero et al., 1999; Gidhagen et al., 2002; Olivares et al., 2002; Godoy et al., 2003; Grass and Cane, 2008).

The lakes for this study were chosen according to their situation relative to Santiago and the other major emissions sources under consideration (copper mine El Teniente and the transnational traffic route Paso Libertadores; Fig. 8-1). In combination, the different sites yield a comprehensive view of the pollution situation of the region. We have chosen five lakes with different basin configurations, morphologies and trophic states at a maximum distance of 90 km from to Santiago (Fig. 8-1 and Table 8-1):

Laguna Aculeo (33°50'S/70°54'W, 355 m a.s.l., Fig. 8-1) is a warm polymictic eutrophic to hypertrophic lake of tectonic origin located 50 km south-east on the windward side from Santiago. Lake morphology and water chemistry data are listed in Table 8-1. Sub-fossil diatoms in the lake sediments suggest that the modern trophic state was reached ca. 2000 years ago (Jenny et al., 2002). The anoxic sediments are formed by massive diatomaceous organic-rich dark grey ooze. Mountains in the north-west of the catchment range up to 2281 m a.s.l., the flatter south-eastern area is used for agriculture and housing, while the rest of the catchment is covered by forests. The lake is today intensely used for recreational activities.

Table 8-I Lake morphological and water chemistry data. b.d.l.: Below detection limit.

	Aculeo	**Negra**	**El Ocho**	**Ensueño**	**Del Inca**
Measurment depth (m)	0	0 / 40	0 / 30	0	0 / 40
Measurment date	23.10.2005	04.03.2006	02.03.2006	02.03.2006	07.03.2006
					Lake morphology
Area (km^2)	11	5.73	0.15	0.023	1.60
Max depth (m)	7	> 120	45	4.5	> 120
Volume (m^3)	40-50 10^6	-	2.4 10^6	5.0 10^4	-
					Water chemistry
Temp (°C)	21.0	14.4 / 5.7	6.3 / 6.5	5.0	10.7 / 4.5
pH	7.5	6.6 / 7.4	6.5 / 7.0	6.5	6.7 / 6.9
Conductivity (μScm^{-1})	231	131 / 130	93 / 809	71	122 / 145
Dissolved O_2 (mgl^{-1})	8.9	6.8 / 9.8	7.9 / 0.6	-	8.3 / 8.7
Hardness (mgl^{-1})	122	36.6 / 39.0	22.0 / -	< 10	48.8 / 51.2
F (mgl^{-1})	0.13	0.088 / 0.081	0.094 / -	0.12	0.079 / 0.079
Cl (mgl^{-1})	5.54	0.92 / 0.90	0.69 / -	0.67	3.58 / 5.18
NO_2 (mgl^{-1})	0.21	b.d.l. / b.d.l.	b.d.l. / -	b.d.l.	0.01 / 0.022
NO_3 (mgl^{-1})	0.01	0.42 / 0.54	0.45 / -	0.40	0.52 / 0.74
PO_4 (mgl^{-1})	0.02	b.d.l. / b.d.l.	b.d.l. / -	b.d.l.	b.d.l. / b.d.l.
SO_4 (mgl^{-1})	13.1	32.92 / 32.49	29.75 / -	23.78	14.39 / 17.24
Na (mgl^{-1})	14.3	1.71 / 1.71	0.84 / -	1.10	3.31 / 3.82
NH_4 (mgl^{-1})	0.00	0.085 / 0.038	0.031 / -	0.044	0.096 / 0.045
K (mgl^{-1})	2.10	0.47 / 0.46	0.20 / -	0.13	0.22 / 0.25
Mg (mgl^{-1})	8.09	1.21 / 1.24	0.54 / -	0.86	1.82 / 1.82
Ca (mgl^{-1})	17.32	19.96 / 20.59	14.50 / -	8.54	17.26 / 19.93
Sr (mgl^{-1})	0.10	0.025 / 0.024	0.027 / -	0.022	0.025 / 0.034

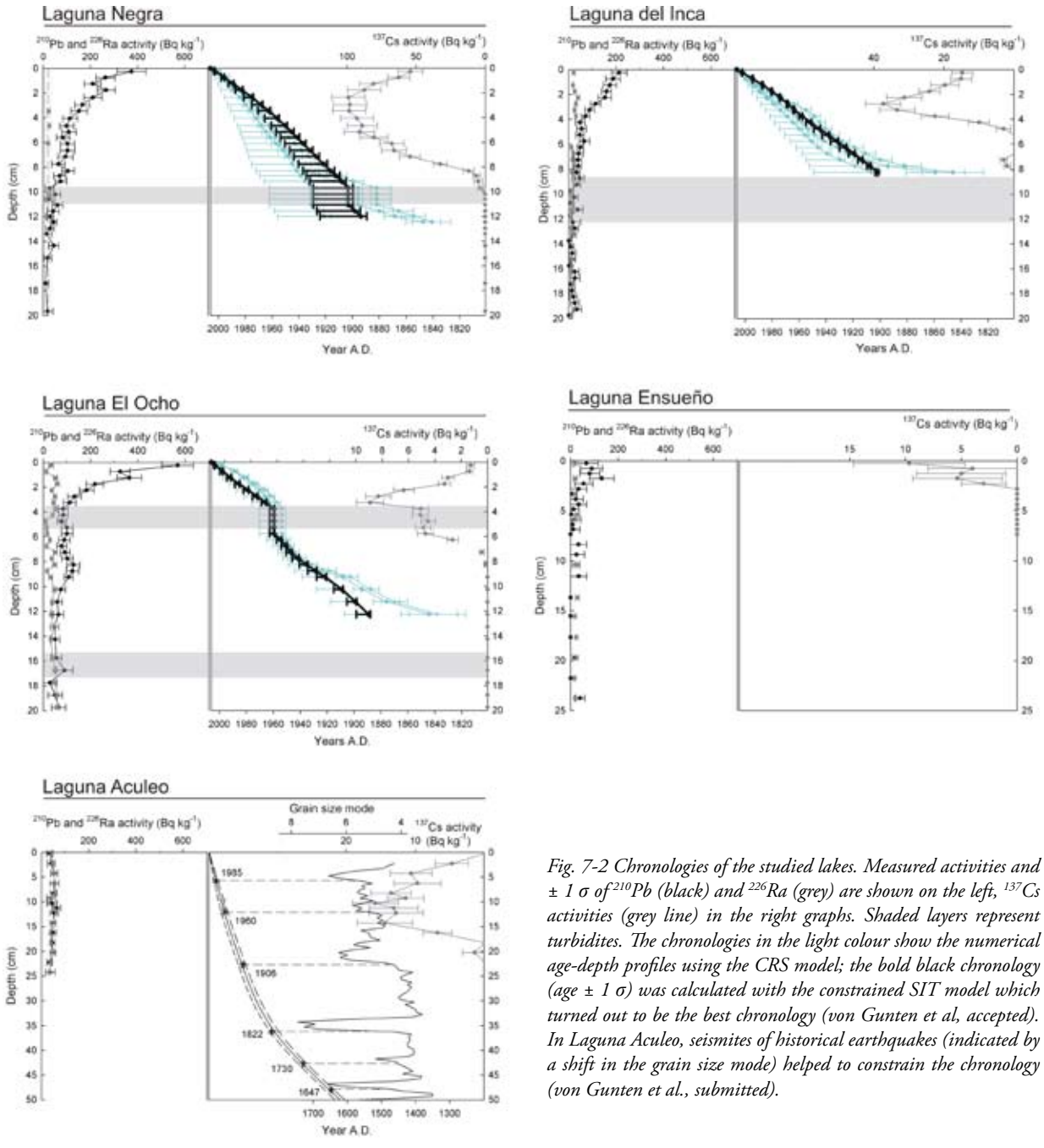


Fig. 7-2 Chronologies of the studied lakes. Measured activities and ± 1 σ of ^{210}Pb (black) and ^{226}Ra (grey) are shown on the left, ^{137}Cs activities (grey line) in the right graphs. Shaded layers represent turbidites. The chronologies in the light colour show the numerical age-depth profiles using the CRS model; the bold black chronology (age ± 1 σ) was calculated with the constrained SIT model which turned out to be the best chronology (von Gunten et al, accepted). In Laguna Aculeo, seismites of historical earthquakes (indicated by a shift in the grain size mode) helped to constrain the chronology (von Gunten et al., submitted).

Laguna Negra (33°38'S / 70°08'W, 2680 m a.s.l.) is a dimictic, oligotrophic lake of combined glacial/landslide origin, located ca. 50 km east (i.e. on the lee side) of Santiago in a remote valley situation. This lake is part of the potable water reservoir for Santiago (Fig. 8-1 and Table 8-1). The catchment is very steep and ranges up to 4600 m a.s.l.; vegetation cover is very scarce (<10%, grasses and small shrubs). Sediments consist of dark greyish brown silt.

Laguna El Ocho (34°02'S / 70°19'W, 3250 m a.s.l.), situated 80 km south-east of Santiago is a meromictic cirque lake with monomictic to dimictic water circulation in the mixolimnion. The lower hypolimnion is anoxic (Table 8-1). The catchment has very steep slopes, ranges up to 3800 m a.s.l. and is free of vegetation. The lake sediments consist mainly of very finely to medium laminated greyish brown to grey clay and silty clay. Laguna El Ocho is in the vicinity (< 10 km) of the El Teniente copper mine, the World's largest underground Cu mine, located on the windward side further down-valley.

Laguna Ensueño (34°02'S / 70°20'W, 3180 m a.s.l.) is a polymictic, oligo-mesotrophic lake situated ca. 2 km south-west of Laguna El Ocho. Approximately 50% of the lake shore is covered with terrestrial wetland macrophytes. The sediments consist of massive dark yellowish brown silt and show bioturbation marks in the sediment-water interface.

Laguna del Inca (32°50'S / 70°08'W, 2840 m a.s.l.) is situated ca. 90 km north-east from Santiago, next to the ski-resort of Portillo. The lake is close (< 1 km) to the heavily used international transandean pass road which connects Santiago (Chile) and Mendoza (Argentina). Laguna del Inca is a dimictic, oligotrophic lake of glacial origin. The catchment ranges up to > 4600 m a.s.l. and exhibits very scarce vegetation cover (< 10%, grasses and small shrubs near the lake). Sediments consist of massive (partly laminated) brown to dark reddish grey clay and silty-clay.

8.3 Methods

We retrieved short sediment cores with an UWITEC gravity corer equipped with action hammer. In Laguna Aculeo, we have used a modified Livingstone piston corer. The coring sites and water depths are shown in Fig. 1. The sediment cores were sealed in the liners and stored cold (4°C) and dark until sampling in the laboratory.

Chronologies

^{210}Pb, ^{137}Cs and ^{226}Ra activities were measured on Ortec HPGe GWL series well-type coaxial low background intrinsic germanium detectors at the University of Liverpool (Laguna Aculeo) and on Canberra low background, well-type GeLi detectors at EAWAG, Dübendorf, Switzerland (all other lakes). Sections with rapid sedimentation (e.g., turbidites) were identified by sedimentary microfacies analysis of thin sections (Laguna Negra, Laguna El Ocho and Laguna del Inca) and removed from the profiles. Unsupported ^{210}Pb was inferred level-by-level by subtraction of the ^{226}Ra activity from the total ^{210}Pb activity (Laguna El Ocho) or by subtraction of the mean ^{226}Ra activity (Laguna Negra and Laguna del Inca) as ^{226}Ra activity levels were partly below detection limit. ^{210}Pb activities were too low for reliable age estimates in Laguna Aculeo and Laguna Ensueño. We have tested multiple numerical models (CFCS, CIC, CRS and SIT) to convert unsupported ^{210}Pb activity profiles into depth-age models (Fig. 8-2). The 'best' model was chosen objectively by using independent chronostratigraphic marker horizons such as the ^{137}Cs bomb fallout peak of AD 1964 and historical earthquakes (von Gunten et al., in press). For Laguna Negra, Laguna del Inca and Laguna El Ocho, the constrained SIT model yielded the best results (Fig. 8-2). The sediment core of Laguna Aculeo was dated with the ^{137}Cs AD 1964 peak and stratigraphic layers of well documented historical earthquakes (Fig. 8-2, von Gunten et al., in review). The sediment core of Laguna Ensueño could not be dated because of too low ^{210}Pb activities. Results for that lake are reported in sediment depth only. However, the first occurrence of SCPs in Laguna Ensueño is assumed to be contemporaneous to the first SCPs in adjacent Laguna El Ocho, placing the age of the sediments at 20 cm sediment depth to ca. AD 1900.

SCPs (atmospheric deposition)

SCP samples were prepared after (Renberg and Wik, 1985, H_2O_2 30% and HCl 10%) and counted under a stereo-microscope at 50x magnification (Grob, 2008). We calculated SCP flux (SCP cm^{-2} yr^{-1}) using the sedimentation rate as derived from the age-depth models (Fig. 8-2). SCPs can be used as indicators for fossil fuel combustion from industrial activity, road traffic or oil-thermal power generation (Rose, 2001).

Excess copper (atmospheric deposition)

Freeze-dried samples were homogenized in a mortar and analysed on a PANalytical MiniPal II Energy Dispersive X-ray Fluorescence (EDXRF) spectrometer (semi-quantitative). A subset of samples was analysed quantitatively with a Philips PW2400 X-ray fluorescence spectrometer. A calibration curve ($r > 0.99$) was then calculated for the elements under consideration here (Cu, Zr, Rb) to convert all XRF measurements into quantitative concentrations [µg g^{-1}].

Cu concentrations were normalized to the conservative elements Zr and Rb. Changes in the lake sediment Cu/Zr or Cu/Rb ratios were used as a proxy for excess atmospheric Cu deposition (Shotyk, 1996), since Cu is enriched in dust fallout from sources outside the catchment (e.g., from the El Teniente mine, Smuda et al., 2008) relative to element rations in the lake catchment geology or lake sediments of pre-industrial age.

TOC, N and C/N

Total organic carbon (TOC) and nitrogen (N) were analysed using a Vario Macro Elemental Analyser (Elementar Analysen Systeme) on freeze-dried sediment material (100-200 mg). Inorganic carbon was removed with HCl (10%) prior to analysis. TOC and N fluxes were calculated with the sedimentation rate as inferred from the depth-age models. TOC and N can be used as proxies for primary production in the lake given the C/N ratio (as a measure of the ratio between aquatic and terrestrial sources of organic matter) suggests predominantly aquatic sources and remains constant (Meyers and Teranes, 2001).

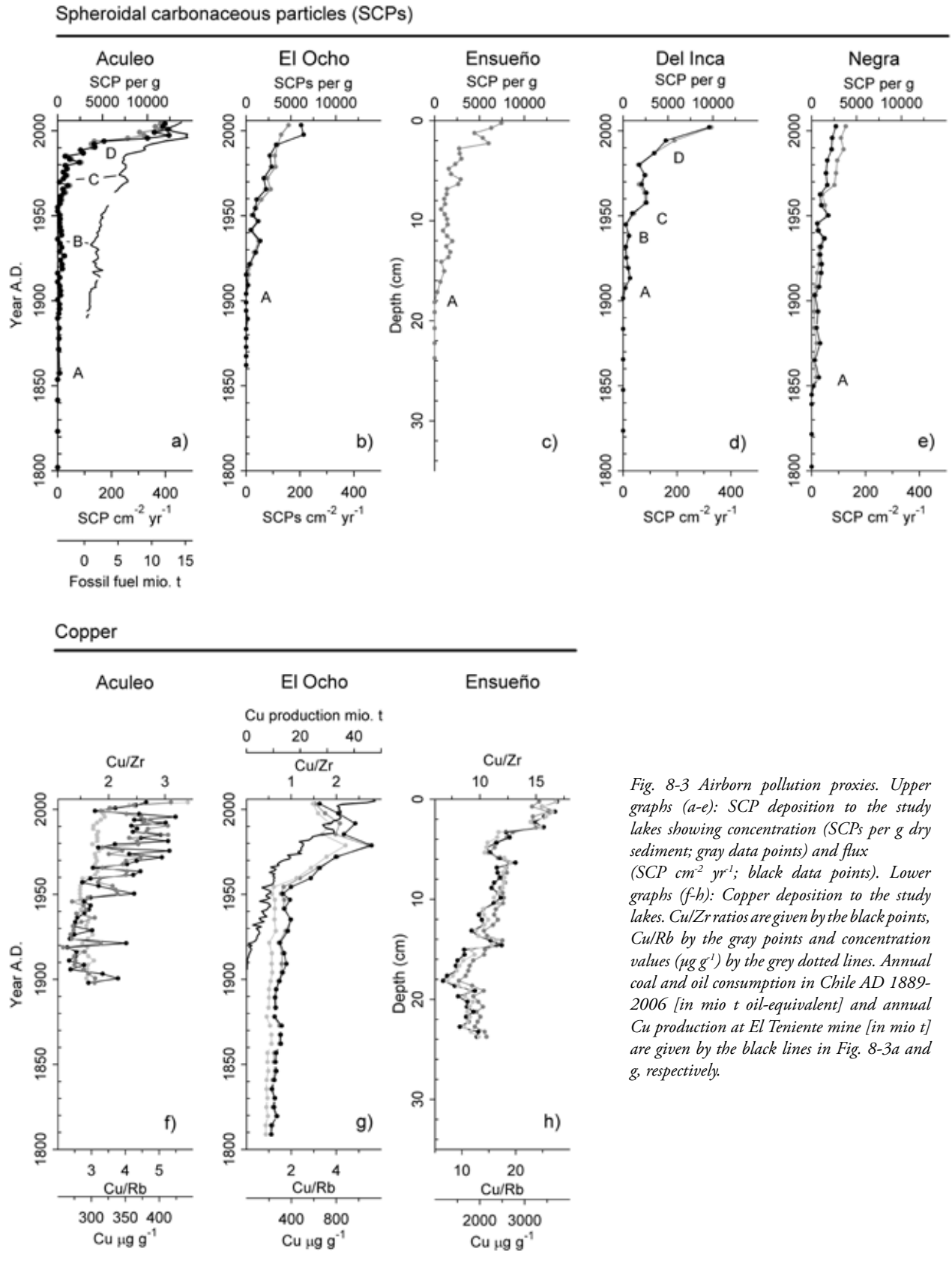


Fig. 8-3 Airborn pollution proxies. Upper graphs (a-e): SCP deposition to the study lakes showing concentration (SCPs per g dry sediment; gray data points) and flux (SCP cm^{-2} yr^{-1}; black data points). Lower graphs (f-h): Copper deposition to the study lakes. Cu/Zr ratios are given by the black points, Cu/Rb by the gray points and concentration values (µg g^{-1}) by the grey dotted lines. Annual coal and oil consumption in Chile AD 1889-2006 [in mio t oil-equivalent] and annual Cu production at El Teniente mine [in mio t] are given by the black lines in Fig. 8-3a and g, respectively.

8.4 Results

Atmospheric pollution fallout

While SCP flux profiles show a clear overall positive trend in all of the five lakes (Fig. 8-3), the structures of the SCP flux profiles show significant differences in the details. First, the initial occurrence of continuous SCP fallout is observed at different times in the different lakes. In Laguna Aculeo and Negra deposition started around AD 1850-1860 (Fig. 8-3a and 8-3e, Litt. A), while in Laguna del Inca and Laguna El Ocho (and Ensueño) continuous SCP fallout started later around AD 1900-1910 (Fig. 8-3b, 8-3c and 8-3d, Litt. A). Second, in Laguna Aculeo and Laguna del Inca, the deposition of SCPs increased very rapidly from AD 1980-1990 onwards (Fig. 8-3a and 8-3d, Litt. D), and reached maximum concentrations higher than 11 000 SCP g^{-1} (flux: 350-460 SCP cm^{-2} yr^{-1}) in the surface sediments of Laguna Aculeo and 9800 SCP g^{-1} (flux: 319 SCP cm^{-2} yr^{-1}) in Laguna del Inca, respectively. In the other lakes, the SCP profiles show a rather steady and constant increase over the 20th century reaching significantly lower peak values in Laguna El Ocho (concentrations: 4728 SCP g^{-1}; flux: 204 SCP cm^{-2} yr^{-1}) and in Laguna Negra (concentrations: 3804 SCP g^{-1}; flux: 90 SCP cm^{-2} yr^{-1}). The peak flux of SCPs to lake sediments decreased with increasing distance between the lake and the emissions sources. Third, the detailed structure of the profiles with the local minima and maxima is different from lake to lake; the exceptions are, as expected, adjacent Laguna El Ocho and Laguna Ensueño showing a very similar pattern (Fig. 8-3b and 8-3c). The comparison of the five lakes shows that (i) the local conditions are reproducible (Laguna El Ocho and Laguna Ensueño), but (ii) the distinct differences at the regional scale point to a rather local fingerprint and a site-specific history of SCP deposition in each of the lake basins. A common regional pattern seems to be of minor importance.

In Laguna El Ocho, the profiles of Cu/Rb, Cu/Zr and Cu concentrations show generally low values and very little short-term variance during pre-industrial times (Fig. 8-3g), while the profiles of Laguna Aculeo and Laguna Ensueño (Fig. 8-3f and 8-3h) show larger variability over the whole profile.

In Laguna El Ocho, the pre-industrial background values in the sediments are low (Table 8-2). Notable deposition of excess Cu starts at the beginning of the 20th century and remains low but increases rapidly between AD 1960 and the end of the 1970s. Maximum values are observed around AD 1977 (Cu/Rb: 5.43; Cu/Zr: 2.78 and 882 µg Cu g^{-1}) which corresponds to a factor of 4.2-4.6 times enrichment compared to the natural background (pre-1910 AD). Afterwards, values decrease continuously. In Laguna Ensueño, excess copper deposition shows a positive trend since the beginning of the 20th century. Background values are very high (Table 8-2). Maximum values are observed in the surface sediments and correspond to an enrichment factor of 1.9-2.1 compared to natural background levels. Excess copper deposition in Laguna Aculeo is highly variable. A positive trend is observed starting in the AD 1960s but this trend levels off in the AD 1980s. Maximum values correspond to an enrichment factor of 1.5 to 2 increase compared to values before AD 1910 (Table 8-2).

Eutrophication

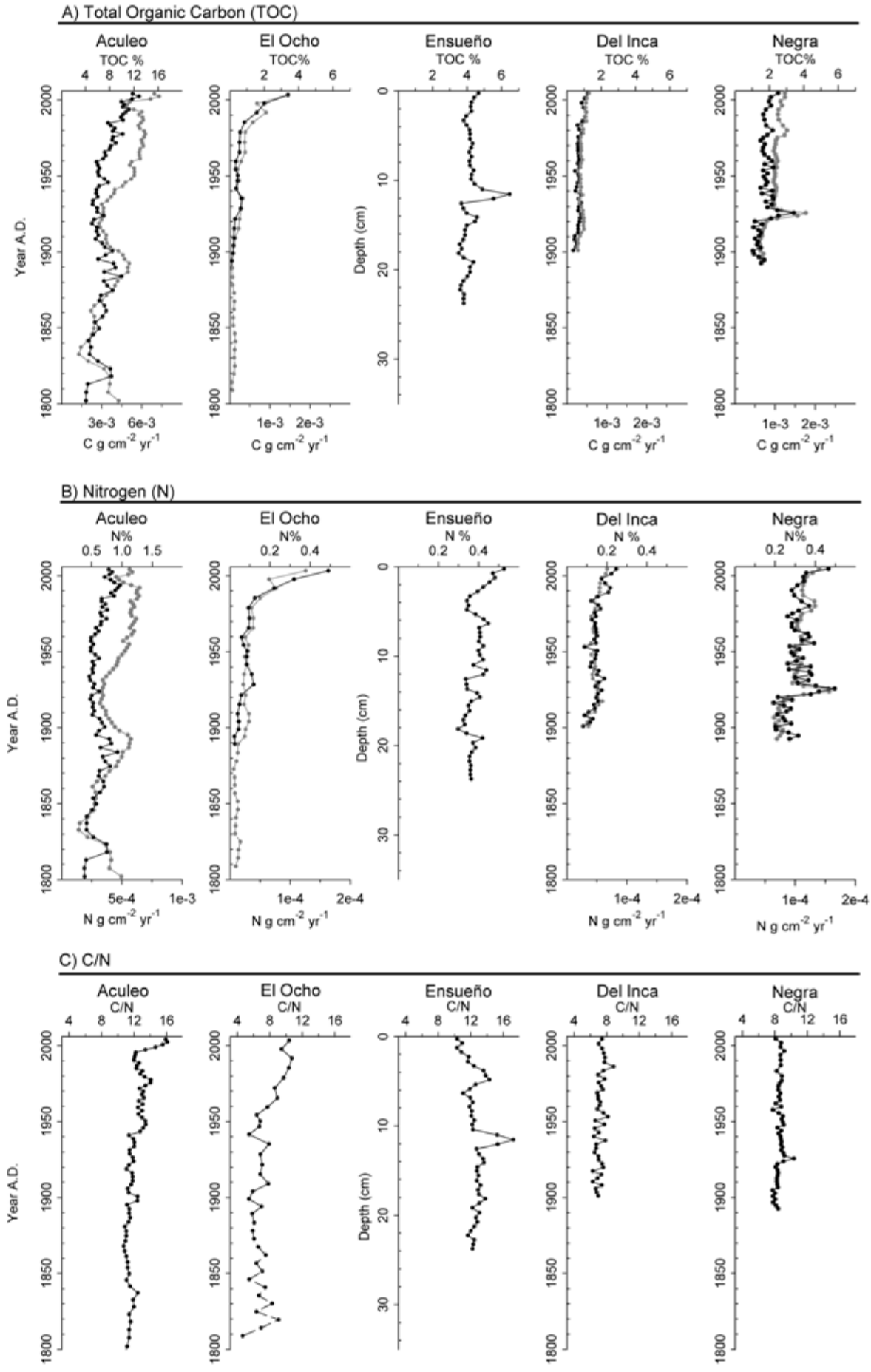
Concentration and flux profiles of TOC and N (Fig. 8-4a and b) do not show significant trends until ca. AD 1980-1990. Afterwards, all lakes except Laguna Aculeo show higher values and increasing productivity.

Absolute pre-industrial TOC and N background values are given in Table 8-2. High values at 10-12 cm sediment depth in Laguna Ensueño and around AD 1920 in Laguna Negra are due to organic rich plant layers (mainly Fissidens water moss).

In Laguna El Ocho, the productivity increases strongest (factor 9-20 wrt the background values before AD 1910). In the other lakes, the enrichment factors between background and sediment surface are less pronounced (Laguna del Inca: 1.8-2.6; Laguna Negra: 1.8-1.9; Laguna Ensueño: 1.1-1.4). In Laguna Aculeo no enrichment is visible.

C/N ratios (Fig. 8-4c) remain constant over almost the whole measurement period in all lakes. Values fluctuate around 12 in Laguna Aculeo and Laguna Ensueño, and around 8 in Laguna El Ocho, Laguna Negra and Laguna del Inca. C/N ratios values around 8 point to predominantly aquatic biomass production, while values >10 are related to increased terrestrial organic matter input to the lake. A marked increase of the C/N ratio in the surface sediments is observed in Laguna Aculeo and in Laguna El Ocho, while C/N ratios decrease in the top sediments in Laguna Ensueño. The marked peak of the C/N ratio at 10-12 cm sediment depth in Laguna Ensueño is related to the Fissidens layer.

Fig. 8-4 Eutrophication proxies showing A) Total organic C (TOC) concentration (black data points) and flux (gray data points) and B) Nitrogen (N) concentration (black data points) and flux (gray data points), C) C/N ratios.


A) Total Organic Carbon (TOC)
Aculeo
El Ocho
Ensueño
Del Inca
Negra
TOC %
TOC%
Year A.D.
Depth (cm)
C g cm-2 yr-1
B) Nitrogen (N)
N%
N %
N g cm-2 yr-1
C) C/N
C/N

8.5 Discussion

Fossil fuel consumption

SCPs were found in all lake sediments and all profiles showed an overall positive trend in SCP deposition flux. But significant differences between the profiles can be recognised in the temporal onset of deposition, in the intensification of SCP deposition during most recent times (last 20 years of the record), and in the fine structure of the profiles.

SCP deposition in Laguna Aculeo and Negra started around AD 1850-1860. Documentary sources show that this corresponds precisely to the onset of significant historical industrial activities in Santiago (Rippy and Pfeiffer, 1948; Mamalakis, 1976; Ortega, 1981). In the other lakes, first continuous SCP deposition started around AD 1900, i.e. almost 50 years later. Laguna El Ocho and Laguna Ensueño are situated south-east of the Metropolitan area; the extraordinarily persistent south-westerly winds (Fig. 8-1) do not allow significant amounts of pollutants to be transported from the city to these lakes. Wind transport to Laguna del Inca in the NE seems reasonable in the light of the regional wind pattern. However, the lagged appearance of SCPs and the very low overall flux rates of SCPs in this lake until ca. AD 1950 suggest that emissions transported over long distances (90 km) from the Metropolitan area to this lake are limited. A local source of SCPs seems to be more important: the trans-national traffic route Paso Libertadores crossing the Andes next to the lake is a first-order candidate.

The SCP profile of Laguna Aculeo depicts in great detail the industrial and urban history of Santiago and its surroundings, which goes hand in hand with the history of coal and oil consumption in Chile AD 1889-2006 (Folchi and Rubio 2004, BP 2008, in mio t oil-equivalent; thin black line in Fig. 8-3a). The start of the SCPs record at AD 1850-1860 (Fig. 8-3a, Litt. A) matches well with the onset of industrial activity. During the Great Depression (AD 1929-1939), SCP deposition reached a local minimum (Fig. 8-3a, Litt. B) as it was the case after the national political and economic crisis and the oil crisis in AD 1973 (Litt. C). After the end of the 1980s, SCP deposition has strongly increased in the sediments (Litt. D), which corresponds to the time of significant and persistent economic growth, and the rapidly increasing fossil fuel consumption from AD 1987 onwards (BP, 2008). The increased SCP deposition after AD 1990 is likely related to enhanced recreational activities around and on Laguna Aculeo.

Continuous SCP deposition in Laguna El Ocho is dated to AD $1909^{+6}/_{-1}$ which coincides precisely with the start of industrial mining activities at the nearby El Teniente copper mines. The mines are located on the windward side approximately 10 km to the SW of the lakes. El Teniente is the World's largest underground copper mine. Two large-scale smelters were commissioned in AD 1907 and 1909 (Jara, 2005). The continuously increasing deposition rates during the 20th century concur with the increasing energy consumption and Cu production of the mines (Fig. 8-4g, thin black line). It remains inconclusive whether first isolated SCPs in Laguna El Ocho found in the sediments of AD $1889^{+9}/_{-1}$ reflect prospecting activities and small-scale mining that started towards the end of the 19th century (Jara, 2005).

The SCP profile of Laguna del Inca reflects the history of the railway and, later, the history of the road traffic that crossed the Andes through the Paso Libertadores near the lake's southern shores. The first SCPs (Fig. 8-3d, Litt. A) in the sediments are dated to AD $1907^{+2}/_{-0}$, which is related to the inauguration of the first transandean railway route crossing the Paso Libertadores in AD 1910. The railway traffic resulted in a relatively constant SCP flux to Laguna del Inca until ca. AD 1940. The small positive anomaly of the SCP flux at ca. AD 1930 (Fig. 8-3d, Litt. B) coincides with the construction of a mountain hut and a first ski lift for the emerging winter tourism near the lake. The strong increase dated to the very end of the 1940s (Fig. 8-3d, Litt. C) marks increased tourist and traffic activities, and the inauguration of the "Grand Hotel Portillo" on the shores of Laguna del Inca in AD 1949. The second significant increase in SCP flux (Fig. 8-3d, Litt. D) started in the 1980s and lasts up to date. This increase coincides with the opening of the new international pass road (Paso Libertadores) and tunnel in AD 1980. This is particularly evident in the most recent sediments where

Table 8-I Background values for TOC and N (concentration and flux) and Cu (concentration, Cu/Rb and Cu/Zr ratio) in the lakes sediments of pre-industrial ages (mean ± 1 σ).

	Aculeo	El Ocho	Ensueño	Del Inca	Negra
N %	0.77±0.24	0.04±0.01	0.38±0.031	0.11±0.02	0.22±0.01
N μg cm^{-2} yr^{-1}	0.31±0.073	0.011±0.003	-	0.035±0.007	0.085±0.014
TOC %	7.48±2.37	0.22±0.03	4.08±0.24	0.66±0.06	1.50±0.09
TOC μg cm^{-2} yr^{-1}	3.0±0.70	0.07±0.02	-	0.20±0.03	0.58±0.10
Cu μg g^{-1}	294±1.1	193.0±16.3	1683±189.6	-	-
Cu/Rb	2.87±0.25	1.28±0.12	12.72±1.45	-	-
Cu/Zr	1.72±0.32	0.66±0.07	8.61±0.99	-	-

SCP concentrations have increased by 72% (from AD 1994-2002), while the traffic volume crossing the pass has also increased by the same order of magnitude (+ 78% between AD 1997-2005, total of 524 000 vehicles in 2005; Servicio Nacional de Aduanas 2008), supporting the conclusion that the local road traffic is the dominant source for SCP fallout in the lake.

In Laguna Negra, the diagnostic historical structure of fossil fuel consumption is more difficult to detect in the SCP profile. A steady significant positive long-term trend is, however, visible. From the prevailing pattern of the boundary-layer winds it is likely that transport of pollutants and deposition to Laguna Negra originates predominantly from Santiago as no other emission source exists closer to the lake (e.g., Romero et al., 1999). Overall concentrations and flux of SCPs to the sediments are, however, relatively low. This is attributed to the long distance of transport (> 60 km) between the Metropolitan area and the sink in the high-Andean lake catchment.

Although a similar general long-term trend in SCP deposition is observed in all lakes, our data suggest that local emission sources and dispersal of pollutants in the boundary layer near the lakes are very important and modify significantly the history of SCP deposition. A general regional pattern of SCP deposition as it is known from Europe or North America (Rose, 2001) is hard to be identified for Central Chile. Our conclusions are in good agreement with those of Chirinos et al. (2006) who describe SCP deposition in two lakes in the BioBío region 500 km to the south of Santiago. Two factors seem to be important: unlike in Europe or North-America, the industrial activity in Central Chile is (i) grouped around a few larger centres, whereby each of the sources has an individual history, and (ii) prevailing winds from the Pacific Ocean transport air masses with very-low-background concentrations of pollutants. In consequence, the pollution signal that is a common denominator to all the investigated sites is relatively small.

Copper deposition

Laguna El Ocho and Laguna Ensueño are expected to reflect mostly the mining activities at the nearby El Teniente copper mines. In Laguna El Ocho this is indeed the case, and excess Cu deposition data are in close agreement with production numbers and the mining activities (Fig. 8-3g). The first detectable signal of excess atmospheric Cu deposition coincides with the commissioning of the first industrial smelters in AD 1904/1909. The strong deposition increase recorded in the sediments from the 1960s onwards is related to the increased Cu production of the mines. After AD $1977^{+3}/_{-1}$ excess Cu deposition to the lake sediment decreases significantly despite a persisting increase in copper production. By the end of the 1970s, novel smelting technologies were installed and measures to reduce emissions in the Cu processing line were imposed at El Teniente. Most significant were three innovations: the "Teniente converter" with off-gas recuperation and treatment (installed in AD 1977), the underground primary ore crusher (installed in AD 1982) and the establishment of a gas management system in AD 1987-1989 and gas treatment plants in AD 1998-2001. The lake sediment data show clearly the positive effects of such technological innovations: despite growing Cu production, the immissions of atmospheric Cu could be significantly reduced (approximately half) compared to peak immissions around AD 1977.

While the metal pollution history in Laguna El Ocho is highly consistent with the documented industrial and technological development, the excess Cu profile in nearby Laguna Ensueño is more difficult to interpret: natural background Cu concentrations and Cu/Zr, Cu/Rb ratios in the sediments are at least by one order of magnitude higher compared to the sediments of Laguna El Ocho. It appears that the Cu concentrations in the bedrock geology around Laguna Ensueño are particularly high, which makes the signal/noise ratio very low to detect the presence of excess atmospheric Cu. Indeed, other that the catchment of Laguna El Ocho, the catchment of Laguna Ensueño is currently subject to Cu ore prospecting for the mines. Nevertheless, the general positive trend of Cu deposition during the 20th century is clearly visible in Laguna Ensueño. Not visible in Laguna Ensueño is the decrease of Cu deposition during most recent years; this may be masked by pronounced bioturbation in the surface sediments of that lake.

Laguna Aculeo shows a different history of atmospheric Cu deposition, although a long-term positive trend is also observed. While atmospheric contamination from the mines is possible (Romo-Kröger et al., 1994; Olivares et al., 2002), increasing Cu deposition in the sediments of Laguna Aculeo is more likely due to agricultural activities: copper compounds are often used for disease control. Indeed, agriculture has strongly expanded and intensified in Central Chile during the decade between 1960 and 1970 and onwards. However, since both, the agricultural and the mining activities show the same common trend, discrimination of both causes is difficult. Noteworthy is the high variability of Cu in the sediments after AD 1960, which might be related to subtle redox changes in the sediment-water interface or to complexion of dissolved Cu with DOC or co-precipitation with carbonate in the water body (Nguyen et al., submitted).

The comparison of the three lakes shows that both, the catchment configuration (here: the geochemistry of the bedrock geology or land use) and the sediment dynamics (here: presence or absence of bioturbation, possibly also redox changes at the sediment-water interface) are fundamental to make a lake sediment record a suitable archive for historical metal pollution.

Eutrophication

All of the lakes except Laguna Aculeo show relatively constant TOC and N values (concentration and flux) until ca. AD 1980-1990 (Fig. 8-4). Afterwards, a marked positive trend is observed, which points to increased aquatic primary production (PP). Higher TOC or N contents due to enhanced organic matter transport from the catchment are not likely in Laguna El Ocho, Negra and del Inca given the continuously low (~8) C/N ratios (Fig. 8-4c). In principle, increasing aquatic PP may be related to higher nutrient influx (eutrophication) or to climate change (e.g. higher temperatures or light, among other factors; Blass et al. 2007; McKay et al. 2008) depending on the limiting factor in the aquatic ecosystems.

The marked increase in PP since AD 1980 was likely not stimulated by global warming since meteorological data do not show a warming trend for Central Chile over the last few decades (e.g., GISS 2008). Therefore, enhanced nutrient supply remains the most plausible explanation. Particularly in the most remote lakes (Laguna El Ocho, Laguna Ensueño and Laguna Negra), where direct anthropogenic impacts in the catchment remained minimal up to date, accelerated atmospheric nitrogen deposition seems to be the most significant driver for enhanced PP during the past 20-30 years.

For the time before AD 1980-1990, the situation looks very different: TOC and N as a proxy for primary production are significantly correlated to warm season temperatures in Laguna Aculeo ($p< 0.01$, calibration period AD 1901-1996), Laguna Negra ($p< 0.01$, AD 1901-2000) and Laguna del Inca ($p< 0.01$, AD 1910-1980, von Gunten et al., in prep.). Similar observations were made in the Swiss Alps (Blass et al. 2007) and in the Arctic (McKay et al. 2008). In oligotrophic Laguna Negra and Laguna del Inca for the time before AD 1980-1990 it seems that anthropogenic nutrient flux has had a minor impact on aquatic PP, but climate factors explain most of the variance in TOC and N fluxes to the sediments. In hypertrophic Laguna Aculeo, it seems that the nutrient availability was not the limiting factor for aquatic primary production, but other factors such as light or temperature govern changes in the TOC or N fluxes until very recent times (von Gunten et al., in review). Unusually high C/N ratios in the top-surface sediments (younger than ca. AD 2000) of Laguna Aculeo (Fig. 8-4c) point to a non-aquatic source of sedimentary organic matter.

However, the post-1980 eutrophication effect is small to moderate in all of the investigated lakes (enrichment factor of 1.1-2.6) except in Laguna El Ocho (enrichment factor of 9-20). This suggests that N is not the limiting factor for PP in these remote Andean lakes, but phosphorus. The particular sensitivity of meromictic Laguna El Ocho to primary production and nutrient deposition (increase of TOC and N flux to the sediments) is likely to be attributed to PO_4 recycling in the anoxic hypolimnion (Wetzel, 2001); in this case, available reactive nitrogen would govern aquatic primary production and the full impact of the accelerated global reactive N cycles (NO_x and NH_y; Galloway et al., 2008) would be visible.

8.6 Conclusions

In this study, we have presented high-resolution data for TOC and N fluxes (as an indicator for aquatic primary production and eutrophication) as well as profiles for spheroidal carbonaceous particles SCPs (as an indicator for fossil fuel burning) and excess Cu (as an indicator for copper mining activities) in well-dated sediments of five lakes in Central Chile and the adjacent Andes.

We have put much emphasis on the site selection of the five lakes, taking into account the different sources of pollutants, different pathways of transport as a function of boundary-layer climate conditions and distance, different catchment configurations (geology and land-use), and types of lakes (oligo- to hypertrophic lakes, dimict and monomict lakes). In consequence we have selected one lake at low elevations near the Metropolitan area (Laguna Aculeo), two lakes on the lee side up-valley from the large Cu mine El Teniente (Laguna El Ocho, Laguna Ensueño), one lake near the most important trans-national traffic route between Chile and Argentina (Laguna del Inca) and, for contrast, one lake in the remote high-elevation areas of the Andes: Laguna Negra, the potable water reservoir for the city of Santiago.

Our data show a consistent and reliable picture of the pollution and eutrophication history for the past ca. 150 years (since AD 1850) which compares in great detail with independent documentary sources of information about the local and regional environmental history.

At the regional scale, an overall positive trend of SCP flux (as a proxy of contamination from fossil fuel combustion) is observed in all of the five lakes for the 20th century. However, considerable differences were found in the initial onset of the SCP contamination, in the detailed structure of the SCP profiles, and in the absolute values and peak SCP flux; this points to the significance of the individual local pollution history for each of the sites. Boundary-layer climate conditions and topography, the distance between the source and the sink, and the intensity of the (local) emissions sources play a major role whereas the background concentrations of pollutants advected with the airflow from the Pacific Ocean seems to be rather low in Central Chile at sites near the continental west coast.

Excess atmospheric copper deposition is directly dependent on the mining activities in the vicinity of the copper mines on the windward side: the history of

excess Cu observed in the lake sediments matches with the copper mining activities of the past 100 years. In the absence of long observational data series (environmental monitoring), baseline levels of Cu contamination can be quantitatively established for any time and period of the recent past that might be of interest in the context of environmental management practices, technological innovations, regulatory directives or clean air legislation. The lake sediments also provide quantitative data for pre-industrial (natural) background levels. Importantly, we can also show the positive effects of technological measures and innovations that were implemented to reduce Cu emissions from the El Teniente copper mine. Despite of growing Cu production, a series of measures taken in the 1980s could reduce the Cu deposition to the environment by as much as 50% (compared with peak values in AD 1977). Emissions reductions measures can be very efficient.

Except in hypertrophic Laguna Aculeo, evidence for eutrophication (flux of TOC and N) was found in all of the investigated lakes since AD 1980-1990. This is particularly the case for oligotrophic lakes in remote high-elevation catchments where direct human impacts in the catchment are not observed. Regional atmospheric deposition of nutrients (mainly reactive nitrogen) seems to govern the increase in primary production. Most sensitive are lakes were phosphorus is not the limiting factor for aquatic primary production: in meromict Laguna El Ocho, the increase in TOC and N flux to the sediments was ten times higher than in the other lakes. Before AD 1980 no general pattern of eutrophication can be recognized and aquatic primary production seems mainly to be driven by climate (here: warm season temperature).

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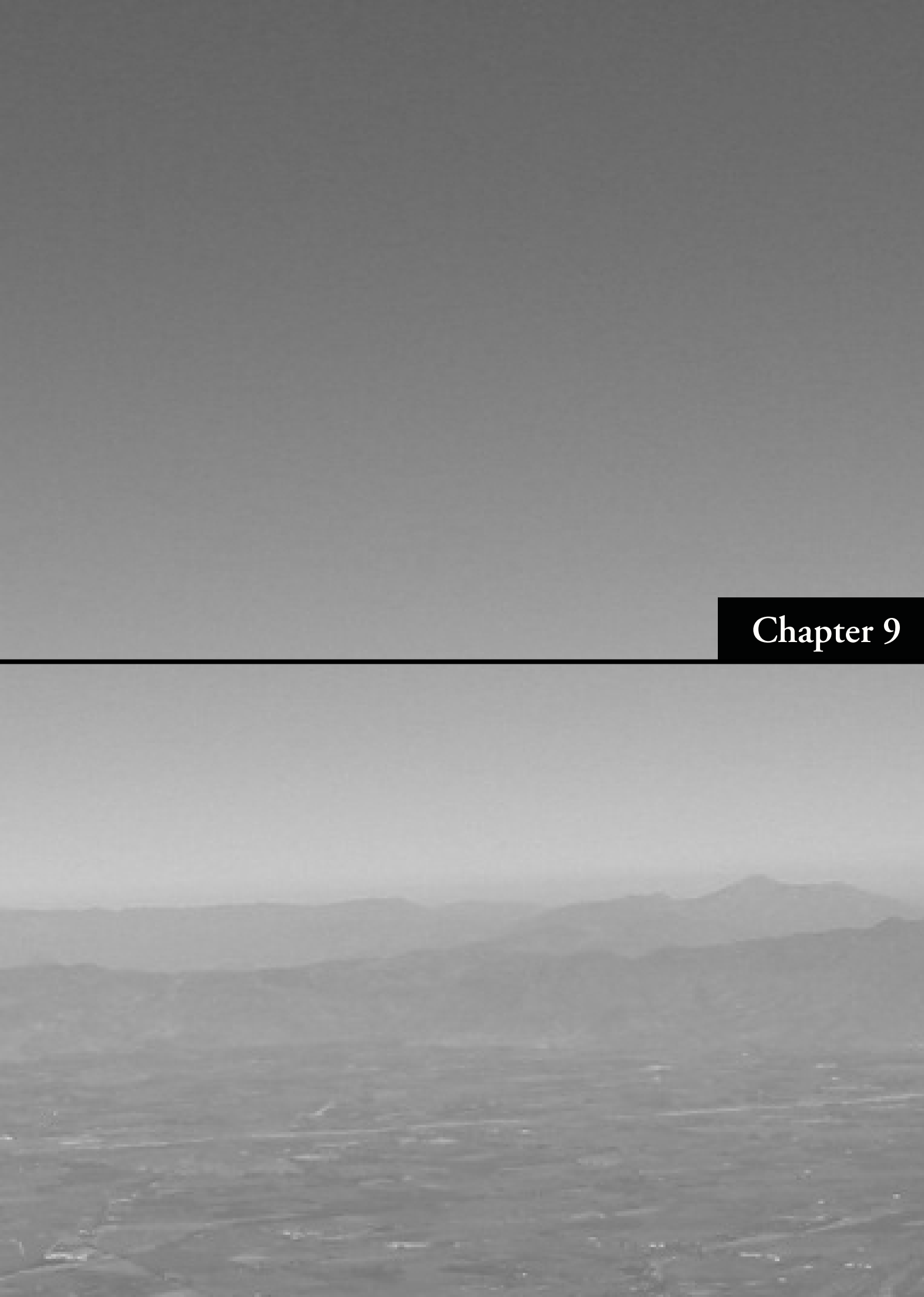

Chapter 9

9. Conclusions

Quantitative, high-resolution climate and pollution reconstruction are essential to assess the extent and variability of human impact on the environment (Bradley et al. 2003; Smol 2008). This knowledge is crucial in order to evaluate the success of technological or regulatory measures to reduce emissions and negative impacts on ecosystems. In the perspective of climate change, long-term data are furthermore critical for placing modern climate warming into a long-term context, for assessing the sensitivity of the climate system to natural and anthropogenic forcings and thus for reducing the uncertainties about the magnitude and impact of future global climate change (Hegerl et al. 2006). In particular, the lack of adequate data series from the southern Hemisphere has to be overcome (Bradley et al. 2003).

For this reason, this project was initiated to produce a high-quality climate and pollutant deposition series using lake sediments from Central Chile. During two fieldwork campaigns in 2005 and 2006, ten lakes were thoroughly analysed to assess their potential as environmental archives. After careful selection of sampling sites, sediment cores were recovered, dated, and analysed at very high temporal resolution. The resulting data were interpreted as pollution indicators or were calibrated with meteorological data to reconstruct climate over the past 1000 years.

Climate reconstruction

An important achievement of this study is the incorporation of new proxies and dating techniques, and the application of statistical methods from tree-ring research on non-varved lake sediments. On the basis of our results, we can offer improvements to established methods used for deriving climate reconstructions from lake sediments.

i) High-precision dating of sediments from the time period with available instrumental data is fundamental for the development of a "calibration-in-time". Our results show that chronologies can be significantly improved if an adequate dating procedure is followed. From the set of proposed measures, the most noteworthy are: the uneven-spaced sampling procedure for radionuclides, the systematic comparison of numerical models for the calculation of the ^{210}Pb chronologies (including the new SIT model), and cross-validation with independent diagnostic time-markers.

We also recommend choosing sampling intervals according to the established chronology. This allows sampling at regular time interval in the desired resolution. This step is essential to calibrate proxies of non-varved sediments to annually resolved meteorological data.

ii) We tested and applied in-situ reflectance spectroscopy as a new method for paleoclimate reconstruction using lake sediments. Our results show that this method has a great potential for developing climate reconstructions from sediments taken from low-altitude, eutrophic and shallow Laguna Aculeo, but also from high-elevation and oligotrophic Laguna Negra.

We believe that this technique is very promising and has been under-explored. To our knowledge, in-situ reflectance spectroscopy has only been applied in this study and by Trachsel et al. (2008), in order to produce well-calibrated quantitative millennial-long paleoclimate time series at very high resolution from lake sediments. Trachsel et al. (2008) successfully tested in-situ reflectance spectroscopy in sediments taken from proglacial Lake Silvaplana of the eastern Swiss Alps. To establish in-situ reflectance spectroscopy as a routine method for paleoclimatology, a systematic assessment of the potential and limitations of this method and an application of this technique in a variety of lakes and environments is required.

iii) We successfully applied numerical methods from tree-ring research to calibrate the lake sediment records with meteorological time series. Our results show that the application of these methods to non-varved lake sediments is feasible provided that the chronology and the sampling resolution are adequate.

Our results show a highly significant correlation between proxy data and meteorological series in all investigated lakes for the calibration period (Laguna Aculeo, del Inca and Negra). This implies that climate variability has a significant influence on these lake systems and is preserved as a signal in the sediments, which is the main prerequisite for sediment-based climate reconstructions. The aforementioned lakes exhibit the highest correlation with temperature (in particular austral summer temperature). Therefore, lakes in Central Chile have a high potential for paleotemperature reconstruction. This is particularly significant because all the other known natural climate archives in this area are sensitive to winter precipitation.

Another requirement for a sediment-derived climate reconstruction is a good chronological control over the reconstruction period. This is usually achieved by ^{14}C dating. Although ^{14}C analyses yielded good results in meso- and eutrophic Laguna Chepical and Aculeo, samples from oligotrophic, high-Andean Laguna Negra and del Inca generated unusually high age values (attributed to the radiocarbon-reservoir effect) and age inversions. Therefore, these dates were not used for age estimation. Alternatively, for Laguna Aculeo, ^{14}C measurements were reliable. In combination with stratigraphic layers of well documented historical earthquakes, these radiocarbon dates were used to develop a precise chronology for the past 1200 years.

The combination of an effective calibration for the instrumental period and precise chronology in Laguna Aculeo sediments permitted a reconstruction of the summer temperature in Central Chile back to AD 850. To our knowledge, this is the first quantitative and high-resolution temperature record with known errors of reconstruction and robustness to span the last millennium in the southern hemisphere. Correlation map analyses show that Central Chile is an excellent estimator for large parts of southern South America, sections of the northern Andes and Venezuela, and large expanses of the western and equatorial Pacific Ocean.

Our DJF temperature reconstruction provides insight into sub-decadal- to centennial-scale climate variability in Central Chile and provides quantitative evidence for the presence of a warm Medieval Climate Anomaly and a cool period synchronous with the "Little Ice Age". The structure of variability corresponds well to tree-ring based warm-season temperature reconstructions from northern Patagonia, to climate reconstructions from regional and continental fluctuations of Andean glaciers and to hydrological changes identified in Patagonian lake sediment records.

Pollution history in Central Chile

The second goal of this study was to reconstruct the pollution and eutrophication history for the Region Metropolitana which surrounds Santiago.

Our results show that lake sediments are well suited to reconstruct the impact of anthropogenic emissions. We provide quantitative and high-resolution data for the history of airborne pollutants and eutrophication using sediments from five lakes in Central Chile which cover AD 1800-2006. These results are essential for quantifying the impact of pollutants and for evaluating the success of technological or regulatory measures which aim to reduce emissions of pollutants.

A consistent and reliable picture of the pollution and eutrophication history of Central Chile can be drawn from our results, which is corroborated by independent documentary information about the local and regional environmental history. Despite the overall increasing emission trend found in the sediments, atmospheric deposition of inert pollutants (here Cu and SCPs) depicts mainly the history of point-source emissions in the vicinity of each site. This contrasts with the well-defined European or North American deposition patterns (e.g. Rose 2001). Our data further show that measures to reduce Cu emissions during the smelting process in the El Teniente mine were successfully implemented and led to a significant reduction of Cu immissions in the environment.

In all lakes, except for eutrophic Laguna Aculeo, evidence of eutrophication appeared since 1980-1990. However, this eutrophication trend is small to moderate, suggesting that phosphorus is the limiting factor for primary production in most remote Andean lakes. Prior to 1980, no distinct eutrophication trend can be recognized in the sediments of the studied lakes.

These results are particularly significant for the fast growing Region Metropolitana where pollution is a growing problem for human health and the environment.

Outlook

Further improvements of paleoclimate methodology and the generation of additional climate data series for South America are necessary. Some of the methods presented in this thesis are novel in paleolimnology (in particular, the use of in-situ reflectance spectroscopy as climate proxy and application of the SIT model for ^{210}Pb age estimation) and should be systematically tested in different lakes and environments to explore their potential and limitations. Our quantitative austral summer temperature reconstruction from Laguna Aculeo is unique in terms of its resolution for South America. Additional climate series are required to validate our

results and offer a better view of the spatial heterogeneity of climate in South America.

Consequently, the promising results obtained in this study have motivated a follow-up project (NF 200020-121869, starting end of AD 2008) which aims to produce additional temperature and/or precipitation reconstructions from lake sediments in southern Chile (Patagonia). On a continental scale, the IGBP-PAGES research initiative LOTRED-SA (Long-term climate reconstruction and diagnosis in South America) was initiated in 2006 to merge the already existing and new multi-proxy paleoclimate data sets for South-America and to produce a regional reconstruction at different temporal and spatial resolution for South America (Grosjean and Villalba 2006).

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Soon after, the "Lake sediment research and paleolimnology" group began to take form. We now have a nice and productive group, in which working is a pleasure. Christian Kamenik was an important help, especially for statistic questions and for his help with R. Thank you for answering all my stupid questions. I enjoyed using scientific words in French with Isabelle Larocque. I had many interesting and fun moments with Mathias Trachsel in the field, in the office and at conferences. Rixt de Jong and Monique Stewart brought life and good mood to our office. It's nice having you here. Thank you also for the interesting discussions and, Monique, for your help improving the English of this dissertation. The master's students Erica Baumann, Peter Gisler and Dany Schnyder cheered up coffee time. Philipp Grob was an important help as he analyzed, with the help of Lea Moser, all the SCPs of the Chilean lakes. Daniela Fischer joined our group in 2006 and took the lead of the lab. It was very important to have such a competent and friendly person in this position. Hansruedi Wernli made all of the ion chromatography measurements and was always a very helpful expert for all questions related to water analysis.

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I enjoyed working with Urs Eggenberger from the Geological Institute. He introduced me to the methods of XRF and was indispensable for analysis of the result.

Edith Vogel and Prof. Krähenbühl, from the DCB, did the ^{210}Pb analysis of Laguna Ensueño.

It was always a pleasure to meet the people from the old (Brigitta Ammann) and new (Willy Tinner) Paleoecology group of the IPS. Willi Tanner was a valuable help with his technical support.

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Finally, I would like my family and all of my friends who were there to support me.

萨宾　我爱你

Appendix

Appendix

A1a Core inventory. Processed analysis are marked with (x)

Cores AD 2005	Coordinates (S/W)	Coring date	Coring depth (m)	Core length (cm)	Core diameter (mm)	MSCLogger	Core opened	Photos	MS	Spectrolino	Thin sections	Sampling interval (cm)	Radionuclide meas.	^{14}C	SCPs	XRF	XRD	CN	LOI	Grain size	BSi	Current location	Comment
Laguna Aculeo																							
ACU 05/01	33°50.833/70°54.455	23.10.2005	6.3	106	46	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
ACU 05/02A	33°50.833/70°54.455	23.10.2005	6.4	117	46	x	x	x	x	x	-	0.5/0.5	x	x	x	x	x	-	x	x	-	GIUB	
ACU 05/02B	33°50.833/70°54.455	23.10.2005	6.4	17	46	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	Lower part of 02A
ACU 05/03	33°50.833/70°54.455	23.10.2005	6.3	123	46	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	
ACU 05/04	33°51.113/70°53.520	23.10.2005	4.7	110	46	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
ACU 05/06	33°51.139/70°53.446	23.10.2005	4.6	81	46	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	
ACU 05/A	33°49.991/70°55.480	23.10.2005	5.8	45	59.4	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Laguna Conchuca																							
CONCH 05/01	32°05.255/70°35.026	26.10.2005	2.9	10	59.4	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
Laguna Del Copin																							
COP 05/01	32°36.053/70°33.499	30.10.2005	5.1	18	59.4	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
COP 05/02	32°36.053/70°33.499	30.10.2005	5.1	19	59.4	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	GIUB	Sampled in field
COP 05/03	32°36.053/70°33.499	30.10.2005	5.1	34	59.4	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
COP 05/04	32°36.053/70°33.499	30.10.2005	5.1	32	59.4	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	
COP 05/05	32°36.053/70°33.499	30.10.2005	5.1	30	59.4	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	
COP 05/06	32°36.053/70°33.499	30.10.2005	5.1	26	59.4	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
Laguna Verde																							
VER 05/01	32°41.262/70°29.094	31.10.2005	2.3	34	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
VER 05/02	32°41.262/70°29.094	31.10.2005	2.3	62	59.4	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	
VER 05/03	32°41.262/70°29.094	31.10.2005	2.3	47	59.4	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
VER 05/05	32°41.262/70°29.094	31.10.2005	2.3	18	59.4	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	GIUB	Sampled in field
VER 05/06	32°41.262/70°29.094	31.10.2005	2.4	45	59.4	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
VER 05/07	32°41.262/70°29.094	31.10.2005	2.0	54	59.4	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
VER 05/08	32°41.262/70°29.094	31.10.2005	2.2	58	59.4	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
VER 05/09	32°41.262/70°29.094	31.10.2005	2.2	59	59.4	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
Laguna Encañado																							
ENCA 05/01	32°40.277/70°08.057	04.11.2005	34.4	65	59.4	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
ENCA 05/02	32°40.275/70°08.058	04.11.2005	34.4	83	59.4	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	
ENCA 05/03	32°40.271/70°08.060	04.11.2005	34.0	96	59.4	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
ENCA 05/04	32°40.137/70°08.209	04.11.2005	18.9	80	59.4	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	

A1b Core inventory. Processed analysis are marked with (x)

Cores AD 2006	Coordinates (S/W)	Coring date	Coring depth (m)	Core length (cm)	Core diameter (mm)	MSCLogger	Core opened	Photos	MS	spectrolino	Thin sections	Sampling interval (cm)	Radionuclides meas.	^{14}C	SCPs	XRF	XRD	CN	LOI	Grain size	BSi	Current location	Comment
Laguna Ensueño																							
ENSU 06/01 (2130)	34°02.566/70°19.636	01.03.2006	4.3	100	59.4	-	x	x	x	x	-	0.5v/0.5	x	x	x	x	-	x	x	x	-	GIUB	
ENSU 06/02 (2131)	34°02.566/70°19.636	01.03.2006	4.3	73	59.4	-	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	
ENSU 06/03 (2132)	34°02.566/70°19.636	01.03.2006	4.3	57	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EULA	Sampled in field
ENSU 06/04 (2133)	34°02.566/70°19.636	01.03.2006	4.3	35	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EULA	Sampled in field
Laguna El Ocho																							
OCHO 06/01 (2202)	34°01.770/70°19.091	02.03.2006	42	92	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
OCHO 06/02 (2203)	34°01.770/70°19.091	02.03.2006	42	108	59.4	-	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	
OCHO 06/03 (2204)	34°01.770/70°19.091	02.03.2006	42	100	59.4	-	x	x	x	x	x	0.5/-	x	-	x	x	-	x	-	x	-	GIUB	
OCHO 06/04 (2201)	34°01.770/70°19.091	02.03.2006	42	40	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EULA	Sampled in field
Laguna Negra																							
NEGRA 06/01 (2302)	33°39.478/70°07.533	04.03.2006	53.6	75	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
NEGRA 06/02 (2303)	33°39.442/70°07.498	04.03.2006	79	111	59.4	-	x	x	x	x	-	0.5v/0.2	x	x	x	-	x	x	-	x	x	GIUB	
NEGRA 06/03 (2304)	33°39.442/70°07.499	04.03.2006	79.6	92	59.4	-	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	GIUB	
NEGRA 06/04 (2300)	33°39.499/70°07.522	04.03.2006	49.6	63	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EULA	Sampled in field
Laguna Del Inca																							
INCA 06/01 (2410)	32°49.921/70°07.815	07.03.2006	30.0	76	59.4	-	x	x	x	x	-	0.5/0.2	x	x	x	-	-	x	-	x	x	GIUB	
INCA 06/02 (2413)	32°49.968/70°07.837	07.03.2006	31.8	68	59.4	-	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	
INCA 06/03 (2414)	32°49.916/70°07.862	07.03.2006	44.3	80	59.4	-	x	x	x	x	x	-	-	-	-	-	-	-	-	-	-	GIUB	
INCA 06/04 (2412)	32°49.968/70°07.837	07.03.2006	31.8	63	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EULA	Sampled in field
Laguna Chepical																							
CHEP 06/01 (2530)	32°15.609/70°29.874	09.03.2006	12.4	97	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
CHEP 06/02 (2531)	32°15.609/70°29.874	09.03.2006	12.4	84	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	
CHEP 06/03 (2532)	32°15.547/70°29.917	09.03.2006	12.3	89	59.4	-	x	x	x	x	-	0.5v/0.2	x	x	x	-	-	x	-	-	-	GIUB	
CHEP 06/04 (2533)	32°15.547/70°29.917	09.03.2006	12.3	89	59.4	-	x	x	x	x	-	-	-	-	-	-	-	-	-	-	-	GIUB	
CHEP 06/05 (2520)	32°15.626/70°29.943	09.03.2006	12.1	-	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EULA	Sampled in field
CHEP 06/06 (2521)	32°15.626/70°29.943	09.03.2006	12.1	-	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	EULA	Sampled in field
CHEP 06/07 (2522)	32°15.626/70°29.943	09.03.2006	12.1	-	59.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	GIUB	Sampled in field

A2a Surface sample inventory Processed analysis are marked with (x), samples with (¤) were analysed by Salvetti (2006)

Sediments samples	Collection date	Coordinates (S/W)	Collection depth (m)	Description	CN	LOI	Grain size	BSi	Current location
Laguna Verde									
1401	31.10.2005	32°41.262/70°29.094	2.3	Surface sediment	x	x	x	x	GIUB
Laguna Aculeo									
1410-1	23.10.2005	33°51.331/70°53.354	2.8	Surface sediment	¤	x	¤	¤	GIUB
1410-2	23.10.2005	33°51.312/70°53.421	3.8	Surface sediment	¤	x	¤	¤	GIUB
1410-3	23.10.2005	33°51.284/70°53.449	4.5	Surface sediment	¤	x	¤	¤	GIUB
1410-4	23.10.2005	33°51.321/70°53.872	5.7	Surface sediment	¤	x	¤	¤	GIUB
1410-5	23.10.2005	33°50.198/70°55.459	5.6	Surface sediment	¤	x	¤	¤	GIUB
1410-6	23.10.2005	33°50.601/70°55.183	6.3	Surface sediment	¤	x	¤	¤	GIUB
1410-7	23.10.2005	33°50.710/70°54.857	6.4	Surface sediment	¤	x	¤	¤	GIUB
1410-8	23.10.2005	33°50.829/70°54.493	6.6	Surface sediment	¤	x	¤	¤	GIUB
1410-9	23.10.2005	33°50.923/70°54.125	6.5	Surface sediment	¤	x	¤	¤	GIUB
1410-10	23.10.2005	33°51.029/70°53.860	6.0	Surface sediment	¤	x	¤	¤	GIUB
Laguna Conchuca									
1420-1	26.10.2005	32°04.738/70°35.605	2.0	Surface sediment	¤	x	¤	¤	GIUB
1420-2	26.10.2005	32°04.729/70°35.596	2.1	Surface sediment	¤	x	¤	¤	GIUB
1423 A	26.10.2005	-	-	Lake border	¤	x	¤	¤	GIUB
Laguna Del Copin									
1430-1	30.10.2005	32°36.035/70°33.444	4.9	Surface sediment	¤	x	¤	¤	GIUB
1430-2	30.10.2005	32°36.052/70°33.405	4	Surface sediment	¤	x	¤	¤	GIUB
1430-3	30.10.2005	32°36.074/70°33.388	2	Surface sediment	¤	x	¤	¤	GIUB
1430-4	30.10.2005	32°36.089/70°33.403	3	Surface sediment	¤	x	¤	¤	GIUB
1430-5	30.10.2005	32°36.106/70°33.407	0.9	Surface sediment	¤	x	¤	¤	GIUB
1432	30.10.2005	-	-	Catchment, shore E	x	x	x	x	GIUB
1433	30.10.2005	-	-	Catch., lim. perennial plants	x	x	x	x	GIUB
1434	30.10.2005	-	-	Catch., out lake max.	x	x	x	x	GIUB
1435	30.10.2005	-	-	Catch., shore NE	x	x	x	x	GIUB
1436	30.10.2005	-	-	Below rock glacier	x	x	x	x	GIUB
Laguna Encañado									
1463 A	03.11.2005	33°40.100/70°08.211	0.6	Surface sediment, Fine gravel	-	-	-	-	GIUB
1463 B	03.11.2005	33°40.107/70°08.216	1.8	Surface sediment, gravel	-	-	-	-	GIUB
1463 C	03.11.2005	33°40.121/70°08.208	6.8	Surface sediment, macrophytes	¤	x	¤	¤	GIUB
1463 D	03.11.2005	33°40.118/70°08.221	2.9	Surface sediment	¤	x	¤	¤	GIUB
1463 E	03.11.2005	33°40.130/70°08.213	10.0	Surface sediment, gravel	¤	x	¤	¤	GIUB
1463 F	03.11.2005	33°40.143/70°08.232	16.4	Surface sediment	¤	x	¤	¤	GIUB
1463 G	03.11.2005	33°40.157/70°08.226	20.5	Surface sediment	¤	x	¤	¤	GIUB
1463 H	03.11.2005	33°40.205/70°08.204	25.5	Surface sediment	¤	x	¤	¤	GIUB
1463 I	03.11.2005	33°40.243/70°08.176	29.3	Surface sediment	¤	x	¤	¤	GIUB
1463 J	03.11.2005	33°40.317/70°08.076	34.2	Surface sediment	¤	x	¤	¤	GIUB
1463 K	03.11.2005	33°40.388/70°07.872	28.1	Surface sediment	¤	x	¤	¤	GIUB
1463 L	03.11.2005	33°40.414/70°07.849	19.0	Surface sediment	¤	x	¤	¤	GIUB
1463 M	03.11.2005	33°40.451/70°07.814	2.9	Surface sediment	¤	x	¤	¤	GIUB
1463 N	03.11.2005	33°40.472/70°07.798	1.0	Surface sediment, macrophytes	-	-	-	-	GIUB
1451	03.11.2005	33°40.352/70°07.771	-	Sediment, alluvial fan	x	x	x	x	GIUB
1452	03.11.2005	33°40.293/70°07.775	-	Soil, slope, not moraine	x	x	x	x	GIUB
1453	03.11.2005	33°40.059/70°07.891	-	Soil, mafic	x	x	x	x	GIUB
1454	03.11.2005	33°40.058/70°07.907	-	Soil, granitic	x	x	x	x	GIUB
1457	03.11.2005	33°40.024/70°07.950	-	Sediment, alluvial fan	x	x	x	x	GIUB
1458	03.11.2005	33°40.023/70°07.982	-	Sediment	x	x	x	x	GIUB
1459	03.11.2005	33°40.050/70°08.063	-	Sediment, fan middle	x	x	x	x	GIUB
1461	03.11.2005	33°40.060/70°08.159	-	-	x	x	x	x	GIUB

A2b Surface sample inventory Processed analysis are marked with (x)

Sediments samples	Collection date	Coordinates (S/W)	Collection depth (m)	Description	CN	LOI	Grain size	BSi	Current location
Laguna Ensueño									
2120	01.03.2006	34°02.565/70°19.672	0.5	Surface sediment	x	x	x	x	GIUB
2121	01.03.2006	34°02.573/70°19.675	2.2	Surface sediment	x	x	x	x	GIUB
2122	01.03.2006	34°02.570/70°19.650	4.3	Surface sediment	x	x	x	x	GIUB
Laguna Negra									
2320	05.03.2006	33°39.689/70°07.323	5.0	Surface sediment	x	x	x	x	GIUB
2321	05.03.2006	33°39.691/70°07.344	9.0	Surface sediment	x	x	x	x	GIUB
2322	05.03.2006	33°39.687/70°07.374	20.2	Surface sediment	x	x	x	x	GIUB
2323	05.03.2006	33°39.674/70°07.399	32.0	Surface sediment	x	x	x	x	GIUB
2324	05.03.2006	33°39.586/70°07.347	40.1	Surface sediment	x	x	x	x	GIUB
2325	05.03.2006	33°39.511/70°07.303	51.0	Surface sediment	x	x	x	x	GIUB
2326	05.03.2006	33°39.465/70°07.293	62.0	Surface sediment	x	x	x	x	GIUB
2327	05.03.2006	33°39.375/70°07.407	89.0	Surface sediment	x	x	x	x	GIUB
Laguna Del Inca									
2420	08.03.2006	32°49.814/70°07.697	5.0	Surface sediment, stones	-	-	-	-	GIUB
2421	08.03.2006	32°50.070/70°07.925	19.0	Surface sediment	x	x	x	x	GIUB
2422	08.03.2006	32°50.036/70°07.918	30.5	Surface sediment	x	x	x	x	GIUB
2423	08.03.2006	32°49.934/70°07.878	39.6	Surface sediment	x	x	x	x	GIUB
2424	08.03.2006	32°49.930/70°07.882	45.5	Surface sediment	x	x	x	x	GIUB
2425	08.03.2006	32°49.889/70°07.900	66.0	Surface sediment	x	x	x	x	GIUB
Laguna Chepical									
2540	09.03.2006	32°15.600/70°29.897	11.3	Surface sediment	x	x	x	x	GIUB
2541	09.03.2006	32°15.720/70°29.762	10	Surface sediment	x	x	x	x	GIUB
2542	09.03.2006	32°15.736/70°29.767	8.1	Surface sediment	x	x	x	x	GIUB
2543	09.03.2006	32°15.749/70°29.766	6.0	Surface sediment	x	x	x	x	GIUB
2544	09.03.2006	32°15.763/70°29.764	2.7	Surface sediment	x	x	x	x	GIUB
2545	09.03.2006	-	1.1	Surface sediment, stones	-	-	-	-	GIUB
2546	09.03.2006	32°15.769/70°29.772	2.7	Surface sediment	x	x	x	x	GIUB
2547	09.03.2006	-	2-4	Aquatic macrophytes	-	-	-	-	GIUB

A3 Correlation matrix of Laguna Aculeo. Non-filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
Temperature CRU TS 2.1	Jan	Person's r	0.418	0.449	-0.109	0.212	0.252	0.222	-0.023	-0.355	0.414
		N	96	96	96	96	96	96	96	96	96
	Feb	Person's r	0.454	0.488	-0.170	0.193	0.332	0.364	-0.110	-0.342	0.377
		N	96	96	96	96	96	96	96	96	96
	Mar	Person's r	0.375	0.349	-0.001	0.213	0.268	0.235	-0.156	-0.145	0.181
		N	96	96	96	96	96	96	96	96	96
	Apr	Person's r	0.145	0.112	0.142	0.188	0.169	0.113	-0.145	0.064	0.023
		N	96	96	96	96	96	96	96	96	96
	May	Person's r	0.124	0.133	0.086	0.111	0.184	0.049	0.015	-0.121	0.183
		N	96	96	96	96	96	96	96	96	96
	Jun	Person's r	0.050	0.054	0.105	0.016	0.101	0.127	0.091	0.036	0.016
		N	96	96	96	96	96	96	96	96	96
	Jul	Person's r	0.118	0.088	0.037	0.193	0.185	0.079	-0.219	0.008	0.058
		N	96	96	96	96	96	96	96	96	96
	Aug	Person's r	0.170	0.131	0.096	0.178	0.169	-0.035	-0.194	0.019	0.054
		N	96	96	96	96	96	96	96	96	96
	Sep	Person's r	0.236	0.199	0.031	0.185	0.228	0.078	-0.209	0.051	0.031
		N	96	96	96	96	96	96	96	96	96
	Oct	Person's r	0.312	0.286	-0.020	0.183	0.261	-0.013	-0.193	-0.122	0.208
		N	96	96	96	96	96	96	96	96	96
	Nov	Person's r	0.424	0.442	-0.143	0.202	0.204	0.346	-0.133	-0.313	0.375
		N	96	96	96	96	96	96	96	96	96
	Dec	Person's r	0.433	0.491	-0.123	0.067	0.402	0.229	-0.129	-0.330	0.409
		N	96	96	96	96	96	96	96	96	96
	Annual Mean	Person's r	0.554	0.548	-0.006	0.329	0.473	0.311	-0.234	-0.263	0.399
		N	96	96	96	96	96	96	96	96	96
	DJF	Person's r	0.562	0.615	-0.173	0.199	0.427	0.347	-0.114	-0.442	0.517
		N	96	96	96	96	96	96	96	96	96
	MAM	Person's r	0.304	0.282	0.106	0.240	0.295	0.186	-0.130	-0.101	0.188
		N	96	96	96	96	96	96	96	96	96
	JJA	Person's r	0.156	0.127	0.117	0.177	0.218	0.098	-0.135	0.032	0.060
		N	96	96	96	96	96	96	96	96	96
	SON	Person's r	0.504	0.483	-0.074	0.292	0.354	0.220	-0.270	-0.210	0.327
		N	96	96	96	96	96	96	96	96	96
Temperature HadCRUT3	Jan	Person's r	0.387	0.410	-0.314	0.139	0.218	0.281	-0.016	-0.350	0.345
		N	96	96	96	96	96	96	96	96	96
	Feb	Person's r	0.455	0.466	-0.130	0.243	0.311	0.292	-0.186	-0.308	0.398
		N	96	96	96	96	96	96	96	96	96
	Mar	Person's r	0.308	0.320	-0.285	0.073	0.118	0.267	-0.139	-0.250	0.172
		N	96	96	96	96	96	96	96	96	96
	Apr	Person's r	0.252	0.235	-0.158	0.197	0.095	0.194	-0.079	-0.216	0.226
		N	96	96	96	96	96	96	96	96	96
	May	Person's r	0.238	0.227	-0.086	0.155	0.202	0.041	-0.052	-0.237	0.271
		N	96	96	96	96	96	96	96	96	96
	Jun	Person's r	0.285	0.286	-0.115	0.193	0.278	0.252	-0.030	-0.258	0.289
		N	96	96	96	96	96	96	96	96	96
	Jul	Person's r	0.303	0.319	-0.247	0.170	0.338	0.242	-0.097	-0.255	0.287
		N	96	96	96	96	96	96	96	96	96
	Aug	Person's r	0.254	0.249	-0.101	0.138	0.154	0.012	-0.157	-0.188	0.192
		N	96	96	96	96	96	96	96	96	96
	Sep	Person's r	0.273	0.277	-0.127	0.140	0.240	0.209	-0.142	-0.107	0.152
		N	96	96	96	96	96	96	96	96	96
	Oct	Person's r	0.364	0.363	-0.147	0.163	0.209	0.073	-0.177	-0.269	0.299
		N	96	96	96	96	96	96	96	96	96
	Nov	Person's r	0.411	0.438	-0.289	0.151	0.312	0.241	-0.088	-0.366	0.310
		N	96	96	96	96	96	96	96	96	96
	Dec	Person's r	0.439	0.447	-0.229	0.250	0.283	0.315	-0.217	-0.302	0.355
		N	96	96	96	96	96	96	96	96	96
	Annual Mean	Person's r	0.543	0.552	-0.306	0.277	0.377	0.336	-0.185	-0.428	0.454
		N	96	96	96	96	96	96	96	96	96
	DJF	Person's r	0.564	0.583	-0.296	0.277	0.358	0.391	-0.181	-0.423	0.484
		N	96	96	96	96	96	96	96	96	96
	MAM	Person's r	0.336	0.329	-0.221	0.178	0.177	0.208	-0.113	-0.296	0.283
		N	96	96	96	96	96	96	96	96	96
	JJA	Person's r	0.362	0.367	-0.199	0.217	0.335	0.226	-0.117	-0.303	0.333
		N	96	96	96	96	96	96	96	96	96
	SON	Person's r	0.436	0.449	-0.236	0.189	0.319	0.222	-0.168	-0.307	0.315
		N	96	96	96	96	96	96	96	96	96

A3 (continued) Correlation matrix of Laguna Aculeo. Non-filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
Precipitation HadCRUT3	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	96	96	96	96	96	96	96	96	96
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	96	96	96	96	96	96	96	96	96
	Mar	Person's r	0.091	0.078	-0.094	0.052	-0.002	-0.048	-0.097	-0.064	0.015
		N	96	96	96	96	96	96	96	96	96
	Apr	Person's r	0.112	0.091	0.095	0.094	0.099	0.057	-0.086	-0.021	0.111
		N	96	96	96	96	96	96	96	96	96
	May	Person's r	-0.007	-0.008	0.016	-0.032	0.178	-0.072	0.064	-0.019	0.012
		N	96	96	96	96	96	96	96	96	96
	Jun	Person's r	-0.231	-0.237	0.022	-0.126	-0.061	-0.161	0.150	0.134	-0.259
		N	96	96	96	96	96	96	96	96	96
	Jul	Person's r	0.040	0.010	-0.024	0.077	0.031	0.069	-0.048	-0.049	0.034
		N	96	96	96	96	96	96	96	96	96
	Aug	Person's r	0.064	0.017	0.098	0.271	0.011	0.071	-0.111	-0.004	0.031
		N	96	96	96	96	96	96	96	96	96
	Sep	Person's r	0.038	0.027	0.082	0.005	0.093	-0.087	-0.058	0.006	0.040
		N	96	96	96	96	96	96	96	96	96
	Oct	Person's r	0.016	0.036	0.025	0.045	0.051	0.119	-0.023	-0.076	0.059
		N	96	96	96	96	96	96	96	96	96
	Nov	Person's r	0.048	0.027	0.005	0.097	0.018	-0.057	-0.003	-0.107	0.139
		N	96	96	96	96	96	96	96	96	96
	Dec	Person's r	0.060	0.002	0.035	0.274	-0.111	0.120	-0.065	-0.062	0.050
		N	96	96	96	96	96	96	96	96	96
	Annual Mean	Person's r	-0.037	-0.075	0.062	0.085	0.082	-0.045	0.002	0.008	-0.046
		N	96	96	96	96	96	96	96	96	96
	DJF	Person's r	0.060	0.002	0.035	0.274	-0.111	0.120	-0.065	-0.062	0.050
		N	96	96	96	96	96	96	96	96	96
	MAM	Person's r	0.038	0.029	0.036	0.006	0.193	-0.051	0.022	-0.029	0.048
		N	96	96	96	96	96	96	96	96	96
	JJA	Person's r	-0.087	-0.127	0.035	0.079	-0.012	-0.023	0.015	0.046	-0.119
		N	96	96	96	96	96	96	96	96	96
	SON	Person's r	0.057	0.047	0.084	0.056	0.108	-0.053	-0.061	-0.061	0.107
		N	96	96	96	96	96	96	96	96	96
Precipitation CRU TS 2.1	Jan	Person's r	-0.066	-0.122	0.236	0.109	-0.116	-0.092	-0.082	0.138	-0.113
		N	96	96	96	96	96	96	96	96	96
	Feb	Person's r	-0.002	-0.018	0.083	0.136	-0.008	-0.180	-0.086	0.079	0.013
		N	96	96	96	96	96	96	96	96	96
	Mar	Person's r	0.151	0.115	-0.147	0.153	0.037	0.065	-0.109	-0.062	-0.016
		N	96	96	96	96	96	96	96	96	96
	Apr	Person's r	0.061	0.033	0.161	0.041	0.031	-0.089	-0.072	0.052	-0.015
		N	96	96	96	96	96	96	96	96	96
	May	Person's r	-0.137	-0.194	0.105	0.034	-0.040	-0.201	-0.104	0.150	-0.194
		N	96	96	96	96	96	96	96	96	96
	Jun	Person's r	-0.226	-0.245	0.030	-0.080	-0.091	-0.065	0.066	0.220	-0.292
		N	96	96	96	96	96	96	96	96	96
	Jul	Person's r	-0.009	-0.055	-0.039	0.123	0.058	0.040	-0.093	-0.015	-0.005
		N	96	96	96	96	96	96	96	96	96
	Aug	Person's r	-0.008	-0.058	0.130	0.233	-0.021	0.058	-0.090	0.059	-0.030
		N	96	96	96	96	96	96	96	96	96
	Sep	Person's r	-0.054	-0.054	0.029	-0.051	0.031	0.029	-0.056	0.125	-0.091
		N	96	96	96	96	96	96	96	96	96
	Oct	Person's r	-0.099	-0.087	0.131	0.015	-0.025	0.004	-0.032	0.062	-0.012
		N	96	96	96	96	96	96	96	96	96
	Nov	Person's r	0.018	-0.006	0.008	0.061	-0.036	-0.011	-0.065	-0.024	0.058
		N	96	96	96	96	96	96	96	96	96
	Dec	Person's r	0.033	-0.019	0.020	0.207	-0.085	0.149	-0.071	-0.002	-0.049
		N	96	96	96	96	96	96	96	96	96
	Total annual	Person's r	-0.173	-0.254	0.120	0.128	-0.036	-0.089	-0.125	0.211	-0.251
		N	96	96	96	96	96	96	96	96	96
	DJF	Person's r	-0.004	-0.078	0.158	0.272	-0.123	-0.003	-0.131	0.095	-0.084
		N	96	96	96	96	96	96	96	96	96
	MAM	Person's r	-0.091	-0.152	0.129	0.056	-0.023	-0.199	-0.124	0.143	-0.179
		N	96	96	96	96	96	96	96	96	96
	JJA	Person's r	-0.144	-0.204	0.043	0.118	-0.026	0.008	-0.053	0.145	-0.190
		N	96	96	96	96	96	96	96	96	96
	SON	Person's r	-0.071	-0.074	0.073	-0.012	0.002	0.019	-0.075	0.107	-0.052
		N	96	96	96	96	96	96	96	96	96

A3 (continued) Correlation matrix of Laguna Aculeo. Non-filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
SOI	Jan	Person's r	-0.062	-0.072	0.079	-0.010	0.127	0.015	0.030	0.044	-0.033
		N	96	96	96	96	96	96	96	96	96
	Feb	Person's r	-0.129	-0.112	0.055	-0.108	-0.005	-0.101	0.099	0.060	0.013
		N	96	96	96	96	96	96	96	96	96
	Mar	Person's r	-0.098	-0.066	0.007	-0.141	-0.024	-0.042	0.194	0.060	-0.013
		N	96	96	96	96	96	96	96	96	96
	Apr	Person's r	0.039	0.027	-0.008	-0.022	-0.005	0.024	0.086	0.014	-0.022
		N	96	96	96	96	96	96	96	96	96
	May	Person's r	-0.047	-0.044	-0.028	-0.066	-0.106	0.034	0.086	0.047	-0.052
		N	96	96	96	96	96	96	96	96	96
	Jun	Person's r	-0.129	-0.119	0.076	-0.108	-0.042	-0.079	0.081	0.095	-0.078
		N	96	96	96	96	96	96	96	96	96
	Jul	Person's r	-0.081	-0.091	0.061	-0.057	-0.018	0.014	0.067	0.118	-0.089
		N	96	96	96	96	96	96	96	96	96
	Aug	Person's r	-0.043	-0.018	-0.050	-0.096	-0.004	0.007	0.160	-0.010	0.047
		N	96	96	96	96	96	96	96	96	96
	Sep	Person's r	-0.231	-0.199	0.071	-0.227	-0.122	-0.142	0.218	0.105	-0.074
		N	96	96	96	96	96	96	96	96	96
	Oct	Person's r	-0.122	-0.098	0.078	-0.133	-0.049	-0.016	0.173	-0.011	0.062
		N	96	96	96	96	96	96	96	96	96
	Nov	Person's r	-0.178	-0.103	0.044	-0.309	-0.058	-0.057	0.213	-0.009	0.004
		N	96	96	96	96	96	96	96	96	96
	Dec	Person's r	-0.130	-0.115	0.072	-0.129	-0.174	-0.054	0.093	0.080	-0.053
		N	96	96	96	96	96	96	96	96	96
	Annual mean	Person's r	-0.140	-0.124	0.047	-0.120	-0.085	-0.024	0.178	0.073	-0.043
		N	96	96	96	96	96	96	96	96	96
	DJF	Person's r	-0.157	-0.139	0.082	-0.143	-0.036	-0.051	0.115	0.075	-0.034
		N	96	96	96	96	96	96	96	96	96
	MAM	Person's r	-0.081	-0.077	0.048	-0.094	-0.009	-0.015	0.117	0.107	-0.069
		N	96	96	96	96	96	96	96	96	96
	JJA	Person's r	-0.109	-0.106	0.034	-0.107	-0.029	-0.014	0.107	0.079	-0.068
		N	96	96	96	96	96	96	96	96	96
	SON	Person's r	-0.108	-0.073	0.017	-0.190	-0.083	0.030	0.207	-0.023	0.030
		N	96	96	96	96	96	96	96	96	96
El Niño 3		Person's r	-0.224	-0.253	0.231	0.044	-0.092	-0.130	-0.122	0.296	-0.213
		N	79	79	79	79	79	79	79	79	79
SAB		Person's r	0.042	0.053	0.085	0.034	0.029	-0.084	0.104	-0.080	0.181
		N	75	75	75	75	75	75	75	75	75

A3 (continued) Correlation matrix of Laguna Aculeo. Non-filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
Temperature CRU TS 2.1	Jan	Person's r	-0.355	-0.299	0.165	0.090	-0.348	0.268	0.387	0.372	0.170	0.212
		N	96	96	96	96	96	96	96	96	96	96
	Feb	Person's r	-0.261	-0.213	0.026	-0.172	-0.260	0.219	0.342	0.323	0.051	0.087
		N	96	96	96	96	96	96	96	96	96	96
	Mar	Person's r	-0.118	-0.041	-0.134	0.028	-0.125	0.070	0.159	0.139	0.108	0.105
		N	96	96	96	96	96	96	96	96	96	96
	Apr	Person's r	0.048	0.051	-0.055	0.142	0.045	0.005	-0.069	-0.060	-0.117	-0.113
		N	96	96	96	96	96	96	96	96	96	96
	May	Person's r	-0.087	-0.127	0.045	-0.037	-0.085	0.210	0.051	0.094	-0.184	-0.119
		N	96	96	96	96	96	96	96	96	96	96
	Jun	Person's r	0.078	0.110	-0.047	-0.005	0.076	0.057	-0.033	-0.016	0.044	0.052
		N	96	96	96	96	96	96	96	96	96	96
	Jul	Person's r	0.022	-0.028	-0.097	-0.113	0.018	0.019	-0.037	-0.028	-0.208	-0.190
		N	96	96	96	96	96	96	96	96	96	96
	Aug	Person's r	0.026	0.000	-0.059	-0.080	0.023	-0.009	-0.051	-0.045	-0.187	-0.178
		N	96	96	96	96	96	96	96	96	96	96
	Sep	Person's r	0.114	0.147	0.013	-0.016	0.115	-0.007	0.001	-0.010	0.051	0.034
		N	96	96	96	96	96	96	96	96	96	96
	Oct	Person's r	-0.144	-0.114	0.022	-0.002	-0.144	0.089	0.155	0.140	0.079	0.090
		N	96	96	96	96	96	96	96	96	96	96
	Nov	Person's r	-0.327	-0.281	-0.035	-0.151	-0.329	0.315	0.335	0.339	0.114	0.171
		N	96	96	96	96	96	96	96	96	96	96
	Dec	Person's r	-0.334	-0.301	-0.013	-0.146	-0.335	0.251	0.354	0.342	0.131	0.174
		N	96	96	96	96	96	96	96	96	96	96
	Annual Mean	Person's r	-0.226	-0.187	-0.034	-0.083	-0.229	0.260	0.270	0.271	0.007	0.055
		N	96	96	96	96	96	96	96	96	96	96
	DJF	Person's r	-0.411	-0.352	0.074	-0.100	-0.408	0.318	0.467	0.447	0.154	0.206
		N	96	96	96	96	96	96	96	96	96	96
	MAM	Person's r	-0.078	-0.061	-0.066	0.058	-0.081	0.141	0.071	0.086	-0.094	-0.061
		N	96	96	96	96	96	96	96	96	96	96
	JJA	Person's r	0.066	0.048	-0.099	-0.091	0.062	0.039	-0.058	-0.041	-0.153	-0.136
		N	96	96	96	96	96	96	96	96	96	96
	SON	Person's r	-0.199	-0.143	-0.002	-0.092	-0.200	0.215	0.264	0.253	0.127	0.155
		N	96	96	96	96	96	96	96	96	96	96
Temperature HadCRUT3	Jan	Person's r	-0.370	-0.295	0.110	-0.050	-0.365	0.186	0.404	0.370	0.329	0.340
		N	96	96	96	96	96	96	96	96	96	96
	Feb	Person's r	-0.267	-0.202	-0.051	-0.091	-0.270	0.219	0.337	0.319	0.124	0.157
		N	96	96	96	96	96	96	96	96	96	96
	Mar	Person's r	-0.226	-0.140	-0.058	-0.085	-0.229	0.035	0.291	0.242	0.304	0.282
		N	96	96	96	96	96	96	96	96	96	96
	Apr	Person's r	-0.227	-0.143	-0.147	-0.027	-0.235	0.061	0.272	0.234	0.240	0.231
		N	96	96	96	96	96	96	96	96	96	96
	May	Person's r	-0.209	-0.182	-0.067	-0.101	-0.213	0.171	0.240	0.237	0.113	0.143
		N	96	96	96	96	96	96	96	96	96	96
	Jun	Person's r	-0.156	-0.134	-0.088	-0.214	-0.160	0.258	0.262	0.272	0.078	0.127
		N	96	96	96	96	96	96	96	96	96	96
	Jul	Person's r	-0.208	-0.208	-0.022	-0.207	-0.209	0.210	0.269	0.268	0.027	0.070
		N	96	96	96	96	96	96	96	96	96	96
	Aug	Person's r	-0.125	-0.096	-0.145	-0.161	-0.132	0.099	0.213	0.195	0.043	0.060
		N	96	96	96	96	96	96	96	96	96	96
	Sep	Person's r	-0.067	0.010	-0.185	-0.151	-0.076	0.061	0.179	0.153	0.186	0.177
		N	96	96	96	96	96	96	96	96	96	96
	Oct	Person's r	-0.295	-0.211	-0.062	-0.104	-0.298	0.129	0.342	0.305	0.293	0.298
		N	96	96	96	96	96	96	96	96	96	96
	Nov	Person's r	-0.292	-0.253	-0.010	-0.209	-0.293	0.232	0.385	0.363	0.203	0.235
		N	96	96	96	96	96	96	96	96	96	96
	Dec	Person's r	-0.344	-0.283	0.016	-0.075	-0.344	0.169	0.371	0.337	0.246	0.260
		N	96	96	96	96	96	96	96	96	96	96
	Annual Mean	Person's r	-0.383	-0.294	-0.096	-0.200	-0.388	0.253	0.489	0.453	0.299	0.326
		N	96	96	96	96	96	96	96	96	96	96
	DJF	Person's r	-0.431	-0.342	0.033	-0.095	-0.431	0.254	0.490	0.452	0.307	0.333
		N	96	96	96	96	96	96	96	96	96	96
	MAM	Person's r	-0.279	-0.197	-0.113	-0.091	-0.285	0.115	0.337	0.301	0.274	0.274
		N	96	96	96	96	96	96	96	96	96	96
	JJA	Person's r	-0.210	-0.189	-0.107	-0.251	-0.216	0.249	0.321	0.318	0.065	0.112
		N	96	96	96	96	96	96	96	96	96	96
	SON	Person's r	-0.269	-0.186	-0.108	-0.195	-0.274	0.176	0.376	0.341	0.282	0.294
		N	96	96	96	96	96	96	96	96	96	96

A3 (continued) Correlation matrix of Laguna Aculeo. Non-filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	96	96	96	96	96	96	96	96	96	96
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	96	96	96	96	96	96	96	96	96	96
	Mar	Person's r	-0.012	0.000	0.254	0.218	0.000	-0.043	0.035	0.016	0.071	0.049
		N	96	96	96	96	96	96	96	96	96	96
	Apr	Person's r	-0.036	-0.008	-0.010	-0.008	-0.036	0.028	0.052	0.046	0.036	0.036
		N	96	96	96	96	96	96	96	96	96	96
	May	Person's r	0.093	0.094	-0.063	-0.050	0.090	-0.022	-0.056	-0.053	-0.126	-0.127
		N	96	96	96	96	96	96	96	96	96	96
	Jun	Person's r	0.200	0.170	-0.043	0.102	0.198	-0.178	-0.177	-0.181	-0.144	-0.171
		N	96	96	96	96	96	96	96	96	96	96
	Jul	Person's r	-0.033	-0.021	0.082	0.000	-0.029	-0.080	0.081	0.050	0.119	0.089
		N	96	96	96	96	96	96	96	96	96	96
	Aug	Person's r	0.003	-0.003	-0.214	-0.114	-0.007	-0.096	0.024	-0.006	-0.097	-0.118
		N	96	96	96	96	96	96	96	96	96	96
	Sep	Person's r	-0.001	-0.012	-0.014	-0.002	-0.002	-0.037	-0.035	-0.036	-0.095	-0.099
		N	96	96	96	96	96	96	96	96	96	96
	Oct	Person's r	-0.035	-0.053	-0.033	-0.061	-0.037	0.059	0.063	0.064	-0.061	-0.043
		N	96	96	96	96	96	96	96	96	96	96
	Nov	Person's r	-0.131	-0.150	-0.017	-0.084	-0.133	0.019	0.085	0.080	0.031	0.042
		N	96	96	96	96	96	96	96	96	96	96
	Dec	Person's r	-0.065	-0.032	-0.037	0.090	-0.067	0.035	0.105	0.093	0.101	0.100
		N	96	96	96	96	96	96	96	96	96	96
	Total annual	Person's r	0.083	0.073	-0.064	-0.008	0.080	-0.153	-0.035	-0.062	-0.090	-0.122
		N	96	96	96	96	96	96	96	96	96	96
	DJF	Person's r	-0.065	-0.032	-0.037	0.090	-0.067	0.035	0.105	0.093	0.101	0.100
		N	96	96	96	96	96	96	96	96	96	96
	MAM	Person's r	0.072	0.082	-0.038	-0.028	0.070	-0.015	-0.031	-0.032	-0.097	-0.099
		N	96	96	96	96	96	96	96	96	96	96
	JJA	Person's r	0.098	0.085	-0.055	0.016	0.095	-0.193	-0.044	-0.077	-0.046	-0.089
		N	96	96	96	96	96	96	96	96	96	96
	SON	Person's r	-0.062	-0.084	-0.031	-0.054	-0.063	-0.004	0.023	0.020	-0.096	-0.088
		N	96	96	96	96	96	96	96	96	96	96
Precipitation HadCRUT3	Jan	Person's r	0.108	0.091	-0.017	0.113	0.108	-0.132	-0.166	-0.167	-0.188	-0.204
		N	96	96	96	96	96	96	96	96	96	96
	Feb	Person's r	0.076	0.080	-0.109	0.001	0.071	0.018	-0.055	-0.047	-0.104	-0.093
		N	96	96	96	96	96	96	96	96	96	96
	Mar	Person's r	0.029	0.062	0.120	0.048	0.035	-0.110	0.075	0.031	0.066	0.027
		N	96	96	96	96	96	96	96	96	96	96
	Apr	Person's r	0.028	0.053	0.035	-0.005	0.030	-0.074	-0.026	-0.037	0.024	0.004
		N	96	96	96	96	96	96	96	96	96	96
	May	Person's r	0.222	0.207	-0.103	0.053	0.218	-0.222	-0.207	-0.219	-0.164	-0.204
		N	96	96	96	96	96	96	96	96	96	96
	Jun	Person's r	0.259	0.222	-0.055	0.132	0.257	-0.219	-0.251	-0.253	-0.198	-0.233
		N	96	96	96	96	96	96	96	96	96	96
	Jul	Person's r	-0.002	-0.008	0.038	-0.026	0.000	-0.079	0.053	0.026	0.070	0.045
		N	96	96	96	96	96	96	96	96	96	96
	Aug	Person's r	0.027	0.012	-0.208	-0.041	0.017	-0.098	-0.016	-0.036	-0.103	-0.122
		N	96	96	96	96	96	96	96	96	96	96
	Sep	Person's r	0.042	0.007	-0.075	-0.063	0.038	-0.082	-0.125	-0.119	-0.099	-0.108
		N	96	96	96	96	96	96	96	96	96	96
	Oct	Person's r	0.056	0.048	-0.060	-0.013	0.053	0.015	-0.065	-0.050	-0.077	-0.064
		N	96	96	96	96	96	96	96	96	96	96
	Nov	Person's r	-0.062	-0.071	-0.020	-0.123	-0.063	-0.005	0.015	0.017	0.064	0.067
		N	96	96	96	96	96	96	96	96	96	96
	Dec	Person's r	0.062	0.105	-0.004	0.065	0.062	-0.109	-0.014	-0.039	0.024	-0.008
		N	96	96	96	96	96	96	96	96	96	96
	Total annual	Person's r	0.244	0.212	-0.124	0.046	0.238	-0.301	-0.217	-0.244	-0.177	-0.234
		N	96	96	96	96	96	96	96	96	96	96
	DJF	Person's r	0.131	0.159	-0.058	0.103	0.129	-0.138	-0.110	-0.127	-0.112	-0.139
		N	96	96	96	96	96	96	96	96	96	96
	MAM	Person's r	0.209	0.205	-0.071	0.050	0.206	-0.229	-0.186	-0.203	-0.133	-0.177
		N	96	96	96	96	96	96	96	96	96	96
	JJA	Person's r	0.164	0.132	-0.088	0.047	0.160	-0.218	-0.123	-0.149	-0.114	-0.157
		N	96	96	96	96	96	96	96	96	96	96
	SON	Person's r	0.031	0.000	-0.084	-0.092	0.027	-0.056	-0.112	-0.100	-0.081	-0.082
		N	96	96	96	96	96	96	96	96	96	96

A3 (continued) Correlation matrix of Laguna Aculeo. Non-filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
SOI	Jan	Person's r	0.078	0.037	-0.092	-0.131	0.074	-0.015	-0.082	-0.066	-0.162	-0.150
		N	96	96	96	96	96	96	96	96	96	96
	Feb	Person's r	0.015	-0.019	-0.059	-0.118	0.012	0.073	-0.063	-0.031	-0.070	-0.044
		N	96	96	96	96	96	96	96	96	96	96
	Mar	Person's r	0.028	0.028	0.013	0.102	0.029	0.121	-0.064	-0.024	-0.017	0.016
		N	96	96	96	96	96	96	96	96	96	96
	Apr	Person's r	0.056	0.013	0.027	0.150	0.057	0.002	-0.032	-0.023	-0.044	-0.040
		N	96	96	96	96	96	96	96	96	96	96
	May	Person's r	0.010	-0.031	0.077	0.027	0.013	-0.044	-0.047	-0.044	0.004	-0.001
		N	96	96	96	96	96	96	96	96	96	96
	Jun	Person's r	0.067	0.002	-0.061	-0.039	0.064	-0.012	-0.138	-0.112	-0.163	-0.148
		N	96	96	96	96	96	96	96	96	96	96
	Jul	Person's r	0.156	0.081	-0.069	-0.134	0.153	-0.021	-0.172	-0.145	-0.199	-0.187
		N	96	96	96	96	96	96	96	96	96	96
	Aug	Person's r	-0.038	-0.075	-0.148	-0.228	-0.045	0.134	0.002	0.036	-0.075	-0.031
		N	96	96	96	96	96	96	96	96	96	96
	Sep	Person's r	0.072	-0.028	-0.119	-0.110	0.066	0.071	-0.143	-0.095	-0.186	-0.146
		N	96	96	96	96	96	96	96	96	96	96
	Oct	Person's r	-0.038	-0.108	-0.109	-0.121	-0.044	0.160	-0.054	-0.004	-0.181	-0.124
		N	96	96	96	96	96	96	96	96	96	96
	Nov	Person's r	-0.036	-0.068	-0.036	-0.115	-0.038	0.142	-0.049	-0.002	-0.156	-0.101
		N	96	96	96	96	96	96	96	96	96	96
	Dec	Person's r	0.053	0.039	0.034	-0.095	0.054	-0.032	-0.111	-0.096	-0.081	-0.080
		N	96	96	96	96	96	96	96	96	96	96
	Annual mean	Person's r	0.081	-0.013	-0.007	0.000	0.080	0.040	-0.122	-0.087	-0.149	-0.125
		N	96	96	96	96	96	96	96	96	96	96
	DJF	Person's r	0.040	0.029	-0.053	-0.018	0.037	0.015	-0.095	-0.071	-0.105	-0.091
		N	96	96	96	96	96	96	96	96	96	96
	MAM	Person's r	0.092	0.007	-0.032	0.021	0.091	0.026	-0.131	-0.097	-0.144	-0.124
		N	96	96	96	96	96	96	96	96	96	96
	JJA	Person's r	0.081	0.003	-0.090	-0.110	0.077	0.036	-0.128	-0.094	-0.156	-0.133
		N	96	96	96	96	96	96	96	96	96	96
	SON	Person's r	-0.043	-0.078	-0.027	-0.124	-0.044	0.112	-0.014	0.018	-0.056	-0.018
		N	96	96	96	96	96	96	96	96	96	96
El Niño 3		Person's r	0.254	0.207	-0.156	-0.093	0.247	-0.175	-0.315	-0.295	-0.335	-0.347
		N	79	79	79	79	79	79	79	79	79	79
SAB		Person's r	-0.117	-0.117	-0.023	0.132	-0.118	0.141	0.085	0.101	0.022	0.057
		N	75	75	75	75	75	75	75	75	75	75

A3 (continued) Correlation matrix of Laguna Aculeo. Non-filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	0.147	-0.059	-0.108	0.105	0.081	0.117	0.139	0.119	0.090	0.139	0.125	0.166	0.005	-0.201
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Feb	Person's r	0.009	-0.169	-0.080	0.067	0.076	0.092	0.076	-0.019	-0.097	0.076	0.007	0.135	-0.173	-0.220
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Mar	Person's r	-0.125	-0.042	0.086	-0.089	-0.080	-0.069	-0.077	-0.137	-0.180	-0.077	-0.126	-0.033	-0.102	-0.048
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Apr	Person's r	-0.091	0.192	0.140	-0.169	-0.180	-0.173	-0.161	-0.116	-0.062	-0.161	-0.133	-0.169	0.100	0.135
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	May	Person's r	-0.058	-0.006	0.065	-0.066	-0.078	-0.056	-0.039	-0.034	-0.049	-0.039	-0.042	-0.031	0.043	-0.006
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Jun	Person's r	-0.022	-0.029	0.020	-0.001	0.011	0.014	0.001	-0.039	-0.051	0.001	-0.025	0.023	-0.092	-0.035
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Jul	Person's r	-0.038	0.015	0.034	-0.037	-0.031	-0.029	-0.034	-0.039	-0.032	-0.034	-0.037	-0.031	-0.017	0.024
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Aug	Person's r	-0.021	-0.012	0.011	-0.026	-0.047	-0.031	-0.008	0.025	0.027	-0.008	0.011	-0.021	0.097	0.007
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Sep	Person's r	-0.160	0.081	0.196	-0.172	-0.165	-0.150	-0.147	-0.174	-0.177	-0.147	-0.173	-0.108	-0.039	0.065
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Oct	Person's r	0.107	-0.039	-0.061	0.077	0.053	0.087	0.112	0.110	0.100	0.112	0.111	0.123	0.034	-0.121
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Nov	Person's r	0.112	-0.140	-0.162	0.124	0.111	0.134	0.135	0.082	0.024	0.135	0.097	0.165	-0.073	-0.244
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Dec	Person's r	0.217	-0.040	-0.133	0.129	0.077	0.140	0.189	0.193	0.171	0.189	0.190	0.208	0.088	-0.250
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Annual Mean	Person's r	0.014	-0.045	0.000	-0.007	-0.026	0.016	0.034	-0.005	-0.041	0.034	0.002	0.076	-0.027	-0.156
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	DJF	Person's r	0.166	-0.112	-0.140	0.132	0.101	0.152	0.177	0.132	0.078	0.177	0.144	0.222	-0.028	-0.290
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	MAM	Person's r	-0.129	0.061	0.136	-0.150	-0.156	-0.138	-0.127	-0.134	-0.137	-0.127	-0.139	-0.106	0.018	0.034
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	JJA	Person's r	-0.040	-0.014	0.033	-0.029	-0.028	-0.019	-0.019	-0.032	-0.035	-0.019	-0.029	-0.010	-0.022	-0.005
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	SON	Person's r	0.041	-0.059	-0.028	0.026	0.010	0.047	0.062	0.019	-0.020	0.062	0.028	0.102	-0.042	-0.165
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
Temperature HadCRUT3	Jan	Person's r	0.198	-0.196	-0.205	0.203	0.174	0.214	0.241	0.196	0.116	0.241	0.207	0.275	-0.030	-0.327
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Feb	Person's r	0.100	-0.149	-0.119	0.112	0.098	0.135	0.142	0.077	0.019	0.142	0.095	0.188	-0.092	-0.256
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Mar	Person's r	-0.010	-0.180	-0.065	0.068	0.080	0.085	0.073	-0.019	-0.108	0.073	0.004	0.121	-0.166	-0.188
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Apr	Person's r	0.017	-0.051	-0.028	0.012	0.010	0.030	0.029	-0.033	-0.082	0.029	-0.019	0.071	-0.099	-0.162
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	May	Person's r	0.074	-0.100	-0.069	0.072	0.056	0.085	0.103	0.070	0.013	0.103	0.075	0.126	-0.020	-0.176
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Jun	Person's r	0.060	-0.171	-0.105	0.114	0.132	0.142	0.119	0.011	-0.070	0.119	0.044	0.173	-0.214	-0.240
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Jul	Person's r	0.032	-0.093	-0.050	0.041	0.043	0.064	0.060	-0.001	-0.055	0.060	0.015	0.103	-0.105	-0.175
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Aug	Person's r	0.060	-0.147	-0.093	0.093	0.092	0.112	0.111	0.056	0.000	0.111	0.072	0.141	-0.089	-0.186
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Sep	Person's r	0.071	0.046	0.022	0.004	-0.017	0.021	0.049	0.032	0.016	0.049	0.033	0.079	0.013	-0.105
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Oct	Person's r	0.268	-0.080	-0.181	0.203	0.161	0.213	0.255	0.241	0.201	0.255	0.246	0.273	0.043	-0.278
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Nov	Person's r	0.134	-0.248	-0.198	0.199	0.205	0.222	0.209	0.107	0.013	0.209	0.139	0.260	-0.183	-0.319
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Dec	Person's r	0.171	-0.076	-0.128	0.117	0.077	0.128	0.168	0.149	0.101	0.168	0.150	0.195	0.038	-0.256
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Annual Mean	Person's r	0.155	-0.201	-0.165	0.167	0.151	0.197	0.210	0.116	0.016	0.210	0.141	0.272	-0.128	-0.365
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	DJF	Person's r	0.206	-0.188	-0.200	0.192	0.155	0.211	0.243	0.185	0.103	0.243	0.199	0.291	-0.040	-0.371
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	MAM	Person's r	0.035	-0.140	-0.069	0.065	0.062	0.085	0.087	0.010	-0.072	0.087	0.027	0.135	-0.118	-0.222
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	JJA	Person's r	0.065	-0.177	-0.107	0.107	0.116	0.137	0.125	0.027	-0.056	0.125	0.055	0.180	-0.180	-0.260
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	SON	Person's r	0.193	-0.117	-0.146	0.166	0.143	0.187	0.210	0.154	0.091	0.210	0.170	0.252	-0.056	-0.290
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96

A3 (continued) Correlation matrix of Laguna Aculeo. Non-filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Mar	Person's r	-0.018	-0.070	-0.027	0.020	0.025	0.018	0.013	0.009	-0.004	0.013	0.010	0.016	-0.015	-0.018
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Apr	Person's r	-0.069	-0.045	0.024	-0.034	-0.028	-0.029	-0.036	-0.064	-0.088	-0.036	-0.058	-0.020	-0.050	-0.023
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	May	Person's r	-0.139	-0.088	0.075	-0.047	-0.024	-0.038	-0.056	-0.094	-0.131	-0.056	-0.086	-0.040	-0.083	0.042
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Jun	Person's r	-0.144	0.070	0.130	-0.112	-0.081	-0.114	-0.141	-0.138	-0.119	-0.141	-0.139	-0.154	-0.037	0.180
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Jul	Person's r	0.040	-0.102	-0.069	0.076	0.082	0.084	0.075	0.041	0.009	0.075	0.052	0.091	-0.072	-0.100
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Aug	Person's r	-0.004	0.082	0.045	-0.042	-0.044	-0.036	-0.038	-0.043	-0.020	-0.038	-0.040	-0.032	-0.009	0.018
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Sep	Person's r	0.010	-0.034	-0.052	0.028	0.026	0.017	0.014	0.026	0.024	0.014	0.023	0.002	0.024	-0.007
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Oct	Person's r	0.200	0.126	-0.051	0.076	0.032	0.067	0.114	0.189	0.236	0.114	0.169	0.084	0.193	-0.015
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Nov	Person's r	0.159	-0.050	-0.110	0.130	0.102	0.129	0.156	0.176	0.168	0.156	0.171	0.138	0.077	-0.108
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Dec	Person's r	-0.102	0.049	0.088	-0.106	-0.090	-0.095	-0.112	-0.141	-0.141	-0.112	-0.135	-0.089	-0.073	0.039
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Total annual	Person's r	-0.069	-0.029	0.041	-0.024	-0.005	-0.018	-0.036	-0.059	-0.071	-0.036	-0.052	-0.031	-0.060	0.036
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	DJF	Person's r	-0.102	0.049	0.088	-0.106	-0.090	-0.095	-0.112	-0.141	-0.141	-0.112	-0.135	-0.089	-0.073	0.039
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	MAM	Person's r	-0.149	-0.100	0.073	-0.052	-0.028	-0.043	-0.061	-0.105	-0.147	-0.061	-0.095	-0.041	-0.093	0.029
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	JJA	Person's r	-0.061	0.007	0.050	-0.034	-0.012	-0.028	-0.050	-0.072	-0.072	-0.050	-0.064	-0.045	-0.071	0.049
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	SON	Person's r	0.140	-0.002	-0.104	0.099	0.072	0.086	0.111	0.157	0.169	0.111	0.145	0.083	0.120	-0.052
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
Precipitation HadCRUT3	Jan	Person's r	-0.070	0.055	0.044	-0.059	-0.046	-0.063	-0.083	-0.085	-0.059	-0.083	-0.082	-0.090	-0.031	0.085
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Feb	Person's r	0.012	0.301	0.163	-0.155	-0.193	-0.159	-0.111	-0.021	0.067	-0.111	-0.050	-0.130	0.221	0.153
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Mar	Person's r	-0.029	-0.042	0.014	-0.008	-0.006	-0.006	-0.002	-0.003	-0.019	-0.002	-0.005	0.007	0.004	-0.007
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Apr	Person's r	-0.084	-0.001	0.066	-0.067	-0.061	-0.059	-0.063	-0.089	-0.105	-0.063	-0.085	-0.048	-0.047	0.006
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	May	Person's r	-0.173	-0.029	0.116	-0.094	-0.069	-0.095	-0.110	-0.123	-0.142	-0.110	-0.123	-0.111	-0.041	0.125
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Jun	Person's r	-0.187	0.142	0.190	-0.181	-0.155	-0.186	-0.207	-0.181	-0.133	-0.207	-0.189	-0.226	0.009	0.246
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Jul	Person's r	0.041	-0.107	-0.071	0.086	0.097	0.094	0.081	0.044	0.015	0.081	0.058	0.093	-0.086	-0.086
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Aug	Person's r	-0.019	0.076	0.048	-0.046	-0.039	-0.038	-0.050	-0.064	-0.040	-0.050	-0.057	-0.045	-0.043	0.032
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Sep	Person's r	0.055	0.023	-0.057	0.041	0.033	0.024	0.029	0.068	0.091	0.029	0.059	-0.003	0.072	0.029
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Oct	Person's r	0.146	0.204	0.017	-0.001	-0.045	-0.013	0.035	0.136	0.211	0.035	0.108	-0.006	0.240	0.074
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Nov	Person's r	0.140	-0.080	-0.123	0.143	0.128	0.140	0.154	0.155	0.134	0.154	0.157	0.137	0.023	-0.105
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Dec	Person's r	-0.120	-0.012	0.087	-0.085	-0.071	-0.075	-0.086	-0.111	-0.122	-0.086	-0.107	-0.068	-0.056	0.042
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Total annual	Person's r	-0.137	0.043	0.119	-0.098	-0.072	-0.097	-0.117	-0.122	-0.108	-0.117	-0.121	-0.126	-0.041	0.147
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	DJF	Person's r	-0.121	0.147	0.160	-0.162	-0.161	-0.157	-0.154	-0.135	-0.094	-0.154	-0.143	-0.151	0.038	0.138
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	MAM	Person's r	-0.181	-0.029	0.123	-0.104	-0.080	-0.102	-0.116	-0.136	-0.159	-0.116	-0.135	-0.113	-0.050	0.112
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	JJA	Person's r	-0.094	0.047	0.087	-0.072	-0.046	-0.067	-0.092	-0.105	-0.086	-0.092	-0.099	-0.093	-0.065	0.106
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	SON	Person's r	0.142	0.068	-0.076	0.077	0.049	0.059	0.085	0.152	0.190	0.085	0.135	0.041	0.151	0.015
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96

A3 (continued) Correlation matrix of Laguna Aculeo. Non-filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
SOI	Jan	Person's r	0.085	-0.010	-0.054	0.059	0.041	0.055	0.072	0.102	0.116	0.072	0.094	0.056	0.074	-0.034
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Feb	Person's r	0.117	0.008	-0.075	0.073	0.047	0.065	0.089	0.122	0.135	0.089	0.113	0.071	0.087	-0.054
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Mar	Person's r	-0.031	0.060	0.048	-0.058	-0.059	-0.055	-0.056	-0.051	-0.032	-0.056	-0.053	-0.049	0.006	0.028
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Apr	Person's r	-0.064	0.039	0.072	-0.077	-0.077	-0.071	-0.070	-0.065	-0.056	-0.070	-0.069	-0.061	0.015	0.036
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	May	Person's r	0.068	0.042	-0.021	0.022	0.007	0.017	0.033	0.065	0.087	0.033	0.056	0.019	0.073	-0.004
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Jun	Person's r	-0.045	0.060	0.056	-0.059	-0.064	-0.068	-0.061	-0.026	0.003	-0.061	-0.037	-0.079	0.069	0.091
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Jul	Person's r	-0.066	-0.008	0.031	-0.034	-0.028	-0.042	-0.046	-0.027	-0.014	-0.046	-0.033	-0.059	0.027	0.079
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Aug	Person's r	0.104	-0.032	-0.087	0.088	0.079	0.087	0.095	0.099	0.095	0.095	0.100	0.089	0.011	-0.078
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Sep	Person's r	0.002	0.076	0.020	-0.025	-0.024	-0.033	-0.034	-0.004	0.027	-0.034	-0.011	-0.056	0.046	0.082
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Oct	Person's r	0.077	-0.095	-0.135	0.116	0.120	0.109	0.095	0.085	0.066	0.095	0.092	0.079	-0.031	-0.072
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Nov	Person's r	0.100	-0.081	-0.140	0.128	0.131	0.120	0.107	0.101	0.092	0.107	0.109	0.089	-0.029	-0.070
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Dec	Person's r	0.026	-0.029	-0.054	0.042	0.041	0.032	0.029	0.038	0.041	0.029	0.037	0.018	0.010	-0.009
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	Annual mean	Person's r	-0.080	0.062	0.068	-0.094	-0.094	-0.099	-0.101	-0.074	-0.048	-0.101	-0.084	-0.106	0.044	0.086
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	DJF	Person's r	0.047	0.022	-0.038	0.016	0.002	0.007	0.016	0.048	0.067	0.016	0.039	0.003	0.067	-0.008
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	MAM	Person's r	-0.040	0.086	0.075	-0.076	-0.079	-0.074	-0.071	-0.046	-0.013	-0.071	-0.054	-0.078	0.046	0.074
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	JJA	Person's r	-0.084	0.040	0.074	-0.076	-0.071	-0.080	-0.083	-0.064	-0.047	-0.083	-0.072	-0.093	0.028	0.095
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	SON	Person's r	0.097	-0.083	-0.133	0.122	0.123	0.114	0.107	0.102	0.086	0.107	0.107	0.096	-0.019	-0.078
		N	96	96	96	96	96	96	96	96	96	96	96	96	96	96
	El Niño 3	Person's r	-0.161	0.216	0.209	-0.209	-0.198	-0.214	-0.219	-0.168	-0.089	-0.219	-0.183	-0.244	0.070	0.266
		N	79	79	79	79	79	79	79	79	79	79	79	79	79	79
	SAB	Person's r	0.122	0.039	-0.054	0.053	0.017	0.045	0.082	0.139	0.165	0.082	0.123	0.058	0.152	-0.033
		N	75	75	75	75	75	75	75	75	75	75	75	75	75	75

A4 Correlation matrix of Laguna Aculeo. 3-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
Temperature CRU TS 2.1	Jan	Person's r	0.596	0.641	-0.178	0.281	0.368	0.350	-0.018	-0.512	0.608
		N	95	95	95	95	95	95	95	95	95
	Feb	Person's r	0.644	0.655	-0.235	0.325	0.459	0.409	-0.168	-0.457	0.502
		N	95	95	95	95	95	95	95	95	95
	Mar	Person's r	0.581	0.530	-0.022	0.367	0.389	0.343	-0.269	-0.215	0.275
		N	95	95	95	95	95	95	95	95	95
	Apr	Person's r	0.273	0.203	0.255	0.351	0.323	0.160	-0.302	0.152	0.009
		N	95	95	95	95	95	95	95	95	95
	May	Person's r	0.240	0.252	0.109	0.186	0.361	0.165	-0.013	-0.165	0.268
		N	95	95	95	95	95	95	95	95	95
	Jun	Person's r	0.118	0.114	0.198	0.046	0.123	0.028	0.075	0.051	0.065
		N	95	95	95	95	95	95	95	95	95
	Jul	Person's r	0.192	0.149	0.042	0.277	0.295	0.053	-0.283	0.010	0.084
		N	95	95	95	95	95	95	95	95	95
	Aug	Person's r	0.270	0.212	0.137	0.266	0.301	0.093	-0.313	0.030	0.068
		N	95	95	95	95	95	95	95	95	95
	Sep	Person's r	0.338	0.298	0.065	0.247	0.343	0.048	-0.263	0.045	0.085
		N	95	95	95	95	95	95	95	95	95
	Oct	Person's r	0.464	0.440	-0.049	0.274	0.419	0.162	-0.266	-0.180	0.285
		N	95	95	95	95	95	95	95	95	95
	Nov	Person's r	0.591	0.623	-0.230	0.278	0.386	0.571	-0.105	-0.456	0.526
		N	95	95	95	95	95	95	95	95	95
	Dec	Person's r	0.613	0.665	-0.157	0.172	0.532	0.338	-0.161	-0.458	0.573
		N	95	95	95	95	95	95	95	95	95
	Annual Mean	Person's r	0.691	0.675	-0.016	0.420	0.601	0.383	-0.279	-0.315	0.480
		N	95	95	95	95	95	95	95	95	95
	DJF	Person's r	0.724	0.767	-0.222	0.300	0.535	0.428	-0.138	-0.556	0.657
		N	95	95	95	95	95	95	95	95	95
	MAM	Person's r	0.485	0.441	0.135	0.389	0.472	0.297	-0.243	-0.123	0.259
		N	95	95	95	95	95	95	95	95	95
	JJA	Person's r	0.269	0.222	0.188	0.268	0.333	0.079	-0.223	0.045	0.105
		N	95	95	95	95	95	95	95	95	95
	SON	Person's r	0.661	0.647	-0.107	0.377	0.541	0.379	-0.295	-0.289	0.431
		N	95	95	95	95	95	95	95	95	95
Temperature HadCRUT3	Jan	Person's r	0.610	0.642	-0.478	0.221	0.338	0.450	-0.071	-0.544	0.529
		N	95	95	95	95	95	95	95	95	95
	Feb	Person's r	0.650	0.631	-0.175	0.393	0.443	0.318	-0.291	-0.420	0.527
		N	95	95	95	95	95	95	95	95	95
	Mar	Person's r	0.439	0.442	-0.413	0.138	0.139	0.330	-0.196	-0.350	0.251
		N	95	95	95	95	95	95	95	95	95
	Apr	Person's r	0.415	0.388	-0.262	0.291	0.136	0.328	-0.180	-0.311	0.323
		N	95	95	95	95	95	95	95	95	95
	May	Person's r	0.385	0.392	-0.158	0.197	0.348	0.212	-0.102	-0.336	0.389
		N	95	95	95	95	95	95	95	95	95
	Jun	Person's r	0.445	0.448	-0.158	0.269	0.362	0.298	-0.072	-0.352	0.409
		N	95	95	95	95	95	95	95	95	95
	Jul	Person's r	0.458	0.474	-0.344	0.235	0.455	0.251	-0.117	-0.362	0.395
		N	95	95	95	95	95	95	95	95	95
	Aug	Person's r	0.424	0.420	-0.208	0.220	0.319	0.173	-0.225	-0.295	0.304
		N	95	95	95	95	95	95	95	95	95
	Sep	Person's r	0.380	0.376	-0.172	0.204	0.303	0.183	-0.197	-0.148	0.211
		N	95	95	95	95	95	95	95	95	95
	Oct	Person's r	0.469	0.499	-0.257	0.155	0.304	0.242	-0.172	-0.375	0.418
		N	95	95	95	95	95	95	95	95	95
	Nov	Person's r	0.582	0.622	-0.407	0.204	0.434	0.464	-0.118	-0.519	0.454
		N	95	95	95	95	95	95	95	95	95
	Dec	Person's r	0.635	0.642	-0.325	0.365	0.394	0.463	-0.288	-0.446	0.513
		N	95	95	95	95	95	95	95	95	95
	Annual Mean	Person's r	0.662	0.670	-0.375	0.327	0.445	0.417	-0.227	-0.500	0.531
		N	95	95	95	95	95	95	95	95	95
	DJF	Person's r	0.731	0.738	-0.370	0.380	0.456	0.469	-0.253	-0.542	0.605
		N	95	95	95	95	95	95	95	95	95
	MAM	Person's r	0.484	0.478	-0.326	0.241	0.246	0.338	-0.186	-0.390	0.375
		N	95	95	95	95	95	95	95	95	95
	JJA	Person's r	0.528	0.534	-0.280	0.290	0.454	0.293	-0.156	-0.404	0.446
		N	95	95	95	95	95	95	95	95	95
	SON	Person's r	0.559	0.584	-0.325	0.222	0.408	0.347	-0.192	-0.402	0.419
		N	95	95	95	95	95	95	95	95	95

A4 (Continued) Correlation matrix of Laguna Aculeo. 3-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
Precipitation HadCRUT3	Jan	Person's r	-0.088	-0.172	0.406	0.155	-0.129	-0.115	-0.142	0.226	-0.182
		N	95	95	95	95	95	95	95	95	95
	Feb	Person's r	0.020	0.011	0.126	0.179	0.060	-0.131	-0.140	0.110	0.018
		N	95	95	95	95	95	95	95	95	95
	Mar	Person's r	0.316	0.254	-0.215	0.284	0.148	0.261	-0.220	-0.096	-0.036
		N	95	95	95	95	95	95	95	95	95
	Apr	Person's r	0.144	0.093	0.184	0.078	0.135	-0.035	-0.156	0.093	-0.028
		N	95	95	95	95	95	95	95	95	95
	May	Person's r	-0.158	-0.239	0.151	0.069	-0.041	-0.256	-0.194	0.219	-0.286
		N	95	95	95	95	95	95	95	95	95
	Jun	Person's r	-0.335	-0.385	0.108	-0.096	-0.188	-0.270	0.029	0.400	-0.472
		N	95	95	95	95	95	95	95	95	95
	Jul	Person's r	0.025	-0.043	-0.135	0.223	-0.032	-0.049	-0.197	-0.023	-0.029
		N	95	95	95	95	95	95	95	95	95
	Aug	Person's r	0.028	-0.044	0.145	0.342	-0.008	0.081	-0.146	0.081	-0.046
		N	95	95	95	95	95	95	95	95	95
	Sep	Person's r	-0.141	-0.157	0.069	-0.062	-0.046	-0.023	-0.126	0.228	-0.168
		N	95	95	95	95	95	95	95	95	95
	Oct	Person's r	-0.219	-0.187	0.191	-0.071	-0.082	-0.113	0.115	0.113	-0.029
		N	95	95	95	95	95	95	95	95	95
	Nov	Person's r	-0.036	-0.056	-0.008	0.045	-0.059	0.018	-0.063	-0.027	0.081
		N	95	95	95	95	95	95	95	95	95
	Dec	Person's r	0.071	-0.018	0.003	0.336	-0.092	0.234	-0.156	0.009	-0.090
		N	95	95	95	95	95	95	95	95	95
	Total annual	Person's r	-0.204	-0.329	0.147	0.217	-0.112	-0.235	-0.261	0.338	-0.390
		N	95	95	95	95	95	95	95	95	95
	DJF	Person's r	0.020	-0.082	0.233	0.375	-0.091	0.052	-0.229	0.152	-0.132
		N	95	95	95	95	95	95	95	95	95
	MAM	Person's r	-0.086	-0.176	0.165	0.103	0.006	-0.221	-0.230	0.214	-0.269
		N	95	95	95	95	95	95	95	95	95
	JJA	Person's r	-0.163	-0.260	0.038	0.212	-0.128	-0.149	-0.158	0.244	-0.301
		N	95	95	95	95	95	95	95	95	95
	SON	Person's r	-0.210	-0.217	0.127	-0.058	-0.091	-0.057	-0.071	0.206	-0.105
		N	95	95	95	95	95	95	95	95	95
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	95	95	95	95	95	95	95	95	95
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	95	95	95	95	95	95	95	95	95
	Mar	Person's r	0.219	0.194	-0.091	0.099	0.069	0.013	-0.172	-0.089	0.043
		N	95	95	95	95	95	95	95	95	95
	Apr	Person's r	0.223	0.188	0.101	0.172	0.225	0.017	-0.183	-0.036	0.176
		N	95	95	95	95	95	95	95	95	95
	May	Person's r	0.058	0.052	0.063	-0.020	0.229	-0.097	0.017	-0.019	0.039
		N	95	95	95	95	95	95	95	95	95
	Jun	Person's r	-0.366	-0.379	0.105	-0.230	-0.163	-0.272	0.190	0.257	-0.423
		N	95	95	95	95	95	95	95	95	95
	Jul	Person's r	0.114	0.068	-0.106	0.163	-0.037	0.017	-0.136	-0.090	0.073
		N	95	95	95	95	95	95	95	95	95
	Aug	Person's r	0.149	0.087	0.120	0.392	0.087	0.128	-0.188	-0.014	0.072
		N	95	95	95	95	95	95	95	95	95
	Sep	Person's r	0.054	0.026	0.128	0.030	0.136	-0.140	-0.159	0.034	0.038
		N	95	95	95	95	95	95	95	95	95
	Oct	Person's r	0.030	0.056	0.052	0.070	0.047	0.065	0.053	-0.129	0.128
		N	95	95	95	95	95	95	95	95	95
	Nov	Person's r	0.049	0.034	-0.025	0.118	0.038	0.000	-0.035	-0.141	0.195
		N	95	95	95	95	95	95	95	95	95
	Dec	Person's r	0.106	0.048	-0.027	0.314	-0.090	0.286	-0.073	-0.089	0.062
		N	95	95	95	95	95	95	95	95	95
	Total annual	Person's r	0.023	-0.040	0.094	0.158	0.091	-0.118	-0.099	0.025	-0.046
		N	95	95	95	95	95	95	95	95	95
	DJF	Person's r	0.106	0.048	-0.027	0.314	-0.090	0.286	-0.073	-0.089	0.062
		N	95	95	95	95	95	95	95	95	95
	MAM	Person's r	0.130	0.113	0.079	0.034	0.278	-0.085	-0.046	-0.034	0.086
		N	95	95	95	95	95	95	95	95	95
	JJA	Person's r	-0.074	-0.137	0.042	0.139	-0.080	-0.091	-0.058	0.083	-0.165
		N	95	95	95	95	95	95	95	95	95
	SON	Person's r	0.082	0.060	0.122	0.106	0.155	-0.099	-0.136	-0.083	0.170
		N	95	95	95	95	95	95	95	95	95

A4 (Continued) Correlation matrix of Laguna Aculeo. 3-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
SOI	Jan	Person's r	-0.135	-0.146	0.219	-0.002	0.083	-0.052	0.041	0.114	-0.080
		N	95	95	95	95	95	95	95	95	95
	Feb	Person's r	-0.205	-0.167	0.124	-0.156	-0.005	-0.096	0.169	0.081	0.021
		N	95	95	95	95	95	95	95	95	95
	Mar	Person's r	-0.194	-0.136	0.084	-0.221	-0.041	-0.069	0.317	0.066	-0.007
		N	95	95	95	95	95	95	95	95	95
	Apr	Person's r	0.037	0.023	0.013	0.020	0.029	0.056	0.122	-0.027	-0.006
		N	95	95	95	95	95	95	95	95	95
	May	Person's r	-0.177	-0.185	0.025	-0.039	-0.184	0.038	0.119	0.093	-0.122
		N	95	95	95	95	95	95	95	95	95
	Jun	Person's r	-0.236	-0.216	0.127	-0.160	-0.055	-0.043	0.132	0.125	-0.129
		N	95	95	95	95	95	95	95	95	95
	Jul	Person's r	-0.185	-0.193	0.143	-0.057	0.043	0.017	0.061	0.182	-0.145
		N	95	95	95	95	95	95	95	95	95
	Aug	Person's r	-0.112	-0.053	-0.076	-0.153	0.055	0.103	0.264	-0.024	0.061
		N	95	95	95	95	95	95	95	95	95
	Sep	Person's r	-0.359	-0.300	0.140	-0.316	-0.103	-0.171	0.320	0.148	-0.120
		N	95	95	95	95	95	95	95	95	95
	Oct	Person's r	-0.183	-0.129	0.144	-0.205	0.020	-0.007	0.288	-0.010	0.075
		N	95	95	95	95	95	95	95	95	95
	Nov	Person's r	-0.269	-0.161	0.059	-0.445	-0.091	-0.155	0.402	-0.046	0.025
		N	95	95	95	95	95	95	95	95	95
	Dec	Person's r	-0.255	-0.232	0.164	-0.204	-0.127	-0.085	0.168	0.167	-0.135
		N	95	95	95	95	95	95	95	95	95
	Annual mean	Person's r	-0.229	-0.184	0.094	-0.211	-0.059	-0.033	0.273	0.064	-0.042
		N	95	95	95	95	95	95	95	95	95
	DJF	Person's r	-0.248	-0.231	0.203	-0.138	-0.028	-0.107	0.161	0.150	-0.087
		N	95	95	95	95	95	95	95	95	95
	MAM	Person's r	-0.161	-0.143	0.107	-0.117	-0.026	-0.048	0.197	0.103	-0.075
		N	95	95	95	95	95	95	95	95	95
	JJA	Person's r	-0.212	-0.187	0.072	-0.159	0.016	0.021	0.181	0.110	-0.105
		N	95	95	95	95	95	95	95	95	95
	SON	Person's r	-0.247	-0.168	0.087	-0.351	-0.068	-0.083	0.381	-0.002	0.019
		N	95	95	95	95	95	95	95	95	95
El Niño 3		Person's r	-0.359	-0.406	0.348	0.012	-0.095	-0.303	-0.110	0.451	-0.350
		N	78	78	78	78	78	78	78	78	78
SAB		Person's r	0.113	0.123	0.139	0.117	0.094	-0.033	0.032	-0.101	0.258
		N	74	74	74	74	74	74	74	74	74

A4 (Continued) Correlation matrix of Laguna Aculeo. 3-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
Temperature CRU TS 2.1	Jan	Person's r	-0.513	-0.423	0.146	0.087	-0.508	0.426	0.553	0.539	0.264	0.331
		N	95	95	95	95	95	95	95	95	95	95
	Feb	Person's r	-0.350	-0.291	-0.005	-0.227	-0.351	0.289	0.456	0.429	0.096	0.139
		N	95	95	95	95	95	95	95	95	95	95
	Mar	Person's r	-0.186	-0.079	-0.129	0.097	-0.192	0.110	0.240	0.210	0.168	0.164
		N	95	95	95	95	95	95	95	95	95	95
	Apr	Person's r	0.100	0.118	-0.113	0.247	0.096	-0.013	-0.127	-0.116	-0.174	-0.174
		N	95	95	95	95	95	95	95	95	95	95
	May	Person's r	-0.138	-0.191	0.059	-0.026	-0.136	0.306	0.092	0.147	-0.247	-0.154
		N	95	95	95	95	95	95	95	95	95	95
	Jun	Person's r	0.083	0.145	-0.037	0.057	0.082	0.115	-0.033	-0.007	0.058	0.077
		N	95	95	95	95	95	95	95	95	95	95
	Jul	Person's r	0.042	-0.037	-0.128	-0.178	0.037	0.028	-0.049	-0.037	-0.325	-0.297
		N	95	95	95	95	95	95	95	95	95	95
	Aug	Person's r	0.036	-0.009	-0.081	-0.067	0.033	-0.035	-0.081	-0.076	-0.258	-0.251
		N	95	95	95	95	95	95	95	95	95	95
	Sep	Person's r	0.108	0.160	0.007	0.016	0.108	0.025	0.016	0.006	0.047	0.035
		N	95	95	95	95	95	95	95	95	95	95
	Oct	Person's r	-0.187	-0.140	0.024	-0.026	-0.187	0.137	0.222	0.202	0.105	0.121
		N	95	95	95	95	95	95	95	95	95	95
	Nov	Person's r	-0.458	-0.398	-0.073	-0.243	-0.462	0.432	0.478	0.478	0.175	0.248
		N	95	95	95	95	95	95	95	95	95	95
	Dec	Person's r	-0.474	-0.430	-0.019	-0.181	-0.476	0.378	0.479	0.470	0.161	0.229
		N	95	95	95	95	95	95	95	95	95	95
	Annual Mean	Person's r	-0.282	-0.229	-0.047	-0.072	-0.285	0.320	0.327	0.328	0.022	0.080
		N	95	95	95	95	95	95	95	95	95	95
	DJF	Person's r	-0.523	-0.449	0.043	-0.132	-0.522	0.427	0.580	0.561	0.202	0.272
		N	95	95	95	95	95	95	95	95	95	95
	MAM	Person's r	-0.115	-0.084	-0.074	0.124	-0.119	0.192	0.109	0.125	-0.103	-0.061
		N	95	95	95	95	95	95	95	95	95	95
	JJA	Person's r	0.081	0.060	-0.115	-0.080	0.076	0.063	-0.075	-0.053	-0.229	-0.202
		N	95	95	95	95	95	95	95	95	95	95
	SON	Person's r	-0.265	-0.190	-0.021	-0.125	-0.266	0.288	0.346	0.333	0.156	0.194
		N	95	95	95	95	95	95	95	95	95	95
Temperature HadCRUT3	Jan	Person's r	-0.558	-0.454	0.078	-0.123	-0.555	0.291	0.600	0.551	0.474	0.493
		N	95	95	95	95	95	95	95	95	95	95
	Feb	Person's r	-0.370	-0.290	-0.076	-0.121	-0.373	0.297	0.453	0.428	0.181	0.225
		N	95	95	95	95	95	95	95	95	95	95
	Mar	Person's r	-0.321	-0.209	-0.068	-0.115	-0.325	0.077	0.403	0.341	0.433	0.406
		N	95	95	95	95	95	95	95	95	95	95
	Apr	Person's r	-0.336	-0.214	-0.187	-0.009	-0.345	0.106	0.401	0.348	0.375	0.363
		N	95	95	95	95	95	95	95	95	95	95
	May	Person's r	-0.318	-0.278	-0.055	-0.122	-0.321	0.250	0.362	0.354	0.195	0.236
		N	95	95	95	95	95	95	95	95	95	95
	Jun	Person's r	-0.232	-0.192	-0.102	-0.260	-0.237	0.359	0.373	0.382	0.137	0.203
		N	95	95	95	95	95	95	95	95	95	95
	Jul	Person's r	-0.293	-0.296	-0.010	-0.270	-0.294	0.297	0.385	0.380	0.054	0.113
		N	95	95	95	95	95	95	95	95	95	95
	Aug	Person's r	-0.215	-0.174	-0.181	-0.206	-0.223	0.159	0.333	0.305	0.098	0.121
		N	95	95	95	95	95	95	95	95	95	95
	Sep	Person's r	-0.103	-0.002	-0.206	-0.144	-0.112	0.080	0.241	0.204	0.254	0.242
		N	95	95	95	95	95	95	95	95	95	95
	Oct	Person's r	-0.402	-0.279	-0.081	-0.134	-0.406	0.200	0.471	0.423	0.421	0.430
		N	95	95	95	95	95	95	95	95	95	95
	Nov	Person's r	-0.414	-0.352	-0.022	-0.294	-0.416	0.356	0.540	0.515	0.289	0.338
		N	95	95	95	95	95	95	95	95	95	95
	Dec	Person's r	-0.501	-0.411	-0.008	-0.110	-0.503	0.277	0.529	0.488	0.351	0.379
		N	95	95	95	95	95	95	95	95	95	95
	Annual Mean	Person's r	-0.455	-0.353	-0.102	-0.212	-0.460	0.310	0.570	0.529	0.365	0.397
		N	95	95	95	95	95	95	95	95	95	95
	DJF	Person's r	-0.545	-0.440	-0.006	-0.137	-0.546	0.334	0.606	0.563	0.380	0.415
		N	95	95	95	95	95	95	95	95	95	95
	MAM	Person's r	-0.380	-0.274	-0.118	-0.099	-0.386	0.170	0.455	0.407	0.390	0.391
		N	95	95	95	95	95	95	95	95	95	95
	JJA	Person's r	-0.295	-0.264	-0.111	-0.295	-0.300	0.334	0.435	0.428	0.116	0.177
		N	95	95	95	95	95	95	95	95	95	95
	SON	Person's r	-0.352	-0.240	-0.125	-0.224	-0.358	0.246	0.485	0.442	0.374	0.391
		N	95	95	95	95	95	95	95	95	95	95

A4 (Continued) Correlation matrix of Laguna Aculeo. 3-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
Precipitation HadCRUT3	Jan	Person's r	0.177	0.150	-0.002	0.223	0.177	-0.222	-0.273	-0.274	-0.308	-0.334
		N	95	95	95	95	95	95	95	95	95	95
	Feb	Person's r	0.113	0.118	-0.173	0.029	0.106	0.014	-0.085	-0.075	-0.156	-0.142
		N	95	95	95	95	95	95	95	95	95	95
	Mar	Person's r	0.054	0.112	0.136	0.084	0.060	-0.175	0.108	0.041	0.105	0.042
		N	95	95	95	95	95	95	95	95	95	95
	Apr	Person's r	0.068	0.101	0.130	0.038	0.073	-0.140	-0.052	-0.073	0.035	-0.004
		N	95	95	95	95	95	95	95	95	95	95
	May	Person's r	0.320	0.299	-0.139	0.083	0.314	-0.346	-0.281	-0.307	-0.197	-0.265
		N	95	95	95	95	95	95	95	95	95	95
	Jun	Person's r	0.419	0.372	-0.040	0.262	0.418	-0.344	-0.419	-0.417	-0.276	-0.332
		N	95	95	95	95	95	95	95	95	95	95
	Jul	Person's r	0.020	0.009	-0.009	-0.060	0.020	-0.130	0.077	0.034	0.104	0.064
		N	95	95	95	95	95	95	95	95	95	95
	Aug	Person's r	0.048	0.030	-0.261	-0.031	0.037	-0.135	-0.026	-0.053	-0.127	-0.153
		N	95	95	95	95	95	95	95	95	95	95
	Sep	Person's r	0.071	0.011	-0.145	-0.084	0.065	-0.140	-0.224	-0.210	-0.165	-0.180
		N	95	95	95	95	95	95	95	95	95	95
	Oct	Person's r	0.093	0.090	-0.143	0.025	0.087	0.010	-0.118	-0.095	-0.101	-0.083
		N	95	95	95	95	95	95	95	95	95	95
	Nov	Person's r	-0.083	-0.092	-0.028	-0.170	-0.084	0.001	0.025	0.029	0.096	0.100
		N	95	95	95	95	95	95	95	95	95	95
	Dec	Person's r	0.098	0.166	-0.050	0.161	0.096	-0.204	-0.007	-0.057	0.038	-0.020
		N	95	95	95	95	95	95	95	95	95	95
	Total annual	Person's r	0.380	0.339	-0.179	0.109	0.374	-0.459	-0.330	-0.371	-0.223	-0.314
		N	95	95	95	95	95	95	95	95	95	95
	DJF	Person's r	0.193	0.230	-0.112	0.219	0.189	-0.229	-0.160	-0.190	-0.176	-0.220
		N	95	95	95	95	95	95	95	95	95	95
	MAM	Person's r	0.311	0.304	-0.085	0.091	0.308	-0.362	-0.260	-0.294	-0.163	-0.238
		N	95	95	95	95	95	95	95	95	95	95
	JJA	Person's r	0.267	0.226	-0.131	0.099	0.262	-0.324	-0.201	-0.235	-0.144	-0.210
		N	95	95	95	95	95	95	95	95	95	95
	SON	Person's r	0.058	0.009	-0.179	-0.120	0.051	-0.100	-0.206	-0.185	-0.127	-0.129
		N	95	95	95	95	95	95	95	95	95	95
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	95	95	95	95	95	95	95	95	95	95
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	95	95	95	95	95	95	95	95	95	95
	Mar	Person's r	-0.052	-0.013	0.383	0.319	-0.036	-0.049	0.067	0.038	0.143	0.111
		N	95	95	95	95	95	95	95	95	95	95
	Apr	Person's r	-0.042	-0.001	0.036	0.004	-0.040	0.042	0.080	0.070	0.067	0.063
		N	95	95	95	95	95	95	95	95	95	95
	May	Person's r	0.101	0.108	-0.059	-0.017	0.099	-0.019	-0.059	-0.056	-0.141	-0.141
		N	95	95	95	95	95	95	95	95	95	95
	Jun	Person's r	0.331	0.284	-0.040	0.194	0.330	-0.281	-0.310	-0.309	-0.224	-0.264
		N	95	95	95	95	95	95	95	95	95	95
	Jul	Person's r	-0.071	-0.048	0.083	-0.005	-0.067	-0.092	0.139	0.095	0.185	0.147
		N	95	95	95	95	95	95	95	95	95	95
	Aug	Person's r	-0.015	-0.019	-0.263	-0.106	-0.026	-0.110	0.043	0.006	-0.130	-0.153
		N	95	95	95	95	95	95	95	95	95	95
	Sep	Person's r	0.019	-0.004	0.017	0.027	0.020	-0.081	-0.075	-0.078	-0.138	-0.149
		N	95	95	95	95	95	95	95	95	95	95
	Oct	Person's r	-0.085	-0.107	-0.111	-0.060	-0.089	0.105	0.100	0.104	-0.096	-0.062
		N	95	95	95	95	95	95	95	95	95	95
	Nov	Person's r	-0.178	-0.199	-0.008	-0.105	-0.179	0.061	0.120	0.120	0.045	0.067
		N	95	95	95	95	95	95	95	95	95	95
	Dec	Person's r	-0.090	-0.044	-0.056	0.137	-0.093	0.063	0.157	0.143	0.134	0.135
		N	95	95	95	95	95	95	95	95	95	95
	Total annual	Person's r	0.112	0.102	-0.078	0.046	0.109	-0.206	-0.053	-0.088	-0.120	-0.162
		N	95	95	95	95	95	95	95	95	95	95
	DJF	Person's r	-0.090	-0.044	-0.056	0.137	-0.093	0.063	0.157	0.143	0.134	0.135
		N	95	95	95	95	95	95	95	95	95	95
	MAM	Person's r	0.079	0.099	-0.017	0.009	0.078	-0.010	-0.028	-0.031	-0.102	-0.106
		N	95	95	95	95	95	95	95	95	95	95
	JJA	Person's r	0.138	0.124	-0.081	0.063	0.135	-0.268	-0.070	-0.113	-0.064	-0.121
		N	95	95	95	95	95	95	95	95	95	95
	SON	Person's r	-0.096	-0.133	-0.032	-0.046	-0.097	-0.004	0.026	0.024	-0.139	-0.126
		N	95	95	95	95	95	95	95	95	95	95

A4 (Continued) Correlation matrix of Laguna Aculeo. 3-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
SOI	Jan	Person's r	0.142	0.057	-0.170	-0.101	0.136	-0.049	-0.168	-0.142	-0.261	-0.248
		N	95	95	95	95	95	95	95	95	95	95
	Feb	Person's r	0.004	-0.034	-0.089	-0.159	0.001	0.123	-0.096	-0.046	-0.152	-0.105
		N	95	95	95	95	95	95	95	95	95	95
	Mar	Person's r	0.032	0.027	0.012	0.041	0.033	0.188	-0.101	-0.038	-0.097	-0.038
		N	95	95	95	95	95	95	95	95	95	95
	Apr	Person's r	0.054	-0.001	0.028	0.119	0.055	0.008	-0.027	-0.015	-0.112	-0.100
		N	95	95	95	95	95	95	95	95	95	95
	May	Person's r	0.076	-0.050	0.051	-0.011	0.078	-0.088	-0.136	-0.122	-0.146	-0.147
		N	95	95	95	95	95	95	95	95	95	95
	Jun	Person's r	0.109	0.019	-0.021	-0.080	0.109	-0.041	-0.197	-0.164	-0.211	-0.199
		N	95	95	95	95	95	95	95	95	95	95
	Jul	Person's r	0.238	0.126	-0.158	-0.251	0.232	-0.039	-0.279	-0.234	-0.388	-0.363
		N	95	95	95	95	95	95	95	95	95	95
	Aug	Person's r	-0.027	-0.124	-0.236	-0.399	-0.037	0.180	-0.006	0.042	-0.182	-0.118
		N	95	95	95	95	95	95	95	95	95	95
	Sep	Person's r	0.118	-0.046	-0.200	-0.244	0.111	0.088	-0.209	-0.143	-0.351	-0.289
		N	95	95	95	95	95	95	95	95	95	95
	Oct	Person's r	-0.041	-0.151	-0.155	-0.239	-0.047	0.226	-0.085	-0.012	-0.310	-0.223
		N	95	95	95	95	95	95	95	95	95	95
	Nov	Person's r	-0.066	-0.111	0.047	-0.234	-0.064	0.209	-0.047	0.018	-0.225	-0.145
		N	95	95	95	95	95	95	95	95	95	95
	Dec	Person's r	0.133	0.065	0.052	-0.125	0.135	-0.040	-0.236	-0.197	-0.243	-0.229
		N	95	95	95	95	95	95	95	95	95	95
	Annual mean	Person's r	0.073	-0.022	-0.060	-0.131	0.070	0.058	-0.134	-0.090	-0.213	-0.178
		N	95	95	95	95	95	95	95	95	95	95
	DJF	Person's r	0.115	0.041	-0.072	-0.089	0.113	0.013	-0.212	-0.164	-0.279	-0.248
		N	95	95	95	95	95	95	95	95	95	95
	MAM	Person's r	0.098	-0.005	-0.074	-0.003	0.095	0.054	-0.163	-0.114	-0.232	-0.195
		N	95	95	95	95	95	95	95	95	95	95
	JJA	Person's r	0.133	0.010	-0.155	-0.242	0.127	0.034	-0.194	-0.146	-0.284	-0.250
		N	95	95	95	95	95	95	95	95	95	95
	SON	Person's r	-0.031	-0.119	-0.054	-0.220	-0.033	0.180	-0.069	-0.009	-0.201	-0.131
		N	95	95	95	95	95	95	95	95	95	95
El Niño 3		Person's r	0.401	0.375	-0.167	-0.120	0.395	-0.270	-0.464	-0.437	-0.491	-0.511
		N	78	78	78	78	78	78	78	78	78	78
SAB		Person's r	-0.147	-0.132	0.012	0.176	-0.147	0.189	0.112	0.132	0.020	0.063
		N	74	74	74	74	74	74	74	74	74	74

A4 (Continued) Correlation matrix of Laguna Aculeo. 3-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	0.216	-0.093	-0.159	0.153	0.115	0.172	0.207	0.172	0.121	0.207	0.181	0.248	-0.001	-0.306
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Feb	Person's r	0.011	-0.246	-0.120	0.102	0.117	0.135	0.112	-0.020	-0.133	0.112	0.017	0.190	-0.236	-0.297
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Mar	Person's r	-0.144	-0.089	0.081	-0.088	-0.080	-0.061	-0.070	-0.158	-0.226	-0.070	-0.140	-0.006	-0.138	-0.107
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Apr	Person's r	-0.240	0.319	0.314	-0.353	-0.367	-0.352	-0.333	-0.272	-0.184	-0.333	-0.300	-0.329	0.148	0.255
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	May	Person's r	-0.086	0.037	0.109	-0.120	-0.136	-0.106	-0.083	-0.069	-0.075	-0.083	-0.082	-0.070	0.075	0.010
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Jun	Person's r	-0.048	-0.039	0.035	-0.015	0.003	0.005	-0.014	-0.072	-0.090	-0.014	-0.053	0.020	-0.126	-0.042
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Jul	Person's r	-0.054	0.009	0.045	-0.049	-0.043	-0.035	-0.041	-0.047	-0.038	-0.041	-0.045	-0.037	-0.016	0.025
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Aug	Person's r	-0.057	0.009	0.043	-0.066	-0.091	-0.073	-0.045	0.003	0.013	-0.045	-0.017	-0.062	0.130	0.040
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Sep	Person's r	-0.190	0.116	0.242	-0.217	-0.212	-0.191	-0.183	-0.208	-0.205	-0.183	-0.209	-0.138	-0.017	0.085
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Oct	Person's r	0.156	-0.058	-0.093	0.112	0.077	0.125	0.161	0.159	0.140	0.161	0.160	0.177	0.044	-0.176
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Nov	Person's r	0.154	-0.219	-0.226	0.184	0.169	0.203	0.202	0.116	0.024	0.202	0.141	0.249	-0.128	-0.352
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Dec	Person's r	0.309	-0.093	-0.221	0.209	0.142	0.220	0.281	0.286	0.244	0.281	0.283	0.300	0.102	-0.348
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Annual Mean	Person's r	0.015	-0.063	-0.007	-0.006	-0.027	0.022	0.042	-0.005	-0.051	0.042	0.003	0.093	-0.032	-0.186
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	DJF	Person's r	0.215	-0.168	-0.198	0.184	0.147	0.208	0.238	0.177	0.097	0.238	0.193	0.291	-0.047	-0.374
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	MAM	Person's r	-0.196	0.093	0.205	-0.227	-0.236	-0.208	-0.194	-0.206	-0.208	-0.194	-0.214	-0.156	0.026	0.048
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	JJA	Person's r	-0.076	-0.015	0.058	-0.058	-0.056	-0.044	-0.045	-0.061	-0.063	-0.045	-0.058	-0.032	-0.024	0.004
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	SON	Person's r	0.064	-0.084	-0.047	0.047	0.025	0.073	0.093	0.038	-0.014	0.093	0.051	0.144	-0.050	-0.218
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
Temperature HadCRUT3	Jan	Person's r	0.291	-0.298	-0.313	0.307	0.268	0.321	0.355	0.282	0.158	0.355	0.301	0.402	-0.063	-0.477
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Feb	Person's r	0.152	-0.231	-0.192	0.182	0.165	0.211	0.217	0.125	0.036	0.217	0.152	0.278	-0.132	-0.361
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Mar	Person's r	0.052	-0.279	-0.153	0.156	0.168	0.177	0.163	0.038	-0.092	0.163	0.071	0.226	-0.220	-0.308
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Apr	Person's r	0.052	-0.118	-0.074	0.058	0.054	0.085	0.084	-0.013	-0.095	0.084	0.011	0.146	-0.152	-0.266
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	May	Person's r	0.130	-0.127	-0.110	0.113	0.088	0.129	0.158	0.118	0.041	0.158	0.124	0.192	-0.016	-0.255
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Jun	Person's r	0.049	-0.262	-0.131	0.143	0.172	0.184	0.148	-0.010	-0.132	0.148	0.037	0.232	-0.310	-0.330
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Jul	Person's r	0.055	-0.164	-0.092	0.083	0.090	0.116	0.107	0.015	-0.068	0.107	0.040	0.167	-0.159	-0.257
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Aug	Person's r	0.116	-0.205	-0.150	0.154	0.148	0.178	0.181	0.106	0.026	0.181	0.128	0.225	-0.116	-0.279
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Sep	Person's r	0.084	0.045	0.030	0.004	-0.025	0.025	0.064	0.042	0.019	0.064	0.043	0.104	0.021	-0.135
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Oct	Person's r	0.370	-0.109	-0.245	0.276	0.216	0.290	0.351	0.334	0.275	0.351	0.339	0.376	0.062	-0.382
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Nov	Person's r	0.168	-0.368	-0.269	0.275	0.285	0.309	0.288	0.137	-0.007	0.288	0.183	0.364	-0.269	-0.448
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Dec	Person's r	0.253	-0.135	-0.202	0.190	0.135	0.204	0.258	0.227	0.151	0.258	0.231	0.295	0.042	-0.374
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Annual Mean	Person's r	0.193	-0.255	-0.211	0.215	0.196	0.247	0.262	0.151	0.028	0.262	0.180	0.334	-0.152	-0.433
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	DJF	Person's r	0.264	-0.258	-0.271	0.261	0.219	0.283	0.318	0.240	0.128	0.318	0.260	0.374	-0.065	-0.466
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	MAM	Person's r	0.092	-0.207	-0.133	0.130	0.123	0.154	0.160	0.058	-0.055	0.160	0.082	0.222	-0.151	-0.324
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	JJA	Person's r	0.084	-0.253	-0.147	0.150	0.163	0.190	0.171	0.038	-0.077	0.171	0.076	0.248	-0.242	-0.346
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	SON	Person's r	0.236	-0.164	-0.182	0.210	0.179	0.237	0.268	0.193	0.106	0.268	0.214	0.323	-0.073	-0.371
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95

A4 (Continued) Correlation matrix of Laguna Aculeo. 3-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation HadCRUT3	Jan	Person's r	-0.130	0.086	0.082	-0.106	-0.083	-0.112	-0.144	-0.144	-0.100	-0.144	-0.140	-0.157	-0.042	0.150
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Feb	Person's r	-0.003	0.437	0.259	-0.246	-0.303	-0.250	-0.176	-0.039	0.092	-0.176	-0.085	-0.202	0.331	0.232
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Mar	Person's r	-0.094	-0.041	0.077	-0.063	-0.059	-0.054	-0.048	-0.057	-0.080	-0.048	-0.060	-0.026	-0.002	0.015
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Apr	Person's r	-0.181	-0.022	0.124	-0.132	-0.118	-0.120	-0.132	-0.180	-0.210	-0.132	-0.173	-0.101	-0.089	0.020
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	May	Person's r	-0.262	-0.027	0.182	-0.155	-0.120	-0.155	-0.176	-0.193	-0.214	-0.176	-0.195	-0.172	-0.053	0.184
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Jun	Person's r	-0.297	0.223	0.305	-0.293	-0.257	-0.299	-0.327	-0.285	-0.205	-0.327	-0.299	-0.350	0.025	0.375
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Jul	Person's r	0.063	-0.145	-0.095	0.127	0.150	0.142	0.118	0.054	0.012	0.118	0.078	0.137	-0.152	-0.117
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Aug	Person's r	-0.030	0.099	0.073	-0.067	-0.061	-0.057	-0.067	-0.080	-0.047	-0.067	-0.074	-0.058	-0.041	0.044
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Sep	Person's r	0.083	0.055	-0.077	0.051	0.032	0.021	0.035	0.108	0.153	0.035	0.090	-0.023	0.139	0.067
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Oct	Person's r	0.173	0.339	0.085	-0.055	-0.122	-0.071	0.005	0.163	0.287	0.005	0.118	-0.054	0.370	0.151
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Nov	Person's r	0.198	-0.081	-0.164	0.184	0.162	0.178	0.198	0.207	0.185	0.198	0.208	0.176	0.043	-0.137
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Dec	Person's r	-0.187	0.007	0.146	-0.137	-0.112	-0.123	-0.143	-0.179	-0.184	-0.143	-0.172	-0.117	-0.083	0.092
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Total annual	Person's r	-0.226	0.078	0.207	-0.174	-0.137	-0.170	-0.198	-0.203	-0.176	-0.198	-0.202	-0.203	-0.053	0.229
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	DJF	Person's r	-0.185	0.235	0.249	-0.248	-0.246	-0.242	-0.237	-0.201	-0.128	-0.237	-0.215	-0.236	0.071	0.230
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	MAM	Person's r	-0.289	-0.033	0.200	-0.178	-0.141	-0.174	-0.195	-0.223	-0.251	-0.195	-0.223	-0.182	-0.070	0.174
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	JJA	Person's r	-0.142	0.079	0.144	-0.116	-0.080	-0.107	-0.141	-0.160	-0.127	-0.141	-0.151	-0.139	-0.092	0.159
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	SON	Person's r	0.212	0.149	-0.087	0.089	0.038	0.057	0.107	0.231	0.306	0.107	0.199	0.030	0.273	0.058
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Mar	Person's r	-0.005	-0.117	-0.062	0.048	0.045	0.042	0.044	0.042	0.014	0.044	0.041	0.048	-0.002	-0.056
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Apr	Person's r	-0.150	-0.087	0.062	-0.081	-0.069	-0.069	-0.080	-0.135	-0.183	-0.080	-0.126	-0.041	-0.093	-0.042
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	May	Person's r	-0.163	-0.131	0.068	-0.042	-0.016	-0.033	-0.051	-0.097	-0.148	-0.051	-0.087	-0.030	-0.088	0.027
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Jun	Person's r	-0.219	0.101	0.192	-0.167	-0.120	-0.172	-0.211	-0.201	-0.166	-0.211	-0.204	-0.231	-0.037	0.274
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Jul	Person's r	0.113	-0.149	-0.137	0.152	0.156	0.162	0.154	0.106	0.059	0.154	0.124	0.169	-0.098	-0.169
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Aug	Person's r	0.025	0.106	0.041	-0.042	-0.056	-0.036	-0.025	-0.013	0.022	-0.025	-0.015	-0.022	0.038	0.009
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Sep	Person's r	-0.020	-0.038	-0.043	0.009	0.007	-0.006	-0.009	0.010	0.008	-0.009	0.004	-0.023	0.036	0.012
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Oct	Person's r	0.299	0.197	-0.063	0.100	0.029	0.087	0.164	0.289	0.369	0.164	0.255	0.113	0.309	-0.013
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Nov	Person's r	0.256	-0.037	-0.166	0.185	0.141	0.181	0.224	0.267	0.265	0.224	0.257	0.197	0.128	-0.155
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Dec	Person's r	-0.134	0.060	0.114	-0.134	-0.107	-0.117	-0.146	-0.196	-0.199	-0.146	-0.184	-0.111	-0.118	0.047
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Total annual	Person's r	-0.067	-0.052	0.032	-0.010	0.009	-0.004	-0.021	-0.042	-0.058	-0.020	-0.035	-0.017	-0.052	0.030
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	DJF	Person's r	-0.134	0.060	0.114	-0.134	-0.107	-0.117	-0.146	-0.196	-0.199	-0.146	-0.184	-0.111	-0.118	0.047
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	MAM	Person's r	-0.191	-0.154	0.075	-0.057	-0.030	-0.046	-0.066	-0.123	-0.185	-0.066	-0.112	-0.035	-0.107	0.010
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	JJA	Person's r	-0.042	0.006	0.039	-0.015	0.008	-0.009	-0.032	-0.053	-0.048	-0.032	-0.043	-0.033	-0.069	0.052
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	SON	Person's r	0.212	0.026	-0.136	0.129	0.080	0.109	0.155	0.240	0.267	0.155	0.217	0.111	0.208	-0.064
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95

A4 (Continued) Correlation matrix of Laguna Aculeo. 3-year filtered data

			Grain size												
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
SOI	Jan	Person's r	0.088	0.055	-0.020	0.032	0.007	0.024	0.048	0.109	0.155	0.048	0.094	0.017	0.131	0.028
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Feb	Person's r	0.186	0.032	-0.118	0.111	0.073	0.096	0.129	0.191	0.225	0.129	0.177	0.093	0.142	-0.059
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Mar	Person's r	0.040	0.044	-0.010	0.006	0.000	0.006	0.006	0.024	0.052	0.006	0.022	-0.001	0.025	0.006
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Apr	Person's r	-0.042	0.034	0.064	-0.062	-0.066	-0.054	-0.049	-0.035	-0.021	-0.049	-0.041	-0.044	0.034	0.031
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	May	Person's r	0.043	0.095	0.013	-0.017	-0.032	-0.026	-0.013	0.043	0.091	-0.013	0.028	-0.042	0.106	0.065
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Jun	Person's r	-0.078	0.070	0.085	-0.086	-0.091	-0.098	-0.090	-0.047	-0.013	-0.090	-0.062	-0.112	0.082	0.126
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Jul	Person's r	-0.130	-0.001	0.071	-0.077	-0.063	-0.086	-0.098	-0.073	-0.052	-0.099	-0.081	-0.119	0.025	0.141
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Aug	Person's r	0.099	-0.044	-0.093	0.089	0.084	0.089	0.091	0.091	0.084	0.091	0.094	0.084	-0.005	-0.082
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Sep	Person's r	0.039	0.083	-0.015	0.009	0.012	-0.005	-0.010	0.036	0.080	-0.010	0.028	-0.050	0.061	0.100
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Oct	Person's r	0.104	-0.144	-0.190	0.169	0.177	0.158	0.137	0.122	0.096	0.137	0.134	0.112	-0.049	-0.095
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Nov	Person's r	0.179	-0.179	-0.261	0.246	0.252	0.234	0.211	0.189	0.156	0.211	0.205	0.187	-0.069	-0.153
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Dec	Person's r	-0.031	-0.011	-0.023	0.000	0.008	-0.015	-0.028	-0.007	0.010	-0.028	-0.011	-0.052	0.012	0.060
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	Annual mean	Person's r	0.022	0.005	-0.034	0.017	0.012	0.007	0.007	0.037	0.056	0.007	0.030	-0.012	0.047	0.021
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	DJF	Person's r	0.039	0.062	-0.017	-0.003	-0.020	-0.017	-0.006	0.052	0.098	-0.006	0.037	-0.038	0.109	0.053
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	MAM	Person's r	-0.002	0.099	0.056	-0.054	-0.062	-0.054	-0.047	-0.008	0.040	-0.047	-0.018	-0.065	0.072	0.076
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	JJA	Person's r	-0.097	0.030	0.075	-0.077	-0.069	-0.083	-0.089	-0.066	-0.046	-0.089	-0.074	-0.106	0.029	0.114
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
	SON	Person's r	0.110	-0.101	-0.168	0.148	0.154	0.136	0.119	0.115	0.100	0.119	0.122	0.098	-0.032	-0.076
		N	95	95	95	95	95	95	95	95	95	95	95	95	95	95
El Niño 3		Person's r	-0.209	0.261	0.259	-0.258	-0.245	-0.268	-0.273	-0.195	-0.090	-0.273	-0.218	-0.312	0.110	0.355
		N	78	78	78	78	78	78	78	78	78	78	78	78	78	78
SAB		Person's r	0.191	0.103	-0.053	0.054	-0.014	0.043	0.112	0.211	0.260	0.112	0.182	0.076	0.257	-0.043
		N	74	74	74	74	74	74	74	74	74	74	74	74	74	74

A5 Correlation matrix of Laguna Aculeo. 5-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
Temperature CRU TS 2.1	Jan	Person's r	0.685	0.732	-0.230	0.317	0.447	0.414	-0.001	-0.589	0.707
		N	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.742	0.738	-0.269	0.400	0.555	0.489	-0.178	-0.517	0.562
		N	94	94	94	94	94	94	94	94	94
	Mar	Person's r	0.707	0.641	-0.035	0.469	0.489	0.431	-0.343	-0.261	0.343
		N	94	94	94	94	94	94	94	94	94
	Apr	Person's r	0.343	0.252	0.329	0.447	0.403	0.199	-0.380	0.197	0.006
		N	94	94	94	94	94	94	94	94	94
	May	Person's r	0.317	0.333	0.108	0.216	0.475	0.196	-0.007	-0.192	0.320
		N	94	94	94	94	94	94	94	94	94
	Jun	Person's r	0.171	0.160	0.257	0.071	0.184	-0.017	0.063	0.052	0.103
		N	94	94	94	94	94	94	94	94	94
	Jul	Person's r	0.225	0.171	0.038	0.325	0.339	0.021	-0.330	0.005	0.085
		N	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.341	0.252	0.186	0.396	0.399	0.189	-0.418	0.047	0.053
		N	94	94	94	94	94	94	94	94	94
	Sep	Person's r	0.378	0.339	0.119	0.278	0.414	-0.008	-0.278	0.027	0.141
		N	94	94	94	94	94	94	94	94	94
	Oct	Person's r	0.554	0.520	-0.078	0.362	0.487	0.228	-0.326	-0.212	0.324
		N	94	94	94	94	94	94	94	94	94
	Nov	Person's r	0.706	0.730	-0.287	0.354	0.487	0.686	-0.103	-0.519	0.586
		N	94	94	94	94	94	94	94	94	94
	Dec	Person's r	0.730	0.769	-0.197	0.287	0.621	0.437	-0.187	-0.537	0.668
		N	94	94	94	94	94	94	94	94	94
	Annual Mean	Person's r	0.767	0.739	-0.029	0.492	0.679	0.428	-0.301	-0.347	0.523
		N	94	94	94	94	94	94	94	94	94
	DJF	Person's r	0.809	0.840	-0.261	0.375	0.611	0.503	-0.141	-0.615	0.725
		N	94	94	94	94	94	94	94	94	94
	MAM	Person's r	0.594	0.539	0.147	0.473	0.584	0.359	-0.296	-0.142	0.308
		N	94	94	94	94	94	94	94	94	94
	JJA	Person's r	0.348	0.279	0.241	0.363	0.434	0.079	-0.300	0.051	0.122
		N	94	94	94	94	94	94	94	94	94
	SON	Person's r	0.730	0.710	-0.119	0.440	0.613	0.418	-0.306	-0.325	0.475
		N	94	94	94	94	94	94	94	94	94
Temperature HadCRUT3	Jan	Person's r	0.697	0.734	-0.534	0.242	0.398	0.539	-0.080	-0.627	0.611
		N	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.746	0.718	-0.203	0.458	0.529	0.387	-0.317	-0.486	0.594
		N	94	94	94	94	94	94	94	94	94
	Mar	Person's r	0.527	0.524	-0.507	0.183	0.173	0.402	-0.228	-0.417	0.312
		N	94	94	94	94	94	94	94	94	94
	Apr	Person's r	0.511	0.484	-0.337	0.320	0.164	0.378	-0.212	-0.372	0.379
		N	94	94	94	94	94	94	94	94	94
	May	Person's r	0.474	0.492	-0.224	0.215	0.413	0.268	-0.112	-0.399	0.460
		N	94	94	94	94	94	94	94	94	94
	Jun	Person's r	0.549	0.549	-0.186	0.300	0.439	0.296	-0.085	-0.410	0.478
		N	94	94	94	94	94	94	94	94	94
	Jul	Person's r	0.540	0.559	-0.404	0.257	0.501	0.273	-0.116	-0.434	0.458
		N	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.558	0.541	-0.288	0.315	0.426	0.279	-0.276	-0.386	0.383
		N	94	94	94	94	94	94	94	94	94
	Sep	Person's r	0.440	0.427	-0.171	0.247	0.328	0.149	-0.224	-0.179	0.251
		N	94	94	94	94	94	94	94	94	94
	Oct	Person's r	0.514	0.547	-0.306	0.165	0.311	0.244	-0.143	-0.429	0.477
		N	94	94	94	94	94	94	94	94	94
	Nov	Person's r	0.679	0.716	-0.469	0.250	0.496	0.516	-0.102	-0.602	0.545
		N	94	94	94	94	94	94	94	94	94
	Dec	Person's r	0.700	0.708	-0.366	0.390	0.451	0.516	-0.275	-0.515	0.577
		N	94	94	94	94	94	94	94	94	94
	Annual Mean	Person's r	0.728	0.734	-0.416	0.352	0.484	0.447	-0.227	-0.551	0.581
		N	94	94	94	94	94	94	94	94	94
	DJF	Person's r	0.798	0.803	-0.402	0.409	0.516	0.531	-0.254	-0.603	0.662
		N	94	94	94	94	94	94	94	94	94
	MAM	Person's r	0.575	0.570	-0.408	0.270	0.287	0.398	-0.210	-0.452	0.437
		N	94	94	94	94	94	94	94	94	94
	JJA	Person's r	0.632	0.634	-0.332	0.333	0.526	0.326	-0.170	-0.475	0.514
		N	94	94	94	94	94	94	94	94	94
	SON	Person's r	0.623	0.644	-0.358	0.255	0.434	0.345	-0.182	-0.457	0.482
		N	94	94	94	94	94	94	94	94	94

A5 (Continued) Correlation matrix of Laguna Aculeo. 5-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
Precipitation HadCRUT3	Jan	Person's r	-0.089	-0.186	0.485	0.188	-0.131	-0.126	-0.187	0.265	-0.217
		N	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.053	0.034	0.207	0.238	0.126	-0.138	-0.193	0.131	0.025
		N	94	94	94	94	94	94	94	94	94
	Mar	Person's r	0.407	0.324	-0.254	0.378	0.209	0.339	-0.298	-0.108	-0.038
		N	94	94	94	94	94	94	94	94	94
	Apr	Person's r	0.210	0.144	0.198	0.137	0.230	0.013	-0.232	0.133	-0.041
		N	94	94	94	94	94	94	94	94	94
	May	Person's r	-0.160	-0.256	0.178	0.082	-0.033	-0.281	-0.272	0.274	-0.353
		N	94	94	94	94	94	94	94	94	94
	Jun	Person's r	-0.435	-0.508	0.221	-0.105	-0.276	-0.433	-0.007	0.551	-0.605
		N	94	94	94	94	94	94	94	94	94
	Jul	Person's r	0.018	-0.043	-0.197	0.200	-0.088	-0.095	-0.218	-0.048	-0.014
		N	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.071	-0.013	0.151	0.388	0.018	0.107	-0.167	0.081	-0.037
		N	94	94	94	94	94	94	94	94	94
	Sep	Person's r	-0.253	-0.280	0.096	-0.073	-0.135	-0.062	-0.151	0.304	-0.252
		N	94	94	94	94	94	94	94	94	94
	Oct	Person's r	-0.275	-0.234	0.244	-0.113	-0.127	-0.258	0.184	0.145	-0.036
		N	94	94	94	94	94	94	94	94	94
	Nov	Person's r	-0.076	-0.082	-0.035	-0.001	-0.083	-0.037	-0.020	-0.034	0.089
		N	94	94	94	94	94	94	94	94	94
	Dec	Person's r	0.114	0.007	-0.018	0.395	-0.093	0.258	-0.226	0.018	-0.133
		N	94	94	94	94	94	94	94	94	94
	Total annual	Person's r	-0.239	-0.384	0.187	0.232	-0.160	-0.335	-0.343	0.424	-0.475
		N	94	94	94	94	94	94	94	94	94
	DJF	Person's r	0.056	-0.068	0.308	0.452	-0.066	0.048	-0.321	0.194	-0.177
		N	94	94	94	94	94	94	94	94	94
	MAM	Person's r	-0.071	-0.179	0.187	0.133	0.035	-0.229	-0.321	0.272	-0.335
		N	94	94	94	94	94	94	94	94	94
	JJA	Person's r	-0.199	-0.309	0.061	0.219	-0.198	-0.252	-0.203	0.305	-0.354
		N	94	94	94	94	94	94	94	94	94
	SON	Person's r	-0.326	-0.331	0.153	-0.099	-0.184	-0.166	-0.041	0.262	-0.158
		N	94	94	94	94	94	94	94	94	94
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	94	94	94	94	94	94	94	94	94
	Mar	Person's r	0.288	0.254	-0.116	0.135	0.135	0.079	-0.217	-0.091	0.064
		N	94	94	94	94	94	94	94	94	94
	Apr	Person's r	0.305	0.266	0.094	0.223	0.368	0.090	-0.250	-0.042	0.213
		N	94	94	94	94	94	94	94	94	94
	May	Person's r	0.103	0.097	0.096	-0.025	0.288	-0.099	-0.008	-0.022	0.063
		N	94	94	94	94	94	94	94	94	94
	Jun	Person's r	-0.471	-0.484	0.182	-0.293	-0.258	-0.391	0.217	0.351	-0.511
		N	94	94	94	94	94	94	94	94	94
	Jul	Person's r	0.127	0.085	-0.185	0.166	-0.088	-0.022	-0.148	-0.147	0.125
		N	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.212	0.134	0.112	0.456	0.138	0.171	-0.228	-0.018	0.076
		N	94	94	94	94	94	94	94	94	94
	Sep	Person's r	0.022	-0.018	0.170	0.037	0.114	-0.168	-0.199	0.066	0.009
		N	94	94	94	94	94	94	94	94	94
	Oct	Person's r	0.048	0.076	0.087	0.098	0.053	-0.002	0.093	-0.161	0.180
		N	94	94	94	94	94	94	94	94	94
	Nov	Person's r	0.033	0.036	-0.056	0.087	0.031	-0.022	0.001	-0.170	0.235
		N	94	94	94	94	94	94	94	94	94
	Dec	Person's r	0.159	0.103	-0.108	0.324	-0.077	0.334	-0.088	-0.114	0.062
		N	94	94	94	94	94	94	94	94	94
	Total annual	Person's r	0.037	-0.035	0.116	0.174	0.095	-0.183	-0.137	0.036	-0.035
		N	94	94	94	94	94	94	94	94	94
	DJF	Person's r	0.159	0.103	-0.108	0.324	-0.077	0.334	-0.088	-0.114	0.062
		N	94	94	94	94	94	94	94	94	94
	MAM	Person's r	0.194	0.176	0.104	0.045	0.368	-0.061	-0.088	-0.037	0.118
		N	94	94	94	94	94	94	94	94	94
	JJA	Person's r	-0.102	-0.176	0.042	0.149	-0.151	-0.172	-0.075	0.108	-0.193
		N	94	94	94	94	94	94	94	94	94
	SON	Person's r	0.052	0.029	0.152	0.108	0.132	-0.155	-0.136	-0.082	0.183
		N	94	94	94	94	94	94	94	94	94

A5 (Continued) Correlation matrix of Laguna Aculeo. 5-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
SOI	Jan	Person's r	-0.177	-0.207	0.317	0.024	0.058	-0.120	0.049	0.159	-0.140
		N	94	94	94	94	94	94	94	94	94
	Feb	Person's r	-0.265	-0.219	0.198	-0.168	-0.003	-0.117	0.240	0.098	0.010
		N	94	94	94	94	94	94	94	94	94
	Mar	Person's r	-0.239	-0.173	0.143	-0.228	-0.069	-0.121	0.346	0.045	0.018
		N	94	94	94	94	94	94	94	94	94
	Apr	Person's r	0.042	0.022	0.059	0.082	0.054	0.100	0.091	-0.035	0.004
		N	94	94	94	94	94	94	94	94	94
	May	Person's r	-0.278	-0.297	0.123	-0.007	-0.220	-0.022	0.114	0.176	-0.194
		N	94	94	94	94	94	94	94	94	94
	Jun	Person's r	-0.308	-0.290	0.196	-0.174	-0.088	-0.078	0.129	0.179	-0.180
		N	94	94	94	94	94	94	94	94	94
	Jul	Person's r	-0.240	-0.255	0.222	-0.031	0.089	-0.032	0.005	0.244	-0.197
		N	94	94	94	94	94	94	94	94	94
	Aug	Person's r	-0.129	-0.051	-0.110	-0.202	0.087	0.134	0.314	-0.049	0.062
		N	94	94	94	94	94	94	94	94	94
	Sep	Person's r	-0.414	-0.346	0.157	-0.346	-0.124	-0.206	0.349	0.173	-0.158
		N	94	94	94	94	94	94	94	94	94
	Oct	Person's r	-0.157	-0.087	0.141	-0.244	0.070	0.009	0.338	-0.053	0.109
		N	94	94	94	94	94	94	94	94	94
	Nov	Person's r	-0.289	-0.166	0.057	-0.504	-0.105	-0.152	0.482	-0.066	0.037
		N	94	94	94	94	94	94	94	94	94
	Dec	Person's r	-0.344	-0.323	0.245	-0.235	-0.126	-0.108	0.185	0.236	-0.212
		N	94	94	94	94	94	94	94	94	94
	Annual mean	Person's r	-0.294	-0.244	0.174	-0.231	-0.047	-0.083	0.281	0.107	-0.074
		N	94	94	94	94	94	94	94	94	94
	DJF	Person's r	-0.327	-0.316	0.336	-0.131	-0.018	-0.160	0.156	0.235	-0.154
		N	94	94	94	94	94	94	94	94	94
	MAM	Person's r	-0.191	-0.178	0.171	-0.095	-0.048	-0.044	0.221	0.120	-0.099
		N	94	94	94	94	94	94	94	94	94
	JJA	Person's r	-0.242	-0.214	0.099	-0.150	0.021	0.027	0.166	0.127	-0.114
		N	94	94	94	94	94	94	94	94	94
	SON	Person's r	-0.292	-0.192	0.108	-0.412	-0.056	-0.109	0.417	-0.004	0.021
		N	94	94	94	94	94	94	94	94	94
El Niño 3		Person's r	-0.455	-0.508	0.412	-0.040	-0.126	-0.369	-0.096	0.564	-0.466
		N	77	77	77	77	77	77	77	77	77
SAB		Person's r	0.190	0.190	0.194	0.217	0.166	0.000	-0.051	-0.124	0.328
		N	73	73	73	73	73	73	73	73	73

A5 (Continued) Correlation matrix of Laguna Aculeo. 5-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
Temperature CRU TS 2.1	Jan	Person's r	-0.586	-0.480	0.125	0.041	-0.583	0.516	0.634	0.623	0.318	0.399
		N	94	94	94	94	94	94	94	94	94	94
	Feb	Person's r	-0.391	-0.327	-0.020	-0.244	-0.393	0.340	0.513	0.484	0.128	0.178
		N	94	94	94	94	94	94	94	94	94	94
	Mar	Person's r	-0.243	-0.121	-0.046	0.150	-0.245	0.150	0.298	0.264	0.207	0.205
		N	94	94	94	94	94	94	94	94	94	94
	Apr	Person's r	0.125	0.147	-0.053	0.306	0.123	-0.026	-0.157	-0.147	-0.204	-0.205
		N	94	94	94	94	94	94	94	94	94	94
	May	Person's r	-0.167	-0.229	0.085	-0.020	-0.164	0.365	0.122	0.183	-0.263	-0.156
		N	94	94	94	94	94	94	94	94	94	94
	Jun	Person's r	0.079	0.158	0.010	0.113	0.079	0.140	-0.020	0.006	0.057	0.080
		N	94	94	94	94	94	94	94	94	94	94
	Jul	Person's r	0.061	-0.035	-0.160	-0.204	0.055	0.030	-0.053	-0.040	-0.375	-0.341
		N	94	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.062	-0.001	-0.070	-0.035	0.060	-0.078	-0.114	-0.114	-0.312	-0.313
		N	94	94	94	94	94	94	94	94	94	94
	Sep	Person's r	0.084	0.149	0.039	0.062	0.086	0.061	0.033	0.026	0.039	0.036
		N	94	94	94	94	94	94	94	94	94	94
	Oct	Person's r	-0.206	-0.143	-0.003	-0.020	-0.206	0.173	0.261	0.239	0.117	0.138
		N	94	94	94	94	94	94	94	94	94	94
	Nov	Person's r	-0.508	-0.444	-0.066	-0.259	-0.512	0.481	0.533	0.532	0.199	0.278
		N	94	94	94	94	94	94	94	94	94	94
	Dec	Person's r	-0.548	-0.495	-0.016	-0.188	-0.550	0.467	0.552	0.546	0.181	0.264
		N	94	94	94	94	94	94	94	94	94	94
	Annual Mean	Person's r	-0.311	-0.253	-0.020	-0.051	-0.313	0.357	0.362	0.362	0.036	0.099
		N	94	94	94	94	94	94	94	94	94	94
	DJF	Person's r	-0.571	-0.488	0.029	-0.152	-0.571	0.495	0.635	0.618	0.232	0.313
		N	94	94	94	94	94	94	94	94	94	94
	MAM	Person's r	-0.146	-0.110	-0.002	0.167	-0.147	0.227	0.141	0.156	-0.093	-0.046
		N	94	94	94	94	94	94	94	94	94	94
	JJA	Person's r	0.099	0.071	-0.101	-0.051	0.096	0.061	-0.084	-0.063	-0.280	-0.251
		N	94	94	94	94	94	94	94	94	94	94
	SON	Person's r	-0.293	-0.209	-0.016	-0.105	-0.294	0.326	0.378	0.365	0.160	0.204
		N	94	94	94	94	94	94	94	94	94	94
Temperature HadCRUT3	Jan	Person's r	-0.632	-0.517	0.055	-0.171	-0.631	0.358	0.677	0.627	0.533	0.560
		N	94	94	94	94	94	94	94	94	94	94
	Feb	Person's r	-0.427	-0.344	-0.087	-0.120	-0.431	0.347	0.514	0.487	0.214	0.264
		N	94	94	94	94	94	94	94	94	94	94
	Mar	Person's r	-0.390	-0.260	-0.047	-0.133	-0.392	0.120	0.481	0.412	0.526	0.499
		N	94	94	94	94	94	94	94	94	94	94
	Apr	Person's r	-0.402	-0.262	-0.130	0.006	-0.407	0.155	0.475	0.418	0.468	0.458
		N	94	94	94	94	94	94	94	94	94	94
	May	Person's r	-0.386	-0.335	0.008	-0.142	-0.386	0.308	0.441	0.429	0.268	0.315
		N	94	94	94	94	94	94	94	94	94	94
	Jun	Person's r	-0.281	-0.232	-0.084	-0.266	-0.284	0.410	0.439	0.445	0.185	0.257
		N	94	94	94	94	94	94	94	94	94	94
	Jul	Person's r	-0.346	-0.348	-0.011	-0.311	-0.347	0.367	0.456	0.452	0.094	0.165
		N	94	94	94	94	94	94	94	94	94	94
	Aug	Person's r	-0.289	-0.240	-0.184	-0.231	-0.296	0.206	0.428	0.390	0.160	0.186
		N	94	94	94	94	94	94	94	94	94	94
	Sep	Person's r	-0.129	-0.014	-0.153	-0.089	-0.135	0.089	0.280	0.236	0.309	0.292
		N	94	94	94	94	94	94	94	94	94	94
	Oct	Person's r	-0.452	-0.312	-0.084	-0.107	-0.456	0.254	0.526	0.478	0.488	0.502
		N	94	94	94	94	94	94	94	94	94	94
	Nov	Person's r	-0.482	-0.410	-0.062	-0.329	-0.485	0.436	0.619	0.594	0.328	0.390
		N	94	94	94	94	94	94	94	94	94	94
	Dec	Person's r	-0.557	-0.457	-0.063	-0.129	-0.560	0.341	0.584	0.545	0.391	0.428
		N	94	94	94	94	94	94	94	94	94	94
	Annual Mean	Person's r	-0.501	-0.391	-0.085	-0.209	-0.504	0.357	0.620	0.577	0.416	0.453
		N	94	94	94	94	94	94	94	94	94	94
	DJF	Person's r	-0.595	-0.485	-0.038	-0.155	-0.597	0.389	0.656	0.613	0.414	0.457
		N	94	94	94	94	94	94	94	94	94	94
	MAM	Person's r	-0.447	-0.326	-0.062	-0.105	-0.450	0.222	0.531	0.479	0.479	0.483
		N	94	94	94	94	94	94	94	94	94	94
	JJA	Person's r	-0.352	-0.315	-0.099	-0.313	-0.356	0.392	0.509	0.499	0.170	0.238
		N	94	94	94	94	94	94	94	94	94	94
	SON	Person's r	-0.400	-0.274	-0.116	-0.200	-0.404	0.294	0.540	0.495	0.428	0.450
		N	94	94	94	94	94	94	94	94	94	94

A5 (Continued) Correlation matrix of Laguna Aculeo. 5-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
Precipitation HadCRUT3	Jan	Person's r	0.221	0.192	-0.039	0.279	0.220	-0.264	-0.316	-0.318	-0.349	-0.380
		N	94	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.137	0.139	-0.165	0.095	0.131	-0.007	-0.105	-0.098	-0.193	-0.180
		N	94	94	94	94	94	94	94	94	94	94
	Mar	Person's r	0.060	0.132	0.065	0.105	0.062	-0.208	0.122	0.044	0.128	0.053
		N	94	94	94	94	94	94	94	94	94	94
	Apr	Person's r	0.101	0.141	0.179	0.090	0.107	-0.166	-0.076	-0.100	0.026	-0.022
		N	94	94	94	94	94	94	94	94	94	94
	May	Person's r	0.392	0.369	-0.142	0.094	0.388	-0.439	-0.333	-0.369	-0.202	-0.291
		N	94	94	94	94	94	94	94	94	94	94
	Jun	Person's r	0.536	0.477	-0.044	0.364	0.536	-0.453	-0.558	-0.553	-0.333	-0.407
		N	94	94	94	94	94	94	94	94	94	94
	Jul	Person's r	0.005	-0.005	-0.092	-0.108	0.002	-0.121	0.106	0.061	0.125	0.086
		N	94	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.051	0.032	-0.275	-0.009	0.042	-0.151	-0.022	-0.053	-0.143	-0.170
		N	94	94	94	94	94	94	94	94	94	94
	Sep	Person's r	0.116	0.038	-0.207	-0.075	0.110	-0.203	-0.303	-0.287	-0.200	-0.225
		N	94	94	94	94	94	94	94	94	94	94
	Oct	Person's r	0.111	0.112	-0.160	0.103	0.106	-0.007	-0.153	-0.127	-0.117	-0.098
		N	94	94	94	94	94	94	94	94	94	94
	Nov	Person's r	-0.095	-0.100	-0.081	-0.171	-0.098	0.023	0.035	0.041	0.107	0.115
		N	94	94	94	94	94	94	94	94	94	94
	Dec	Person's r	0.137	0.220	-0.091	0.230	0.135	-0.283	-0.005	-0.073	0.053	-0.026
		N	94	94	94	94	94	94	94	94	94	94
	Total annual	Person's r	0.466	0.419	-0.236	0.153	0.459	-0.561	-0.407	-0.455	-0.246	-0.357
		N	94	94	94	94	94	94	94	94	94	94
	DJF	Person's r	0.254	0.296	-0.151	0.323	0.250	-0.311	-0.198	-0.241	-0.215	-0.275
		N	94	94	94	94	94	94	94	94	94	94
	MAM	Person's r	0.385	0.378	-0.087	0.113	0.383	-0.453	-0.312	-0.356	-0.170	-0.267
		N	94	94	94	94	94	94	94	94	94	94
	JJA	Person's r	0.317	0.270	-0.190	0.130	0.311	-0.382	-0.249	-0.286	-0.163	-0.238
		N	94	94	94	94	94	94	94	94	94	94
	SON	Person's r	0.089	0.031	-0.248	-0.084	0.080	-0.139	-0.265	-0.240	-0.146	-0.152
		N	94	94	94	94	94	94	94	94	94	94
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	94	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	94	94	94	94	94	94	94	94	94	94
	Mar	Person's r	-0.082	-0.025	0.402	0.289	-0.069	-0.056	0.089	0.053	0.210	0.168
		N	94	94	94	94	94	94	94	94	94	94
	Apr	Person's r	-0.045	0.005	0.053	-0.022	-0.043	0.066	0.097	0.087	0.078	0.075
		N	94	94	94	94	94	94	94	94	94	94
	May	Person's r	0.108	0.119	-0.040	-0.006	0.107	-0.023	-0.056	-0.056	-0.136	-0.138
		N	94	94	94	94	94	94	94	94	94	94
	Jun	Person's r	0.408	0.347	-0.047	0.230	0.408	-0.348	-0.400	-0.395	-0.277	-0.323
		N	94	94	94	94	94	94	94	94	94	94
	Jul	Person's r	-0.129	-0.097	0.028	-0.030	-0.129	-0.055	0.198	0.153	0.241	0.209
		N	94	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.003	0.000	-0.243	-0.070	-0.005	-0.136	0.050	0.005	-0.130	-0.160
		N	94	94	94	94	94	94	94	94	94	94
	Sep	Person's r	0.056	0.023	0.041	0.061	0.057	-0.128	-0.115	-0.120	-0.146	-0.166
		N	94	94	94	94	94	94	94	94	94	94
	Oct	Person's r	-0.113	-0.139	-0.161	-0.016	-0.119	0.121	0.119	0.122	-0.118	-0.077
		N	94	94	94	94	94	94	94	94	94	94
	Nov	Person's r	-0.214	-0.233	-0.046	-0.117	-0.216	0.112	0.150	0.155	0.052	0.086
		N	94	94	94	94	94	94	94	94	94	94
	Dec	Person's r	-0.107	-0.053	-0.073	0.153	-0.110	0.078	0.197	0.179	0.159	0.161
		N	94	94	94	94	94	94	94	94	94	94
	Total annual	Person's r	0.131	0.121	-0.106	0.073	0.128	-0.237	-0.063	-0.102	-0.126	-0.173
		N	94	94	94	94	94	94	94	94	94	94
	DJF	Person's r	-0.107	-0.053	-0.073	0.153	-0.110	0.078	0.197	0.179	0.159	0.161
		N	94	94	94	94	94	94	94	94	94	94
	MAM	Person's r	0.081	0.108	0.006	0.009	0.082	-0.008	-0.019	-0.025	-0.089	-0.095
		N	94	94	94	94	94	94	94	94	94	94
	JJA	Person's r	0.165	0.148	-0.126	0.087	0.161	-0.315	-0.090	-0.138	-0.071	-0.136
		N	94	94	94	94	94	94	94	94	94	94
	SON	Person's r	-0.093	-0.139	-0.046	-0.008	-0.095	-0.013	0.015	0.014	-0.144	-0.131
		N	94	94	94	94	94	94	94	94	94	94

A5 (Continued) Correlation matrix of Laguna Aculeo. 5-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
SOI	Jan	Person's r	0.197	0.073	-0.170	-0.013	0.191	-0.098	-0.239	-0.210	-0.349	-0.337
		N	94	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.009	-0.046	-0.051	-0.150	0.008	0.156	-0.150	-0.080	-0.300	-0.229
		N	94	94	94	94	94	94	94	94	94	94
	Mar	Person's r	0.022	0.033	0.093	-0.021	0.025	0.231	-0.114	-0.037	-0.194	-0.114
		N	94	94	94	94	94	94	94	94	94	94
	Apr	Person's r	0.054	-0.009	0.020	0.049	0.055	0.033	-0.042	-0.021	-0.213	-0.184
		N	94	94	94	94	94	94	94	94	94	94
	May	Person's r	0.165	-0.072	-0.064	-0.077	0.163	-0.123	-0.251	-0.220	-0.342	-0.331
		N	94	94	94	94	94	94	94	94	94	94
	Jun	Person's r	0.165	0.041	-0.018	-0.120	0.164	-0.073	-0.273	-0.231	-0.304	-0.290
		N	94	94	94	94	94	94	94	94	94	94
	Jul	Person's r	0.301	0.167	-0.276	-0.335	0.292	-0.063	-0.367	-0.309	-0.559	-0.522
		N	94	94	94	94	94	94	94	94	94	94
	Aug	Person's r	-0.035	-0.167	-0.314	-0.515	-0.045	0.225	-0.003	0.056	-0.248	-0.167
		N	94	94	94	94	94	94	94	94	94	94
	Sep	Person's r	0.149	-0.053	-0.227	-0.296	0.142	0.086	-0.244	-0.170	-0.432	-0.361
		N	94	94	94	94	94	94	94	94	94	94
	Oct	Person's r	-0.074	-0.175	-0.135	-0.281	-0.079	0.269	-0.059	0.019	-0.324	-0.226
		N	94	94	94	94	94	94	94	94	94	94
	Nov	Person's r	-0.083	-0.132	0.101	-0.273	-0.080	0.232	-0.037	0.032	-0.217	-0.132
		N	94	94	94	94	94	94	94	94	94	94
	Dec	Person's r	0.209	0.102	0.047	-0.166	0.211	-0.068	-0.346	-0.290	-0.391	-0.370
		N	94	94	94	94	94	94	94	94	94	94
	Annual mean	Person's r	0.099	-0.023	-0.149	-0.223	0.094	0.090	-0.211	-0.143	-0.374	-0.314
		N	94	94	94	94	94	94	94	94	94	94
	DJF	Person's r	0.190	0.060	-0.111	-0.147	0.187	0.014	-0.339	-0.264	-0.491	-0.438
		N	94	94	94	94	94	94	94	94	94	94
	MAM	Person's r	0.122	-0.012	-0.051	-0.007	0.120	0.056	-0.199	-0.142	-0.310	-0.263
		N	94	94	94	94	94	94	94	94	94	94
	JJA	Person's r	0.152	0.019	-0.192	-0.344	0.146	0.030	-0.226	-0.171	-0.388	-0.344
		N	94	94	94	94	94	94	94	94	94	94
	SON	Person's r	-0.036	-0.139	-0.106	-0.317	-0.039	0.227	-0.091	-0.015	-0.290	-0.199
		N	94	94	94	94	94	94	94	94	94	94
El Niño 3		Person's r	0.511	0.541	-0.213	-0.089	0.505	-0.341	-0.568	-0.537	-0.549	-0.578
		N	77	77	77	77	77	77	77	77	77	77
SAB		Person's r	-0.185	-0.164	0.046	0.221	-0.184	0.217	0.142	0.160	0.028	0.074
		N	73	73	73	73	73	73	73	73	73	73

A5 (Continued) Correlation matrix of Laguna Aculeo. 5-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	0.285	-0.124	-0.210	0.205	0.155	0.228	0.272	0.233	0.166	0.272	0.244	0.318	-0.003	-0.380
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.034	-0.315	-0.170	0.152	0.170	0.189	0.162	0.007	-0.135	0.162	0.052	0.247	-0.275	-0.356
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Mar	Person's r	-0.099	-0.139	0.025	-0.037	-0.036	-0.010	-0.012	-0.110	-0.197	-0.012	-0.090	0.058	-0.139	-0.175
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Apr	Person's r	-0.308	0.352	0.388	-0.428	-0.447	-0.423	-0.396	-0.327	-0.225	-0.396	-0.361	-0.384	0.189	0.294
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	May	Person's r	-0.101	0.066	0.134	-0.154	-0.172	-0.136	-0.111	-0.092	-0.092	-0.111	-0.108	-0.092	0.091	0.015
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Jun	Person's r	-0.082	-0.020	0.070	-0.052	-0.033	-0.028	-0.049	-0.113	-0.129	-0.049	-0.093	-0.005	-0.127	-0.030
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Jul	Person's r	-0.049	0.001	0.041	-0.042	-0.038	-0.028	-0.033	-0.036	-0.023	-0.033	-0.034	-0.029	-0.009	0.021
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Aug	Person's r	-0.108	0.009	0.076	-0.102	-0.125	-0.109	-0.082	-0.033	-0.019	-0.082	-0.055	-0.098	0.135	0.067
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Sep	Person's r	-0.186	0.141	0.259	-0.235	-0.241	-0.209	-0.189	-0.201	-0.188	-0.189	-0.208	-0.141	0.030	0.087
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Oct	Person's r	0.175	-0.059	-0.099	0.120	0.081	0.135	0.177	0.174	0.152	0.177	0.175	0.196	0.046	-0.197
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Nov	Person's r	0.162	-0.283	-0.253	0.218	0.206	0.242	0.237	0.124	0.006	0.237	0.159	0.296	-0.181	-0.405
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Dec	Person's r	0.341	-0.151	-0.262	0.252	0.182	0.266	0.331	0.325	0.260	0.331	0.326	0.354	0.078	-0.406
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Annual Mean	Person's r	0.027	-0.088	-0.023	0.011	-0.014	0.040	0.063	0.010	-0.046	0.063	0.020	0.119	-0.036	-0.215
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	DJF	Person's r	0.249	-0.222	-0.242	0.230	0.191	0.257	0.288	0.214	0.111	0.288	0.235	0.346	-0.073	-0.429
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	MAM	Person's r	-0.199	0.086	0.207	-0.235	-0.249	-0.213	-0.193	-0.206	-0.212	-0.193	-0.216	-0.147	0.042	0.026
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	JJA	Person's r	-0.115	-0.008	0.090	-0.091	-0.088	-0.074	-0.077	-0.095	-0.092	-0.077	-0.092	-0.057	-0.021	0.021
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	SON	Person's r	0.076	-0.101	-0.055	0.058	0.033	0.087	0.111	0.052	-0.008	0.111	0.066	0.167	-0.053	-0.240
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
Temperature HadCRUT3	Jan	Person's r	0.347	-0.361	-0.382	0.376	0.333	0.390	0.426	0.339	0.189	0.426	0.363	0.475	-0.082	-0.552
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.201	-0.290	-0.257	0.247	0.229	0.275	0.281	0.175	0.066	0.281	0.208	0.343	-0.152	-0.424
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Mar	Person's r	0.136	-0.364	-0.252	0.256	0.265	0.278	0.264	0.119	-0.043	0.264	0.159	0.332	-0.250	-0.412
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Apr	Person's r	0.120	-0.189	-0.148	0.138	0.129	0.165	0.169	0.056	-0.051	0.169	0.085	0.238	-0.170	-0.352
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	May	Person's r	0.185	-0.159	-0.155	0.161	0.129	0.178	0.214	0.169	0.077	0.214	0.177	0.254	-0.015	-0.318
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Jun	Person's r	0.041	-0.322	-0.148	0.161	0.196	0.210	0.167	-0.020	-0.165	0.167	0.035	0.268	-0.358	-0.377
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Jul	Person's r	0.085	-0.230	-0.140	0.135	0.144	0.171	0.159	0.044	-0.063	0.159	0.077	0.227	-0.199	-0.321
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.163	-0.267	-0.203	0.216	0.211	0.245	0.247	0.148	0.042	0.247	0.178	0.302	-0.156	-0.355
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Sep	Person's r	0.086	0.029	0.034	0.006	-0.027	0.030	0.076	0.050	0.019	0.076	0.052	0.124	0.023	-0.158
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Oct	Person's r	0.424	-0.132	-0.286	0.321	0.252	0.335	0.406	0.389	0.320	0.406	0.395	0.431	0.074	-0.431
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Nov	Person's r	0.186	-0.444	-0.315	0.323	0.338	0.362	0.335	0.155	-0.018	0.335	0.211	0.423	-0.319	-0.512
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Dec	Person's r	0.303	-0.184	-0.257	0.249	0.190	0.262	0.319	0.281	0.188	0.319	0.288	0.356	0.033	-0.428
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Annual Mean	Person's r	0.235	-0.307	-0.262	0.269	0.249	0.302	0.318	0.196	0.054	0.318	0.230	0.393	-0.168	-0.486
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	DJF	Person's r	0.312	-0.312	-0.331	0.322	0.279	0.344	0.379	0.291	0.160	0.379	0.315	0.434	-0.080	-0.520
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	MAM	Person's r	0.168	-0.273	-0.213	0.213	0.201	0.238	0.248	0.132	-0.006	0.248	0.162	0.315	-0.166	-0.412
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	JJA	Person's r	0.103	-0.318	-0.184	0.192	0.210	0.238	0.214	0.054	-0.086	0.214	0.101	0.303	-0.287	-0.406
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	SON	Person's r	0.260	-0.204	-0.209	0.242	0.208	0.271	0.305	0.221	0.118	0.305	0.245	0.367	-0.084	-0.415
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94

A5 (Continued) Correlation matrix of Laguna Aculeo. 5-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation HadCRUT3	Jan	Person's r	-0.175	0.113	0.125	-0.148	-0.122	-0.153	-0.189	-0.187	-0.128	-0.189	-0.184	-0.201	-0.036	0.194
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Feb	Person's r	-0.020	0.504	0.326	-0.306	-0.377	-0.308	-0.217	-0.048	0.113	-0.217	-0.106	-0.245	0.404	0.278
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Mar	Person's r	-0.152	-0.032	0.130	-0.110	-0.101	-0.095	-0.091	-0.113	-0.142	-0.091	-0.115	-0.058	-0.021	0.038
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Apr	Person's r	-0.274	-0.015	0.187	-0.204	-0.178	-0.187	-0.208	-0.273	-0.309	-0.208	-0.264	-0.163	-0.117	0.057
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	May	Person's r	-0.323	-0.023	0.225	-0.196	-0.154	-0.195	-0.220	-0.241	-0.262	-0.221	-0.244	-0.211	-0.056	0.222
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Jun	Person's r	-0.375	0.318	0.401	-0.392	-0.355	-0.401	-0.429	-0.361	-0.241	-0.429	-0.384	-0.457	0.076	0.484
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Jul	Person's r	0.144	-0.162	-0.164	0.200	0.221	0.212	0.188	0.122	0.075	0.188	0.151	0.199	-0.160	-0.159
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.008	0.114	0.052	-0.048	-0.049	-0.040	-0.044	-0.043	0.003	-0.044	-0.039	-0.043	-0.009	0.041
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Sep	Person's r	0.060	0.073	-0.061	0.029	0.008	-0.008	0.008	0.101	0.158	0.008	0.076	-0.064	0.166	0.110
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Oct	Person's r	0.201	0.435	0.133	-0.093	-0.181	-0.113	-0.013	0.198	0.365	-0.013	0.136	-0.087	0.476	0.205
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Nov	Person's r	0.246	-0.062	-0.193	0.207	0.179	0.197	0.223	0.249	0.234	0.223	0.246	0.193	0.071	-0.147
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Dec	Person's r	-0.259	0.037	0.216	-0.201	-0.167	-0.181	-0.208	-0.257	-0.257	-0.208	-0.247	-0.169	-0.103	0.137
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Total annual	Person's r	-0.251	0.123	0.242	-0.208	-0.171	-0.208	-0.234	-0.223	-0.175	-0.234	-0.227	-0.246	-0.019	0.283
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	DJF	Person's r	-0.260	0.301	0.344	-0.337	-0.334	-0.327	-0.321	-0.277	-0.177	-0.320	-0.295	-0.313	0.096	0.304
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	MAM	Person's r	-0.367	-0.027	0.256	-0.232	-0.187	-0.226	-0.254	-0.288	-0.317	-0.254	-0.289	-0.233	-0.078	0.219
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	JJA	Person's r	-0.114	0.121	0.140	-0.112	-0.079	-0.106	-0.138	-0.140	-0.085	-0.138	-0.134	-0.146	-0.060	0.185
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	SON	Person's r	0.229	0.203	-0.072	0.071	0.008	0.032	0.095	0.259	0.361	0.095	0.214	0.000	0.344	0.101
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Mar	Person's r	0.030	-0.139	-0.092	0.079	0.066	0.071	0.085	0.086	0.046	0.085	0.083	0.088	0.016	-0.097
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Apr	Person's r	-0.191	-0.117	0.074	-0.098	-0.081	-0.082	-0.097	-0.174	-0.242	-0.097	-0.160	-0.043	-0.123	-0.059
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	May	Person's r	-0.175	-0.159	0.059	-0.038	-0.014	-0.028	-0.046	-0.095	-0.157	-0.046	-0.086	-0.018	-0.086	0.009
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Jun	Person's r	-0.258	0.167	0.246	-0.221	-0.173	-0.229	-0.269	-0.238	-0.175	-0.269	-0.247	-0.295	0.005	0.349
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Jul	Person's r	0.238	-0.175	-0.231	0.253	0.244	0.259	0.262	0.222	0.168	0.262	0.241	0.266	-0.084	-0.243
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.028	0.117	0.055	-0.051	-0.072	-0.044	-0.024	-0.002	0.042	-0.024	-0.008	-0.021	0.065	0.015
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Sep	Person's r	-0.061	-0.051	-0.023	-0.011	-0.009	-0.025	-0.032	-0.020	-0.027	-0.032	-0.025	-0.045	0.022	0.027
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Oct	Person's r	0.337	0.257	-0.038	0.083	-0.005	0.070	0.167	0.332	0.444	0.167	0.287	0.107	0.386	0.006
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Nov	Person's r	0.345	-0.005	-0.211	0.225	0.166	0.215	0.274	0.347	0.359	0.274	0.330	0.234	0.182	-0.180
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Dec	Person's r	-0.146	0.055	0.117	-0.136	-0.099	-0.114	-0.156	-0.230	-0.241	-0.156	-0.210	-0.110	-0.166	0.039
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Total annual	Person's r	-0.032	-0.042	0.019	0.008	0.016	0.012	0.007	0.003	-0.006	0.007	0.004	0.004	-0.009	0.023
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	DJF	Person's r	-0.146	0.055	0.117	-0.136	-0.099	-0.114	-0.156	-0.230	-0.241	-0.156	-0.210	-0.110	-0.166	0.039
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	MAM	Person's r	-0.207	-0.185	0.067	-0.055	-0.029	-0.042	-0.061	-0.126	-0.204	-0.061	-0.114	-0.022	-0.109	-0.014
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	JJA	Person's r	0.013	0.041	0.023	0.009	0.022	0.012	-0.001	0.001	0.025	-0.001	0.005	-0.013	-0.022	0.059
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	SON	Person's r	0.232	0.049	-0.132	0.126	0.067	0.104	0.161	0.267	0.308	0.161	0.237	0.110	0.246	-0.058
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94

A5 (continued) Correlation matrix of Laguna Aculeo. 5-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
SOI	Jan	Person's r	0.029	0.104	0.046	-0.028	-0.049	-0.037	-0.015	0.064	0.132	-0.015	0.043	-0.056	0.157	0.114
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.156	0.069	-0.094	0.073	0.037	0.054	0.083	0.168	0.225	0.083	0.148	0.032	0.171	-0.001
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Mar	Person's r	0.066	0.027	-0.041	0.034	0.025	0.031	0.031	0.055	0.090	0.031	0.053	0.015	0.032	-0.004
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Apr	Person's r	-0.032	0.029	0.059	-0.051	-0.057	-0.043	-0.037	-0.018	0.001	-0.037	-0.025	-0.038	0.041	0.035
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	May	Person's r	0.002	0.143	0.056	-0.062	-0.073	-0.075	-0.065	0.015	0.089	-0.065	-0.006	-0.112	0.137	0.150
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Jun	Person's r	-0.122	0.079	0.112	-0.118	-0.119	-0.132	-0.129	-0.079	-0.038	-0.129	-0.097	-0.158	0.087	0.171
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Jul	Person's r	-0.195	0.003	0.110	-0.120	-0.095	-0.128	-0.152	-0.126	-0.097	-0.152	-0.134	-0.177	0.011	0.197
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.059	-0.081	-0.088	0.083	0.092	0.087	0.075	0.056	0.033	0.075	0.064	0.069	-0.052	-0.076
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Sep	Person's r	0.049	0.067	-0.038	0.032	0.040	0.014	0.003	0.055	0.102	0.003	0.047	-0.047	0.057	0.109
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Oct	Person's r	0.098	-0.216	-0.235	0.203	0.220	0.192	0.158	0.126	0.080	0.158	0.143	0.138	-0.091	-0.132
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Nov	Person's r	0.171	-0.223	-0.285	0.265	0.281	0.253	0.218	0.180	0.134	0.218	0.202	0.198	-0.111	-0.172
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Dec	Person's r	-0.091	-0.021	-0.003	-0.029	-0.010	-0.048	-0.074	-0.049	-0.025	-0.074	-0.054	-0.109	0.001	0.117
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	Annual mean	Person's r	0.025	-0.005	-0.046	0.031	0.031	0.020	0.013	0.047	0.073	0.013	0.041	-0.019	0.041	0.039
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	DJF	Person's r	-0.017	0.102	0.036	-0.054	-0.064	-0.070	-0.065	0.010	0.080	-0.065	-0.009	-0.114	0.125	0.141
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	MAM	Person's r	-0.013	0.110	0.070	-0.065	-0.074	-0.067	-0.059	-0.008	0.050	-0.059	-0.021	-0.086	0.089	0.105
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	JJA	Person's r	-0.102	-0.013	0.047	-0.056	-0.043	-0.063	-0.077	-0.059	-0.047	-0.077	-0.065	-0.096	0.010	0.102
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
	SON	Person's r	0.127	-0.141	-0.208	0.186	0.200	0.173	0.147	0.133	0.111	0.147	0.146	0.120	-0.062	-0.095
		N	94	94	94	94	94	94	94	94	94	94	94	94	94	94
El Niño 3		Person's r	-0.251	0.313	0.317	-0.307	-0.293	-0.321	-0.323	-0.223	-0.092	-0.323	-0.254	-0.373	0.153	0.433
		N	77	77	77	77	77	77	77	77	77	77	77	77	77	77
SAB		Person's r	0.273	0.189	-0.040	0.046	-0.055	0.033	0.138	0.288	0.367	0.138	0.244	0.090	0.362	-0.048
		N	73	73	73	73	73	73	73	73	73	73	73	73	73	73

A6 Correlation matrix of Laguna Aculeo. 7-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
Temperature CRU TS 2.1	Jan	Person's r	0.742	0.785	-0.259	0.347	0.507	0.466	0.001	-0.628	0.754
		N	93	93	93	93	93	93	93	93	93
	Feb	Person's r	0.813	0.797	-0.295	0.465	0.634	0.556	-0.190	-0.553	0.601
		N	93	93	93	93	93	93	93	93	93
	Mar	Person's r	0.773	0.697	-0.043	0.541	0.549	0.485	-0.386	-0.292	0.386
		N	93	93	93	93	93	93	93	93	93
	Apr	Person's r	0.379	0.272	0.390	0.532	0.452	0.222	-0.442	0.223	0.001
		N	93	93	93	93	93	93	93	93	93
	May	Person's r	0.367	0.391	0.103	0.234	0.552	0.224	0.008	-0.223	0.375
		N	93	93	93	93	93	93	93	93	93
	Jun	Person's r	0.221	0.206	0.300	0.111	0.236	-0.037	0.026	0.039	0.144
		N	93	93	93	93	93	93	93	93	93
	Jul	Person's r	0.241	0.183	0.046	0.362	0.384	0.009	-0.350	-0.014	0.099
		N	93	93	93	93	93	93	93	93	93
	Aug	Person's r	0.393	0.278	0.245	0.522	0.479	0.274	-0.508	0.059	0.050
		N	93	93	93	93	93	93	93	93	93
	Sep	Person's r	0.416	0.381	0.177	0.314	0.479	-0.040	-0.292	-0.002	0.214
		N	93	93	93	93	93	93	93	93	93
	Oct	Person's r	0.611	0.566	-0.095	0.445	0.530	0.273	-0.360	-0.237	0.352
		N	93	93	93	93	93	93	93	93	93
	Nov	Person's r	0.784	0.797	-0.315	0.413	0.569	0.747	-0.092	-0.559	0.629
		N	93	93	93	93	93	93	93	93	93
	Dec	Person's r	0.821	0.846	-0.235	0.400	0.695	0.532	-0.192	-0.599	0.738
		N	93	93	93	93	93	93	93	93	93
	Annual Mean	Person's r	0.806	0.770	-0.031	0.551	0.728	0.463	-0.310	-0.373	0.554
		N	93	93	93	93	93	93	93	93	93
	DJF	Person's r	0.861	0.880	-0.286	0.440	0.667	0.564	-0.140	-0.645	0.758
		N	93	93	93	93	93	93	93	93	93
	MAM	Person's r	0.660	0.597	0.157	0.542	0.657	0.405	-0.332	-0.162	0.350
		N	93	93	93	93	93	93	93	93	93
	JJA	Person's r	0.403	0.319	0.293	0.451	0.516	0.093	-0.361	0.039	0.152
		N	93	93	93	93	93	93	93	93	93
	SON	Person's r	0.768	0.742	-0.115	0.492	0.660	0.439	-0.302	-0.354	0.513
		N	93	93	93	93	93	93	93	93	93
Temperature HadCRUT3	Jan	Person's r	0.737	0.776	-0.554	0.251	0.435	0.591	-0.073	-0.668	0.654
		N	93	93	93	93	93	93	93	93	93
	Feb	Person's r	0.800	0.767	-0.219	0.493	0.589	0.434	-0.317	-0.532	0.635
		N	93	93	93	93	93	93	93	93	93
	Mar	Person's r	0.567	0.564	-0.553	0.197	0.204	0.452	-0.222	-0.458	0.352
		N	93	93	93	93	93	93	93	93	93
	Apr	Person's r	0.569	0.548	-0.385	0.314	0.192	0.412	-0.200	-0.426	0.424
		N	93	93	93	93	93	93	93	93	93
	May	Person's r	0.520	0.548	-0.280	0.209	0.435	0.306	-0.096	-0.449	0.507
		N	93	93	93	93	93	93	93	93	93
	Jun	Person's r	0.610	0.607	-0.207	0.313	0.494	0.297	-0.092	-0.448	0.515
		N	93	93	93	93	93	93	93	93	93
	Jul	Person's r	0.587	0.611	-0.446	0.262	0.537	0.305	-0.088	-0.493	0.505
		N	93	93	93	93	93	93	93	93	93
	Aug	Person's r	0.658	0.630	-0.355	0.391	0.486	0.357	-0.306	-0.462	0.443
		N	93	93	93	93	93	93	93	93	93
	Sep	Person's r	0.490	0.469	-0.164	0.289	0.350	0.130	-0.250	-0.209	0.289
		N	93	93	93	93	93	93	93	93	93
	Oct	Person's r	0.544	0.579	-0.336	0.177	0.311	0.245	-0.116	-0.472	0.520
		N	93	93	93	93	93	93	93	93	93
	Nov	Person's r	0.761	0.792	-0.510	0.293	0.568	0.564	-0.086	-0.669	0.622
		N	93	93	93	93	93	93	93	93	93
	Dec	Person's r	0.741	0.753	-0.398	0.397	0.501	0.553	-0.245	-0.570	0.628
		N	93	93	93	93	93	93	93	93	93
	Annual Mean	Person's r	0.767	0.773	-0.442	0.362	0.514	0.472	-0.210	-0.591	0.618
		N	93	93	93	93	93	93	93	93	93
	DJF	Person's r	0.831	0.836	-0.419	0.420	0.558	0.570	-0.235	-0.642	0.698
		N	93	93	93	93	93	93	93	93	93
	MAM	Person's r	0.621	0.622	-0.460	0.267	0.312	0.440	-0.195	-0.500	0.479
		N	93	93	93	93	93	93	93	93	93
	JJA	Person's r	0.691	0.691	-0.368	0.355	0.570	0.354	-0.163	-0.525	0.555
		N	93	93	93	93	93	93	93	93	93
	SON	Person's r	0.673	0.689	-0.375	0.287	0.461	0.348	-0.173	-0.501	0.534
		N	93	93	93	93	93	93	93	93	93

A6 (Continued) Correlation matrix of Laguna Aculeo. 7-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
Precipitation HadCRUT3	Jan	Person's r	-0.089	-0.198	0.534	0.232	-0.121	-0.135	-0.232	0.297	-0.241
		N	93	93	93	93	93	93	93	93	93
	Feb	Person's r	0.080	0.052	0.285	0.286	0.176	-0.182	-0.238	0.148	0.038
		N	93	93	93	93	93	93	93	93	93
	Mar	Person's r	0.468	0.372	-0.264	0.458	0.255	0.397	-0.367	-0.122	-0.016
		N	93	93	93	93	93	93	93	93	93
	Apr	Person's r	0.246	0.166	0.214	0.209	0.285	0.042	-0.286	0.161	-0.049
		N	93	93	93	93	93	93	93	93	93
	May	Person's r	-0.173	-0.278	0.210	0.087	-0.051	-0.314	-0.355	0.327	-0.409
		N	93	93	93	93	93	93	93	93	93
	Jun	Person's r	-0.538	-0.615	0.357	-0.130	-0.349	-0.529	-0.049	0.669	-0.693
		N	93	93	93	93	93	93	93	93	93
	Jul	Person's r	-0.005	-0.048	-0.229	0.135	-0.142	-0.149	-0.201	-0.072	0.009
		N	93	93	93	93	93	93	93	93	93
	Aug	Person's r	0.114	0.021	0.164	0.425	0.025	0.091	-0.213	0.086	-0.040
		N	93	93	93	93	93	93	93	93	93
	Sep	Person's r	-0.339	-0.373	0.101	-0.088	-0.206	-0.083	-0.156	0.351	-0.333
		N	93	93	93	93	93	93	93	93	93
	Oct	Person's r	-0.302	-0.258	0.291	-0.131	-0.161	-0.355	0.195	0.165	-0.043
		N	93	93	93	93	93	93	93	93	93
	Nov	Person's r	-0.129	-0.111	-0.060	-0.079	-0.128	-0.091	0.048	-0.044	0.094
		N	93	93	93	93	93	93	93	93	93
	Dec	Person's r	0.151	0.037	-0.019	0.412	-0.094	0.240	-0.271	0.018	-0.145
		N	93	93	93	93	93	93	93	93	93
	Total annual	Person's r	-0.295	-0.443	0.253	0.210	-0.226	-0.430	-0.416	0.499	-0.540
		N	93	93	93	93	93	93	93	93	93
	DJF	Person's r	0.085	-0.051	0.380	0.498	-0.039	0.001	-0.390	0.224	-0.191
		N	93	93	93	93	93	93	93	93	93
	MAM	Person's r	-0.074	-0.193	0.216	0.156	0.030	-0.249	-0.409	0.323	-0.386
		N	93	93	93	93	93	93	93	93	93
	JJA	Person's r	-0.251	-0.358	0.119	0.184	-0.269	-0.345	-0.238	0.356	-0.389
		N	93	93	93	93	93	93	93	93	93
	SON	Person's r	-0.419	-0.418	0.167	-0.150	-0.266	-0.244	-0.010	0.299	-0.215
		N	93	93	93	93	93	93	93	93	93
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	93	93	93	93	93	93	93	93	93
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	93	93	93	93	93	93	93	93	93
	Mar	Person's r	0.339	0.297	-0.139	0.179	0.182	0.159	-0.284	-0.090	0.073
		N	93	93	93	93	93	93	93	93	93
	Apr	Person's r	0.357	0.316	0.078	0.254	0.446	0.124	-0.286	-0.045	0.226
		N	93	93	93	93	93	93	93	93	93
	May	Person's r	0.145	0.136	0.124	0.001	0.335	-0.101	-0.063	-0.027	0.084
		N	93	93	93	93	93	93	93	93	93
	Jun	Person's r	-0.578	-0.588	0.255	-0.340	-0.352	-0.467	0.214	0.431	-0.578
		N	93	93	93	93	93	93	93	93	93
	Jul	Person's r	0.113	0.089	-0.235	0.119	-0.128	-0.054	-0.110	-0.218	0.190
		N	93	93	93	93	93	93	93	93	93
	Aug	Person's r	0.273	0.182	0.125	0.510	0.178	0.179	-0.280	-0.024	0.086
		N	93	93	93	93	93	93	93	93	93
	Sep	Person's r	-0.018	-0.068	0.210	0.040	0.076	-0.200	-0.242	0.103	-0.028
		N	93	93	93	93	93	93	93	93	93
	Oct	Person's r	0.074	0.099	0.122	0.136	0.074	-0.030	0.088	-0.176	0.222
		N	93	93	93	93	93	93	93	93	93
	Nov	Person's r	0.005	0.029	-0.089	0.032	0.006	-0.050	0.058	-0.195	0.256
		N	93	93	93	93	93	93	93	93	93
	Dec	Person's r	0.184	0.137	-0.168	0.293	-0.075	0.341	-0.062	-0.143	0.070
		N	93	93	93	93	93	93	93	93	93
	Total annual	Person's r	0.032	-0.039	0.155	0.180	0.084	-0.243	-0.183	0.032	-0.013
		N	93	93	93	93	93	93	93	93	93
	DJF	Person's r	0.184	0.137	-0.168	0.293	-0.075	0.341	-0.062	-0.143	0.070
		N	93	93	93	93	93	93	93	93	93
	MAM	Person's r	0.248	0.225	0.122	0.081	0.429	-0.046	-0.151	-0.042	0.140
		N	93	93	93	93	93	93	93	93	93
	JJA	Person's r	-0.149	-0.219	0.066	0.131	-0.220	-0.243	-0.085	0.112	-0.193
		N	93	93	93	93	93	93	93	93	93
	SON	Person's r	0.015	-0.005	0.179	0.100	0.094	-0.200	-0.139	-0.074	0.182
		N	93	93	93	93	93	93	93	93	93

A6 (Continued) Correlation matrix of Laguna Aculeo. 7-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
SOI	Jan	Person's r	-0.197	-0.242	0.377	0.058	0.021	-0.164	0.016	0.191	-0.169
		N	93	93	93	93	93	93	93	93	93
	Feb	Person's r	-0.296	-0.247	0.266	-0.179	0.017	-0.154	0.249	0.131	-0.010
		N	93	93	93	93	93	93	93	93	93
	Mar	Person's r	-0.254	-0.187	0.205	-0.245	-0.057	-0.173	0.347	0.062	0.013
		N	93	93	93	93	93	93	93	93	93
	Apr	Person's r	0.054	0.024	0.091	0.129	0.075	0.123	0.079	-0.028	-0.007
		N	93	93	93	93	93	93	93	93	93
	May	Person's r	-0.339	-0.361	0.159	-0.013	-0.250	-0.031	0.139	0.204	-0.233
		N	93	93	93	93	93	93	93	93	93
	Jun	Person's r	-0.367	-0.353	0.247	-0.192	-0.112	-0.109	0.140	0.232	-0.233
		N	93	93	93	93	93	93	93	93	93
	Jul	Person's r	-0.254	-0.280	0.261	0.000	0.130	-0.036	-0.037	0.290	-0.247
		N	93	93	93	93	93	93	93	93	93
	Aug	Person's r	-0.093	-0.010	-0.152	-0.209	0.134	0.179	0.344	-0.073	0.078
		N	93	93	93	93	93	93	93	93	93
	Sep	Person's r	-0.444	-0.371	0.167	-0.369	-0.116	-0.226	0.365	0.204	-0.192
		N	93	93	93	93	93	93	93	93	93
	Oct	Person's r	-0.138	-0.061	0.154	-0.266	0.136	0.025	0.358	-0.059	0.116
		N	93	93	93	93	93	93	93	93	93
	Nov	Person's r	-0.312	-0.187	0.069	-0.524	-0.087	-0.131	0.523	-0.047	0.027
		N	93	93	93	93	93	93	93	93	93
	Dec	Person's r	-0.395	-0.381	0.315	-0.231	-0.112	-0.145	0.167	0.306	-0.269
		N	93	93	93	93	93	93	93	93	93
	Annual mean	Person's r	-0.323	-0.279	0.221	-0.223	-0.030	-0.093	0.285	0.141	-0.109
		N	93	93	93	93	93	93	93	93	93
	DJF	Person's r	-0.351	-0.349	0.393	-0.118	-0.025	-0.189	0.143	0.273	-0.190
		N	93	93	93	93	93	93	93	93	93
	MAM	Person's r	-0.204	-0.197	0.218	-0.078	-0.054	-0.049	0.227	0.135	-0.110
		N	93	93	93	93	93	93	93	93	93
	JJA	Person's r	-0.264	-0.239	0.118	-0.148	0.048	0.028	0.161	0.156	-0.146
		N	93	93	93	93	93	93	93	93	93
	SON	Person's r	-0.306	-0.202	0.120	-0.430	-0.036	-0.100	0.450	0.016	0.004
		N	93	93	93	93	93	93	93	93	93
El Niño 3		Person's r	-0.518	-0.575	0.442	-0.051	-0.164	-0.405	-0.096	0.630	-0.553
		N	76	76	76	76	76	76	76	76	76
SAB		Person's r	0.254	0.242	0.243	0.329	0.217	0.011	-0.150	-0.147	0.379
		N	72	72	72	72	72	72	72	72	72

A6 (Continued) Correlation matrix of Laguna Aculeo. 7-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
Temperature CRU TS 2.1	Jan	Person's r	-0.616	-0.500	0.115	-0.007	-0.614	0.569	0.674	0.665	0.349	0.437
		N	93	93	93	93	93	93	93	93	93	93
	Feb	Person's r	-0.416	-0.345	-0.029	-0.250	-0.418	0.389	0.549	0.522	0.156	0.212
		N	93	93	93	93	93	93	93	93	93	93
	Mar	Person's r	-0.278	-0.149	0.034	0.169	-0.278	0.183	0.333	0.298	0.229	0.231
		N	93	93	93	93	93	93	93	93	93	93
	Apr	Person's r	0.150	0.171	0.041	0.340	0.151	-0.039	-0.182	-0.171	-0.232	-0.233
		N	93	93	93	93	93	93	93	93	93	93
	May	Person's r	-0.203	-0.272	0.093	-0.043	-0.201	0.435	0.154	0.222	-0.269	-0.146
		N	93	93	93	93	93	93	93	93	93	93
	Jun	Person's r	0.057	0.145	0.101	0.175	0.060	0.163	0.001	0.026	0.043	0.071
		N	93	93	93	93	93	93	93	93	93	93
	Jul	Person's r	0.065	-0.048	-0.231	-0.222	0.059	0.044	-0.049	-0.034	-0.423	-0.380
		N	93	93	93	93	93	93	93	93	93	93
	Aug	Person's r	0.069	-0.007	-0.085	0.005	0.067	-0.096	-0.139	-0.139	-0.362	-0.363
		N	93	93	93	93	93	93	93	93	93	93
	Sep	Person's r	0.043	0.116	0.095	0.114	0.046	0.118	0.057	0.055	0.023	0.033
		N	93	93	93	93	93	93	93	93	93	93
	Oct	Person's r	-0.215	-0.140	-0.048	-0.011	-0.217	0.197	0.289	0.265	0.128	0.150
		N	93	93	93	93	93	93	93	93	93	93
	Nov	Person's r	-0.543	-0.476	-0.023	-0.246	-0.545	0.520	0.568	0.567	0.212	0.295
		N	93	93	93	93	93	93	93	93	93	93
	Dec	Person's r	-0.597	-0.537	-0.003	-0.186	-0.599	0.538	0.607	0.604	0.203	0.296
		N	93	93	93	93	93	93	93	93	93	93
	Annual Mean	Person's r	-0.334	-0.272	0.011	-0.034	-0.334	0.391	0.385	0.386	0.044	0.112
		N	93	93	93	93	93	93	93	93	93	93
	DJF	Person's r	-0.590	-0.500	0.028	-0.164	-0.590	0.541	0.663	0.648	0.255	0.340
		N	93	93	93	93	93	93	93	93	93	93
	MAM	Person's r	-0.171	-0.132	0.070	0.177	-0.170	0.264	0.166	0.182	-0.086	-0.033
		N	93	93	93	93	93	93	93	93	93	93
	JJA	Person's r	0.092	0.057	-0.089	-0.005	0.090	0.077	-0.079	-0.057	-0.327	-0.290
		N	93	93	93	93	93	93	93	93	93	93
	SON	Person's r	-0.320	-0.231	0.005	-0.074	-0.320	0.363	0.400	0.389	0.157	0.208
		N	93	93	93	93	93	93	93	93	93	93
Temperature HadCRUT3	Jan	Person's r	-0.666	-0.549	0.072	-0.206	-0.666	0.411	0.711	0.664	0.562	0.596
		N	93	93	93	93	93	93	93	93	93	93
	Feb	Person's r	-0.467	-0.381	-0.091	-0.114	-0.470	0.393	0.554	0.527	0.239	0.296
		N	93	93	93	93	93	93	93	93	93	93
	Mar	Person's r	-0.432	-0.293	-0.035	-0.156	-0.433	0.163	0.526	0.457	0.583	0.558
		N	93	93	93	93	93	93	93	93	93	93
	Apr	Person's r	-0.452	-0.301	-0.056	0.006	-0.454	0.212	0.531	0.474	0.541	0.535
		N	93	93	93	93	93	93	93	93	93	93
	May	Person's r	-0.429	-0.370	0.055	-0.186	-0.429	0.366	0.496	0.484	0.330	0.383
		N	93	93	93	93	93	93	93	93	93	93
	Jun	Person's r	-0.307	-0.255	-0.024	-0.263	-0.308	0.443	0.477	0.480	0.215	0.290
		N	93	93	93	93	93	93	93	93	93	93
	Jul	Person's r	-0.383	-0.385	-0.019	-0.356	-0.384	0.431	0.507	0.506	0.130	0.212
		N	93	93	93	93	93	93	93	93	93	93
	Aug	Person's r	-0.347	-0.291	-0.179	-0.250	-0.352	0.256	0.502	0.458	0.220	0.250
		N	93	93	93	93	93	93	93	93	93	93
	Sep	Person's r	-0.152	-0.026	-0.052	-0.027	-0.154	0.111	0.309	0.262	0.347	0.330
		N	93	93	93	93	93	93	93	93	93	93
	Oct	Person's r	-0.486	-0.335	-0.068	-0.070	-0.489	0.302	0.563	0.516	0.530	0.550
		N	93	93	93	93	93	93	93	93	93	93
	Nov	Person's r	-0.537	-0.462	-0.081	-0.348	-0.540	0.507	0.678	0.656	0.352	0.425
		N	93	93	93	93	93	93	93	93	93	93
	Dec	Person's r	-0.597	-0.492	-0.092	-0.152	-0.600	0.400	0.625	0.590	0.422	0.468
		N	93	93	93	93	93	93	93	93	93	93
	Annual Mean	Person's r	-0.532	-0.419	-0.052	-0.211	-0.535	0.405	0.654	0.613	0.454	0.497
		N	93	93	93	93	93	93	93	93	93	93
	DJF	Person's r	-0.624	-0.513	-0.042	-0.170	-0.627	0.438	0.685	0.645	0.438	0.488
		N	93	93	93	93	93	93	93	93	93	93
	MAM	Person's r	-0.492	-0.361	-0.013	-0.130	-0.493	0.277	0.582	0.530	0.546	0.554
		N	93	93	93	93	93	93	93	93	93	93
	JJA	Person's r	-0.386	-0.347	-0.070	-0.328	-0.388	0.440	0.555	0.544	0.211	0.284
		N	93	93	93	93	93	93	93	93	93	93
	SON	Person's r	-0.436	-0.303	-0.075	-0.164	-0.438	0.341	0.578	0.534	0.461	0.488
		N	93	93	93	93	93	93	93	93	93	93

A6 (Continued) Correlation matrix of Laguna Aculeo. 7-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
Precipitation HadCRUT3	Jan	Person's r	0.263	0.234	-0.075	0.335	0.262	-0.293	-0.346	-0.349	-0.378	-0.413
		N	93	93	93	93	93	93	93	93	93	93
	Feb	Person's r	0.151	0.154	-0.114	0.173	0.149	-0.016	-0.118	-0.112	-0.217	-0.204
		N	93	93	93	93	93	93	93	93	93	93
	Mar	Person's r	0.040	0.126	-0.035	0.107	0.039	-0.211	0.141	0.059	0.148	0.069
		N	93	93	93	93	93	93	93	93	93	93
	Apr	Person's r	0.133	0.174	0.216	0.127	0.139	-0.172	-0.100	-0.122	-0.001	-0.051
		N	93	93	93	93	93	93	93	93	93	93
	May	Person's r	0.450	0.432	-0.161	0.101	0.447	-0.505	-0.380	-0.421	-0.199	-0.303
		N	93	93	93	93	93	93	93	93	93	93
	Jun	Person's r	0.613	0.546	-0.077	0.443	0.612	-0.530	-0.669	-0.659	-0.400	-0.482
		N	93	93	93	93	93	93	93	93	93	93
	Jul	Person's r	-0.032	-0.025	-0.205	-0.133	-0.038	-0.087	0.140	0.097	0.176	0.143
		N	93	93	93	93	93	93	93	93	93	93
	Aug	Person's r	0.068	0.056	-0.246	0.050	0.061	-0.164	-0.024	-0.058	-0.147	-0.178
		N	93	93	93	93	93	93	93	93	93	93
	Sep	Person's r	0.171	0.079	-0.268	-0.061	0.164	-0.276	-0.361	-0.348	-0.225	-0.262
		N	93	93	93	93	93	93	93	93	93	93
	Oct	Person's r	0.126	0.130	-0.127	0.207	0.123	-0.025	-0.173	-0.148	-0.132	-0.113
		N	93	93	93	93	93	93	93	93	93	93
	Nov	Person's r	-0.114	-0.109	-0.157	-0.151	-0.119	0.053	0.047	0.058	0.129	0.145
		N	93	93	93	93	93	93	93	93	93	93
	Dec	Person's r	0.148	0.244	-0.144	0.275	0.144	-0.320	0.005	-0.073	0.065	-0.024
		N	93	93	93	93	93	93	93	93	93	93
	Total annual	Person's r	0.525	0.489	-0.316	0.211	0.518	-0.626	-0.472	-0.521	-0.256	-0.378
		N	93	93	93	93	93	93	93	93	93	93
	DJF	Person's r	0.289	0.336	-0.178	0.414	0.285	-0.350	-0.221	-0.268	-0.243	-0.310
		N	93	93	93	93	93	93	93	93	93	93
	MAM	Person's r	0.442	0.440	-0.106	0.126	0.440	-0.512	-0.357	-0.405	-0.171	-0.282
		N	93	93	93	93	93	93	93	93	93	93
	JJA	Person's r	0.342	0.305	-0.268	0.180	0.336	-0.410	-0.288	-0.323	-0.168	-0.246
		N	93	93	93	93	93	93	93	93	93	93
	SON	Person's r	0.126	0.065	-0.308	-0.020	0.118	-0.184	-0.309	-0.284	-0.161	-0.173
		N	93	93	93	93	93	93	93	93	93	93
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	93	93	93	93	93	93	93	93	93	93
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	93	93	93	93	93	93	93	93	93	93
	Mar	Person's r	-0.103	-0.026	0.368	0.228	-0.093	-0.069	0.105	0.063	0.271	0.219
		N	93	93	93	93	93	93	93	93	93	93
	Apr	Person's r	-0.040	0.016	0.070	-0.060	-0.038	0.086	0.105	0.095	0.087	0.085
		N	93	93	93	93	93	93	93	93	93	93
	May	Person's r	0.119	0.132	-0.053	-0.027	0.117	-0.025	-0.055	-0.057	-0.139	-0.142
		N	93	93	93	93	93	93	93	93	93	93
	Jun	Person's r	0.474	0.398	-0.096	0.241	0.472	-0.404	-0.481	-0.472	-0.337	-0.386
		N	93	93	93	93	93	93	93	93	93	93
	Jul	Person's r	-0.211	-0.171	-0.056	-0.048	-0.213	0.000	0.261	0.217	0.289	0.266
		N	93	93	93	93	93	93	93	93	93	93
	Aug	Person's r	0.017	0.020	-0.196	-0.005	0.011	-0.145	0.054	0.005	-0.129	-0.162
		N	93	93	93	93	93	93	93	93	93	93
	Sep	Person's r	0.094	0.057	0.042	0.080	0.096	-0.169	-0.157	-0.163	-0.147	-0.175
		N	93	93	93	93	93	93	93	93	93	93
	Oct	Person's r	-0.130	-0.156	-0.159	0.055	-0.135	0.131	0.128	0.131	-0.135	-0.090
		N	93	93	93	93	93	93	93	93	93	93
	Nov	Person's r	-0.233	-0.249	-0.115	-0.124	-0.237	0.149	0.173	0.181	0.063	0.105
		N	93	93	93	93	93	93	93	93	93	93
	Dec	Person's r	-0.133	-0.076	-0.069	0.137	-0.135	0.094	0.233	0.212	0.180	0.183
		N	93	93	93	93	93	93	93	93	93	93
	Total annual	Person's r	0.137	0.129	-0.176	0.089	0.132	-0.248	-0.069	-0.110	-0.137	-0.183
		N	93	93	93	93	93	93	93	93	93	93
	DJF	Person's r	-0.133	-0.076	-0.069	0.137	-0.135	0.094	0.233	0.212	0.180	0.183
		N	93	93	93	93	93	93	93	93	93	93
	MAM	Person's r	0.088	0.120	-0.004	-0.024	0.088	-0.004	-0.014	-0.021	-0.082	-0.089
		N	93	93	93	93	93	93	93	93	93	93
	JJA	Person's r	0.166	0.147	-0.202	0.118	0.161	-0.334	-0.100	-0.149	-0.083	-0.148
		N	93	93	93	93	93	93	93	93	93	93
	SON	Person's r	-0.081	-0.129	-0.080	0.029	-0.083	-0.019	0.000	0.000	-0.143	-0.130
		N	93	93	93	93	93	93	93	93	93	93

A6 (Continued) Correlation matrix of Laguna Aculeo. 7-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
SOI	Jan	Person's r	0.227	0.095	-0.126	0.061	0.224	-0.126	-0.287	-0.254	-0.427	-0.414
		N	93	93	93	93	93	93	93	93	93	93
	Feb	Person's r	0.032	-0.046	-0.013	-0.187	0.032	0.155	-0.208	-0.125	-0.423	-0.340
		N	93	93	93	93	93	93	93	93	93	93
	Mar	Person's r	0.034	0.039	0.192	-0.044	0.039	0.226	-0.143	-0.061	-0.270	-0.182
		N	93	93	93	93	93	93	93	93	93	93
	Apr	Person's r	0.062	-0.014	0.018	0.050	0.063	0.030	-0.059	-0.035	-0.266	-0.231
		N	93	93	93	93	93	93	93	93	93	93
	May	Person's r	0.189	-0.102	-0.116	-0.084	0.186	-0.142	-0.294	-0.257	-0.419	-0.402
		N	93	93	93	93	93	93	93	93	93	93
	Jun	Person's r	0.211	0.065	0.026	-0.126	0.212	-0.104	-0.340	-0.290	-0.387	-0.370
		N	93	93	93	93	93	93	93	93	93	93
	Jul	Person's r	0.352	0.211	-0.314	-0.359	0.344	-0.106	-0.424	-0.364	-0.648	-0.613
		N	93	93	93	93	93	93	93	93	93	93
	Aug	Person's r	-0.059	-0.208	-0.294	-0.570	-0.067	0.259	0.021	0.084	-0.264	-0.172
		N	93	93	93	93	93	93	93	93	93	93
	Sep	Person's r	0.173	-0.060	-0.240	-0.307	0.167	0.070	-0.279	-0.201	-0.480	-0.406
		N	93	93	93	93	93	93	93	93	93	93
	Oct	Person's r	-0.080	-0.196	-0.133	-0.321	-0.084	0.293	-0.071	0.015	-0.387	-0.277
		N	93	93	93	93	93	93	93	93	93	93
	Nov	Person's r	-0.078	-0.142	0.094	-0.304	-0.076	0.255	-0.064	0.016	-0.268	-0.172
		N	93	93	93	93	93	93	93	93	93	93
	Dec	Person's r	0.261	0.132	0.032	-0.183	0.263	-0.096	-0.433	-0.365	-0.522	-0.493
		N	93	93	93	93	93	93	93	93	93	93
	Annual mean	Person's r	0.130	-0.022	-0.129	-0.261	0.127	0.085	-0.267	-0.187	-0.491	-0.420
		N	93	93	93	93	93	93	93	93	93	93
	DJF	Person's r	0.224	0.082	-0.072	-0.130	0.222	-0.019	-0.390	-0.312	-0.575	-0.521
		N	93	93	93	93	93	93	93	93	93	93
	MAM	Person's r	0.129	-0.017	-0.015	-0.003	0.129	0.053	-0.223	-0.160	-0.369	-0.316
		N	93	93	93	93	93	93	93	93	93	93
	JJA	Person's r	0.180	0.029	-0.200	-0.402	0.175	0.022	-0.270	-0.207	-0.480	-0.428
		N	93	93	93	93	93	93	93	93	93	93
	SON	Person's r	-0.019	-0.154	-0.088	-0.341	-0.021	0.231	-0.119	-0.036	-0.341	-0.245
		N	93	93	93	93	93	93	93	93	93	93
El Niño 3		Person's r	0.598	0.675	-0.222	-0.049	0.593	-0.400	-0.637	-0.606	-0.604	-0.641
		N	76	76	76	76	76	76	76	76	76	76
SAB		Person's r	-0.222	-0.200	0.091	0.278	-0.220	0.231	0.166	0.181	0.033	0.079
		N	72	72	72	72	72	72	72	72	72	72

A6 (Continued) Correlation matrix of Laguna Aculeo. 7-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	0.333	-0.155	-0.245	0.246	0.191	0.271	0.321	0.276	0.195	0.321	0.290	0.369	-0.020	-0.428
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Feb	Person's r	0.048	-0.370	-0.202	0.189	0.209	0.229	0.199	0.023	-0.146	0.199	0.076	0.290	-0.315	-0.399
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Mar	Person's r	-0.064	-0.175	-0.015	0.003	-0.001	0.031	0.033	-0.071	-0.174	0.033	-0.048	0.106	-0.140	-0.219
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Apr	Person's r	-0.346	0.359	0.424	-0.462	-0.483	-0.455	-0.423	-0.351	-0.242	-0.423	-0.389	-0.406	0.219	0.313
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	May	Person's r	-0.076	0.072	0.121	-0.146	-0.169	-0.127	-0.097	-0.072	-0.068	-0.097	-0.090	-0.077	0.110	-0.004
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Jun	Person's r	-0.089	0.022	0.098	-0.084	-0.074	-0.061	-0.072	-0.126	-0.131	-0.072	-0.111	-0.025	-0.089	-0.014
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Jul	Person's r	-0.031	0.004	0.031	-0.032	-0.032	-0.019	-0.020	-0.011	0.010	-0.020	-0.011	-0.022	0.017	0.022
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Aug	Person's r	-0.137	0.006	0.091	-0.120	-0.143	-0.127	-0.100	-0.044	-0.026	-0.100	-0.069	-0.119	0.154	0.084
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Sep	Person's r	-0.150	0.167	0.256	-0.233	-0.256	-0.209	-0.169	-0.157	-0.130	-0.169	-0.172	-0.123	0.103	0.075
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Oct	Person's r	0.168	-0.056	-0.086	0.108	0.067	0.125	0.169	0.165	0.139	0.169	0.166	0.194	0.042	-0.202
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Nov	Person's r	0.169	-0.338	-0.279	0.248	0.239	0.275	0.268	0.136	-0.008	0.268	0.177	0.332	-0.223	-0.443
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Dec	Person's r	0.359	-0.213	-0.294	0.289	0.221	0.307	0.372	0.351	0.260	0.372	0.356	0.401	0.037	-0.456
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Annual Mean	Person's r	0.047	-0.109	-0.042	0.032	0.004	0.061	0.089	0.035	-0.030	0.089	0.045	0.146	-0.035	-0.237
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	DJF	Person's r	0.267	-0.269	-0.269	0.263	0.226	0.293	0.323	0.235	0.111	0.323	0.261	0.385	-0.109	-0.465
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	MAM	Person's r	-0.180	0.069	0.189	-0.218	-0.237	-0.194	-0.169	-0.184	-0.194	-0.169	-0.194	-0.120	0.055	-0.001
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	JJA	Person's r	-0.122	0.016	0.107	-0.111	-0.115	-0.095	-0.091	-0.096	-0.081	-0.091	-0.097	-0.072	0.018	0.035
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	SON	Person's r	0.090	-0.115	-0.066	0.069	0.040	0.098	0.128	0.071	0.004	0.128	0.084	0.185	-0.046	-0.257
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
Temperature HadCRUT3	Jan	Person's r	0.395	-0.415	-0.438	0.436	0.391	0.451	0.489	0.392	0.224	0.489	0.420	0.537	-0.096	-0.607
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Feb	Person's r	0.246	-0.333	-0.307	0.301	0.282	0.330	0.336	0.223	0.099	0.336	0.259	0.397	-0.160	-0.470
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Mar	Person's r	0.199	-0.433	-0.327	0.337	0.345	0.357	0.344	0.185	0.000	0.344	0.231	0.414	-0.271	-0.484
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Apr	Person's r	0.193	-0.254	-0.223	0.223	0.210	0.249	0.256	0.133	0.004	0.256	0.167	0.327	-0.183	-0.425
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	May	Person's r	0.237	-0.199	-0.205	0.216	0.180	0.234	0.275	0.221	0.114	0.274	0.232	0.317	-0.024	-0.373
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Jun	Person's r	0.048	-0.355	-0.162	0.181	0.218	0.233	0.187	-0.012	-0.170	0.188	0.047	0.296	-0.378	-0.401
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Jul	Person's r	0.120	-0.290	-0.187	0.188	0.199	0.228	0.212	0.081	-0.046	0.212	0.119	0.286	-0.229	-0.375
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Aug	Person's r	0.198	-0.326	-0.246	0.270	0.268	0.303	0.302	0.180	0.049	0.302	0.218	0.366	-0.197	-0.414
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Sep	Person's r	0.093	0.004	0.026	0.018	-0.019	0.044	0.094	0.066	0.026	0.094	0.067	0.149	0.025	-0.180
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Oct	Person's r	0.459	-0.155	-0.318	0.357	0.283	0.369	0.446	0.430	0.352	0.446	0.436	0.471	0.080	-0.464
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Nov	Person's r	0.215	-0.507	-0.366	0.375	0.392	0.416	0.385	0.187	-0.009	0.385	0.249	0.478	-0.351	-0.566
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Dec	Person's r	0.356	-0.242	-0.319	0.316	0.254	0.329	0.388	0.343	0.232	0.388	0.353	0.423	0.022	-0.484
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Annual Mean	Person's r	0.277	-0.356	-0.311	0.325	0.303	0.357	0.374	0.243	0.086	0.374	0.281	0.450	-0.180	-0.530
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	DJF	Person's r	0.359	-0.362	-0.386	0.382	0.337	0.403	0.438	0.344	0.198	0.438	0.372	0.492	-0.091	-0.566
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	MAM	Person's r	0.236	-0.336	-0.285	0.293	0.278	0.317	0.330	0.203	0.044	0.330	0.237	0.398	-0.181	-0.482
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	JJA	Person's r	0.125	-0.366	-0.216	0.232	0.252	0.280	0.253	0.078	-0.080	0.253	0.130	0.349	-0.315	-0.445
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	SON	Person's r	0.284	-0.242	-0.241	0.276	0.240	0.305	0.342	0.252	0.136	0.342	0.278	0.407	-0.090	-0.449
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93

A6 (Continued) Correlation matrix of Laguna Aculeo. 7-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation HadCRUT3	Jan	Person's r	-0.214	0.147	0.171	-0.193	-0.167	-0.197	-0.232	-0.224	-0.149	-0.232	-0.224	-0.242	-0.014	0.233
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Feb	Person's r	-0.029	0.542	0.367	-0.342	-0.421	-0.341	-0.238	-0.048	0.135	-0.238	-0.115	-0.266	0.457	0.301
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Mar	Person's r	-0.173	-0.025	0.152	-0.129	-0.120	-0.110	-0.105	-0.136	-0.170	-0.105	-0.136	-0.065	-0.024	0.039
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Apr	Person's r	-0.350	-0.005	0.237	-0.260	-0.226	-0.241	-0.270	-0.347	-0.386	-0.270	-0.337	-0.215	-0.129	0.095
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	May	Person's r	-0.369	-0.008	0.262	-0.230	-0.184	-0.229	-0.257	-0.280	-0.298	-0.257	-0.283	-0.244	-0.051	0.256
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Jun	Person's r	-0.421	0.426	0.478	-0.477	-0.446	-0.490	-0.510	-0.407	-0.240	-0.510	-0.444	-0.549	0.160	0.580
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Jul	Person's r	0.223	-0.153	-0.214	0.254	0.266	0.262	0.244	0.187	0.141	0.244	0.215	0.249	-0.149	-0.192
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Aug	Person's r	0.007	0.150	0.076	-0.069	-0.075	-0.062	-0.060	-0.046	0.017	-0.060	-0.046	-0.061	0.020	0.064
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Sep	Person's r	0.015	0.071	-0.039	0.004	-0.010	-0.036	-0.027	0.068	0.129	-0.027	0.042	-0.104	0.158	0.147
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Oct	Person's r	0.207	0.508	0.180	-0.137	-0.237	-0.158	-0.042	0.207	0.410	-0.042	0.131	-0.122	0.549	0.248
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Nov	Person's r	0.298	-0.041	-0.219	0.231	0.193	0.215	0.250	0.298	0.292	0.250	0.290	0.212	0.104	-0.156
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Dec	Person's r	-0.282	0.067	0.243	-0.228	-0.192	-0.206	-0.236	-0.290	-0.284	-0.236	-0.280	-0.191	-0.101	0.159
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Total annual	Person's r	-0.269	0.196	0.288	-0.254	-0.223	-0.258	-0.276	-0.241	-0.164	-0.276	-0.254	-0.294	0.040	0.343
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	DJF	Person's r	-0.293	0.358	0.401	-0.391	-0.391	-0.379	-0.368	-0.312	-0.189	-0.368	-0.336	-0.358	0.136	0.349
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	MAM	Person's r	-0.422	-0.010	0.299	-0.273	-0.223	-0.267	-0.297	-0.336	-0.363	-0.297	-0.337	-0.271	-0.075	0.256
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	JJA	Person's r	-0.089	0.198	0.159	-0.131	-0.108	-0.130	-0.151	-0.125	-0.037	-0.151	-0.127	-0.170	0.003	0.223
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	SON	Person's r	0.220	0.243	-0.044	0.042	-0.025	-0.002	0.067	0.257	0.383	0.067	0.204	-0.037	0.382	0.142
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Mar	Person's r	0.060	-0.155	-0.113	0.105	0.083	0.097	0.120	0.120	0.067	0.120	0.117	0.125	0.020	-0.134
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Apr	Person's r	-0.217	-0.139	0.080	-0.102	-0.080	-0.083	-0.103	-0.201	-0.289	-0.103	-0.181	-0.039	-0.151	-0.069
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	May	Person's r	-0.196	-0.166	0.067	-0.050	-0.026	-0.038	-0.055	-0.111	-0.180	-0.055	-0.100	-0.022	-0.086	0.005
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Jun	Person's r	-0.296	0.259	0.311	-0.290	-0.245	-0.300	-0.336	-0.278	-0.175	-0.336	-0.297	-0.371	0.070	0.432
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Jul	Person's r	0.383	-0.180	-0.327	0.353	0.324	0.353	0.374	0.360	0.312	0.374	0.376	0.361	-0.043	-0.310
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Aug	Person's r	0.021	0.136	0.079	-0.070	-0.097	-0.063	-0.035	-0.001	0.056	-0.035	-0.011	-0.033	0.095	0.031
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Sep	Person's r	-0.083	-0.076	-0.022	-0.009	-0.003	-0.022	-0.034	-0.031	-0.046	-0.034	-0.034	-0.046	0.004	0.028
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Oct	Person's r	0.349	0.299	-0.011	0.056	-0.043	0.044	0.153	0.348	0.488	0.153	0.292	0.089	0.436	0.022
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Nov	Person's r	0.402	0.019	-0.230	0.245	0.175	0.232	0.302	0.401	0.428	0.302	0.377	0.254	0.218	-0.190
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Dec	Person's r	-0.128	0.029	0.087	-0.107	-0.062	-0.082	-0.133	-0.229	-0.253	-0.132	-0.200	-0.082	-0.205	0.009
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Total annual	Person's r	0.012	0.001	0.015	0.015	0.007	0.015	0.026	0.052	0.066	0.026	0.045	0.015	0.057	0.029
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	DJF	Person's r	-0.128	0.029	0.087	-0.107	-0.062	-0.082	-0.133	-0.229	-0.253	-0.132	-0.200	-0.082	-0.205	0.009
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	MAM	Person's r	-0.228	-0.195	0.074	-0.065	-0.039	-0.049	-0.068	-0.144	-0.233	-0.068	-0.130	-0.021	-0.115	-0.024
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	JJA	Person's r	0.086	0.113	0.014	0.022	0.016	0.018	0.025	0.070	0.132	0.025	0.063	-0.005	0.065	0.079
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	SON	Person's r	0.253	0.060	-0.130	0.129	0.063	0.107	0.172	0.295	0.348	0.172	0.260	0.114	0.272	-0.057
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93

A6 (Continued) Correlation matrix of Laguna Aculeo. 7-year filtered data

			Grain size												
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
SOI	Jan	Person's r	-0.029	0.151	0.104	-0.089	-0.108	-0.099	-0.081	0.010	0.098	-0.081	-0.014	-0.127	0.172	0.184
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Feb	Person's r	0.138	0.087	-0.080	0.056	0.020	0.032	0.060	0.161	0.233	0.060	0.137	-0.004	0.191	0.040
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Mar	Person's r	0.074	0.035	-0.046	0.038	0.027	0.032	0.033	0.070	0.114	0.033	0.065	0.008	0.052	0.012
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Apr	Person's r	-0.067	0.051	0.096	-0.088	-0.091	-0.078	-0.074	-0.052	-0.023	-0.074	-0.060	-0.077	0.046	0.072
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	May	Person's r	-0.026	0.171	0.082	-0.092	-0.102	-0.108	-0.100	-0.007	0.081	-0.100	-0.032	-0.157	0.155	0.198
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Jun	Person's r	-0.174	0.078	0.137	-0.152	-0.145	-0.168	-0.173	-0.118	-0.072	-0.173	-0.137	-0.207	0.086	0.216
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Jul	Person's r	-0.285	0.002	0.164	-0.181	-0.143	-0.189	-0.224	-0.204	-0.174	-0.224	-0.212	-0.248	-0.010	0.255
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Aug	Person's r	0.024	-0.130	-0.093	0.083	0.102	0.089	0.065	0.027	-0.014	0.065	0.040	0.065	-0.097	-0.088
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Sep	Person's r	-0.003	0.078	-0.005	-0.010	0.006	-0.028	-0.046	0.007	0.060	-0.046	-0.003	-0.098	0.048	0.147
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Oct	Person's r	0.067	-0.255	-0.243	0.202	0.228	0.191	0.146	0.104	0.051	0.146	0.125	0.125	-0.119	-0.133
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Nov	Person's r	0.140	-0.231	-0.275	0.250	0.276	0.238	0.192	0.148	0.102	0.192	0.173	0.170	-0.134	-0.153
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Dec	Person's r	-0.148	-0.009	0.030	-0.070	-0.045	-0.092	-0.126	-0.092	-0.055	-0.126	-0.099	-0.171	0.007	0.176
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Annual mean	Person's r	-0.026	-0.007	-0.021	0.000	0.009	-0.012	-0.028	0.009	0.041	-0.028	0.002	-0.067	0.034	0.085
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	DJF	Person's r	-0.052	0.113	0.058	-0.080	-0.087	-0.099	-0.097	-0.011	0.071	-0.097	-0.033	-0.155	0.137	0.186
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	MAM	Person's r	-0.030	0.130	0.089	-0.087	-0.097	-0.090	-0.083	-0.021	0.049	-0.083	-0.037	-0.115	0.105	0.136
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	JJA	Person's r	-0.166	-0.039	0.068	-0.086	-0.060	-0.092	-0.118	-0.110	-0.105	-0.118	-0.114	-0.138	-0.019	0.132
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	SON	Person's r	0.087	-0.156	-0.196	0.168	0.190	0.155	0.119	0.101	0.078	0.119	0.115	0.091	-0.080	-0.075
		N	93	93	93	93	93	93	93	93	93	93	93	93	93	93
El Niño 3		Person's r	-0.346	0.380	0.414	-0.407	-0.384	-0.420	-0.428	-0.315	-0.156	-0.428	-0.353	-0.476	0.176	0.529
		N	76	76	76	76	76	76	76	76	76	76	76	76	76	76
SAB		Person's r	0.343	0.260	-0.029	0.040	-0.087	0.025	0.157	0.350	0.459	0.157	0.293	0.100	0.444	-0.049
		N	72	72	72	72	72	72	72	72	72	72	72	72	72	72

A7 Correlation matrix of Laguna Aculeo. 9-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
Temperature CRU TS 2.1	Jan	Person's r	0.778	0.817	-0.274	0.370	0.549	0.500	0.005	-0.650	0.780
		N	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.859	0.838	-0.307	0.512	0.698	0.607	-0.195	-0.579	0.636
		N	92	92	92	92	92	92	92	92	92
	Mar	Person's r	0.810	0.727	-0.052	0.598	0.589	0.525	-0.408	-0.317	0.418
		N	92	92	92	92	92	92	92	92	92
	Apr	Person's r	0.397	0.279	0.437	0.605	0.494	0.225	-0.493	0.242	-0.006
		N	92	92	92	92	92	92	92	92	92
	May	Person's r	0.402	0.432	0.087	0.252	0.608	0.256	0.026	-0.252	0.425
		N	92	92	92	92	92	92	92	92	92
	Jun	Person's r	0.271	0.249	0.329	0.168	0.282	-0.043	-0.024	0.023	0.181
		N	92	92	92	92	92	92	92	92	92
	Jul	Person's r	0.257	0.198	0.066	0.403	0.440	0.018	-0.367	-0.036	0.124
		N	92	92	92	92	92	92	92	92	92
	Aug	Person's r	0.425	0.292	0.287	0.626	0.542	0.339	-0.577	0.069	0.050
		N	92	92	92	92	92	92	92	92	92
	Sep	Person's r	0.452	0.417	0.220	0.360	0.536	-0.036	-0.312	-0.029	0.273
		N	92	92	92	92	92	92	92	92	92
	Oct	Person's r	0.654	0.599	-0.103	0.518	0.562	0.309	-0.387	-0.259	0.375
		N	92	92	92	92	92	92	92	92	92
	Nov	Person's r	0.837	0.841	-0.329	0.461	0.634	0.780	-0.083	-0.585	0.660
		N	92	92	92	92	92	92	92	92	92
	Dec	Person's r	0.875	0.888	-0.266	0.481	0.742	0.592	-0.182	-0.636	0.777
		N	92	92	92	92	92	92	92	92	92
	Annual Mean	Person's r	0.829	0.787	-0.033	0.598	0.764	0.490	-0.313	-0.392	0.577
		N	92	92	92	92	92	92	92	92	92
	DJF	Person's r	0.890	0.900	-0.301	0.483	0.704	0.602	-0.133	-0.660	0.775
		N	92	92	92	92	92	92	92	92	92
	MAM	Person's r	0.699	0.631	0.157	0.601	0.710	0.439	-0.352	-0.183	0.384
		N	92	92	92	92	92	92	92	92	92
	JJA	Person's r	0.448	0.354	0.335	0.536	0.587	0.115	-0.417	0.022	0.185
		N	92	92	92	92	92	92	92	92	92
	SON	Person's r	0.796	0.764	-0.110	0.541	0.699	0.460	-0.302	-0.375	0.541
		N	92	92	92	92	92	92	92	92	92
Temperature HadCRUT3	Jan	Person's r	0.754	0.802	-0.546	0.253	0.496	0.609	-0.056	-0.713	0.722
		N	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.785	0.769	-0.199	0.443	0.610	0.401	-0.251	-0.554	0.670
		N	92	92	92	92	92	92	92	92	92
	Mar	Person's r	0.579	0.585	-0.592	0.183	0.240	0.473	-0.169	-0.513	0.420
		N	92	92	92	92	92	92	92	92	92
	Apr	Person's r	0.607	0.604	-0.432	0.269	0.242	0.443	-0.127	-0.482	0.496
		N	92	92	92	92	92	92	92	92	92
	May	Person's r	0.520	0.567	-0.321	0.168	0.410	0.337	-0.015	-0.484	0.552
		N	92	92	92	92	92	92	92	92	92
	Jun	Person's r	0.635	0.646	-0.213	0.278	0.519	0.266	-0.040	-0.478	0.574
		N	92	92	92	92	92	92	92	92	92
	Jul	Person's r	0.596	0.635	-0.444	0.241	0.573	0.327	-0.008	-0.537	0.562
		N	92	92	92	92	92	92	92	92	92
	Aug	Person's r	0.710	0.685	-0.380	0.417	0.508	0.404	-0.282	-0.508	0.504
		N	92	92	92	92	92	92	92	92	92
	Sep	Person's r	0.506	0.487	-0.162	0.306	0.348	0.100	-0.257	-0.242	0.332
		N	92	92	92	92	92	92	92	92	92
	Oct	Person's r	0.523	0.572	-0.355	0.131	0.283	0.220	-0.040	-0.504	0.548
		N	92	92	92	92	92	92	92	92	92
	Nov	Person's r	0.816	0.848	-0.480	0.297	0.652	0.545	-0.052	-0.720	0.705
		N	92	92	92	92	92	92	92	92	92
	Dec	Person's r	0.747	0.772	-0.398	0.351	0.551	0.542	-0.167	-0.616	0.686
		N	92	92	92	92	92	92	92	92	92
	Annual Mean	Person's r	0.764	0.783	-0.442	0.326	0.532	0.460	-0.142	-0.624	0.668
		N	92	92	92	92	92	92	92	92	92
	DJF	Person's r	0.823	0.841	-0.403	0.380	0.598	0.553	-0.174	-0.674	0.746
		N	92	92	92	92	92	92	92	92	92
	MAM	Person's r	0.630	0.649	-0.502	0.228	0.329	0.465	-0.117	-0.548	0.541
		N	92	92	92	92	92	92	92	92	92
	JJA	Person's r	0.705	0.718	-0.368	0.331	0.589	0.355	-0.099	-0.557	0.609
		N	92	92	92	92	92	92	92	92	92
	SON	Person's r	0.680	0.702	-0.365	0.273	0.472	0.315	-0.133	-0.537	0.582
		N	92	92	92	92	92	92	92	92	92

A7 (Continued) Correlation matrix of Laguna Aculeo. 9-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
Precipitation HadCRUT3	Jan	Person's r	-0.105	-0.225	0.546	0.244	-0.114	-0.188	-0.281	0.364	-0.282
		N	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.050	0.011	0.333	0.310	0.160	-0.259	-0.261	0.189	-0.003
		N	92	92	92	92	92	92	92	92	92
	Mar	Person's r	0.523	0.428	-0.265	0.535	0.305	0.472	-0.435	-0.206	0.082
		N	92	92	92	92	92	92	92	92	92
	Apr	Person's r	0.291	0.198	0.204	0.328	0.345	0.105	-0.365	0.159	-0.008
		N	92	92	92	92	92	92	92	92	92
	May	Person's r	-0.206	-0.302	0.274	0.057	-0.081	-0.350	-0.396	0.361	-0.391
		N	92	92	92	92	92	92	92	92	92
	Jun	Person's r	-0.637	-0.702	0.450	-0.182	-0.439	-0.564	-0.073	0.737	-0.745
		N	92	92	92	92	92	92	92	92	92
	Jul	Person's r	-0.023	-0.025	-0.248	-0.011	-0.155	-0.164	-0.097	-0.137	0.058
		N	92	92	92	92	92	92	92	92	92
	Aug	Person's r	0.201	0.095	0.179	0.465	0.112	0.084	-0.322	0.095	-0.043
		N	92	92	92	92	92	92	92	92	92
	Sep	Person's r	-0.401	-0.431	0.072	-0.163	-0.242	-0.116	-0.121	0.398	-0.428
		N	92	92	92	92	92	92	92	92	92
	Oct	Person's r	-0.380	-0.327	0.353	-0.217	-0.256	-0.457	0.232	0.206	-0.097
		N	92	92	92	92	92	92	92	92	92
	Nov	Person's r	-0.265	-0.188	-0.105	-0.344	-0.207	-0.195	0.290	-0.050	0.073
		N	92	92	92	92	92	92	92	92	92
	Dec	Person's r	0.227	0.102	0.012	0.456	-0.022	0.255	-0.343	-0.016	-0.098
		N	92	92	92	92	92	92	92	92	92
	Total annual	Person's r	-0.380	-0.506	0.340	0.104	-0.285	-0.516	-0.442	0.560	-0.578
		N	92	92	92	92	92	92	92	92	92
	DJF	Person's r	0.103	-0.048	0.432	0.529	0.004	-0.064	-0.459	0.258	-0.198
		N	92	92	92	92	92	92	92	92	92
	MAM	Person's r	-0.094	-0.207	0.271	0.157	0.015	-0.266	-0.468	0.347	-0.355
		N	92	92	92	92	92	92	92	92	92
	JJA	Person's r	-0.301	-0.385	0.178	0.085	-0.309	-0.400	-0.243	0.381	-0.416
		N	92	92	92	92	92	92	92	92	92
	SON	Person's r	-0.557	-0.525	0.159	-0.348	-0.367	-0.357	0.129	0.354	-0.320
		N	92	92	92	92	92	92	92	92	92
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	92	92	92	92	92	92	92	92	92
	Mar	Person's r	0.370	0.315	-0.152	0.229	0.198	0.223	-0.351	-0.085	0.071
		N	92	92	92	92	92	92	92	92	92
	Apr	Person's r	0.394	0.352	0.059	0.274	0.494	0.145	-0.304	-0.050	0.228
		N	92	92	92	92	92	92	92	92	92
	May	Person's r	0.190	0.174	0.155	0.057	0.387	-0.083	-0.133	-0.038	0.115
		N	92	92	92	92	92	92	92	92	92
	Jun	Person's r	-0.684	-0.692	0.318	-0.370	-0.457	-0.530	0.190	0.510	-0.644
		N	92	92	92	92	92	92	92	92	92
	Jul	Person's r	0.100	0.099	-0.261	0.050	-0.165	-0.066	-0.058	-0.290	0.252
		N	92	92	92	92	92	92	92	92	92
	Aug	Person's r	0.335	0.234	0.161	0.565	0.232	0.188	-0.341	-0.032	0.107
		N	92	92	92	92	92	92	92	92	92
	Sep	Person's r	-0.064	-0.117	0.250	0.030	0.039	-0.234	-0.274	0.143	-0.065
		N	92	92	92	92	92	92	92	92	92
	Oct	Person's r	0.100	0.118	0.157	0.177	0.093	-0.049	0.061	-0.181	0.253
		N	92	92	92	92	92	92	92	92	92
	Nov	Person's r	-0.027	0.019	-0.113	-0.038	-0.027	-0.089	0.119	-0.219	0.270
		N	92	92	92	92	92	92	92	92	92
	Dec	Person's r	0.194	0.163	-0.218	0.241	-0.075	0.348	-0.005	-0.179	0.090
		N	92	92	92	92	92	92	92	92	92
	Total annual	Person's r	0.025	-0.042	0.214	0.192	0.068	-0.286	-0.245	0.023	0.017
		N	92	92	92	92	92	92	92	92	92
	DJF	Person's r	0.194	0.163	-0.218	0.241	-0.075	0.348	-0.005	-0.179	0.090
		N	92	92	92	92	92	92	92	92	92
	MAM	Person's r	0.296	0.266	0.140	0.139	0.482	-0.017	-0.220	-0.052	0.166
		N	92	92	92	92	92	92	92	92	92
	JJA	Person's r	-0.195	-0.257	0.111	0.105	-0.293	-0.294	-0.106	0.110	-0.185
		N	92	92	92	92	92	92	92	92	92
	SON	Person's r	-0.023	-0.036	0.208	0.077	0.055	-0.246	-0.137	-0.062	0.176
		N	92	92	92	92	92	92	92	92	92

A7 (Continued) Correlation matrix of Laguna Aculeo. 9-year filtered data

			Spectrolino							MS	Density
			RABD660;670	R660/R670	RABD610	R730/R460	RABD480	RABD500	Total Absorption	SI	cps
SOI	Jan	Person's r	-0.216	-0.268	0.421	0.081	-0.013	-0.207	-0.014	0.224	-0.192
		N	92	92	92	92	92	92	92	92	92
	Feb	Person's r	-0.303	-0.254	0.308	-0.182	0.036	-0.186	0.236	0.162	-0.027
		N	92	92	92	92	92	92	92	92	92
	Mar	Person's r	-0.256	-0.195	0.261	-0.243	-0.035	-0.219	0.328	0.087	0.008
		N	92	92	92	92	92	92	92	92	92
	Apr	Person's r	0.062	0.024	0.127	0.179	0.093	0.138	0.061	-0.019	-0.011
		N	92	92	92	92	92	92	92	92	92
	May	Person's r	-0.385	-0.399	0.186	-0.048	-0.268	-0.051	0.171	0.224	-0.256
		N	92	92	92	92	92	92	92	92	92
	Jun	Person's r	-0.413	-0.400	0.275	-0.221	-0.127	-0.131	0.159	0.285	-0.281
		N	92	92	92	92	92	92	92	92	92
	Jul	Person's r	-0.257	-0.294	0.280	0.027	0.163	-0.040	-0.073	0.330	-0.292
		N	92	92	92	92	92	92	92	92	92
	Aug	Person's r	-0.050	0.036	-0.206	-0.205	0.189	0.229	0.370	-0.105	0.099
		N	92	92	92	92	92	92	92	92	92
	Sep	Person's r	-0.460	-0.387	0.173	-0.371	-0.111	-0.232	0.365	0.233	-0.219
		N	92	92	92	92	92	92	92	92	92
	Oct	Person's r	-0.107	-0.032	0.157	-0.256	0.192	0.043	0.352	-0.057	0.121
		N	92	92	92	92	92	92	92	92	92
	Nov	Person's r	-0.320	-0.201	0.070	-0.512	-0.073	-0.110	0.537	-0.025	0.017
		N	92	92	92	92	92	92	92	92	92
	Dec	Person's r	-0.416	-0.412	0.356	-0.212	-0.095	-0.169	0.140	0.357	-0.309
		N	92	92	92	92	92	92	92	92	92
	Annual mean	Person's r	-0.332	-0.294	0.251	-0.212	-0.009	-0.094	0.283	0.175	-0.139
		N	92	92	92	92	92	92	92	92	92
	DJF	Person's r	-0.364	-0.366	0.426	-0.106	-0.029	-0.214	0.124	0.306	-0.217
		N	92	92	92	92	92	92	92	92	92
	MAM	Person's r	-0.211	-0.206	0.256	-0.061	-0.055	-0.060	0.221	0.143	-0.112
		N	92	92	92	92	92	92	92	92	92
	JJA	Person's r	-0.272	-0.252	0.124	-0.142	0.079	0.030	0.158	0.187	-0.180
		N	92	92	92	92	92	92	92	92	92
	SON	Person's r	-0.307	-0.204	0.114	-0.434	-0.020	-0.085	0.473	0.026	-0.005
		N	92	92	92	92	92	92	92	92	92
El Niño 3		Person's r	-0.567	-0.620	0.481	-0.073	-0.189	-0.435	-0.095	0.683	-0.621
		N	75	75	75	75	75	75	75	75	75
SAB		Person's r	0.284	0.268	0.275	0.409	0.235	0.006	-0.202	-0.169	0.408
		N	71	71	71	71	71	71	71	71	71

A7 (Continued) Correlation matrix of Laguna Aculeo. 9-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
Temperature CRU TS 2.1	Jan	Person's r	-0.629	-0.509	0.120	-0.049	-0.628	0.604	0.695	0.687	0.366	0.457
		N	92	92	92	92	92	92	92	92	92	92
	Feb	Person's r	-0.442	-0.366	-0.042	-0.259	-0.444	0.437	0.574	0.551	0.176	0.238
		N	92	92	92	92	92	92	92	92	92	92
	Mar	Person's r	-0.303	-0.170	0.094	0.164	-0.301	0.218	0.355	0.322	0.241	0.248
		N	92	92	92	92	92	92	92	92	92	92
	Apr	Person's r	0.180	0.200	0.107	0.358	0.183	-0.051	-0.205	-0.193	-0.263	-0.264
		N	92	92	92	92	92	92	92	92	92	92
	May	Person's r	-0.239	-0.312	0.074	-0.089	-0.238	0.498	0.184	0.257	-0.268	-0.132
		N	92	92	92	92	92	92	92	92	92	92
	Jun	Person's r	0.037	0.130	0.206	0.242	0.041	0.180	0.019	0.042	0.028	0.060
		N	92	92	92	92	92	92	92	92	92	92
	Jul	Person's r	0.060	-0.067	-0.341	-0.233	0.053	0.063	-0.042	-0.025	-0.466	-0.413
		N	92	92	92	92	92	92	92	92	92	92
	Aug	Person's r	0.071	-0.012	-0.133	0.038	0.068	-0.102	-0.159	-0.157	-0.400	-0.399
		N	92	92	92	92	92	92	92	92	92	92
	Sep	Person's r	0.010	0.089	0.156	0.158	0.013	0.164	0.077	0.080	0.009	0.031
		N	92	92	92	92	92	92	92	92	92	92
	Oct	Person's r	-0.219	-0.133	-0.083	-0.001	-0.221	0.214	0.310	0.283	0.139	0.161
		N	92	92	92	92	92	92	92	92	92	92
	Nov	Person's r	-0.567	-0.498	0.031	-0.234	-0.567	0.550	0.592	0.591	0.221	0.307
		N	92	92	92	92	92	92	92	92	92	92
	Dec	Person's r	-0.619	-0.553	0.007	-0.193	-0.621	0.584	0.639	0.637	0.224	0.321
		N	92	92	92	92	92	92	92	92	92	92
	Annual Mean	Person's r	-0.349	-0.285	0.031	-0.029	-0.349	0.420	0.400	0.403	0.049	0.122
		N	92	92	92	92	92	92	92	92	92	92
	DJF	Person's r	-0.597	-0.505	0.028	-0.179	-0.598	0.574	0.675	0.663	0.271	0.359
		N	92	92	92	92	92	92	92	92	92	92
	MAM	Person's r	-0.190	-0.150	0.112	0.161	-0.188	0.302	0.185	0.203	-0.084	-0.023
		N	92	92	92	92	92	92	92	92	92	92
	JJA	Person's r	0.078	0.038	-0.097	0.043	0.076	0.096	-0.070	-0.048	-0.363	-0.319
		N	92	92	92	92	92	92	92	92	92	92
	SON	Person's r	-0.337	-0.244	0.036	-0.050	-0.337	0.390	0.416	0.406	0.157	0.212
		N	92	92	92	92	92	92	92	92	92	92
Temperature HadCRUT3	Jan	Person's r	-0.703	-0.595	0.080	-0.261	-0.702	0.476	0.737	0.698	0.556	0.604
		N	92	92	92	92	92	92	92	92	92	92
	Feb	Person's r	-0.498	-0.407	-0.057	-0.080	-0.500	0.472	0.561	0.548	0.270	0.343
		N	92	92	92	92	92	92	92	92	92	92
	Mar	Person's r	-0.480	-0.336	-0.049	-0.196	-0.481	0.243	0.570	0.511	0.620	0.610
		N	92	92	92	92	92	92	92	92	92	92
	Apr	Person's r	-0.518	-0.347	-0.019	0.005	-0.519	0.321	0.584	0.539	0.626	0.637
		N	92	92	92	92	92	92	92	92	92	92
	May	Person's r	-0.465	-0.385	0.056	-0.209	-0.464	0.447	0.535	0.530	0.390	0.456
		N	92	92	92	92	92	92	92	92	92	92
	Jun	Person's r	-0.369	-0.301	0.072	-0.202	-0.368	0.516	0.518	0.526	0.266	0.352
		N	92	92	92	92	92	92	92	92	92	92
	Jul	Person's r	-0.412	-0.407	-0.026	-0.353	-0.413	0.514	0.534	0.544	0.154	0.253
		N	92	92	92	92	92	92	92	92	92	92
	Aug	Person's r	-0.404	-0.325	-0.207	-0.182	-0.409	0.359	0.539	0.509	0.288	0.335
		N	92	92	92	92	92	92	92	92	92	92
	Sep	Person's r	-0.197	-0.052	0.027	0.095	-0.197	0.136	0.337	0.289	0.390	0.374
		N	92	92	92	92	92	92	92	92	92	92
	Oct	Person's r	-0.511	-0.348	-0.066	0.009	-0.513	0.349	0.580	0.539	0.563	0.589
		N	92	92	92	92	92	92	92	92	92	92
	Nov	Person's r	-0.589	-0.513	-0.044	-0.325	-0.591	0.577	0.717	0.701	0.360	0.448
		N	92	92	92	92	92	92	92	92	92	92
	Dec	Person's r	-0.627	-0.517	-0.099	-0.163	-0.630	0.474	0.652	0.626	0.440	0.502
		N	92	92	92	92	92	92	92	92	92	92
	Annual Mean	Person's r	-0.570	-0.448	-0.025	-0.182	-0.571	0.481	0.674	0.645	0.487	0.544
		N	92	92	92	92	92	92	92	92	92	92
	DJF	Person's r	-0.652	-0.542	-0.027	-0.178	-0.653	0.511	0.697	0.669	0.449	0.515
		N	92	92	92	92	92	92	92	92	92	92
	MAM	Person's r	-0.540	-0.395	-0.006	-0.152	-0.541	0.371	0.624	0.583	0.607	0.630
		N	92	92	92	92	92	92	92	92	92	92
	JJA	Person's r	-0.433	-0.379	-0.035	-0.274	-0.434	0.525	0.582	0.581	0.257	0.346
		N	92	92	92	92	92	92	92	92	92	92
	SON	Person's r	-0.475	-0.332	-0.029	-0.077	-0.476	0.388	0.600	0.561	0.486	0.521
		N	92	92	92	92	92	92	92	92	92	92

A7 (Continued) Correlation matrix of Laguna Aculeo. 9-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
Precipitation HadCRUT3	Jan	Person's r	0.317	0.295	-0.073	0.407	0.316	-0.338	-0.393	-0.396	-0.393	-0.438
		N	92	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.195	0.212	-0.128	0.323	0.192	-0.090	-0.157	-0.159	-0.244	-0.244
		N	92	92	92	92	92	92	92	92	92	92
	Mar	Person's r	-0.045	0.045	-0.182	0.061	-0.049	-0.165	0.185	0.104	0.140	0.068
		N	92	92	92	92	92	92	92	92	92	92
	Apr	Person's r	0.157	0.195	0.267	0.102	0.164	-0.154	-0.105	-0.126	-0.018	-0.068
		N	92	92	92	92	92	92	92	92	92	92
	May	Person's r	0.443	0.434	-0.142	0.123	0.441	-0.482	-0.407	-0.436	-0.186	-0.287
		N	92	92	92	92	92	92	92	92	92	92
	Jun	Person's r	0.646	0.581	0.044	0.574	0.649	-0.589	-0.751	-0.736	-0.454	-0.544
		N	92	92	92	92	92	92	92	92	92	92
	Jul	Person's r	-0.135	-0.112	-0.321	-0.076	-0.143	0.038	0.195	0.170	0.243	0.237
		N	92	92	92	92	92	92	92	92	92	92
	Aug	Person's r	0.066	0.064	-0.238	0.187	0.061	-0.190	-0.035	-0.074	-0.173	-0.209
		N	92	92	92	92	92	92	92	92	92	92
	Sep	Person's r	0.253	0.163	-0.251	-0.054	0.248	-0.299	-0.413	-0.393	-0.228	-0.270
		N	92	92	92	92	92	92	92	92	92	92
	Oct	Person's r	0.150	0.166	-0.068	0.380	0.149	-0.076	-0.210	-0.188	-0.148	-0.137
		N	92	92	92	92	92	92	92	92	92	92
	Nov	Person's r	-0.120	-0.105	-0.235	-0.159	-0.126	0.135	0.054	0.081	0.175	0.210
		N	92	92	92	92	92	92	92	92	92	92
	Dec	Person's r	0.115	0.209	-0.293	0.255	0.108	-0.304	0.028	-0.050	0.055	-0.036
		N	92	92	92	92	92	92	92	92	92	92
	Total annual	Person's r	0.536	0.515	-0.332	0.374	0.530	-0.627	-0.543	-0.577	-0.270	-0.391
		N	92	92	92	92	92	92	92	92	92	92
	DJF	Person's r	0.314	0.365	-0.265	0.499	0.309	-0.386	-0.251	-0.299	-0.276	-0.351
		N	92	92	92	92	92	92	92	92	92	92
	MAM	Person's r	0.435	0.440	-0.093	0.138	0.433	-0.485	-0.380	-0.418	-0.164	-0.272
		N	92	92	92	92	92	92	92	92	92	92
	JJA	Person's r	0.318	0.294	-0.285	0.366	0.312	-0.400	-0.327	-0.351	-0.181	-0.253
		N	92	92	92	92	92	92	92	92	92	92
	SON	Person's r	0.198	0.146	-0.304	0.059	0.191	-0.193	-0.364	-0.330	-0.156	-0.168
		N	92	92	92	92	92	92	92	92	92	92
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	92	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	92	92	92	92	92	92	92	92	92	92
	Mar	Person's r	-0.111	-0.016	0.301	0.171	-0.105	-0.089	0.115	0.066	0.320	0.258
		N	92	92	92	92	92	92	92	92	92	92
	Apr	Person's r	-0.031	0.031	0.099	-0.099	-0.028	0.107	0.109	0.101	0.097	0.097
		N	92	92	92	92	92	92	92	92	92	92
	May	Person's r	0.113	0.128	-0.088	-0.053	0.111	-0.011	-0.050	-0.052	-0.153	-0.152
		N	92	92	92	92	92	92	92	92	92	92
	Jun	Person's r	0.539	0.453	-0.160	0.257	0.537	-0.456	-0.560	-0.545	-0.392	-0.444
		N	92	92	92	92	92	92	92	92	92	92
	Jul	Person's r	-0.297	-0.252	-0.111	-0.045	-0.300	0.051	0.319	0.276	0.333	0.317
		N	92	92	92	92	92	92	92	92	92	92
	Aug	Person's r	0.023	0.033	-0.137	0.076	0.019	-0.139	0.056	0.007	-0.136	-0.167
		N	92	92	92	92	92	92	92	92	92	92
	Sep	Person's r	0.124	0.090	0.001	0.085	0.125	-0.193	-0.198	-0.202	-0.138	-0.170
		N	92	92	92	92	92	92	92	92	92	92
	Oct	Person's r	-0.136	-0.161	-0.122	0.125	-0.139	0.134	0.131	0.135	-0.149	-0.102
		N	92	92	92	92	92	92	92	92	92	92
	Nov	Person's r	-0.245	-0.259	-0.183	-0.126	-0.249	0.179	0.192	0.202	0.078	0.125
		N	92	92	92	92	92	92	92	92	92	92
	Dec	Person's r	-0.172	-0.115	-0.051	0.103	-0.173	0.124	0.269	0.248	0.198	0.206
		N	92	92	92	92	92	92	92	92	92	92
	Total annual	Person's r	0.129	0.125	-0.254	0.122	0.124	-0.243	-0.074	-0.114	-0.149	-0.191
		N	92	92	92	92	92	92	92	92	92	92
	DJF	Person's r	-0.172	-0.115	-0.051	0.103	-0.173	0.124	0.269	0.248	0.198	0.206
		N	92	92	92	92	92	92	92	92	92	92
	MAM	Person's r	0.082	0.118	-0.029	-0.062	0.081	0.014	-0.006	-0.013	-0.085	-0.088
		N	92	92	92	92	92	92	92	92	92	92
	JJA	Person's r	0.155	0.136	-0.262	0.181	0.149	-0.343	-0.109	-0.158	-0.095	-0.157
		N	92	92	92	92	92	92	92	92	92	92
	SON	Person's r	-0.070	-0.114	-0.134	0.059	-0.074	-0.015	-0.015	-0.011	-0.133	-0.117
		N	92	92	92	92	92	92	92	92	92	92

A7 (Continued) Correlation matrix of Laguna Aculeo. 9-year filtered data

			Bsi					C and N				
			bSi µg/g	bSi Flux	Al µg/g	Fe µg/g	Si µg/g	C/N	N %	TOC %	N Flux	TOC Flux
SOI	Jan	Person's r	0.249	0.114	-0.076	0.136	0.247	-0.152	-0.325	-0.290	-0.481	-0.467
		N	92	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.052	-0.043	0.065	-0.175	0.053	0.142	-0.248	-0.161	-0.497	-0.409
		N	92	92	92	92	92	92	92	92	92	92
	Mar	Person's r	0.048	0.042	0.272	-0.039	0.053	0.201	-0.173	-0.090	-0.346	-0.255
		N	92	92	92	92	92	92	92	92	92	92
	Apr	Person's r	0.063	-0.024	0.020	0.064	0.063	0.032	-0.076	-0.048	-0.330	-0.288
		N	92	92	92	92	92	92	92	92	92	92
	May	Person's r	0.194	-0.138	-0.142	-0.056	0.192	-0.154	-0.318	-0.278	-0.455	-0.434
		N	92	92	92	92	92	92	92	92	92	92
	Jun	Person's r	0.250	0.091	0.075	-0.120	0.252	-0.135	-0.394	-0.339	-0.435	-0.419
		N	92	92	92	92	92	92	92	92	92	92
	Jul	Person's r	0.394	0.253	-0.331	-0.354	0.388	-0.156	-0.465	-0.407	-0.699	-0.669
		N	92	92	92	92	92	92	92	92	92	92
	Aug	Person's r	-0.090	-0.243	-0.235	-0.606	-0.096	0.298	0.053	0.117	-0.267	-0.166
		N	92	92	92	92	92	92	92	92	92	92
	Sep	Person's r	0.194	-0.067	-0.225	-0.292	0.190	0.046	-0.309	-0.229	-0.514	-0.441
		N	92	92	92	92	92	92	92	92	92	92
	Oct	Person's r	-0.086	-0.215	-0.102	-0.320	-0.089	0.298	-0.078	0.010	-0.427	-0.311
		N	92	92	92	92	92	92	92	92	92	92
	Nov	Person's r	-0.069	-0.145	0.080	-0.309	-0.067	0.260	-0.085	0.000	-0.307	-0.205
		N	92	92	92	92	92	92	92	92	92	92
	Dec	Person's r	0.297	0.155	0.039	-0.148	0.298	-0.133	-0.484	-0.412	-0.587	-0.560
		N	92	92	92	92	92	92	92	92	92	92
	Annual mean	Person's r	0.153	-0.019	-0.076	-0.240	0.151	0.066	-0.306	-0.222	-0.558	-0.483
		N	92	92	92	92	92	92	92	92	92	92
	DJF	Person's r	0.246	0.099	-0.012	-0.076	0.247	-0.049	-0.426	-0.347	-0.624	-0.570
		N	92	92	92	92	92	92	92	92	92	92
	MAM	Person's r	0.123	-0.027	0.028	0.025	0.124	0.047	-0.234	-0.170	-0.418	-0.360
		N	92	92	92	92	92	92	92	92	92	92
	JJA	Person's r	0.210	0.042	-0.178	-0.421	0.207	-0.003	-0.304	-0.240	-0.531	-0.480
		N	92	92	92	92	92	92	92	92	92	92
	SON	Person's r	-0.015	-0.165	-0.057	-0.344	-0.016	0.231	-0.133	-0.047	-0.374	-0.274
		N	92	92	92	92	92	92	92	92	92	92
El Niño 3		Person's r	0.664	0.744	-0.238	0.019	0.660	-0.451	-0.693	-0.662	-0.650	-0.693
		N	75	75	75	75	75	75	75	75	75	75
SAB		Person's r	-0.251	-0.233	0.155	0.328	-0.248	0.246	0.183	0.196	0.031	0.080
		N	71	71	71	71	71	71	71	71	71	71

A7 (Continued) Correlation matrix of Laguna Aculeo. 9-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	0.364	-0.188	-0.272	0.278	0.222	0.305	0.357	0.307	0.209	0.357	0.323	0.408	-0.048	-0.462
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.068	-0.404	-0.227	0.219	0.237	0.260	0.233	0.046	-0.147	0.233	0.104	0.325	-0.337	-0.428
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Mar	Person's r	-0.034	-0.203	-0.047	0.036	0.028	0.064	0.071	-0.037	-0.155	0.071	-0.012	0.145	-0.143	-0.251
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Apr	Person's r	-0.386	0.366	0.459	-0.494	-0.513	-0.483	-0.451	-0.381	-0.265	-0.451	-0.421	-0.427	0.243	0.333
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	May	Person's r	-0.036	0.065	0.093	-0.118	-0.147	-0.099	-0.065	-0.034	-0.029	-0.065	-0.053	-0.045	0.125	-0.032
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Jun	Person's r	-0.097	0.072	0.133	-0.123	-0.122	-0.099	-0.099	-0.140	-0.130	-0.099	-0.131	-0.049	-0.041	0.006
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Jul	Person's r	-0.025	0.019	0.034	-0.037	-0.042	-0.025	-0.020	0.005	0.038	-0.020	-0.001	-0.028	0.052	0.032
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Aug	Person's r	-0.163	0.012	0.108	-0.141	-0.167	-0.150	-0.120	-0.054	-0.028	-0.120	-0.084	-0.141	0.182	0.101
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Sep	Person's r	-0.118	0.185	0.251	-0.229	-0.267	-0.206	-0.150	-0.117	-0.079	-0.150	-0.140	-0.106	0.165	0.063
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Oct	Person's r	0.143	-0.053	-0.059	0.082	0.042	0.102	0.148	0.138	0.105	0.148	0.139	0.181	0.032	-0.198
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Nov	Person's r	0.174	-0.380	-0.298	0.269	0.263	0.299	0.290	0.145	-0.024	0.290	0.191	0.358	-0.260	-0.468
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Dec	Person's r	0.364	-0.262	-0.312	0.311	0.247	0.333	0.394	0.360	0.245	0.394	0.370	0.431	-0.012	-0.487
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Annual Mean	Person's r	0.060	-0.123	-0.052	0.044	0.014	0.075	0.106	0.051	-0.021	0.106	0.062	0.163	-0.035	-0.250
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	DJF	Person's r	0.280	-0.304	-0.287	0.286	0.251	0.318	0.348	0.251	0.107	0.348	0.281	0.412	-0.143	-0.488
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	MAM	Person's r	-0.159	0.049	0.168	-0.195	-0.218	-0.170	-0.141	-0.158	-0.175	-0.141	-0.167	-0.089	0.064	-0.026
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	JJA	Person's r	-0.132	0.054	0.135	-0.143	-0.155	-0.126	-0.113	-0.100	-0.069	-0.113	-0.109	-0.096	0.071	0.057
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	SON	Person's r	0.092	-0.126	-0.067	0.071	0.040	0.101	0.135	0.077	0.002	0.135	0.090	0.195	-0.046	-0.266
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
Temperature HadCRUT3	Jan	Person's r	0.485	-0.441	-0.505	0.511	0.449	0.521	0.575	0.498	0.328	0.575	0.522	0.610	-0.043	-0.655
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.321	-0.335	-0.353	0.356	0.323	0.379	0.399	0.306	0.186	0.399	0.338	0.450	-0.110	-0.497
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Mar	Person's r	0.266	-0.478	-0.388	0.404	0.405	0.424	0.417	0.258	0.060	0.417	0.306	0.484	-0.260	-0.540
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Apr	Person's r	0.307	-0.294	-0.313	0.323	0.294	0.345	0.367	0.259	0.122	0.367	0.290	0.428	-0.139	-0.494
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	May	Person's r	0.307	-0.203	-0.251	0.269	0.226	0.287	0.333	0.284	0.178	0.333	0.296	0.373	-0.012	-0.411
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Jun	Person's r	0.136	-0.308	-0.190	0.213	0.229	0.261	0.237	0.070	-0.069	0.238	0.121	0.335	-0.298	-0.419
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Jul	Person's r	0.173	-0.261	-0.189	0.203	0.195	0.241	0.247	0.147	0.031	0.247	0.175	0.311	-0.147	-0.377
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Aug	Person's r	0.223	-0.310	-0.246	0.275	0.265	0.309	0.317	0.201	0.070	0.317	0.236	0.382	-0.170	-0.426
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Sep	Person's r	0.156	0.065	0.026	0.024	-0.040	0.044	0.123	0.140	0.123	0.123	0.127	0.164	0.139	-0.170
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Oct	Person's r	0.503	-0.130	-0.329	0.374	0.286	0.381	0.472	0.483	0.415	0.472	0.481	0.488	0.142	-0.461
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Nov	Person's r	0.282	-0.524	-0.411	0.425	0.430	0.463	0.446	0.262	0.061	0.446	0.320	0.533	-0.309	-0.607
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Dec	Person's r	0.432	-0.285	-0.390	0.394	0.325	0.403	0.468	0.431	0.312	0.468	0.441	0.495	0.041	-0.532
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Annual Mean	Person's r	0.354	-0.348	-0.352	0.373	0.336	0.401	0.435	0.330	0.179	0.435	0.361	0.499	-0.116	-0.552
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	DJF	Person's r	0.441	-0.382	-0.446	0.451	0.393	0.467	0.515	0.439	0.292	0.515	0.463	0.556	-0.045	-0.603
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	MAM	Person's r	0.325	-0.366	-0.354	0.371	0.346	0.393	0.415	0.296	0.131	0.415	0.330	0.477	-0.156	-0.536
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	JJA	Person's r	0.188	-0.322	-0.224	0.248	0.249	0.293	0.287	0.142	0.000	0.287	0.186	0.373	-0.236	-0.447
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	SON	Person's r	0.346	-0.210	-0.258	0.298	0.244	0.323	0.380	0.325	0.221	0.380	0.340	0.433	-0.005	-0.452
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92

A7 (Continued) Correlation matrix of Laguna Aculeo. 9-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation HadCRUT3	Jan	Person's r	-0.272	0.156	0.209	-0.237	-0.206	-0.238	-0.281	-0.286	-0.203	-0.281	-0.283	-0.284	-0.027	0.259
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Feb	Person's r	-0.052	0.632	0.446	-0.412	-0.501	-0.411	-0.293	-0.064	0.166	-0.294	-0.146	-0.326	0.551	0.373
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Mar	Person's r	-0.104	-0.061	0.088	-0.065	-0.075	-0.051	-0.028	-0.045	-0.090	-0.028	-0.049	0.004	0.027	-0.020
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Apr	Person's r	-0.333	0.012	0.233	-0.259	-0.238	-0.244	-0.258	-0.309	-0.337	-0.258	-0.308	-0.210	-0.054	0.107
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	May	Person's r	-0.359	0.017	0.254	-0.234	-0.195	-0.237	-0.259	-0.273	-0.283	-0.259	-0.279	-0.250	-0.012	0.256
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Jun	Person's r	-0.475	0.552	0.573	-0.586	-0.574	-0.607	-0.606	-0.446	-0.222	-0.606	-0.506	-0.658	0.313	0.685
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Jul	Person's r	0.350	-0.135	-0.288	0.329	0.321	0.329	0.329	0.307	0.272	0.329	0.328	0.315	-0.091	-0.235
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Aug	Person's r	0.021	0.193	0.096	-0.089	-0.111	-0.085	-0.065	-0.015	0.077	-0.065	-0.027	-0.077	0.104	0.089
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Sep	Person's r	-0.122	0.032	0.023	-0.060	-0.039	-0.093	-0.119	-0.070	-0.030	-0.119	-0.083	-0.175	0.048	0.197
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Oct	Person's r	0.191	0.585	0.234	-0.190	-0.294	-0.214	-0.092	0.187	0.436	-0.092	0.101	-0.177	0.600	0.306
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Nov	Person's r	0.372	-0.059	-0.277	0.298	0.261	0.279	0.310	0.367	0.366	0.310	0.360	0.263	0.085	-0.180
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Dec	Person's r	-0.217	-0.010	0.147	-0.134	-0.099	-0.115	-0.149	-0.222	-0.238	-0.149	-0.203	-0.107	-0.128	0.085
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Total annual	Person's r	-0.250	0.300	0.321	-0.296	-0.287	-0.311	-0.306	-0.210	-0.082	-0.306	-0.243	-0.346	0.184	0.410
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	DJF	Person's r	-0.286	0.362	0.394	-0.385	-0.390	-0.374	-0.362	-0.301	-0.164	-0.362	-0.326	-0.353	0.165	0.349
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	MAM	Person's r	-0.402	0.014	0.285	-0.270	-0.231	-0.269	-0.290	-0.314	-0.332	-0.290	-0.320	-0.270	-0.019	0.255
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	JJA	Person's r	-0.041	0.317	0.189	-0.167	-0.174	-0.177	-0.167	-0.068	0.080	-0.167	-0.094	-0.212	0.169	0.285
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	SON	Person's r	0.144	0.248	0.005	-0.004	-0.048	-0.045	0.001	0.177	0.312	0.001	0.128	-0.096	0.324	0.200
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
Precipitation CRU TS 2.1	Jan	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Mar	Person's r	0.077	-0.173	-0.125	0.124	0.098	0.117	0.146	0.138	0.070	0.146	0.137	0.153	0.009	-0.164
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Apr	Person's r	-0.239	-0.164	0.082	-0.100	-0.072	-0.078	-0.102	-0.223	-0.335	-0.102	-0.197	-0.029	-0.183	-0.080
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	May	Person's r	-0.204	-0.161	0.072	-0.058	-0.038	-0.045	-0.057	-0.113	-0.186	-0.057	-0.103	-0.022	-0.070	0.001
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Jun	Person's r	-0.338	0.354	0.378	-0.362	-0.320	-0.376	-0.409	-0.326	-0.179	-0.409	-0.354	-0.450	0.138	0.515
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Jul	Person's r	0.524	-0.189	-0.419	0.448	0.398	0.440	0.481	0.502	0.462	0.480	0.510	0.449	-0.003	-0.373
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Aug	Person's r	0.003	0.167	0.114	-0.104	-0.136	-0.095	-0.060	-0.011	0.064	-0.060	-0.027	-0.058	0.136	0.058
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Sep	Person's r	-0.078	-0.095	-0.034	0.010	0.016	-0.005	-0.016	-0.013	-0.035	-0.016	-0.015	-0.031	0.002	0.023
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Oct	Person's r	0.344	0.330	0.018	0.023	-0.081	0.013	0.129	0.344	0.512	0.129	0.280	0.065	0.466	0.037
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Nov	Person's r	0.450	0.033	-0.243	0.262	0.185	0.248	0.326	0.450	0.491	0.326	0.418	0.271	0.242	-0.197
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Dec	Person's r	-0.082	-0.008	0.034	-0.052	-0.005	-0.026	-0.082	-0.197	-0.238	-0.082	-0.160	-0.030	-0.239	-0.037
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Total annual	Person's r	0.069	0.054	0.011	0.022	-0.005	0.018	0.050	0.115	0.161	0.050	0.097	0.025	0.142	0.038
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	DJF	Person's r	-0.082	-0.008	0.034	-0.052	-0.005	-0.026	-0.082	-0.197	-0.238	-0.082	-0.160	-0.030	-0.239	-0.037
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	MAM	Person's r	-0.236	-0.195	0.076	-0.069	-0.046	-0.052	-0.068	-0.149	-0.247	-0.068	-0.134	-0.017	-0.110	-0.032
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	JJA	Person's r	0.157	0.191	0.011	0.026	0.000	0.016	0.043	0.141	0.251	0.044	0.120	-0.005	0.166	0.103
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	SON	Person's r	0.286	0.072	-0.133	0.140	0.066	0.117	0.192	0.338	0.407	0.192	0.296	0.128	0.301	-0.059
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92

A7 (Continued) Correlation matrix of Laguna Aculeo. 9-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec. Surf.	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
SOI	Jan	Person's r	-0.075	0.209	0.156	-0.150	-0.168	-0.161	-0.142	-0.036	0.072	-0.142	-0.066	-0.193	0.197	0.247
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.100	0.121	-0.046	0.012	-0.023	-0.013	0.013	0.128	0.216	0.013	0.099	-0.058	0.214	0.088
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Mar	Person's r	0.059	0.069	-0.026	0.010	-0.003	0.002	0.005	0.059	0.119	0.005	0.049	-0.030	0.083	0.049
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Apr	Person's r	-0.093	0.084	0.124	-0.122	-0.124	-0.112	-0.110	-0.079	-0.036	-0.110	-0.089	-0.116	0.058	0.110
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	May	Person's r	-0.039	0.203	0.098	-0.114	-0.125	-0.133	-0.125	-0.018	0.085	-0.125	-0.047	-0.190	0.179	0.234
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Jun	Person's r	-0.218	0.084	0.159	-0.182	-0.170	-0.202	-0.212	-0.153	-0.102	-0.212	-0.174	-0.252	0.085	0.255
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Jul	Person's r	-0.369	0.015	0.220	-0.246	-0.197	-0.253	-0.299	-0.283	-0.250	-0.299	-0.291	-0.320	-0.026	0.310
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Aug	Person's r	-0.012	-0.170	-0.094	0.076	0.107	0.085	0.049	-0.009	-0.066	0.049	0.010	0.057	-0.142	-0.098
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Sep	Person's r	-0.058	0.097	0.036	-0.061	-0.039	-0.078	-0.102	-0.047	0.015	-0.102	-0.058	-0.154	0.045	0.187
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Oct	Person's r	0.033	-0.265	-0.233	0.181	0.212	0.170	0.118	0.073	0.021	0.118	0.094	0.097	-0.131	-0.123
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Nov	Person's r	0.100	-0.220	-0.249	0.216	0.249	0.205	0.151	0.106	0.065	0.151	0.131	0.127	-0.145	-0.123
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Dec	Person's r	-0.208	0.028	0.083	-0.133	-0.104	-0.156	-0.193	-0.147	-0.094	-0.193	-0.159	-0.243	0.023	0.238
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	Annual mean	Person's r	-0.082	0.016	0.018	-0.049	-0.035	-0.063	-0.085	-0.042	0.001	-0.086	-0.052	-0.129	0.037	0.137
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	DJF	Person's r	-0.100	0.152	0.102	-0.133	-0.139	-0.154	-0.154	-0.055	0.042	-0.154	-0.082	-0.217	0.156	0.241
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	MAM	Person's r	-0.039	0.161	0.102	-0.108	-0.120	-0.113	-0.106	-0.030	0.054	-0.106	-0.050	-0.144	0.129	0.165
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	JJA	Person's r	-0.229	-0.045	0.099	-0.126	-0.089	-0.132	-0.169	-0.167	-0.163	-0.169	-0.170	-0.188	-0.041	0.169
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	SON	Person's r	0.053	-0.164	-0.186	0.148	0.177	0.135	0.091	0.071	0.048	0.091	0.085	0.061	-0.094	-0.059
		N	92	92	92	92	92	92	92	92	92	92	92	92	92	92
	El Niño 3	Person's r	-0.445	0.455	0.515	-0.514	-0.484	-0.526	-0.539	-0.414	-0.220	-0.539	-0.459	-0.583	0.211	0.622
		N	75	75	75	75	75	75	75	75	75	75	75	75	75	75
	SAB	Person's r	0.390	0.297	-0.026	0.039	-0.100	0.024	0.169	0.391	0.524	0.169	0.325	0.108	0.490	-0.052
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71

A8 Correlation matrix of Laguna Negra. Non-filtered data

			Spectrolino								
			RABD660;670	R590/640	RABD510	RABD550	RABD480	Chlorin	RABD720	Total Absorbtion	Clastic input
Temperature CRU TS 2.1	Jan	Person's r	0.414	-0.359	0.227	-0.082	0.324	-0.325	0.125	-0.281	-0.319
		N	89	89	89	89	89	89	89	89	89
	Feb	Person's r	0.363	-0.246	0.094	-0.113	0.132	-0.315	-0.042	-0.126	-0.177
		N	89	89	89	89	89	89	89	89	89
	Mar	Person's r	0.281	-0.146	0.073	-0.046	0.087	-0.238	-0.015	-0.066	-0.108
		N	89	89	89	89	89	89	89	89	89
	Apr	Person's r	-0.003	0.007	-0.011	-0.076	0.012	-0.076	-0.044	0.083	0.021
		N	89	89	89	89	89	89	89	89	89
	May	Person's r	0.199	-0.089	-0.018	-0.222	0.087	-0.158	0.084	-0.014	-0.043
		N	89	89	89	89	89	89	89	89	89
	Jun	Person's r	0.159	-0.100	0.119	0.063	0.088	-0.002	-0.079	-0.147	-0.093
		N	89	89	89	89	89	89	89	89	89
	Jul	Person's r	0.099	-0.036	-0.033	-0.023	-0.055	-0.010	0.005	0.021	-0.007
		N	89	89	89	89	89	89	89	89	89
	Aug	Person's r	-0.063	0.100	-0.120	-0.104	-0.105	0.005	-0.020	0.121	0.113
		N	89	89	89	89	89	89	89	89	89
	Sep	Person's r	0.232	-0.197	0.183	0.134	0.101	-0.088	-0.115	-0.128	-0.185
		N	89	89	89	89	89	89	89	89	89
	Oct	Person's r	0.257	-0.208	0.167	0.040	0.152	-0.131	-0.145	-0.175	-0.162
		N	89	89	89	89	89	89	89	89	89
	Nov	Person's r	0.150	-0.237	0.159	0.048	0.143	-0.290	-0.120	-0.149	-0.193
		N	89	89	89	89	89	89	89	89	89
	Dec	Person's r	0.315	-0.211	0.094	-0.128	0.143	-0.253	-0.241	-0.180	-0.134
		N	89	89	89	89	89	89	89	89	89
	Annual Mean	Person's r	0.417	-0.300	0.164	-0.085	0.193	-0.322	-0.106	-0.185	-0.224
		N	89	89	89	89	89	89	89	89	89
	DJF	Person's r	0.472	-0.353	0.179	-0.140	0.259	-0.386	-0.072	-0.255	-0.272
		N	89	89	89	89	89	89	89	89	89
	MAM	Person's r	0.222	-0.106	0.017	-0.167	0.088	-0.216	0.019	-0.001	-0.060
		N	89	89	89	89	89	89	89	89	89
	JJA	Person's r	0.116	-0.035	0.001	-0.019	-0.022	-0.004	-0.050	-0.022	-0.011
		N	89	89	89	89	89	89	89	89	89
	SON	Person's r	0.315	-0.322	0.253	0.105	0.200	-0.264	-0.190	-0.226	-0.270
		N	89	89	89	89	89	89	89	89	89
Temperature HadCRUT3	Jan	Person's r	0.370	-0.221	0.147	0.057	0.122	-0.272	-0.036	-0.104	-0.175
		N	94	94	94	94	94	94	94	94	94
	Feb	Person's r	0.458	-0.371	0.320	0.209	0.258	-0.304	0.002	-0.296	-0.327
		N	94	94	94	94	94	94	94	94	94
	Mar	Person's r	0.324	-0.265	0.266	0.224	0.206	-0.328	-0.120	-0.161	-0.246
		N	94	94	94	94	94	94	94	94	94
	Apr	Person's r	0.407	-0.335	0.344	0.271	0.306	-0.301	0.076	-0.307	-0.335
		N	94	94	94	94	94	94	94	94	94
	May	Person's r	0.373	-0.275	0.213	0.030	0.248	-0.313	0.038	-0.180	-0.239
		N	94	94	94	94	94	94	94	94	94
	Jun	Person's r	0.446	-0.381	0.307	0.150	0.290	-0.278	-0.033	-0.317	-0.347
		N	94	94	94	94	94	94	94	94	94
	Jul	Person's r	0.493	-0.323	0.218	0.079	0.188	-0.248	-0.015	-0.255	-0.265
		N	94	94	94	94	94	94	94	94	94
	Aug	Person's r	0.355	-0.287	0.240	0.128	0.221	-0.248	-0.073	-0.251	-0.250
		N	94	94	94	94	94	94	94	94	94
	Sep	Person's r	0.479	-0.365	0.318	0.259	0.237	-0.241	-0.058	-0.323	-0.352
		N	94	94	94	94	94	94	94	94	94
	Oct	Person's r	0.437	-0.390	0.371	0.250	0.319	-0.235	-0.150	-0.429	-0.369
		N	94	94	94	94	94	94	94	94	94
	Nov	Person's r	0.414	-0.352	0.261	0.127	0.244	-0.248	0.040	-0.359	-0.312
		N	94	94	94	94	94	94	94	94	94
	Dec	Person's r	0.359	-0.301	0.192	0.035	0.214	-0.291	-0.062	-0.239	-0.264
		N	94	94	94	94	94	94	94	94	94
	Annual Mean	Person's r	0.668	-0.524	0.434	0.246	0.388	-0.453	-0.048	-0.432	-0.472
		N	94	94	94	94	94	94	94	94	94
	DJF	Person's r	0.539	-0.405	0.300	0.140	0.269	-0.392	-0.042	-0.289	-0.348
		N	94	94	94	94	94	94	94	94	94
	MAM	Person's r	0.458	-0.363	0.340	0.215	0.315	-0.390	0.000	-0.269	-0.339
		N	94	94	94	94	94	94	94	94	94
	JJA	Person's r	0.564	-0.433	0.334	0.155	0.306	-0.336	-0.051	-0.359	-0.377
		N	94	94	94	94	94	94	94	94	94
	SON	Person's r	0.553	-0.460	0.393	0.263	0.331	-0.301	-0.067	-0.460	-0.429
		N	94	94	94	94	94	94	94	94	94
El Niño 3		Person's r	-0.092	0.199	-0.124	0.015	-0.139	0.197	0.142	0.191	0.169
		N	67	67	67	67	67	67	67	67	67
SOI		Person's r	0.021	-0.060	0.010	-0.024	0.041	-0.061	-0.006	-0.122	-0.050
		N	66	66	66	66	66	66	66	66	66
SAB		Person's r	0.124	-0.252	0.302	0.165	0.273	-0.105	-0.048	-0.319	-0.282
		N	63	63	63	63	63	63	63	63	63

A8 (continued) Correlation matrix of Laguna Negra. Non-filtered data

			Spectrolino								
			RABD660;670	R590/640	RABD510	RABD550	RABD480	Chlorin	RABD720	Total Absorbtion	Clastic input
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.239	0.378	-0.302	-0.259	-0.213	0.222	-0.163	0.222	0.353
		N	55	55	55	55	55	55	55	55	55
	Feb	Person's r	0.195	-0.164	0.198	0.173	0.135	-0.035	-0.130	-0.072	-0.171
		N	54	54	54	54	54	54	54	54	54
	Mar	Person's r	0.040	-0.102	0.048	0.086	0.001	-0.103	0.024	-0.010	-0.075
		N	56	56	56	56	56	56	56	56	56
	Apr	Person's r	0.243	-0.237	0.194	0.252	0.120	-0.243	-0.092	-0.082	-0.208
		N	56	56	56	56	56	56	56	56	56
	May	Person's r	0.110	-0.180	0.218	0.343	0.111	-0.138	0.128	-0.031	-0.191
		N	56	56	56	56	56	56	56	56	56
	Jun	Person's r	-0.090	0.089	-0.047	-0.083	-0.038	0.105	-0.080	0.031	0.070
		N	56	56	56	56	56	56	56	56	56
	Jul	Person's r	0.127	-0.085	0.130	0.125	0.126	0.029	0.063	-0.127	-0.106
		N	55	55	55	55	55	55	55	55	55
	Aug	Person's r	0.116	0.015	-0.088	-0.144	0.025	-0.020	0.149	0.110	-0.013
		N	55	55	55	55	55	55	55	55	55
	Sep	Person's r	0.179	-0.003	0.001	0.015	0.018	-0.037	0.163	-0.034	0.002
		N	56	56	56	56	56	56	56	56	56
	Oct	Person's r	-0.025	0.000	0.054	-0.002	0.024	0.281	-0.081	-0.232	-0.018
		N	56	56	56	56	56	56	56	56	56
	Nov	Person's r	0.138	-0.035	0.107	0.164	0.028	0.176	-0.168	-0.204	-0.016
		N	56	56	56	56	56	56	56	56	56
	Dec	Person's r	0.016	0.160	-0.169	-0.213	-0.079	0.131	0.304	0.021	0.147
		N	54	54	54	54	54	54	54	54	54
	Total Annual	Person's r	0.226	-0.132	0.170	0.201	0.145	-0.012	0.103	-0.089	-0.162
		N	56	56	56	56	56	56	56	56	56
Precipitation HadCRUT3	Jan	Person's r	-0.183	0.179	-0.138	-0.074	-0.114	0.156	-0.057	0.119	0.160
		N	87	87	87	87	87	87	87	87	87
	Feb	Person's r	0.179	-0.159	0.155	0.059	0.143	-0.054	-0.118	-0.106	-0.159
		N	87	87	87	87	87	87	87	87	87
	Mar	Person's r	-0.051	-0.014	-0.025	-0.084	-0.012	-0.123	-0.054	0.056	0.017
		N	87	87	87	87	87	87	87	87	87
	Apr	Person's r	0.081	0.041	-0.037	-0.031	-0.049	-0.044	-0.103	0.070	0.062
		N	87	87	87	87	87	87	87	87	87
	May	Person's r	-0.027	0.183	-0.153	0.002	-0.207	0.131	0.170	0.253	0.172
		N	87	87	87	87	87	87	87	87	87
	Jun	Person's r	-0.135	0.156	-0.108	0.014	-0.162	0.219	-0.002	0.112	0.134
		N	87	87	87	87	87	87	87	87	87
	Jul	Person's r	0.117	-0.134	0.109	0.104	0.113	-0.038	0.069	-0.122	-0.142
		N	87	87	87	87	87	87	87	87	87
	Aug	Person's r	0.047	-0.011	-0.039	-0.016	0.001	-0.020	0.140	0.046	-0.020
		N	87	87	87	87	87	87	87	87	87
	Sep	Person's r	-0.147	0.156	-0.105	0.016	-0.108	0.098	0.154	0.157	0.125
		N	87	87	87	87	87	87	87	87	87
	Oct	Person's r	-0.075	0.000	0.026	0.006	0.021	0.153	-0.089	-0.123	-0.010
		N	87	87	87	87	87	87	87	87	87
	Nov	Person's r	-0.014	0.023	0.007	-0.007	0.018	0.104	-0.073	-0.093	0.031
		N	87	87	87	87	87	87	87	87	87
	Dec	Person's r	0.088	-0.023	0.012	-0.040	0.065	-0.046	0.240	-0.059	-0.024
		N	87	87	87	87	87	87	87	87	87
	Total Annual	Person's r	-0.027	0.119	-0.098	0.042	-0.131	0.161	0.144	0.137	0.097
		N	87	87	87	87	87	87	87	87	87
	DJF	Person's r	0.063	-0.006	0.015	-0.039	0.061	0.012	0.106	-0.038	-0.016
		N	87	87	87	87	87	87	87	87	87
	MAM	Person's r	-0.003	0.176	-0.152	-0.015	-0.202	0.093	0.116	0.254	0.176
		N	87	87	87	87	87	87	87	87	87
	JJA	Person's r	0.005	0.012	-0.017	0.061	-0.031	0.102	0.092	0.015	-0.009
		N	87	87	87	87	87	87	87	87	87
	SON	Person's r	-0.140	0.121	-0.065	0.012	-0.065	0.163	0.055	0.037	0.097
		N	87	87	87	87	87	87	87	87	87
Precipitation CRU TS 2.1	Jan	Person's r	0.009	0.067	-0.121	-0.154	-0.067	-0.042	0.012	0.106	0.093
		N	89	89	89	89	89	89	89	89	89
	Feb	Person's r	0.095	0.011	0.005	0.111	-0.077	0.232	-0.020	-0.155	0.003
		N	89	89	89	89	89	89	89	89	89
	Mar	Person's r	-0.053	-0.036	0.061	0.034	0.031	-0.101	-0.100	0.041	-0.021
		N	89	89	89	89	89	89	89	89	89
	Apr	Person's r	0.223	-0.158	0.144	0.091	0.115	-0.178	-0.013	-0.090	-0.147
		N	89	89	89	89	89	89	89	89	89
	May	Person's r	-0.003	0.054	-0.051	0.014	-0.133	0.079	0.205	0.139	0.056
		N	89	89	89	89	89	89	89	89	89
	Jun	Person's r	-0.136	0.147	-0.106	-0.086	-0.092	0.144	0.012	0.109	0.136
		N	89	89	89	89	89	89	89	89	89
	Jul	Person's r	0.073	-0.048	0.054	0.092	0.023	0.047	0.012	-0.061	-0.059
		N	89	89	89	89	89	89	89	89	89
	Aug	Person's r	0.108	-0.031	-0.014	0.022	-0.023	-0.026	0.156	0.035	-0.035
		N	89	89	89	89	89	89	89	89	89
	Sep	Person's r	0.005	0.093	-0.037	0.058	-0.109	0.054	0.080	0.101	0.084
		N	89	89	89	89	89	89	89	89	89
	Oct	Person's r	0.003	-0.090	0.043	-0.037	0.103	-0.034	0.003	-0.106	-0.100
		N	89	89	89	89	89	89	89	89	89
	Nov	Person's r	0.107	-0.003	-0.025	-0.091	0.018	0.097	-0.022	-0.104	0.019
		N	89	89	89	89	89	89	89	89	89
	Dec	Person's r	0.056	-0.168	0.123	-0.077	0.278	-0.258	0.166	-0.117	-0.168
		N	89	89	89	89	89	89	89	89	89
	Total Annual	Person's r	0.053	0.026	-0.023	0.024	-0.066	0.078	0.153	0.063	0.018
		N	89	89	89	89	89	89	89	89	89
	DJF	Person's r	0.016	0.042	-0.036	0.015	-0.051	0.099	0.089	0.044	0.027
		N	89	89	89	89	89	89	89	89	89
	MAM	Person's r	0.045	0.015	-0.012	-0.013	-0.013	0.055	0.052	-0.025	0.011
		N	89	89	89	89	89	89	89	89	89
	JJA	Person's r	0.095	-0.073	0.024	-0.066	0.109	-0.063	0.106	-0.112	-0.064
		N	89	89	89	89	89	89	89	89	89
	SON	Person's r	0.057	-0.005	0.008	0.045	-0.078	0.000	0.162	0.101	0.002
		N	89	89	89	89	89	89	89	89	89

A8 (continued) Correlation matrix of Laguna Negra. Non-filtered data

			Bsi						C, N und C/N				
			Al µg/g	Fe µg/g	Si µg/g	Si non Biol µg/g	Bsi Flux	bSi µg/g	N %	TOC %	N Flux	TOC Flux	C/N
Temperature CRU TS 2.1	Jan	Person's r	-0.139	-0.063	0.063	-0.139	0.128	0.134	0.181	0.213	0.212	0.236	0.267
		N	77	77	77	77	77	77	77	77	77	77	77
	Feb	Person's r	-0.132	-0.177	0.156	-0.132	0.178	0.247	0.103	0.132	0.220	0.227	0.257
		N	77	77	77	77	77	77	77	77	77	77	77
	Mrz	Person's r	-0.010	-0.039	0.021	-0.010	0.098	0.030	0.039	0.050	0.285	0.273	0.100
		N	77	77	77	77	77	77	77	77	77	77	77
	Apr	Person's r	0.220	0.170	0.192	0.220	0.313	0.152	-0.113	-0.109	0.257	0.225	-0.016
		N	77	77	77	77	77	77	77	77	77	77	77
	Mai	Person's r	0.127	0.121	0.241	0.127	0.156	0.250	0.098	0.113	0.223	0.220	0.142
		N	77	77	77	77	77	77	77	77	77	77	77
	Jun	Person's r	0.087	-0.038	-0.075	0.087	0.081	-0.128	-0.107	-0.089	0.071	0.035	0.026
		N	77	77	77	77	77	77	77	77	77	77	77
	Jul	Person's r	0.197	0.010	0.218	0.197	0.163	0.193	0.077	0.078	0.151	0.132	0.019
		N	77	77	77	77	77	77	77	77	77	77	77
	Aug	Person's r	0.135	0.070	0.044	0.135	0.123	0.001	-0.076	-0.078	0.213	0.156	-0.075
		N	77	77	77	77	77	77	77	77	77	77	77
	Sep	Person's r	0.145	-0.122	0.192	0.145	0.259	0.182	-0.019	0.010	0.275	0.270	0.166
		N	77	77	77	77	77	77	77	77	77	77	77
	Okt	Person's r	0.094	-0.195	0.115	0.094	0.063	0.106	0.195	0.220	0.384	0.366	0.175
		N	77	77	77	77	77	77	77	77	77	77	77
	Nov	Person's r	-0.072	-0.072	0.146	-0.072	0.072	0.211	0.000	0.005	0.214	0.214	0.121
		N	77	77	77	77	77	77	77	77	77	77	77
	Dez	Person's r	-0.085	-0.221	0.187	-0.085	0.142	0.268	0.186	0.187	0.323	0.328	0.164
		N	77	77	77	77	77	77	77	77	77	77	77
	Annual Average	Person's r	0.123	-0.096	0.283	0.123	0.331	0.304	0.100	0.131	0.525	0.496	0.244
		N	77	77	77	77	77	77	77	77	77	77	77
	DJF	Person's r	-0.160	-0.210	0.185	-0.160	0.203	0.295	0.214	0.241	0.344	0.360	0.311
		N	77	77	77	77	77	77	77	77	77	77	77
	MAM	Person's r	0.158	0.120	0.216	0.158	0.259	0.207	0.017	0.030	0.348	0.327	0.107
		N	77	77	77	77	77	77	77	77	77	77	77
	JJA	Person's r	0.213	0.014	0.095	0.213	0.186	0.034	-0.050	-0.041	0.212	0.157	-0.007
		N	77	77	77	77	77	77	77	77	77	77	77
	SON	Person's r	0.080	-0.206	0.238	0.080	0.200	0.265	0.098	0.128	0.463	0.451	0.244
		N	77	77	77	77	77	77	77	77	77	77	77
Temperature HadCRUT3	Jan	Person's r	-0.318	-0.434	-0.097	-0.318	-0.075	0.005	0.293	0.304	0.167	0.203	0.253
		N	81	81	81	81	81	81	81	81	81	81	81
	Feb	Person's r	-0.087	-0.276	-0.018	-0.087	0.028	0.012	0.244	0.247	0.338	0.333	0.179
		N	81	81	81	81	81	81	81	81	81	81	81
	Mrz	Person's r	-0.396	-0.295	-0.234	-0.396	-0.182	-0.134	0.415	0.398	0.269	0.296	0.145
		N	81	81	81	81	81	81	81	81	81	81	81
	Apr	Person's r	-0.321	-0.199	-0.241	-0.321	-0.134	-0.173	0.343	0.352	0.267	0.288	0.264
		N	81	81	81	81	81	81	81	81	81	81	81
	Mai	Person's r	-0.122	-0.142	-0.012	-0.122	-0.023	0.034	0.376	0.376	0.189	0.225	0.246
		N	81	81	81	81	81	81	81	81	81	81	81
	Jun	Person's r	-0.175	-0.216	-0.056	-0.175	-0.010	-0.001	0.190	0.187	0.075	0.074	0.157
		N	81	81	81	81	81	81	81	81	81	81	81
	Jul	Person's r	-0.142	-0.345	0.053	-0.142	0.020	0.123	0.405	0.397	0.275	0.282	0.183
		N	81	81	81	81	81	81	81	81	81	81	81
	Aug	Person's r	-0.165	-0.245	-0.125	-0.165	-0.104	-0.091	0.316	0.305	0.179	0.184	0.114
		N	81	81	81	81	81	81	81	81	81	81	81
	Sep	Person's r	-0.123	-0.387	-0.035	-0.123	0.049	0.006	0.162	0.175	0.266	0.285	0.208
		N	81	81	81	81	81	81	81	81	81	81	81
	Okt	Person's r	-0.215	-0.404	-0.094	-0.215	-0.096	-0.032	0.392	0.402	0.304	0.329	0.269
		N	81	81	81	81	81	81	81	81	81	81	81
	Nov	Person's r	-0.309	-0.404	-0.024	-0.309	-0.055	0.094	0.282	0.263	0.255	0.257	0.122
		N	81	81	81	81	81	81	81	81	81	81	81
	Dez	Person's r	-0.258	-0.376	0.008	-0.258	-0.016	0.114	0.332	0.354	0.281	0.310	0.324
		N	81	81	81	81	81	81	81	81	81	81	81
	Annual Mean	Person's r	-0.372	-0.511	-0.129	-0.372	-0.087	-0.013	0.527	0.528	0.397	0.426	0.345
		N	81	81	81	81	81	81	81	81	81	81	81
	DJF	Person's r	-0.296	-0.482	-0.049	-0.296	-0.029	0.057	0.384	0.399	0.344	0.371	0.334
		N	81	81	81	81	81	81	81	81	81	81	81
	MAM	Person's r	-0.350	-0.264	-0.204	-0.350	-0.142	-0.115	0.467	0.464	0.300	0.334	0.269
		N	81	81	81	81	81	81	81	81	81	81	81
	JJA	Person's r	-0.214	-0.357	-0.054	-0.214	-0.037	0.019	0.400	0.390	0.231	0.236	0.204
		N	81	81	81	81	81	81	81	81	81	81	81
	SON	Person's r	-0.268	-0.505	-0.064	-0.268	-0.039	0.027	0.347	0.350	0.349	0.369	0.255
		N	81	81	81	81	81	81	81	81	81	81	81
El Niño 3		Person's r	0.078	0.060	-0.010	0.078	-0.084	-0.040	0.016	0.048	-0.019	0.004	0.075
		N	55	55	55	55	55	55	55	55	55	55	55
SOI		Person's r	-0.096	-0.019	-0.107	-0.096	0.052	-0.085	-0.041	-0.098	-0.153	-0.164	-0.190
		N	54	54	54	54	54	54	54	54	54	54	54
SAB		Person's r	-0.006	-0.027	-0.230	-0.006	-0.295	-0.256	0.141	0.149	0.001	0.003	0.023
		N	51	51	51	51	51	51	51	51	51	51	51

A8 (continued) Correlation matrix of Laguna Negra. Non-filtered data

			Bsi						C, N und C/N				
			Al µg/g	Fe µg/g	Si µg/g	Si non Biol µg/g	Bsi Flux	bSi µg/g	N %	TOC %	N Flux	TOC Flux	C/N
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.088	0.153	-0.249	-0.088	0.076	-0.278	-0.285	-0.296	-0.022	-0.109	-0.182
		N	55	55	55	55	51	55	55	55	51	51	55
	Feb	Person's r	0.157	-0.086	0.097	0.157	0.222	0.063	-0.027	-0.002	0.123	0.122	0.112
		N	54	54	54	54	51	54	54	54	51	51	54
	Mrz	Person's r	-0.234	-0.272	-0.039	-0.234	-0.001	0.038	0.219	0.211	0.127	0.143	0.068
		N	56	56	56	56	51	56	56	56	51	51	56
	Apr	Person's r	-0.253	-0.211	-0.169	-0.253	-0.235	-0.118	0.276	0.310	-0.060	-0.017	0.268
		N	56	56	56	56	51	56	56	56	51	51	56
	Mai	Person's r	-0.281	-0.145	-0.252	-0.281	-0.242	-0.210	0.214	0.189	-0.086	-0.055	-0.029
		N	56	56	56	56	51	56	56	56	51	51	56
	Jun	Person's r	0.080	0.078	-0.033	0.080	-0.011	-0.071	-0.072	-0.086	0.053	0.020	-0.128
		N	56	56	56	56	51	56	56	56	51	51	56
	Jul	Person's r	0.016	-0.045	-0.081	0.016	-0.222	-0.106	0.253	0.291	0.094	0.109	0.235
		N	55	55	55	55	51	55	55	55	51	51	55
	Aug	Person's r	0.188	0.108	0.253	0.188	0.341	0.246	-0.072	0.004	0.258	0.275	0.286
		N	55	55	55	55	51	55	55	55	51	51	55
	Sep	Person's r	-0.101	-0.001	-0.129	-0.101	0.031	-0.124	0.102	0.075	-0.084	-0.072	-0.051
		N	56	56	56	56	51	56	56	56	51	51	56
	Okt	Person's r	0.209	-0.029	0.185	0.209	0.014	0.154	-0.086	-0.079	0.023	0.027	-0.014
		N	56	56	56	56	51	56	56	56	51	51	56
	Nov	Person's r	0.103	-0.076	0.027	0.103	-0.224	-0.004	0.162	0.218	0.086	0.136	0.309
		N	56	56	56	56	51	56	56	56	51	51	56
	Dez	Person's r	0.046	0.061	-0.055	0.046	-0.057	-0.085	-0.114	-0.114	-0.140	-0.141	-0.082
		N	54	54	54	54	51	54	54	54	51	51	54
	Total Annual	Person's r	-0.048	-0.078	-0.115	-0.048	-0.121	-0.126	0.245	0.286	0.144	0.173	0.236
		N	56	56	56	56	51	56	56	56	51	51	56
Precipitation HadCRUT3	Jan	Person's r	0.122	0.218	0.014	0.122	0.170	-0.031	-0.338	-0.310	0.080	0.012	-0.021
		N	75	75	75	75	75	75	75	75	75	75	75
	Feb	Person's r	0.131	-0.074	0.116	0.131	0.203	0.091	0.038	0.055	0.137	0.117	0.093
		N	75	75	75	75	75	75	75	75	75	75	75
	Mrz	Person's r	-0.013	-0.152	0.122	-0.013	-0.011	0.158	0.081	0.081	0.179	0.162	0.027
		N	75	75	75	75	75	75	75	75	75	75	75
	Apr	Person's r	0.008	-0.059	0.060	0.008	-0.050	0.072	0.048	0.110	0.122	0.109	0.313
		N	75	75	75	75	75	75	75	75	75	75	75
	Mai	Person's r	-0.030	-0.072	-0.046	-0.030	-0.108	-0.045	0.016	0.027	0.033	0.048	0.043
		N	75	75	75	75	75	75	75	75	75	75	75
	Jun	Person's r	0.101	0.086	-0.036	0.101	-0.051	-0.086	-0.101	-0.114	0.027	0.017	-0.172
		N	75	75	75	75	75	75	75	75	75	75	75
	Jul	Person's r	-0.052	-0.087	-0.055	-0.052	-0.149	-0.048	0.207	0.211	-0.071	-0.061	0.065
		N	75	75	75	75	75	75	75	75	75	75	75
	Aug	Person's r	0.126	0.171	0.163	0.126	0.234	0.151	-0.114	-0.065	0.051	0.062	0.192
		N	75	75	75	75	75	75	75	75	75	75	75
	Sep	Person's r	0.023	0.065	-0.071	0.023	0.043	-0.097	-0.002	-0.032	-0.008	-0.019	-0.158
		N	75	75	75	75	75	75	75	75	75	75	75
	Okt	Person's r	0.154	0.059	0.156	0.154	0.109	0.132	-0.087	-0.079	-0.042	-0.054	0.001
		N	75	75	75	75	75	75	75	75	75	75	75
	Nov	Person's r	0.032	-0.046	0.051	0.032	-0.171	0.051	0.181	0.222	-0.006	0.030	0.276
		N	75	75	75	75	75	75	75	75	75	75	75
	Dez	Person's r	0.013	0.080	-0.024	0.013	-0.030	-0.035	-0.095	-0.092	-0.149	-0.138	-0.023
		N	75	75	75	75	75	75	75	75	75	75	75
	Total Annual	Person's r	0.081	0.031	0.016	0.081	-0.058	-0.013	0.026	0.053	0.030	0.034	0.076
		N	75	75	75	75	75	75	75	75	75	75	75
	DJF	Person's r	0.126	0.129	0.040	0.126	0.147	-0.001	-0.213	-0.190	-0.017	-0.048	0.015
		N	75	75	75	75	75	75	75	75	75	75	75
	MAM	Person's r	-0.025	-0.104	-0.005	-0.025	-0.117	0.005	0.041	0.075	0.095	0.103	0.158
		N	75	75	75	75	75	75	75	75	75	75	75
	JJA	Person's r	0.081	0.069	0.012	0.081	-0.023	-0.018	0.016	0.032	-0.005	-0.001	0.015
		N	75	75	75	75	75	75	75	75	75	75	75
	SON	Person's r	0.098	0.060	0.033	0.098	0.018	0.001	0.028	0.024	-0.027	-0.028	-0.020
		N	75	75	75	75	75	75	75	75	75	75	75
Precipitation CRU TS 2.1	Jan	Person's r	-0.043	-0.031	0.183	-0.043	0.043	0.246	0.066	0.058	0.101	0.071	0.043
		N	77	77	77	77	77	77	77	77	77	77	77
	Feb	Person's r	0.038	-0.086	-0.175	0.038	-0.155	-0.233	-0.112	-0.108	-0.143	-0.153	-0.075
		N	77	77	77	77	77	77	77	77	77	77	77
	Mrz	Person's r	-0.003	-0.097	-0.004	-0.003	-0.050	-0.004	0.161	0.152	0.213	0.198	-0.015
		N	77	77	77	77	77	77	77	77	77	77	77
	Apr	Person's r	-0.095	-0.192	-0.074	-0.095	-0.128	-0.054	0.198	0.246	0.104	0.132	0.329
		N	77	77	77	77	77	77	77	77	77	77	77
	Mai	Person's r	0.072	-0.064	0.109	0.072	0.009	0.108	-0.042	-0.033	0.072	0.076	-0.002
		N	77	77	77	77	77	77	77	77	77	77	77
	Jun	Person's r	-0.001	0.073	-0.025	-0.001	-0.049	-0.031	0.013	-0.005	0.073	0.050	-0.104
		N	77	77	77	77	77	77	77	77	77	77	77
	Jul	Person's r	-0.056	-0.116	-0.081	-0.056	-0.188	-0.079	0.153	0.154	-0.093	-0.081	0.011
		N	77	77	77	77	77	77	77	77	77	77	77
	Aug	Person's r	0.137	0.100	0.194	0.137	0.212	0.187	-0.095	-0.031	0.101	0.124	0.273
		N	77	77	77	77	77	77	77	77	77	77	77
	Sep	Person's r	0.011	0.028	-0.079	0.011	-0.076	-0.104	-0.001	-0.008	-0.024	-0.032	-0.016
		N	77	77	77	77	77	77	77	77	77	77	77
	Okt	Person's r	0.085	0.145	0.191	0.085	0.165	0.204	-0.122	-0.117	-0.037	-0.039	-0.021
		N	77	77	77	77	77	77	77	77	77	77	77
	Nov	Person's r	0.109	-0.010	0.153	0.109	-0.082	0.148	0.183	0.239	0.034	0.084	0.335
		N	77	77	77	77	77	77	77	77	77	77	77
	Dez	Person's r	-0.110	0.184	-0.038	-0.110	-0.055	-0.004	0.015	0.016	-0.147	-0.152	0.016
		N	77	77	77	77	77	77	77	77	77	77	77
	Total Annual	Person's r	0.057	-0.017	0.080	0.057	-0.044	0.077	0.055	0.085	0.067	0.077	0.127
		N	77	77	77	77	77	77	77	77	77	77	77
	DJF	Person's r	0.036	0.021	0.036	0.036	-0.033	0.031	0.052	0.075	0.036	0.042	0.089
		N	77	77	77	77	77	77	77	77	77	77	77
	MAM	Person's r	0.099	0.101	0.111	0.099	0.008	0.100	-0.001	0.019	-0.026	-0.013	0.106
		N	77	77	77	77	77	77	77	77	77	77	77
	JJA	Person's r	-0.074	0.063	-0.043	-0.074	-0.109	-0.024	-0.024	-0.025	-0.138	-0.161	-0.013
		N	77	77	77	77	77	77	77	77	77	77	77
	SON	Person's r	0.033	-0.130	0.072	0.033	-0.039	0.077	0.050	0.070	0.128	0.138	0.097
		N	77	77	77	77	77	77	77	77	77	77	77

A8 (continued) Correlation matrix of Laguna Negra. Non-filtered data

			Grain size										
			D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	0.306	0.277	0.288	0.316	0.302	0.297	0.316	0.306	0.197	0.226	0.126
		N	77	77	77	77	77	77	77	77	77	77	77
	Feb	Person's r	0.217	0.198	0.198	0.212	0.198	0.173	0.212	0.193	0.093	0.168	0.143
		N	77	77	77	77	77	77	77	77	77	77	77
	Mrz	Person's r	0.032	0.052	0.044	-0.003	-0.036	-0.035	-0.003	-0.033	-0.029	-0.058	0.011
		N	77	77	77	77	77	77	77	77	77	77	77
	Apr	Person's r	-0.036	-0.056	-0.035	0.015	0.034	0.028	0.015	0.030	0.073	0.049	-0.051
		N	77	77	77	77	77	77	77	77	77	77	77
	Mai	Person's r	0.159	0.094	0.125	0.228	0.280	0.295	0.228	0.280	0.121	0.297	0.161
		N	77	77	77	77	77	77	77	77	77	77	77
	Jun	Person's r	-0.073	-0.080	-0.067	-0.043	0.014	0.036	-0.043	0.016	0.023	0.019	0.037
		N	77	77	77	77	77	77	77	77	77	77	77
	Jul	Person's r	-0.007	-0.072	-0.032	0.094	0.183	0.175	0.094	0.174	0.083	0.230	0.077
		N	77	77	77	77	77	77	77	77	77	77	77
	Aug	Person's r	-0.128	-0.156	-0.148	-0.087	0.057	0.048	-0.087	0.040	-0.186	0.133	0.285
		N	77	77	77	77	77	77	77	77	77	77	77
	Sep	Person's r	0.051	-0.016	0.019	0.142	0.252	0.258	0.142	0.242	0.112	0.287	0.176
		N	77	77	77	77	77	77	77	77	77	77	77
	Okt	Person's r	0.076	0.040	0.066	0.133	0.153	0.174	0.133	0.159	0.184	0.125	-0.039
		N	77	77	77	77	77	77	77	77	77	77	77
	Nov	Person's r	0.129	0.144	0.126	0.070	0.039	0.046	0.070	0.044	-0.005	0.012	0.136
		N	77	77	77	77	77	77	77	77	77	77	77
	Dez	Person's r	0.102	0.059	0.063	0.123	0.172	0.155	0.123	0.162	0.028	0.206	0.184
		N	77	77	77	77	77	77	77	77	77	77	77
	Annual Average	Person's r	0.146	0.080	0.112	0.219	0.307	0.310	0.219	0.301	0.133	0.318	0.228
		N	77	77	77	77	77	77	77	77	77	77	77
	DJF	Person's r	0.282	0.240	0.247	0.294	0.304	0.283	0.294	0.299	0.143	0.272	0.206
		N	77	77	77	77	77	77	77	77	77	77	77
	MAM	Person's r	0.078	0.045	0.067	0.121	0.142	0.147	0.121	0.141	0.081	0.148	0.064
		N	77	77	77	77	77	77	77	77	77	77	77
	JJA	Person's r	-0.099	-0.150	-0.118	-0.010	0.132	0.136	-0.010	0.121	-0.021	0.192	0.183
		N	77	77	77	77	77	77	77	77	77	77	77
	SON	Person's r	0.139	0.095	0.116	0.181	0.227	0.245	0.181	0.229	0.153	0.213	0.140
		N	77	77	77	77	77	77	77	77	77	77	77
Temperature HadCRUT3	Jan	Person's r	0.310	0.310	0.299	0.264	0.199	0.170	0.264	0.200	0.122	0.111	0.059
		N	81	81	81	81	81	81	81	81	81	81	81
	Feb	Person's r	0.064	0.037	0.043	0.086	0.148	0.136	0.086	0.140	-0.037	0.160	0.142
		N	81	81	81	81	81	81	81	81	81	81	81
	Mrz	Person's r	0.173	0.201	0.180	0.101	-0.008	-0.024	0.101	-0.001	0.057	-0.076	-0.116
		N	81	81	81	81	81	81	81	81	81	81	81
	Apr	Person's r	0.170	0.201	0.186	0.106	0.019	0.021	0.106	0.031	0.102	-0.078	-0.108
		N	81	81	81	81	81	81	81	81	81	81	81
	Mai	Person's r	0.330	0.276	0.296	0.359	0.341	0.334	0.359	0.345	0.241	0.282	0.048
		N	81	81	81	81	81	81	81	81	81	81	81
	Jun	Person's r	0.203	0.161	0.176	0.228	0.241	0.240	0.228	0.243	0.147	0.216	0.090
		N	81	81	81	81	81	81	81	81	81	81	81
	Jul	Person's r	0.275	0.206	0.239	0.333	0.350	0.335	0.333	0.349	0.261	0.304	0.053
		N	81	81	81	81	81	81	81	81	81	81	81
	Aug	Person's r	0.129	0.096	0.104	0.145	0.217	0.219	0.145	0.215	0.044	0.195	0.189
		N	81	81	81	81	81	81	81	81	81	81	81
	Sep	Person's r	0.111	0.084	0.095	0.132	0.139	0.135	0.132	0.135	0.149	0.124	0.007
		N	81	81	81	81	81	81	81	81	81	81	81
	Okt	Person's r	0.179	0.157	0.161	0.191	0.161	0.156	0.191	0.164	0.225	0.108	-0.079
		N	81	81	81	81	81	81	81	81	81	81	81
	Nov	Person's r	0.248	0.249	0.230	0.195	0.159	0.140	0.195	0.162	0.094	0.096	0.095
		N	81	81	81	81	81	81	81	81	81	81	81
	Dez	Person's r	0.344	0.334	0.328	0.311	0.234	0.225	0.311	0.242	0.217	0.142	0.020
		N	81	81	81	81	81	81	81	81	81	81	81
	Annual Mean	Person's r	0.356	0.326	0.329	0.343	0.304	0.288	0.343	0.308	0.227	0.216	0.049
		N	81	81	81	81	81	81	81	81	81	81	81
	DJF	Person's r	0.319	0.303	0.298	0.293	0.257	0.234	0.293	0.257	0.134	0.181	0.097
		N	81	81	81	81	81	81	81	81	81	81	81
	MAM	Person's r	0.275	0.279	0.271	0.229	0.140	0.131	0.229	0.149	0.162	0.047	-0.075
		N	81	81	81	81	81	81	81	81	81	81	81
	JJA	Person's r	0.273	0.209	0.234	0.317	0.360	0.353	0.317	0.360	0.206	0.319	0.142
		N	81	81	81	81	81	81	81	81	81	81	81
	SON	Person's r	0.223	0.203	0.202	0.217	0.193	0.182	0.217	0.194	0.198	0.140	0.009
		N	81	81	81	81	81	81	81	81	81	81	81
El Niño 3		Person's r	-0.056	-0.055	-0.041	-0.032	-0.061	-0.056	-0.032	-0.055	0.012	-0.073	-0.161
		N	55	55	55	55	55	55	55	55	55	55	55
SOI		Person's r	0.076	0.079	0.063	0.046	0.088	0.077	0.046	0.080	-0.013	0.092	0.208
		N	54	54	54	54	54	54	54	54	54	54	54
SAB		Person's r	0.015	0.024	0.033	0.012	-0.026	0.023	0.012	-0.005	0.069	-0.079	-0.112
		N	51	51	51	51	51	51	51	51	51	51	51

A8 (continued) Correlation matrix of Laguna Negra. Non-filtered data

			Grain size										
			D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.229	-0.167	-0.198	-0.290	-0.307	-0.307	-0.290	-0.311	-0.205	-0.255	-0.048
		N	55	55	55	55	55	55	55	55	55	55	55
	Feb	Person's r	0.021	-0.026	0.007	0.102	0.108	0.127	0.102	0.111	0.205	0.119	-0.106
		N	54	54	54	54	54	54	54	54	54	54	54
	Mrz	Person's r	0.141	0.155	0.134	0.084	0.027	0.020	0.084	0.034	0.066	-0.032	0.020
		N	56	56	56	56	56	56	56	56	56	56	56
	Apr	Person's r	0.246	0.243	0.245	0.207	0.088	0.101	0.207	0.109	0.142	-0.017	-0.132
		N	56	56	56	56	56	56	56	56	56	56	56
	Mai	Person's r	-0.031	-0.005	-0.029	-0.091	-0.133	-0.149	-0.091	-0.135	-0.146	-0.114	-0.032
		N	56	56	56	56	56	56	56	56	56	56	56
	Jun	Person's r	-0.192	-0.195	-0.188	-0.166	-0.105	-0.110	-0.166	-0.114	-0.092	-0.040	-0.013
		N	56	56	56	56	56	56	56	56	56	56	56
	Jul	Person's r	0.121	0.110	0.123	0.142	0.105	0.128	0.142	0.122	0.117	0.029	-0.101
		N	55	55	55	55	55	55	55	55	55	55	55
	Aug	Person's r	0.151	0.186	0.198	0.138	-0.040	-0.039	0.138	-0.023	0.295	-0.170	-0.323
		N	55	55	55	55	55	55	55	55	55	55	55
	Sep	Person's r	0.031	0.031	0.021	0.020	0.005	-0.031	0.020	-0.004	-0.009	0.009	-0.027
		N	56	56	56	56	56	56	56	56	56	56	56
	Okt	Person's r	-0.132	-0.178	-0.154	-0.047	0.099	0.101	-0.047	0.084	-0.006	0.171	0.120
		N	56	56	56	56	56	56	56	56	56	56	56
	Nov	Person's r	0.005	-0.036	-0.017	0.065	0.079	0.092	0.065	0.079	0.026	0.115	-0.055
		N	56	56	56	56	56	56	56	56	56	56	56
	Dez	Person's r	-0.059	-0.043	-0.056	-0.083	0.099	0.111	-0.083	0.091	-0.201	0.088	0.389
		N	54	54	54	54	54	54	54	54	54	54	54
	Total Annual	Person's r	0.063	0.072	0.078	0.059	-0.029	-0.027	0.059	-0.017	0.105	-0.093	-0.219
		N	56	56	56	56	56	56	56	56	56	56	56
Precipitation HadCRUT3	Jan	Person's r	-0.250	-0.228	-0.241	-0.259	-0.215	-0.213	-0.259	-0.223	-0.225	-0.138	0.040
		N	75	75	75	75	75	75	75	75	75	75	75
	Feb	Person's r	0.026	-0.034	0.002	0.121	0.178	0.193	0.121	0.178	0.187	0.204	-0.016
		N	75	75	75	75	75	75	75	75	75	75	75
	Mrz	Person's r	-0.006	0.012	-0.001	-0.036	-0.058	-0.063	-0.035	-0.057	-0.008	-0.068	0.005
		N	75	75	75	75	75	75	75	75	75	75	75
	Apr	Person's r	0.035	0.040	0.044	0.028	0.001	0.015	0.028	0.010	0.024	-0.033	-0.057
		N	75	75	75	75	75	75	75	75	75	75	75
	Mai	Person's r	-0.117	-0.124	-0.127	-0.111	-0.069	-0.083	-0.111	-0.079	-0.195	-0.001	0.082
		N	75	75	75	75	75	75	75	75	75	75	75
	Jun	Person's r	-0.203	-0.207	-0.198	-0.171	-0.125	-0.125	-0.171	-0.132	-0.095	-0.069	-0.054
		N	75	75	75	75	75	75	75	75	75	75	75
	Jul	Person's r	0.161	0.159	0.170	0.174	0.119	0.119	0.174	0.130	0.183	0.031	-0.134
		N	75	75	75	75	75	75	75	75	75	75	75
	Aug	Person's r	0.110	0.151	0.156	0.086	-0.049	-0.047	0.086	-0.035	0.212	-0.152	-0.254
		N	75	75	75	75	75	75	75	75	75	75	75
	Sep	Person's r	-0.122	-0.115	-0.120	-0.116	-0.101	-0.116	-0.116	-0.109	-0.081	-0.064	-0.052
		N	75	75	75	75	75	75	75	75	75	75	75
	Okt	Person's r	-0.082	-0.121	-0.104	-0.017	0.096	0.096	-0.017	0.084	0.023	0.149	0.115
		N	75	75	75	75	75	75	75	75	75	75	75
	Nov	Person's r	0.102	0.057	0.076	0.154	0.158	0.167	0.154	0.160	0.094	0.170	-0.032
		N	75	75	75	75	75	75	75	75	75	75	75
	Dez	Person's r	0.005	0.041	0.023	-0.049	0.007	0.018	-0.049	0.008	-0.119	-0.039	0.216
		N	75	75	75	75	75	75	75	75	75	75	75
	Total Annual	Person's r	-0.046	-0.040	-0.028	-0.022	-0.045	-0.048	-0.022	-0.042	0.036	-0.063	-0.147
		N	75	75	75	75	75	75	75	75	75	75	75
	DJF	Person's r	-0.101	-0.089	-0.094	-0.103	-0.014	0.003	-0.103	-0.016	-0.111	-0.002	0.178
		N	75	75	75	75	75	75	75	75	75	75	75
	MAM	Person's r	-0.093	-0.094	-0.098	-0.093	-0.068	-0.076	-0.093	-0.074	-0.166	-0.021	0.052
		N	75	75	75	75	75	75	75	75	75	75	75
	JJA	Person's r	0.020	0.034	0.048	0.037	-0.024	-0.023	0.037	-0.016	0.139	-0.085	-0.215
		N	75	75	75	75	75	75	75	75	75	75	75
	SON	Person's r	-0.094	-0.123	-0.112	-0.041	0.022	0.014	-0.041	0.012	-0.018	0.079	-0.003
		N	75	75	75	75	75	75	75	75	75	75	75
Precipitation CRU TS 2.1	Jan	Person's r	0.055	0.066	0.054	0.018	-0.039	-0.062	0.018	-0.041	-0.006	-0.046	-0.041
		N	77	77	77	77	77	77	77	77	77	77	77
	Feb	Person's r	-0.175	-0.178	-0.175	-0.148	-0.104	-0.099	-0.148	-0.109	-0.099	-0.054	-0.044
		N	77	77	77	77	77	77	77	77	77	77	77
	Mrz	Person's r	-0.007	0.000	0.002	-0.014	-0.051	-0.044	-0.014	-0.044	0.045	-0.076	-0.123
		N	77	77	77	77	77	77	77	77	77	77	77
	Apr	Person's r	0.183	0.172	0.181	0.177	0.147	0.175	0.177	0.163	0.115	0.076	0.003
		N	77	77	77	77	77	77	77	77	77	77	77
	Mai	Person's r	-0.108	-0.131	-0.126	-0.081	0.010	-0.010	-0.081	-0.004	-0.185	0.082	0.188
		N	77	77	77	77	77	77	77	77	77	77	77
	Jun	Person's r	-0.082	-0.087	-0.081	-0.066	-0.065	-0.081	-0.066	-0.070	-0.016	-0.036	-0.086
		N	77	77	77	77	77	77	77	77	77	77	77
	Jul	Person's r	0.026	0.026	0.032	0.043	0.007	-0.001	0.043	0.011	0.078	-0.029	-0.154
		N	77	77	77	77	77	77	77	77	77	77	77
	Aug	Person's r	0.045	0.055	0.068	0.052	-0.033	-0.037	0.052	-0.027	0.142	-0.074	-0.195
		N	77	77	77	77	77	77	77	77	77	77	77
	Sep	Person's r	-0.155	-0.170	-0.171	-0.130	-0.058	-0.081	-0.131	-0.075	-0.204	0.025	0.082
		N	77	77	77	77	77	77	77	77	77	77	77
	Okt	Person's r	0.003	-0.009	-0.004	0.024	0.067	0.050	0.024	0.058	0.053	0.078	0.079
		N	77	77	77	77	77	77	77	77	77	77	77
	Nov	Person's r	0.115	0.050	0.082	0.194	0.220	0.225	0.194	0.219	0.099	0.244	0.004
		N	77	77	77	77	77	77	77	77	77	77	77
	Dez	Person's r	0.222	0.302	0.276	0.112	-0.032	-0.009	0.112	-0.006	0.109	-0.198	-0.106
		N	77	77	77	77	77	77	77	77	77	77	77
	Total Annual	Person's r	-0.032	-0.047	-0.033	0.001	0.001	-0.019	0.001	-0.003	0.004	0.012	-0.079
		N	77	77	77	77	77	77	77	77	77	77	77
	DJF	Person's r	-0.006	-0.004	0.010	0.016	-0.049	-0.065	0.016	-0.046	0.112	-0.076	-0.243
		N	77	77	77	77	77	77	77	77	77	77	77
	MAM	Person's r	-0.067	-0.109	-0.095	-0.006	0.082	0.057	-0.006	0.063	-0.080	0.157	0.107
		N	77	77	77	77	77	77	77	77	77	77	77
	JJA	Person's r	0.078	0.137	0.115	0.000	-0.101	-0.093	0.000	-0.086	0.015	-0.190	-0.118
		N	77	77	77	77	77	77	77	77	77	77	77
	SON	Person's r	-0.039	-0.061	-0.054	-0.018	0.047	0.039	-0.018	0.040	-0.119	0.084	0.146
		N	77	77	77	77	77	77	77	77	77	77	77

A9 Correlation matrix of Laguna Negra. 3-year filtered data

			Spectrolino								
			RABD660;670	R590/640	RABD510	RABD550	RABD480	Chlorin	RABD720	Total Absorbtion	Clastic input
Temperature CRU TS 2.1	Jan	Person's r	0.616	-0.582	0.405	-0.048	0.519	-0.509	0.093	-0.460	-0.532
		N	87	87	87	87	87	87	87	87	87
	Feb	Person's r	0.499	-0.398	0.204	-0.078	0.234	-0.459	-0.026	-0.216	-0.318
		N	87	87	87	87	87	87	87	87	87
	Mar	Person's r	0.381	-0.230	0.156	0.012	0.143	-0.349	-0.039	-0.084	-0.184
		N	87	87	87	87	87	87	87	87	87
	Apr	Person's r	0.001	0.026	-0.062	-0.141	-0.017	-0.094	-0.133	0.138	0.049
		N	87	87	87	87	87	87	87	87	87
	May	Person's r	0.263	-0.113	-0.040	-0.333	0.105	-0.193	0.080	-0.013	-0.048
		N	87	87	87	87	87	87	87	87	87
	Jun	Person's r	0.237	-0.150	0.179	0.110	0.121	-0.006	-0.077	-0.201	-0.143
		N	87	87	87	87	87	87	87	87	87
	Jul	Person's r	0.103	-0.055	-0.043	-0.026	-0.086	-0.004	-0.124	0.060	-0.003
		N	87	87	87	87	87	87	87	87	87
	Aug	Person's r	-0.155	0.206	-0.250	-0.194	-0.235	0.027	-0.037	0.280	0.233
		N	87	87	87	87	87	87	87	87	87
	Sep	Person's r	0.358	-0.271	0.233	0.143	0.137	-0.149	-0.140	-0.172	-0.253
		N	87	87	87	87	87	87	87	87	87
	Oct	Person's r	0.377	-0.335	0.270	0.088	0.240	-0.243	-0.329	-0.264	-0.274
		N	87	87	87	87	87	87	87	87	87
	Nov	Person's r	0.287	-0.346	0.220	0.038	0.215	-0.423	-0.127	-0.209	-0.289
		N	87	87	87	87	87	87	87	87	87
	Dec	Person's r	0.439	-0.355	0.198	-0.119	0.249	-0.404	-0.294	-0.259	-0.260
		N	87	87	87	87	87	87	87	87	87
	Annual Mean	Person's r	0.486	-0.374	0.216	-0.070	0.235	-0.393	-0.165	-0.210	-0.292
		N	87	87	87	87	87	87	87	87	87
	DJF	Person's r	0.597	-0.511	0.308	-0.097	0.382	-0.528	-0.097	-0.357	-0.423
		N	87	87	87	87	87	87	87	87	87
	MAM	Person's r	0.294	-0.145	0.025	-0.210	0.107	-0.279	-0.024	0.007	-0.085
		N	87	87	87	87	87	87	87	87	87
	JJA	Person's r	0.123	-0.028	-0.021	-0.030	-0.070	0.006	-0.121	0.030	0.013
		N	87	87	87	87	87	87	87	87	87
	SON	Person's r	0.467	-0.440	0.332	0.120	0.275	-0.384	-0.275	-0.298	-0.376
		N	87	87	87	87	87	87	87	87	87
Temperature HadCRUT3	Jan	Person's r	0.545	-0.429	0.341	0.213	0.270	-0.468	-0.083	-0.269	-0.381
		N	92	92	92	92	92	92	92	92	92
	Feb	Person's r	0.569	-0.513	0.429	0.307	0.334	-0.396	-0.055	-0.414	-0.462
		N	92	92	92	92	92	92	92	92	92
	Mar	Person's r	0.439	-0.392	0.411	0.343	0.322	-0.471	-0.202	-0.268	-0.377
		N	92	92	92	92	92	92	92	92	92
	Apr	Person's r	0.588	-0.475	0.517	0.403	0.452	-0.427	0.010	-0.463	-0.480
		N	92	92	92	92	92	92	92	92	92
	May	Person's r	0.527	-0.385	0.296	0.035	0.345	-0.425	-0.006	-0.266	-0.340
		N	92	92	92	92	92	92	92	92	92
	Jun	Person's r	0.656	-0.540	0.432	0.211	0.405	-0.395	-0.033	-0.448	-0.495
		N	92	92	92	92	92	92	92	92	92
	Jul	Person's r	0.641	-0.470	0.336	0.145	0.283	-0.346	-0.102	-0.368	-0.396
		N	92	92	92	92	92	92	92	92	92
	Aug	Person's r	0.508	-0.406	0.333	0.189	0.297	-0.374	-0.149	-0.313	-0.355
		N	92	92	92	92	92	92	92	92	92
	Sep	Person's r	0.617	-0.474	0.440	0.365	0.322	-0.329	-0.102	-0.398	-0.463
		N	92	92	92	92	92	92	92	92	92
	Oct	Person's r	0.667	-0.547	0.538	0.367	0.456	-0.363	-0.247	-0.562	-0.520
		N	92	92	92	92	92	92	92	92	92
	Nov	Person's r	0.607	-0.512	0.389	0.186	0.364	-0.398	-0.006	-0.483	-0.456
		N	92	92	92	92	92	92	92	92	92
	Dec	Person's r	0.551	-0.462	0.322	0.092	0.344	-0.463	-0.051	-0.346	-0.415
		N	92	92	92	92	92	92	92	92	92
	Annual Mean	Person's r	0.770	-0.624	0.535	0.321	0.469	-0.543	-0.111	-0.511	-0.573
		N	92	92	92	92	92	92	92	92	92
	DJF	Person's r	0.656	-0.555	0.434	0.248	0.374	-0.518	-0.074	-0.409	-0.497
		N	92	92	92	92	92	92	92	92	92
	MAM	Person's r	0.601	-0.484	0.473	0.302	0.433	-0.512	-0.078	-0.385	-0.463
		N	92	92	92	92	92	92	92	92	92
	JJA	Person's r	0.723	-0.567	0.441	0.217	0.394	-0.443	-0.107	-0.453	-0.500
		N	92	92	92	92	92	92	92	92	92
	SON	Person's r	0.734	-0.594	0.529	0.357	0.440	-0.423	-0.134	-0.557	-0.558
		N	92	92	92	92	92	92	92	92	92
El Niño 3		Person's r	-0.202	0.279	-0.154	0.053	-0.166	0.251	0.135	0.270	0.231
		N	65	65	65	65	65	65	65	65	65
SOI		Person's r	0.015	-0.029	-0.070	-0.109	-0.013	-0.070	0.049	-0.109	-0.008
		N	64	64	64	64	64	64	64	64	64
SAB		Person's r	0.209	-0.294	0.37	0.210	0.321	-0.086	0.084	-0.381	-0.338
		N	61	61	61	61	61	61	61	61	61

A9 (continued) Correlation matrix of Laguna Negra. 3-year filtered data

			Spectrolino								
			RABD660;670	R590/640	RABD510	RABD550	RABD480	Chlorin	RABD720	Total Absorbtion	Clastic input
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.364	0.539	-0.491	-0.482	-0.285	0.224	-0.207	0.284	0.511
		N	49	49	49	49	49	49	49	49	49
	Feb	Person's r	0.354	-0.253	0.269	0.315	0.128	-0.029	-0.184	-0.101	-0.271
		N	49	49	49	49	49	49	49	49	49
	Mar	Person's r	0.033	-0.048	-0.114	-0.150	-0.114	-0.107	0.079	-0.007	0.027
		N	49	49	49	49	49	49	49	49	49
	Apr	Person's r	0.407	-0.402	0.316	0.375	0.161	-0.383	0.096	-0.096	-0.342
		N	49	49	49	49	49	49	49	49	49
	May	Person's r	-0.106	0.111	-0.069	0.085	-0.154	0.073	0.354	0.111	0.093
		N	49	49	49	49	49	49	49	49	49
	Jun	Person's r	-0.247	0.258	-0.107	-0.197	-0.068	0.201	-0.252	0.155	0.224
		N	49	49	49	49	49	49	49	49	49
	Jul	Person's r	0.227	-0.213	0.262	0.208	0.258	0.074	0.209	-0.312	-0.233
		N	49	49	49	49	49	49	49	49	49
	Aug	Person's r	0.152	-0.151	0.033	-0.101	0.200	-0.142	0.136	0.030	-0.195
		N	49	49	49	49	49	49	49	49	49
	Sep	Person's r	0.166	-0.103	0.017	0.002	0.071	-0.098	0.299	-0.184	-0.082
		N	49	49	49	49	49	49	49	49	49
	Oct	Person's r	0.046	-0.039	0.215	0.196	0.088	0.467	-0.113	-0.353	-0.098
		N	49	49	49	49	49	49	49	49	49
	Nov	Person's r	0.160	-0.138	0.281	0.289	0.121	0.358	-0.157	-0.435	-0.120
		N	49	49	49	49	49	49	49	49	49
	Dec	Person's r	-0.078	0.243	-0.255	-0.273	-0.121	0.193	0.431	0.030	0.207
		N	49	49	49	49	49	49	49	49	49
	Total Annual	Person's r	0.213	-0.158	0.204	0.142	0.215	0.092	0.259	-0.194	-0.204
		N	49	49	49	49	49	49	49	49	49
Precipitation HadCRUT3	Jan	Person's r	-0.242	0.354	-0.325	-0.190	-0.285	0.313	-0.048	0.249	0.343
		N	85	85	85	85	85	85	85	85	85
	Feb	Person's r	0.284	-0.197	0.151	0.051	0.136	-0.039	-0.114	-0.137	-0.197
		N	85	85	85	85	85	85	85	85	85
	Mar	Person's r	-0.054	-0.056	0.006	-0.115	0.024	-0.231	-0.271	0.069	-0.006
		N	85	85	85	85	85	85	85	85	85
	Apr	Person's r	0.135	0.075	-0.048	-0.041	-0.079	-0.076	-0.062	0.148	0.107
		N	85	85	85	85	85	85	85	85	85
	May	Person's r	-0.082	0.261	-0.220	-0.005	-0.296	0.174	0.165	0.330	0.252
		N	85	85	85	85	85	85	85	85	85
	Jun	Person's r	-0.284	0.286	-0.188	0.045	-0.275	0.373	-0.046	0.232	0.249
		N	85	85	85	85	85	85	85	85	85
	Jul	Person's r	0.194	-0.241	0.233	0.253	0.202	-0.051	0.109	-0.231	-0.258
		N	85	85	85	85	85	85	85	85	85
	Aug	Person's r	0.098	-0.040	-0.028	-0.017	0.040	-0.040	0.126	0.011	-0.049
		N	85	85	85	85	85	85	85	85	85
	Sep	Person's r	-0.369	0.302	-0.218	0.036	-0.247	0.213	0.181	0.296	0.255
		N	85	85	85	85	85	85	85	85	85
	Oct	Person's r	-0.069	0.008	0.053	0.043	0.029	0.265	-0.113	-0.147	-0.018
		N	85	85	85	85	85	85	85	85	85
	Nov	Person's r	-0.038	0.018	0.056	0.047	0.045	0.176	-0.062	-0.153	0.016
		N	85	85	85	85	85	85	85	85	85
	Dec	Person's r	0.101	-0.036	0.013	-0.071	0.096	-0.066	0.389	-0.094	-0.043
		N	85	85	85	85	85	85	85	85	85
	Total Annual	Person's r	-0.092	0.189	-0.127	0.123	-0.202	0.265	0.148	0.205	0.155
		N	85	85	85	85	85	85	85	85	85
	DJF	Person's r	0.090	0.041	-0.065	-0.107	0.001	0.075	0.185	-0.016	0.032
		N	85	85	85	85	85	85	85	85	85
	MAM	Person's r	-0.043	0.256	-0.215	-0.025	-0.292	0.121	0.113	0.350	0.261
		N	85	85	85	85	85	85	85	85	85
	JJA	Person's r	-0.012	0.011	0.014	0.168	-0.027	0.173	0.090	0.007	-0.025
		N	85	85	85	85	85	85	85	85	85
	SON	Person's r	-0.320	0.237	-0.119	0.063	-0.155	0.338	0.065	0.101	0.190
		N	85	85	85	85	85	85	85	85	85
Precipitation CRU TS 2.1	Jan	Person's r	-0.010	0.108	-0.210	-0.255	-0.133	-0.064	-0.044	0.180	0.161
		N	87	87	87	87	87	87	87	87	87
	Feb	Person's r	0.122	-0.011	0.069	0.280	-0.088	0.310	0.055	-0.204	-0.036
		N	87	87	87	87	87	87	87	87	87
	Mar	Person's r	-0.056	-0.081	0.124	0.096	0.062	-0.201	-0.397	0.038	-0.053
		N	87	87	87	87	87	87	87	87	87
	Apr	Person's r	0.378	-0.244	0.234	0.162	0.168	-0.282	0.206	-0.114	-0.233
		N	87	87	87	87	87	87	87	87	87
	May	Person's r	0.013	0.065	-0.071	0.000	-0.183	0.065	0.226	0.166	0.080
		N	87	87	87	87	87	87	87	87	87
	Jun	Person's r	-0.287	0.308	-0.262	-0.210	-0.215	0.273	-0.054	0.277	0.301
		N	87	87	87	87	87	87	87	87	87
	Jul	Person's r	0.086	-0.101	0.145	0.248	0.059	0.092	0.066	-0.131	-0.125
		N	87	87	87	87	87	87	87	87	87
	Aug	Person's r	0.181	-0.069	0.008	0.045	0.001	-0.035	0.121	-0.016	-0.072
		N	87	87	87	87	87	87	87	87	87
	Sep	Person's r	-0.130	0.208	-0.142	0.081	-0.268	0.166	0.138	0.252	0.197
		N	87	87	87	87	87	87	87	87	87
	Oct	Person's r	-0.008	-0.112	0.051	-0.058	0.140	-0.017	-0.004	-0.097	-0.130
		N	87	87	87	87	87	87	87	87	87
	Nov	Person's r	0.107	-0.023	0.019	-0.069	0.055	0.156	0.025	-0.179	-0.004
		N	87	87	87	87	87	87	87	87	87
	Dec	Person's r	0.059	-0.229	0.156	-0.146	0.392	-0.332	0.201	-0.187	-0.232
		N	87	87	87	87	87	87	87	87	87
	Total Annual	Person's r	0.033	0.057	-0.046	0.054	-0.126	0.146	0.188	0.112	0.052
		N	87	87	87	87	87	87	87	87	87
	DJF	Person's r	-0.023	0.082	-0.061	0.047	-0.089	0.192	0.069	0.074	0.063
		N	87	87	87	87	87	87	87	87	87
	MAM	Person's r	-0.049	0.074	-0.063	-0.007	-0.086	0.181	0.108	0.043	0.064
		N	87	87	87	87	87	87	87	87	87
	JJA	Person's r	0.106	-0.118	0.052	-0.064	0.167	-0.090	0.153	-0.164	-0.110
		N	87	87	87	87	87	87	87	87	87
	SON	Person's r	0.107	-0.018	0.015	0.055	-0.112	-0.043	0.209	0.123	0.003
		N	87	87	87	87	87	87	87	87	87

A9 (continued) Correlation matrix of Laguna Negra. 3-year filtered data

			Bsi						C, N und C/N				
			Al µg/g	Fe µg/g	Si µg/g	Si non Biol µg/g	Bsi Flux	bSi µg/g	N %	TOC %	N Flux	TOC Flux	C/N
Temperature CRU TS 2.1	Jan	Person's r	-0.158	-0.149	0.197	-0.158	0.194	0.311	0.257	0.284	0.439	0.478	0.322
		N	76	76	76	76	76	76	76	76	75	75	76
	Feb	Person's r	-0.151	-0.217	0.229	-0.151	0.284	0.348	0.159	0.172	0.435	0.444	0.250
		N	76	76	76	76	76	76	76	76	75	75	76
	Mrz	Person's r	-0.041	-0.074	-0.003	-0.041	0.166	0.012	0.019	0.024	0.492	0.466	0.096
		N	76	76	76	76	76	76	76	76	75	75	76
	Apr	Person's r	0.330	0.221	0.287	0.330	0.440	0.229	-0.229	-0.203	0.459	0.410	0.057
		N	76	76	76	76	76	76	76	76	75	75	76
	Mai	Person's r	0.129	0.080	0.334	0.129	0.337	0.368	0.170	0.181	0.397	0.393	0.189
		N	76	76	76	76	76	76	76	76	75	75	76
	Jun	Person's r	0.239	0.039	0.007	0.239	0.066	-0.087	-0.162	-0.100	0.187	0.143	0.218
		N	76	76	76	76	76	76	76	76	75	75	76
	Jul	Person's r	0.269	0.005	0.338	0.269	0.361	0.318	0.106	0.108	0.285	0.259	0.038
		N	76	76	76	76	76	76	76	76	75	75	76
	Aug	Person's r	0.246	0.193	0.175	0.246	0.217	0.122	-0.107	-0.107	0.305	0.232	-0.096
		N	76	76	76	76	76	76	76	76	75	75	76
	Sep	Person's r	0.192	-0.203	0.267	0.192	0.276	0.258	0.037	0.098	0.399	0.409	0.351
		N	76	76	76	76	76	76	76	76	75	75	76
	Okt	Person's r	0.152	-0.203	0.222	0.152	0.166	0.218	0.212	0.240	0.579	0.560	0.234
		N	76	76	76	76	76	76	76	76	75	75	76
	Nov	Person's r	-0.131	-0.098	0.148	-0.131	0.134	0.239	0.089	0.092	0.338	0.340	0.165
		N	76	76	76	76	76	76	76	76	75	75	76
	Dez	Person's r	-0.189	-0.336	0.148	-0.189	0.146	0.262	0.342	0.339	0.479	0.488	0.228
		N	76	76	76	76	76	76	76	76	75	75	76
	Annual Average	Person's r	0.143	-0.111	0.350	0.143	0.412	0.383	0.133	0.169	0.716	0.688	0.308
		N	76	76	76	76	76	76	76	76	75	75	76
	DJF	Person's r	-0.204	-0.295	0.231	-0.204	0.252	0.373	0.312	0.326	0.560	0.581	0.320
		N	76	76	76	76	76	76	76	76	75	75	76
	MAM	Person's r	0.171	0.092	0.273	0.171	0.403	0.274	0.006	0.024	0.584	0.553	0.156
		N	76	76	76	76	76	76	76	76	75	75	76
	JJA	Person's r	0.383	0.108	0.257	0.383	0.320	0.170	-0.082	-0.046	0.387	0.317	0.102
		N	76	76	76	76	76	76	76	76	75	75	76
	SON	Person's r	0.099	-0.247	0.313	0.099	0.281	0.354	0.170	0.213	0.651	0.647	0.366
		N	76	76	76	76	76	76	76	76	75	75	76
Temperature HadCRUT3	Jan	Person's r	-0.458	-0.592	-0.141	-0.458	-0.165	0.007	0.448	0.440	0.306	0.359	0.286
		N	79	79	79	79	79	79	79	79	79	79	79
	Feb	Person's r	-0.169	-0.379	-0.039	-0.169	-0.011	0.019	0.379	0.402	0.505	0.513	0.356
		N	79	79	79	79	79	79	79	79	79	79	79
	Mrz	Person's r	-0.552	-0.489	-0.364	-0.552	-0.285	-0.237	0.471	0.434	0.370	0.399	0.098
		N	79	79	79	79	79	79	79	79	79	79	79
	Apr	Person's r	-0.496	-0.345	-0.416	-0.496	-0.259	-0.326	0.437	0.443	0.355	0.393	0.323
		N	79	79	79	79	79	79	79	79	79	79	79
	Mai	Person's r	-0.360	-0.390	-0.109	-0.360	-0.068	0.008	0.568	0.576	0.343	0.394	0.400
		N	79	79	79	79	79	79	79	79	79	79	79
	Jun	Person's r	-0.225	-0.349	-0.081	-0.225	-0.029	-0.012	0.329	0.356	0.273	0.286	0.400
		N	79	79	79	79	79	79	79	79	79	79	79
	Jul	Person's r	-0.198	-0.495	0.069	-0.198	0.079	0.168	0.563	0.574	0.410	0.436	0.384
		N	79	79	79	79	79	79	79	79	79	79	79
	Aug	Person's r	-0.301	-0.408	-0.192	-0.301	-0.151	-0.122	0.524	0.526	0.346	0.348	0.282
		N	79	79	79	79	79	79	79	79	79	79	79
	Sep	Person's r	-0.199	-0.508	-0.173	-0.199	-0.020	-0.139	0.322	0.357	0.415	0.442	0.398
		N	79	79	79	79	79	79	79	79	79	79	79
	Okt	Person's r	-0.361	-0.605	-0.225	-0.361	-0.182	-0.138	0.517	0.555	0.430	0.475	0.501
		N	79	79	79	79	79	79	79	79	79	79	79
	Nov	Person's r	-0.423	-0.515	-0.096	-0.423	-0.117	0.050	0.467	0.468	0.362	0.385	0.303
		N	79	79	79	79	79	79	79	79	79	79	79
	Dez	Person's r	-0.404	-0.507	-0.079	-0.404	-0.070	0.064	0.489	0.508	0.401	0.455	0.421
		N	79	79	79	79	79	79	79	79	79	79	79
	Annual Mean	Person's r	-0.477	-0.630	-0.219	-0.477	-0.149	-0.084	0.625	0.638	0.518	0.561	0.465
		N	79	79	79	79	79	79	79	79	79	79	79
	DJF	Person's r	-0.404	-0.575	-0.102	-0.404	-0.097	0.035	0.511	0.524	0.468	0.514	0.411
		N	79	79	79	79	79	79	79	79	79	79	79
	MAM	Person's r	-0.547	-0.474	-0.347	-0.547	-0.240	-0.218	0.568	0.558	0.416	0.461	0.309
		N	79	79	79	79	79	79	79	79	79	79	79
	JJA	Person's r	-0.292	-0.512	-0.075	-0.292	-0.033	0.023	0.574	0.591	0.429	0.447	0.441
		N	79	79	79	79	79	79	79	79	79	79	79
	SON	Person's r	-0.376	-0.640	-0.197	-0.376	-0.119	-0.097	0.505	0.536	0.479	0.517	0.476
		N	79	79	79	79	79	79	79	79	79	79	79
El Niño 3		Person's r	0.201	0.106	-0.040	0.201	0.075	-0.122	-0.142	-0.111	0.003	0.010	0.012
		N	54	54	54	54	54	54	54	54	53	53	54
SOI		Person's r	-0.281	-0.094	-0.247	-0.281	-0.219	-0.169	0.143	0.102	-0.176	-0.189	-0.083
		N	53	53	53	53	53	53	53	53	52	52	53
SAB		Person's r	0.117	-0.077	-0.134	0.117	-0.332	-0.194	0.059	0.124	-0.068	-0.073	0.238
		N	50	50	50	50	50	50	50	50	49	49	50

A9 (continued) Correlation matrix of Laguna Negra. 3-year filtered data

			Bsi						C, N und C/N				
			Al µg/g	Fe µg/g	Si µg/g	Si non Biol µg/g	Bsi Flux	bSi µg/g	N %	TOC %	N Flux	TOC Flux	C/N
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.108	0.509	-0.266	-0.108	-0.116	-0.297	-0.375	-0.407	-0.153	-0.238	-0.359
		N	49	49	49	49	49	49	49	49	49	49	49
	Feb	Person's r	0.273	-0.160	0.120	0.273	0.300	0.045	-0.062	-0.009	0.292	0.294	0.223
		N	49	49	49	49	49	49	49	49	49	49	49
	Mrz	Person's r	-0.072	-0.134	0.203	-0.072	0.106	0.289	0.279	0.241	0.208	0.236	0.008
		N	49	49	49	49	49	49	49	49	49	49	49
	Apr	Person's r	-0.414	-0.336	-0.175	-0.414	-0.258	-0.060	0.292	0.289	-0.086	-0.029	0.220
		N	49	49	49	49	49	49	49	49	49	49	49
	Mai	Person's r	0.020	0.124	-0.118	0.020	-0.174	-0.159	0.029	-0.018	-0.170	-0.157	-0.210
		N	49	49	49	49	49	49	49	49	49	49	49
	Jun	Person's r	0.339	0.296	0.127	0.339	0.145	0.027	-0.243	-0.196	0.061	0.000	0.028
		N	49	49	49	49	49	49	49	49	49	49	49
	Jul	Person's r	0.054	-0.099	0.045	0.054	-0.147	0.037	0.266	0.340	0.111	0.141	0.436
		N	49	49	49	49	49	49	49	49	49	49	49
	Aug	Person's r	0.277	0.129	0.352	0.277	0.564	0.339	-0.262	-0.195	0.365	0.389	0.193
		N	49	49	49	49	49	49	49	49	49	49	49
	Sep	Person's r	-0.442	-0.111	-0.400	-0.442	-0.144	-0.335	0.243	0.218	-0.084	-0.076	0.045
		N	49	49	49	49	49	49	49	49	49	49	49
	Okt	Person's r	0.415	-0.156	0.168	0.415	0.023	0.050	0.056	0.135	0.028	0.039	0.314
		N	49	49	49	49	49	49	49	49	49	49	49
	Nov	Person's r	0.156	-0.175	0.075	0.156	-0.162	0.034	0.334	0.387	0.131	0.177	0.408
		N	49	49	49	49	49	49	49	49	49	49	49
	Dez	Person's r	0.034	0.104	-0.134	0.034	-0.095	-0.184	0.098	0.102	-0.133	-0.147	-0.047
		N	49	49	49	49	49	49	49	49	49	49	49
	Total Annual	Person's r	0.240	0.054	0.131	0.240	0.123	0.072	0.072	0.160	0.215	0.240	0.406
		N	49	49	49	49	49	49	49	49	49	49	49
Precipitation HadCRUT3	Jan	Person's r	0.320	0.622	0.103	0.320	0.252	-0.003	-0.541	-0.523	-0.022	-0.091	-0.178
		N	74	74	74	74	74	74	74	74	73	73	74
	Feb	Person's r	0.261	-0.100	0.230	0.261	0.316	0.182	0.033	0.085	0.299	0.288	0.249
		N	74	74	74	74	74	74	74	74	73	73	74
	Mrz	Person's r	-0.004	-0.139	0.123	-0.004	0.122	0.156	0.198	0.158	0.368	0.336	-0.114
		N	74	74	74	74	74	74	74	74	73	73	74
	Apr	Person's r	-0.005	-0.028	0.067	-0.005	0.128	0.086	-0.057	0.002	0.233	0.227	0.340
		N	74	74	74	74	74	74	74	74	73	73	74
	Mai	Person's r	0.045	-0.059	0.003	0.045	-0.024	-0.014	0.005	-0.016	0.079	0.089	-0.076
		N	74	74	74	74	74	74	74	74	73	73	74
	Jun	Person's r	0.291	0.224	0.057	0.291	0.102	-0.048	-0.240	-0.237	0.075	0.035	-0.169
		N	74	74	74	74	74	74	74	74	73	73	74
	Jul	Person's r	-0.090	-0.173	-0.057	-0.090	-0.177	-0.035	0.170	0.182	-0.118	-0.098	0.104
		N	74	74	74	74	74	74	74	74	73	73	74
	Aug	Person's r	0.156	0.238	0.148	0.156	0.345	0.122	-0.274	-0.239	0.066	0.066	0.088
		N	74	74	74	74	74	74	74	74	73	73	74
	Sep	Person's r	-0.066	0.058	-0.277	-0.066	-0.092	-0.320	-0.084	-0.114	-0.052	-0.077	-0.252
		N	74	74	74	74	74	74	74	74	73	73	74
	Okt	Person's r	0.264	0.021	0.161	0.264	0.103	0.093	-0.005	0.047	-0.065	-0.066	0.196
		N	74	74	74	74	74	74	74	74	73	73	74
	Nov	Person's r	-0.024	-0.095	0.011	-0.024	-0.131	0.023	0.222	0.267	-0.036	-0.005	0.343
		N	74	74	74	74	74	74	74	74	73	73	74
	Dez	Person's r	-0.025	0.122	-0.101	-0.025	-0.032	-0.116	-0.013	-0.004	-0.155	-0.158	0.010
		N	74	74	74	74	74	74	74	74	73	73	74
	Total Annual	Person's r	0.188	0.086	0.050	0.188	0.094	-0.014	-0.127	-0.104	0.071	0.061	0.026
		N	74	74	74	74	74	74	74	74	73	73	74
	DJF	Person's r	0.243	0.309	0.084	0.243	0.235	0.005	-0.232	-0.194	0.025	-0.013	0.043
		N	74	74	74	74	74	74	74	74	73	73	74
	MAM	Person's r	0.040	-0.077	0.036	0.040	0.030	0.029	0.006	0.001	0.183	0.187	0.023
		N	74	74	74	74	74	74	74	74	73	73	74
	JJA	Person's r	0.185	0.132	0.064	0.185	0.104	0.005	-0.159	-0.135	0.002	-0.010	0.001
		N	74	74	74	74	74	74	74	74	73	73	74
	SON	Person's r	0.068	0.008	-0.127	0.068	-0.083	-0.187	0.043	0.068	-0.090	-0.094	0.074
		N	74	74	74	74	74	74	74	74	73	73	74
Precipitation CRU TS 2.1	Jan	Person's r	-0.097	0.051	0.095	-0.097	0.237	0.159	0.139	0.068	0.187	0.159	-0.241
		N	76	76	76	76	76	76	76	76	75	75	76
	Feb	Person's r	0.114	0.041	-0.168	0.114	-0.148	-0.258	-0.205	-0.184	-0.164	-0.183	-0.009
		N	76	76	76	76	76	76	76	76	75	75	76
	Mrz	Person's r	-0.025	-0.098	-0.009	-0.025	-0.068	-0.001	0.191	0.142	0.348	0.327	-0.186
		N	76	76	76	76	76	76	76	76	75	75	76
	Apr	Person's r	-0.171	-0.328	-0.048	-0.171	-0.104	0.009	0.197	0.261	0.224	0.271	0.514
		N	76	76	76	76	76	76	76	76	75	75	76
	Mai	Person's r	0.195	-0.066	0.231	0.195	0.133	0.213	-0.038	-0.040	0.106	0.109	0.000
		N	76	76	76	76	76	76	76	76	75	75	76
	Jun	Person's r	0.187	0.262	0.183	0.187	0.178	0.155	-0.063	-0.069	-0.012	-0.050	-0.070
		N	76	76	76	76	76	76	76	76	75	75	76
	Jul	Person's r	-0.061	-0.201	-0.096	-0.061	-0.205	-0.096	0.060	0.076	-0.168	-0.162	0.057
		N	76	76	76	76	76	76	76	76	75	75	76
	Aug	Person's r	0.189	0.160	0.195	0.189	0.408	0.169	-0.257	-0.214	0.138	0.148	0.158
		N	76	76	76	76	76	76	76	76	75	75	76
	Sep	Person's r	-0.021	-0.030	-0.102	-0.021	-0.009	-0.120	-0.075	-0.078	-0.055	-0.069	-0.022
		N	76	76	76	76	76	76	76	76	75	75	76
	Okt	Person's r	0.224	0.205	0.316	0.224	0.344	0.308	-0.136	-0.109	-0.035	-0.039	0.045
		N	76	76	76	76	76	76	76	76	75	75	76
	Nov	Person's r	0.093	-0.050	0.177	0.093	0.048	0.186	0.177	0.229	0.000	0.040	0.351
		N	76	76	76	76	76	76	76	76	75	75	76
	Dez	Person's r	-0.212	0.144	-0.121	-0.212	-0.096	-0.067	0.062	0.051	-0.221	-0.222	-0.027
		N	76	76	76	76	76	76	76	76	75	75	76
	Total Annual	Person's r	0.198	0.015	0.226	0.198	0.210	0.205	-0.077	-0.046	0.052	0.051	0.142
		N	76	76	76	76	76	76	76	76	75	75	76
	DJF	Person's r	0.162	0.104	0.142	0.162	0.186	0.114	-0.132	-0.103	-0.035	-0.046	0.078
		N	76	76	76	76	76	76	76	76	75	75	76
	MAM	Person's r	0.155	0.070	0.191	0.155	0.210	0.177	-0.044	-0.007	-0.058	-0.051	0.176
		N	76	76	76	76	76	76	76	76	75	75	76
	JJA	Person's r	-0.134	0.152	-0.144	-0.134	-0.052	-0.128	-0.011	-0.039	-0.176	-0.200	-0.132
		N	76	76	76	76	76	76	76	76	75	75	76
	SON	Person's r	0.125	-0.161	0.193	0.125	0.082	0.193	0.043	0.053	0.200	0.213	0.115
		N	76	76	76	76	76	76	76	76	75	75	76

A9 (continued) Correlation matrix of Laguna Negra. 3-year filtered data

			Grain size										
			D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	0.436	0.405	0.419	0.429	0.344	0.350	0.429	0.357	0.339	0.242	0.049
		N	76	76	76	76	76	76	76	76	76	76	76
	Feb	Person's r	0.352	0.350	0.346	0.306	0.212	0.192	0.306	0.218	0.233	0.127	0.059
		N	76	76	76	76	76	76	76	76	76	76	76
	Mrz	Person's r	0.033	0.077	0.057	-0.039	-0.112	-0.097	-0.039	-0.102	-0.043	-0.150	-0.015
		N	76	76	76	76	76	76	76	76	76	76	76
	Apr	Person's r	-0.028	-0.038	-0.010	0.022	-0.016	0.002	0.022	-0.010	0.142	-0.007	-0.156
		N	76	76	76	76	76	76	76	76	76	76	76
	Mai	Person's r	0.237	0.144	0.192	0.335	0.390	0.393	0.335	0.386	0.197	0.416	0.182
		N	76	76	76	76	76	76	76	76	76	76	76
	Jun	Person's r	-0.125	-0.157	-0.134	-0.064	0.040	0.091	-0.064	0.044	-0.033	0.086	0.111
		N	76	76	76	76	76	76	76	76	76	76	76
	Jul	Person's r	0.009	-0.095	-0.030	0.169	0.267	0.248	0.169	0.250	0.132	0.362	0.019
		N	76	76	76	76	76	76	76	76	76	76	76
	Aug	Person's r	-0.100	-0.094	-0.087	-0.080	-0.054	-0.066	-0.080	-0.060	-0.092	-0.025	0.056
		N	76	76	76	76	76	76	76	76	76	76	76
	Sep	Person's r	0.066	-0.038	0.017	0.207	0.351	0.365	0.207	0.340	0.186	0.409	0.173
		N	76	76	76	76	76	76	76	76	76	76	76
	Okt	Person's r	0.142	0.081	0.124	0.235	0.250	0.255	0.235	0.250	0.282	0.236	-0.101
		N	76	76	76	76	76	76	76	76	76	76	76
	Nov	Person's r	0.185	0.209	0.187	0.102	0.045	0.062	0.102	0.058	0.050	-0.020	0.150
		N	76	76	76	76	76	76	76	76	76	76	76
	Dez	Person's r	0.305	0.263	0.273	0.314	0.304	0.287	0.314	0.303	0.257	0.259	0.121
		N	76	76	76	76	76	76	76	76	76	76	76
	Annual Average	Person's r	0.214	0.150	0.189	0.284	0.306	0.317	0.284	0.307	0.240	0.299	0.105
		N	76	76	76	76	76	76	76	76	76	76	76
	DJF	Person's r	0.438	0.407	0.414	0.421	0.347	0.334	0.421	0.354	0.333	0.256	0.097
		N	76	76	76	76	76	76	76	76	76	76	76
	MAM	Person's r	0.121	0.090	0.116	0.159	0.141	0.155	0.159	0.145	0.133	0.141	0.025
		N	76	76	76	76	76	76	76	76	76	76	76
	JJA	Person's r	-0.110	-0.180	-0.129	0.018	0.140	0.154	0.018	0.130	0.011	0.228	0.097
		N	76	76	76	76	76	76	76	76	76	76	76
	SON	Person's r	0.197	0.131	0.167	0.267	0.312	0.330	0.267	0.314	0.254	0.299	0.108
		N	76	76	76	76	76	76	76	76	76	76	76
Temperature HadCRUT3	Jan	Person's r	0.416	0.437	0.411	0.314	0.161	0.139	0.314	0.173	0.236	0.022	-0.080
		N	79	79	79	79	79	79	79	79	79	79	79
	Feb	Person's r	0.165	0.165	0.163	0.143	0.109	0.103	0.143	0.114	0.070	0.055	-0.003
		N	79	79	79	79	79	79	79	79	79	79	79
	Mrz	Person's r	0.199	0.267	0.224	0.068	-0.127	-0.141	0.068	-0.112	0.098	-0.237	-0.281
		N	79	79	79	79	79	79	79	79	79	79	79
	Apr	Person's r	0.182	0.234	0.205	0.078	-0.070	-0.052	0.078	-0.049	0.123	-0.184	-0.231
		N	79	79	79	79	79	79	79	79	79	79	79
	Mai	Person's r	0.476	0.434	0.450	0.472	0.357	0.350	0.472	0.371	0.383	0.236	-0.112
		N	79	79	79	79	79	79	79	79	79	79	79
	Jun	Person's r	0.305	0.249	0.267	0.321	0.308	0.334	0.321	0.321	0.216	0.263	0.088
		N	79	79	79	79	79	79	79	79	79	79	79
	Jul	Person's r	0.429	0.336	0.383	0.509	0.470	0.446	0.509	0.472	0.429	0.400	-0.081
		N	79	79	79	79	79	79	79	79	79	79	79
	Aug	Person's r	0.266	0.248	0.256	0.259	0.218	0.219	0.259	0.229	0.237	0.120	-0.052
		N	79	79	79	79	79	79	79	79	79	79	79
	Sep	Person's r	0.207	0.173	0.193	0.239	0.225	0.237	0.239	0.232	0.304	0.155	-0.100
		N	79	79	79	79	79	79	79	79	79	79	79
	Okt	Person's r	0.296	0.267	0.275	0.301	0.252	0.259	0.301	0.261	0.312	0.164	-0.105
		N	79	79	79	79	79	79	79	79	79	79	79
	Nov	Person's r	0.396	0.412	0.391	0.307	0.215	0.211	0.307	0.232	0.215	0.074	0.065
		N	79	79	79	79	79	79	79	79	79	79	79
	Dez	Person's r	0.470	0.474	0.462	0.399	0.263	0.267	0.399	0.282	0.320	0.111	-0.044
		N	79	79	79	79	79	79	79	79	79	79	79
	Annual Mean	Person's r	0.428	0.418	0.415	0.381	0.260	0.259	0.381	0.276	0.332	0.123	-0.118
		N	79	79	79	79	79	79	79	79	79	79	79
	DJF	Person's r	0.411	0.421	0.405	0.334	0.208	0.198	0.334	0.222	0.245	0.073	-0.050
		N	79	79	79	79	79	79	79	79	79	79	79
	MAM	Person's r	0.325	0.358	0.335	0.230	0.052	0.051	0.231	0.072	0.227	-0.081	-0.244
		N	79	79	79	79	79	79	79	79	79	79	79
	JJA	Person's r	0.414	0.342	0.373	0.452	0.415	0.416	0.452	0.425	0.364	0.330	-0.016
		N	79	79	79	79	79	79	79	79	79	79	79
	SON	Person's r	0.345	0.325	0.329	0.330	0.273	0.279	0.330	0.285	0.331	0.158	-0.061
		N	79	79	79	79	79	79	79	79	79	79	79
El Niño 3		Person's r	-0.144	-0.161	-0.137	-0.079	-0.045	-0.038	-0.079	-0.050	-0.010	0.001	-0.134
		N	54	54	54	54	54	54	54	54	54	54	54
SOI		Person's r	0.170	0.208	0.179	0.080	0.038	0.049	0.080	0.053	0.009	-0.064	0.141
		N	53	53	53	53	53	53	53	53	53	53	53
SAB		Person's r	0.008	-0.013	0.005	0.055	0.147	0.180	0.055	0.150	-0.006	0.132	0.118
		N	50	50	50	50	50	50	50	50	50	50	50

A9 (continued) Correlation matrix of Laguna Negra. 3-year filtered data

			Grain size										
			D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.266	-0.157	-0.213	-0.401	-0.524	-0.525	-0.401	-0.522	-0.264	-0.451	-0.113
		N	49	49	49	49	49	49	49	49	49	49	49
	Feb	Person's r	0.014	-0.069	-0.013	0.167	0.211	0.242	0.167	0.211	0.282	0.245	-0.150
		N	49	49	49	49	49	49	49	49	49	49	49
	Mrz	Person's r	0.262	0.263	0.253	0.210	0.169	0.146	0.210	0.173	0.130	0.059	0.083
		N	49	49	49	49	49	49	49	49	49	49	49
	Apr	Person's r	0.338	0.327	0.313	0.259	0.106	0.106	0.259	0.125	0.093	-0.006	-0.103
		N	49	49	49	49	49	49	49	49	49	49	49
	Mai	Person's r	-0.233	-0.200	-0.227	-0.289	-0.220	-0.229	-0.289	-0.234	-0.402	-0.101	0.223
		N	49	49	49	49	49	49	49	49	49	49	49
	Jun	Person's r	-0.287	-0.294	-0.282	-0.214	-0.125	-0.141	-0.214	-0.145	-0.079	-0.010	-0.030
		N	49	49	49	49	49	49	49	49	49	49	49
	Jul	Person's r	0.119	0.064	0.093	0.196	0.268	0.288	0.196	0.271	0.007	0.246	0.068
		N	49	49	49	49	49	49	49	49	49	49	49
	Aug	Person's r	0.194	0.217	0.236	0.201	0.011	0.033	0.201	0.032	0.389	-0.125	-0.362
		N	49	49	49	49	49	49	49	49	49	49	49
	Sep	Person's r	0.296	0.345	0.314	0.175	-0.025	-0.044	0.175	-0.007	0.060	-0.163	-0.123
		N	49	49	49	49	49	49	49	49	49	49	49
	Okt	Person's r	-0.186	-0.307	-0.240	0.049	0.354	0.374	0.049	0.331	0.105	0.469	0.162
		N	49	49	49	49	49	49	49	49	49	49	49
	Nov	Person's r	0.046	-0.070	-0.022	0.212	0.348	0.336	0.212	0.328	0.057	0.435	0.044
		N	49	49	49	49	49	49	49	49	49	49	49
	Dez	Person's r	-0.128	-0.107	-0.114	-0.140	0.032	0.066	-0.140	0.033	-0.217	0.028	0.338
		N	49	49	49	49	49	49	49	49	49	49	49
	Total Annual	Person's r	0.054	0.021	0.049	0.125	0.128	0.142	0.125	0.129	0.069	0.119	-0.081
		N	49	49	49	49	49	49	49	49	49	49	49
Precipitation HadCRUT3	Jan	Person's r	-0.426	-0.397	-0.413	-0.426	-0.364	-0.359	-0.426	-0.377	-0.366	-0.210	0.070
		N	74	74	74	74	74	74	74	74	74	74	74
	Feb	Person's r	0.055	-0.048	0.015	0.219	0.320	0.341	0.219	0.314	0.288	0.371	-0.007
		N	74	74	74	74	74	74	74	74	74	74	74
	Mrz	Person's r	0.138	0.171	0.160	0.094	0.044	0.026	0.095	0.048	0.160	-0.051	-0.050
		N	74	74	74	74	74	74	74	74	74	74	74
	Apr	Person's r	0.029	0.040	0.031	0.004	-0.031	-0.022	0.004	-0.027	-0.003	-0.043	-0.032
		N	74	74	74	74	74	74	74	74	74	74	74
	Mai	Person's r	-0.226	-0.223	-0.238	-0.234	-0.163	-0.183	-0.234	-0.181	-0.321	-0.052	0.151
		N	74	74	74	74	74	74	74	74	74	74	74
	Jun	Person's r	-0.301	-0.308	-0.292	-0.236	-0.190	-0.194	-0.236	-0.201	-0.084	-0.101	-0.162
		N	74	74	74	74	74	74	74	74	74	74	74
	Jul	Person's r	0.128	0.123	0.133	0.141	0.091	0.079	0.141	0.095	0.114	0.031	-0.171
		N	74	74	74	74	74	74	74	74	74	74	74
	Aug	Person's r	0.085	0.127	0.128	0.055	-0.069	-0.049	0.055	-0.052	0.195	-0.158	-0.250
		N	74	74	74	74	74	74	74	74	74	74	74
	Sep	Person's r	-0.124	-0.059	-0.076	-0.177	-0.269	-0.273	-0.177	-0.263	-0.104	-0.296	-0.223
		N	74	74	74	74	74	74	74	74	74	74	74
	Okt	Person's r	-0.072	-0.166	-0.116	0.085	0.272	0.289	0.085	0.259	0.144	0.347	0.138
		N	74	74	74	74	74	74	74	74	74	74	74
	Nov	Person's r	0.121	0.055	0.079	0.198	0.244	0.235	0.198	0.236	0.086	0.278	0.024
		N	74	74	74	74	74	74	74	74	74	74	74
	Dez	Person's r	-0.022	0.026	0.005	-0.087	-0.051	-0.020	-0.087	-0.039	-0.139	-0.112	0.203
		N	74	74	74	74	74	74	74	74	74	74	74
	Total Annual	Person's r	-0.155	-0.147	-0.138	-0.124	-0.134	-0.141	-0.124	-0.139	-0.046	-0.103	-0.193
		N	74	74	74	74	74	74	74	74	74	74	74
	DJF	Person's r	-0.177	-0.179	-0.172	-0.145	-0.047	-0.015	-0.145	-0.048	-0.121	0.003	0.162
		N	74	74	74	74	74	74	74	74	74	74	74
	MAM	Person's r	-0.185	-0.176	-0.194	-0.205	-0.156	-0.173	-0.205	-0.170	-0.281	-0.066	0.125
		N	74	74	74	74	74	74	74	74	74	74	74
	JJA	Person's r	-0.063	-0.052	-0.036	-0.030	-0.087	-0.088	-0.030	-0.084	0.105	-0.110	-0.307
		N	74	74	74	74	74	74	74	74	74	74	74
	SON	Person's r	-0.070	-0.100	-0.077	0.005	0.050	0.050	0.005	0.044	0.034	0.083	-0.090
		N	74	74	74	74	74	74	74	74	74	74	74
Precipitation CRU TS 2.1	Jan	Person's r	0.097	0.119	0.105	0.050	-0.077	-0.115	0.050	-0.077	0.099	-0.094	-0.190
		N	76	76	76	76	76	76	76	76	76	76	76
	Feb	Person's r	-0.296	-0.288	-0.293	-0.275	-0.218	-0.204	-0.275	-0.224	-0.213	-0.131	-0.047
		N	76	76	76	76	76	76	76	76	76	76	76
	Mrz	Person's r	0.030	0.070	0.059	-0.015	-0.132	-0.138	-0.015	-0.123	0.094	-0.192	-0.297
		N	76	76	76	76	76	76	76	76	76	76	76
	Apr	Person's r	0.219	0.207	0.201	0.183	0.185	0.220	0.183	0.198	0.022	0.123	0.183
		N	76	76	76	76	76	76	76	76	76	76	76
	Mai	Person's r	-0.183	-0.219	-0.213	-0.142	-0.002	-0.024	-0.142	-0.025	-0.283	0.131	0.320
		N	76	76	76	76	76	76	76	76	76	76	76
	Jun	Person's r	-0.089	-0.114	-0.100	-0.033	-0.006	-0.039	-0.033	-0.020	0.020	0.053	-0.076
		N	76	76	76	76	76	76	76	76	76	76	76
	Jul	Person's r	-0.019	-0.014	-0.014	-0.005	-0.032	-0.057	-0.005	-0.037	-0.015	-0.035	-0.161
		N	76	76	76	76	76	76	76	76	76	76	76
	Aug	Person's r	0.053	0.065	0.076	0.063	-0.027	-0.026	0.063	-0.022	0.190	-0.060	-0.226
		N	76	76	76	76	76	76	76	76	76	76	76
	Sep	Person's r	-0.192	-0.187	-0.200	-0.193	-0.147	-0.189	-0.193	-0.168	-0.288	-0.048	0.080
		N	76	76	76	76	76	76	76	76	76	76	76
	Okt	Person's r	0.063	0.041	0.062	0.120	0.147	0.138	0.120	0.144	0.213	0.121	-0.006
		N	76	76	76	76	76	76	76	76	76	76	76
	Nov	Person's r	0.143	0.048	0.088	0.264	0.347	0.324	0.264	0.331	0.132	0.400	0.078
		N	76	76	76	76	76	76	76	76	76	76	76
	Dez	Person's r	0.225	0.309	0.275	0.095	-0.050	-0.018	0.095	-0.019	0.082	-0.225	-0.072
		N	76	76	76	76	76	76	76	76	76	76	76
	Total Annual	Person's r	-0.076	-0.102	-0.088	-0.022	0.013	-0.024	-0.022	-0.005	-0.056	0.081	-0.010
		N	76	76	76	76	76	76	76	76	76	76	76
	DJF	Person's r	-0.031	-0.036	-0.022	0.012	-0.036	-0.068	0.012	-0.044	0.101	-0.024	-0.254
		N	76	76	76	76	76	76	76	76	76	76	76
	MAM	Person's r	-0.030	-0.084	-0.062	0.059	0.145	0.100	0.059	0.121	-0.018	0.224	0.089
		N	76	76	76	76	76	76	76	76	76	76	76
	JJA	Person's r	0.038	0.113	0.080	-0.067	-0.197	-0.182	-0.067	-0.178	-0.019	-0.283	-0.164
		N	76	76	76	76	76	76	76	76	76	76	76
	SON	Person's r	-0.100	-0.131	-0.129	-0.080	0.031	0.021	-0.080	0.015	-0.236	0.126	0.298
		N	76	76	76	76	76	76	76	76	76	76	76

A10 Correlation matrix of Laguna Negra. 5-year filtered data

			Spectrolino								
			RABD660;670	R590/640	RABD510	RABD550	RABD480	Chlorin	RABD720	Total Absorbtion	Clastic input
Temperature CRU TS 2.1	Jan	Person's r	0.705	-0.693	0.499	-0.033	0.613	-0.610	0.029	-0.550	-0.637
		N	85	85	85	85	85	85	85	85	85
	Feb	Person's r	0.556	-0.490	0.288	-0.048	0.317	-0.554	-0.036	-0.272	-0.411
		N	85	85	85	85	85	85	85	85	85
	Mar	Person's r	0.390	-0.276	0.210	0.059	0.171	-0.406	-0.107	-0.090	-0.228
		N	85	85	85	85	85	85	85	85	85
	Apr	Person's r	-0.018	0.041	-0.093	-0.180	-0.041	-0.107	-0.199	0.200	0.070
		N	85	85	85	85	85	85	85	85	85
	May	Person's r	0.262	-0.117	-0.079	-0.447	0.101	-0.209	0.076	0.000	-0.037
		N	85	85	85	85	85	85	85	85	85
	Jun	Person's r	0.279	-0.193	0.220	0.134	0.145	-0.029	-0.092	-0.235	-0.186
		N	85	85	85	85	85	85	85	85	85
	Jul	Person's r	0.121	-0.085	-0.050	-0.061	-0.090	-0.015	-0.203	0.055	-0.016
		N	85	85	85	85	85	85	85	85	85
	Aug	Person's r	-0.263	0.315	-0.391	-0.303	-0.364	0.068	-0.024	0.436	0.359
		N	85	85	85	85	85	85	85	85	85
	Sep	Person's r	0.442	-0.325	0.271	0.152	0.167	-0.190	-0.115	-0.190	-0.307
		N	85	85	85	85	85	85	85	85	85
	Oct	Person's r	0.426	-0.421	0.356	0.159	0.302	-0.316	-0.420	-0.292	-0.364
		N	85	85	85	85	85	85	85	85	85
	Nov	Person's r	0.368	-0.388	0.234	0.003	0.245	-0.490	-0.064	-0.213	-0.325
		N	85	85	85	85	85	85	85	85	85
	Dec	Person's r	0.545	-0.487	0.314	-0.078	0.361	-0.538	-0.321	-0.314	-0.392
		N	85	85	85	85	85	85	85	85	85
	Annual Mean	Person's r	0.511	-0.423	0.250	-0.070	0.267	-0.447	-0.187	-0.215	-0.339
		N	85	85	85	85	85	85	85	85	85
	DJF	Person's r	0.665	-0.614	0.403	-0.059	0.471	-0.628	-0.124	-0.414	-0.528
		N	85	85	85	85	85	85	85	85	85
	MAM	Person's r	0.289	-0.162	0.021	-0.252	0.109	-0.313	-0.078	0.030	-0.092
		N	85	85	85	85	85	85	85	85	85
	JJA	Person's r	0.120	-0.028	-0.055	-0.076	-0.109	0.004	-0.168	0.067	0.029
		N	85	85	85	85	85	85	85	85	85
	SON	Person's r	0.535	-0.497	0.373	0.131	0.314	-0.446	-0.258	-0.304	-0.434
		N	85	85	85	85	85	85	85	85	85
Temperature HadCRUT3	Jan	Person's r	0.621	-0.532	0.450	0.300	0.357	-0.573	-0.105	-0.348	-0.489
		N	90	90	90	90	90	90	90	90	90
	Feb	Person's r	0.616	-0.577	0.497	0.354	0.389	-0.446	-0.128	-0.470	-0.529
		N	90	90	90	90	90	90	90	90	90
	Mar	Person's r	0.483	-0.468	0.503	0.423	0.393	-0.551	-0.300	-0.336	-0.456
		N	90	90	90	90	90	90	90	90	90
	Apr	Person's r	0.640	-0.544	0.607	0.471	0.526	-0.495	-0.095	-0.535	-0.553
		N	90	90	90	90	90	90	90	90	90
	May	Person's r	0.601	-0.475	0.384	0.055	0.437	-0.518	-0.110	-0.343	-0.427
		N	90	90	90	90	90	90	90	90	90
	Jun	Person's r	0.753	-0.630	0.502	0.232	0.469	-0.468	-0.064	-0.528	-0.580
		N	90	90	90	90	90	90	90	90	90
	Jul	Person's r	0.707	-0.566	0.410	0.178	0.350	-0.425	-0.156	-0.440	-0.487
		N	90	90	90	90	90	90	90	90	90
	Aug	Person's r	0.593	-0.517	0.430	0.240	0.388	-0.500	-0.243	-0.383	-0.461
		N	90	90	90	90	90	90	90	90	90
	Sep	Person's r	0.686	-0.556	0.544	0.451	0.401	-0.409	-0.206	-0.448	-0.551
		N	90	90	90	90	90	90	90	90	90
	Oct	Person's r	0.737	-0.639	0.646	0.464	0.536	-0.444	-0.331	-0.618	-0.620
		N	90	90	90	90	90	90	90	90	90
	Nov	Person's r	0.701	-0.610	0.470	0.225	0.437	-0.513	-0.043	-0.537	-0.549
		N	90	90	90	90	90	90	90	90	90
	Dec	Person's r	0.622	-0.544	0.414	0.158	0.417	-0.555	-0.085	-0.389	-0.498
		N	90	90	90	90	90	90	90	90	90
	Annual Mean	Person's r	0.804	-0.690	0.610	0.372	0.531	-0.612	-0.192	-0.558	-0.644
		N	90	90	90	90	90	90	90	90	90
	DJF	Person's r	0.706	-0.630	0.520	0.315	0.442	-0.591	-0.123	-0.464	-0.578
		N	90	90	90	90	90	90	90	90	90
	MAM	Person's r	0.653	-0.563	0.567	0.363	0.514	-0.594	-0.193	-0.460	-0.544
		N	90	90	90	90	90	90	90	90	90
	JJA	Person's r	0.795	-0.662	0.517	0.248	0.466	-0.531	-0.168	-0.525	-0.591
		N	90	90	90	90	90	90	90	90	90
	SON	Person's r	0.801	-0.680	0.625	0.431	0.516	-0.515	-0.216	-0.602	-0.648
		N	90	90	90	90	90	90	90	90	90
El Niño 3		Person's r	-0.342	0.356	-0.177	0.095	-0.184	0.317	-0.004	0.326	0.292
		N	63	63	63	63	63	63	63	63	63
SOI		Person's r	0.010	0.039	-0.206	-0.213	-0.115	-0.090	0.212	0.013	0.075
		N	62	62	62	62	62	62	62	62	62
SAB		Person's r	0.234	-0.325	0.429	0.275	0.343	-0.043	0.227	-0.446	-0.383
		N	59	59	59	59	59	59	59	59	59

A10 (continued) Correlation matrix of Laguna Negra. 5-year filtered data

			Spectrolino								
			RABD660;670	R590/640	RABD510	RABD550	RABD480	Chlorin	RABD720	Total Absorbtion	Clastic input
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.453	0.479	-0.456	-0.484	-0.187	0.058	-0.218	0.263	0.461
		N	47	47	47	47	47	47	47	47	47
	Feb	Person's r	0.426	-0.350	0.350	0.445	0.126	-0.029	-0.220	-0.109	-0.374
		N	47	47	47	47	47	47	47	47	47
	Mar	Person's r	0.038	-0.011	-0.203	-0.251	-0.170	-0.147	0.154	0.027	0.091
		N	47	47	47	47	47	47	47	47	47
	Apr	Person's r	0.479	-0.419	0.281	0.324	0.119	-0.389	0.237	-0.118	-0.340
		N	47	47	47	47	47	47	47	47	47
	May	Person's r	-0.233	0.442	-0.376	-0.114	-0.448	0.293	0.380	0.215	0.425
		N	47	47	47	47	47	47	47	47	47
	Jun	Person's r	-0.277	0.297	-0.104	-0.182	-0.074	0.251	-0.326	0.158	0.252
		N	47	47	47	47	47	47	47	47	47
	Jul	Person's r	0.218	-0.267	0.339	0.244	0.311	0.147	0.206	-0.393	-0.285
		N	47	47	47	47	47	47	47	47	47
	Aug	Person's r	0.218	-0.364	0.213	0.008	0.362	-0.293	0.092	-0.032	-0.401
		N	47	47	47	47	47	47	47	47	47
	Sep	Person's r	0.068	-0.065	-0.066	-0.119	0.044	-0.101	0.221	-0.190	-0.015
		N	47	47	47	47	47	47	47	47	47
	Oct	Person's r	0.122	-0.061	0.325	0.365	0.097	0.596	-0.117	-0.399	-0.157
		N	47	47	47	47	47	47	47	47	47
	Nov	Person's r	0.214	-0.190	0.398	0.395	0.161	0.471	-0.164	-0.555	-0.180
		N	47	47	47	47	47	47	47	47	47
	Dec	Person's r	-0.190	0.253	-0.287	-0.302	-0.128	0.162	0.466	0.064	0.217
		N	47	47	47	47	47	47	47	47	47
	Total Annual	Person's r	0.205	-0.191	0.252	0.169	0.226	0.175	0.216	-0.266	-0.232
		N	47	47	47	47	47	47	47	47	47
Precipitation HadCRUT3	Jan	Person's r	-0.295	0.433	-0.408	-0.220	-0.367	0.389	-0.016	0.330	0.426
		N	83	83	83	83	83	83	83	83	83
	Feb	Person's r	0.313	-0.222	0.158	0.063	0.132	-0.030	-0.126	-0.145	-0.224
		N	83	83	83	83	83	83	83	83	83
	Mar	Person's r	-0.039	-0.094	0.045	-0.099	0.068	-0.304	-0.338	0.082	-0.044
		N	83	83	83	83	83	83	83	83	83
	Apr	Person's r	0.142	0.088	-0.055	-0.034	-0.097	-0.079	-0.009	0.173	0.116
		N	83	83	83	83	83	83	83	83	83
	May	Person's r	-0.138	0.334	-0.285	-0.008	-0.386	0.225	0.159	0.398	0.330
		N	83	83	83	83	83	83	83	83	83
	Jun	Person's r	-0.454	0.440	-0.317	0.031	-0.419	0.534	-0.060	0.359	0.397
		N	83	83	83	83	83	83	83	83	83
	Jul	Person's r	0.251	-0.330	0.337	0.360	0.285	-0.090	0.042	-0.338	-0.353
		N	83	83	83	83	83	83	83	83	83
	Aug	Person's r	0.105	-0.051	-0.027	-0.032	0.058	-0.052	0.115	0.006	-0.059
		N	83	83	83	83	83	83	83	83	83
	Sep	Person's r	-0.521	0.418	-0.332	-0.006	-0.356	0.275	0.095	0.405	0.377
		N	83	83	83	83	83	83	83	83	83
	Oct	Person's r	-0.034	0.003	0.052	0.012	0.044	0.316	-0.091	-0.182	-0.028
		N	83	83	83	83	83	83	83	83	83
	Nov	Person's r	-0.004	-0.018	0.108	0.083	0.086	0.183	-0.078	-0.222	-0.026
		N	83	83	83	83	83	83	83	83	83
	Dec	Person's r	0.060	-0.027	0.005	-0.089	0.100	-0.076	0.390	-0.075	-0.034
		N	83	83	83	83	83	83	83	83	83
	Total Annual	Person's r	-0.172	0.259	-0.178	0.157	-0.276	0.347	0.106	0.254	0.221
		N	83	83	83	83	83	83	83	83	83
	DJF	Person's r	0.040	0.088	-0.118	-0.132	-0.050	0.121	0.185	0.042	0.079
		N	83	83	83	83	83	83	83	83	83
	MAM	Person's r	-0.096	0.324	-0.274	-0.024	-0.376	0.164	0.118	0.419	0.331
		N	83	83	83	83	83	83	83	83	83
	JJA	Person's r	-0.055	0.022	0.017	0.226	-0.035	0.224	0.044	-0.003	-0.020
		N	83	83	83	83	83	83	83	83	83
	SON	Person's r	-0.390	0.293	-0.169	0.037	-0.200	0.408	-0.003	0.118	0.248
		N	83	83	83	83	83	83	83	83	83
Precipitation CRU TS 2.1	Jan	Person's r	-0.034	0.119	-0.249	-0.299	-0.160	-0.093	-0.125	0.222	0.187
		N	85	85	85	85	85	85	85	85	85
	Feb	Person's r	0.085	-0.005	0.104	0.431	-0.118	0.381	0.098	-0.214	-0.047
		N	85	85	85	85	85	85	85	85	85
	Mar	Person's r	-0.031	-0.110	0.167	0.162	0.081	-0.244	-0.516	0.025	-0.084
		N	85	85	85	85	85	85	85	85	85
	Apr	Person's r	0.438	-0.276	0.260	0.190	0.174	-0.315	0.300	-0.130	-0.268
		N	85	85	85	85	85	85	85	85	85
	May	Person's r	0.043	0.067	-0.080	-0.003	-0.214	0.058	0.220	0.166	0.093
		N	85	85	85	85	85	85	85	85	85
	Jun	Person's r	-0.386	0.421	-0.383	-0.305	-0.309	0.372	-0.069	0.360	0.419
		N	85	85	85	85	85	85	85	85	85
	Jul	Person's r	0.129	-0.193	0.267	0.410	0.133	0.073	-0.014	-0.259	-0.225
		N	85	85	85	85	85	85	85	85	85
	Aug	Person's r	0.199	-0.084	0.013	0.037	0.010	-0.038	0.067	-0.030	-0.082
		N	85	85	85	85	85	85	85	85	85
	Sep	Person's r	-0.183	0.265	-0.205	0.063	-0.336	0.231	0.119	0.287	0.257
		N	85	85	85	85	85	85	85	85	85
	Oct	Person's r	0.021	-0.100	0.004	-0.144	0.130	0.015	0.041	-0.077	-0.115
		N	85	85	85	85	85	85	85	85	85
	Nov	Person's r	0.120	-0.054	0.065	-0.032	0.088	0.184	0.017	-0.241	-0.040
		N	85	85	85	85	85	85	85	85	85
	Dec	Person's r	0.062	-0.270	0.192	-0.184	0.473	-0.369	0.216	-0.260	-0.276
		N	85	85	85	85	85	85	85	85	85
	Total Annual	Person's r	0.044	0.062	-0.056	0.071	-0.156	0.183	0.148	0.092	0.064
		N	85	85	85	85	85	85	85	85	85
	DJF	Person's r	-0.045	0.094	-0.068	0.074	-0.102	0.243	-0.012	0.049	0.075
		N	85	85	85	85	85	85	85	85	85
	MAM	Person's r	-0.058	0.102	-0.109	-0.051	-0.119	0.256	0.112	0.040	0.095
		N	85	85	85	85	85	85	85	85	85
	JJA	Person's r	0.078	-0.150	0.085	-0.040	0.215	-0.110	0.159	-0.211	-0.146
		N	85	85	85	85	85	85	85	85	85
	SON	Person's r	0.152	-0.029	0.020	0.068	-0.134	-0.062	0.214	0.115	0.000
		N	85	85	85	85	85	85	85	85	85

A10 (continued) Correlation matrix of Laguna Negra. 5-year filtered data

			Bsi						C, N und C/N				
			Al µg/g	Fe µg/g	Si µg/g	Si non Biol µg/g	Bsi Flux	bSi µg/g	N %	TOC %	N Flux	TOC Flux	C/N
Temperature CRU TS 2.1	Jan	Person's r	-0.118	-0.186	0.320	-0.118	0.194	0.455	0.325	0.360	0.554	0.600	0.430
		N	74	74	74	74	76	74	74	74	73	73	74
	Feb	Person's r	-0.062	-0.197	0.343	-0.062	0.284	0.461	0.154	0.168	0.537	0.545	0.263
		N	74	74	74	74	76	74	74	74	73	73	74
	Mrz	Person's r	0.003	-0.055	0.047	0.003	0.166	0.058	-0.012	-0.003	0.631	0.602	0.126
		N	74	74	74	74	76	74	74	74	73	73	74
	Apr	Person's r	0.454	0.310	0.410	0.454	0.440	0.333	-0.324	-0.296	0.576	0.523	0.041
		N	74	74	74	74	76	74	74	74	73	73	74
	Mai	Person's r	0.208	0.079	0.459	0.208	0.337	0.497	0.157	0.172	0.479	0.475	0.202
		N	74	74	74	74	76	74	74	74	73	73	74
	Jun	Person's r	0.396	0.130	0.127	0.396	0.066	-0.003	-0.288	-0.219	0.295	0.259	0.244
		N	74	74	74	74	76	74	74	74	73	73	74
	Jul	Person's r	0.356	0.021	0.473	0.356	0.361	0.453	0.096	0.096	0.388	0.362	0.024
		N	74	74	74	74	76	74	74	74	73	73	74
	Aug	Person's r	0.327	0.228	0.297	0.327	0.217	0.241	-0.199	-0.204	0.392	0.318	-0.147
		N	74	74	74	74	76	74	74	74	73	73	74
	Sep	Person's r	0.263	-0.225	0.374	0.263	0.276	0.366	0.017	0.091	0.507	0.534	0.456
		N	74	74	74	74	76	74	74	74	73	73	74
	Okt	Person's r	0.213	-0.222	0.315	0.213	0.166	0.312	0.247	0.284	0.687	0.676	0.324
		N	74	74	74	74	76	74	74	74	73	73	74
	Nov	Person's r	-0.120	-0.107	0.168	-0.120	0.134	0.263	0.081	0.075	0.410	0.412	0.124
		N	74	74	74	74	76	74	74	74	73	73	74
	Dez	Person's r	-0.170	-0.378	0.228	-0.170	0.146	0.360	0.419	0.426	0.609	0.623	0.324
		N	74	74	74	74	76	74	74	74	73	73	74
	Annual Average	Person's r	0.245	-0.086	0.482	0.245	0.412	0.511	0.092	0.130	0.822	0.804	0.331
		N	74	74	74	74	76	74	74	74	73	73	74
	DJF	Person's r	-0.139	-0.308	0.343	-0.139	0.252	0.493	0.352	0.372	0.672	0.696	0.388
		N	74	74	74	74	76	74	74	74	73	73	74
	MAM	Person's r	0.269	0.129	0.394	0.269	0.403	0.388	-0.047	-0.026	0.713	0.680	0.167
		N	74	74	74	74	76	74	74	74	73	73	74
	JJA	Person's r	0.560	0.185	0.455	0.560	0.320	0.346	-0.200	-0.163	0.546	0.480	0.088
		N	74	74	74	74	76	74	74	74	73	73	74
	SON	Person's r	0.155	-0.255	0.394	0.155	0.281	0.436	0.162	0.209	0.745	0.752	0.413
		N	74	74	74	74	76	74	74	74	73	73	74
Temperature HadCRUT3	Jan	Person's r	-0.521	-0.688	-0.188	-0.521	-0.165	-0.027	0.542	0.538	0.353	0.418	0.362
		N	77	77	77	77	79	77	77	77	77	77	77
	Feb	Person's r	-0.134	-0.411	-0.018	-0.134	-0.011	0.032	0.388	0.409	0.609	0.616	0.365
		N	77	77	77	77	79	77	77	77	77	77	77
	Mrz	Person's r	-0.602	-0.562	-0.423	-0.602	-0.285	-0.293	0.543	0.510	0.401	0.437	0.150
		N	77	77	77	77	79	77	77	77	77	77	77
	Apr	Person's r	-0.540	-0.414	-0.484	-0.540	-0.259	-0.396	0.465	0.477	0.400	0.445	0.380
		N	77	77	77	77	79	77	77	77	77	77	77
	Mai	Person's r	-0.416	-0.521	-0.126	-0.416	-0.068	0.010	0.643	0.658	0.413	0.470	0.497
		N	77	77	77	77	79	77	77	77	77	77	77
	Jun	Person's r	-0.183	-0.408	-0.030	-0.183	-0.029	0.037	0.355	0.379	0.420	0.454	0.428
		N	77	77	77	77	79	77	77	77	77	77	77
	Jul	Person's r	-0.175	-0.574	0.146	-0.175	0.079	0.258	0.611	0.623	0.520	0.562	0.429
		N	77	77	77	77	79	77	77	77	77	77	77
	Aug	Person's r	-0.319	-0.486	-0.160	-0.319	-0.151	-0.074	0.564	0.562	0.483	0.489	0.291
		N	77	77	77	77	79	77	77	77	77	77	77
	Sep	Person's r	-0.168	-0.554	-0.119	-0.168	-0.020	-0.083	0.343	0.392	0.548	0.588	0.507
		N	77	77	77	77	79	77	77	77	77	77	77
	Okt	Person's r	-0.368	-0.665	-0.238	-0.368	-0.182	-0.154	0.589	0.636	0.481	0.535	0.609
		N	77	77	77	77	79	77	77	77	77	77	77
	Nov	Person's r	-0.434	-0.588	-0.082	-0.434	-0.117	0.074	0.544	0.544	0.453	0.489	0.355
		N	77	77	77	77	79	77	77	77	77	77	77
	Dez	Person's r	-0.421	-0.581	-0.094	-0.421	-0.070	0.053	0.559	0.579	0.476	0.535	0.480
		N	77	77	77	77	79	77	77	77	77	77	77
	Annual Mean	Person's r	-0.461	-0.681	-0.204	-0.461	-0.149	-0.071	0.648	0.664	0.584	0.636	0.508
		N	77	77	77	77	79	77	77	77	77	77	77
	DJF	Person's r	-0.408	-0.632	-0.114	-0.408	-0.097	0.022	0.560	0.573	0.536	0.586	0.453
		N	77	77	77	77	79	77	77	77	77	77	77
	MAM	Person's r	-0.597	-0.572	-0.397	-0.597	-0.240	-0.262	0.627	0.622	0.460	0.511	0.380
		N	77	77	77	77	79	77	77	77	77	77	77
	JJA	Person's r	-0.262	-0.588	-0.003	-0.262	-0.033	0.104	0.611	0.625	0.572	0.607	0.464
		N	77	77	77	77	79	77	77	77	77	77	77
	SON	Person's r	-0.358	-0.691	-0.169	-0.358	-0.119	-0.069	0.555	0.594	0.575	0.625	0.571
		N	77	77	77	77	79	77	77	77	77	77	77
El Niño 3		Person's r	0.384	0.251	0.010	0.384	0.075	-0.143	-0.239	-0.181	-0.007	-0.015	0.073
		N	52	52	52	52	54	52	52	52	51	51	52
SOI		Person's r	-0.418	-0.167	-0.282	-0.418	-0.219	-0.145	0.133	0.073	-0.175	-0.182	-0.170
		N	51	51	51	51	53	51	51	51	50	50	51
SAB		Person's r	0.213	-0.092	-0.112	0.213	-0.332	-0.210	0.005	0.079	-0.157	-0.154	0.252
		N	48	48	48	48	50	48	48	48	47	47	48

A10 (continued) Correlation matrix of Laguna Negra. 5-year filtered data

			Bsi						C, N und C/N				
			Al µg/g	Fe µg/g	Si µg/g	Si non Biol µg/g	Bsi Flux	bSi µg/g	N %	TOC %	N Flux	TOC Flux	C/N
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.182	0.574	-0.246	-0.182	-0.116	-0.245	-0.307	-0.388	-0.154	-0.227	-0.522
		N	47	47	47	47	49	47	47	47	47	47	47
	Feb	Person's r	0.388	-0.211	0.309	0.388	0.300	0.239	-0.106	-0.041	0.412	0.437	0.269
		N	47	47	47	47	49	47	47	47	47	47	47
	Mrz	Person's r	-0.164	-0.178	0.161	-0.164	0.106	0.286	0.385	0.336	0.258	0.280	0.003
		N	47	47	47	47	49	47	47	47	47	47	47
	Apr	Person's r	-0.470	-0.373	-0.245	-0.470	-0.258	-0.117	0.279	0.285	-0.142	-0.090	0.285
		N	47	47	47	47	49	47	47	47	47	47	47
	Mai	Person's r	0.018	0.118	-0.150	0.018	-0.174	-0.207	-0.108	-0.133	-0.242	-0.251	-0.174
		N	47	47	47	47	49	47	47	47	47	47	47
	Jun	Person's r	0.400	0.304	0.175	0.400	0.145	0.054	-0.263	-0.215	0.079	0.027	0.006
		N	47	47	47	47	49	47	47	47	47	47	47
	Jul	Person's r	0.100	-0.135	0.036	0.100	-0.147	0.004	0.348	0.436	0.097	0.128	0.510
		N	47	47	47	47	49	47	47	47	47	47	47
	Aug	Person's r	0.317	0.124	0.455	0.317	0.564	0.463	-0.171	-0.092	0.443	0.474	0.278
		N	47	47	47	47	49	47	47	47	47	47	47
	Sep	Person's r	-0.493	-0.098	-0.413	-0.493	-0.144	-0.329	0.274	0.245	-0.127	-0.135	0.068
		N	47	47	47	47	49	47	47	47	47	47	47
	Okt	Person's r	0.493	-0.211	0.181	0.493	0.023	0.021	0.032	0.141	0.063	0.088	0.401
		N	47	47	47	47	49	47	47	47	47	47	47
	Nov	Person's r	0.146	-0.272	0.010	0.146	-0.162	-0.052	0.453	0.527	0.107	0.143	0.530
		N	47	47	47	47	49	47	47	47	47	47	47
	Dez	Person's r	0.084	0.109	0.036	0.084	-0.095	0.011	0.106	0.108	-0.042	-0.049	-0.057
		N	47	47	47	47	49	47	47	47	47	47	47
	Total Annual	Person's r	0.319	-0.003	0.208	0.319	0.123	0.134	0.123	0.242	0.244	0.270	0.548
		N	47	47	47	47	49	47	47	47	47	47	47
Precipitation HadCRUT3	Jan	Person's r	0.414	0.723	0.136	0.414	0.252	-0.003	-0.665	-0.658	-0.052	-0.126	-0.290
		N	72	72	72	72	74	72	72	72	71	71	72
	Feb	Person's r	0.374	-0.095	0.403	0.374	0.316	0.352	-0.011	0.043	0.424	0.433	0.278
		N	72	72	72	72	74	72	72	72	71	71	72
	Mrz	Person's r	-0.012	-0.163	0.162	-0.012	0.122	0.210	0.250	0.221	0.476	0.441	-0.053
		N	72	72	72	72	74	72	72	72	71	71	72
	Apr	Person's r	0.038	-0.005	0.059	0.038	0.128	0.058	-0.099	-0.035	0.325	0.320	0.398
		N	72	72	72	72	74	72	72	72	71	71	72
	Mai	Person's r	0.054	-0.124	-0.019	0.054	-0.024	-0.047	-0.021	-0.036	0.088	0.094	-0.077
		N	72	72	72	72	74	72	72	72	71	71	72
	Jun	Person's r	0.479	0.366	0.151	0.479	0.102	-0.013	-0.396	-0.395	0.072	0.020	-0.274
		N	72	72	72	72	74	72	72	72	71	71	72
	Jul	Person's r	-0.141	-0.216	-0.142	-0.141	-0.177	-0.120	0.236	0.243	-0.157	-0.129	0.098
		N	72	72	72	72	74	72	72	72	71	71	72
	Aug	Person's r	0.239	0.339	0.204	0.239	0.345	0.157	-0.348	-0.312	0.063	0.047	0.070
		N	72	72	72	72	74	72	72	72	71	71	72
	Sep	Person's r	-0.044	0.104	-0.260	-0.044	-0.092	-0.311	-0.109	-0.148	-0.115	-0.153	-0.323
		N	72	72	72	72	74	72	72	72	71	71	72
	Okt	Person's r	0.366	0.048	0.250	0.366	0.103	0.161	-0.063	0.003	-0.059	-0.055	0.255
		N	72	72	72	72	74	72	72	72	71	71	72
	Nov	Person's r	-0.057	-0.154	-0.066	-0.057	-0.131	-0.060	0.288	0.338	-0.068	-0.042	0.404
		N	72	72	72	72	74	72	72	72	71	71	72
	Dez	Person's r	0.000	0.189	-0.067	0.000	-0.032	-0.085	-0.102	-0.092	-0.118	-0.129	-0.033
		N	72	72	72	72	74	72	72	72	71	71	72
	Total Annual	Person's r	0.291	0.135	0.071	0.291	0.094	-0.034	-0.202	-0.178	0.062	0.044	-0.012
		N	72	72	72	72	74	72	72	72	71	71	72
	DJF	Person's r	0.371	0.426	0.207	0.371	0.235	0.105	-0.391	-0.356	0.095	0.056	-0.033
		N	72	72	72	72	74	72	72	72	71	71	72
	MAM	Person's r	0.060	-0.134	0.015	0.060	0.030	-0.006	-0.022	-0.021	0.224	0.225	0.035
		N	72	72	72	72	74	72	72	72	71	71	72
	JJA	Person's r	0.286	0.221	0.087	0.286	0.104	-0.011	-0.230	-0.209	-0.029	-0.048	-0.060
		N	72	72	72	72	74	72	72	72	71	71	72
	SON	Person's r	0.125	0.015	-0.088	0.125	-0.083	-0.165	0.045	0.077	-0.142	-0.151	0.119
		N	72	72	72	72	74	72	72	72	71	71	72
Precipitation CRU TS 2.1	Jan	Person's r	-0.131	0.036	0.104	-0.131	0.237	0.187	0.167	0.084	0.268	0.240	-0.320
		N	74	74	74	74	76	74	74	74	73	73	74
	Feb	Person's r	0.213	0.135	-0.187	0.213	-0.148	-0.325	-0.332	-0.319	-0.205	-0.227	-0.122
		N	74	74	74	74	76	74	74	74	73	73	74
	Mrz	Person's r	-0.123	-0.188	-0.081	-0.123	-0.068	-0.051	0.302	0.258	0.402	0.380	-0.110
		N	74	74	74	74	76	74	74	74	73	73	74
	Apr	Person's r	-0.168	-0.394	-0.051	-0.168	-0.104	0.005	0.207	0.274	0.274	0.330	0.578
		N	74	74	74	74	76	74	74	74	73	73	74
	Mai	Person's r	0.239	-0.102	0.249	0.239	0.133	0.218	-0.074	-0.067	0.157	0.155	0.016
		N	74	74	74	74	76	74	74	74	73	73	74
	Jun	Person's r	0.258	0.330	0.196	0.258	0.178	0.142	-0.148	-0.162	-0.086	-0.136	-0.194
		N	74	74	74	74	76	74	74	74	73	73	74
	Jul	Person's r	-0.081	-0.229	-0.183	-0.081	-0.205	-0.198	0.110	0.116	-0.248	-0.236	0.015
		N	74	74	74	74	76	74	74	74	73	73	74
	Aug	Person's r	0.285	0.229	0.266	0.285	0.408	0.219	-0.327	-0.279	0.134	0.129	0.168
		N	74	74	74	74	76	74	74	74	73	73	74
	Sep	Person's r	0.044	-0.007	-0.074	0.044	-0.009	-0.111	-0.127	-0.131	-0.114	-0.130	-0.063
		N	74	74	74	74	76	74	74	74	73	73	74
	Okt	Person's r	0.319	0.231	0.427	0.319	0.344	0.410	-0.216	-0.183	-0.028	-0.036	0.040
		N	74	74	74	74	76	74	74	74	73	73	74
	Nov	Person's r	0.079	-0.100	0.139	0.079	0.048	0.144	0.238	0.297	-0.038	-0.008	0.413
		N	74	74	74	74	76	74	74	74	73	73	74
	Dez	Person's r	-0.268	0.203	-0.179	-0.268	-0.096	-0.116	0.082	0.059	-0.255	-0.259	-0.101
		N	74	74	74	74	76	74	74	74	73	73	74
	Total Annual	Person's r	0.296	0.029	0.250	0.296	0.210	0.196	-0.139	-0.106	0.023	0.012	0.107
		N	74	74	74	74	76	74	74	74	73	73	74
	DJF	Person's r	0.249	0.172	0.146	0.249	0.186	0.082	-0.195	-0.173	-0.115	-0.138	-0.004
		N	74	74	74	74	76	74	74	74	73	73	74
	MAM	Person's r	0.230	0.065	0.236	0.230	0.210	0.205	-0.081	-0.039	-0.109	-0.109	0.177
		N	74	74	74	74	76	74	74	74	73	73	74
	JJA	Person's r	-0.153	0.256	-0.200	-0.153	-0.052	-0.191	-0.047	-0.096	-0.195	-0.224	-0.302
		N	74	74	74	74	76	74	74	74	73	73	74
	SON	Person's r	0.151	-0.221	0.198	0.151	0.082	0.189	0.028	0.046	0.263	0.274	0.157
		N	74	74	74	74	76	74	74	74	73	73	74

A10 (continued) Correlation matrix of Laguna Negra. 5-year filtered data

			Grain size										
			D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	0.540	0.489	0.511	0.544	0.483	0.493	0.544	0.497	0.426	0.358	0.138
		N	74	74	74	74	74	74	74	74	74	74	74
	Feb	Person's r	0.364	0.359	0.358	0.321	0.239	0.220	0.321	0.245	0.229	0.150	0.106
		N	74	74	74	74	74	74	74	74	74	74	74
	Mrz	Person's r	0.011	0.070	0.043	-0.078	-0.151	-0.132	-0.078	-0.140	-0.092	-0.191	0.031
		N	74	74	74	74	74	74	74	74	74	74	74
	Apr	Person's r	-0.052	-0.066	-0.033	0.013	0.007	0.030	0.013	0.010	0.130	0.024	-0.105
		N	74	74	74	74	74	74	74	74	74	74	74
	Mai	Person's r	0.274	0.159	0.220	0.399	0.496	0.509	0.399	0.492	0.241	0.525	0.282
		N	74	74	74	74	74	74	74	74	74	74	74
	Jun	Person's r	-0.211	-0.251	-0.222	-0.121	0.021	0.071	-0.121	0.018	-0.083	0.111	0.160
		N	74	74	74	74	74	74	74	74	74	74	74
	Jul	Person's r	0.013	-0.115	-0.038	0.208	0.350	0.327	0.208	0.327	0.169	0.464	0.075
		N	74	74	74	74	74	74	74	74	74	74	74
	Aug	Person's r	-0.135	-0.125	-0.119	-0.121	-0.080	-0.088	-0.121	-0.087	-0.160	-0.033	0.139
		N	74	74	74	74	74	74	74	74	74	74	74
	Sep	Person's r	0.070	-0.056	0.009	0.242	0.423	0.439	0.242	0.408	0.208	0.503	0.240
		N	74	74	74	74	74	74	74	74	74	74	74
	Okt	Person's r	0.181	0.106	0.159	0.295	0.327	0.333	0.295	0.326	0.346	0.304	-0.098
		N	74	74	74	74	74	74	74	74	74	74	74
	Nov	Person's r	0.222	0.255	0.233	0.125	0.041	0.058	0.125	0.057	0.063	-0.043	0.147
		N	74	74	74	74	74	74	74	74	74	74	74
	Dez	Person's r	0.384	0.332	0.349	0.400	0.385	0.374	0.400	0.387	0.315	0.320	0.140
		N	74	74	74	74	74	74	74	74	74	74	74
	Annual Average	Person's r	0.215	0.143	0.188	0.297	0.348	0.362	0.297	0.347	0.238	0.347	0.177
		N	74	74	74	74	74	74	74	74	74	74	74
	DJF	Person's r	0.491	0.450	0.463	0.482	0.422	0.413	0.482	0.430	0.369	0.317	0.150
		N	74	74	74	74	74	74	74	74	74	74	74
	MAM	Person's r	0.119	0.082	0.113	0.166	0.179	0.203	0.166	0.184	0.126	0.183	0.112
		N	74	74	74	74	74	74	74	74	74	74	74
	JJA	Person's r	-0.172	-0.260	-0.199	-0.010	0.165	0.178	-0.010	0.148	-0.026	0.298	0.193
		N	74	74	74	74	74	74	74	74	74	74	74
	SON	Person's r	0.225	0.151	0.194	0.305	0.358	0.377	0.305	0.359	0.283	0.341	0.133
		N	74	74	74	74	74	74	74	74	74	74	74
Temperature HadCRUT3	Jan	Person's r	0.481	0.508	0.479	0.359	0.176	0.160	0.359	0.194	0.274	0.007	-0.116
		N	77	77	77	77	77	77	77	77	77	77	77
	Feb	Person's r	0.142	0.136	0.135	0.126	0.116	0.112	0.126	0.118	0.029	0.080	0.051
		N	77	77	77	77	77	77	77	77	77	77	77
	Mrz	Person's r	0.235	0.312	0.261	0.078	-0.136	-0.144	0.078	-0.116	0.097	-0.264	-0.294
		N	77	77	77	77	77	77	77	77	77	77	77
	Apr	Person's r	0.183	0.245	0.207	0.058	-0.096	-0.072	0.058	-0.073	0.090	-0.216	-0.227
		N	77	77	77	77	77	77	77	77	77	77	77
	Mai	Person's r	0.542	0.493	0.509	0.531	0.425	0.426	0.531	0.441	0.422	0.287	-0.084
		N	77	77	77	77	77	77	77	77	77	77	77
	Jun	Person's r	0.302	0.230	0.254	0.337	0.343	0.366	0.337	0.351	0.211	0.321	0.108
		N	77	77	77	77	77	77	77	77	77	77	77
	Jul	Person's r	0.486	0.374	0.428	0.581	0.560	0.538	0.581	0.560	0.478	0.491	-0.048
		N	77	77	77	77	77	77	77	77	77	77	77
	Aug	Person's r	0.283	0.273	0.277	0.261	0.209	0.209	0.261	0.220	0.230	0.104	-0.057
		N	77	77	77	77	77	77	77	77	77	77	77
	Sep	Person's r	0.193	0.157	0.178	0.230	0.211	0.227	0.230	0.218	0.311	0.149	-0.146
		N	77	77	77	77	77	77	77	77	77	77	77
	Okt	Person's r	0.303	0.272	0.281	0.307	0.254	0.264	0.307	0.265	0.334	0.159	-0.153
		N	77	77	77	77	77	77	77	77	77	77	77
	Nov	Person's r	0.449	0.463	0.441	0.349	0.240	0.238	0.349	0.258	0.230	0.088	0.072
		N	77	77	77	77	77	77	77	77	77	77	77
	Dez	Person's r	0.503	0.504	0.492	0.429	0.294	0.301	0.429	0.314	0.330	0.133	-0.037
		N	77	77	77	77	77	77	77	77	77	77	77
	Annual Mean	Person's r	0.430	0.419	0.415	0.378	0.262	0.265	0.378	0.278	0.318	0.128	-0.111
		N	77	77	77	77	77	77	77	77	77	77	77
	DJF	Person's r	0.427	0.435	0.419	0.346	0.221	0.216	0.346	0.236	0.241	0.082	-0.040
		N	77	77	77	77	77	77	77	77	77	77	77
	MAM	Person's r	0.360	0.397	0.367	0.245	0.062	0.068	0.245	0.085	0.225	-0.084	-0.235
		N	77	77	77	77	77	77	77	77	77	77	77
	JJA	Person's r	0.436	0.354	0.389	0.484	0.459	0.459	0.484	0.467	0.378	0.384	0.002
		N	77	77	77	77	77	77	77	77	77	77	77
	SON	Person's r	0.349	0.327	0.332	0.334	0.269	0.279	0.334	0.282	0.340	0.155	-0.097
		N	77	77	77	77	77	77	77	77	77	77	77
El Niño 3		Person's r	-0.226	-0.248	-0.215	-0.129	-0.064	-0.051	-0.129	-0.070	0.016	-0.011	-0.207
		N	52	52	52	52	52	52	52	52	52	52	52
SOI		Person's r	0.207	0.267	0.222	0.067	-0.030	-0.024	0.067	-0.011	-0.060	-0.148	0.175
		N	51	51	51	51	51	51	51	51	51	51	51
SAB		Person's r	-0.063	-0.093	-0.069	0.006	0.158	0.191	0.006	0.156	-0.042	0.165	0.181
		N	48	48	48	48	48	48	48	48	48	48	48

A10 (continued) Correlation matrix of Laguna Negra. 5-year filtered data

			Grain size										
			D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.199	-0.055	-0.127	-0.399	-0.648	-0.654	-0.399	-0.638	-0.226	-0.599	-0.221
		N	47	47	47	47	47	47	47	47	47	47	47
	Feb	Person's r	-0.011	-0.124	-0.049	0.206	0.307	0.328	0.206	0.299	0.329	0.362	-0.165
		N	47	47	47	47	47	47	47	47	47	47	47
	Mrz	Person's r	0.291	0.306	0.291	0.208	0.115	0.098	0.208	0.127	0.138	-0.026	0.041
		N	47	47	47	47	47	47	47	47	47	47	47
	Apr	Person's r	0.466	0.436	0.427	0.382	0.223	0.213	0.382	0.246	0.138	0.058	-0.063
		N	47	47	47	47	47	47	47	47	47	47	47
	Mai	Person's r	-0.338	-0.284	-0.329	-0.431	-0.301	-0.306	-0.431	-0.322	-0.598	-0.126	0.421
		N	47	47	47	47	47	47	47	47	47	47	47
	Jun	Person's r	-0.338	-0.340	-0.327	-0.248	-0.143	-0.167	-0.248	-0.171	-0.085	0.003	-0.036
		N	47	47	47	47	47	47	47	47	47	47	47
	Jul	Person's r	0.154	0.073	0.113	0.270	0.421	0.448	0.270	0.424	0.060	0.367	0.147
		N	47	47	47	47	47	47	47	47	47	47	47
	Aug	Person's r	0.280	0.275	0.311	0.327	0.162	0.177	0.327	0.184	0.500	-0.021	-0.366
		N	47	47	47	47	47	47	47	47	47	47	47
	Sep	Person's r	0.386	0.448	0.404	0.210	-0.052	-0.066	0.210	-0.024	0.062	-0.240	-0.133
		N	47	47	47	47	47	47	47	47	47	47	47
	Okt	Person's r	-0.329	-0.471	-0.394	-0.023	0.387	0.401	-0.023	0.347	0.036	0.582	0.210
		N	47	47	47	47	47	47	47	47	47	47	47
	Nov	Person's r	0.031	-0.111	-0.052	0.242	0.441	0.435	0.241	0.420	0.079	0.527	0.062
		N	47	47	47	47	47	47	47	47	47	47	47
	Dez	Person's r	-0.157	-0.121	-0.138	-0.188	0.025	0.056	-0.188	0.021	-0.291	0.028	0.464
		N	47	47	47	47	47	47	47	47	47	47	47
	Total Annual	Person's r	0.087	0.023	0.064	0.207	0.306	0.318	0.207	0.302	0.110	0.275	0.034
		N	47	47	47	47	47	47	47	47	47	47	47
Precipitation HadCRUT3	Jan	Person's r	-0.550	-0.510	-0.529	-0.546	-0.472	-0.466	-0.546	-0.489	-0.468	-0.281	0.071
		N	72	72	72	72	72	72	72	72	72	72	72
	Feb	Person's r	0.029	-0.103	-0.024	0.243	0.405	0.418	0.243	0.390	0.311	0.492	0.046
		N	72	72	72	72	72	72	72	72	72	72	72
	Mrz	Person's r	0.192	0.238	0.227	0.134	0.042	0.027	0.134	0.052	0.207	-0.090	-0.111
		N	72	72	72	72	72	72	72	72	72	72	72
	Apr	Person's r	0.022	0.034	0.028	0.001	-0.022	-0.013	0.001	-0.018	-0.020	-0.035	-0.004
		N	72	72	72	72	72	72	72	72	72	72	72
	Mai	Person's r	-0.311	-0.308	-0.328	-0.317	-0.204	-0.225	-0.317	-0.227	-0.444	-0.056	0.253
		N	72	72	72	72	72	72	72	72	72	72	72
	Jun	Person's r	-0.451	-0.460	-0.437	-0.354	-0.272	-0.279	-0.354	-0.291	-0.164	-0.130	-0.188
		N	72	72	72	72	72	72	72	72	72	72	72
	Jul	Person's r	0.138	0.132	0.141	0.152	0.108	0.095	0.152	0.112	0.142	0.038	-0.193
		N	72	72	72	72	72	72	72	72	72	72	72
	Aug	Person's r	0.058	0.099	0.105	0.041	-0.069	-0.055	0.041	-0.055	0.201	-0.158	-0.260
		N	72	72	72	72	72	72	72	72	72	72	72
	Sep	Person's r	-0.149	-0.071	-0.097	-0.222	-0.337	-0.348	-0.222	-0.331	-0.144	-0.365	-0.285
		N	72	72	72	72	72	72	72	72	72	72	72
	Okt	Person's r	-0.128	-0.250	-0.186	0.081	0.324	0.333	0.081	0.300	0.130	0.451	0.190
		N	72	72	72	72	72	72	72	72	72	72	72
	Nov	Person's r	0.115	0.038	0.066	0.205	0.266	0.262	0.205	0.258	0.102	0.304	0.014
		N	72	72	72	72	72	72	72	72	72	72	72
	Dez	Person's r	-0.080	-0.005	-0.039	-0.174	-0.144	-0.113	-0.174	-0.133	-0.221	-0.205	0.250
		N	72	72	72	72	72	72	72	72	72	72	72
	Total Annual	Person's r	-0.265	-0.260	-0.249	-0.211	-0.175	-0.187	-0.211	-0.187	-0.126	-0.106	-0.167
		N	72	72	72	72	72	72	72	72	72	72	72
	DJF	Person's r	-0.303	-0.296	-0.291	-0.263	-0.134	-0.106	-0.263	-0.142	-0.225	-0.041	0.215
		N	72	72	72	72	72	72	72	72	72	72	72
	MAM	Person's r	-0.266	-0.254	-0.276	-0.283	-0.193	-0.212	-0.283	-0.213	-0.401	-0.072	0.225
		N	72	72	72	72	72	72	72	72	72	72	72
	JJA	Person's r	-0.140	-0.129	-0.109	-0.084	-0.116	-0.121	-0.084	-0.117	0.086	-0.120	-0.341
		N	72	72	72	72	72	72	72	72	72	72	72
	SON	Person's r	-0.107	-0.155	-0.127	-0.004	0.071	0.066	-0.004	0.060	0.020	0.136	-0.094
		N	72	72	72	72	72	72	72	72	72	72	72
Precipitation CRU TS 2.1	Jan	Person's r	0.124	0.157	0.139	0.058	-0.094	-0.134	0.058	-0.092	0.093	-0.126	-0.207
		N	74	74	74	74	74	74	74	74	74	74	74
	Feb	Person's r	-0.480	-0.469	-0.476	-0.441	-0.347	-0.341	-0.441	-0.363	-0.377	-0.192	-0.049
		N	74	74	74	74	74	74	74	74	74	74	74
	Mrz	Person's r	0.124	0.173	0.158	0.057	-0.098	-0.109	0.057	-0.085	0.161	-0.202	-0.358
		N	74	74	74	74	74	74	74	74	74	74	74
	Apr	Person's r	0.242	0.220	0.218	0.215	0.244	0.273	0.215	0.254	0.011	0.184	0.264
		N	74	74	74	74	74	74	74	74	74	74	74
	Mai	Person's r	-0.266	-0.308	-0.305	-0.216	-0.015	-0.036	-0.216	-0.045	-0.397	0.155	0.472
		N	74	74	74	74	74	74	74	74	74	74	74
	Jun	Person's r	-0.185	-0.213	-0.196	-0.108	-0.050	-0.084	-0.108	-0.069	-0.038	0.046	-0.060
		N	74	74	74	74	74	74	74	74	74	74	74
	Jul	Person's r	-0.054	-0.045	-0.048	-0.043	-0.062	-0.092	-0.043	-0.068	-0.021	-0.070	-0.214
		N	74	74	74	74	74	74	74	74	74	74	74
	Aug	Person's r	0.024	0.032	0.048	0.051	-0.014	-0.016	0.051	-0.011	0.194	-0.044	-0.219
		N	74	74	74	74	74	74	74	74	74	74	74
	Sep	Person's r	-0.261	-0.260	-0.275	-0.256	-0.174	-0.213	-0.256	-0.199	-0.382	-0.044	0.157
		N	74	74	74	74	74	74	74	74	74	74	74
	Okt	Person's r	0.035	-0.007	0.026	0.131	0.195	0.182	0.131	0.185	0.220	0.203	0.038
		N	74	74	74	74	74	74	74	74	74	74	74
	Nov	Person's r	0.142	0.034	0.081	0.282	0.387	0.369	0.282	0.371	0.172	0.439	0.071
		N	74	74	74	74	74	74	74	74	74	74	74
	Dez	Person's r	0.282	0.384	0.344	0.128	-0.043	-0.012	0.128	-0.008	0.119	-0.259	-0.080
		N	74	74	74	74	74	74	74	74	74	74	74
	Total Annual	Person's r	-0.184	-0.220	-0.204	-0.104	0.000	-0.041	-0.104	-0.026	-0.148	0.110	0.084
		N	74	74	74	74	74	74	74	74	74	74	74
	DJF	Person's r	-0.118	-0.124	-0.107	-0.055	-0.070	-0.107	-0.055	-0.083	0.073	-0.039	-0.276
		N	74	74	74	74	74	74	74	74	74	74	74
	MAM	Person's r	-0.088	-0.160	-0.131	0.032	0.169	0.129	0.032	0.140	-0.060	0.286	0.158
		N	74	74	74	74	74	74	74	74	74	74	74
	JJA	Person's r	0.008	0.111	0.067	-0.124	-0.278	-0.268	-0.124	-0.258	-0.078	-0.376	-0.190
		N	74	74	74	74	74	74	74	74	74	74	74
	SON	Person's r	-0.156	-0.193	-0.192	-0.127	0.041	0.028	-0.127	0.019	-0.330	0.163	0.447
		N	74	74	74	74	74	74	74	74	74	74	74

A11 Correlation matrix of Laguna Negra. 7-year filtered data

			Spectrolino								
			RABD660;670	R590/640	RABD510	RABD550	RABD480	Chlorin	RABD720	Total Absorbtion	Clastic input
Temperature CRU TS 2.1	Jan	Person's r	0.747	-0.737	0.535	-0.035	0.644	-0.658	-0.020	-0.581	-0.678
		N	83	83	83	83	83	83	83	83	83
	Feb	Person's r	0.599	-0.545	0.338	-0.042	0.371	-0.612	-0.034	-0.305	-0.466
		N	83	83	83	83	83	83	83	83	83
	Mrz	Person's r	0.373	-0.287	0.222	0.071	0.172	-0.431	-0.147	-0.076	-0.238
		N	83	83	83	83	83	83	83	83	83
	Apr	Person's r	-0.030	0.055	-0.120	-0.220	-0.058	-0.114	-0.181	0.247	0.086
		N	83	83	83	83	83	83	83	83	83
	Mai	Person's r	0.248	-0.120	-0.112	-0.534	0.091	-0.215	0.086	0.014	-0.030
		N	83	83	83	83	83	83	83	83	83
	Jun	Person's r	0.288	-0.214	0.242	0.155	0.153	-0.048	-0.127	-0.236	-0.211
		N	83	83	83	83	83	83	83	83	83
	Jul	Person's r	0.143	-0.109	-0.072	-0.124	-0.089	-0.016	-0.219	0.050	-0.028
		N	83	83	83	83	83	83	83	83	83
	Aug	Person's r	-0.374	0.423	-0.528	-0.405	-0.489	0.121	0.044	0.594	0.484
		N	83	83	83	83	83	83	83	83	83
	Sep	Person's r	0.498	-0.365	0.297	0.154	0.194	-0.221	-0.077	-0.199	-0.348
		N	83	83	83	83	83	83	83	83	83
	Okt	Person's r	0.469	-0.478	0.403	0.198	0.335	-0.375	-0.466	-0.295	-0.426
		N	83	83	83	83	83	83	83	83	83
	Nov	Person's r	0.420	-0.417	0.237	-0.046	0.268	-0.548	-0.011	-0.205	-0.347
		N	83	83	83	83	83	83	83	83	83
	Dez	Person's r	0.640	-0.596	0.401	-0.060	0.452	-0.656	-0.293	-0.357	-0.504
		N	83	83	83	83	83	83	83	83	83
	Annual Average	Person's r	0.522	-0.446	0.260	-0.087	0.281	-0.480	-0.172	-0.204	-0.364
		N	83	83	83	83	83	83	83	83	83
	DJF	Person's r	0.708	-0.668	0.452	-0.048	0.520	-0.688	-0.120	-0.440	-0.586
		N	83	83	83	83	83	83	83	83	83
	MAM	Person's r	0.272	-0.164	0.004	-0.297	0.099	-0.331	-0.086	0.058	-0.090
		N	83	83	83	83	83	83	83	83	83
	JJA	Person's r	0.104	-0.022	-0.089	-0.121	-0.139	0.010	-0.170	0.108	0.043
		N	83	83	83	83	83	83	83	83	83
	SON	Person's r	0.577	-0.528	0.388	0.118	0.335	-0.493	-0.224	-0.292	-0.468
		N	83	83	83	83	83	83	83	83	83
Temperature HadCRUT3	Jan	Person's r	0.652	-0.576	0.499	0.338	0.396	-0.627	-0.134	-0.378	-0.536
		N	88	88	88	88	88	88	88	88	88
	Feb	Person's r	0.643	-0.605	0.530	0.371	0.418	-0.475	-0.184	-0.486	-0.560
		N	88	88	88	88	88	88	88	88	88
	Mrz	Person's r	0.510	-0.502	0.546	0.462	0.423	-0.583	-0.365	-0.372	-0.492
		N	88	88	88	88	88	88	88	88	88
	Apr	Person's r	0.651	-0.582	0.660	0.514	0.565	-0.541	-0.188	-0.563	-0.595
		N	88	88	88	88	88	88	88	88	88
	Mai	Person's r	0.649	-0.546	0.461	0.093	0.508	-0.582	-0.194	-0.406	-0.503
		N	88	88	88	88	88	88	88	88	88
	Jun	Person's r	0.794	-0.679	0.547	0.244	0.512	-0.513	-0.124	-0.570	-0.629
		N	88	88	88	88	88	88	88	88	88
	Jul	Person's r	0.734	-0.623	0.452	0.190	0.392	-0.481	-0.192	-0.473	-0.545
		N	88	88	88	88	88	88	88	88	88
	Aug	Person's r	0.633	-0.594	0.508	0.287	0.462	-0.589	-0.323	-0.422	-0.541
		N	88	88	88	88	88	88	88	88	88
	Sep	Person's r	0.721	-0.611	0.625	0.523	0.464	-0.467	-0.305	-0.476	-0.615
		N	88	88	88	88	88	88	88	88	88
	Okt	Person's r	0.770	-0.700	0.726	0.541	0.594	-0.507	-0.410	-0.650	-0.694
		N	88	88	88	88	88	88	88	88	88
	Nov	Person's r	0.739	-0.667	0.522	0.254	0.476	-0.596	-0.083	-0.547	-0.606
		N	88	88	88	88	88	88	88	88	88
	Dez	Person's r	0.664	-0.600	0.482	0.212	0.465	-0.620	-0.137	-0.412	-0.555
		N	88	88	88	88	88	88	88	88	88
	Annual Mean	Person's r	0.816	-0.728	0.658	0.407	0.569	-0.658	-0.263	-0.577	-0.688
		N	88	88	88	88	88	88	88	88	88
	DJF	Person's r	0.729	-0.664	0.565	0.349	0.475	-0.634	-0.172	-0.480	-0.616
		N	88	88	88	88	88	88	88	88	88
	MAM	Person's r	0.675	-0.609	0.624	0.405	0.558	-0.639	-0.283	-0.500	-0.594
		N	88	88	88	88	88	88	88	88	88
	JJA	Person's r	0.821	-0.716	0.567	0.267	0.514	-0.588	-0.226	-0.559	-0.648
		N	88	88	88	88	88	88	88	88	88
	SON	Person's r	0.828	-0.734	0.695	0.490	0.568	-0.582	-0.295	-0.619	-0.710
		N	88	88	88	88	88	88	88	88	88
El Niño 3		Person's r	-0.426	0.415	-0.208	0.117	-0.203	0.405	-0.116	0.339	0.342
		N	61	61	61	61	61	61	61	61	61
SOI		Person's r	-0.047	0.103	-0.308	-0.273	-0.204	-0.103	0.328	0.150	0.157
		N	60	60	60	60	60	60	60	60	60
SAB		Person's r	0.246	-0.342	0.471	0.326	0.353	-0.016	0.260	-0.49	-0.411
		N	57	57	57	57	57	57	57	57	57

A11 (continued) Correlation matrix of Laguna Negra. 7-year filtered data

			Spectrolino								
			RABD660;670	R590/640	RABD510	RABD550	RABD480	Chlorin	RABD720	Total Absorbtion	Clastic input
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.535	0.416	-0.481	-0.580	-0.152	-0.140	-0.209	0.267	0.447
		N	45	45	45	45	45	45	45	45	45
	Feb	Person's r	0.490	-0.419	0.421	0.541	0.133	-0.023	-0.265	-0.100	-0.438
		N	45	45	45	45	45	45	45	45	45
	Mrz	Person's r	-0.036	0.084	-0.306	-0.357	-0.221	-0.175	0.169	0.117	0.195
		N	45	45	45	45	45	45	45	45	45
	Apr	Person's r	0.486	-0.376	0.209	0.264	0.071	-0.373	0.300	-0.101	-0.295
		N	45	45	45	45	45	45	45	45	45
	Mai	Person's r	-0.271	0.606	-0.522	-0.184	-0.605	0.409	0.410	0.233	0.594
		N	45	45	45	45	45	45	45	45	45
	Jun	Person's r	-0.263	0.267	-0.050	-0.104	-0.066	0.338	-0.342	0.049	0.215
		N	45	45	45	45	45	45	45	45	45
	Jul	Person's r	0.174	-0.225	0.318	0.218	0.287	0.232	0.152	-0.373	-0.253
		N	45	45	45	45	45	45	45	45	45
	Aug	Person's r	0.222	-0.410	0.261	0.030	0.392	-0.325	0.009	-0.021	-0.431
		N	45	45	45	45	45	45	45	45	45
	Sep	Person's r	-0.053	0.027	-0.180	-0.274	0.002	-0.132	0.186	-0.115	0.098
		N	45	45	45	45	45	45	45	45	45
	Okt	Person's r	0.183	-0.111	0.417	0.494	0.121	0.642	-0.129	-0.442	-0.224
		N	45	45	45	45	45	45	45	45	45
	Nov	Person's r	0.252	-0.197	0.435	0.445	0.154	0.556	-0.185	-0.597	-0.203
		N	45	45	45	45	45	45	45	45	45
	Dez	Person's r	-0.333	0.373	-0.391	-0.388	-0.199	0.171	0.439	0.181	0.335
		N	45	45	45	45	45	45	45	45	45
	Total Annual	Person's r	0.185	-0.149	0.232	0.175	0.166	0.283	0.152	-0.276	-0.187
		N	45	45	45	45	45	45	45	45	45
Precipitation HadCRUT3	Jan	Person's r	-0.357	0.468	-0.442	-0.213	-0.410	0.431	0.024	0.375	0.462
		N	81	81	81	81	81	81	81	81	81
	Feb	Person's r	0.321	-0.234	0.174	0.071	0.140	-0.027	-0.151	-0.138	-0.238
		N	81	81	81	81	81	81	81	81	81
	Mrz	Person's r	0.002	-0.135	0.086	-0.081	0.116	-0.370	-0.361	0.078	-0.088
		N	81	81	81	81	81	81	81	81	81
	Apr	Person's r	0.110	0.107	-0.075	-0.029	-0.128	-0.079	0.046	0.217	0.127
		N	81	81	81	81	81	81	81	81	81
	Mai	Person's r	-0.186	0.392	-0.329	0.007	-0.455	0.276	0.153	0.437	0.389
		N	81	81	81	81	81	81	81	81	81
	Jun	Person's r	-0.565	0.557	-0.420	0.014	-0.525	0.656	-0.049	0.428	0.511
		N	81	81	81	81	81	81	81	81	81
	Jul	Person's r	0.296	-0.389	0.419	0.445	0.345	-0.127	-0.085	-0.410	-0.417
		N	81	81	81	81	81	81	81	81	81
	Aug	Person's r	0.075	-0.053	-0.019	-0.039	0.075	-0.064	0.063	0.022	-0.061
		N	81	81	81	81	81	81	81	81	81
	Sep	Person's r	-0.593	0.497	-0.410	-0.031	-0.435	0.337	0.053	0.472	0.468
		N	81	81	81	81	81	81	81	81	81
	Okt	Person's r	0.021	-0.024	0.077	0.004	0.081	0.328	-0.070	-0.232	-0.059
		N	81	81	81	81	81	81	81	81	81
	Nov	Person's r	0.077	-0.074	0.170	0.124	0.137	0.175	-0.116	-0.311	-0.086
		N	81	81	81	81	81	81	81	81	81
	Dez	Person's r	-0.007	-0.015	0.003	-0.098	0.104	-0.101	0.320	-0.035	-0.022
		N	81	81	81	81	81	81	81	81	81
	Total Annual	Person's r	-0.235	0.314	-0.206	0.203	-0.329	0.414	0.027	0.277	0.273
		N	81	81	81	81	81	81	81	81	81
	DJF	Person's r	-0.036	0.116	-0.137	-0.133	-0.075	0.138	0.140	0.101	0.107
		N	81	81	81	81	81	81	81	81	81
	MAM	Person's r	-0.146	0.376	-0.314	-0.006	-0.440	0.206	0.122	0.459	0.381
		N	81	81	81	81	81	81	81	81	81
	JJA	Person's r	-0.097	0.042	0.022	0.275	-0.043	0.261	-0.054	-0.010	-0.005
		N	81	81	81	81	81	81	81	81	81
	SON	Person's r	-0.387	0.318	-0.187	0.035	-0.219	0.469	-0.045	0.100	0.275
		N	81	81	81	81	81	81	81	81	81
Precipitation CRU TS 2.1	Jan	Person's r	-0.063	0.111	-0.250	-0.308	-0.157	-0.125	-0.167	0.236	0.185
		N	83	83	83	83	83	83	83	83	83
	Feb	Person's r	0.027	0.034	0.093	0.502	-0.162	0.435	0.083	-0.181	-0.015
		N	83	83	83	83	83	83	83	83	83
	Mrz	Person's r	-0.009	-0.124	0.189	0.214	0.086	-0.271	-0.579	0.027	-0.102
		N	83	83	83	83	83	83	83	83	83
	Apr	Person's r	0.470	-0.294	0.271	0.196	0.174	-0.337	0.305	-0.136	-0.284
		N	83	83	83	83	83	83	83	83	83
	Mai	Person's r	0.090	0.064	-0.094	-0.020	-0.236	0.057	0.242	0.153	0.100
		N	83	83	83	83	83	83	83	83	83
	Jun	Person's r	-0.472	0.511	-0.477	-0.367	-0.383	0.475	-0.048	0.396	0.510
		N	83	83	83	83	83	83	83	83	83
	Jul	Person's r	0.179	-0.258	0.362	0.546	0.187	0.050	-0.124	-0.349	-0.299
		N	83	83	83	83	83	83	83	83	83
	Aug	Person's r	0.180	-0.085	0.015	0.028	0.016	-0.036	0.029	-0.018	-0.082
		N	83	83	83	83	83	83	83	83	83
	Sep	Person's r	-0.188	0.292	-0.226	0.078	-0.364	0.298	0.145	0.272	0.285
		N	83	83	83	83	83	83	83	83	83
	Okt	Person's r	0.049	-0.097	-0.010	-0.189	0.133	0.035	0.061	-0.083	-0.108
		N	83	83	83	83	83	83	83	83	83
	Nov	Person's r	0.152	-0.094	0.109	0.008	0.118	0.190	-0.011	-0.299	-0.087
		N	83	83	83	83	83	83	83	83	83
	Dez	Person's r	0.064	-0.296	0.224	-0.209	0.525	-0.404	0.154	-0.306	-0.302
		N	83	83	83	83	83	83	83	83	83
	Total Annual	Person's r	0.070	0.061	-0.054	0.099	-0.174	0.222	0.120	0.055	0.065
		N	83	83	83	83	83	83	83	83	83
	DJF	Person's r	-0.073	0.105	-0.064	0.118	-0.110	0.292	-0.085	0.021	0.082
		N	83	83	83	83	83	83	83	83	83
	MAM	Person's r	-0.026	0.099	-0.106	-0.046	-0.116	0.311	0.126	-0.006	0.091
		N	83	83	83	83	83	83	83	83	83
	JJA	Person's r	0.035	-0.157	0.105	-0.033	0.241	-0.133	0.085	-0.223	-0.153
		N	83	83	83	83	83	83	83	83	83
	SON	Person's r	0.207	-0.039	0.014	0.060	-0.147	-0.074	0.230	0.098	-0.002
		N	83	83	83	83	83	83	83	83	83

A11 (continued) Correlation matrix of Laguna Negra. 7-year filtered data

			Bsi						C, N und C/N				
			Al µg/g	Fe µg/g	Si µg/g	Si non Biol µg/g	Bsi Flux	bSi µg/g	N %	TOC %	N Flux	TOC Flux	C/N
Temperature CRU TS 2.1	Jan	Person's r	-0.083	-0.251	0.379	-0.083	0.339	0.523	0.359	0.401	0.605	0.649	0.508
		N	72	72	72	72	72	72	72	72	71	71	72
	Feb	Person's r	-0.002	-0.206	0.394	-0.002	0.422	0.507	0.150	0.164	0.609	0.611	0.273
		N	72	72	72	72	72	72	72	72	71	71	72
	Mar	Person's r	0.049	-0.049	0.103	0.049	0.234	0.111	-0.032	-0.019	0.689	0.662	0.159
		N	72	72	72	72	72	72	72	72	71	71	72
	Apr	Person's r	0.532	0.353	0.492	0.532	0.635	0.407	-0.372	-0.339	0.641	0.591	0.069
		N	72	72	72	72	72	72	72	72	71	71	72
	May	Person's r	0.292	0.069	0.566	0.292	0.513	0.605	0.125	0.145	0.521	0.516	0.216
		N	72	72	72	72	72	72	72	72	71	71	72
	Jun	Person's r	0.496	0.195	0.228	0.496	0.294	0.083	-0.376	-0.303	0.381	0.349	0.274
		N	72	72	72	72	72	72	72	72	71	71	72
	Jul	Person's r	0.457	0.046	0.620	0.457	0.589	0.604	0.057	0.058	0.462	0.436	0.010
		N	72	72	72	72	72	72	72	72	71	71	72
	Aug	Person's r	0.417	0.280	0.443	0.417	0.468	0.392	-0.270	-0.277	0.472	0.397	-0.158
		N	72	72	72	72	72	72	72	72	71	71	72
	Sep	Person's r	0.354	-0.212	0.473	0.354	0.464	0.458	-0.018	0.066	0.592	0.628	0.545
		N	72	72	72	72	72	72	72	72	71	71	72
	Oct	Person's r	0.255	-0.252	0.397	0.255	0.364	0.402	0.252	0.298	0.766	0.763	0.408
		N	72	72	72	72	72	72	72	72	71	71	72
	Nov	Person's r	-0.085	-0.105	0.208	-0.085	0.245	0.303	0.068	0.056	0.471	0.463	0.078
		N	72	72	72	72	72	72	72	72	71	71	72
	Dec	Person's r	-0.135	-0.424	0.304	-0.135	0.262	0.449	0.473	0.487	0.725	0.744	0.400
		N	72	72	72	72	72	72	72	72	71	71	72
	Annual Mean	Person's r	0.328	-0.075	0.580	0.328	0.608	0.606	0.050	0.091	0.877	0.861	0.357
		N	72	72	72	72	72	72	72	72	71	71	72
	DJF	Person's r	-0.082	-0.336	0.402	-0.082	0.384	0.552	0.366	0.390	0.740	0.762	0.432
		N	72	72	72	72	72	72	72	72	71	71	72
	MAM	Person's r	0.353	0.140	0.491	0.353	0.575	0.482	-0.091	-0.063	0.777	0.745	0.196
		N	72	72	72	72	72	72	72	72	71	71	72
	JJA	Person's r	0.696	0.251	0.635	0.696	0.667	0.522	-0.299	-0.258	0.653	0.590	0.100
		N	72	72	72	72	72	72	72	72	71	71	72
	SON	Person's r	0.223	-0.252	0.477	0.223	0.476	0.519	0.136	0.186	0.817	0.827	0.450
		N	72	72	72	72	72	72	72	72	71	71	72
Temperature HadCRUT3	Jan	Person's r	-0.548	-0.734	-0.221	-0.548	-0.243	-0.058	0.602	0.601	0.367	0.432	0.412
		N	75	75	75	75	75	75	75	75	75	75	75
	Feb	Person's r	-0.093	-0.432	0.013	-0.093	0.013	0.056	0.376	0.398	0.645	0.652	0.382
		N	75	75	75	75	75	75	75	75	75	75	75
	Mar	Person's r	-0.637	-0.613	-0.459	-0.637	-0.412	-0.329	0.602	0.575	0.392	0.432	0.217
		N	75	75	75	75	75	75	75	75	75	75	75
	Apr	Person's r	-0.559	-0.464	-0.522	-0.559	-0.410	-0.442	0.486	0.500	0.408	0.453	0.406
		N	75	75	75	75	75	75	75	75	75	75	75
	May	Person's r	-0.443	-0.625	-0.154	-0.443	-0.194	-0.015	0.696	0.717	0.436	0.501	0.553
		N	75	75	75	75	75	75	75	75	75	75	75
	Jun	Person's r	-0.133	-0.459	0.018	-0.133	0.027	0.078	0.371	0.396	0.515	0.556	0.453
		N	75	75	75	75	75	75	75	75	75	75	75
	Jul	Person's r	-0.162	-0.630	0.195	-0.162	0.134	0.319	0.648	0.663	0.567	0.620	0.477
		N	75	75	75	75	75	75	75	75	75	75	75
	Aug	Person's r	-0.325	-0.530	-0.130	-0.325	-0.117	-0.033	0.586	0.581	0.556	0.571	0.295
		N	75	75	75	75	75	75	75	75	75	75	75
	Sep	Person's r	-0.132	-0.579	-0.068	-0.132	0.002	-0.034	0.362	0.422	0.636	0.687	0.609
		N	75	75	75	75	75	75	75	75	75	75	75
	Oct	Person's r	-0.370	-0.705	-0.256	-0.370	-0.263	-0.177	0.624	0.675	0.509	0.570	0.661
		N	75	75	75	75	75	75	75	75	75	75	75
	Nov	Person's r	-0.426	-0.639	-0.058	-0.426	-0.113	0.101	0.590	0.588	0.508	0.545	0.387
		N	75	75	75	75	75	75	75	75	75	75	75
	Dec	Person's r	-0.434	-0.643	-0.115	-0.434	-0.122	0.032	0.620	0.640	0.515	0.575	0.522
		N	75	75	75	75	75	75	75	75	75	75	75
	Annual Mean	Person's r	-0.445	-0.715	-0.194	-0.445	-0.185	-0.067	0.665	0.683	0.606	0.662	0.540
		N	75	75	75	75	75	75	75	75	75	75	75
	DJF	Person's r	-0.401	-0.667	-0.122	-0.401	-0.133	0.009	0.588	0.603	0.555	0.605	0.482
		N	75	75	75	75	75	75	75	75	75	75	75
	MAM	Person's r	-0.619	-0.639	-0.430	-0.619	-0.385	-0.299	0.666	0.667	0.459	0.513	0.426
		N	75	75	75	75	75	75	75	75	75	75	75
	JJA	Person's r	-0.232	-0.636	0.051	-0.232	0.031	0.162	0.628	0.643	0.639	0.683	0.486
		N	75	75	75	75	75	75	75	75	75	75	75
	SON	Person's r	-0.335	-0.723	-0.144	-0.335	-0.135	-0.048	0.583	0.628	0.632	0.690	0.637
		N	75	75	75	75	75	75	75	75	75	75	75
El Niño 3		Person's r	0.474	0.339	0.023	0.474	0.132	-0.177	-0.306	-0.237	-0.043	-0.051	0.112
		N	50	50	50	50	50	50	50	50	49	49	50
SOI		Person's r	-0.508	-0.198	-0.276	-0.508	-0.327	-0.090	0.165	0.088	-0.153	-0.160	-0.235
		N	49	49	49	49	49	49	49	49	48	48	49
SAB		Person's r	0.295	-0.088	-0.046	0.295	-0.288	-0.178	-0.079	0.007	-0.195	-0.172	0.292
		N	46	46	46	46	46	46	46	46	45	45	46

A11 (continued) Correlation matrix of Laguna Negra. 7-year filtered data

			Bsi						C, N und C/N				
			Al µg/g	Fe µg/g	Si µg/g	Si non Biol µg/g	Bsi Flux	bSi µg/g	N %	TOC %	N Flux	TOC Flux	C/N
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.385	0.547	-0.297	-0.385	-0.108	-0.225	-0.144	-0.310	-0.166	-0.234	-0.708
		N	45	45	45	45	45	45	45	45	45	45	45
	Feb	Person's r	0.508	-0.259	0.474	0.508	0.549	0.409	-0.129	-0.034	0.508	0.554	0.362
		N	45	45	45	45	45	45	45	45	45	45	45
	Mar	Person's r	-0.188	-0.105	0.152	-0.188	0.173	0.296	0.402	0.338	0.296	0.295	-0.054
		N	45	45	45	45	45	45	45	45	45	45	45
	Apr	Person's r	-0.485	-0.369	-0.309	-0.485	-0.327	-0.194	0.212	0.213	-0.191	-0.151	0.242
		N	45	45	45	45	45	45	45	45	45	45	45
	May	Person's r	-0.051	0.015	-0.203	-0.051	-0.384	-0.254	-0.114	-0.140	-0.268	-0.290	-0.151
		N	45	45	45	45	45	45	45	45	45	45	45
	Jun	Person's r	0.388	0.204	0.171	0.388	0.141	0.051	-0.167	-0.120	0.064	0.032	0.024
		N	45	45	45	45	45	45	45	45	45	45	45
	Jul	Person's r	0.234	-0.134	0.115	0.234	-0.092	0.047	0.290	0.417	0.109	0.135	0.575
		N	45	45	45	45	45	45	45	45	45	45	45
	Aug	Person's r	0.354	0.143	0.506	0.354	0.677	0.526	-0.129	-0.033	0.477	0.505	0.324
		N	45	45	45	45	45	45	45	45	45	45	45
	Sep	Person's r	-0.520	-0.023	-0.417	-0.520	-0.351	-0.326	0.264	0.217	-0.175	-0.199	0.005
		N	45	45	45	45	45	45	45	45	45	45	45
	Oct	Person's r	0.525	-0.271	0.202	0.525	0.051	0.029	0.053	0.192	0.074	0.113	0.470
		N	45	45	45	45	45	45	45	45	45	45	45
	Nov	Person's r	0.210	-0.362	0.004	0.210	-0.242	-0.093	0.480	0.584	0.089	0.125	0.598
		N	45	45	45	45	45	45	45	45	45	45	45
	Dec	Person's r	0.139	0.182	0.163	0.139	0.060	0.158	0.017	0.024	0.023	0.007	-0.084
		N	45	45	45	45	45	45	45	45	45	45	45
	Total Annual	Person's r	0.410	-0.084	0.286	0.410	0.153	0.199	0.135	0.292	0.265	0.291	0.641
		N	45	45	45	45	45	45	45	45	45	45	45
Precipitation HadCRUT3	Jan	Person's r	0.504	0.780	0.169	0.504	0.360	-0.004	-0.766	-0.772	-0.061	-0.145	-0.410
		N	70	70	70	70	70	70	70	70	69	69	70
	Feb	Person's r	0.470	-0.072	0.529	0.470	0.562	0.475	-0.044	0.020	0.516	0.541	0.352
		N	70	70	70	70	70	70	70	70	69	69	70
	Mar	Person's r	-0.024	-0.167	0.176	-0.024	0.191	0.238	0.272	0.254	0.560	0.530	0.009
		N	70	70	70	70	70	70	70	70	69	69	70
	Apr	Person's r	0.116	0.020	0.074	0.116	0.191	0.044	-0.169	-0.110	0.387	0.380	0.383
		N	70	70	70	70	70	70	70	70	69	69	70
	May	Person's r	0.042	-0.189	-0.061	0.042	-0.105	-0.097	-0.023	-0.029	0.107	0.112	-0.037
		N	70	70	70	70	70	70	70	70	69	69	70
	Jun	Person's r	0.538	0.451	0.179	0.538	0.277	-0.006	-0.462	-0.456	0.076	0.025	-0.274
		N	70	70	70	70	70	70	70	70	69	69	70
	Jul	Person's r	-0.224	-0.275	-0.232	-0.224	-0.295	-0.201	0.308	0.313	-0.177	-0.143	0.129
		N	70	70	70	70	70	70	70	70	69	69	70
	Aug	Person's r	0.325	0.435	0.245	0.325	0.455	0.173	-0.438	-0.409	0.080	0.045	-0.008
		N	70	70	70	70	70	70	70	70	69	69	70
	Sep	Person's r	-0.105	0.130	-0.283	-0.105	-0.201	-0.318	-0.060	-0.110	-0.175	-0.217	-0.351
		N	70	70	70	70	70	70	70	70	69	69	70
	Oct	Person's r	0.418	0.090	0.281	0.418	0.205	0.178	-0.105	-0.034	-0.059	-0.050	0.276
		N	70	70	70	70	70	70	70	70	69	69	70
	Nov	Person's r	-0.094	-0.221	-0.162	-0.094	-0.298	-0.167	0.332	0.378	-0.114	-0.083	0.404
		N	70	70	70	70	70	70	70	70	69	69	70
	Dec	Person's r	0.041	0.263	-0.037	0.041	0.022	-0.066	-0.197	-0.190	-0.072	-0.100	-0.106
		N	70	70	70	70	70	70	70	70	69	69	70
	Total Annual	Person's r	0.296	0.136	0.030	0.296	0.103	-0.091	-0.216	-0.191	0.067	0.049	-0.002
		N	70	70	70	70	70	70	70	70	69	69	70
	DJF	Person's r	0.503	0.528	0.311	0.503	0.461	0.179	-0.534	-0.503	0.166	0.117	-0.111
		N	70	70	70	70	70	70	70	70	69	69	70
	MAM	Person's r	0.067	-0.189	-0.020	0.067	-0.030	-0.056	-0.037	-0.029	0.258	0.258	0.065
		N	70	70	70	70	70	70	70	70	69	69	70
	JJA	Person's r	0.287	0.257	0.055	0.287	0.160	-0.055	-0.243	-0.224	-0.040	-0.060	-0.068
		N	70	70	70	70	70	70	70	70	69	69	70
	SON	Person's r	0.112	0.012	-0.108	0.112	-0.170	-0.188	0.082	0.114	-0.195	-0.198	0.147
		N	70	70	70	70	70	70	70	70	69	69	70
Precipitation CRU TS 2.1	Jan	Person's r	-0.140	0.024	0.098	-0.140	0.215	0.185	0.190	0.104	0.303	0.268	-0.376
		N	72	72	72	72	72	72	72	72	71	71	72
	Feb	Person's r	0.257	0.196	-0.192	0.257	-0.119	-0.356	-0.396	-0.389	-0.233	-0.251	-0.184
		N	72	72	72	72	72	72	72	72	71	71	72
	Mar	Person's r	-0.204	-0.274	-0.125	-0.204	-0.132	-0.075	0.378	0.341	0.431	0.416	-0.026
		N	72	72	72	72	72	72	72	72	71	71	72
	Apr	Person's r	-0.143	-0.437	-0.046	-0.143	-0.089	0.002	0.197	0.261	0.315	0.371	0.588
		N	72	72	72	72	72	72	72	72	71	71	72
	May	Person's r	0.265	-0.141	0.256	0.265	0.131	0.217	-0.105	-0.088	0.211	0.206	0.067
		N	72	72	72	72	72	72	72	72	71	71	72
	Jun	Person's r	0.308	0.393	0.173	0.308	0.203	0.092	-0.225	-0.246	-0.158	-0.209	-0.323
		N	72	72	72	72	72	72	72	72	71	71	72
	Jul	Person's r	-0.174	-0.287	-0.299	-0.174	-0.377	-0.310	0.192	0.193	-0.298	-0.275	0.035
		N	72	72	72	72	72	72	72	72	71	71	72
	Aug	Person's r	0.388	0.296	0.328	0.388	0.498	0.257	-0.416	-0.371	0.143	0.120	0.104
		N	72	72	72	72	72	72	72	72	71	71	72
	Sep	Person's r	0.069	0.001	-0.094	0.069	-0.101	-0.151	-0.145	-0.147	-0.147	-0.162	-0.071
		N	72	72	72	72	72	72	72	72	71	71	72
	Oct	Person's r	0.391	0.262	0.466	0.391	0.476	0.434	-0.256	-0.222	-0.031	-0.042	0.015
		N	72	72	72	72	72	72	72	72	71	71	72
	Nov	Person's r	0.066	-0.152	0.082	0.066	-0.060	0.077	0.268	0.321	-0.084	-0.053	0.397
		N	72	72	72	72	72	72	72	72	71	71	72
	Dec	Person's r	-0.310	0.236	-0.231	-0.310	-0.177	-0.166	0.097	0.067	-0.275	-0.288	-0.171
		N	72	72	72	72	72	72	72	72	71	71	72
	Total Annual	Person's r	0.346	0.016	0.222	0.346	0.186	0.139	-0.186	-0.153	0.013	-0.002	0.075
		N	72	72	72	72	72	72	72	72	71	71	72
	DJF	Person's r	0.275	0.204	0.099	0.275	0.163	0.011	-0.235	-0.222	-0.173	-0.199	-0.093
		N	72	72	72	72	72	72	72	72	71	71	72
	MAM	Person's r	0.275	0.062	0.214	0.275	0.148	0.159	-0.098	-0.057	-0.152	-0.153	0.150
		N	72	72	72	72	72	72	72	72	71	71	72
	JJA	Person's r	-0.174	0.311	-0.246	-0.174	-0.105	-0.242	-0.051	-0.113	-0.200	-0.237	-0.422
		N	72	72	72	72	72	72	72	72	71	71	72
	SON	Person's r	0.170	-0.274	0.198	0.170	0.075	0.182	0.005	0.033	0.319	0.329	0.217
		N	72	72	72	72	72	72	72	72	71	71	72

A11 (continued) Correlation matrix of Laguna Negra. 7-year filtered data

			Grain size										
			D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	0.588	0.519	0.551	0.609	0.578	0.592	0.609	0.592	0.471	0.440	0.213
		N	72	72	72	72	72	72	72	72	72	72	72
	Feb	Person's r	0.365	0.359	0.361	0.323	0.253	0.239	0.323	0.260	0.218	0.154	0.145
		N	72	72	72	72	72	72	72	72	72	72	72
	Mrz	Person's r	0.006	0.067	0.039	-0.090	-0.156	-0.134	-0.089	-0.145	-0.114	-0.196	0.073
		N	72	72	72	72	72	72	72	72	72	72	72
	Apr	Person's r	-0.057	-0.077	-0.037	0.022	0.041	0.072	0.022	0.045	0.127	0.059	-0.052
		N	72	72	72	72	72	72	72	72	72	72	72
	Mai	Person's r	0.298	0.160	0.234	0.455	0.590	0.608	0.455	0.585	0.285	0.618	0.360
		N	72	72	72	72	72	72	72	72	72	72	72
	Jun	Person's r	-0.283	-0.326	-0.293	-0.178	-0.019	0.029	-0.178	-0.027	-0.120	0.102	0.170
		N	72	72	72	72	72	72	72	72	72	72	72
	Jul	Person's r	0.027	-0.123	-0.034	0.255	0.426	0.403	0.255	0.401	0.213	0.550	0.121
		N	72	72	72	72	72	72	72	72	72	72	72
	Aug	Person's r	-0.133	-0.126	-0.118	-0.119	-0.057	-0.060	-0.119	-0.065	-0.200	0.001	0.255
		N	72	72	72	72	72	72	72	72	72	72	72
	Sep	Person's r	0.062	-0.081	-0.005	0.261	0.471	0.493	0.261	0.455	0.220	0.562	0.288
		N	72	72	72	72	72	72	72	72	72	72	72
	Okt	Person's r	0.215	0.130	0.191	0.343	0.382	0.388	0.343	0.382	0.390	0.352	-0.089
		N	72	72	72	72	72	72	72	72	72	72	72
	Nov	Person's r	0.264	0.304	0.283	0.156	0.049	0.064	0.156	0.068	0.087	-0.059	0.130
		N	72	72	72	72	72	72	72	72	72	72	72
	Dez	Person's r	0.464	0.401	0.426	0.485	0.465	0.460	0.485	0.471	0.372	0.372	0.156
		N	72	72	72	72	72	72	72	72	72	72	72
	Annual Average	Person's r	0.220	0.141	0.191	0.313	0.381	0.399	0.313	0.381	0.243	0.377	0.225
		N	72	72	72	72	72	72	72	72	72	72	72
	DJF	Person's r	0.520	0.470	0.492	0.518	0.472	0.468	0.518	0.481	0.386	0.351	0.189
		N	72	72	72	72	72	72	72	72	72	72	72
	MAM	Person's r	0.123	0.077	0.114	0.185	0.226	0.256	0.185	0.230	0.132	0.230	0.183
		N	72	72	72	72	72	72	72	72	72	72	72
	JJA	Person's r	-0.205	-0.305	-0.236	-0.019	0.188	0.202	-0.019	0.167	-0.040	0.346	0.266
		N	72	72	72	72	72	72	72	72	72	72	72
	SON	Person's r	0.247	0.168	0.217	0.337	0.393	0.412	0.337	0.395	0.307	0.367	0.147
		N	72	72	72	72	72	72	72	72	72	72	72
Temperature HadCRUT3	Jan	Person's r	0.511	0.545	0.512	0.374	0.175	0.163	0.374	0.197	0.290	-0.014	-0.150
		N	75	75	75	75	75	75	75	75	75	75	75
	Feb	Person's r	0.121	0.109	0.109	0.109	0.116	0.118	0.109	0.117	-0.009	0.097	0.101
		N	75	75	75	75	75	75	75	75	75	75	75
	Mrz	Person's r	0.281	0.363	0.307	0.105	-0.121	-0.126	0.105	-0.098	0.110	-0.269	-0.299
		N	75	75	75	75	75	75	75	75	75	75	75
	Apr	Person's r	0.175	0.246	0.201	0.033	-0.131	-0.106	0.034	-0.107	0.069	-0.255	-0.255
		N	75	75	75	75	75	75	75	75	75	75	75
	Mai	Person's r	0.562	0.509	0.526	0.551	0.450	0.458	0.551	0.469	0.447	0.301	-0.096
		N	75	75	75	75	75	75	75	75	75	75	75
	Jun	Person's r	0.278	0.192	0.224	0.334	0.357	0.378	0.334	0.362	0.205	0.354	0.103
		N	75	75	75	75	75	75	75	75	75	75	75
	Jul	Person's r	0.533	0.409	0.468	0.634	0.617	0.601	0.634	0.619	0.519	0.540	-0.035
		N	75	75	75	75	75	75	75	75	75	75	75
	Aug	Person's r	0.302	0.298	0.298	0.265	0.192	0.191	0.265	0.204	0.236	0.079	-0.090
		N	75	75	75	75	75	75	75	75	75	75	75
	Sep	Person's r	0.183	0.139	0.163	0.229	0.220	0.240	0.229	0.226	0.304	0.168	-0.151
		N	75	75	75	75	75	75	75	75	75	75	75
	Okt	Person's r	0.288	0.259	0.266	0.290	0.236	0.248	0.290	0.247	0.324	0.142	-0.189
		N	75	75	75	75	75	75	75	75	75	75	75
	Nov	Person's r	0.487	0.495	0.475	0.383	0.268	0.268	0.383	0.287	0.232	0.112	0.095
		N	75	75	75	75	75	75	75	75	75	75	75
	Dez	Person's r	0.513	0.512	0.502	0.436	0.300	0.308	0.436	0.322	0.331	0.133	-0.051
		N	75	75	75	75	75	75	75	75	75	75	75
	Annual Mean	Person's r	0.426	0.414	0.410	0.371	0.256	0.263	0.371	0.274	0.307	0.123	-0.118
		N	75	75	75	75	75	75	75	75	75	75	75
	DJF	Person's r	0.426	0.434	0.418	0.341	0.218	0.217	0.341	0.234	0.229	0.077	-0.041
		N	75	75	75	75	75	75	75	75	75	75	75
	MAM	Person's r	0.375	0.416	0.382	0.247	0.059	0.069	0.247	0.084	0.225	-0.098	-0.249
		N	75	75	75	75	75	75	75	75	75	75	75
	JJA	Person's r	0.446	0.356	0.395	0.501	0.478	0.478	0.501	0.485	0.390	0.404	-0.006
		N	75	75	75	75	75	75	75	75	75	75	75
	SON	Person's r	0.346	0.319	0.326	0.333	0.271	0.284	0.333	0.284	0.329	0.163	-0.105
		N	75	75	75	75	75	75	75	75	75	75	75
El Niño 3		Person's r	-0.291	-0.316	-0.279	-0.174	-0.091	-0.075	-0.174	-0.100	0.025	-0.022	-0.257
		N	50	50	50	50	50	50	50	50	50	50	50
SOI		Person's r	0.248	0.320	0.265	0.077	-0.060	-0.062	0.077	-0.039	-0.096	-0.194	0.196
		N	49	49	49	49	49	49	49	49	49	49	49
SAB		Person's r	-0.131	-0.174	-0.145	-0.036	0.173	0.202	-0.036	0.163	-0.082	0.226	0.270
		N	46	46	46	46	46	46	46	46	46	46	46

A11 (continued) Correlation matrix of Laguna Negra. 7-year filtered data

			Grain size										
			D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.014	0.167	0.077	-0.327	-0.768	-0.783	-0.327	-0.745	-0.143	-0.764	-0.336
		N	45	45	45	45	45	45	45	45	45	45	45
	Feb	Person's r	-0.043	-0.184	-0.093	0.250	0.418	0.436	0.249	0.405	0.359	0.477	-0.161
		N	45	45	45	45	45	45	45	45	45	45	45
	Mrz	Person's r	0.265	0.300	0.275	0.141	0.003	-0.017	0.142	0.018	0.075	-0.132	0.033
		N	45	45	45	45	45	45	45	45	45	45	45
	Apr	Person's r	0.511	0.475	0.466	0.412	0.213	0.202	0.411	0.244	0.145	0.019	-0.071
		N	45	45	45	45	45	45	45	45	45	45	45
	Mai	Person's r	-0.374	-0.307	-0.369	-0.505	-0.327	-0.334	-0.505	-0.356	-0.706	-0.109	0.551
		N	45	45	45	45	45	45	45	45	45	45	45
	Jun	Person's r	-0.374	-0.383	-0.366	-0.251	-0.085	-0.114	-0.251	-0.123	-0.084	0.088	0.001
		N	45	45	45	45	45	45	45	45	45	45	45
	Jul	Person's r	0.116	0.015	0.068	0.285	0.523	0.558	0.285	0.526	0.092	0.441	0.199
		N	45	45	45	45	45	45	45	45	45	45	45
	Aug	Person's r	0.274	0.244	0.294	0.371	0.257	0.269	0.371	0.278	0.525	0.061	-0.329
		N	45	45	45	45	45	45	45	45	45	45	45
	Sep	Person's r	0.463	0.538	0.483	0.219	-0.131	-0.136	0.219	-0.088	0.055	-0.356	-0.144
		N	45	45	45	45	45	45	45	45	45	45	45
	Okt	Person's r	-0.426	-0.577	-0.497	-0.063	0.448	0.457	-0.063	0.397	-0.008	0.670	0.245
		N	45	45	45	45	45	45	45	45	45	45	45
	Nov	Person's r	-0.020	-0.184	-0.115	0.250	0.544	0.545	0.250	0.521	0.091	0.617	0.108
		N	45	45	45	45	45	45	45	45	45	45	45
	Dez	Person's r	-0.246	-0.180	-0.210	-0.304	-0.075	-0.052	-0.304	-0.087	-0.363	-0.040	0.497
		N	45	45	45	45	45	45	45	45	45	45	45
	Total Annual	Person's r	0.040	-0.052	0.001	0.225	0.447	0.461	0.225	0.437	0.112	0.410	0.144
		N	45	45	45	45	45	45	45	45	45	45	45
Precipitation HadCRUT3	Jan	Person's r	-0.670	-0.620	-0.640	-0.659	-0.561	-0.552	-0.659	-0.581	-0.567	-0.333	0.097
		N	70	70	70	70	70	70	70	70	70	70	70
	Feb	Person's r	-0.004	-0.156	-0.065	0.248	0.451	0.463	0.248	0.430	0.315	0.563	0.080
		N	70	70	70	70	70	70	70	70	70	70	70
	Mrz	Person's r	0.220	0.275	0.262	0.147	0.034	0.025	0.147	0.048	0.211	-0.116	-0.122
		N	70	70	70	70	70	70	70	70	70	70	70
	Apr	Person's r	-0.018	-0.003	-0.006	-0.036	-0.053	-0.038	-0.036	-0.049	-0.050	-0.060	-0.004
		N	70	70	70	70	70	70	70	70	70	70	70
	Mai	Person's r	-0.373	-0.371	-0.395	-0.375	-0.224	-0.243	-0.375	-0.251	-0.533	-0.045	0.349
		N	70	70	70	70	70	70	70	70	70	70	70
	Jun	Person's r	-0.527	-0.542	-0.516	-0.408	-0.287	-0.288	-0.408	-0.310	-0.223	-0.105	-0.132
		N	70	70	70	70	70	70	70	70	70	70	70
	Jul	Person's r	0.146	0.141	0.145	0.152	0.102	0.086	0.152	0.106	0.156	0.029	-0.223
		N	70	70	70	70	70	70	70	70	70	70	70
	Aug	Person's r	-0.031	0.016	0.023	-0.037	-0.128	-0.115	-0.037	-0.117	0.156	-0.196	-0.276
		N	70	70	70	70	70	70	70	70	70	70	70
	Sep	Person's r	-0.115	-0.028	-0.064	-0.214	-0.357	-0.372	-0.214	-0.348	-0.163	-0.392	-0.303
		N	70	70	70	70	70	70	70	70	70	70	70
	Okt	Person's r	-0.199	-0.334	-0.263	0.041	0.322	0.330	0.041	0.293	0.089	0.485	0.223
		N	70	70	70	70	70	70	70	70	70	70	70
	Nov	Person's r	0.080	-0.004	0.025	0.181	0.260	0.258	0.181	0.251	0.093	0.311	0.001
		N	70	70	70	70	70	70	70	70	70	70	70
	Dez	Person's r	-0.168	-0.065	-0.112	-0.283	-0.271	-0.245	-0.283	-0.262	-0.285	-0.323	0.218
		N	70	70	70	70	70	70	70	70	70	70	70
	Total Annual	Person's r	-0.356	-0.354	-0.345	-0.290	-0.211	-0.222	-0.290	-0.229	-0.211	-0.101	-0.107
		N	70	70	70	70	70	70	70	70	70	70	70
	DJF	Person's r	-0.449	-0.430	-0.427	-0.396	-0.244	-0.217	-0.396	-0.258	-0.319	-0.106	0.222
		N	70	70	70	70	70	70	70	70	70	70	70
	MAM	Person's r	-0.332	-0.321	-0.346	-0.347	-0.221	-0.236	-0.347	-0.244	-0.492	-0.070	0.314
		N	70	70	70	70	70	70	70	70	70	70	70
	JJA	Person's r	-0.202	-0.193	-0.174	-0.138	-0.145	-0.150	-0.138	-0.150	0.048	-0.123	-0.333
		N	70	70	70	70	70	70	70	70	70	70	70
	SON	Person's r	-0.136	-0.200	-0.169	-0.014	0.092	0.086	-0.014	0.077	-0.003	0.185	-0.066
		N	70	70	70	70	70	70	70	70	70	70	70
Precipitation CRU TS 2.1	Jan	Person's r	0.127	0.168	0.147	0.049	-0.113	-0.149	0.049	-0.108	0.070	-0.152	-0.211
		N	72	72	72	72	72	72	72	72	72	72	72
	Feb	Person's r	-0.596	-0.584	-0.593	-0.546	-0.431	-0.431	-0.546	-0.453	-0.489	-0.222	-0.043
		N	72	72	72	72	72	72	72	72	72	72	72
	Mrz	Person's r	0.218	0.278	0.258	0.124	-0.070	-0.082	0.124	-0.051	0.214	-0.213	-0.395
		N	72	72	72	72	72	72	72	72	72	72	72
	Apr	Person's r	0.226	0.199	0.200	0.206	0.242	0.267	0.206	0.250	0.002	0.190	0.271
		N	72	72	72	72	72	72	72	72	72	72	72
	Mai	Person's r	-0.320	-0.370	-0.367	-0.258	-0.008	-0.024	-0.258	-0.041	-0.472	0.191	0.608
		N	72	72	72	72	72	72	72	72	72	72	72
	Jun	Person's r	-0.306	-0.338	-0.318	-0.205	-0.100	-0.129	-0.205	-0.124	-0.127	0.043	-0.010
		N	72	72	72	72	72	72	72	72	72	72	72
	Jul	Person's r	-0.062	-0.049	-0.059	-0.063	-0.087	-0.118	-0.063	-0.094	-0.031	-0.092	-0.243
		N	72	72	72	72	72	72	72	72	72	72	72
	Aug	Person's r	-0.061	-0.055	-0.034	-0.014	-0.046	-0.049	-0.014	-0.047	0.150	-0.052	-0.209
		N	72	72	72	72	72	72	72	72	72	72	72
	Sep	Person's r	-0.332	-0.333	-0.351	-0.322	-0.208	-0.238	-0.322	-0.234	-0.468	-0.048	0.225
		N	72	72	72	72	72	72	72	72	72	72	72
	Okt	Person's r	-0.031	-0.093	-0.048	0.104	0.228	0.218	0.104	0.212	0.180	0.272	0.117
		N	72	72	72	72	72	72	72	72	72	72	72
	Nov	Person's r	0.104	-0.015	0.037	0.263	0.395	0.381	0.263	0.378	0.172	0.462	0.073
		N	72	72	72	72	72	72	72	72	72	72	72
	Dez	Person's r	0.297	0.413	0.367	0.125	-0.076	-0.048	0.125	-0.038	0.151	-0.314	-0.146
		N	72	72	72	72	72	72	72	72	72	72	72
	Total Annual	Person's r	-0.318	-0.364	-0.346	-0.213	-0.035	-0.072	-0.213	-0.069	-0.270	0.131	0.198
		N	72	72	72	72	72	72	72	72	72	72	72
	DJF	Person's r	-0.230	-0.236	-0.220	-0.151	-0.128	-0.163	-0.151	-0.145	-0.003	-0.059	-0.260
		N	72	72	72	72	72	72	72	72	72	72	72
	MAM	Person's r	-0.182	-0.271	-0.235	-0.032	0.168	0.136	-0.032	0.135	-0.131	0.325	0.240
		N	72	72	72	72	72	72	72	72	72	72	72
	JJA	Person's r	-0.031	0.088	0.036	-0.180	-0.355	-0.350	-0.180	-0.335	-0.117	-0.449	-0.243
		N	72	72	72	72	72	72	72	72	72	72	72
	SON	Person's r	-0.194	-0.238	-0.237	-0.156	0.052	0.043	-0.156	0.026	-0.389	0.196	0.562
		N	72	72	72	72	72	72	72	72	72	72	72

A12 Correlation matrix of Laguna Negra. 9-year filtered data

			Spectrolino								
			RABD660;670	R590/640	RABD510	RABD550	RABD480	Chlorin	RABD720	Total Absorbtion	Clastic input
Temperature CRU TS 2.1	Jan	Person's r	0.765	-0.753	0.545	-0.052	0.651	-0.687	-0.037	-0.581	-0.692
		N	81	81	81	81	81	81	81	81	81
	Feb	Person's r	0.626	-0.573	0.361	-0.055	0.402	-0.647	-0.028	-0.318	-0.494
		N	81	81	81	81	81	81	81	81	81
	Mar	Person's r	0.359	-0.283	0.211	0.061	0.158	-0.441	-0.145	-0.052	-0.233
		N	81	81	81	81	81	81	81	81	81
	Apr	Person's r	-0.034	0.071	-0.159	-0.269	-0.086	-0.107	-0.119	0.289	0.107
		N	81	81	81	81	81	81	81	81	81
	May	Person's r	0.241	-0.127	-0.132	-0.585	0.079	-0.217	0.140	0.025	-0.033
		N	81	81	81	81	81	81	81	81	81
	Jun	Person's r	0.286	-0.213	0.232	0.145	0.140	-0.058	-0.132	-0.206	-0.210
		N	81	81	81	81	81	81	81	81	81
	Jul	Person's r	0.158	-0.118	-0.104	-0.195	-0.092	-0.010	-0.170	0.054	-0.032
		N	81	81	81	81	81	81	81	81	81
	Aug	Person's r	-0.430	0.494	-0.628	-0.482	-0.579	0.165	0.159	0.698	0.568
		N	81	81	81	81	81	81	81	81	81
	Sep	Person's r	0.516	-0.368	0.285	0.124	0.192	-0.227	-0.026	-0.182	-0.351
		N	81	81	81	81	81	81	81	81	81
	Oct	Person's r	0.511	-0.508	0.416	0.198	0.346	-0.416	-0.472	-0.288	-0.460
		N	81	81	81	81	81	81	81	81	81
	Nov	Person's r	0.449	-0.432	0.227	-0.108	0.278	-0.595	0.025	-0.185	-0.353
		N	81	81	81	81	81	81	81	81	81
	Dec	Person's r	0.704	-0.658	0.439	-0.073	0.498	-0.721	-0.230	-0.382	-0.567
		N	81	81	81	81	81	81	81	81	81
	Annual Mean	Person's r	0.527	-0.449	0.245	-0.123	0.276	-0.494	-0.122	-0.183	-0.368
		N	81	81	81	81	81	81	81	81	81
	DJF	Person's r	0.730	-0.690	0.466	-0.063	0.538	-0.717	-0.098	-0.444	-0.610
		N	81	81	81	81	81	81	81	81	81
	MAM	Person's r	0.262	-0.162	-0.021	-0.339	0.079	-0.335	-0.039	0.086	-0.084
		N	81	81	81	81	81	81	81	81	81
	JJA	Person's r	0.097	-0.008	-0.132	-0.176	-0.167	0.019	-0.104	0.151	0.061
		N	81	81	81	81	81	81	81	81	81
	SON	Person's r	0.600	-0.535	0.374	0.074	0.335	-0.522	-0.182	-0.266	-0.474
		N	81	81	81	81	81	81	81	81	81
Temperature HadCRUT3	Jan	Person's r	0.664	-0.598	0.526	0.358	0.419	-0.661	-0.176	-0.393	-0.561
		N	86	86	86	86	86	86	86	86	86
	Feb	Person's r	0.664	-0.616	0.537	0.362	0.427	-0.497	-0.226	-0.482	-0.571
		N	86	86	86	86	86	86	86	86	86
	Mar	Person's r	0.535	-0.522	0.571	0.485	0.442	-0.597	-0.414	-0.399	-0.514
		N	86	86	86	86	86	86	86	86	86
	Apr	Person's r	0.659	-0.613	0.701	0.545	0.598	-0.580	-0.294	-0.584	-0.630
		N	86	86	86	86	86	86	86	86	86
	May	Person's r	0.692	-0.606	0.526	0.142	0.558	-0.623	-0.250	-0.462	-0.569
		N	86	86	86	86	86	86	86	86	86
	Jun	Person's r	0.818	-0.708	0.578	0.249	0.538	-0.547	-0.181	-0.588	-0.660
		N	86	86	86	86	86	86	86	86	86
	Jul	Person's r	0.748	-0.656	0.471	0.179	0.418	-0.521	-0.216	-0.485	-0.579
		N	86	86	86	86	86	86	86	86	86
	Aug	Person's r	0.664	-0.647	0.561	0.311	0.516	-0.649	-0.384	-0.451	-0.599
		N	86	86	86	86	86	86	86	86	86
	Sep	Person's r	0.737	-0.632	0.661	0.552	0.490	-0.496	-0.379	-0.482	-0.641
		N	86	86	86	86	86	86	86	86	86
	Oct	Person's r	0.788	-0.734	0.775	0.589	0.630	-0.549	-0.481	-0.667	-0.738
		N	86	86	86	86	86	86	86	86	86
	Nov	Person's r	0.754	-0.697	0.545	0.254	0.494	-0.660	-0.123	-0.533	-0.633
		N	86	86	86	86	86	86	86	86	86
	Dec	Person's r	0.702	-0.641	0.535	0.252	0.501	-0.667	-0.208	-0.438	-0.597
		N	86	86	86	86	86	86	86	86	86
	Annual Mean	Person's r	0.824	-0.749	0.685	0.422	0.590	-0.688	-0.325	-0.585	-0.713
		N	86	86	86	86	86	86	86	86	86
	DJF	Person's r	0.745	-0.681	0.587	0.360	0.492	-0.662	-0.226	-0.485	-0.635
		N	86	86	86	86	86	86	86	86	86
	MAM	Person's r	0.694	-0.641	0.664	0.438	0.587	-0.666	-0.359	-0.531	-0.631
		N	86	86	86	86	86	86	86	86	86
	JJA	Person's r	0.835	-0.747	0.594	0.266	0.543	-0.625	-0.272	-0.573	-0.682
		N	86	86	86	86	86	86	86	86	86
	SON	Person's r	0.840	-0.759	0.730	0.516	0.593	-0.627	-0.364	-0.617	-0.741
		N	86	86	86	86	86	86	86	86	86
El Niño 3		Person's r	-0.472	0.450	-0.236	0.152	-0.231	0.465	-0.165	0.356	0.370
		N	59	59	59	59	59	59	59	59	59
SOI		Person's r	-0.080	0.128	-0.352	-0.312	-0.242	-0.135	0.372	0.243	0.200
		N	58	58	58	58	58	58	58	58	58
SAB		Person's r	0.272	-0.354	0.511	0.360	0.367	-0.003	0.210	-0.529	-0.431
		N	55	55	55	55	55	55	55	55	55

A12 (continued) Correlation matrix of Laguna Negra. 9-year filtered data

			Spectrolino								
			RABD660;670	R590/640	RABD510	RABD550	RABD480	Chlorin	RABD720	Total Absorbtion	Clastic input
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.583	0.382	-0.504	-0.668	-0.121	-0.267	-0.161	0.251	0.445
		N	43	43	43	43	43	43	43	43	43
	Feb	Person's r	0.549	-0.447	0.457	0.589	0.124	0.016	-0.325	-0.092	-0.455
		N	43	43	43	43	43	43	43	43	43
	Mar	Person's r	-0.201	0.250	-0.454	-0.488	-0.293	-0.178	0.147	0.251	0.355
		N	43	43	43	43	43	43	43	43	43
	Apr	Person's r	0.459	-0.326	0.142	0.225	0.024	-0.375	0.334	-0.056	-0.247
		N	43	43	43	43	43	43	43	43	43
	May	Person's r	-0.233	0.648	-0.556	-0.174	-0.668	0.441	0.470	0.215	0.643
		N	43	43	43	43	43	43	43	43	43
	Jun	Person's r	-0.225	0.221	0.043	0.002	-0.031	0.491	-0.355	-0.133	0.154
		N	43	43	43	43	43	43	43	43	43
	Jul	Person's r	0.160	-0.205	0.309	0.229	0.259	0.257	0.102	-0.295	-0.252
		N	43	43	43	43	43	43	43	43	43
	Aug	Person's r	0.179	-0.393	0.259	0.017	0.380	-0.306	-0.109	0.002	-0.398
		N	43	43	43	43	43	43	43	43	43
	Sep	Person's r	-0.172	0.114	-0.293	-0.404	-0.043	-0.234	0.240	0.015	0.196
		N	43	43	43	43	43	43	43	43	43
	Oct	Person's r	0.238	-0.146	0.468	0.559	0.132	0.681	-0.157	-0.469	-0.267
		N	43	43	43	43	43	43	43	43	43
	Nov	Person's r	0.323	-0.223	0.470	0.517	0.136	0.608	-0.198	-0.595	-0.250
		N	43	43	43	43	43	43	43	43	43
	Dec	Person's r	-0.484	0.507	-0.487	-0.472	-0.254	0.194	0.393	0.290	0.454
		N	43	43	43	43	43	43	43	43	43
	Total Annual	Person's r	0.188	-0.116	0.225	0.213	0.104	0.365	0.094	-0.251	-0.159
		N	43	43	43	43	43	43	43	43	43
Precipitation HadCRUT3	Jan	Person's r	-0.419	0.492	-0.464	-0.202	-0.441	0.464	0.062	0.405	0.487
		N	79	79	79	79	79	79	79	79	79
	Feb	Person's r	0.320	-0.231	0.179	0.067	0.142	-0.022	-0.180	-0.125	-0.235
		N	79	79	79	79	79	79	79	79	79
	Mar	Person's r	0.046	-0.162	0.108	-0.075	0.146	-0.411	-0.370	0.072	-0.116
		N	79	79	79	79	79	79	79	79	79
	Apr	Person's r	0.068	0.130	-0.120	-0.038	-0.183	-0.071	0.109	0.282	0.150
		N	79	79	79	79	79	79	79	79	79
	May	Person's r	-0.226	0.427	-0.346	0.051	-0.501	0.324	0.145	0.452	0.422
		N	79	79	79	79	79	79	79	79	79
	Jun	Person's r	-0.662	0.657	-0.514	-0.008	-0.614	0.756	-0.014	0.489	0.611
		N	79	79	79	79	79	79	79	79	79
	Jul	Person's r	0.319	-0.419	0.483	0.513	0.387	-0.152	-0.224	-0.453	-0.457
		N	79	79	79	79	79	79	79	79	79
	Aug	Person's r	0.002	-0.032	-0.027	-0.055	0.075	-0.071	-0.012	0.069	-0.042
		N	79	79	79	79	79	79	79	79	79
	Sep	Person's r	-0.617	0.549	-0.459	-0.033	-0.489	0.393	0.050	0.501	0.528
		N	79	79	79	79	79	79	79	79	79
	Oct	Person's r	0.035	-0.031	0.098	0.018	0.102	0.334	-0.067	-0.245	-0.073
		N	79	79	79	79	79	79	79	79	79
	Nov	Person's r	0.165	-0.140	0.246	0.191	0.190	0.160	-0.170	-0.399	-0.158
		N	79	79	79	79	79	79	79	79	79
	Dec	Person's r	-0.079	0.004	-0.006	-0.115	0.103	-0.125	0.235	0.015	-0.004
		N	79	79	79	79	79	79	79	79	79
	Total Annual	Person's r	-0.317	0.376	-0.233	0.251	-0.383	0.483	-0.055	0.313	0.328
		N	79	79	79	79	79	79	79	79	79
	DJF	Person's r	-0.108	0.142	-0.153	-0.137	-0.095	0.149	0.084	0.154	0.133
		N	79	79	79	79	79	79	79	79	79
	MAM	Person's r	-0.191	0.408	-0.336	0.033	-0.489	0.250	0.126	0.482	0.412
		N	79	79	79	79	79	79	79	79	79
	JJA	Person's r	-0.178	0.096	0.003	0.306	-0.073	0.311	-0.160	0.020	0.041
		N	79	79	79	79	79	79	79	79	79
	SON	Person's r	-0.364	0.328	-0.181	0.070	-0.226	0.523	-0.072	0.073	0.283
		N	79	79	79	79	79	79	79	79	79
Precipitation CRU TS 2.1	Jan	Person's r	-0.081	0.092	-0.238	-0.306	-0.142	-0.154	-0.191	0.230	0.171
		N	81	81	81	81	81	81	81	81	81
	Feb	Person's r	-0.030	0.080	0.071	0.529	-0.195	0.471	0.025	-0.145	0.029
		N	81	81	81	81	81	81	81	81	81
	Mar	Person's r	0.028	-0.140	0.209	0.263	0.093	-0.294	-0.608	0.015	-0.123
		N	81	81	81	81	81	81	81	81	81
	Apr	Person's r	0.515	-0.326	0.292	0.206	0.183	-0.369	0.263	-0.150	-0.311
		N	81	81	81	81	81	81	81	81	81
	May	Person's r	0.144	0.052	-0.096	-0.025	-0.242	0.053	0.284	0.133	0.093
		N	81	81	81	81	81	81	81	81	81
	Jun	Person's r	-0.570	0.586	-0.537	-0.377	-0.439	0.575	-0.014	0.418	0.577
		N	81	81	81	81	81	81	81	81	81
	Jul	Person's r	0.198	-0.276	0.412	0.629	0.213	0.041	-0.233	-0.386	-0.328
		N	81	81	81	81	81	81	81	81	81
	Aug	Person's r	0.127	-0.072	0.007	0.015	0.012	-0.036	-0.009	0.020	-0.069
		N	81	81	81	81	81	81	81	81	81
	Sep	Person's r	-0.173	0.305	-0.224	0.127	-0.381	0.361	0.186	0.239	0.296
		N	81	81	81	81	81	81	81	81	81
	Oct	Person's r	0.041	-0.088	-0.006	-0.201	0.139	0.053	0.055	-0.078	-0.100
		N	81	81	81	81	81	81	81	81	81
	Nov	Person's r	0.198	-0.147	0.169	0.064	0.163	0.178	-0.060	-0.364	-0.149
		N	81	81	81	81	81	81	81	81	81
	Dec	Person's r	0.062	-0.313	0.245	-0.229	0.554	-0.436	0.060	-0.325	-0.317
		N	81	81	81	81	81	81	81	81	81
	Total Annual	Person's r	0.078	0.061	-0.035	0.156	-0.179	0.258	0.087	0.026	0.060
		N	81	81	81	81	81	81	81	81	81
	DJF	Person's r	-0.142	0.135	-0.059	0.177	-0.121	0.347	-0.158	0.019	0.099
		N	81	81	81	81	81	81	81	81	81
	MAM	Person's r	0.004	0.081	-0.069	0.003	-0.095	0.350	0.123	-0.061	0.067
		N	81	81	81	81	81	81	81	81	81
	JJA	Person's r	-0.006	-0.158	0.119	-0.035	0.261	-0.156	-0.030	-0.226	-0.152
		N	81	81	81	81	81	81	81	81	81
	SON	Person's r	0.268	-0.061	0.021	0.063	-0.146	-0.087	0.251	0.073	-0.020
		N	81	81	81	81	81	81	81	81	81

A12 (continued) Correlation matrix of Laguna Negra. 9-year filtered data

			Bsi						C, N und C/N				
			Al µg/g	Fe µg/g	Si µg/g	Si non Biol µg/g	Bsi Flux	bSi µg/g	N %	TOC %	N Flux	TOC Flux	C/N
Temperature CRU TS 2.1	Jan	Person's r	-0.009	-0.298	0.439	-0.009	0.380	0.576	0.350	0.396	0.675	0.713	0.545
		N	70	70	70	70	70	70	70	70	69	69	70
	Feb	Person's r	0.060	-0.214	0.423	0.060	0.429	0.526	0.128	0.142	0.675	0.673	0.271
		N	70	70	70	70	70	70	70	70	69	69	70
	Mrz	Person's r	0.102	-0.050	0.156	0.102	0.254	0.160	-0.058	-0.042	0.715	0.688	0.180
		N	70	70	70	70	70	70	70	70	69	69	70
	Apr	Person's r	0.599	0.376	0.575	0.599	0.697	0.491	-0.406	-0.367	0.691	0.640	0.112
		N	70	70	70	70	70	70	70	70	69	69	70
	Mai	Person's r	0.382	0.074	0.654	0.382	0.579	0.689	0.075	0.101	0.545	0.536	0.234
		N	70	70	70	70	70	70	70	70	69	69	70
	Jun	Person's r	0.583	0.239	0.323	0.583	0.380	0.171	-0.454	-0.379	0.444	0.413	0.292
		N	70	70	70	70	70	70	70	70	69	69	70
	Jul	Person's r	0.539	0.074	0.731	0.539	0.684	0.721	0.016	0.019	0.517	0.492	0.004
		N	70	70	70	70	70	70	70	70	69	69	70
	Aug	Person's r	0.499	0.326	0.559	0.499	0.575	0.513	-0.327	-0.333	0.544	0.467	-0.157
		N	70	70	70	70	70	70	70	70	69	69	70
	Sep	Person's r	0.452	-0.183	0.556	0.452	0.529	0.530	-0.067	0.024	0.645	0.680	0.603
		N	70	70	70	70	70	70	70	70	69	69	70
	Okt	Person's r	0.283	-0.279	0.445	0.283	0.424	0.458	0.234	0.284	0.815	0.817	0.454
		N	70	70	70	70	70	70	70	70	69	69	70
	Nov	Person's r	-0.040	-0.095	0.264	-0.040	0.296	0.362	0.061	0.046	0.519	0.507	0.059
		N	70	70	70	70	70	70	70	70	69	69	70
	Dez	Person's r	-0.065	-0.458	0.380	-0.065	0.319	0.523	0.475	0.493	0.811	0.831	0.429
		N	70	70	70	70	70	70	70	70	69	69	70
	Annual Average	Person's r	0.413	-0.060	0.657	0.413	0.664	0.679	-0.004	0.040	0.909	0.892	0.369
		N	70	70	70	70	70	70	70	70	69	69	70
	DJF	Person's r	-0.003	-0.355	0.452	-0.003	0.413	0.590	0.341	0.368	0.800	0.819	0.440
		N	70	70	70	70	70	70	70	70	69	69	70
	MAM	Person's r	0.439	0.148	0.582	0.439	0.633	0.569	-0.137	-0.104	0.814	0.780	0.228
		N	70	70	70	70	70	70	70	70	69	69	70
	JJA	Person's r	0.794	0.299	0.763	0.794	0.778	0.653	-0.378	-0.336	0.720	0.660	0.110
		N	70	70	70	70	70	70	70	70	69	69	70
	SON	Person's r	0.294	-0.241	0.550	0.294	0.544	0.590	0.099	0.151	0.867	0.876	0.477
		N	70	70	70	70	70	70	70	70	69	69	70
Temperature HadCRUT3	Jan	Person's r	-0.569	-0.768	-0.258	-0.569	-0.292	-0.099	0.643	0.643	0.367	0.431	0.438
		N	73	73	73	73	73	73	73	73	73	73	73
	Feb	Person's r	-0.057	-0.451	0.041	-0.057	0.019	0.077	0.357	0.381	0.662	0.672	0.392
		N	73	73	73	73	73	73	73	73	73	73	73
	Mrz	Person's r	-0.651	-0.652	-0.483	-0.651	-0.458	-0.359	0.631	0.609	0.366	0.409	0.261
		N	73	73	73	73	73	73	73	73	73	73	73
	Apr	Person's r	-0.570	-0.508	-0.543	-0.570	-0.462	-0.471	0.508	0.524	0.401	0.448	0.422
		N	73	73	73	73	73	73	73	73	73	73	73
	Mai	Person's r	-0.435	-0.701	-0.166	-0.435	-0.235	-0.036	0.720	0.746	0.442	0.508	0.593
		N	73	73	73	73	73	73	73	73	73	73	73
	Jun	Person's r	-0.065	-0.503	0.077	-0.065	0.041	0.127	0.372	0.404	0.567	0.607	0.499
		N	73	73	73	73	73	73	73	73	73	73	73
	Jul	Person's r	-0.152	-0.664	0.216	-0.152	0.128	0.345	0.671	0.687	0.577	0.632	0.505
		N	73	73	73	73	73	73	73	73	73	73	73
	Aug	Person's r	-0.314	-0.559	-0.094	-0.314	-0.100	0.008	0.598	0.595	0.597	0.618	0.313
		N	73	73	73	73	73	73	73	73	73	73	73
	Sep	Person's r	-0.093	-0.594	-0.030	-0.093	0.001	-0.001	0.370	0.438	0.677	0.732	0.690
		N	73	73	73	73	73	73	73	73	73	73	73
	Okt	Person's r	-0.368	-0.737	-0.272	-0.368	-0.294	-0.202	0.637	0.688	0.510	0.575	0.679
		N	73	73	73	73	73	73	73	73	73	73	73
	Nov	Person's r	-0.407	-0.669	-0.042	-0.407	-0.109	0.114	0.610	0.607	0.533	0.574	0.394
		N	73	73	73	73	73	73	73	73	73	73	73
	Dez	Person's r	-0.433	-0.695	-0.138	-0.433	-0.165	0.000	0.658	0.677	0.543	0.600	0.537
		N	73	73	73	73	73	73	73	73	73	73	73
	Annual Mean	Person's r	-0.424	-0.745	-0.189	-0.424	-0.209	-0.070	0.672	0.694	0.606	0.663	0.563
		N	73	73	73	73	73	73	73	73	73	73	73
	DJF	Person's r	-0.393	-0.696	-0.135	-0.393	-0.165	-0.012	0.603	0.618	0.561	0.609	0.493
		N	73	73	73	73	73	73	73	73	73	73	73
	MAM	Person's r	-0.620	-0.689	-0.448	-0.620	-0.433	-0.327	0.686	0.691	0.440	0.497	0.454
		N	73	73	73	73	73	73	73	73	73	73	73
	JJA	Person's r	-0.193	-0.665	0.096	-0.193	0.041	0.205	0.631	0.649	0.663	0.710	0.513
		N	73	73	73	73	73	73	73	73	73	73	73
	SON	Person's r	-0.310	-0.748	-0.129	-0.310	-0.145	-0.040	0.595	0.643	0.653	0.715	0.677
		N	73	73	73	73	73	73	73	73	73	73	73
El Niño 3		Person's r	0.496	0.379	0.021	0.496	0.179	-0.199	-0.369	-0.300	-0.072	-0.082	0.095
		N	48	48	48	48	48	48	48	48	47	47	48
SOI		Person's r	-0.544	-0.191	-0.239	-0.544	-0.347	-0.025	0.208	0.124	-0.113	-0.119	-0.259
		N	47	47	47	47	47	47	47	47	46	46	47
SAB		Person's r	0.339	-0.067	0.036	0.339	-0.189	-0.110	-0.119	-0.021	-0.211	-0.177	0.373
		N	44	44	44	44	44	44	44	44	43	43	44

A12 (continued) Correlation matrix of Laguna Negra. 9-year filtered data

			Bsi						C, N und C/N				
			Al µg/g	Fe µg/g	Si µg/g	Si non Biol µg/g	Bsi Flux	bSi µg/g	N %	TOC %	N Flux	TOC Flux	C/N
Precipitation (Dai et al. 1997)	Jan	Person's r	-0.546	0.523	-0.386	-0.546	-0.195	-0.276	0.042	-0.214	-0.210	-0.274	-0.817
		N	43	43	43	43	43	43	43	43	43	43	43
	Feb	Person's r	0.614	-0.310	0.575	0.614	0.602	0.507	-0.151	-0.002	0.568	0.617	0.489
		N	43	43	43	43	43	43	43	43	43	43	43
	Mrz	Person's r	-0.178	0.063	0.152	-0.178	0.200	0.297	0.353	0.256	0.285	0.271	-0.186
		N	43	43	43	43	43	43	43	43	43	43	43
	Apr	Person's r	-0.484	-0.349	-0.345	-0.484	-0.346	-0.249	0.123	0.104	-0.232	-0.202	0.141
		N	43	43	43	43	43	43	43	43	43	43	43
	Mai	Person's r	-0.139	-0.150	-0.250	-0.139	-0.445	-0.282	-0.040	-0.078	-0.261	-0.280	-0.117
		N	43	43	43	43	43	43	43	43	43	43	43
	Jun	Person's r	0.362	0.048	0.131	0.362	0.057	0.008	0.012	0.080	0.034	0.017	0.113
		N	43	43	43	43	43	43	43	43	43	43	43
	Jul	Person's r	0.400	-0.120	0.243	0.400	0.064	0.146	0.146	0.338	0.164	0.186	0.624
		N	43	43	43	43	43	43	43	43	43	43	43
	Aug	Person's r	0.401	0.174	0.548	0.401	0.692	0.571	-0.107	0.014	0.496	0.518	0.346
		N	43	43	43	43	43	43	43	43	43	43	43
	Sep	Person's r	-0.561	0.099	-0.440	-0.561	-0.385	-0.344	0.232	0.130	-0.229	-0.262	-0.176
		N	43	43	43	43	43	43	43	43	43	43	43
	Okt	Person's r	0.556	-0.334	0.237	0.556	0.075	0.062	0.055	0.250	0.089	0.133	0.556
		N	43	43	43	43	43	43	43	43	43	43	43
	Nov	Person's r	0.315	-0.470	0.054	0.315	-0.171	-0.076	0.454	0.617	0.102	0.140	0.660
		N	43	43	43	43	43	43	43	43	43	43	43
	Dez	Person's r	0.188	0.319	0.238	0.188	0.161	0.241	-0.106	-0.095	0.066	0.043	-0.131
		N	43	43	43	43	43	43	43	43	43	43	43
	Total Annual	Person's r	0.514	-0.181	0.375	0.514	0.224	0.275	0.121	0.339	0.307	0.333	0.714
		N	43	43	43	43	43	43	43	43	43	43	43
Precipitation HadCRUT3	Jan	Person's r	0.574	0.812	0.197	0.574	0.373	0.003	-0.831	-0.843	-0.062	-0.152	-0.490
		N	68	68	68	68	68	68	68	68	67	67	68
	Feb	Person's r	0.546	-0.048	0.593	0.546	0.593	0.532	-0.070	0.005	0.569	0.593	0.436
		N	68	68	68	68	68	68	68	68	67	67	68
	Mrz	Person's r	-0.032	-0.167	0.177	-0.032	0.201	0.246	0.266	0.258	0.602	0.576	0.065
		N	68	68	68	68	68	68	68	68	67	67	68
	Apr	Person's r	0.225	0.046	0.151	0.225	0.252	0.097	-0.257	-0.207	0.434	0.425	0.321
		N	68	68	68	68	68	68	68	68	67	67	68
	Mai	Person's r	0.040	-0.232	-0.079	0.040	-0.132	-0.121	-0.014	-0.009	0.127	0.131	0.038
		N	68	68	68	68	68	68	68	68	67	67	68
	Jun	Person's r	0.574	0.535	0.218	0.574	0.327	0.030	-0.503	-0.490	0.056	0.005	-0.245
		N	68	68	68	68	68	68	68	68	67	67	68
	Jul	Person's r	-0.317	-0.334	-0.328	-0.317	-0.367	-0.288	0.371	0.373	-0.198	-0.160	0.132
		N	68	68	68	68	68	68	68	68	67	67	68
	Aug	Person's r	0.402	0.524	0.286	0.402	0.486	0.195	-0.526	-0.506	0.115	0.066	-0.113
		N	68	68	68	68	68	68	68	68	67	67	68
	Sep	Person's r	-0.195	0.128	-0.335	-0.195	-0.262	-0.351	0.001	-0.061	-0.235	-0.273	-0.415
		N	68	68	68	68	68	68	68	68	67	67	68
	Okt	Person's r	0.456	0.132	0.283	0.456	0.210	0.167	-0.149	-0.076	-0.052	-0.043	0.281
		N	68	68	68	68	68	68	68	68	67	67	68
	Nov	Person's r	-0.134	-0.285	-0.253	-0.134	-0.375	-0.271	0.363	0.401	-0.167	-0.131	0.363
		N	68	68	68	68	68	68	68	68	67	67	68
	Dez	Person's r	0.081	0.341	-0.012	0.081	0.070	-0.051	-0.283	-0.282	-0.035	-0.074	-0.184
		N	68	68	68	68	68	68	68	68	67	67	68
	Total Annual	Person's r	0.277	0.127	-0.006	0.277	0.065	-0.131	-0.213	-0.188	0.068	0.051	0.004
		N	68	68	68	68	68	68	68	68	67	67	68
	DJF	Person's r	0.609	0.601	0.380	0.609	0.520	0.226	-0.634	-0.604	0.219	0.160	-0.155
		N	68	68	68	68	68	68	68	68	67	67	68
	MAM	Person's r	0.086	-0.223	-0.021	0.086	-0.045	-0.066	-0.045	-0.030	0.279	0.279	0.116
		N	68	68	68	68	68	68	68	68	67	67	68
	JJA	Person's r	0.255	0.277	0.017	0.255	0.133	-0.091	-0.237	-0.221	-0.056	-0.077	-0.086
		N	68	68	68	68	68	68	68	68	67	67	68
	SON	Person's r	0.078	0.004	-0.163	0.078	-0.225	-0.248	0.101	0.126	-0.247	-0.244	0.105
		N	68	68	68	68	68	68	68	68	67	67	68
Precipitation CRU TS 2.1	Jan	Person's r	-0.145	0.011	0.080	-0.145	0.169	0.167	0.211	0.127	0.306	0.270	-0.404
		N	70	70	70	70	70	70	70	70	69	69	70
	Feb	Person's r	0.232	0.217	-0.219	0.232	-0.145	-0.385	-0.384	-0.381	-0.251	-0.266	-0.191
		N	70	70	70	70	70	70	70	70	69	69	70
	Mrz	Person's r	-0.293	-0.363	-0.174	-0.293	-0.159	-0.100	0.437	0.409	0.443	0.435	0.061
		N	70	70	70	70	70	70	70	70	69	69	70
	Apr	Person's r	-0.113	-0.467	-0.022	-0.113	-0.072	0.019	0.192	0.253	0.367	0.420	0.602
		N	70	70	70	70	70	70	70	70	69	69	70
	Mai	Person's r	0.289	-0.158	0.269	0.289	0.151	0.227	-0.125	-0.094	0.275	0.272	0.160
		N	70	70	70	70	70	70	70	70	69	69	70
	Jun	Person's r	0.338	0.455	0.149	0.338	0.180	0.049	-0.275	-0.295	-0.218	-0.268	-0.381
		N	70	70	70	70	70	70	70	70	69	69	70
	Jul	Person's r	-0.280	-0.342	-0.406	-0.280	-0.461	-0.409	0.264	0.260	-0.331	-0.298	0.044
		N	70	70	70	70	70	70	70	70	69	69	70
	Aug	Person's r	0.485	0.365	0.390	0.485	0.536	0.300	-0.502	-0.463	0.182	0.148	0.028
		N	70	70	70	70	70	70	70	70	69	69	70
	Sep	Person's r	0.077	-0.006	-0.136	0.077	-0.169	-0.210	-0.154	-0.153	-0.160	-0.172	-0.068
		N	70	70	70	70	70	70	70	70	69	69	70
	Okt	Person's r	0.465	0.311	0.484	0.465	0.482	0.430	-0.296	-0.257	-0.013	-0.029	0.012
		N	70	70	70	70	70	70	70	70	69	69	70
	Nov	Person's r	0.056	-0.193	0.019	0.056	-0.113	0.000	0.277	0.323	-0.125	-0.092	0.344
		N	70	70	70	70	70	70	70	70	69	69	70
	Dez	Person's r	-0.335	0.263	-0.262	-0.335	-0.200	-0.197	0.095	0.058	-0.303	-0.323	-0.244
		N	70	70	70	70	70	70	70	70	69	69	70
	Total Annual	Person's r	0.371	0.007	0.186	0.371	0.143	0.083	-0.213	-0.176	0.034	0.021	0.086
		N	70	70	70	70	70	70	70	70	69	69	70
	DJF	Person's r	0.267	0.224	0.042	0.267	0.103	-0.059	-0.252	-0.244	-0.211	-0.236	-0.154
		N	70	70	70	70	70	70	70	70	69	69	70
	MAM	Person's r	0.317	0.067	0.173	0.317	0.090	0.090	-0.123	-0.081	-0.167	-0.168	0.122
		N	70	70	70	70	70	70	70	70	69	69	70
	JJA	Person's r	-0.215	0.334	-0.289	-0.215	-0.157	-0.284	-0.028	-0.097	-0.221	-0.262	-0.496
		N	70	70	70	70	70	70	70	70	69	69	70
	SON	Person's r	0.187	-0.302	0.208	0.187	0.094	0.190	-0.009	0.031	0.384	0.395	0.309
		N	70	70	70	70	70	70	70	70	69	69	70

A12 (continued) Correlation matrix of Laguna Negra. 9-year filtered data

			Grain size										
			D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	0.589	0.505	0.548	0.633	0.632	0.647	0.633	0.645	0.491	0.487	0.258
		N	70	70	70	70	70	70	70	70	70	70	70
	Feb	Person's r	0.349	0.344	0.349	0.308	0.248	0.242	0.308	0.258	0.198	0.143	0.178
		N	70	70	70	70	70	70	70	70	70	70	70
	Mrz	Person's r	-0.003	0.060	0.033	-0.096	-0.152	-0.130	-0.096	-0.141	-0.132	-0.189	0.110
		N	70	70	70	70	70	70	70	70	70	70	70
	Apr	Person's r	-0.048	-0.079	-0.031	0.048	0.097	0.134	0.048	0.100	0.132	0.116	0.024
		N	70	70	70	70	70	70	70	70	70	70	70
	Mai	Person's r	0.303	0.145	0.232	0.492	0.658	0.678	0.492	0.652	0.317	0.684	0.413
		N	70	70	70	70	70	70	70	70	70	70	70
	Jun	Person's r	-0.345	-0.391	-0.354	-0.221	-0.038	0.007	-0.221	-0.050	-0.156	0.109	0.201
		N	70	70	70	70	70	70	70	70	70	70	70
	Jul	Person's r	0.056	-0.112	-0.012	0.312	0.506	0.484	0.312	0.480	0.257	0.625	0.176
		N	70	70	70	70	70	70	70	70	70	70	70
	Aug	Person's r	-0.124	-0.124	-0.111	-0.102	-0.014	-0.012	-0.102	-0.022	-0.223	0.050	0.374
		N	70	70	70	70	70	70	70	70	70	70	70
	Sep	Person's r	0.047	-0.108	-0.022	0.273	0.511	0.536	0.273	0.493	0.227	0.605	0.329
		N	70	70	70	70	70	70	70	70	70	70	70
	Okt	Person's r	0.228	0.137	0.201	0.363	0.410	0.417	0.363	0.409	0.403	0.374	-0.067
		N	70	70	70	70	70	70	70	70	70	70	70
	Nov	Person's r	0.315	0.359	0.341	0.202	0.074	0.084	0.202	0.095	0.125	-0.060	0.114
		N	70	70	70	70	70	70	70	70	70	70	70
	Dez	Person's r	0.513	0.440	0.476	0.544	0.523	0.522	0.545	0.532	0.415	0.406	0.164
		N	70	70	70	70	70	70	70	70	70	70	70
	Annual Average	Person's r	0.214	0.128	0.186	0.322	0.410	0.429	0.322	0.409	0.242	0.402	0.270
		N	70	70	70	70	70	70	70	70	70	70	70
	DJF	Person's r	0.518	0.462	0.491	0.526	0.492	0.494	0.526	0.504	0.388	0.361	0.213
		N	70	70	70	70	70	70	70	70	70	70	70
	MAM	Person's r	0.123	0.065	0.112	0.205	0.276	0.309	0.206	0.280	0.138	0.280	0.249
		N	70	70	70	70	70	70	70	70	70	70	70
	JJA	Person's r	-0.218	-0.328	-0.252	-0.011	0.225	0.240	-0.011	0.201	-0.047	0.393	0.346
		N	70	70	70	70	70	70	70	70	70	70	70
	SON	Person's r	0.265	0.180	0.235	0.365	0.426	0.445	0.365	0.428	0.326	0.388	0.166
		N	70	70	70	70	70	70	70	70	70	70	70
Temperature HadCRUT3	Jan	Person's r	0.525	0.564	0.529	0.373	0.158	0.149	0.373	0.183	0.290	-0.044	-0.183
		N	73	73	73	73	73	73	73	73	73	73	73
	Feb	Person's r	0.100	0.084	0.084	0.091	0.111	0.114	0.091	0.110	-0.042	0.104	0.140
		N	73	73	73	73	73	73	73	73	73	73	73
	Mrz	Person's r	0.305	0.393	0.333	0.114	-0.124	-0.128	0.114	-0.099	0.109	-0.285	-0.317
		N	73	73	73	73	73	73	73	73	73	73	73
	Apr	Person's r	0.172	0.254	0.203	0.015	-0.168	-0.144	0.015	-0.142	0.056	-0.296	-0.301
		N	73	73	73	73	73	73	73	73	73	73	73
	Mai	Person's r	0.559	0.500	0.519	0.553	0.457	0.469	0.553	0.477	0.456	0.305	-0.120
		N	73	73	73	73	73	73	73	73	73	73	73
	Jun	Person's r	0.257	0.154	0.194	0.339	0.388	0.407	0.339	0.389	0.195	0.402	0.126
		N	73	73	73	73	73	73	73	73	73	73	73
	Jul	Person's r	0.573	0.440	0.502	0.676	0.660	0.649	0.676	0.665	0.549	0.568	-0.024
		N	73	73	73	73	73	73	73	73	73	73	73
	Aug	Person's r	0.328	0.326	0.325	0.282	0.189	0.187	0.282	0.203	0.246	0.069	-0.119
		N	73	73	73	73	73	73	73	73	73	73	73
	Sep	Person's r	0.171	0.119	0.146	0.228	0.237	0.260	0.228	0.242	0.285	0.196	-0.126
		N	73	73	73	73	73	73	73	73	73	73	73
	Okt	Person's r	0.264	0.236	0.241	0.262	0.208	0.220	0.262	0.218	0.297	0.120	-0.214
		N	73	73	73	73	73	73	73	73	73	73	73
	Nov	Person's r	0.504	0.509	0.490	0.396	0.272	0.271	0.396	0.292	0.228	0.113	0.093
		N	73	73	73	73	73	73	73	73	73	73	73
	Dez	Person's r	0.501	0.500	0.490	0.420	0.283	0.291	0.420	0.305	0.319	0.114	-0.078
		N	73	73	73	73	73	73	73	73	73	73	73
	Annual Mean	Person's r	0.420	0.407	0.402	0.362	0.247	0.254	0.362	0.265	0.292	0.114	-0.127
		N	73	73	73	73	73	73	73	73	73	73	73
	DJF	Person's r	0.415	0.424	0.407	0.324	0.199	0.200	0.324	0.217	0.211	0.059	-0.051
		N	73	73	73	73	73	73	73	73	73	73	73
	MAM	Person's r	0.377	0.423	0.386	0.239	0.042	0.053	0.239	0.069	0.219	-0.121	-0.279
		N	73	73	73	73	73	73	73	73	73	73	73
	JJA	Person's r	0.458	0.359	0.402	0.520	0.502	0.503	0.520	0.509	0.398	0.428	-0.001
		N	73	73	73	73	73	73	73	73	73	73	73
	SON	Person's r	0.336	0.305	0.312	0.324	0.267	0.281	0.324	0.280	0.307	0.165	-0.104
		N	73	73	73	73	73	73	73	73	73	73	73
El Niño 3		Person's r	-0.342	-0.365	-0.329	-0.219	-0.125	-0.108	-0.219	-0.136	0.011	-0.035	-0.271
		N	48	48	48	48	48	48	48	48	48	48	48
SOI		Person's r	0.290	0.366	0.308	0.101	-0.065	-0.074	0.101	-0.042	-0.098	-0.217	0.191
		N	47	47	47	47	47	47	47	47	47	47	47
SAB		Person's r	-0.170	-0.233	-0.197	-0.045	0.207	0.231	-0.046	0.189	-0.089	0.308	0.334
		N	44	44	44	44	44	44	44	44	44	44	44

A12 (continued) Correlation matrix of Laguna Negra. 9-year filtered data

			Grain size										
			D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation (Dai et al. 1997)	Jan	Person's r	0.188	0.377	0.281	-0.231	-0.832	-0.848	-0.231	-0.802	-0.070	-0.835	-0.367
		N	43	43	43	43	43	43	43	43	43	43	43
	Feb	Person's r	-0.095	-0.262	-0.156	0.299	0.576	0.594	0.299	0.562	0.367	0.597	-0.115
		N	43	43	43	43	43	43	43	43	43	43	43
	Mrz	Person's r	0.202	0.274	0.232	0.004	-0.210	-0.234	0.005	-0.198	-0.030	-0.289	0.028
		N	43	43	43	43	43	43	43	43	43	43	43
	Apr	Person's r	0.510	0.470	0.460	0.383	0.107	0.098	0.383	0.147	0.106	-0.078	-0.097
		N	43	43	43	43	43	43	43	43	43	43	43
	Mai	Person's r	-0.356	-0.277	-0.354	-0.540	-0.326	-0.337	-0.540	-0.366	-0.759	-0.080	0.610
		N	43	43	43	43	43	43	43	43	43	43	43
	Jun	Person's r	-0.433	-0.456	-0.435	-0.247	0.066	0.038	-0.247	0.016	-0.087	0.248	0.090
		N	43	43	43	43	43	43	43	43	43	43	43
	Jul	Person's r	0.011	-0.101	-0.036	0.265	0.618	0.655	0.264	0.621	0.105	0.503	0.232
		N	43	43	43	43	43	43	43	43	43	43	43
	Aug	Person's r	0.236	0.181	0.247	0.404	0.352	0.364	0.404	0.375	0.534	0.135	-0.281
		N	43	43	43	43	43	43	43	43	43	43	43
	Sep	Person's r	0.523	0.611	0.547	0.187	-0.298	-0.301	0.187	-0.246	0.011	-0.508	-0.157
		N	43	43	43	43	43	43	43	43	43	43	43
	Okt	Person's r	-0.517	-0.663	-0.585	-0.085	0.558	0.564	-0.085	0.500	-0.022	0.747	0.273
		N	43	43	43	43	43	43	43	43	43	43	43
	Nov	Person's r	-0.127	-0.307	-0.230	0.236	0.668	0.671	0.236	0.643	0.093	0.709	0.155
		N	43	43	43	43	43	43	43	43	43	43	43
	Dez	Person's r	-0.351	-0.240	-0.287	-0.458	-0.212	-0.196	-0.458	-0.237	-0.434	-0.119	0.493
		N	43	43	43	43	43	43	43	43	43	43	43
	Total Annual	Person's r	-0.073	-0.189	-0.123	0.207	0.599	0.614	0.207	0.585	0.087	0.542	0.251
		N	43	43	43	43	43	43	43	43	43	43	43
Precipitation HadCRUT3	Jan	Person's r	-0.756	-0.699	-0.719	-0.737	-0.607	-0.596	-0.737	-0.631	-0.640	-0.352	0.149
		N	68	68	68	68	68	68	68	68	68	68	68
	Feb	Person's r	-0.041	-0.207	-0.108	0.240	0.484	0.499	0.240	0.460	0.298	0.612	0.130
		N	68	68	68	68	68	68	68	68	68	68	68
	Mrz	Person's r	0.232	0.294	0.277	0.144	0.020	0.016	0.144	0.037	0.197	-0.140	-0.110
		N	68	68	68	68	68	68	68	68	68	68	68
	Apr	Person's r	-0.062	-0.048	-0.045	-0.070	-0.076	-0.055	-0.070	-0.072	-0.078	-0.068	0.009
		N	68	68	68	68	68	68	68	68	68	68	68
	Mai	Person's r	-0.401	-0.403	-0.429	-0.398	-0.220	-0.237	-0.398	-0.250	-0.575	-0.022	0.416
		N	68	68	68	68	68	68	68	68	68	68	68
	Jun	Person's r	-0.571	-0.600	-0.569	-0.428	-0.254	-0.248	-0.428	-0.281	-0.269	-0.034	-0.016
		N	68	68	68	68	68	68	68	68	68	68	68
	Jul	Person's r	0.138	0.139	0.135	0.131	0.065	0.046	0.131	0.069	0.151	-0.004	-0.273
		N	68	68	68	68	68	68	68	68	68	68	68
	Aug	Person's r	-0.134	-0.077	-0.071	-0.134	-0.207	-0.193	-0.134	-0.198	0.092	-0.249	-0.283
		N	68	68	68	68	68	68	68	68	68	68	68
	Sep	Person's r	-0.082	0.011	-0.034	-0.205	-0.368	-0.385	-0.205	-0.357	-0.186	-0.404	-0.293
		N	68	68	68	68	68	68	68	68	68	68	68
	Okt	Person's r	-0.280	-0.419	-0.346	-0.021	0.292	0.303	-0.021	0.259	0.037	0.483	0.243
		N	68	68	68	68	68	68	68	68	68	68	68
	Nov	Person's r	0.025	-0.062	-0.034	0.133	0.225	0.222	0.133	0.213	0.068	0.295	-0.033
		N	68	68	68	68	68	68	68	68	68	68	68
	Dez	Person's r	-0.245	-0.118	-0.173	-0.380	-0.391	-0.371	-0.380	-0.383	-0.332	-0.430	0.167
		N	68	68	68	68	68	68	68	68	68	68	68
	Total Annual	Person's r	-0.433	-0.432	-0.427	-0.360	-0.244	-0.252	-0.360	-0.266	-0.291	-0.094	-0.039
		N	68	68	68	68	68	68	68	68	68	68	68
	DJF	Person's r	-0.559	-0.534	-0.529	-0.493	-0.315	-0.290	-0.493	-0.334	-0.387	-0.143	0.238
		N	68	68	68	68	68	68	68	68	68	68	68
	MAM	Person's r	-0.365	-0.357	-0.382	-0.373	-0.221	-0.232	-0.373	-0.246	-0.535	-0.051	0.379
		N	68	68	68	68	68	68	68	68	68	68	68
	JJA	Person's r	-0.255	-0.245	-0.229	-0.187	-0.175	-0.179	-0.187	-0.183	0.004	-0.128	-0.313
		N	68	68	68	68	68	68	68	68	68	68	68
	SON	Person's r	-0.195	-0.265	-0.235	-0.063	0.068	0.062	-0.063	0.049	-0.052	0.192	-0.049
		N	68	68	68	68	68	68	68	68	68	68	68
Precipitation CRU TS 2.1	Jan	Person's r	0.137	0.185	0.161	0.047	-0.120	-0.153	0.047	-0.113	0.050	-0.170	-0.200
		N	70	70	70	70	70	70	70	70	70	70	70
	Feb	Person's r	-0.649	-0.637	-0.650	-0.596	-0.462	-0.464	-0.596	-0.489	-0.560	-0.216	-0.003
		N	70	70	70	70	70	70	70	70	70	70	70
	Mrz	Person's r	0.302	0.376	0.347	0.175	-0.059	-0.069	0.175	-0.034	0.250	-0.239	-0.419
		N	70	70	70	70	70	70	70	70	70	70	70
	Apr	Person's r	0.208	0.177	0.181	0.196	0.233	0.255	0.196	0.239	0.002	0.189	0.258
		N	70	70	70	70	70	70	70	70	70	70	70
	Mai	Person's r	-0.344	-0.401	-0.396	-0.271	0.013	0.004	-0.271	-0.022	-0.509	0.228	0.713
		N	70	70	70	70	70	70	70	70	70	70	70
	Jun	Person's r	-0.409	-0.449	-0.426	-0.287	-0.127	-0.148	-0.287	-0.156	-0.214	0.060	0.074
		N	70	70	70	70	70	70	70	70	70	70	70
	Jul	Person's r	-0.074	-0.056	-0.076	-0.090	-0.123	-0.155	-0.090	-0.130	-0.059	-0.117	-0.261
		N	70	70	70	70	70	70	70	70	70	70	70
	Aug	Person's r	-0.159	-0.152	-0.128	-0.094	-0.090	-0.091	-0.094	-0.095	0.086	-0.067	-0.179
		N	70	70	70	70	70	70	70	70	70	70	70
	Sep	Person's r	-0.413	-0.416	-0.436	-0.396	-0.246	-0.267	-0.396	-0.274	-0.563	-0.049	0.302
		N	70	70	70	70	70	70	70	70	70	70	70
	Okt	Person's r	-0.125	-0.203	-0.149	0.047	0.234	0.231	0.047	0.213	0.121	0.314	0.193
		N	70	70	70	70	70	70	70	70	70	70	70
	Nov	Person's r	0.031	-0.096	-0.042	0.209	0.369	0.356	0.209	0.348	0.143	0.459	0.062
		N	70	70	70	70	70	70	70	70	70	70	70
	Dez	Person's r	0.291	0.419	0.368	0.103	-0.129	-0.107	0.104	-0.090	0.172	-0.374	-0.236
		N	70	70	70	70	70	70	70	70	70	70	70
	Total Annual	Person's r	-0.451	-0.505	-0.487	-0.323	-0.076	-0.104	-0.323	-0.116	-0.397	0.148	0.322
		N	70	70	70	70	70	70	70	70	70	70	70
	DJF	Person's r	-0.340	-0.345	-0.332	-0.251	-0.187	-0.218	-0.251	-0.209	-0.099	-0.075	-0.214
		N	70	70	70	70	70	70	70	70	70	70	70
	MAM	Person's r	-0.313	-0.415	-0.374	-0.130	0.137	0.115	-0.131	0.098	-0.229	0.346	0.321
		N	70	70	70	70	70	70	70	70	70	70	70
	JJA	Person's r	-0.049	0.083	0.024	-0.215	-0.411	-0.411	-0.215	-0.391	-0.139	-0.500	-0.289
		N	70	70	70	70	70	70	70	70	70	70	70
	SON	Person's r	-0.207	-0.257	-0.255	-0.161	0.069	0.066	-0.161	0.042	-0.411	0.222	0.640
		N	70	70	70	70	70	70	70	70	70	70	70

A13 Correlation matrix of Laguna del Inca. Non-filtered data

			Spectrolino							
			RABD610;620	R590/640	RABD510	RABD510	RABD480	chlorin	RABD720	R570/630
Temperature CRU TS 2.1	Jan	Person's r	0.1075	-0.3710	0.0343	-0.0207	0.2274	-0.3245	-0.0619	-0.3422
		N	71	71	71	71	71	71	71	71
	Feb	Person's r	0.1986	-0.3432	-0.0642	-0.1121	0.1689	-0.3376	-0.0122	-0.2766
		N	71	71	71	71	71	71	71	71
	Mar	Person's r	0.2445	-0.1734	-0.2390	-0.2791	-0.0325	-0.1985	-0.1030	-0.0937
		N	71	71	71	71	71	71	71	71
	Apr	Person's r	0.1594	0.0201	-0.0799	-0.0735	-0.0354	0.0247	-0.0153	0.0555
		N	71	71	71	71	71	71	71	71
	May	Person's r	0.0326	-0.1520	-0.0178	-0.0209	0.1442	-0.1995	0.0035	-0.1178
		N	71	71	71	71	71	71	71	71
	Jun	Person's r	0.0592	-0.0563	-0.0769	-0.1055	-0.0508	-0.0371	0.0324	-0.0374
		N	71	71	71	71	71	71	71	71
	Jul	Person's r	0.1311	0.0146	-0.1558	-0.1205	-0.1102	0.0422	-0.0064	0.0477
		N	71	71	71	71	71	71	71	71
	Aug	Person's r	0.0827	0.0633	-0.1232	-0.0931	-0.0309	-0.0267	-0.1639	0.0795
		N	71	71	71	71	71	71	71	71
	Sep	Person's r	0.1157	0.0416	-0.1500	-0.1246	-0.1030	0.1561	0.1706	0.0675
		N	71	71	71	71	71	71	71	71
	Oct	Person's r	0.2798	-0.0631	-0.1681	-0.1656	-0.0220	0.0092	0.0904	-0.0118
		N	71	71	71	71	71	71	71	71
	Nov	Person's r	0.2836	-0.3510	-0.0116	-0.1089	0.1599	-0.2675	0.1858	-0.2769
		N	71	71	71	71	71	71	71	71
	Dec	Person's r	0.2326	-0.3551	-0.0576	-0.1181	0.1924	-0.3575	0.1232	-0.3040
		N	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	0.2989	-0.2717	-0.1710	-0.2085	0.0796	-0.2380	0.0408	-0.1916
		N	71	71	71	71	71	71	71	71
	DJF	Person's r	0.2202	-0.4389	-0.0348	-0.1020	0.2422	-0.4181	0.0202	-0.3792
		N	71	71	71	71	71	71	71	71
	MAM	Person's r	0.1975	-0.1441	-0.1531	-0.1702	0.0393	-0.1765	-0.0522	-0.0756
		N	71	71	71	71	71	71	71	71
	JJA	Person's r	0.1279	0.0047	-0.1658	-0.1508	-0.0920	-0.0096	-0.0548	0.0371
		N	71	71	71	71	71	71	71	71
	SON	Person's r	0.3231	-0.1854	-0.1510	-0.1869	0.0234	-0.0591	0.2104	-0.1130
		N	71	71	71	71	71	71	71	71
Temperature HadCRUT3	Jan	Person's r	0.2678	-0.2311	-0.1911	-0.2330	0.0468	-0.1748	-0.0175	-0.1551
		N	71	71	71	71	71	71	71	71
	Feb	Person's r	0.3185	-0.1663	-0.3622	-0.3954	-0.0737	-0.1966	0.2117	-0.0566
		N	71	71	71	71	71	71	71	71
	Mar	Person's r	0.3994	-0.1590	-0.2676	-0.2778	-0.0300	-0.1574	-0.0472	-0.0675
		N	71	71	71	71	71	71	71	71
	Apr	Person's r	0.1745	-0.1360	-0.2345	-0.2605	-0.0477	-0.1186	0.1244	-0.0506
		N	71	71	71	71	71	71	71	71
	May	Person's r	0.0661	-0.1452	-0.0701	-0.0745	0.1310	-0.1807	0.0280	-0.0939
		N	71	71	71	71	71	71	71	71
	Jun	Person's r	0.0922	-0.2512	-0.0952	-0.1701	0.0683	-0.2423	0.1771	-0.1841
		N	71	71	71	71	71	71	71	71
	Jul	Person's r	0.2781	-0.2257	-0.1821	-0.1935	0.0024	-0.1450	0.1350	-0.1558
		N	71	71	71	71	71	71	71	71
	Aug	Person's r	0.2375	-0.1189	-0.1919	-0.1946	-0.0432	-0.1150	0.0462	-0.0501
		N	71	71	71	71	71	71	71	71
	Sep	Person's r	0.1240	-0.0132	-0.1989	-0.1801	-0.1471	0.1337	0.2135	0.0336
		N	71	71	71	71	71	71	71	71
	Oct	Person's r	0.2470	-0.1327	-0.1868	-0.1912	-0.0336	-0.0033	0.3379	-0.0763
		N	71	71	71	71	71	71	71	71
	Nov	Person's r	0.3468	-0.3163	-0.1307	-0.2025	0.0678	-0.2235	0.1468	-0.2452
		N	71	71	71	71	71	71	71	71
	Dec	Person's r	0.3280	-0.1973	-0.2643	-0.2822	0.0038	-0.1638	0.2169	-0.0926
		N	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	0.3905	-0.2899	-0.3230	-0.3625	-0.0021	-0.2261	0.2054	-0.1664
		N	71	71	71	71	71	71	71	71
	DJF	Person's r	0.4034	-0.2637	-0.3619	-0.4040	-0.0104	-0.2379	0.1762	-0.1357
		N	71	71	71	71	71	71	71	71
	MAM	Person's r	0.2659	-0.1871	-0.2376	-0.2544	0.0281	-0.1956	0.0437	-0.0912
		N	71	71	71	71	71	71	71	71
	JJA	Person's r	0.2575	-0.2599	-0.1985	-0.2384	0.0151	-0.2185	0.1579	-0.1718
		N	71	71	71	71	71	71	71	71
	SON	Person's r	0.3061	-0.2001	-0.2179	-0.2439	-0.0466	-0.0442	0.2890	-0.1258
		N	71	71	71	71	71	71	71	71
SOI		Person's r	0.0854	-0.1337	0.0426	-0.0093	0.0677	-0.1192	0.1429	-0.1132
		N	68	68	68	68	68	68	68	68
El Niño 3		Person's r	-0.0746	0.2000	0.0051	0.0753	-0.0697	0.1923	-0.1815	0.1802
		N	68	68	68	68	68	68	68	68
SAB		Person's r	-0.1031	-0.0229	0.0381	0.0585	-0.0304	-0.0013	0.0322	-0.0402
		N	65	65	65	65	65	65	65	65

A13 (continued) Correlation matrix of Laguna del Inca. Non-filtered data

			Spectrolino							
			RABD610;620	R590/640	RABD510	RABD510	RABD480	chlorin	RABD720	R570/630
Precipitation HadCRUT3	Jan	Person's r	-0.1085	0.0699	-0.0308	0.0226	-0.1094	0.1703	0.0975	0.0570
		N	71	71	71	71	71	71	71	71
	Feb	Person's r	0.0926	-0.1256	-0.0597	-0.1122	0.0709	-0.1373	0.2476	-0.0801
		N	71	71	71	71	71	71	71	71
	Mar	Person's r	-0.1735	-0.0977	0.3099	0.3400	0.1998	-0.1270	-0.1215	-0.1650
		N	71	71	71	71	71	71	71	71
	Apr	Person's r	-0.0130	-0.0323	0.0470	0.0704	-0.0017	-0.0046	0.0898	-0.0181
		N	71	71	71	71	71	71	71	71
	May	Person's r	-0.0738	0.2352	0.0041	0.0318	-0.1178	0.2294	-0.0506	0.2404
		N	71	71	71	71	71	71	71	71
	Jun	Person's r	-0.1957	0.3031	-0.0134	0.0642	-0.1527	0.2588	0.0059	0.2513
		N	71	71	71	71	71	71	71	71
	Jul	Person's r	-0.0396	0.0766	0.0832	0.1003	0.0431	0.0621	-0.0727	0.0649
		N	71	71	71	71	71	71	71	71
	Aug	Person's r	-0.2168	-0.0996	0.2332	0.2173	0.2054	-0.0366	-0.0060	-0.1284
		N	71	71	71	71	71	71	71	71
	Sep	Person's r	-0.0450	0.1832	-0.0767	-0.0356	-0.1928	0.1999	-0.0286	0.1457
		N	71	71	71	71	71	71	71	71
	Oct	Person's r	0.0536	0.0714	-0.1509	-0.1537	-0.0745	0.0623	0.1119	0.1029
		N	71	71	71	71	71	71	71	71
	Nov	Person's r	0.1305	0.1209	-0.0273	0.0288	-0.0432	0.1671	-0.2221	0.0860
		N	71	71	71	71	71	71	71	71
	Dec	Person's r	-0.0704	-0.0480	0.1046	0.0826	0.1080	-0.0263	-0.0289	-0.0507
		N	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	-0.2013	0.2587	0.0975	0.1573	-0.0609	0.2594	-0.0476	0.2198
		N	71	71	71	71	71	71	71	71
	DJF	Person's r	-0.0630	-0.0613	0.0383	0.0226	0.0635	-0.0024	0.1375	-0.0486
		N	71	71	71	71	71	71	71	71
	MAM	Person's r	-0.0832	0.1886	0.0435	0.0770	-0.0868	0.1890	-0.0288	0.1915
		N	71	71	71	71	71	71	71	71
	JJA	Person's r	-0.2165	0.1744	0.1328	0.1797	0.0210	0.1659	-0.0421	0.1276
		N	71	71	71	71	71	71	71	71
	SON	Person's r	0.0180	0.1943	-0.1179	-0.0736	-0.1828	0.2154	-0.0387	0.1682
		N	71	71	71	71	71	71	71	71
Precipitation CRU TS 2.1	Jan	Person's r	0.1145	-0.0052	-0.1858	-0.1929	-0.0701	-0.0713	-0.0817	0.0504
		N	71	71	71	71	71	71	71	71
	Feb	Person's r	0.0262	0.0924	-0.1971	-0.2310	-0.1818	0.0894	0.1244	0.1178
		N	71	71	71	71	71	71	71	71
	Mar	Person's r	0.2338	0.0128	-0.0454	-0.0304	-0.0166	0.0348	0.0066	0.0306
		N	71	71	71	71	71	71	71	71
	Apr	Person's r	0.0469	-0.0488	-0.0953	-0.1170	0.0646	-0.1029	0.2193	0.0071
		N	71	71	71	71	71	71	71	71
	May	Person's r	-0.1528	0.1023	0.0016	0.0344	0.0233	0.0037	0.0229	0.0843
		N	71	71	71	71	71	71	71	71
	Jun	Person's r	-0.2337	0.1093	0.1641	0.2111	-0.0425	0.1288	-0.1057	0.0618
		N	71	71	71	71	71	71	71	71
	Jul	Person's r	0.1035	0.0193	-0.1261	-0.0764	-0.0859	0.0320	-0.0419	0.0245
		N	71	71	71	71	71	71	71	71
	Aug	Person's r	-0.1115	0.0604	-0.0496	-0.0339	-0.1201	0.1649	0.0416	0.0617
		N	71	71	71	71	71	71	71	71
	Sep	Person's r	-0.0607	0.1555	-0.1371	-0.1035	-0.0788	0.0375	-0.0124	0.1508
		N	71	71	71	71	71	71	71	71
	Oct	Person's r	-0.1230	0.1034	-0.0504	0.0041	-0.2062	0.1907	0.1567	0.0685
		N	71	71	71	71	71	71	71	71
	Nov	Person's r	0.0361	-0.0975	-0.0209	-0.0174	0.1241	-0.0966	0.2746	-0.0775
		N	71	71	71	71	71	71	71	71
	Dec	Person's r	0.0883	-0.1275	-0.0656	-0.0665	-0.0641	-0.1229	0.0226	-0.0806
		N	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	-0.1838	0.1504	-0.0500	0.0161	-0.1067	0.1306	0.0535	0.1325
		N	71	71	71	71	71	71	71	71
	DJF	Person's r	0.1201	0.0056	-0.2719	-0.3008	-0.1994	-0.0291	0.0586	0.0751
		N	71	71	71	71	71	71	71	71
	MAM	Person's r	-0.1114	0.0848	-0.0260	0.0006	0.0364	-0.0191	0.0763	0.0833
		N	71	71	71	71	71	71	71	71
	JJA	Person's r	-0.1552	0.1086	0.0153	0.0758	-0.1307	0.1827	-0.0620	0.0825
		N	71	71	71	71	71	71	71	71
	SON	Person's r	-0.1179	0.1414	-0.1319	-0.0685	-0.1607	0.1326	0.2065	0.1194
		N	71	71	71	71	71	71	71	71

A13 (continued) Correlation matrix of Laguna del Inca. Non-filtered data

			Bsi					C, N und C/N				
			Si µg/g	Bsi µg/g	Bsi Flux	Fe µg/g	Al µg/g	N %	TOC %	TOC/N	TOC Flux	N Flux
Temperature CRU TS 2.1	Jan	Person's r	0.0155	-0.5243	-0.3630	0.0155	-0.2290	-0.4874	-0.4700	0.1168	-0.2183	-0.1708
		N	71	71	71	71	71	71	71	71	71	71
	Feb	Person's r	-0.0245	-0.5316	-0.4120	-0.0245	-0.1760	-0.4497	-0.4109	0.1761	-0.2487	-0.1939
		N	71	71	71	71	71	71	71	71	71	71
	Mar	Person's r	0.2592	-0.2061	-0.0920	0.2592	0.1484	-0.2242	-0.2393	0.0409	-0.0224	-0.0410
		N	71	71	71	71	71	71	71	71	71	71
	Apr	Person's r	0.2344	0.0231	-0.0990	0.2344	0.2295	0.0772	-0.0604	-0.2481	-0.1458	-0.2520
		N	71	71	71	71	71	71	71	71	71	71
	May	Person's r	0.1390	-0.2581	-0.2510	0.1390	0.0055	-0.1438	-0.1290	0.0407	-0.1271	-0.1025
		N	71	71	71	71	71	71	71	71	71	71
	Jun	Person's r	0.0703	-0.1204	0.0330	0.0703	-0.0247	-0.1391	-0.2202	-0.1221	0.1155	0.0472
		N	71	71	71	71	71	71	71	71	71	71
	Jul	Person's r	0.0413	-0.0912	-0.1330	0.0413	-0.0006	0.0941	0.0490	-0.1139	-0.0140	-0.0528
		N	71	71	71	71	71	71	71	71	71	71
	Aug	Person's r	0.1205	0.0395	0.0390	0.1205	0.1730	0.0386	0.0082	-0.0170	0.0389	0.0024
		N	71	71	71	71	71	71	71	71	71	71
	Sep	Person's r	-0.0007	-0.1717	-0.1670	-0.0007	0.0254	-0.1526	-0.1802	-0.0191	-0.1624	-0.1719
		N	71	71	71	71	71	71	71	71	71	71
	Oct	Person's r	0.1135	-0.2387	-0.2210	0.1135	-0.0336	0.0227	-0.0699	-0.1955	0.0024	-0.0587
		N	71	71	71	71	71	71	71	71	71	71
	Nov	Person's r	-0.0333	-0.3354	-0.2720	-0.0333	-0.0881	-0.3381	-0.2724	0.1842	-0.2052	-0.1308
		N	71	71	71	71	71	71	71	71	71	71
	Dec	Person's r	0.0766	-0.4666	-0.3430	0.0766	-0.0991	-0.2974	-0.2169	0.2213	-0.0936	-0.0098
		N	71	71	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	0.1550	-0.4509	-0.3540	0.1550	-0.0162	-0.3130	-0.3457	0.0098	-0.1641	-0.1722
		N	71	71	71	71	71	71	71	71	71	71
	DJF	Person's r	0.0286	-0.6241	-0.4580	0.0286	-0.2070	-0.5060	-0.4500	0.2105	-0.2289	-0.1525
		N	71	71	71	71	71	71	71	71	71	71
	MAM	Person's r	0.2884	-0.2090	-0.2060	0.2884	0.1710	-0.1385	-0.1984	-0.0700	-0.1354	-0.1784
		N	71	71	71	71	71	71	71	71	71	71
	JJA	Person's r	0.1060	-0.0890	-0.0320	0.1060	0.0591	-0.0094	-0.0852	-0.1244	0.0684	-0.0004
		N	71	71	71	71	71	71	71	71	71	71
	SON	Person's r	0.0362	-0.3545	-0.3120	0.0362	-0.0482	-0.2252	-0.2481	-0.0083	-0.1730	-0.1688
		N	71	71	71	71	71	71	71	71	71	71
Temperature HadCRUT3	Jan	Person's r	0.0388	-0.2414	-0.2070	0.0388	-0.0659	-0.1506	-0.0109	0.3042	-0.0863	0.0302
		N	71	71	71	71	71	71	71	71	71	71
	Feb	Person's r	-0.0628	-0.3605	-0.2470	-0.0628	-0.2363	-0.2805	-0.2481	0.1506	-0.0876	-0.0352
		N	71	71	71	71	71	71	71	71	71	71
	Mar	Person's r	0.0602	-0.1139	-0.1700	0.0602	0.0008	0.0347	0.0710	0.0959	-0.0749	-0.0449
		N	71	71	71	71	71	71	71	71	71	71
	Apr	Person's r	0.2055	-0.0944	-0.1060	0.2055	0.0315	-0.0311	-0.0589	-0.0101	-0.0538	-0.0698
		N	71	71	71	71	71	71	71	71	71	71
	May	Person's r	0.1698	-0.2059	-0.2460	0.1698	-0.0053	-0.0657	-0.0780	-0.0021	-0.1408	-0.1377
		N	71	71	71	71	71	71	71	71	71	71
	Jun	Person's r	-0.0862	-0.4006	-0.2760	-0.0862	-0.2551	-0.3865	-0.3550	0.1343	-0.1544	-0.1027
		N	71	71	71	71	71	71	71	71	71	71
	Jul	Person's r	-0.0333	-0.3312	-0.3590	-0.0333	-0.2166	-0.0902	-0.0676	0.0579	-0.1589	-0.1171
		N	71	71	71	71	71	71	71	71	71	71
	Aug	Person's r	0.1150	-0.1771	-0.2220	0.1150	0.0034	-0.0555	-0.1202	-0.0762	-0.1471	-0.1751
		N	71	71	71	71	71	71	71	71	71	71
	Sep	Person's r	0.0781	-0.1538	-0.1820	0.0781	-0.0093	-0.1041	-0.1178	0.0221	-0.1628	-0.1528
		N	71	71	71	71	71	71	71	71	71	71
	Oct	Person's r	0.0916	-0.2026	-0.2070	0.0916	-0.0815	-0.0893	-0.0224	0.1409	-0.1077	-0.0319
		N	71	71	71	71	71	71	71	71	71	71
	Nov	Person's r	-0.1540	-0.3880	-0.2650	-0.1540	-0.2559	-0.4630	-0.2961	0.3968	-0.2143	-0.0386
		N	71	71	71	71	71	71	71	71	71	71
	Dec	Person's r	-0.1000	-0.3115	-0.3050	-0.1000	-0.1896	-0.1588	-0.0791	0.2054	-0.1529	-0.0611
		N	71	71	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	0.0452	-0.4106	-0.3840	0.0452	-0.1760	-0.2530	-0.1914	0.1927	-0.2101	-0.1287
		N	71	71	71	71	71	71	71	71	71	71
	DJF	Person's r	-0.0510	-0.4037	-0.3330	-0.0510	-0.2156	-0.2631	-0.1509	0.2940	-0.1420	-0.0266
		N	71	71	71	71	71	71	71	71	71	71
	MAM	Person's r	0.1858	-0.1793	-0.2260	0.1858	0.0106	-0.0283	-0.0302	0.0345	-0.1171	-0.1097
		N	71	71	71	71	71	71	71	71	71	71
	JJA	Person's r	-0.0090	-0.3969	-0.3710	-0.0090	-0.2100	-0.2362	-0.2371	0.0567	-0.1975	-0.1665
		N	71	71	71	71	71	71	71	71	71	71
	SON	Person's r	-0.0008	-0.3210	-0.2790	-0.0008	-0.1514	-0.2903	-0.1949	0.2437	-0.2099	-0.0968
		N	71	71	71	71	71	71	71	71	71	71
SOI		Person's r	-0.2470	-0.0640	-0.0460	-0.2470	-0.1807	-0.0673	-0.0797	0.0225	-0.0203	-0.0194
		N	68	68	68	68	68	68	68	68	68	68
El Niño 3		Person's r	0.2434	0.2220	0.1350	0.2434	0.2473	0.1833	0.1730	-0.0769	0.0263	0.0021
		N	68	68	68	68	68	68	68	68	68	68
SAB		Person's r	0.0070	-0.0338	0.0030	0.0070	-0.0419	-0.1049	-0.1393	-0.0447	-0.0359	-0.0541
		N	65	65	65	65	65	65	65	65	65	65

A13 (continued) Correlation matrix of Laguna del Inca. Non-filtered data

			Bsi					C, N und C/N				
			Si µg/g	Bsi µg/g	Bsi Flux	Fe µg/g	Al µg/g	N %	TOC %	TOC/N	TOC Flux	N Flux
Precipitation HadCRUT3	Jan	Person's r	0.1271	-0.1154	0.2630	0.1271	-0.0017	-0.0435	-0.0652	-0.0285	-0.2478	-0.2451
		N	71	71	71	71	71	71	71	71	71	71
	Feb	Person's r	-0.2260	-0.1836	-0.1060	-0.2260	-0.1888	-0.2795	-0.2114	0.2090	-0.1440	-0.0654
		N	71	71	71	71	71	71	71	71	71	71
	Mar	Person's r	-0.0890	-0.0699	-0.0780	-0.0890	-0.0721	-0.1524	-0.0847	0.1505	-0.2027	-0.1389
		N	71	71	71	71	71	71	71	71	71	71
	Apr	Person's r	0.0584	0.0184	-0.0190	0.0584	0.0399	0.0813	0.0401	-0.0818	-0.1703	-0.1944
		N	71	71	71	71	71	71	71	71	71	71
	May	Person's r	0.1961	0.3082	0.1820	0.1961	0.3350	0.3099	0.2089	-0.2342	0.0500	-0.0557
		N	71	71	71	71	71	71	71	71	71	71
	Jun	Person's r	-0.0516	0.1191	0.1220	-0.0516	0.0873	-0.0101	-0.0329	-0.0408	0.0158	-0.0076
		N	71	71	71	71	71	71	71	71	71	71
	Jul	Person's r	-0.1780	0.0287	-0.0330	-0.1780	-0.0539	0.0012	-0.0307	-0.0865	-0.1208	-0.1403
		N	71	71	71	71	71	71	71	71	71	71
	Aug	Person's r	-0.2379	-0.1805	0.0640	-0.2379	-0.2450	-0.2212	-0.3121	-0.1164	-0.3387	-0.3707
		N	71	71	71	71	71	71	71	71	71	71
	Sep	Person's r	0.0959	0.2074	0.1140	0.0959	0.1183	0.0796	0.0927	-0.0044	0.1622	0.1569
		N	71	71	71	71	71	71	71	71	71	71
	Oct	Person's r	-0.2681	-0.1381	0.0270	-0.2681	-0.1834	-0.2628	-0.2986	0.0052	-0.1747	-0.1758
		N	71	71	71	71	71	71	71	71	71	71
	Nov	Person's r	-0.0602	0.1340	-0.0090	-0.0602	-0.0022	0.0593	-0.0010	-0.1066	-0.0419	-0.0902
		N	71	71	71	71	71	71	71	71	71	71
	Dec	Person's r	0.0126	-0.0393	0.0500	0.0126	-0.0489	0.0073	0.0109	-0.0100	-0.0656	-0.0594
		N	71	71	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	-0.0946	0.1594	0.1610	-0.0946	0.0814	0.0548	-0.0431	-0.1946	-0.1567	-0.2308
		N	71	71	71	71	71	71	71	71	71	71
	DJF	Person's r	-0.0337	-0.1690	0.1140	-0.0337	-0.1249	-0.1430	-0.1194	0.0746	-0.2337	-0.1916
		N	71	71	71	71	71	71	71	71	71	71
	MAM	Person's r	0.1811	0.2696	0.1470	0.1811	0.2991	0.2821	0.1875	-0.2161	-0.0225	-0.1167
		N	71	71	71	71	71	71	71	71	71	71
	JJA	Person's r	-0.2268	0.0126	0.0800	-0.2268	-0.0791	-0.0912	-0.1582	-0.1192	-0.1948	-0.2318
		N	71	71	71	71	71	71	71	71	71	71
	SON	Person's r	-0.0371	0.1422	0.0900	-0.0371	0.0244	-0.0171	-0.0351	-0.0286	0.0506	0.0339
		N	71	71	71	71	71	71	71	71	71	71
Precipitation CRU TS 2.1	Jan	Person's r	0.2528	-0.0250	-0.0030	0.2528	0.2293	0.0502	0.0771	0.0481	0.0834	0.0931
		N	71	71	71	71	71	71	71	71	71	71
	Feb	Person's r	-0.1161	0.0789	0.1110	-0.1161	-0.0761	-0.0348	-0.0689	-0.0384	0.0321	-0.0061
		N	71	71	71	71	71	71	71	71	71	71
	Mar	Person's r	0.0420	-0.0132	-0.0800	0.0420	0.0524	0.0903	0.0485	-0.0944	-0.0472	-0.0689
		N	71	71	71	71	71	71	71	71	71	71
	Apr	Person's r	-0.1443	-0.0983	-0.1930	-0.1443	-0.1430	-0.1285	-0.1684	0.0165	-0.2809	-0.2807
		N	71	71	71	71	71	71	71	71	71	71
	May	Person's r	-0.1248	-0.0429	-0.0370	-0.1248	-0.0432	-0.2283	-0.1775	0.1482	-0.1864	-0.1319
		N	71	71	71	71	71	71	71	71	71	71
	Jun	Person's r	0.0889	0.1114	0.0020	0.0889	0.1294	0.0598	0.0350	-0.0678	-0.1297	-0.1496
		N	71	71	71	71	71	71	71	71	71	71
	Jul	Person's r	-0.0130	0.0277	0.0650	-0.0130	-0.1064	-0.0033	0.0563	0.1016	0.0660	0.1133
		N	71	71	71	71	71	71	71	71	71	71
	Aug	Person's r	0.1685	-0.0188	0.0070	0.1685	0.0972	-0.1338	-0.1932	-0.0880	-0.0942	-0.1416
		N	71	71	71	71	71	71	71	71	71	71
	Sep	Person's r	-0.2025	0.1086	0.0820	-0.2025	-0.1237	0.1278	0.1309	0.0243	0.0817	0.0666
		N	71	71	71	71	71	71	71	71	71	71
	Oct	Person's r	0.0050	-0.0868	-0.0040	0.0050	-0.0115	-0.1761	-0.1239	0.1016	-0.0379	0.0092
		N	71	71	71	71	71	71	71	71	71	71
	Nov	Person's r	-0.0811	-0.0586	-0.0830	-0.0811	-0.2345	0.1310	0.1220	-0.0456	0.0622	0.0598
		N	71	71	71	71	71	71	71	71	71	71
	Dec	Person's r	0.0965	-0.1271	-0.0540	0.0965	-0.0137	-0.0681	-0.0604	-0.0018	0.0574	0.0691
		N	71	71	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	-0.0283	0.0010	-0.0240	-0.0283	-0.0230	-0.1707	-0.1549	0.0708	-0.1989	-0.1749
		N	71	71	71	71	71	71	71	71	71	71
	DJF	Person's r	0.0923	-0.0145	0.0540	0.0923	0.0581	-0.0308	-0.0380	-0.0037	0.0938	0.0764
		N	71	71	71	71	71	71	71	71	71	71
	MAM	Person's r	-0.1490	-0.0657	-0.0890	-0.1490	-0.0714	-0.2378	-0.2037	0.1347	-0.2481	-0.1989
		N	71	71	71	71	71	71	71	71	71	71
	JJA	Person's r	0.1391	0.0712	0.0350	0.1391	0.0822	-0.0368	-0.0562	-0.0417	-0.0995	-0.1152
		N	71	71	71	71	71	71	71	71	71	71
	SON	Person's r	-0.1529	-0.0170	0.0190	-0.1529	-0.1696	-0.0050	0.0329	0.0754	0.0452	0.0700
		N	71	71	71	71	71	71	71	71	71	71

A13 (continued) Correlation matrix of Laguna del Inca. Non-filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec surf	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	-0.3762	-0.5189	-0.1487	0.1734	0.3432	0.2565	-0.0085	-0.2456	-0.3235	-0.0082	-0.2101	0.2966	-0.4428	-0.4096
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Feb	Person's r	-0.3805	-0.5102	-0.1405	0.1655	0.3458	0.2519	-0.0308	-0.2719	-0.3405	-0.0306	-0.2335	0.2948	-0.4716	-0.4042
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Mar	Person's r	-0.3115	-0.4019	-0.1395	0.1475	0.3159	0.2168	-0.0481	-0.2541	-0.2956	-0.0478	-0.2183	0.1970	-0.4203	-0.3262
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Apr	Person's r	-0.1808	-0.0972	0.1803	-0.1730	-0.1045	-0.1517	-0.2130	-0.2118	-0.1882	-0.2128	-0.2134	-0.1304	-0.1545	-0.0477
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	May	Person's r	-0.2356	-0.2892	-0.0164	0.0227	0.1111	0.0759	-0.0508	-0.1745	-0.2271	-0.0504	-0.1601	0.1629	-0.2528	-0.2777
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Jun	Person's r	-0.1965	-0.2227	0.0023	-0.0058	0.0790	0.0321	-0.0777	-0.1855	-0.2116	-0.0776	-0.1726	0.1439	-0.2333	-0.2757
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Jul	Person's r	-0.1560	-0.1342	0.0606	-0.0645	0.0099	-0.0374	-0.1249	-0.1493	-0.1558	-0.1250	-0.1464	-0.0493	-0.1578	-0.0378
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Aug	Person's r	0.0089	-0.0433	-0.1126	0.1024	0.1096	0.1201	0.0815	0.0144	0.0016	0.0816	0.0269	0.1464	-0.0507	-0.1115
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Sep	Person's r	-0.3580	-0.3144	0.1648	-0.1591	-0.0039	-0.0947	-0.2767	-0.3771	-0.3859	-0.2766	-0.3656	-0.0049	-0.3916	-0.2675
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Oct	Person's r	-0.3437	-0.2972	0.1827	-0.1741	-0.0366	-0.1234	-0.2762	-0.3125	-0.3047	-0.2761	-0.3067	-0.1186	-0.3097	-0.0985
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Nov	Person's r	-0.2575	-0.3166	-0.0858	0.1008	0.2380	0.1539	-0.0607	-0.1938	-0.2210	-0.0604	-0.1678	0.0917	-0.3203	-0.1463
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Dec	Person's r	-0.3322	-0.4587	-0.1319	0.1455	0.2873	0.2168	-0.0101	-0.1858	-0.2450	-0.0097	-0.1561	0.1879	-0.3604	-0.2614
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	-0.4857	-0.5619	-0.0298	0.0446	0.2647	0.1435	-0.1698	-0.3960	-0.4511	-0.1695	-0.3612	0.1909	-0.5550	-0.4154
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	DJF	Person's r	-0.4463	-0.6101	-0.1728	0.1986	0.4001	0.2973	-0.0199	-0.2878	-0.3722	-0.0196	-0.2454	0.3191	-0.5220	-0.4404
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	MAM	Person's r	-0.3356	-0.3664	0.0069	0.0030	0.1528	0.0698	-0.1396	-0.2933	-0.3274	-0.1393	-0.2706	0.1119	-0.3823	-0.3045
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	JJA	Person's r	-0.1719	-0.1965	-0.0164	0.0085	0.0907	0.0483	-0.0661	-0.1608	-0.1825	-0.0660	-0.1476	0.1105	-0.2163	-0.2053
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	SON	Person's r	-0.4477	-0.4359	0.1160	-0.1020	0.0994	-0.0233	-0.2823	-0.4100	-0.4238	-0.2820	-0.3892	-0.0120	-0.4780	-0.2377
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
Temperature HadCRUT3	Jan	Person's r	-0.0644	-0.1701	-0.1907	0.2096	0.2760	0.2385	0.1024	-0.0130	-0.0411	0.1026	0.0119	0.1655	-0.1644	-0.1030
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Feb	Person's r	-0.2283	-0.3048	-0.0648	0.0749	0.1672	0.1183	-0.0244	-0.1284	-0.1628	-0.0242	-0.1098	0.1433	-0.2344	-0.1711
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Mar	Person's r	0.0385	-0.0285	-0.1451	0.1493	0.1666	0.1548	0.1065	0.0562	0.0408	0.1068	0.0687	0.1146	-0.0298	-0.0316
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Apr	Person's r	-0.0776	-0.1179	-0.0465	0.0489	0.0868	0.0668	0.0117	-0.0491	-0.0730	0.0119	-0.0402	0.1188	-0.1002	-0.1455
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	May	Person's r	-0.1519	-0.1979	0.0049	0.0010	0.0462	0.0369	-0.0207	-0.1055	-0.1547	-0.0203	-0.0991	0.1568	-0.1529	-0.2482
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Jun	Person's r	-0.2708	-0.3499	-0.0567	0.0688	0.1768	0.1216	-0.0373	-0.1879	-0.2453	-0.0369	-0.1678	0.2194	-0.2970	-0.3166
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Jul	Person's r	-0.1158	-0.1786	-0.0803	0.0881	0.1481	0.1158	0.0149	-0.0353	-0.0625	0.0151	-0.0234	0.0566	-0.1264	-0.0162
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Aug	Person's r	-0.0947	-0.1699	-0.1182	0.1139	0.1631	0.1439	0.0536	-0.0473	-0.0841	0.0538	-0.0314	0.1787	-0.1387	-0.1848
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Sep	Person's r	-0.3004	-0.2450	0.2009	-0.1940	-0.0814	-0.1522	-0.2692	-0.2883	-0.2770	-0.2690	-0.2857	-0.1110	-0.2698	-0.1062
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Oct	Person's r	-0.2258	-0.1913	0.1596	-0.1540	-0.0816	-0.1256	-0.1938	-0.1704	-0.1709	-0.1937	-0.1742	-0.1352	-0.1544	0.0168
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Nov	Person's r	-0.1104	-0.1912	-0.1144	0.1263	0.1816	0.1561	0.0477	-0.0359	-0.0707	0.0481	-0.0190	0.1451	-0.1448	-0.0834
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Dec	Person's r	-0.1164	-0.1521	-0.0031	0.0146	0.0562	0.0306	-0.0262	-0.0351	-0.0458	-0.0258	-0.0301	-0.0102	-0.0799	0.0141
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	-0.2325	-0.3159	-0.0709	0.0839	0.1874	0.1333	-0.0241	-0.1392	-0.1832	-0.0237	-0.1194	0.1546	-0.2602	-0.1971
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	DJF	Person's r	-0.1818	-0.2806	-0.1201	0.1383	0.2284	0.1781	0.0262	-0.0791	-0.1124	0.0265	-0.0569	0.1390	-0.2166	-0.1210
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	MAM	Person's r	-0.0849	-0.1500	-0.0765	0.0819	0.1251	0.1078	0.0393	-0.0449	-0.0834	0.0396	-0.0332	0.1671	-0.1227	-0.1854
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	JJA	Person's r	-0.2105	-0.3034	-0.1072	0.1145	0.2091	0.1623	0.0106	-0.1189	-0.1713	0.0110	-0.0984	0.1937	-0.2442	-0.2220
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	SON	Person's r	-0.2680	-0.2673	0.0969	-0.0863	0.0158	-0.0437	-0.1703	-0.2078	-0.2188	-0.1699	-0.2004	-0.0342	-0.2431	-0.0782
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
SOI		Person's r	0.1526	0.0957	-0.1469	0.1434	0.0806	0.1113	0.1679	0.2225	0.2322	0.1680	0.2224	-0.0231	0.1871	0.2019
		N	68	68	68	68	68	68	68	68	68	68	68	68	68	68
El Niño 3		Person's r	0.0102	0.1088	0.1861	-0.1922	-0.1940	-0.1903	-0.1436	-0.1289	-0.1207	-0.1438	-0.1423	-0.0117	-0.0206	-0.1268
		N	68	68	68	68	68	68	68	68	68	68	68	68	68	68
SAB		Person's r	-0.1250	-0.1627	-0.1147	0.0987	0.1634	0.1213	0.0007	-0.0751	-0.0933	0.0007	-0.0586	0.0231	-0.1561	-0.0391
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65

A13 (continued) Correlation matrix of Laguna del Inca. Non-filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec surf	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation HadCRUT3	Jan	Person's r	-0.2891	-0.2306	0.2276	-0.2031	-0.0922	-0.1582	-0.2665	-0.2860	-0.2728	-0.2665	-0.2847	-0.1225	-0.2635	-0.1039
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Feb	Person's r	-0.0566	-0.0971	-0.0761	0.0840	0.1213	0.1012	0.0230	-0.0311	-0.0309	0.0232	-0.0162	0.0657	-0.1004	-0.0455
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Mar	Person's r	0.0384	0.0098	-0.0927	0.0933	0.0945	0.0988	0.0751	0.0330	0.0230	0.0751	0.0412	0.0934	-0.0136	-0.0364
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Apr	Person's r	0.0192	0.0196	-0.0528	0.0479	0.0629	0.0480	0.0142	0.0177	0.0202	0.0140	0.0207	-0.0513	-0.0027	0.0908
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	May	Person's r	-0.0506	0.1171	0.3046	-0.3048	-0.3045	-0.3178	-0.2589	-0.1624	-0.1072	-0.2592	-0.1823	-0.2603	0.0060	0.0656
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Jun	Person's r	-0.0042	0.0753	0.1884	-0.1920	-0.2114	-0.1912	-0.1237	-0.0978	-0.0856	-0.1239	-0.1106	-0.0008	0.0006	-0.1179
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Jul	Person's r	0.0459	0.0845	0.0504	-0.0467	-0.0632	-0.0572	-0.0264	-0.0064	-0.0027	-0.0265	-0.0131	-0.0519	0.0371	0.0199
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Aug	Person's r	-0.0823	-0.1127	-0.0356	0.0437	0.0704	0.0599	0.0076	-0.0434	-0.0618	0.0075	-0.0366	0.0386	-0.0790	-0.0750
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Sep	Person's r	-0.0216	0.0433	0.0954	-0.1010	-0.0973	-0.1121	-0.1059	-0.0339	0.0008	-0.1060	-0.0420	-0.2072	0.0243	0.1820
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Oct	Person's r	-0.1225	-0.1028	0.0615	-0.0589	-0.0171	-0.0433	-0.0949	-0.1185	-0.1068	-0.0948	-0.1138	-0.0247	-0.1126	-0.0729
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Nov	Person's r	0.1332	0.1386	-0.0584	0.0597	0.0367	0.0455	0.0567	0.0724	0.1015	0.0566	0.0763	-0.0149	0.0618	0.0939
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Dec	Person's r	-0.0291	-0.0461	-0.0047	0.0084	0.0202	0.0194	0.0033	-0.0425	-0.0561	0.0033	-0.0382	0.0957	-0.0636	-0.1383
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	-0.0355	0.0862	0.2253	-0.2234	-0.2230	-0.2279	-0.1890	-0.1380	-0.1060	-0.1893	-0.1520	-0.1566	-0.0154	-0.0034
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	DJF	Person's r	-0.1852	-0.1891	0.0694	-0.0513	0.0274	-0.0137	-0.1131	-0.1824	-0.1864	-0.1131	-0.1715	0.0455	-0.2196	-0.1761
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	MAM	Person's r	-0.0356	0.1091	0.2439	-0.2454	-0.2408	-0.2563	-0.2165	-0.1345	-0.0862	-0.2168	-0.1503	-0.2350	0.0033	0.0806
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	JJA	Person's r	-0.0073	0.0478	0.1203	-0.1170	-0.1271	-0.1165	-0.0812	-0.0750	-0.0731	-0.0814	-0.0833	-0.0161	-0.0086	-0.0829
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	SON	Person's r	-0.0255	0.0318	0.0789	-0.0819	-0.0702	-0.0884	-0.0989	-0.0489	-0.0111	-0.0990	-0.0523	-0.1690	-0.0055	0.1358
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
Precipitation CRU TS 2.1	Jan	Person's r	-0.0440	-0.0651	0.0001	0.0067	0.0168	0.0232	0.0075	-0.0333	-0.0486	0.0076	-0.0288	0.0855	-0.0549	-0.1187
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Feb	Person's r	0.0943	0.1122	-0.0103	0.0093	-0.0318	-0.0182	0.0298	0.0876	0.1206	0.0295	0.0848	-0.0647	0.1073	0.1505
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Mar	Person's r	-0.0771	-0.0228	0.1004	-0.0954	-0.0617	-0.0942	-0.1250	-0.0774	-0.0456	-0.1249	-0.0812	-0.2066	-0.0374	0.1365
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Apr	Person's r	-0.0064	-0.0399	-0.0735	0.0786	0.0867	0.0839	0.0550	0.0109	0.0092	0.0551	0.0210	0.0878	-0.0319	-0.0800
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	May	Person's r	-0.1366	-0.1125	0.0414	-0.0406	0.0421	-0.0046	-0.1186	-0.1891	-0.1858	-0.1187	-0.1768	0.0311	-0.2184	-0.1449
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Jun	Person's r	-0.0051	0.0422	0.1072	-0.1039	-0.1155	-0.1023	-0.0663	-0.0469	-0.0472	-0.0663	-0.0559	-0.0438	0.0103	-0.0311
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Jul	Person's r	0.0576	0.0537	-0.0416	0.0320	0.0175	0.0179	0.0330	0.0714	0.0725	0.0329	0.0678	-0.0414	0.0692	0.1287
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Aug	Person's r	-0.2616	-0.1957	0.2006	-0.1879	-0.0883	-0.1546	-0.2485	-0.2911	-0.2946	-0.2486	-0.2913	-0.0597	-0.2486	-0.1897
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Sep	Person's r	0.2433	0.2122	-0.0851	0.0790	-0.0398	0.0398	0.1863	0.2497	0.2574	0.1860	0.2416	0.0751	0.2634	0.1104
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Oct	Person's r	-0.3124	-0.2966	0.1364	-0.1266	-0.0084	-0.0798	-0.2149	-0.2673	-0.2821	-0.2149	-0.2629	-0.0837	-0.2797	-0.1255
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Nov	Person's r	0.0583	0.0543	0.0390	-0.0395	-0.0954	-0.0639	0.0324	0.1328	0.1282	0.0323	0.1157	-0.1152	0.1726	0.1829
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Dec	Person's r	-0.1078	-0.1594	-0.0973	0.1006	0.1676	0.1185	0.0168	-0.0481	-0.0788	0.0170	-0.0372	0.0533	-0.1171	-0.0539
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	Annual Mean	Person's r	-0.1697	-0.1216	0.1257	-0.1204	-0.0462	-0.0911	-0.1714	-0.2042	-0.2035	-0.1715	-0.2019	-0.0399	-0.1879	-0.1165
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	DJF	Person's r	-0.0042	-0.0261	-0.0527	0.0570	0.0634	0.0539	0.0335	0.0242	0.0261	0.0335	0.0296	0.0222	-0.0048	0.0228
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	MAM	Person's r	-0.1359	-0.1171	0.0291	-0.0266	0.0556	0.0084	-0.1080	-0.1808	-0.1755	-0.1080	-0.1672	0.0333	-0.2154	-0.1438
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	JJA	Person's r	-0.1170	-0.0543	0.1543	-0.1499	-0.1103	-0.1376	-0.1589	-0.1521	-0.1537	-0.1591	-0.1594	-0.0783	-0.0951	-0.0612
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71
	SON	Person's r	-0.0598	-0.0690	0.0623	-0.0589	-0.0652	-0.0572	-0.0318	0.0043	-0.0035	-0.0321	-0.0035	-0.0558	0.0178	0.0402
		N	71	71	71	71	71	71	71	71	71	71	71	71	71	71

A14 Correlation matrix of Laguna del Inca. 3-year filtered data

			Spectrolino							
			RABD610;620	R590/640	RABD510	RABD510	RABD480	chlorin	RABD720	R570/630
Temperature CRU TS 2.1	Jan	Person's r	0.1244	-0.4998	0.0649	-0.0319	0.3138	-0.4438	-0.0012	-0.4605
		N	69	69	69	69	69	69	69	69
	Feb	Person's r	0.2228	-0.4333	-0.0300	-0.1104	0.2569	-0.4221	0.0521	-0.3539
		N	69	69	69	69	69	69	69	69
	Mar	Person's r	0.2993	-0.2377	-0.2205	-0.2959	0.0292	-0.2442	-0.0517	-0.1446
		N	69	69	69	69	69	69	69	69
	Apr	Person's r	0.2709	0.0074	-0.1965	-0.2148	-0.0679	0.0230	-0.0804	0.0806
		N	69	69	69	69	69	69	69	69
	May	Person's r	0.0359	-0.2451	0.0214	-0.0030	0.2414	-0.2936	0.0788	-0.1993
		N	69	69	69	69	69	69	69	69
	Jun	Person's r	0.0547	-0.0537	-0.1215	-0.1773	-0.0718	-0.0381	0.1253	-0.0222
		N	69	69	69	69	69	69	69	69
	Jul	Person's r	0.2428	0.0064	-0.2461	-0.2008	-0.1408	0.0556	0.1090	0.0648
		N	69	69	69	69	69	69	69	69
	Aug	Person's r	0.1438	0.0980	-0.1669	-0.1202	-0.0415	-0.0271	-0.1556	0.1272
		N	69	69	69	69	69	69	69	69
	Sep	Person's r	0.1686	0.0724	-0.2826	-0.2527	-0.1741	0.1868	0.2471	0.1230
		N	69	69	69	69	69	69	69	69
	Oct	Person's r	0.3792	-0.0857	-0.2940	-0.2973	-0.0840	0.0171	0.1523	-0.0019
		N	69	69	69	69	69	69	69	69
	Nov	Person's r	0.4472	-0.4826	-0.1155	-0.2559	0.1857	-0.4082	0.1784	-0.3676
		N	69	69	69	69	69	69	69	69
	Dec	Person's r	0.3239	-0.4896	-0.0643	-0.1593	0.2756	-0.4837	0.2205	-0.4131
		N	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	0.3435	-0.3142	-0.2020	-0.2658	0.1023	-0.2770	0.1186	-0.2158
		N	69	69	69	69	69	69	69	69
	DJF	Person's r	0.2477	-0.5251	-0.0110	-0.1114	0.3124	-0.4983	0.0995	-0.4529
		N	69	69	69	69	69	69	69	69
	MAM	Person's r	0.2523	-0.2122	-0.1637	-0.2155	0.0935	-0.2306	-0.0192	-0.1228
		N	69	69	69	69	69	69	69	69
	JJA	Person's r	0.1935	0.0171	-0.2376	-0.2258	-0.1145	-0.0057	0.0449	0.0705
		N	69	69	69	69	69	69	69	69
	SON	Person's r	0.4335	-0.2209	-0.2972	-0.3484	-0.0270	-0.0954	0.2488	-0.1123
		N	69	69	69	69	69	69	69	69
Temperature HadCRUT3	Jan	Person's r	0.4174	-0.4038	-0.1638	-0.2478	0.1855	-0.2793	0.0806	-0.3051
		N	69	69	69	69	69	69	69	69
	Feb	Person's r	0.3742	-0.2298	-0.3582	-0.4153	-0.0012	-0.2397	0.3477	-0.1134
		N	69	69	69	69	69	69	69	69
	Mar	Person's r	0.5073	-0.2567	-0.1985	-0.2305	0.0935	-0.2029	0.0170	-0.1524
		N	69	69	69	69	69	69	69	69
	Apr	Person's r	0.2291	-0.2183	-0.2360	-0.3000	0.0337	-0.1645	0.2400	-0.1123
		N	69	69	69	69	69	69	69	69
	May	Person's r	0.0692	-0.2286	0.0047	-0.0138	0.2561	-0.2471	0.1273	-0.1729
		N	69	69	69	69	69	69	69	69
	Jun	Person's r	0.0878	-0.3459	-0.0528	-0.1654	0.1862	-0.3304	0.3118	-0.2730
		N	69	69	69	69	69	69	69	69
	Jul	Person's r	0.3710	-0.3324	-0.1877	-0.2184	0.0883	-0.2125	0.2646	-0.2491
		N	69	69	69	69	69	69	69	69
	Aug	Person's r	0.3131	-0.1975	-0.2003	-0.2186	0.0063	-0.1648	0.1717	-0.1113
		N	69	69	69	69	69	69	69	69
	Sep	Person's r	0.1617	-0.0067	-0.2880	-0.2741	-0.1816	0.1588	0.3471	0.0576
		N	69	69	69	69	69	69	69	69
	Oct	Person's r	0.3403	-0.1707	-0.3155	-0.3296	-0.0830	-0.0059	0.5396	-0.0832
		N	69	69	69	69	69	69	69	69
	Nov	Person's r	0.4949	-0.4427	-0.2175	-0.3265	0.1070	-0.3393	0.2450	-0.3392
		N	69	69	69	69	69	69	69	69
	Dec	Person's r	0.4502	-0.3057	-0.3016	-0.3432	0.0869	-0.2342	0.3645	-0.1721
		N	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	0.4243	-0.3586	-0.2803	-0.3459	0.0941	-0.2626	0.3469	-0.2331
		N	69	69	69	69	69	69	69	69
	DJF	Person's r	0.4873	-0.3636	-0.3331	-0.4049	0.0989	-0.2965	0.3214	-0.2257
		N	69	69	69	69	69	69	69	69
	MAM	Person's r	0.3121	-0.2856	-0.1634	-0.2085	0.1656	-0.2530	0.1563	-0.1799
		N	69	69	69	69	69	69	69	69
	JJA	Person's r	0.2992	-0.3569	-0.1687	-0.2365	0.1206	-0.2880	0.3046	-0.2615
		N	69	69	69	69	69	69	69	69
	SON	Person's r	0.3949	-0.2465	-0.3263	-0.3705	-0.0639	-0.0737	0.4407	-0.1449
		N	69	69	69	69	69	69	69	69
SOI		Person's r	0.1795	-0.2322	0.0250	-0.0498	0.1204	-0.2263	0.1451	-0.2056
		N	66	66	66	66	66	66	66	66
El Niño 3		Person's r	-0.1681	0.3398	0.0355	0.1419	-0.1353	0.3360	-0.2421	0.3142
		N	67	67	67	67	67	67	67	67
SAB		Person's r	-0.1181	0.0265	-0.0307	0.0159	-0.0884	0.0412	0.1170	0.0077
		N	63	63	63	63	63	63	63	63

A14 (continued) Correlation matrix of Laguna del Inca. 3-year filtered data

			Spectrolino							
			RABD610;620	R590/640	RABD510	RABD510	RABD480	chlorin	RABD720	R570/630
Precipitation HadCRUT3	Jan	Person's r	-0.2573	0.2547	-0.1516	-0.2097	-0.2020	0.1238	0.0095	0.2656
		N	69	69	69	69	69	69	69	69
	Feb	Person's r	-0.0540	0.1993	-0.2611	-0.2227	-0.3219	0.3280	0.2525	0.2255
		N	69	69	69	69	69	69	69	69
	Mar	Person's r	0.3669	0.0098	-0.2579	-0.2317	-0.1933	0.0352	0.1172	0.0878
		N	69	69	69	69	69	69	69	69
	Apr	Person's r	-0.0119	0.0687	-0.1281	-0.1529	0.0113	-0.0281	0.1712	0.1165
		N	69	69	69	69	69	69	69	69
	May	Person's r	-0.1257	0.3874	-0.1348	-0.0713	-0.1834	0.2721	0.0300	0.3992
		N	69	69	69	69	69	69	69	69
	Jun	Person's r	-0.1561	0.3741	0.0010	0.0964	-0.2981	0.4175	-0.2922	0.3061
		N	69	69	69	69	69	69	69	69
	Jul	Person's r	0.1422	0.0325	-0.0942	-0.0355	-0.0688	0.1040	-0.0738	0.0485
		N	69	69	69	69	69	69	69	69
	Aug	Person's r	-0.1478	0.0657	-0.0667	-0.0656	-0.1698	0.1772	-0.0198	0.0851
		N	69	69	69	69	69	69	69	69
	Sep	Person's r	0.0372	0.1763	0.0171	0.1050	-0.0150	0.1045	-0.2710	0.1687
		N	69	69	69	69	69	69	69	69
	Oct	Person's r	-0.3109	0.2180	0.0109	0.0958	-0.2573	0.3107	0.2252	0.1588
		N	69	69	69	69	69	69	69	69
	Nov	Person's r	-0.0011	-0.0359	0.0168	0.0336	0.1306	-0.0607	0.2845	-0.0155
		N	69	69	69	69	69	69	69	69
	Dec	Person's r	0.0522	0.0529	-0.2195	-0.2343	-0.2028	0.0435	0.1285	0.1210
		N	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	-0.1266	0.4450	-0.1679	-0.0504	-0.3426	0.4629	-0.1111	0.4436
		N	69	69	69	69	69	69	69	69
	DJF	Person's r	-0.1035	0.2350	-0.3241	-0.3416	-0.3630	0.2301	0.2002	0.2950
		N	69	69	69	69	69	69	69	69
	MAM	Person's r	-0.0884	0.3775	-0.1808	-0.1265	-0.1829	0.2471	0.0836	0.4078
		N	69	69	69	69	69	69	69	69
	JJA	Person's r	-0.0689	0.2496	-0.0830	0.0025	-0.2757	0.3635	-0.2085	0.2307
		N	69	69	69	69	69	69	69	69
	SON	Person's r	-0.1014	0.2074	0.0238	0.1307	-0.0672	0.1828	0.0016	0.1852
		N	69	69	69	69	69	69	69	69
Precipitation CRU TS 2.1	Jan	Person's r	0.1938	-0.0429	-0.1966	-0.2254	-0.0608	-0.1069	-0.0365	0.0352
		N	69	69	69	69	69	69	69	69
	Feb	Person's r	-0.0022	0.1457	-0.2053	-0.2569	-0.2012	0.1571	0.1718	0.1547
		N	69	69	69	69	69	69	69	69
	Mar	Person's r	0.4469	-0.0031	-0.1990	-0.1849	-0.0861	0.0407	-0.0407	0.0501
		N	69	69	69	69	69	69	69	69
	Apr	Person's r	0.0093	-0.0816	-0.0326	-0.0625	0.2143	-0.1358	0.3294	-0.0259
		N	69	69	69	69	69	69	69	69
	May	Person's r	-0.1869	0.1391	0.0046	0.0427	0.0257	0.0140	0.1348	0.1244
		N	69	69	69	69	69	69	69	69
	Jun	Person's r	-0.3865	0.2045	0.2248	0.3033	-0.0974	0.2136	-0.1524	0.1352
		N	69	69	69	69	69	69	69	69
	Jul	Person's r	0.1341	0.0313	-0.1697	-0.1145	-0.1166	0.0689	-0.0008	0.0402
		N	69	69	69	69	69	69	69	69
	Aug	Person's r	-0.1375	0.0991	-0.1518	-0.1429	-0.2227	0.2236	0.0509	0.1210
		N	69	69	69	69	69	69	69	69
	Sep	Person's r	-0.1783	0.2662	-0.0590	0.0037	-0.0541	0.1073	0.0553	0.2272
		N	69	69	69	69	69	69	69	69
	Oct	Person's r	-0.1927	0.1821	-0.1565	-0.0790	-0.3462	0.2851	0.2207	0.1423
		N	69	69	69	69	69	69	69	69
	Nov	Person's r	0.0357	-0.1122	-0.0292	-0.0288	0.1333	-0.1021	0.3610	-0.0889
		N	69	69	69	69	69	69	69	69
	Dec	Person's r	0.1273	-0.2034	-0.0626	-0.0780	-0.0316	-0.1908	-0.0562	-0.1474
		N	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	-0.2771	0.2402	-0.0911	-0.0084	-0.1666	0.2126	0.1779	0.2240
		N	69	69	69	69	69	69	69	69
	DJF	Person's r	0.1603	-0.0139	-0.2913	-0.3544	-0.2054	-0.0293	0.0881	0.0612
		N	69	69	69	69	69	69	69	69
	MAM	Person's r	-0.1410	0.1121	-0.0171	0.0129	0.0651	-0.0139	0.1958	0.1144
		N	69	69	69	69	69	69	69	69
	JJA	Person's r	-0.2307	0.1858	-0.0443	0.0304	-0.2389	0.2811	-0.0551	0.1643
		N	69	69	69	69	69	69	69	69
	SON	Person's r	-0.2398	0.2479	-0.1712	-0.0734	-0.2455	0.2419	0.3691	0.2043
		N	69	69	69	69	69	69	69	69

A14 (continued) Correlation matrix of Laguna del Inca. 3-year filtered data

			Bsi					C, N und C/N				
			Si µg/g	Bsi µg/g	Bsi Flux	Fe µg/g	Al µg/g	N %	TOC %	TOC/N	TOC Flux	N Flux
Temperature CRU TS 2.1	Jan	Person's r	-0.0709	-0.7254	-0.5333	-0.0709	-0.3856	-0.6637	-0.6578	0.1502	-0.3340	-0.2761
		N	69	69	69	69	69	69	69	69	69	69
	Feb	Person's r	-0.0731	-0.6579	-0.5464	-0.0731	-0.2543	-0.5859	-0.5856	0.1622	-0.3950	-0.3551
		N	69	69	69	69	69	69	69	69	69	69
	Mar	Person's r	0.2536	-0.2995	-0.1812	0.2536	0.1358	-0.3669	-0.4161	0.0226	-0.1416	-0.1719
		N	69	69	69	69	69	69	69	69	69	69
	Apr	Person's r	0.3718	0.0135	-0.1104	0.3718	0.3323	0.1431	-0.0170	-0.3242	-0.1036	-0.2538
		N	69	69	69	69	69	69	69	69	69	69
	May	Person's r	0.1587	-0.4083	-0.3991	0.1587	-0.0430	-0.2616	-0.2403	0.0937	-0.2396	-0.1953
		N	69	69	69	69	69	69	69	69	69	69
	Jun	Person's r	0.0005	-0.2149	-0.0295	0.0005	-0.1170	-0.2537	-0.3879	-0.2176	0.0711	-0.0276
		N	69	69	69	69	69	69	69	69	69	69
	Jul	Person's r	0.0601	-0.1703	-0.2674	0.0601	-0.0274	0.1145	0.0347	-0.2022	-0.1119	-0.1765
		N	69	69	69	69	69	69	69	69	69	69
	Aug	Person's r	0.0989	0.0531	0.0134	0.0989	0.2219	0.0317	-0.0010	-0.0007	-0.0331	-0.0682
		N	69	69	69	69	69	69	69	69	69	69
	Sep	Person's r	-0.1219	-0.2672	-0.3091	-0.1219	-0.0763	-0.2121	-0.2722	-0.0623	-0.3239	-0.3523
		N	69	69	69	69	69	69	69	69	69	69
	Oct	Person's r	0.1327	-0.3387	-0.3483	0.1327	-0.0768	-0.0160	-0.1359	-0.2606	-0.0933	-0.1701
		N	69	69	69	69	69	69	69	69	69	69
	Nov	Person's r	-0.1032	-0.5151	-0.4314	-0.1032	-0.2031	-0.4501	-0.3973	0.2191	-0.2851	-0.2068
		N	69	69	69	69	69	69	69	69	69	69
	Dec	Person's r	0.0504	-0.6521	-0.5404	0.0504	-0.2020	-0.4411	-0.3847	0.2407	-0.2487	-0.1578
		N	69	69	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	0.0828	-0.5510	-0.4786	0.0828	-0.1087	-0.3982	-0.4564	-0.0087	-0.2898	-0.3055
		N	69	69	69	69	69	69	69	69	69	69
	DJF	Person's r	-0.0353	-0.7519	-0.5987	-0.0353	-0.3109	-0.6252	-0.6024	0.2039	-0.3622	-0.2928
		N	69	69	69	69	69	69	69	69	69	69
	MAM	Person's r	0.3228	-0.3091	-0.2975	0.3228	0.1664	-0.2275	-0.3001	-0.0695	-0.2073	-0.2576
		N	69	69	69	69	69	69	69	69	69	69
	JJA	Person's r	0.0678	-0.1588	-0.1262	0.0678	0.0226	-0.0619	-0.1769	-0.1965	-0.0277	-0.1195
		N	69	69	69	69	69	69	69	69	69	69
	SON	Person's r	-0.0392	-0.4873	-0.4720	-0.0392	-0.1554	-0.2954	-0.3492	-0.0420	-0.3026	-0.3131
		N	69	69	69	69	69	69	69	69	69	69
Temperature HadCRUT3	Jan	Person's r	-0.0223	-0.3867	-0.4142	-0.0223	-0.1598	-0.3114	-0.1572	0.4231	-0.3499	-0.1894
		N	69	69	69	69	69	69	69	69	69	69
	Feb	Person's r	-0.1658	-0.4729	-0.3602	-0.1658	-0.3374	-0.4401	-0.4401	0.1501	-0.2341	-0.1836
		N	69	69	69	69	69	69	69	69	69	69
	Mar	Person's r	0.0409	-0.1559	-0.2794	0.0409	0.0086	-0.0176	0.0293	0.1515	-0.2442	-0.1907
		N	69	69	69	69	69	69	69	69	69	69
	Apr	Person's r	0.2331	-0.1552	-0.2077	0.2331	0.0105	-0.0877	-0.1377	-0.0301	-0.1847	-0.2102
		N	69	69	69	69	69	69	69	69	69	69
	May	Person's r	0.1488	-0.3198	-0.3896	0.1488	-0.0719	-0.1360	-0.1481	0.0225	-0.2665	-0.2514
		N	69	69	69	69	69	69	69	69	69	69
	Jun	Person's r	-0.1964	-0.5600	-0.4126	-0.1964	-0.4027	-0.5738	-0.5626	0.1625	-0.2878	-0.2298
		N	69	69	69	69	69	69	69	69	69	69
	Jul	Person's r	-0.0499	-0.4478	-0.5135	-0.0499	-0.3022	-0.1815	-0.1460	0.1225	-0.3227	-0.2530
		N	69	69	69	69	69	69	69	69	69	69
	Aug	Person's r	0.1544	-0.2839	-0.3388	0.1544	-0.0076	-0.1573	-0.2000	-0.0080	-0.2682	-0.2648
		N	69	69	69	69	69	69	69	69	69	69
	Sep	Person's r	0.0476	-0.2198	-0.2870	0.0476	-0.0552	-0.1531	-0.1845	0.0027	-0.2979	-0.2946
		N	69	69	69	69	69	69	69	69	69	69
	Oct	Person's r	0.0542	-0.3268	-0.3628	0.0542	-0.1882	-0.1419	-0.0906	0.1413	-0.2326	-0.1479
		N	69	69	69	69	69	69	69	69	69	69
	Nov	Person's r	-0.2597	-0.5610	-0.4224	-0.2597	-0.3995	-0.6317	-0.4494	0.5236	-0.3497	-0.1283
		N	69	69	69	69	69	69	69	69	69	69
	Dec	Person's r	-0.1375	-0.4406	-0.4535	-0.1375	-0.2604	-0.2851	-0.1994	0.2840	-0.3099	-0.1917
		N	69	69	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	-0.0239	-0.5009	-0.5093	-0.0239	-0.2556	-0.3641	-0.3177	0.2175	-0.3824	-0.2918
		N	69	69	69	69	69	69	69	69	69	69
	DJF	Person's r	-0.1340	-0.5173	-0.4811	-0.1340	-0.3070	-0.4177	-0.3301	0.3265	-0.3476	-0.2227
		N	69	69	69	69	69	69	69	69	69	69
	MAM	Person's r	0.1727	-0.2649	-0.3639	0.1727	-0.0256	-0.1024	-0.1092	0.0564	-0.2854	-0.2678
		N	69	69	69	69	69	69	69	69	69	69
	JJA	Person's r	-0.0563	-0.5273	-0.5095	-0.0563	-0.3067	-0.3778	-0.3716	0.1204	-0.3506	-0.2943
		N	69	69	69	69	69	69	69	69	69	69
	SON	Person's r	-0.0689	-0.4436	-0.4276	-0.0689	-0.2559	-0.3803	-0.3004	0.2685	-0.3575	-0.2344
		N	69	69	69	69	69	69	69	69	69	69
SOI		Person's r	-0.2630	-0.0867	-0.0083	-0.2630	-0.1803	-0.1594	-0.0920	0.2224	0.0233	0.1001
		N	66	66	66	66	66	66	66	66	66	66
El Niño 3		Person's r	0.2683	0.3566	0.1761	0.2683	0.3191	0.3707	0.3032	-0.2570	0.0218	-0.0678
		N	67	67	67	67	67	67	67	67	67	67
SAB		Person's r	-0.0083	-0.0608	-0.0013	-0.0083	-0.0869	-0.1667	-0.1918	-0.0083	-0.0579	-0.0616
		N	63	63	63	63	63	63	63	63	63	63

A14 (continued) Correlation matrix of Laguna del Inca. 3-year filtered data

			Bsi					C, N und C/N				
			Si µg/g	Bsi µg/g	Bsi Flux	Fe µg/g	Al µg/g	N %	TOC %	TOC/N	TOC Flux	N Flux
Precipitation HadCRUT3	Jan	Person's r	0.1182	0.1701	0.4141	0.1182	0.2292	-0.0270	-0.1978	-0.3522	0.4127	0.2286
		N	69	69	69	69	69	69	69	69	69	69
	Feb	Person's r	0.0380	-0.1184	-0.1546	0.0380	0.0330	-0.0042	-0.1405	-0.2924	-0.1229	-0.2269
		N	69	69	69	69	69	69	69	69	69	69
	Mar	Person's r	0.2037	-0.1110	-0.1491	0.2037	0.2209	0.1154	0.1759	0.0923	0.0239	0.0869
		N	69	69	69	69	69	69	69	69	69	69
	Apr	Person's r	0.3121	0.0958	-0.0081	0.3121	0.2396	0.0540	-0.0371	-0.1143	-0.1302	-0.2103
		N	69	69	69	69	69	69	69	69	69	69
	May	Person's r	0.0960	0.3654	0.2565	0.0960	0.3726	0.0603	0.1208	0.1346	-0.0940	-0.0555
		N	69	69	69	69	69	69	69	69	69	69
	Jun	Person's r	0.1748	0.4377	0.3009	0.1748	0.2838	0.2905	0.2444	-0.1687	0.0357	-0.0369
		N	69	69	69	69	69	69	69	69	69	69
	Jul	Person's r	-0.1256	-0.0067	-0.0527	-0.1256	-0.2299	0.0492	0.0181	-0.1087	-0.0508	-0.0594
		N	69	69	69	69	69	69	69	69	69	69
	Aug	Person's r	0.2923	0.0112	0.0620	0.2923	0.1503	-0.1311	-0.2422	-0.2168	-0.0503	-0.1515
		N	69	69	69	69	69	69	69	69	69	69
	Sep	Person's r	0.0156	0.3854	0.2326	0.0156	0.1574	0.3950	0.4056	-0.0071	0.1311	0.1094
		N	69	69	69	69	69	69	69	69	69	69
	Oct	Person's r	-0.0149	-0.0080	0.0170	-0.0149	-0.0396	-0.0210	-0.0131	-0.0329	-0.0086	-0.0006
		N	69	69	69	69	69	69	69	69	69	69
	Nov	Person's r	-0.1938	0.0175	-0.0365	-0.1938	-0.2716	0.2482	0.2559	-0.0529	0.1334	0.1302
		N	69	69	69	69	69	69	69	69	69	69
	Dec	Person's r	0.1222	-0.0130	0.0812	0.1222	0.1180	-0.0567	-0.1166	-0.1379	0.1094	0.0709
		N	69	69	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	0.2079	0.4305	0.2831	0.2079	0.2944	0.2217	0.1620	-0.1728	-0.0436	-0.1148
		N	69	69	69	69	69	69	69	69	69	69
	DJF	Person's r	0.1466	0.0124	0.1627	0.1466	0.1901	-0.0498	-0.2242	-0.3739	0.1944	0.0424
		N	69	69	69	69	69	69	69	69	69	69
	MAM	Person's r	0.1896	0.3543	0.2225	0.1896	0.4275	0.0800	0.1166	0.1016	-0.1199	-0.1004
		N	69	69	69	69	69	69	69	69	69	69
	JJA	Person's r	0.1528	0.2371	0.1598	0.1528	0.0886	0.1263	0.0341	-0.2497	-0.0322	-0.1214
		N	69	69	69	69	69	69	69	69	69	69
	SON	Person's r	-0.0694	0.2900	0.1659	-0.0694	-0.0043	0.3808	0.3950	-0.0394	0.1454	0.1314
		N	69	69	69	69	69	69	69	69	69	69
Precipitation CRU TS 2.1	Jan	Person's r	0.4096	-0.0285	-0.0109	0.4096	0.3782	0.0468	0.0525	0.0182	0.0830	0.0800
		N	69	69	69	69	69	69	69	69	69	69
	Feb	Person's r	-0.1064	0.1726	0.2425	-0.1064	-0.0567	-0.0872	-0.1478	-0.0754	0.0636	0.0014
		N	69	69	69	69	69	69	69	69	69	69
	Mar	Person's r	0.1231	-0.0275	-0.0861	0.1231	0.1060	0.1846	0.1713	-0.0752	0.0489	0.0391
		N	69	69	69	69	69	69	69	69	69	69
	Apr	Person's r	-0.2271	-0.1402	-0.2610	-0.2271	-0.2066	-0.2678	-0.3062	0.0895	-0.4656	-0.4600
		N	69	69	69	69	69	69	69	69	69	69
	May	Person's r	-0.2780	-0.0692	-0.0756	-0.2780	-0.1224	-0.3118	-0.3003	0.1264	-0.2993	-0.2661
		N	69	69	69	69	69	69	69	69	69	69
	Jun	Person's r	0.2688	0.2141	0.0930	0.2688	0.2927	0.1485	0.1317	-0.0904	-0.0844	-0.1178
		N	69	69	69	69	69	69	69	69	69	69
	Jul	Person's r	-0.0297	0.0512	0.0786	-0.0297	-0.1558	0.0377	0.0908	0.0839	0.0872	0.1365
		N	69	69	69	69	69	69	69	69	69	69
	Aug	Person's r	0.2582	-0.0479	-0.0099	0.2582	0.1325	-0.1595	-0.2624	-0.1889	-0.1153	-0.2083
		N	69	69	69	69	69	69	69	69	69	69
	Sep	Person's r	-0.2472	0.2637	0.2165	-0.2472	-0.0584	0.1498	0.1423	0.0145	0.0816	0.0508
		N	69	69	69	69	69	69	69	69	69	69
	Oct	Person's r	-0.0147	-0.1514	-0.0325	-0.0147	-0.0353	-0.2394	-0.1785	0.1272	-0.0481	0.0171
		N	69	69	69	69	69	69	69	69	69	69
	Nov	Person's r	-0.1090	-0.0817	-0.1137	-0.1090	-0.3006	0.1518	0.1452	-0.0553	0.0691	0.0701
		N	69	69	69	69	69	69	69	69	69	69
	Dec	Person's r	0.1645	-0.1912	-0.0792	0.1645	-0.0158	-0.0955	-0.0744	0.0207	0.1121	0.1385
		N	69	69	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	-0.0554	0.0060	-0.0205	-0.0554	-0.0323	-0.2352	-0.2553	0.0293	-0.2827	-0.2873
		N	69	69	69	69	69	69	69	69	69	69
	DJF	Person's r	0.2031	0.0209	0.1443	0.2031	0.1313	-0.0968	-0.1307	-0.0397	0.1502	0.1137
		N	69	69	69	69	69	69	69	69	69	69
	MAM	Person's r	-0.3016	-0.0976	-0.1344	-0.3016	-0.1526	-0.3378	-0.3364	0.1327	-0.3793	-0.3477
		N	69	69	69	69	69	69	69	69	69	69
	JJA	Person's r	0.2852	0.1147	0.0829	0.2852	0.1655	0.0071	-0.0371	-0.1205	-0.0726	-0.1221
		N	69	69	69	69	69	69	69	69	69	69
	SON	Person's r	-0.2040	-0.0038	0.0486	-0.2040	-0.1969	-0.0345	0.0064	0.0842	0.0403	0.0745
		N	69	69	69	69	69	69	69	69	69	69

A14 (continued) Correlation matrix of Laguna del Inca. 3-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec surf	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	-0.5233	-0.7031	-0.1915	0.2218	0.4576	0.3361	-0.0284	-0.3343	-0.4366	-0.0280	-0.2875	0.3872	-0.5987	-0.5281
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Feb	Person's r	-0.4972	-0.6321	-0.1378	0.1676	0.3996	0.2788	-0.0767	-0.3647	-0.4453	-0.0764	-0.3191	0.3493	-0.5956	-0.5055
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Mar	Person's r	-0.4400	-0.4981	-0.0675	0.0817	0.2991	0.1697	-0.1554	-0.3709	-0.4032	-0.1550	-0.3322	0.1432	-0.5289	-0.3544
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Apr	Person's r	-0.2822	-0.1758	0.2503	-0.2393	-0.1237	-0.2025	-0.3155	-0.3293	-0.2975	-0.3152	-0.3279	-0.1634	-0.2686	-0.1135
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	May	Person's r	-0.3894	-0.4545	0.0022	0.0084	0.1608	0.0918	-0.1183	-0.3008	-0.3727	-0.1178	-0.2792	0.2180	-0.4131	-0.4269
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Jun	Person's r	-0.3257	-0.3104	0.1251	-0.1233	-0.0091	-0.0734	-0.2041	-0.3009	-0.3179	-0.2041	-0.2909	0.0893	-0.3127	-0.3171
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Jul	Person's r	-0.2567	-0.2117	0.1362	-0.1328	-0.0186	-0.0902	-0.2192	-0.2519	-0.2555	-0.2193	-0.2482	-0.0831	-0.2529	-0.0807
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Aug	Person's r	-0.0132	-0.0359	-0.0684	0.0587	0.0717	0.0782	0.0345	-0.0160	-0.0130	0.0346	-0.0044	0.0869	-0.0593	-0.0740
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Sep	Person's r	-0.4756	-0.3954	0.2682	-0.2529	-0.0562	-0.1756	-0.4000	-0.4910	-0.4853	-0.3998	-0.4796	-0.0907	-0.4862	-0.2817
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Oct	Person's r	-0.5057	-0.4377	0.2625	-0.2447	-0.0385	-0.1720	-0.4054	-0.4603	-0.4513	-0.4052	-0.4512	-0.1876	-0.4614	-0.1497
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Nov	Person's r	-0.3528	-0.4565	-0.1695	0.1913	0.3845	0.2645	-0.0439	-0.2444	-0.2890	-0.0434	-0.2052	0.1758	-0.4442	-0.2263
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Dec	Person's r	-0.4507	-0.6094	-0.1760	0.1975	0.3938	0.2945	-0.0171	-0.2541	-0.3331	-0.0166	-0.2139	0.2625	-0.4866	-0.3608
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	-0.5791	-0.6373	0.0198	0.0023	0.2578	0.1137	-0.2417	-0.4726	-0.5238	-0.2412	-0.4360	0.1615	-0.6310	-0.4415
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	DJF	Person's r	-0.5438	-0.7184	-0.1863	0.2165	0.4620	0.3358	-0.0456	-0.3529	-0.4495	-0.0452	-0.3038	0.3695	-0.6216	-0.5159
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	MAM	Person's r	-0.4745	-0.4898	0.0632	-0.0480	0.1602	0.0420	-0.2393	-0.4220	-0.4562	-0.2388	-0.3945	0.0995	-0.5202	-0.3893
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	JJA	Person's r	-0.2791	-0.2612	0.0930	-0.0947	0.0173	-0.0433	-0.1827	-0.2658	-0.2747	-0.1826	-0.2544	0.0439	-0.2902	-0.2230
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	SON	Person's r	-0.5751	-0.5580	0.1511	-0.1273	0.1303	-0.0309	-0.3629	-0.5138	-0.5273	-0.3625	-0.4877	-0.0414	-0.6009	-0.2833
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
Temperature HadCRUT3	Jan	Person's r	-0.1383	-0.2570	-0.2306	0.2582	0.3751	0.3046	0.0836	-0.0607	-0.0851	0.0840	-0.0254	0.1461	-0.2624	-0.0781
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Feb	Person's r	-0.3885	-0.4368	0.0079	0.0068	0.1642	0.0739	-0.1495	-0.2699	-0.3002	-0.1492	-0.2476	0.0817	-0.3769	-0.2012
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Mar	Person's r	0.0188	-0.0145	-0.0966	0.1037	0.1360	0.1131	0.0479	0.0199	0.0226	0.0484	0.0318	0.0360	-0.0495	0.0386
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Apr	Person's r	-0.1401	-0.1578	0.0069	0.0008	0.0611	0.0259	-0.0527	-0.1024	-0.1157	-0.0524	-0.0933	0.0660	-0.1435	-0.1294
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	May	Person's r	-0.2531	-0.2932	0.0456	-0.0357	0.0489	0.0173	-0.0857	-0.1906	-0.2468	-0.0852	-0.1822	0.1531	-0.2447	-0.3154
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Jun	Person's r	-0.4038	-0.4801	-0.0111	0.0287	0.1800	0.1034	-0.1093	-0.2913	-0.3582	-0.1088	-0.2674	0.2544	-0.4132	-0.4178
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Jul	Person's r	-0.1989	-0.2750	-0.0880	0.1047	0.2063	0.1490	-0.0131	-0.0928	-0.1250	-0.0128	-0.0742	0.0653	-0.2196	-0.0475
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Aug	Person's r	-0.2439	-0.3089	-0.0767	0.0756	0.1894	0.1340	-0.0419	-0.1782	-0.2196	-0.0415	-0.1561	0.1703	-0.2901	-0.2504
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Sep	Person's r	-0.4179	-0.3284	0.2943	-0.2788	-0.1201	-0.2225	-0.3902	-0.4040	-0.3808	-0.3898	-0.4008	-0.2069	-0.3721	-0.1124
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Oct	Person's r	-0.3337	-0.2973	0.2022	-0.1870	-0.0734	-0.1448	-0.2636	-0.2467	-0.2477	-0.2633	-0.2481	-0.1896	-0.2425	0.0083
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Nov	Person's r	-0.1798	-0.3133	-0.2128	0.2312	0.3294	0.2798	0.0906	-0.0579	-0.1130	0.0911	-0.0281	0.2448	-0.2440	-0.1493
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Dec	Person's r	-0.2469	-0.2818	0.0256	-0.0087	0.0912	0.0313	-0.1034	-0.1451	-0.1619	-0.1029	-0.1340	-0.0200	-0.2145	-0.0416
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	-0.3398	-0.3997	-0.0139	0.0330	0.1814	0.0986	-0.1143	-0.2353	-0.2724	-0.1138	-0.2130	0.0979	-0.3561	-0.2040
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	DJF	Person's r	-0.3174	-0.3953	-0.0707	0.0936	0.2442	0.1556	-0.0756	-0.1979	-0.2267	-0.0751	-0.1709	0.0827	-0.3452	-0.1349
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	MAM	Person's r	-0.1621	-0.1999	-0.0132	0.0234	0.0974	0.0608	-0.0411	-0.1187	-0.1485	-0.0406	-0.1069	0.1090	-0.1856	-0.1790
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	JJA	Person's r	-0.3397	-0.4266	-0.0675	0.0820	0.2282	0.1523	-0.0666	-0.2241	-0.2804	-0.0661	-0.1985	0.1937	-0.3677	-0.2829
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	SON	Person's r	-0.3741	-0.3779	0.1104	-0.0906	0.0595	-0.0309	-0.2248	-0.2872	-0.3003	-0.2243	-0.2738	-0.0540	-0.3495	-0.1092
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
SOI		Person's r	0.1807	0.0587	-0.3139	0.3055	0.2542	0.2769	0.2844	0.2882	0.2783	0.2847	0.3005	0.0651	0.1653	0.2083
		N	66	66	66	66	66	66	66	66	66	66	66	66	66	66
El Niño 3		Person's r	0.0988	0.2752	0.3471	-0.3538	-0.4131	-0.3769	-0.2175	-0.1051	-0.0663	-0.2178	-0.1376	-0.1323	0.1184	-0.0430
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
SAB		Person's r	-0.2184	-0.2467	-0.0901	0.0744	0.1790	0.1119	-0.0629	-0.1580	-0.1726	-0.0630	-0.1375	0.0002	-0.2462	-0.0639
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63

A14 (continued) Correlation matrix of Laguna del Inca. 3-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec surf	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation HadCRUT3	Jan	Person's r	-0.0856	-0.0030	0.2467	-0.2507	-0.2932	-0.2508	-0.1416	-0.1194	-0.1147	-0.1420	-0.1360	0.0409	0.0161	-0.2327
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Feb	Person's r	-0.4664	-0.3375	0.4032	-0.3965	-0.2404	-0.3368	-0.4713	-0.4741	-0.4518	-0.4712	-0.4798	-0.2322	-0.3823	-0.1912
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Mar	Person's r	-0.3165	-0.2707	0.1373	-0.1283	0.0220	-0.0760	-0.2648	-0.2982	-0.2828	-0.2646	-0.2884	-0.2046	-0.3165	0.0010
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Apr	Person's r	0.0147	0.0383	0.0878	-0.0811	-0.1262	-0.0785	-0.0049	-0.0120	-0.0089	-0.0048	-0.0157	0.1060	0.0364	-0.1784
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	May	Person's r	0.0464	0.1935	0.2490	-0.2570	-0.2740	-0.2607	-0.1980	-0.1361	-0.0869	-0.1980	-0.1495	-0.1448	0.0011	-0.0421
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Jun	Person's r	0.1560	0.2901	0.1892	-0.1893	-0.2440	-0.2267	-0.1234	0.0150	0.0880	-0.1238	-0.0037	-0.2797	0.1499	0.2563
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Jul	Person's r	0.0759	0.1234	0.0684	-0.0691	-0.0959	-0.0960	-0.0369	0.0496	0.0637	-0.0370	0.0356	-0.1208	0.1132	0.1775
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Aug	Person's r	-0.2913	-0.1996	0.2556	-0.2394	-0.1309	-0.2068	-0.3012	-0.3424	-0.3456	-0.3013	-0.3452	-0.0667	-0.2725	-0.2418
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Sep	Person's r	0.4036	0.4819	0.0342	-0.0544	-0.2225	-0.1347	0.1048	0.3017	0.3639	0.1046	0.2749	-0.1940	0.4351	0.4000
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Oct	Person's r	-0.2474	-0.1808	0.2507	-0.2466	-0.1753	-0.2161	-0.2562	-0.2511	-0.2639	-0.2565	-0.2628	-0.1195	-0.1849	-0.1344
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Nov	Person's r	0.1691	0.1966	0.0849	-0.0901	-0.1988	-0.1388	0.0451	0.1982	0.2010	0.0448	0.1695	-0.1477	0.2939	0.2479
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Dec	Person's r	-0.1915	-0.1613	0.0703	-0.0788	0.0083	-0.0460	-0.1474	-0.2069	-0.2155	-0.1475	-0.2001	0.0193	-0.2034	-0.1759
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	0.0478	0.2592	0.3876	-0.3884	-0.4183	-0.4162	-0.3001	-0.1459	-0.0760	-0.3004	-0.1757	-0.3177	0.0758	0.1194
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	DJF	Person's r	-0.3703	-0.2567	0.3348	-0.3389	-0.2314	-0.2912	-0.3689	-0.3984	-0.3918	-0.3691	-0.4039	-0.0748	-0.2954	-0.3001
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	MAM	Person's r	0.0201	0.1664	0.2654	-0.2702	-0.2854	-0.2686	-0.2068	-0.1542	-0.1066	-0.2067	-0.1668	-0.1227	-0.0159	-0.0867
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	JJA	Person's r	-0.0025	0.1379	0.2551	-0.2483	-0.2447	-0.2693	-0.2219	-0.1163	-0.0703	-0.2223	-0.1356	-0.2496	0.0240	0.1318
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	SON	Person's r	0.2630	0.3594	0.1620	-0.1773	-0.3148	-0.2432	-0.0107	0.1970	0.2390	-0.0110	0.1611	-0.2508	0.3605	0.3376
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
Precipitation CRU TS 2.1	Jan	Person's r	-0.1456	-0.1320	0.0904	-0.0828	-0.0358	-0.0494	-0.1006	-0.1477	-0.1588	-0.1002	-0.1436	0.0412	-0.1464	-0.1761
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Feb	Person's r	0.0950	0.1630	0.0884	-0.0898	-0.1482	-0.1271	-0.0411	0.0677	0.1234	-0.0414	0.0571	-0.1637	0.1461	0.2196
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Mar	Person's r	-0.1568	-0.1041	0.0988	-0.0921	-0.0037	-0.0766	-0.1844	-0.1560	-0.1200	-0.1843	-0.1535	-0.2730	-0.1451	0.1535
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Apr	Person's r	-0.0648	-0.0873	-0.0445	0.0505	0.0841	0.0714	0.0073	-0.0642	-0.0620	0.0075	-0.0492	0.1272	-0.1132	-0.1670
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	May	Person's r	-0.1509	-0.1089	0.0840	-0.0818	0.0011	-0.0422	-0.1521	-0.2169	-0.2043	-0.1521	-0.2052	0.0252	-0.2293	-0.1721
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Jun	Person's r	0.0240	0.0792	0.1532	-0.1491	-0.1834	-0.1462	-0.0677	-0.0532	-0.0656	-0.0678	-0.0674	0.0121	0.0291	-0.1291
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Jul	Person's r	0.0930	0.0943	-0.0450	0.0349	0.0064	0.0085	0.0433	0.1176	0.1283	0.0431	0.1106	-0.1092	0.1253	0.2391
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Aug	Person's r	-0.3831	-0.2795	0.3188	-0.2963	-0.1598	-0.2484	-0.3740	-0.4185	-0.4182	-0.3741	-0.4205	-0.1090	-0.3477	-0.2596
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Sep	Person's r	0.3485	0.3582	-0.0343	0.0226	-0.1568	-0.0363	0.1991	0.3177	0.3435	0.1987	0.2995	0.0304	0.3946	0.1879
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Oct	Person's r	-0.4500	-0.4180	0.2195	-0.2064	-0.0437	-0.1403	-0.3206	-0.3778	-0.3978	-0.3207	-0.3745	-0.1427	-0.3842	-0.1693
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Nov	Person's r	0.0786	0.0593	0.0252	-0.0239	-0.0941	-0.0529	0.0634	0.1716	0.1610	0.0633	0.1527	-0.1120	0.2070	0.2022
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Dec	Person's r	-0.1888	-0.2696	-0.1406	0.1428	0.2503	0.1774	0.0153	-0.0992	-0.1521	0.0155	-0.0818	0.1218	-0.2107	-0.1362
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	Annual Mean	Person's r	-0.2449	-0.1569	0.2415	-0.2313	-0.1401	-0.1907	-0.2758	-0.3003	-0.2919	-0.2761	-0.3014	-0.0781	-0.2473	-0.1792
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	DJF	Person's r	-0.0962	-0.0788	0.0393	-0.0356	-0.0016	-0.0303	-0.0734	-0.0713	-0.0607	-0.0734	-0.0683	-0.0445	-0.0679	0.0152
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	MAM	Person's r	-0.1669	-0.1287	0.0759	-0.0721	0.0193	-0.0293	-0.1541	-0.2285	-0.2136	-0.1541	-0.2140	0.0320	-0.2501	-0.1870
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	JJA	Person's r	-0.1660	-0.0744	0.2493	-0.2388	-0.1916	-0.2218	-0.2350	-0.2178	-0.2194	-0.2352	-0.2302	-0.1085	-0.1273	-0.1097
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69
	SON	Person's r	-0.1189	-0.0966	0.1651	-0.1610	-0.1678	-0.1559	-0.1099	-0.0378	-0.0434	-0.1102	-0.0542	-0.1457	0.0177	0.0658
		N	69	69	69	69	69	69	69	69	69	69	69	69	69	69

A15 Correlation matrix of Laguna del Inca. 5-year filtered data

			Spectrolino							
			RABD610;620	R590/640	RABD510	RABD510	RABD480	chlorin	RABD720	R570/630
Temperature CRU TS 2.1	Jan	Person's r	0.1569	-0.5702	0.0697	-0.0544	0.3534	-0.5164	0.1071	-0.5167
		N	67	67	67	67	67	67	67	67
	Feb	Person's r	0.2741	-0.4835	-0.0314	-0.1399	0.3069	-0.4785	0.1088	-0.3892
		N	67	67	67	67	67	67	67	67
	Mar	Person's r	0.4057	-0.2812	-0.2640	-0.3773	0.0602	-0.2907	0.0114	-0.1667
		N	67	67	67	67	67	67	67	67
	Apr	Person's r	0.3533	-0.0016	-0.2744	-0.3137	-0.0857	0.0214	-0.0860	0.0972
		N	67	67	67	67	67	67	67	67
	May	Person's r	0.0435	-0.3069	0.0760	0.0300	0.3161	-0.3425	0.1706	-0.2545
		N	67	67	67	67	67	67	67	67
	Jun	Person's r	0.0725	-0.0457	-0.2074	-0.2937	-0.0892	-0.0485	0.2296	0.0002
		N	67	67	67	67	67	67	67	67
	Jul	Person's r	0.2774	-0.0038	-0.2350	-0.2032	-0.1131	0.0666	0.1915	0.0596
		N	67	67	67	67	67	67	67	67
	Aug	Person's r	0.2042	0.1173	-0.1743	-0.1294	-0.0316	-0.0115	-0.0805	0.1600
		N	67	67	67	67	67	67	67	67
	Sep	Person's r	0.2038	0.0774	-0.3700	-0.3504	-0.1869	0.1810	0.3213	0.1425
		N	67	67	67	67	67	67	67	67
	Oct	Person's r	0.4097	-0.0993	-0.3560	-0.3723	-0.1213	0.0262	0.2123	-0.0008
		N	67	67	67	67	67	67	67	67
	Nov	Person's r	0.5195	-0.5329	-0.1411	-0.3055	0.2312	-0.4764	0.1225	-0.4078
		N	67	67	67	67	67	67	67	67
	Dec	Person's r	0.3697	-0.5675	-0.0339	-0.1562	0.3427	-0.5477	0.2658	-0.4779
		N	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	0.3902	-0.3494	-0.2178	-0.3107	0.1355	-0.3118	0.1929	-0.2374
		N	67	67	67	67	67	67	67	67
	DJF	Person's r	0.2879	-0.5795	0.0003	-0.1266	0.3587	-0.5520	0.1717	-0.4939
		N	67	67	67	67	67	67	67	67
	MAM	Person's r	0.3279	-0.2578	-0.1852	-0.2699	0.1303	-0.2690	0.0467	-0.1487
		N	67	67	67	67	67	67	67	67
	JJA	Person's r	0.2479	0.0248	-0.2864	-0.2979	-0.1100	-0.0006	0.1695	0.0950
		N	67	67	67	67	67	67	67	67
	SON	Person's r	0.4735	-0.2412	-0.3525	-0.4226	-0.0231	-0.1245	0.2660	-0.1211
		N	67	67	67	67	67	67	67	67
Temperature HadCRUT3	Jan	Person's r	0.5256	-0.4972	-0.1102	-0.2188	0.2943	-0.3500	0.1616	-0.3890
		N	67	67	67	67	67	67	67	67
	Feb	Person's r	0.3834	-0.2515	-0.3216	-0.4005	0.0544	-0.2507	0.4212	-0.1381
		N	67	67	67	67	67	67	67	67
	Mar	Person's r	0.6017	-0.3352	-0.1438	-0.2052	0.1952	-0.2542	0.0599	-0.2132
		N	67	67	67	67	67	67	67	67
	Apr	Person's r	0.2499	-0.2751	-0.1652	-0.2611	0.1366	-0.1998	0.3047	-0.1671
		N	67	67	67	67	67	67	67	67
	May	Person's r	0.0660	-0.2878	0.0917	0.0593	0.3482	-0.2868	0.2448	-0.2312
		N	67	67	67	67	67	67	67	67
	Jun	Person's r	0.0804	-0.3923	-0.0133	-0.1480	0.2869	-0.3827	0.3899	-0.3225
		N	67	67	67	67	67	67	67	67
	Jul	Person's r	0.3973	-0.4159	-0.1025	-0.1597	0.2076	-0.2617	0.3587	-0.3349
		N	67	67	67	67	67	67	67	67
	Aug	Person's r	0.3916	-0.2668	-0.2079	-0.2510	0.0567	-0.2150	0.3207	-0.1622
		N	67	67	67	67	67	67	67	67
	Sep	Person's r	0.1823	0.0016	-0.3361	-0.3326	-0.1770	0.1699	0.4519	0.0729
		N	67	67	67	67	67	67	67	67
	Oct	Person's r	0.3236	-0.1765	-0.3183	-0.3465	-0.0724	0.0011	0.5994	-0.0891
		N	67	67	67	67	67	67	67	67
	Nov	Person's r	0.5349	-0.5139	-0.2088	-0.3464	0.1757	-0.4092	0.2954	-0.4054
		N	67	67	67	67	67	67	67	67
	Dec	Person's r	0.4616	-0.3527	-0.2449	-0.3065	0.1674	-0.2596	0.3972	-0.2196
		N	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	0.4362	-0.4048	-0.2176	-0.3085	0.1854	-0.2946	0.4350	-0.2818
		N	67	67	67	67	67	67	67	67
	DJF	Person's r	0.5215	-0.4122	-0.2728	-0.3681	0.1861	-0.3279	0.3908	-0.2754
		N	67	67	67	67	67	67	67	67
	MAM	Person's r	0.3477	-0.3666	-0.0700	-0.1442	0.2927	-0.3081	0.2549	-0.2537
		N	67	67	67	67	67	67	67	67
	JJA	Person's r	0.3155	-0.4270	-0.1090	-0.2059	0.2318	-0.3433	0.4176	-0.3315
		N	67	67	67	67	67	67	67	67
	SON	Person's r	0.4055	-0.2691	-0.3358	-0.4001	-0.0279	-0.0948	0.5150	-0.1649
		N	67	67	67	67	67	67	67	67
SOI		Person's r	0.2862	-0.3322	0.0150	-0.0850	0.1886	-0.3425	0.0707	-0.2981
		N	64	64	64	64	64	64	64	64
El Niño 3		Person's r	-0.2770	0.4804	0.0387	0.1846	-0.2257	0.4779	-0.2524	0.4467
		N	65	65	65	65	65	65	65	65
SAB		Person's r	-0.1606	0.1087	-0.1039	-0.0344	-0.1523	0.1049	0.1963	0.0837
		N	61	61	61	61	61	61	61	61

A15 (continued) Correlation matrix of Laguna del Inca. 5-year filtered data

			Spectrolino							
			RABD610;620	R590/640	RABD510	RABD510	RABD480	chlorin	RABD720	R570/630
Precipitation HadCRUT3	Jan	Person's r	-0.2576	0.3069	-0.2273	-0.2895	-0.2641	0.1544	0.0028	0.3196
		N	67	67	67	67	67	67	67	67
	Feb	Person's r	-0.0684	0.2516	-0.3507	-0.2985	-0.3766	0.3955	0.3589	0.2824
		N	67	67	67	67	67	67	67	67
	Mar	Person's r	0.4805	-0.0038	-0.3538	-0.3237	-0.2513	0.0472	0.1296	0.0991
		N	67	67	67	67	67	67	67	67
	Apr	Person's r	-0.0079	0.0777	-0.1208	-0.1511	0.0576	-0.0077	0.1955	0.1318
		N	67	67	67	67	67	67	67	67
	May	Person's r	-0.0795	0.4445	-0.2333	-0.1577	-0.2442	0.3212	0.1519	0.4691
		N	67	67	67	67	67	67	67	67
	Jun	Person's r	-0.1648	0.5264	-0.1150	0.0110	-0.4566	0.5757	-0.2888	0.4582
		N	67	67	67	67	67	67	67	67
	Jul	Person's r	0.0889	0.0515	-0.0690	-0.0064	-0.0928	0.1545	-0.0857	0.0561
		N	67	67	67	67	67	67	67	67
	Aug	Person's r	-0.1326	0.0833	-0.1485	-0.1642	-0.2254	0.1815	-0.0751	0.1143
		N	67	67	67	67	67	67	67	67
	Sep	Person's r	0.0145	0.2324	0.1114	0.2205	0.0053	0.1598	-0.3391	0.2162
		N	67	67	67	67	67	67	67	67
	Oct	Person's r	-0.4107	0.3018	-0.0337	0.0751	-0.3255	0.3844	0.3144	0.2306
		N	67	67	67	67	67	67	67	67
	Nov	Person's r	-0.1054	-0.0046	0.1372	0.1650	0.1695	-0.0202	0.2671	-0.0078
		N	67	67	67	67	67	67	67	67
	Dec	Person's r	0.0589	0.0637	-0.2742	-0.2968	-0.2568	0.0503	0.1284	0.1333
		N	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	-0.1453	0.5757	-0.2738	-0.1385	-0.4642	0.5950	-0.0557	0.5803
		N	67	67	67	67	67	67	67	67
	DJF	Person's r	-0.1143	0.2930	-0.4279	-0.4473	-0.4459	0.2779	0.2387	0.3549
		N	67	67	67	67	67	67	67	67
	MAM	Person's r	-0.0361	0.4266	-0.2719	-0.2072	-0.2309	0.2971	0.1969	0.4705
		N	67	67	67	67	67	67	67	67
	JJA	Person's r	-0.0968	0.3353	-0.1651	-0.0738	-0.3879	0.4621	-0.2289	0.3173
		N	67	67	67	67	67	67	67	67
	SON	Person's r	-0.2003	0.2889	0.1247	0.2596	-0.0569	0.2633	-0.0060	0.2470
		N	67	67	67	67	67	67	67	67
Precipitation CRU TS 2.1	Jan	Person's r	0.3781	-0.1350	-0.2527	-0.3155	-0.1303	-0.1092	-0.0779	-0.0263
		N	67	67	67	67	67	67	67	67
	Feb	Person's r	-0.0138	0.1862	-0.4216	-0.5326	-0.2777	0.0921	0.3799	0.2410
		N	67	67	67	67	67	67	67	67
	Mar	Person's r	0.4190	-0.0470	-0.2203	-0.2167	-0.0778	0.0135	-0.2432	0.0131
		N	67	67	67	67	67	67	67	67
	Apr	Person's r	0.0689	-0.1495	-0.1317	-0.2084	0.2039	-0.1858	0.3832	-0.0890
		N	67	67	67	67	67	67	67	67
	May	Person's r	0.1181	0.0007	-0.2511	-0.2782	-0.0977	-0.0433	0.5611	0.0677
		N	67	67	67	67	67	67	67	67
	Jun	Person's r	-0.1098	0.1811	-0.1442	-0.1132	-0.2645	0.2549	0.1067	0.1708
		N	67	67	67	67	67	67	67	67
	Jul	Person's r	-0.2233	0.1197	-0.0866	-0.0897	-0.1204	0.1705	0.1343	0.0937
		N	67	67	67	67	67	67	67	67
	Aug	Person's r	-0.0439	-0.0194	-0.1982	-0.2833	-0.1431	0.0392	-0.0515	0.0177
		N	67	67	67	67	67	67	67	67
	Sep	Person's r	-0.2963	0.2748	-0.1338	-0.1142	-0.1907	0.1809	0.2626	0.2502
		N	67	67	67	67	67	67	67	67
	Oct	Person's r	-0.0220	0.1240	-0.3264	-0.2742	-0.3494	0.2627	0.4022	0.1226
		N	67	67	67	67	67	67	67	67
	Nov	Person's r	-0.0039	0.0517	-0.1745	-0.1687	-0.0692	0.1244	0.3405	0.0739
		N	67	67	67	67	67	67	67	67
	Dec	Person's r	-0.0903	-0.2016	0.1468	0.1350	0.1032	-0.1604	-0.2230	-0.2151
		N	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	-0.0259	0.0923	-0.3484	-0.3846	-0.2423	0.1254	0.4712	0.1425
		N	67	67	67	67	67	67	67	67
	DJF	Person's r	0.1186	-0.0164	-0.3721	-0.4949	-0.2278	-0.0584	0.1343	0.0715
		N	67	67	67	67	67	67	67	67
	MAM	Person's r	0.1483	-0.0339	-0.2682	-0.3086	-0.0497	-0.0774	0.5710	0.0433
		N	67	67	67	67	67	67	67	67
	JJA	Person's r	-0.1588	0.1254	-0.2083	-0.2382	-0.2534	0.2121	0.0744	0.1304
		N	67	67	67	67	67	67	67	67
	SON	Person's r	-0.1778	0.2575	-0.3692	-0.3179	-0.3819	0.3335	0.5504	0.2507
		N	67	67	67	67	67	67	67	67

A15 (continued) Correlation matrix of Laguna del Inca. 5-year filtered data

			Bsi					C, N und C/N				
			Si µg/g	Bsi µg/g	Bsi Flux	Fe µg/g	Al µg/g	N %	TOC %	TOC/N	TOC Flux	N Flux
Temperature CRU TS 2.1	Jan	Person's r	-0.1937	-0.8516	-0.6210	-0.1937	-0.5400	-0.7425	-0.7676	0.1369	-0.4256	-0.3927
		N	67	67	67	67	67	67	67	67	67	67
	Feb	Person's r	-0.1619	-0.7283	-0.6180	-0.1619	-0.3572	-0.6482	-0.6891	0.1264	-0.4973	-0.4971
		N	67	67	67	67	67	67	67	67	67	67
	Mar	Person's r	0.1598	-0.3787	-0.2750	0.1598	0.0374	-0.4302	-0.4901	0.0323	-0.1957	-0.2328
		N	67	67	67	67	67	67	67	67	67	67
	Apr	Person's r	0.3895	-0.0181	-0.1720	0.3895	0.3291	0.1535	-0.0025	-0.3659	-0.0766	-0.2446
		N	67	67	67	67	67	67	67	67	67	67
	May	Person's r	0.0823	-0.5075	-0.5130	0.0823	-0.1359	-0.3466	-0.3428	0.1170	-0.3626	-0.3299
		N	67	67	67	67	67	67	67	67	67	67
	Jun	Person's r	-0.1165	-0.3050	-0.0990	-0.1165	-0.2440	-0.3355	-0.4950	-0.2851	0.0335	-0.0874
		N	67	67	67	67	67	67	67	67	67	67
	Jul	Person's r	0.0350	-0.2326	-0.3430	0.0350	-0.0724	0.0575	-0.0551	-0.2837	-0.2463	-0.3488
		N	67	67	67	67	67	67	67	67	67	67
	Aug	Person's r	0.0380	0.0690	0.0050	0.0380	0.2396	0.0035	-0.0188	0.0442	-0.1203	-0.1500
		N	67	67	67	67	67	67	67	67	67	67
	Sep	Person's r	-0.2213	-0.3362	-0.3690	-0.2213	-0.1736	-0.2801	-0.3448	-0.0495	-0.4327	-0.4750
		N	67	67	67	67	67	67	67	67	67	67
	Oct	Person's r	0.1235	-0.3931	-0.3970	0.1235	-0.1142	-0.0870	-0.2097	-0.2767	-0.2135	-0.3035
		N	67	67	67	67	67	67	67	67	67	67
	Nov	Person's r	-0.1488	-0.5954	-0.5030	-0.1488	-0.2871	-0.5170	-0.4929	0.2211	-0.3330	-0.2767
		N	67	67	67	67	67	67	67	67	67	67
	Dec	Person's r	-0.0400	-0.7524	-0.6840	-0.0400	-0.3272	-0.5443	-0.5133	0.2564	-0.3953	-0.3176
		N	67	67	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	-0.0239	-0.6279	-0.5650	-0.0239	-0.2253	-0.4744	-0.5508	-0.0150	-0.3984	-0.4352
		N	67	67	67	67	67	67	67	67	67	67
	DJF	Person's r	-0.1422	-0.8343	-0.6890	-0.1422	-0.4368	-0.6931	-0.7063	0.1854	-0.4741	-0.4352
		N	67	67	67	67	67	67	67	67	67	67
	MAM	Person's r	0.2452	-0.3926	-0.4060	0.2452	0.0762	-0.2874	-0.3682	-0.0655	-0.2690	-0.3315
		N	67	67	67	67	67	67	67	67	67	67
	JJA	Person's r	-0.0287	-0.2318	-0.2030	-0.0287	-0.0562	-0.1472	-0.2895	-0.2547	-0.1432	-0.2641
		N	67	67	67	67	67	67	67	67	67	67
	SON	Person's r	-0.0993	-0.5510	-0.5250	-0.0993	-0.2390	-0.3685	-0.4341	-0.0383	-0.4008	-0.4302
		N	67	67	67	67	67	67	67	67	67	67
Temperature HadCRUT3	Jan	Person's r	-0.1212	-0.4640	-0.6669	-0.1212	-0.2615	-0.3882	-0.2735	0.4396	-0.5693	-0.4347
		N	67	67	67	67	67	67	67	67	67	67
	Feb	Person's r	-0.2664	-0.5383	-0.6352	-0.2664	-0.4047	-0.5419	-0.5898	0.0998	-0.3702	-0.3636
		N	67	67	67	67	67	67	67	67	67	67
	Mar	Person's r	0.0006	-0.2091	-0.2591	0.0006	-0.0029	-0.0485	0.0045	0.2077	-0.3884	-0.3338
		N	67	67	67	67	67	67	67	67	67	67
	Apr	Person's r	0.2021	-0.2305	-0.1278	0.2021	-0.0319	-0.1545	-0.2356	-0.0779	-0.3246	-0.3871
		N	67	67	67	67	67	67	67	67	67	67
	May	Person's r	0.0475	-0.4127	-0.5112	0.0475	-0.1701	-0.2046	-0.2153	0.0653	-0.3995	-0.3861
		N	67	67	67	67	67	67	67	67	67	67
	Jun	Person's r	-0.3162	-0.6628	-0.1045	-0.3162	-0.5296	-0.6797	-0.7123	0.1367	-0.3980	-0.3768
		N	67	67	67	67	67	67	67	67	67	67
	Jul	Person's r	-0.0952	-0.5469	-0.3605	-0.0952	-0.3803	-0.3100	-0.2851	0.1710	-0.5477	-0.4876
		N	67	67	67	67	67	67	67	67	67	67
	Aug	Person's r	0.1220	-0.4115	-0.0016	0.1220	-0.0786	-0.2686	-0.2875	0.0817	-0.4080	-0.3853
		N	67	67	67	67	67	67	67	67	67	67
	Sep	Person's r	-0.0099	-0.2810	-0.3890	-0.0099	-0.1217	-0.2083	-0.2567	-0.0178	-0.4246	-0.4458
		N	67	67	67	67	67	67	67	67	67	67
	Oct	Person's r	0.0014	-0.3939	-0.4267	0.0014	-0.2589	-0.2009	-0.1892	0.0923	-0.3659	-0.3159
		N	67	67	67	67	67	67	67	67	67	67
	Nov	Person's r	-0.3254	-0.6479	-0.5004	-0.3254	-0.4781	-0.7120	-0.5653	0.5585	-0.4500	-0.2488
		N	67	67	67	67	67	67	67	67	67	67
	Dec	Person's r	-0.1476	-0.4998	-0.6645	-0.1476	-0.2728	-0.3689	-0.3124	0.2938	-0.4776	-0.3845
		N	67	67	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	-0.1150	-0.5830	-0.5709	-0.1150	-0.3405	-0.4578	-0.4421	0.2190	-0.5513	-0.4907
		N	67	67	67	67	67	67	67	67	67	67
	DJF	Person's r	-0.2162	-0.5847	-0.7044	-0.2162	-0.3725	-0.5131	-0.4752	0.3022	-0.5362	-0.4534
		N	67	67	67	67	67	67	67	67	67	67
	MAM	Person's r	0.0986	-0.3642	-0.3786	0.0986	-0.0958	-0.1751	-0.1909	0.0796	-0.4591	-0.4556
		N	67	67	67	67	67	67	67	67	67	67
	JJA	Person's r	-0.1462	-0.6450	-0.2146	-0.1462	-0.4191	-0.5122	-0.5220	0.1564	-0.5255	-0.4844
		N	67	67	67	67	67	67	67	67	67	67
	SON	Person's r	-0.1371	-0.5175	-0.5444	-0.1371	-0.3347	-0.4480	-0.4046	0.2523	-0.4883	-0.3982
		N	67	67	67	67	67	67	67	67	67	67
SOI		Person's r	-0.2212	-0.1089	0.0180	-0.2212	-0.1376	-0.2903	-0.1250	0.5302	0.0167	0.2021
		N	64	64	64	64	64	64	64	64	64	64
El Niño 3		Person's r	0.2930	0.4915	0.2440	0.2930	0.4153	0.5933	0.4764	-0.4819	0.0909	-0.0702
		N	65	65	65	65	65	65	65	65	65	65
SAB		Person's r	-0.0811	-0.1058	-0.0210	-0.0811	-0.1873	-0.2314	-0.2604	-0.0019	-0.0778	-0.0799
		N	61	61	61	61	61	61	61	61	61	61

A15 (continued) Correlation matrix of Laguna del Inca. 5-year filtered data

			Bsi					C, N und C/N				
			Si µg/g	Bsi µg/g	Bsi Flux	Fe µg/g	Al µg/g	N %	TOC %	TOC/N	TOC Flux	N Flux
Precipitation HadCRUT3	Jan	Person's r	0.1364	0.2043	0.4600	0.1364	0.2591	-0.0288	-0.2289	-0.4651	0.4699	0.2600
		N	67	67	67	67	67	67	67	67	67	67
	Feb	Person's r	0.0480	-0.1584	-0.1990	0.0480	0.0109	-0.0399	-0.1715	-0.3156	-0.1841	-0.2967
		N	67	67	67	67	67	67	67	67	67	67
	Mar	Person's r	0.2507	-0.1345	-0.2050	0.2507	0.2499	0.1053	0.1468	0.0634	-0.0550	-0.0018
		N	67	67	67	67	67	67	67	67	67	67
	Apr	Person's r	0.3037	0.1005	-0.0140	0.3037	0.2550	0.0418	-0.0656	-0.1529	-0.1751	-0.2879
		N	67	67	67	67	67	67	67	67	67	67
	May	Person's r	0.0098	0.4217	0.3190	0.0098	0.3816	0.1388	0.1907	0.1348	-0.0230	0.0089
		N	67	67	67	67	67	67	67	67	67	67
	Jun	Person's r	0.2749	0.6221	0.4800	0.2749	0.4231	0.4675	0.4127	-0.2735	0.1897	0.0897
		N	67	67	67	67	67	67	67	67	67	67
	Jul	Person's r	-0.0679	0.0097	-0.0360	-0.0679	-0.1988	0.0716	0.0316	-0.1568	-0.0396	-0.0681
		N	67	67	67	67	67	67	67	67	67	67
	Aug	Person's r	0.3521	-0.0138	0.0610	0.3521	0.1633	-0.1151	-0.2557	-0.3269	0.0066	-0.1331
		N	67	67	67	67	67	67	67	67	67	67
	Sep	Person's r	0.0756	0.5396	0.3200	0.0756	0.3069	0.5402	0.5464	-0.0709	0.1458	0.1075
		N	67	67	67	67	67	67	67	67	67	67
	Oct	Person's r	-0.1054	-0.0283	-0.0020	-0.1054	-0.1361	0.0069	-0.0155	-0.1326	0.0088	-0.0034
		N	67	67	67	67	67	67	67	67	67	67
	Nov	Person's r	-0.2122	0.0440	-0.0450	-0.2122	-0.2635	0.2496	0.2192	-0.1492	0.0646	0.0310
		N	67	67	67	67	67	67	67	67	67	67
	Dec	Person's r	0.2013	-0.0265	0.0970	0.2013	0.1832	-0.0899	-0.1543	-0.1550	0.1417	0.0994
		N	67	67	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	0.2559	0.5556	0.4050	0.2559	0.4063	0.3606	0.2720	-0.3005	0.0651	-0.0522
		N	67	67	67	67	67	67	67	67	67	67
	DJF	Person's r	0.2069	0.0085	0.1840	0.2069	0.2365	-0.0857	-0.2762	-0.4504	0.2226	0.0494
		N	67	67	67	67	67	67	67	67	67	67
	MAM	Person's r	0.1020	0.4006	0.2730	0.1020	0.4319	0.1460	0.1713	0.0924	-0.0675	-0.0610
		N	67	67	67	67	67	67	67	67	67	67
	JJA	Person's r	0.2660	0.3163	0.2540	0.2660	0.1828	0.2245	0.1097	-0.3764	0.0782	-0.0530
		N	67	67	67	67	67	67	67	67	67	67
	SON	Person's r	-0.0771	0.3982	0.2120	-0.0771	0.0565	0.4993	0.4818	-0.1678	0.1364	0.0896
		N	67	67	67	67	67	67	67	67	67	67
Precipitation CRU TS 2.1	Jan	Person's r	0.4671	-0.0847	-0.0560	0.4671	0.4092	-0.0588	0.0128	0.1533	0.1394	0.2102
		N	67	67	67	67	67	67	67	67	67	67
	Feb	Person's r	-0.0173	0.1213	0.3480	-0.0173	0.0336	-0.1494	-0.2530	-0.1921	0.3721	0.2807
		N	67	67	67	67	67	67	67	67	67	67
	Mar	Person's r	0.2939	-0.0158	-0.1000	0.2939	0.1367	0.0651	0.0400	-0.0683	0.0029	-0.0294
		N	67	67	67	67	67	67	67	67	67	67
	Apr	Person's r	-0.2227	-0.2018	-0.2920	-0.2227	-0.1366	-0.3654	-0.3121	0.3297	-0.3899	-0.3238
		N	67	67	67	67	67	67	67	67	67	67
	May	Person's r	-0.1407	-0.1034	-0.0720	-0.1407	-0.0163	-0.2287	-0.1770	0.2495	-0.1907	-0.1251
		N	67	67	67	67	67	67	67	67	67	67
	Jun	Person's r	0.2674	0.2184	0.1730	0.2674	0.2634	0.1991	0.2778	0.0850	0.3043	0.3648
		N	67	67	67	67	67	67	67	67	67	67
	Jul	Person's r	0.1432	0.0865	0.0970	0.1432	-0.0068	0.0553	-0.0478	-0.2502	0.0111	-0.1026
		N	67	67	67	67	67	67	67	67	67	67
	Aug	Person's r	0.1416	-0.2001	-0.0230	0.1416	0.0328	-0.2121	-0.3535	-0.3102	0.2122	0.0817
		N	67	67	67	67	67	67	67	67	67	67
	Sep	Person's r	0.0505	0.3370	0.3420	0.0505	0.2561	-0.0389	-0.0064	0.1730	0.0975	0.1146
		N	67	67	67	67	67	67	67	67	67	67
	Oct	Person's r	-0.0916	-0.2516	-0.0580	-0.0916	-0.2121	-0.2014	-0.1956	0.0208	-0.0403	0.0053
		N	67	67	67	67	67	67	67	67	67	67
	Nov	Person's r	0.0713	-0.0157	-0.1350	0.0713	-0.0220	0.1008	0.0732	-0.0880	-0.0358	-0.0673
		N	67	67	67	67	67	67	67	67	67	67
	Dec	Person's r	0.2925	-0.2629	-0.1200	0.2925	0.0504	-0.0471	-0.0965	-0.1486	-0.0559	-0.0957
		N	67	67	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	0.0643	-0.0638	0.0000	0.0643	0.0674	-0.1867	-0.1945	0.0595	0.0150	0.0159
		N	67	67	67	67	67	67	67	67	67	67
	DJF	Person's r	0.3530	-0.0792	0.1970	0.3530	0.2454	-0.1694	-0.2483	-0.1700	0.3263	0.2620
		N	67	67	67	67	67	67	67	67	67	67
	MAM	Person's r	-0.1560	-0.1371	-0.1370	-0.1560	-0.0352	-0.2797	-0.2235	0.2901	-0.2556	-0.1847
		N	67	67	67	67	67	67	67	67	67	67
	JJA	Person's r	0.2618	0.0376	0.1270	0.2618	0.1497	0.0104	-0.0604	-0.2088	0.2711	0.1931
		N	67	67	67	67	67	67	67	67	67	67
	SON	Person's r	-0.0175	-0.0078	0.0780	-0.0175	-0.0260	-0.1332	-0.1215	0.0764	0.0089	0.0401
		N	67	67	67	67	67	67	67	67	67	67

A15 (continued) Correlation matrix of Laguna del Inca. 5-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec surf	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	-0.5976	-0.7979	-0.2173	0.2499	0.5155	0.3772	-0.0289	-0.3706	-0.4892	-0.0284	-0.3174	0.4462	-0.6768	-0.5997
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Feb	Person's r	-0.5434	-0.6851	-0.1508	0.1821	0.4345	0.3016	-0.0818	-0.3973	-0.4862	-0.0813	-0.3467	0.3955	-0.6532	-0.5713
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Mar	Person's r	-0.4744	-0.5247	-0.0464	0.0655	0.2911	0.1559	-0.1780	-0.3967	-0.4280	-0.1775	-0.3565	0.1417	-0.5572	-0.3686
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Apr	Person's r	-0.3287	-0.2001	0.3012	-0.2870	-0.1551	-0.2472	-0.3784	-0.3912	-0.3509	-0.3781	-0.3894	-0.2045	-0.3168	-0.1296
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	May	Person's r	-0.4733	-0.5477	0.0051	0.0107	0.1982	0.1083	-0.1479	-0.3704	-0.4507	-0.1472	-0.3426	0.2576	-0.5096	-0.5321
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Jun	Person's r	-0.4421	-0.3912	0.2316	-0.2220	-0.0828	-0.1643	-0.3155	-0.3989	-0.4105	-0.3155	-0.3917	0.0125	-0.3824	-0.3276
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Jul	Person's r	-0.3697	-0.2911	0.2343	-0.2206	-0.0666	-0.1633	-0.3347	-0.3809	-0.3757	-0.3347	-0.3756	-0.1275	-0.3657	-0.1488
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Aug	Person's r	-0.0488	-0.0228	0.0162	-0.0218	0.0097	-0.0022	-0.0582	-0.0876	-0.0640	-0.0580	-0.0782	-0.0105	-0.0938	-0.0450
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Sep	Person's r	-0.5712	-0.4663	0.3395	-0.3169	-0.0897	-0.2293	-0.4906	-0.5859	-0.5699	-0.4903	-0.5722	-0.1474	-0.5750	-0.3113
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Oct	Person's r	-0.6234	-0.5412	0.3054	-0.2808	-0.0245	-0.1913	-0.4918	-0.5782	-0.5710	-0.4915	-0.5637	-0.2197	-0.5930	-0.2143
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Nov	Person's r	-0.3898	-0.5179	-0.2160	0.2392	0.4545	0.3227	-0.0216	-0.2645	-0.3214	-0.0210	-0.2176	0.2557	-0.5069	-0.3037
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Dec	Person's r	-0.5185	-0.6977	-0.2200	0.2453	0.4829	0.3582	-0.0152	-0.3057	-0.4001	-0.0145	-0.2560	0.3367	-0.5894	-0.4512
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	-0.6455	-0.6945	0.0461	-0.0182	0.2624	0.1009	-0.2857	-0.5332	-0.5850	-0.2852	-0.4931	0.1581	-0.7020	-0.4878
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	DJF	Person's r	-0.5944	-0.7802	-0.2095	0.2415	0.5123	0.3704	-0.0462	-0.3858	-0.4936	-0.0457	-0.3308	0.4222	-0.6882	-0.5819
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	MAM	Person's r	-0.5316	-0.5403	0.0877	-0.0673	0.1610	0.0291	-0.2772	-0.4751	-0.5089	-0.2766	-0.4444	0.1006	-0.5804	-0.4378
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	JJA	Person's r	-0.4142	-0.3417	0.2309	-0.2223	-0.0684	-0.1586	-0.3369	-0.4133	-0.4069	-0.3369	-0.4032	-0.0545	-0.4007	-0.2553
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	SON	Person's r	-0.6491	-0.6295	0.1653	-0.1364	0.1513	-0.0291	-0.4040	-0.5819	-0.5973	-0.4036	-0.5503	-0.0379	-0.6885	-0.3412
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
Temperature HadCRUT3	Jan	Person's r	-0.1685	-0.2953	-0.2591	0.2886	0.4313	0.3420	0.0817	-0.0814	-0.1043	0.0823	-0.0398	0.1488	-0.3139	-0.0775
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Feb	Person's r	-0.5097	-0.5417	0.0476	-0.0273	0.1859	0.0596	-0.2369	-0.3989	-0.4288	-0.2367	-0.3694	0.0733	-0.5225	-0.2930
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Mar	Person's r	-0.0205	-0.0436	-0.0903	0.1034	0.1688	0.1214	0.0072	-0.0356	-0.0210	0.0078	-0.0176	0.0008	-0.1212	0.0488
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Apr	Person's r	-0.2207	-0.2259	0.0434	-0.0276	0.0670	0.0105	-0.1141	-0.1867	-0.1946	-0.1137	-0.1727	0.0544	-0.2359	-0.1798
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	May	Person's r	-0.3324	-0.3751	0.0559	-0.0404	0.0802	0.0256	-0.1260	-0.2603	-0.3188	-0.1254	-0.2465	0.1586	-0.3360	-0.3810
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Jun	Person's r	-0.5076	-0.5848	0.0138	0.0091	0.1977	0.1000	-0.1604	-0.3772	-0.4502	-0.1599	-0.3479	0.2803	-0.5198	-0.5162
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Jul	Person's r	-0.3206	-0.3994	-0.0754	0.1022	0.2653	0.1689	-0.0774	-0.2079	-0.2425	-0.0769	-0.1797	0.0721	-0.3728	-0.1352
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Aug	Person's r	-0.4109	-0.4578	-0.0134	0.0239	0.2114	0.1076	-0.1613	-0.3310	-0.3719	-0.1609	-0.3020	0.1196	-0.4635	-0.3077
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Sep	Person's r	-0.5275	-0.4089	0.3735	-0.3495	-0.1501	-0.2794	-0.4960	-0.5220	-0.4908	-0.4956	-0.5165	-0.2730	-0.4825	-0.1551
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Oct	Person's r	-0.4413	-0.4019	0.2244	-0.2012	-0.0371	-0.1408	-0.3297	-0.3546	-0.3569	-0.3293	-0.3488	-0.1977	-0.3739	-0.0714
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Nov	Person's r	-0.2884	-0.4551	-0.2824	0.3042	0.4700	0.3763	0.0835	-0.1352	-0.2027	0.0841	-0.0910	0.2951	-0.3964	-0.2309
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Dec	Person's r	-0.3789	-0.4149	0.0280	-0.0057	0.1666	0.0624	-0.1754	-0.2887	-0.3125	-0.1747	-0.2657	0.0132	-0.4014	-0.1778
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	-0.4559	-0.5082	0.0108	0.0160	0.2207	0.1010	-0.1880	-0.3508	-0.3869	-0.1874	-0.3203	0.0874	-0.4980	-0.2810
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	DJF	Person's r	-0.4268	-0.4978	-0.0568	0.0843	0.2925	0.1667	-0.1434	-0.3140	-0.3440	-0.1428	-0.2780	0.0891	-0.4906	-0.2243
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	MAM	Person's r	-0.2517	-0.2830	0.0100	0.0083	0.1264	0.0613	-0.1012	-0.2094	-0.2355	-0.1005	-0.1909	0.0978	-0.2963	-0.2345
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	JJA	Person's r	-0.4808	-0.5619	-0.0292	0.0537	0.2608	0.1466	-0.1510	-0.3520	-0.4111	-0.1505	-0.3187	0.1906	-0.5233	-0.3773
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	SON	Person's r	-0.4914	-0.4958	0.1190	-0.0920	0.1161	-0.0122	-0.2880	-0.3971	-0.4123	-0.2875	-0.3747	-0.0619	-0.4938	-0.1847
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
SOI		Person's r	0.2164	0.0351	-0.4739	0.4644	0.4236	0.4407	0.4034	0.3495	0.3200	0.4038	0.3756	0.1728	0.1364	0.1948
		N	64	64	64	64	64	64	64	64	64	64	64	64	64	64
El Niño 3		Person's r	0.1671	0.4045	0.4746	-0.4837	-0.5876	-0.5283	-0.2857	-0.0835	-0.0121	-0.2861	-0.1324	-0.2802	0.2415	0.0706
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
SAB		Person's r	-0.3163	-0.3095	0.0181	-0.0272	0.1026	0.0210	-0.1708	-0.2576	-0.2631	-0.1710	-0.2412	-0.0488	-0.3053	-0.1006
		N	61	61	61	61	61	61	61	61	61	61	61	61	61	61

A15 (continued) Correlation matrix of Laguna del Inca. 5-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec surf	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation HadCRUT3	Jan	Person's r	-0.0984	0.0083	0.2992	-0.3040	-0.3526	-0.3066	-0.1831	-0.1469	-0.1376	-0.1835	-0.1675	0.0188	0.0215	-0.2523
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Feb	Person's r	-0.6238	-0.4327	0.5813	-0.5637	-0.3622	-0.4882	-0.6594	-0.6510	-0.6150	-0.6592	-0.6606	-0.3566	-0.5111	-0.2501
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Mar	Person's r	-0.3939	-0.3317	0.1655	-0.1560	0.0384	-0.0906	-0.3359	-0.3901	-0.3747	-0.3356	-0.3764	-0.2427	-0.4170	-0.0306
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Apr	Person's r	-0.0436	0.0210	0.1683	-0.1615	-0.1863	-0.1547	-0.0998	-0.0962	-0.0781	-0.0996	-0.1014	0.0379	-0.0158	-0.1897
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	May	Person's r	0.1101	0.2767	0.2859	-0.2981	-0.3560	-0.3190	-0.1970	-0.0823	-0.0138	-0.1970	-0.1032	-0.2188	0.1002	0.0389
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Jun	Person's r	0.2716	0.4717	0.3033	-0.3076	-0.4292	-0.3771	-0.1638	0.0830	0.1911	-0.1644	0.0465	-0.4520	0.3222	0.4383
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Jul	Person's r	0.0122	0.0602	0.0806	-0.0797	-0.0746	-0.0964	-0.0810	-0.0166	-0.0028	-0.0813	-0.0272	-0.1355	0.0352	0.1450
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Aug	Person's r	-0.3381	-0.2391	0.2892	-0.2710	-0.1597	-0.2334	-0.3323	-0.3775	-0.3824	-0.3325	-0.3804	-0.0663	-0.3002	-0.2743
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Sep	Person's r	0.5360	0.6456	0.0449	-0.0668	-0.2760	-0.1689	0.1278	0.3706	0.4548	0.1276	0.3368	-0.2598	0.5523	0.5095
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Oct	Person's r	-0.2766	-0.1742	0.3655	-0.3605	-0.3102	-0.3344	-0.3261	-0.2739	-0.2818	-0.3265	-0.2966	-0.1915	-0.1491	-0.1149
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Nov	Person's r	0.1849	0.2268	0.1234	-0.1275	-0.2485	-0.1776	0.0288	0.1846	0.1904	0.0285	0.1526	-0.1339	0.3076	0.2063
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Dec	Person's r	-0.2704	-0.2492	0.0700	-0.0768	0.0434	-0.0275	-0.1763	-0.2775	-0.2963	-0.1764	-0.2649	0.0621	-0.2982	-0.2721
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	0.0766	0.3460	0.5077	-0.5107	-0.5738	-0.5541	-0.3784	-0.1574	-0.0589	-0.3788	-0.1989	-0.4539	0.1476	0.1988
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	DJF	Person's r	-0.4870	-0.3397	0.4397	-0.4382	-0.2983	-0.3760	-0.4850	-0.5259	-0.5171	-0.4852	-0.5321	-0.1119	-0.3981	-0.3935
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	MAM	Person's r	0.0588	0.2323	0.3163	-0.3252	-0.3685	-0.3375	-0.2321	-0.1302	-0.0617	-0.2320	-0.1496	-0.2116	0.0545	-0.0122
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	JJA	Person's r	-0.0111	0.1630	0.3325	-0.3258	-0.3336	-0.3531	-0.2816	-0.1413	-0.0808	-0.2820	-0.1671	-0.3354	0.0448	0.1760
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	SON	Person's r	0.3541	0.4926	0.2326	-0.2482	-0.4302	-0.3327	-0.0275	0.2351	0.2954	-0.0279	0.1880	-0.3222	0.4691	0.4094
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
Precipitation CRU TS 2.1	Jan	Person's r	-0.3347	-0.3315	0.0291	-0.0281	0.1341	0.0284	-0.1922	-0.3088	-0.3378	-0.1917	-0.2914	-0.0427	-0.3705	-0.1918
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Feb	Person's r	-0.1136	-0.0222	0.2309	-0.2386	-0.2622	-0.2486	-0.1768	-0.1087	-0.0828	-0.1770	-0.1242	-0.1112	0.0183	-0.0434
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Mar	Person's r	-0.2019	-0.1314	0.1124	-0.0974	0.0156	-0.0840	-0.2320	-0.2075	-0.1680	-0.2318	-0.2023	-0.3101	-0.1991	0.1893
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Apr	Person's r	-0.0723	-0.1408	-0.1253	0.1366	0.1783	0.1709	0.0739	-0.0367	-0.0444	0.0742	-0.0118	0.1984	-0.1497	-0.2008
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	May	Person's r	-0.2226	-0.2338	0.0192	-0.0098	0.0913	0.0371	-0.1109	-0.1832	-0.1860	-0.1109	-0.1670	-0.0282	-0.2489	-0.1128
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Jun	Person's r	-0.0892	-0.0203	0.1842	-0.1837	-0.1745	-0.1934	-0.1687	-0.0713	-0.0495	-0.1688	-0.0889	-0.3281	0.0165	0.1725
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Jul	Person's r	-0.1215	-0.0733	0.1254	-0.1116	-0.0801	-0.1081	-0.1337	-0.0934	-0.0601	-0.1342	-0.0957	-0.1703	-0.0597	0.0796
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Aug	Person's r	-0.4905	-0.4527	0.2200	-0.2032	-0.0364	-0.1376	-0.3242	-0.4328	-0.4464	-0.3242	-0.4216	-0.0163	-0.4360	-0.3633
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Sep	Person's r	0.1619	0.1876	0.0192	-0.0296	-0.1267	-0.0572	0.0673	0.1432	0.1786	0.0670	0.1342	-0.0657	0.2035	0.1075
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Oct	Person's r	-0.6019	-0.5261	0.2957	-0.2852	-0.0526	-0.2103	-0.4777	-0.5060	-0.4899	-0.4777	-0.4986	-0.3536	-0.5092	-0.0529
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Nov	Person's r	-0.0816	-0.0244	0.2365	-0.2230	-0.2442	-0.2261	-0.1460	-0.0493	-0.0360	-0.1459	-0.0695	-0.1775	0.0451	0.0475
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Dec	Person's r	-0.2720	-0.4063	-0.2082	0.2134	0.3516	0.2840	0.0650	-0.1610	-0.2419	0.0650	-0.1287	0.3414	-0.3491	-0.3976
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	Annual Mean	Person's r	-0.4029	-0.3591	0.1956	-0.1801	-0.0374	-0.1252	-0.2947	-0.3372	-0.3250	-0.2948	-0.3283	-0.1876	-0.3444	-0.1272
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	DJF	Person's r	-0.3842	-0.3767	0.0957	-0.0987	0.0280	-0.0439	-0.1990	-0.3173	-0.3530	-0.1989	-0.3053	0.0778	-0.3381	-0.3426
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	MAM	Person's r	-0.2286	-0.2485	-0.0016	0.0134	0.1205	0.0639	-0.0994	-0.1864	-0.1880	-0.0994	-0.1662	-0.0030	-0.2688	-0.1325
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	JJA	Person's r	-0.3462	-0.2738	0.2550	-0.2410	-0.1377	-0.2104	-0.3045	-0.2972	-0.2814	-0.3046	-0.3012	-0.2369	-0.2415	-0.0746
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67
	SON	Person's r	-0.3799	-0.2903	0.3093	-0.3026	-0.1926	-0.2639	-0.3638	-0.3101	-0.2746	-0.3639	-0.3165	-0.3542	-0.2465	0.0345
		N	67	67	67	67	67	67	67	67	67	67	67	67	67	67

A16 Correlation matrix of Laguna del Inca. 7-year filtered data

			Spectrolino							
			RABD610;620	R590/640	RABD510	RABD510	RABD480	chlorin	RABD720	R570/630
Temperature CRU TS 2.1	Jan	Person's r	0.1812	-0.6057	0.0823	-0.0521	0.3769	-0.5553	0.1967	-0.5447
		N	65	65	65	65	65	65	65	65
	Feb	Person's r	0.3333	-0.5227	-0.0329	-0.1620	0.3386	-0.5198	0.1636	-0.4180
		N	65	65	65	65	65	65	65	65
	Mar	Person's r	0.5259	-0.3278	-0.2962	-0.4401	0.0920	-0.3381	0.0650	-0.1956
		N	65	65	65	65	65	65	65	65
	Apr	Person's r	0.4270	-0.0132	-0.3117	-0.3659	-0.0849	0.0175	-0.0850	0.1010
		N	65	65	65	65	65	65	65	65
	May	Person's r	0.0706	-0.3666	0.1105	0.0533	0.3762	-0.3870	0.2437	-0.3063
		N	65	65	65	65	65	65	65	65
	Jun	Person's r	0.0741	-0.0343	-0.2645	-0.3662	-0.1018	-0.0459	0.3232	0.0155
		N	65	65	65	65	65	65	65	65
	Jul	Person's r	0.2928	-0.0123	-0.2656	-0.2531	-0.1167	0.0713	0.2577	0.0609
		N	65	65	65	65	65	65	65	65
	Aug	Person's r	0.3267	0.1102	-0.2529	-0.2284	-0.0434	-0.0150	0.0281	0.1835
		N	65	65	65	65	65	65	65	65
	Sep	Person's r	0.2336	0.0630	-0.4132	-0.4127	-0.1694	0.1592	0.4321	0.1379
		N	65	65	65	65	65	65	65	65
	Oct	Person's r	0.4194	-0.1053	-0.3791	-0.4071	-0.1392	0.0327	0.2689	-0.0012
		N	65	65	65	65	65	65	65	65
	Nov	Person's r	0.5622	-0.5675	-0.1095	-0.2866	0.2911	-0.5243	0.0719	-0.4414
		N	65	65	65	65	65	65	65	65
	Dec	Person's r	0.4018	-0.6242	0.0150	-0.1224	0.4011	-0.5911	0.2628	-0.5269
		N	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	0.4309	-0.3791	-0.2171	-0.3303	0.1650	-0.3394	0.2525	-0.2592
		N	65	65	65	65	65	65	65	65
	DJF	Person's r	0.3224	-0.6115	0.0204	-0.1199	0.3899	-0.5823	0.2167	-0.5187
		N	65	65	65	65	65	65	65	65
	MAM	Person's r	0.4193	-0.3061	-0.1992	-0.3078	0.1673	-0.3086	0.1005	-0.1808
		N	65	65	65	65	65	65	65	65
	JJA	Person's r	0.2983	0.0204	-0.3620	-0.4028	-0.1236	-0.0009	0.3000	0.1088
		N	65	65	65	65	65	65	65	65
	SON	Person's r	0.4903	-0.2591	-0.3484	-0.4344	0.0061	-0.1509	0.2958	-0.1369
		N	65	65	65	65	65	65	65	65
Temperature HadCRUT3	Jan	Person's r	0.6011	-0.5443	-0.0775	-0.1977	0.3513	-0.4009	0.2026	-0.4293
		N	65	65	65	65	65	65	65	65
	Feb	Person's r	0.3883	-0.2545	-0.3181	-0.4156	0.0641	-0.2510	0.4606	-0.1403
		N	65	65	65	65	65	65	65	65
	Mar	Person's r	0.6766	-0.3878	-0.1226	-0.2102	0.2531	-0.3019	0.0835	-0.2514
		N	65	65	65	65	65	65	65	65
	Apr	Person's r	0.2749	-0.3074	-0.1298	-0.2415	0.1876	-0.2317	0.2875	-0.1976
		N	65	65	65	65	65	65	65	65
	May	Person's r	0.0671	-0.3252	0.1339	0.0984	0.3925	-0.3101	0.3246	-0.2655
		N	65	65	65	65	65	65	65	65
	Jun	Person's r	0.0858	-0.4085	-0.0061	-0.1470	0.3288	-0.4077	0.4481	-0.3401
		N	65	65	65	65	65	65	65	65
	Jul	Person's r	0.4104	-0.4671	-0.0613	-0.1393	0.2712	-0.3035	0.4054	-0.3825
		N	65	65	65	65	65	65	65	65
	Aug	Person's r	0.4599	-0.3254	-0.2260	-0.2916	0.0972	-0.2631	0.4166	-0.2059
		N	65	65	65	65	65	65	65	65
	Sep	Person's r	0.2052	0.0092	-0.3700	-0.3764	-0.1643	0.1715	0.5414	0.0857
		N	65	65	65	65	65	65	65	65
	Oct	Person's r	0.2776	-0.1608	-0.2926	-0.3235	-0.0611	0.0217	0.6062	-0.0804
		N	65	65	65	65	65	65	65	65
	Nov	Person's r	0.5571	-0.5624	-0.1739	-0.3309	0.2416	-0.4657	0.3221	-0.4525
		N	65	65	65	65	65	65	65	65
	Dec	Person's r	0.4735	-0.3779	-0.2015	-0.2758	0.2138	-0.2802	0.3886	-0.2433
		N	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	0.4459	-0.4260	-0.1852	-0.2907	0.2311	-0.3185	0.4714	-0.3036
		N	65	65	65	65	65	65	65	65
	DJF	Person's r	0.5426	-0.4295	-0.2405	-0.3511	0.2212	-0.3461	0.4121	-0.2925
		N	65	65	65	65	65	65	65	65
	MAM	Person's r	0.3830	-0.4156	-0.0251	-0.1151	0.3564	-0.3492	0.2950	-0.2961
		N	65	65	65	65	65	65	65	65
	JJA	Person's r	0.3256	-0.4615	-0.0870	-0.2005	0.2859	-0.3790	0.4790	-0.3646
		N	65	65	65	65	65	65	65	65
	SON	Person's r	0.4031	-0.2780	-0.3200	-0.3968	0.0104	-0.1118	0.5537	-0.1752
		N	65	65	65	65	65	65	65	65
SOI		Person's r	0.3914	-0.4321	0.0597	-0.0684	0.2951	-0.4569	-0.0595	-0.3943
		N	62	62	62	62	62	62	62	62
El Niño 3		Person's r	-0.3403	0.5702	-0.0023	0.1682	-0.3114	0.5701	-0.1597	0.5312
		N	63	63	63	63	63	63	63	63
SAB		Person's r	-0.2347	0.2005	-0.1882	-0.1003	-0.2338	0.1832	0.2522	0.1714
		N	59	59	59	59	59	59	59	59

A16 (continued) Correlation matrix of Laguna del Inca. 7-year filtered data

			Spectrolino							
			RABD610;620	R590/640	RABD510	RABD510	RABD480	chlorin	RABD720	R570/640
Precipitation HadCRUT3	Jan	Person's r	-0.2422	0.3467	-0.2833	-0.3426	-0.3167	0.1868	0.0099	0.3592
		N	65	65	65	65	65	65	65	65
	Feb	Person's r	-0.0836	0.2919	-0.4074	-0.3474	-0.4031	0.4305	0.4787	0.3238
		N	65	65	65	65	65	65	65	65
	Mar	Person's r	0.5758	-0.0231	-0.3993	-0.3745	-0.2633	0.0464	0.1378	0.0959
		N	65	65	65	65	65	65	65	65
	Apr	Person's r	0.0440	0.0821	-0.1519	-0.1868	0.0630	0.0070	0.2048	0.1477
		N	65	65	65	65	65	65	65	65
	May	Person's r	-0.0075	0.4942	-0.3404	-0.2599	-0.3004	0.3693	0.3164	0.5310
		N	65	65	65	65	65	65	65	65
	Jun	Person's r	-0.1318	0.6168	-0.2419	-0.1082	-0.5687	0.6656	-0.2114	0.5558
		N	65	65	65	65	65	65	65	65
	Jul	Person's r	-0.0039	0.1013	-0.0605	0.0089	-0.1481	0.2165	-0.1251	0.0904
		N	65	65	65	65	65	65	65	65
	Aug	Person's r	-0.0914	0.0941	-0.2092	-0.2388	-0.2572	0.1742	-0.1282	0.1279
		N	65	65	65	65	65	65	65	65
	Sep	Person's r	0.0069	0.2654	0.1245	0.2341	-0.0193	0.1990	-0.3987	0.2504
		N	65	65	65	65	65	65	65	65
	Oct	Person's r	-0.5048	0.3580	-0.0549	0.0706	-0.3545	0.4250	0.3673	0.2757
		N	65	65	65	65	65	65	65	65
	Nov	Person's r	-0.2754	0.0693	0.2256	0.2814	0.1522	0.0546	0.2082	0.0414
		N	65	65	65	65	65	65	65	65
	Dec	Person's r	0.0686	0.0781	-0.3053	-0.3292	-0.2895	0.0506	0.1041	0.1420
		N	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	-0.1347	0.6876	-0.4006	-0.2581	-0.5843	0.6996	0.0258	0.6947
		N	65	65	65	65	65	65	65	65
	DJF	Person's r	-0.1140	0.3433	-0.4973	-0.5130	-0.5022	0.3124	0.2801	0.4010
		N	65	65	65	65	65	65	65	65
	MAM	Person's r	0.0495	0.4641	-0.3745	-0.3073	-0.2792	0.3398	0.3435	0.5217
		N	65	65	65	65	65	65	65	65
	JJA	Person's r	-0.1104	0.4082	-0.2479	-0.1582	-0.4804	0.5269	-0.2283	0.3867
		N	65	65	65	65	65	65	65	65
	SON	Person's r	-0.3192	0.3759	0.1581	0.3146	-0.1048	0.3496	-0.0553	0.3187
		N	65	65	65	65	65	65	65	65
Precipitation CRU TS 2.1	Jan	Person's r	0.4138	-0.1201	-0.2450	-0.3118	-0.0417	-0.1590	0.0632	0.0030
		N	65	65	65	65	65	65	65	65
	Feb	Person's r	-0.0158	0.2823	-0.3593	-0.4227	-0.3174	0.2673	0.1966	0.2849
		N	65	65	65	65	65	65	65	65
	Mar	Person's r	0.6820	-0.0189	-0.3706	-0.3724	-0.1886	0.0788	-0.0314	0.0785
		N	65	65	65	65	65	65	65	65
	Apr	Person's r	0.0603	-0.0991	-0.0587	-0.0904	0.2690	-0.1500	0.4037	-0.0371
		N	65	65	65	65	65	65	65	65
	May	Person's r	-0.0611	0.1378	-0.1795	-0.1713	-0.0268	-0.0045	0.5251	0.1609
		N	65	65	65	65	65	65	65	65
	Jun	Person's r	-0.4550	0.3186	0.1589	0.2819	-0.2000	0.2999	-0.0815	0.2466
		N	65	65	65	65	65	65	65	65
	Jul	Person's r	-0.0561	0.1669	-0.0757	-0.0087	-0.1906	0.2474	-0.0830	0.1288
		N	65	65	65	65	65	65	65	65
	Aug	Person's r	-0.0429	0.1291	-0.3215	-0.3465	-0.3233	0.2318	0.0489	0.1740
		N	65	65	65	65	65	65	65	65
	Sep	Person's r	-0.3754	0.4240	0.0179	0.0974	-0.0812	0.2355	0.0666	0.3583
		N	65	65	65	65	65	65	65	65
	Oct	Person's r	-0.2748	0.2844	-0.2848	-0.1878	-0.4606	0.3734	0.3276	0.2414
		N	65	65	65	65	65	65	65	65
	Nov	Person's r	-0.2175	-0.0340	0.1556	0.1891	0.1324	0.0060	0.3447	-0.0558
		N	65	65	65	65	65	65	65	65
	Dec	Person's r	0.0561	-0.2702	0.1051	0.0755	0.0885	-0.2556	-0.3456	-0.2401
		N	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	-0.2811	0.3777	-0.3062	-0.2344	-0.3122	0.3189	0.5261	0.3824
		N	65	65	65	65	65	65	65	65
	DJF	Person's r	0.2332	0.0221	-0.3761	-0.4832	-0.2446	-0.0022	-0.0026	0.1059
		N	65	65	65	65	65	65	65	65
	MAM	Person's r	0.0043	0.1001	-0.1992	-0.1992	0.0241	-0.0327	0.5607	0.1413
		N	65	65	65	65	65	65	65	65
	JJA	Person's r	-0.3149	0.3387	-0.1520	-0.0697	-0.4083	0.4291	-0.0491	0.3110
		N	65	65	65	65	65	65	65	65
	SON	Person's r	-0.5254	0.4474	-0.1545	-0.0170	-0.3627	0.4363	0.4584	0.3669
		N	65	65	65	65	65	65	65	65

A16 (continued) Correlation matrix of Laguna del Inca. 7-year filtered data

			Bsi					C, N und C/N				
			Si µg/g	Bsi µg/g	Bsi Flux	Fe µg/g	Al µg/g	N %	TOC %	TOC/N	TOC Flux	N Flux
Temperature CRU TS 2.1	Jan	Person's r	-0.2681	-0.9116	-0.7419	-0.2681	-0.6289	-0.7935	-0.8249	0.1558	-0.5007	-0.4852
		N	65	65	65	65	65	65	65	65	65	65
	Feb	Person's r	-0.2313	-0.7671	-0.6781	-0.2313	-0.4348	-0.6963	-0.7431	0.1451	-0.5551	-0.5752
		N	65	65	65	65	65	65	65	65	65	65
	Mar	Person's r	0.0486	-0.4442	-0.3213	0.0486	-0.0724	-0.4868	-0.5348	0.0823	-0.2381	-0.2658
		N	65	65	65	65	65	65	65	65	65	65
	Apr	Person's r	0.3579	-0.0496	-0.1445	0.3579	0.2941	0.1216	-0.0182	-0.3607	-0.0826	-0.2479
		N	65	65	65	65	65	65	65	65	65	65
	May	Person's r	-0.0297	-0.5968	-0.6108	-0.0297	-0.2491	-0.4237	-0.4217	0.1656	-0.4757	-0.4547
		N	65	65	65	65	65	65	65	65	65	65
	Jun	Person's r	-0.1935	-0.3597	-0.1489	-0.1935	-0.3208	-0.4057	-0.5706	-0.3114	-0.0022	-0.1332
		N	65	65	65	65	65	65	65	65	65	65
	Jul	Person's r	0.0156	-0.2976	-0.4190	0.0156	-0.1115	-0.0412	-0.1679	-0.3090	-0.3525	-0.4837
		N	65	65	65	65	65	65	65	65	65	65
	Aug	Person's r	-0.0383	0.0728	0.0020	-0.0383	0.2286	-0.0190	-0.0103	0.1418	-0.1434	-0.1463
		N	65	65	65	65	65	65	65	65	65	65
	Sep	Person's r	-0.2816	-0.3841	-0.4272	-0.2816	-0.2441	-0.3490	-0.4148	-0.0275	-0.4977	-0.5554
		N	65	65	65	65	65	65	65	65	65	65
	Oct	Person's r	0.1024	-0.4342	-0.4765	0.1024	-0.1415	-0.1730	-0.2895	-0.2604	-0.3229	-0.4255
		N	65	65	65	65	65	65	65	65	65	65
	Nov	Person's r	-0.1781	-0.6439	-0.5478	-0.1781	-0.3473	-0.5779	-0.5731	0.2235	-0.3930	-0.3612
		N	65	65	65	65	65	65	65	65	65	65
	Dec	Person's r	-0.1386	-0.8238	-0.7558	-0.1386	-0.4414	-0.6410	-0.6206	0.2866	-0.5357	-0.4778
		N	65	65	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	-0.1140	-0.6763	-0.6205	-0.1140	-0.3178	-0.5479	-0.6206	0.0193	-0.4766	-0.5246
		N	65	65	65	65	65	65	65	65	65	65
	DJF	Person's r	-0.2241	-0.8739	-0.7604	-0.2241	-0.5244	-0.7458	-0.7670	0.2040	-0.5585	-0.5414
		N	65	65	65	65	65	65	65	65	65	65
	MAM	Person's r	0.1342	-0.4668	-0.4487	0.1342	-0.0337	-0.3561	-0.4258	-0.0191	-0.3335	-0.3949
		N	65	65	65	65	65	65	65	65	65	65
	JJA	Person's r	-0.1156	-0.2965	-0.2606	-0.1156	-0.1324	-0.2493	-0.3911	-0.2467	-0.2100	-0.3396
		N	65	65	65	65	65	65	65	65	65	65
	SON	Person's r	-0.1389	-0.5862	-0.5780	-0.1389	-0.2931	-0.4420	-0.5103	-0.0182	-0.4776	-0.5259
		N	65	65	65	65	65	65	65	65	65	65
Temperature HadCRUT3	Jan	Person's r	-0.1981	-0.5079	-0.6186	-0.1981	-0.3343	-0.4303	-0.3236	0.4919	-0.6734	-0.5575
		N	65	65	65	65	65	65	65	65	65	65
	Feb	Person's r	-0.3379	-0.5777	-0.4785	-0.3379	-0.4452	-0.6120	-0.6760	0.0873	-0.4410	-0.4664
		N	65	65	65	65	65	65	65	65	65	65
	Mar	Person's r	-0.0362	-0.2540	-0.4420	-0.0362	-0.0302	-0.0835	-0.0184	0.2821	-0.4690	-0.4152
		N	65	65	65	65	65	65	65	65	65	65
	Apr	Person's r	0.1401	-0.3138	-0.3977	0.1401	-0.0927	-0.2285	-0.3146	-0.0748	-0.4236	-0.5119
		N	65	65	65	65	65	65	65	65	65	65
	May	Person's r	-0.0609	-0.4860	-0.5942	-0.0609	-0.2617	-0.2701	-0.2684	0.1354	-0.5150	-0.5048
		N	65	65	65	65	65	65	65	65	65	65
	Jun	Person's r	-0.4170	-0.7243	-0.5809	-0.4170	-0.6240	-0.7366	-0.7913	0.1231	-0.4710	-0.4843
		N	65	65	65	65	65	65	65	65	65	65
	Jul	Person's r	-0.1635	-0.6294	-0.7431	-0.1635	-0.4583	-0.4224	-0.3962	0.2420	-0.7052	-0.6612
		N	65	65	65	65	65	65	65	65	65	65
	Aug	Person's r	0.0371	-0.5326	-0.5841	0.0371	-0.1846	-0.3780	-0.3816	0.1610	-0.5162	-0.4918
		N	65	65	65	65	65	65	65	65	65	65
	Sep	Person's r	-0.0856	-0.3369	-0.4306	-0.0856	-0.1957	-0.2584	-0.3168	-0.0323	-0.5075	-0.5574
		N	65	65	65	65	65	65	65	65	65	65
	Oct	Person's r	-0.0465	-0.4494	-0.5303	-0.0465	-0.3019	-0.2725	-0.2935	0.0427	-0.4979	-0.4967
		N	65	65	65	65	65	65	65	65	65	65
	Nov	Person's r	-0.3727	-0.7114	-0.5928	-0.3727	-0.5372	-0.7671	-0.6540	0.5635	-0.5392	-0.3760
		N	65	65	65	65	65	65	65	65	65	65
	Dec	Person's r	-0.1755	-0.5548	-0.6345	-0.1755	-0.2939	-0.4322	-0.3967	0.2987	-0.6263	-0.5731
		N	65	65	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	-0.2033	-0.6447	-0.6893	-0.2033	-0.4142	-0.5304	-0.5267	0.2400	-0.6604	-0.6314
		N	65	65	65	65	65	65	65	65	65	65
	DJF	Person's r	-0.2814	-0.6256	-0.6450	-0.2814	-0.4170	-0.5729	-0.5540	0.3084	-0.6436	-0.5978
		N	65	65	65	65	65	65	65	65	65	65
	MAM	Person's r	0.0060	-0.4481	-0.6018	0.0060	-0.1746	-0.2468	-0.2524	0.1459	-0.5816	-0.5879
		N	65	65	65	65	65	65	65	65	65	65
	JJA	Person's r	-0.2479	-0.7267	-0.7200	-0.2479	-0.5201	-0.6084	-0.6240	0.1964	-0.6363	-0.6183
		N	65	65	65	65	65	65	65	65	65	65
	SON	Person's r	-0.2029	-0.5766	-0.5935	-0.2029	-0.3989	-0.5093	-0.4943	0.2306	-0.5931	-0.5468
		N	65	65	65	65	65	65	65	65	65	65
SOI		Person's r	-0.2255	-0.1369	-0.0019	-0.2255	-0.1546	-0.3701	-0.1464	0.7613	-0.0265	0.2308
		N	62	62	62	62	62	62	62	62	62	62
El Niño 3		Person's r	0.3550	0.5899	0.3309	0.3550	0.5221	0.7465	0.6155	-0.6058	0.2069	0.0203
		N	63	63	63	63	63	63	63	63	63	63
SAB		Person's r	-0.1531	-0.1474	-0.0307	-0.1531	-0.2692	-0.2772	-0.3252	-0.0606	-0.0650	-0.0854
		N	59	59	59	59	59	59	59	59	59	59

A16 (continued) Correlation matrix of Laguna del Inca. 7-year filtered data

			Bsi					C, N und C/N				
			Si µg/g	Bsi µg/g	Bsi Flux	Fe µg/g	Al µg/g	N %	TOC %	TOC/N	TOC Flux	N Flux
Precipitation HadCRUT3	Jan	Person's r	0.1343	0.2310	0.4907	0.1343	0.2731	-0.0241	-0.2250	-0.5219	0.5146	0.3123
		N	65	65	65	65	65	65	65	65	65	65
	Feb	Person's r	0.0247	-0.1870	-0.2296	0.0247	-0.0293	-0.0662	-0.1981	-0.3480	-0.2293	-0.3568
		N	65	65	65	65	65	65	65	65	65	65
	Mar	Person's r	0.2683	-0.1536	-0.2423	0.2683	0.2555	0.0756	0.1033	0.0429	-0.1297	-0.0919
		N	65	65	65	65	65	65	65	65	65	65
	Apr	Person's r	0.2067	0.0879	-0.0251	0.2067	0.2145	0.0277	-0.0783	-0.1637	-0.1989	-0.3296
		N	65	65	65	65	65	65	65	65	65	65
	May	Person's r	-0.0799	0.4787	0.3839	-0.0799	0.3974	0.2126	0.2705	0.1646	0.0554	0.0995
		N	65	65	65	65	65	65	65	65	65	65
	Jun	Person's r	0.3266	0.7419	0.6276	0.3266	0.5143	0.6082	0.5583	-0.3407	0.3840	0.2928
		N	65	65	65	65	65	65	65	65	65	65
	Jul	Person's r	0.0288	0.0320	-0.0223	0.0288	-0.1182	0.1005	0.0393	-0.2392	-0.0383	-0.1019
		N	65	65	65	65	65	65	65	65	65	65
	Aug	Person's r	0.4051	-0.0382	0.0606	0.4051	0.1771	-0.0976	-0.2651	-0.4455	0.0737	-0.1019
		N	65	65	65	65	65	65	65	65	65	65
	Sep	Person's r	0.1602	0.6318	0.3952	0.1602	0.4365	0.6350	0.6486	-0.0960	0.1995	0.1601
		N	65	65	65	65	65	65	65	65	65	65
	Oct	Person's r	-0.1063	-0.0233	0.0091	-0.1063	-0.1470	0.0262	-0.0350	-0.2547	0.0328	-0.0150
		N	65	65	65	65	65	65	65	65	65	65
	Nov	Person's r	-0.1736	0.0884	-0.0329	-0.1736	-0.1928	0.2642	0.2008	-0.2473	0.0037	-0.0719
		N	65	65	65	65	65	65	65	65	65	65
	Dec	Person's r	0.2460	-0.0459	0.0899	0.2460	0.2182	-0.1174	-0.1887	-0.1791	0.1458	0.0969
		N	65	65	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	0.2913	0.6576	0.5207	0.2913	0.5217	0.4888	0.3849	-0.4056	0.2090	0.0673
		N	65	65	65	65	65	65	65	65	65	65
	DJF	Person's r	0.2195	0.0006	0.1859	0.2195	0.2459	-0.1099	-0.3074	-0.5119	0.2303	0.0471
		N	65	65	65	65	65	65	65	65	65	65
	MAM	Person's r	-0.0045	0.4409	0.3225	-0.0045	0.4285	0.2048	0.2359	0.1159	-0.0048	0.0090
		N	65	65	65	65	65	65	65	65	65	65
	JJA	Person's r	0.3634	0.3780	0.3367	0.3634	0.2832	0.3172	0.1857	-0.4942	0.2102	0.0528
		N	65	65	65	65	65	65	65	65	65	65
	SON	Person's r	0.0041	0.4916	0.2826	0.0041	0.1831	0.5848	0.5436	-0.2775	0.1627	0.0832
		N	65	65	65	65	65	65	65	65	65	65
Precipitation CRU TS 2.1	Jan	Person's r	0.3999	-0.0747	-0.0933	0.3999	0.3886	0.0279	0.0140	-0.0087	-0.0010	-0.0173
		N	65	65	65	65	65	65	65	65	65	65
	Feb	Person's r	-0.1300	0.2739	0.4212	-0.1300	-0.0437	-0.0760	-0.1901	-0.2374	0.2430	0.1325
		N	65	65	65	65	65	65	65	65	65	65
	Mar	Person's r	0.1879	-0.0292	-0.1164	0.1879	0.1684	0.1903	0.2253	0.0151	0.0107	0.0480
		N	65	65	65	65	65	65	65	65	65	65
	Apr	Person's r	-0.4060	-0.2232	-0.3212	-0.4060	-0.3056	-0.3569	-0.3665	0.2275	-0.5615	-0.5688
		N	65	65	65	65	65	65	65	65	65	65
	May	Person's r	-0.5737	-0.1115	-0.0610	-0.5737	-0.2646	-0.3845	-0.3741	0.2367	-0.2846	-0.2516
		N	65	65	65	65	65	65	65	65	65	65
	Jun	Person's r	0.4219	0.3461	0.2507	0.4219	0.4355	0.4031	0.3899	-0.2075	0.1967	0.1553
		N	65	65	65	65	65	65	65	65	65	65
	Jul	Person's r	0.0218	0.1562	0.1459	0.0218	-0.1042	0.1252	0.0789	-0.1930	0.0930	0.0479
		N	65	65	65	65	65	65	65	65	65	65
	Aug	Person's r	0.3228	-0.1088	-0.0303	0.3228	0.1316	-0.1606	-0.3273	-0.4118	-0.0497	-0.2232
		N	65	65	65	65	65	65	65	65	65	65
	Sep	Person's r	-0.2624	0.4858	0.4516	-0.2624	0.1205	0.1619	0.1299	-0.0377	0.1225	0.0625
		N	65	65	65	65	65	65	65	65	65	65
	Oct	Person's r	-0.0419	-0.2038	-0.0653	-0.0419	-0.0969	-0.2447	-0.2521	-0.0349	-0.0232	-0.0003
		N	65	65	65	65	65	65	65	65	65	65
	Nov	Person's r	-0.0856	-0.0723	-0.1541	-0.0856	-0.2586	0.1078	0.0670	-0.1505	-0.0873	-0.1238
		N	65	65	65	65	65	65	65	65	65	65
	Dec	Person's r	0.3465	-0.2831	-0.1696	0.3465	0.0558	-0.1524	-0.1826	-0.1003	0.0752	0.0605
		N	65	65	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	-0.2390	0.0044	0.0379	-0.2390	-0.0837	-0.2536	-0.3422	-0.1018	-0.2232	-0.3035
		N	65	65	65	65	65	65	65	65	65	65
	DJF	Person's r	0.3001	0.0307	0.2168	0.3001	0.1958	-0.1425	-0.2668	-0.2706	0.2555	0.1423
		N	65	65	65	65	65	65	65	65	65	65
	MAM	Person's r	-0.5944	-0.1525	-0.1352	-0.5944	-0.2955	-0.4132	-0.4038	0.2650	-0.3818	-0.3513
		N	65	65	65	65	65	65	65	65	65	65
	JJA	Person's r	0.4667	0.1928	0.1853	0.4667	0.2961	0.1787	0.0416	-0.4722	0.1193	-0.0381
		N	65	65	65	65	65	65	65	65	65	65
	SON	Person's r	-0.2145	0.0634	0.1220	-0.2145	-0.1297	-0.0650	-0.1066	-0.1162	0.0083	-0.0217
		N	65	65	65	65	65	65	65	65	65	65

A16 (continued) Correlation matrix of Laguna del Inca. 7-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec surf	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	-0.6527	-0.8628	-0.2341	0.2672	0.5548	0.4035	-0.0336	-0.4111	-0.5425	-0.0331	-0.3519	0.4989	-0.7488	-0.6836
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Feb	Person's r	-0.5767	-0.7279	-0.1766	0.2074	0.4761	0.3319	-0.0772	-0.4218	-0.5182	-0.0767	-0.3653	0.4358	-0.7065	-0.6325
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Mar	Person's r	-0.4821	-0.5391	-0.0636	0.0843	0.3133	0.1754	-0.1667	-0.4021	-0.4395	-0.1662	-0.3587	0.1789	-0.5793	-0.4007
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Apr	Person's r	-0.3597	-0.2170	0.3210	-0.3057	-0.1598	-0.2629	-0.4165	-0.4394	-0.3953	-0.4161	-0.4357	-0.2243	-0.3598	-0.1500
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	May	Person's r	-0.5330	-0.6215	-0.0137	0.0334	0.2473	0.1413	-0.1547	-0.4167	-0.5053	-0.1539	-0.3819	0.3039	-0.5890	-0.6208
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Jun	Person's r	-0.5383	-0.4729	0.2787	-0.2632	-0.0946	-0.1943	-0.3845	-0.4840	-0.4965	-0.3845	-0.4745	-0.0190	-0.4675	-0.3731
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Jul	Person's r	-0.5075	-0.4061	0.3032	-0.2811	-0.0752	-0.2047	-0.4439	-0.5234	-0.5117	-0.4438	-0.5120	-0.1632	-0.5111	-0.2359
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Aug	Person's r	-0.0627	-0.0086	0.0558	-0.0598	-0.0140	-0.0422	-0.1124	-0.1310	-0.0940	-0.1121	-0.1219	-0.0738	-0.1190	-0.0205
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Sep	Person's r	-0.6586	-0.5388	0.3787	-0.3519	-0.0956	-0.2537	-0.5574	-0.6717	-0.6501	-0.5571	-0.6536	-0.1810	-0.6646	-0.3589
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Oct	Person's r	-0.7168	-0.6241	0.3300	-0.3008	-0.0067	-0.1962	-0.5527	-0.6806	-0.6772	-0.5524	-0.6597	-0.2134	-0.7104	-0.3052
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Nov	Person's r	-0.4169	-0.5613	-0.2469	0.2713	0.5004	0.3628	-0.0047	-0.2869	-0.3546	-0.0041	-0.2333	0.3316	-0.5620	-0.3921
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Dec	Person's r	-0.5689	-0.7618	-0.2538	0.2822	0.5523	0.4070	-0.0150	-0.3594	-0.4672	-0.0143	-0.3004	0.4187	-0.6870	-0.5613
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	-0.6914	-0.7412	0.0414	-0.0109	0.2893	0.1147	-0.3026	-0.5801	-0.6366	-0.3020	-0.5345	0.1839	-0.7694	-0.5543
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	DJF	Person's r	-0.6290	-0.8218	-0.2311	0.2633	0.5526	0.3983	-0.0454	-0.4186	-0.5355	-0.0448	-0.3575	0.4734	-0.7502	-0.6578
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	MAM	Person's r	-0.5655	-0.5786	0.0763	-0.0533	0.1905	0.0477	-0.2846	-0.5085	-0.5469	-0.2839	-0.4729	0.1294	-0.6333	-0.4914
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	JJA	Person's r	-0.5397	-0.4383	0.3061	-0.2898	-0.0900	-0.2119	-0.4476	-0.5440	-0.5310	-0.4475	-0.5303	-0.1101	-0.5249	-0.3152
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	SON	Person's r	-0.7026	-0.6831	0.1650	-0.1333	0.1745	-0.0170	-0.4256	-0.6379	-0.6574	-0.4251	-0.6003	-0.0103	-0.7638	-0.4191
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
Temperature HadCRUT3	Jan	Person's r	-0.1865	-0.3243	-0.2902	0.3185	0.4776	0.3763	0.0908	-0.0956	-0.1227	0.0915	-0.0485	0.1792	-0.3562	-0.1032
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Feb	Person's r	-0.5955	-0.6219	0.0620	-0.0378	0.2136	0.0641	-0.2863	-0.4950	-0.5294	-0.2860	-0.4580	0.1015	-0.6399	-0.4034
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Mar	Person's r	-0.0669	-0.0975	-0.1165	0.1331	0.2333	0.1605	-0.0092	-0.0833	-0.0666	-0.0085	-0.0572	-0.0023	-0.2022	0.0321
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Apr	Person's r	-0.3024	-0.3133	0.0391	-0.0174	0.1174	0.0371	-0.1482	-0.2687	-0.2815	-0.1477	-0.2463	0.0897	-0.3491	-0.2689
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	May	Person's r	-0.4003	-0.4483	0.0500	-0.0306	0.1233	0.0473	-0.1537	-0.3222	-0.3831	-0.1530	-0.3016	0.1736	-0.4259	-0.4460
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Jun	Person's r	-0.5819	-0.6660	0.0102	0.0161	0.2337	0.1193	-0.1837	-0.4363	-0.5148	-0.1832	-0.4004	0.3059	-0.6066	-0.5975
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Jul	Person's r	-0.4311	-0.5188	-0.0831	0.1164	0.3337	0.2031	-0.1217	-0.3108	-0.3509	-0.1211	-0.2716	0.1028	-0.5199	-0.2390
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Aug	Person's r	-0.5611	-0.6053	0.0111	0.0097	0.2667	0.1165	-0.2470	-0.4668	-0.5114	-0.2465	-0.4278	0.1013	-0.6375	-0.3882
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Sep	Person's r	-0.6232	-0.4864	0.4220	-0.3925	-0.1575	-0.3084	-0.5737	-0.6271	-0.5929	-0.5733	-0.6173	-0.2990	-0.5892	-0.2251
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Oct	Person's r	-0.5707	-0.5182	0.2626	-0.2324	-0.0098	-0.1486	-0.4185	-0.5011	-0.5038	-0.4181	-0.4862	-0.1879	-0.5411	-0.2021
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Nov	Person's r	-0.3934	-0.5789	-0.3191	0.3448	0.5675	0.4369	0.0607	-0.2188	-0.2944	0.0613	-0.1622	0.3300	-0.5387	-0.3196
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Dec	Person's r	-0.4902	-0.5278	0.0230	0.0045	0.2375	0.0966	-0.2300	-0.4157	-0.4459	-0.2293	-0.3804	0.0612	-0.5710	-0.3217
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	-0.5510	-0.6052	0.0091	0.0225	0.2739	0.1246	-0.2325	-0.4469	-0.4865	-0.2319	-0.4068	0.1096	-0.6284	-0.3778
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	DJF	Person's r	-0.5031	-0.5745	-0.0617	0.0917	0.3402	0.1894	-0.1790	-0.4009	-0.4362	-0.1784	-0.3561	0.1278	-0.6083	-0.3294
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	MAM	Person's r	-0.3318	-0.3709	-0.0045	0.0281	0.1899	0.0965	-0.1326	-0.2870	-0.3157	-0.1319	-0.2591	0.1175	-0.4115	-0.3058
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	JJA	Person's r	-0.5889	-0.6745	-0.0258	0.0568	0.3120	0.1673	-0.1985	-0.4487	-0.5127	-0.1979	-0.4062	0.2088	-0.6561	-0.4734
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	SON	Person's r	-0.6053	-0.6071	0.1305	-0.0980	0.1630	0.0018	-0.3499	-0.5130	-0.5305	-0.3493	-0.4810	-0.0507	-0.6409	-0.2898
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
SOI		Person's r	0.3020	0.0672	-0.6142	0.6055	0.5489	0.5775	0.5403	0.4436	0.3946	0.5407	0.4792	0.3044	0.1605	0.1775
		N	62	62	62	62	62	62	62	62	62	62	62	62	62	62
El Niño 3		Person's r	0.1848	0.4560	0.5482	-0.5605	-0.6808	-0.6170	-0.3414	-0.0672	0.0303	-0.3418	-0.1266	-0.4467	0.3147	0.2150
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
SAB		Person's r	-0.4171	-0.3700	0.1484	-0.1501	0.0012	-0.0888	-0.2907	-0.3759	-0.3759	-0.2910	-0.3656	-0.0677	-0.3674	-0.1928
		N	59	59	59	59	59	59	59	59	59	59	59	59	59	59

A16 (continued) Correlation matrix of Laguna del Inca. 7-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec surf	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation HadCRUT3	Jan	Person's r	-0.0930	0.0310	0.3259	-0.3320	-0.3849	-0.3377	-0.2073	-0.1572	-0.1422	-0.2078	-0.1807	-0.0085	0.0342	-0.2436
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Feb	Person's r	-0.7209	-0.4922	0.6774	-0.6541	-0.4274	-0.5681	-0.7674	-0.7640	-0.7213	-0.7672	-0.7746	-0.4221	-0.5954	-0.3066
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Mar	Person's r	-0.4321	-0.3585	0.1807	-0.1697	0.0475	-0.0971	-0.3737	-0.4492	-0.4346	-0.3734	-0.4322	-0.2430	-0.4814	-0.0747
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Apr	Person's r	-0.0726	0.0187	0.2043	-0.1984	-0.2034	-0.1912	-0.1607	-0.1489	-0.1177	-0.1605	-0.1540	-0.0277	-0.0529	-0.1669
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	May	Person's r	0.1653	0.3536	0.3205	-0.3369	-0.4270	-0.3738	-0.2049	-0.0325	0.0578	-0.2049	-0.0612	-0.3220	0.1949	0.1575
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Jun	Person's r	0.3516	0.5932	0.3746	-0.3856	-0.5551	-0.4796	-0.1894	0.1463	0.2804	-0.1900	0.0952	-0.6058	0.4648	0.6145
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Jul	Person's r	-0.0801	-0.0185	0.1215	-0.1170	-0.0772	-0.1207	-0.1510	-0.1049	-0.0871	-0.1513	-0.1127	-0.1822	-0.0538	0.1147
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Aug	Person's r	-0.3818	-0.2852	0.2925	-0.2747	-0.1556	-0.2306	-0.3454	-0.4042	-0.4116	-0.3456	-0.4051	-0.0579	-0.3325	-0.3057
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Sep	Person's r	0.6027	0.7224	0.0419	-0.0652	-0.2904	-0.1766	0.1416	0.4076	0.5041	0.1414	0.3705	-0.3005	0.6110	0.5780
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Oct	Person's r	-0.3235	-0.1974	0.4345	-0.4284	-0.3773	-0.3988	-0.3849	-0.3207	-0.3218	-0.3853	-0.3469	-0.2347	-0.1647	-0.1384
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Nov	Person's r	0.1576	0.2240	0.1860	-0.1885	-0.3021	-0.2316	-0.0270	0.1214	0.1329	-0.0273	0.0877	-0.1318	0.2723	0.1308
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Dec	Person's r	-0.3118	-0.2989	0.0698	-0.0728	0.0573	-0.0150	-0.1803	-0.3050	-0.3327	-0.1805	-0.2897	0.0951	-0.3395	-0.3292
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	0.0846	0.3985	0.5925	-0.5994	-0.6814	-0.6533	-0.4453	-0.1662	-0.0394	-0.4458	-0.2166	-0.6051	0.2047	0.3074
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	DJF	Person's r	-0.5499	-0.3802	0.5012	-0.4954	-0.3433	-0.4259	-0.5489	-0.5961	-0.5860	-0.5492	-0.6033	-0.1376	-0.4486	-0.4471
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	MAM	Person's r	0.0987	0.2955	0.3505	-0.3632	-0.4284	-0.3891	-0.2516	-0.0989	-0.0090	-0.2516	-0.1247	-0.3174	0.1259	0.0993
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	JJA	Person's r	-0.0321	0.1656	0.3838	-0.3791	-0.3923	-0.4092	-0.3277	-0.1596	-0.0854	-0.3283	-0.1900	-0.4268	0.0610	0.2340
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	SON	Person's r	0.3697	0.5381	0.2898	-0.3054	-0.4950	-0.3922	-0.0701	0.2125	0.2878	-0.0706	0.1606	-0.3741	0.4890	0.4196
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
Precipitation CRU TS 2.1	Jan	Person's r	-0.2215	-0.1929	0.0949	-0.0876	0.0109	-0.0427	-0.1659	-0.2420	-0.2503	-0.1655	-0.2313	0.0027	-0.2562	-0.2095
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Feb	Person's r	0.1059	0.2307	0.2160	-0.2170	-0.3066	-0.2678	-0.1206	0.0470	0.1252	-0.1211	0.0239	-0.2637	0.2144	0.2666
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Mar	Person's r	-0.2168	-0.1252	0.1503	-0.1414	-0.0105	-0.1192	-0.2849	-0.2557	-0.2049	-0.2846	-0.2504	-0.3804	-0.2388	0.2073
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Apr	Person's r	-0.1559	-0.1610	0.0055	0.0031	0.0748	0.0382	-0.0728	-0.1642	-0.1591	-0.0725	-0.1453	0.1136	-0.2198	-0.2299
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	May	Person's r	-0.1277	-0.1021	0.0767	-0.0767	-0.0316	-0.0448	-0.1077	-0.1543	-0.1407	-0.1077	-0.1447	0.0490	-0.1610	-0.1722
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Jun	Person's r	0.1389	0.2314	0.2430	-0.2484	-0.3609	-0.2758	-0.0683	0.0549	0.0591	-0.0685	0.0198	-0.1174	0.2333	0.0141
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Jul	Person's r	0.0651	0.1183	0.0673	-0.0704	-0.0989	-0.1026	-0.0518	0.0552	0.0889	-0.0522	0.0412	-0.2252	0.1243	0.2851
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Aug	Person's r	-0.4951	-0.3710	0.3856	-0.3601	-0.2018	-0.2978	-0.4559	-0.5181	-0.5149	-0.4561	-0.5176	-0.1257	-0.4376	-0.3374
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Sep	Person's r	0.4652	0.5384	0.0520	-0.0718	-0.3003	-0.1525	0.1647	0.3433	0.4023	0.1641	0.3131	-0.0424	0.5150	0.2348
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Oct	Person's r	-0.5872	-0.5103	0.3597	-0.3454	-0.1610	-0.2637	-0.4546	-0.5172	-0.5402	-0.4547	-0.5180	-0.1805	-0.4811	-0.2931
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Nov	Person's r	0.0047	0.0118	0.1094	-0.1039	-0.1476	-0.1152	-0.0228	0.0506	0.0359	-0.0229	0.0316	-0.0742	0.1079	0.0460
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Dec	Person's r	-0.3171	-0.4303	-0.1732	0.1773	0.3352	0.2425	0.0080	-0.2078	-0.2979	0.0081	-0.1788	0.2860	-0.3784	-0.3771
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	Annual Mean	Person's r	-0.3241	-0.1831	0.4011	-0.3907	-0.3157	-0.3478	-0.3938	-0.3839	-0.3575	-0.3941	-0.3936	-0.1544	-0.2557	-0.2394
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	DJF	Person's r	-0.2114	-0.1558	0.1334	-0.1280	-0.0609	-0.1101	-0.1857	-0.2080	-0.1981	-0.1858	-0.2052	-0.0572	-0.1716	-0.1013
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	MAM	Person's r	-0.1644	-0.1365	0.0802	-0.0776	-0.0122	-0.0396	-0.1322	-0.1928	-0.1760	-0.1321	-0.1796	0.0443	-0.2102	-0.1927
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	JJA	Person's r	-0.2203	-0.0627	0.4235	-0.4111	-0.3832	-0.3990	-0.3626	-0.2882	-0.2698	-0.3630	-0.3140	-0.2441	-0.1032	-0.0974
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65
	SON	Person's r	-0.2278	-0.1220	0.3719	-0.3684	-0.3604	-0.3501	-0.2939	-0.2160	-0.2094	-0.2944	-0.2414	-0.2040	-0.0679	-0.0928
		N	65	65	65	65	65	65	65	65	65	65	65	65	65	65

A17 Correlation matrix of Laguna del Inca. 9-year filtered data

			Spectrolino							
			RABD610;620	R590/640	RABD510	RABD510	RABD480	chlorin	RABD720	R570/630
Temperature CRU TS 2.1	Jan	Person's r	0.1951	-0.6227	0.1019	-0.0345	0.4001	-0.5801	0.2470	-0.5591
		N	63	63	63	63	63	63	63	63
	Feb	Person's r	0.3924	-0.5627	-0.0264	-0.1737	0.3720	-0.5612	0.2158	-0.4521
		N	63	63	63	63	63	63	63	63
	Mar	Person's r	0.6173	-0.3787	-0.2906	-0.4585	0.1412	-0.3877	0.0975	-0.2366
		N	63	63	63	63	63	63	63	63
	Apr	Person's r	0.5030	-0.0413	-0.3337	-0.4044	-0.0682	-0.0019	-0.0666	0.0847
		N	63	63	63	63	63	63	63	63
	May	Person's r	0.1105	-0.4249	0.1396	0.0777	0.4298	-0.4279	0.2950	-0.3593
		N	63	63	63	63	63	63	63	63
	Jun	Person's r	0.0729	-0.0204	-0.3069	-0.4145	-0.1169	-0.0368	0.3875	0.0308
		N	63	63	63	63	63	63	63	63
	Jul	Person's r	0.3266	-0.0398	-0.3191	-0.3316	-0.1206	0.0536	0.3422	0.0460
		N	63	63	63	63	63	63	63	63
	Aug	Person's r	0.4691	0.0783	-0.3285	-0.3400	-0.0374	-0.0337	0.1251	0.1837
		N	63	63	63	63	63	63	63	63
	Sep	Person's r	0.2651	0.0340	-0.4361	-0.4578	-0.1412	0.1237	0.5479	0.1176
		N	63	63	63	63	63	63	63	63
	Oct	Person's r	0.4213	-0.1145	-0.3851	-0.4237	-0.1354	0.0227	0.3205	-0.0085
		N	63	63	63	63	63	63	63	63
	Nov	Person's r	0.5972	-0.6053	-0.0735	-0.2611	0.3493	-0.5729	0.0650	-0.4795
		N	63	63	63	63	63	63	63	63
	Dec	Person's r	0.4264	-0.6681	0.0655	-0.0799	0.4589	-0.6291	0.2498	-0.5676
		N	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	0.4670	-0.4135	-0.2041	-0.3334	0.2022	-0.3734	0.3022	-0.2899
		N	63	63	63	63	63	63	63	63
	DJF	Person's r	0.3518	-0.6367	0.0454	-0.1028	0.4227	-0.6092	0.2448	-0.5411
		N	63	63	63	63	63	63	63	63
	MAM	Person's r	0.5012	-0.3640	-0.1901	-0.3174	0.2185	-0.3562	0.1437	-0.2288
		N	63	63	63	63	63	63	63	63
	JJA	Person's r	0.3488	0.0011	-0.4275	-0.4983	-0.1300	-0.0116	0.4077	0.1044
		N	63	63	63	63	63	63	63	63
	SON	Person's r	0.5066	-0.2867	-0.3330	-0.4345	0.0454	-0.1889	0.3446	-0.1635
		N	63	63	63	63	63	63	63	63
Temperature HadCRUT3	Jan	Person's r	0.7251	-0.6856	0.0415	-0.1575	0.4508	-0.5996	-0.1073	-0.5812
		N	63	63	63	63	63	63	63	63
	Feb	Person's r	0.3599	-0.4368	-0.1504	-0.3017	0.2600	-0.4564	0.3003	-0.3107
		N	63	63	63	63	63	63	63	63
	Mar	Person's r	0.7515	-0.5229	0.0454	-0.1049	0.3942	-0.4973	-0.3186	-0.4018
		N	63	63	63	63	63	63	63	63
	Apr	Person's r	0.3376	-0.4575	0.0070	-0.1660	0.3259	-0.4568	-0.0362	-0.3790
		N	63	63	63	63	63	63	63	63
	May	Person's r	0.3713	-0.4348	0.0690	0.0001	0.4111	-0.3550	0.2151	-0.3687
		N	63	63	63	63	63	63	63	63
	Jun	Person's r	0.2748	-0.5416	0.0535	-0.0912	0.4873	-0.5990	0.4102	-0.4508
		N	63	63	63	63	63	63	63	63
	Jul	Person's r	0.5155	-0.6389	0.0800	-0.0952	0.4978	-0.5447	0.0852	-0.5388
		N	63	63	63	63	63	63	63	63
	Aug	Person's r	0.4589	-0.5531	-0.0111	-0.1470	0.3676	-0.4680	0.0510	-0.4414
		N	63	63	63	63	63	63	63	63
	Sep	Person's r	0.4052	-0.2037	-0.2882	-0.4138	0.1231	-0.1559	0.4079	-0.0979
		N	63	63	63	63	63	63	63	63
	Oct	Person's r	0.4096	-0.2865	-0.2301	-0.3529	0.1414	-0.1817	0.2883	-0.1861
		N	63	63	63	63	63	63	63	63
	Nov	Person's r	0.5655	-0.7140	0.1116	-0.0522	0.4896	-0.6661	0.0068	-0.6109
		N	63	63	63	63	63	63	63	63
	Dec	Person's r	0.6415	-0.5594	-0.0508	-0.1904	0.3817	-0.4724	0.0970	-0.4353
		N	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	0.5698	-0.6034	-0.0318	-0.2060	0.4373	-0.5505	0.1666	-0.4805
		N	63	63	63	63	63	63	63	63
	DJF	Person's r	0.6174	-0.6121	-0.0701	-0.2516	0.3947	-0.5635	0.1303	-0.4794
		N	63	63	63	63	63	63	63	63
	MAM	Person's r	0.5742	-0.5620	0.0532	-0.0945	0.4586	-0.5128	-0.0228	-0.4582
		N	63	63	63	63	63	63	63	63
	JJA	Person's r	0.4390	-0.6326	0.0531	-0.1148	0.5075	-0.6015	0.2341	-0.5247
		N	63	63	63	63	63	63	63	63
	SON	Person's r	0.5244	-0.4627	-0.1461	-0.3027	0.2930	-0.3906	0.2615	-0.3459
		N	63	63	63	63	63	63	63	63
SOI		Person's r	0.4786	-0.4906	0.1251	-0.0221	0.3944	-0.5274	-0.1756	-0.4508
		N	60	60	60	60	60	60	60	60
El Niño 3		Person's r	-0.3843	0.6406	-0.0682	0.1215	-0.4078	0.6450	-0.1007	0.5978
		N	61	61	61	61	61	61	61	61
SAB		Person's r	-0.3413	0.2584	-0.2344	-0.1355	-0.2921	0.2400	0.2887	0.2242
		N	57	57	57	57	57	57	57	57

A17 (continued) Correlation matrix of Laguna del Inca. 9-year filtered data

			Spectrolino							
			RABD610;620	R590/640	RABD510	RABD510	RABD480	chlorin	RABD720	R570/630
Precipitation HadCRUT3	Jan	Person's r	-0.1689	0.3930	-0.3490	-0.4046	-0.3765	0.2638	0.0250	0.4041
		N	63	63	63	63	63	63	63	63
	Feb	Person's r	-0.1722	0.3723	-0.4431	-0.3509	-0.4782	0.5006	0.5760	0.3912
		N	63	63	63	63	63	63	63	63
	Mar	Person's r	0.6049	-0.0139	-0.4586	-0.4566	-0.2684	0.0306	0.2882	0.1139
		N	63	63	63	63	63	63	63	63
	Apr	Person's r	0.1844	0.1134	-0.2025	-0.2118	0.0292	0.0704	0.2327	0.1923
		N	63	63	63	63	63	63	63	63
	May	Person's r	-0.0597	0.5304	-0.3340	-0.2533	-0.2713	0.3849	0.4145	0.5624
		N	63	63	63	63	63	63	63	63
	Jun	Person's r	-0.0900	0.6724	-0.3182	-0.1733	-0.6325	0.7118	-0.1566	0.6138
		N	63	63	63	63	63	63	63	63
	Jul	Person's r	0.0287	0.1032	-0.1016	-0.0334	-0.2405	0.2131	-0.1142	0.0820
		N	63	63	63	63	63	63	63	63
	Aug	Person's r	0.0644	0.1474	-0.3270	-0.3415	-0.3584	0.2097	-0.1141	0.1873
		N	63	63	63	63	63	63	63	63
	Sep	Person's r	0.1250	0.2263	0.0988	0.1875	-0.0205	0.1770	-0.4360	0.2206
		N	63	63	63	63	63	63	63	63
	Oct	Person's r	-0.6476	0.4130	-0.0555	0.0817	-0.4055	0.4420	0.3410	0.3078
		N	63	63	63	63	63	63	63	63
	Nov	Person's r	-0.4226	0.0575	0.3244	0.4009	0.1358	0.0531	0.1850	-0.0094
		N	63	63	63	63	63	63	63	63
	Dec	Person's r	0.1161	0.0994	-0.3452	-0.3804	-0.3024	0.0263	0.0635	0.1614
		N	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	-0.0740	0.7745	-0.5004	-0.3431	-0.6908	0.7607	0.1221	0.7748
		N	63	63	63	63	63	63	63	63
	DJF	Person's r	-0.0975	0.4184	-0.5653	-0.5696	-0.5713	0.3737	0.3121	0.4667
		N	63	63	63	63	63	63	63	63
	MAM	Person's r	0.0325	0.4988	-0.3784	-0.3075	-0.2597	0.3629	0.4431	0.5539
		N	63	63	63	63	63	63	63	63
	JJA	Person's r	-0.0069	0.4734	-0.3607	-0.2574	-0.6079	0.5729	-0.1870	0.4495
		N	63	63	63	63	63	63	63	63
	SON	Person's r	-0.3849	0.3927	0.1812	0.3453	-0.1533	0.3670	-0.0951	0.3110
		N	63	63	63	63	63	63	63	63
Precipitation CRU TS 2.1	Jan	Person's r	0.4662	-0.1359	-0.2396	-0.3115	0.0182	-0.1816	0.1789	-0.0047
		N	63	63	63	63	63	63	63	63
	Feb	Person's r	0.0013	0.3645	-0.3813	-0.4098	-0.3846	0.3765	0.1348	0.3452
		N	63	63	63	63	63	63	63	63
	Mar	Person's r	0.7436	-0.0071	-0.4557	-0.4711	-0.2443	0.1142	0.1933	0.1103
		N	63	63	63	63	63	63	63	63
	Apr	Person's r	0.1064	-0.0766	-0.0803	-0.0980	0.2346	-0.1131	0.4068	-0.0160
		N	63	63	63	63	63	63	63	63
	May	Person's r	-0.0692	0.1872	-0.2666	-0.2804	-0.0599	0.0379	0.6352	0.2097
		N	63	63	63	63	63	63	63	63
	Jun	Person's r	-0.5262	0.3506	0.1771	0.3169	-0.1928	0.2826	-0.0466	0.2701
		N	63	63	63	63	63	63	63	63
	Jul	Person's r	-0.0468	0.1944	-0.0782	-0.0046	-0.2726	0.2739	-0.1614	0.1389
		N	63	63	63	63	63	63	63	63
	Aug	Person's r	0.0912	0.2012	-0.4550	-0.4623	-0.4289	0.2844	0.1498	0.2535
		N	63	63	63	63	63	63	63	63
	Sep	Person's r	-0.3216	0.4273	-0.0042	0.0538	-0.0848	0.2519	0.0031	0.3641
		N	63	63	63	63	63	63	63	63
	Oct	Person's r	-0.4159	0.3603	-0.2699	-0.1683	-0.4773	0.3872	0.3375	0.3075
		N	63	63	63	63	63	63	63	63
	Nov	Person's r	-0.4058	-0.0284	0.3069	0.3788	0.1418	-0.0024	0.2917	-0.0929
		N	63	63	63	63	63	63	63	63
	Dec	Person's r	0.1285	-0.3246	0.1256	0.0719	0.1259	-0.3382	-0.4426	-0.2872
		N	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	-0.2782	0.4813	-0.4161	-0.3430	-0.4021	0.3810	0.6594	0.4773
		N	63	63	63	63	63	63	63	63
	DJF	Person's r	0.3325	0.0569	-0.3991	-0.4975	-0.2634	0.0346	-0.0584	0.1332
		N	63	63	63	63	63	63	63	63
	MAM	Person's r	0.0098	0.1473	-0.2819	-0.2991	-0.0151	0.0150	0.6643	0.1882
		N	63	63	63	63	63	63	63	63
	JJA	Person's r	-0.2682	0.4228	-0.2346	-0.1266	-0.5156	0.4717	0.0067	0.3876
		N	63	63	63	63	63	63	63	63
	SON	Person's r	-0.6707	0.4977	-0.0898	0.0519	-0.3675	0.4399	0.3955	0.3956
		N	63	63	63	63	63	63	63	63

A17 (continued) Correlation matrix of Laguna del Inca. 9-year filtered data

			Bsi					C, N und C/N				
			Si µg/g	Bsi µg/g	Bsi Flux	Fe µg/g	Al µg/g	N %	TOC %	TOC/N	TOC Flux	N Flux
Temperature CRU TS 2.1	Jan	Person's r	-0.3170	-0.9364	-0.7867	-0.3170	-0.6802	-0.8299	-0.8519	0.1956	-0.5722	-0.5666
		N	63	63	63	63	63	63	63	63	63	63
	Feb	Person's r	-0.2972	-0.7967	-0.7062	-0.2972	-0.5057	-0.7428	-0.7723	0.2058	-0.5942	-0.6131
		N	63	63	63	63	63	63	63	63	63	63
	Mar	Person's r	-0.0708	-0.4973	-0.3794	-0.0708	-0.1783	-0.5403	-0.5689	0.1472	-0.2952	-0.3101
		N	63	63	63	63	63	63	63	63	63	63
	Apr	Person's r	0.3033	-0.0865	-0.1690	0.3033	0.2416	0.0704	-0.0484	-0.3137	-0.1127	-0.2624
		N	63	63	63	63	63	63	63	63	63	63
	May	Person's r	-0.1611	-0.6679	-0.6941	-0.1611	-0.3725	-0.4873	-0.4737	0.2297	-0.5803	-0.5620
		N	63	63	63	63	63	63	63	63	63	63
	Jun	Person's r	-0.2655	-0.3945	-0.1798	-0.2655	-0.3751	-0.4697	-0.6314	-0.3120	-0.0466	-0.1841
		N	63	63	63	63	63	63	63	63	63	63
	Jul	Person's r	-0.0274	-0.3666	-0.4536	-0.0274	-0.1697	-0.1618	-0.2826	-0.2703	-0.4142	-0.5521
		N	63	63	63	63	63	63	63	63	63	63
	Aug	Person's r	-0.1376	0.0674	0.0039	-0.1376	0.1937	-0.0490	-0.0149	0.2322	-0.1569	-0.1320
		N	63	63	63	63	63	63	63	63	63	63
	Sep	Person's r	-0.3508	-0.4239	-0.4522	-0.3508	-0.3184	-0.4118	-0.4744	-0.0002	-0.5384	-0.6066
		N	63	63	63	63	63	63	63	63	63	63
	Oct	Person's r	0.0519	-0.4715	-0.5092	0.0519	-0.1815	-0.2569	-0.3594	-0.2138	-0.4052	-0.5114
		N	63	63	63	63	63	63	63	63	63	63
	Nov	Person's r	-0.2147	-0.6835	-0.5900	-0.2147	-0.4088	-0.6334	-0.6262	0.2614	-0.4521	-0.4295
		N	63	63	63	63	63	63	63	63	63	63
	Dec	Person's r	-0.2424	-0.8698	-0.8171	-0.2424	-0.5436	-0.7134	-0.6861	0.3371	-0.6447	-0.5986
		N	63	63	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	-0.2077	-0.7133	-0.6559	-0.2077	-0.4054	-0.6155	-0.6704	0.0826	-0.5411	-0.5877
		N	63	63	63	63	63	63	63	63	63	63
	DJF	Person's r	-0.2960	-0.8945	-0.7937	-0.2960	-0.5934	-0.7876	-0.7970	0.2527	-0.6241	-0.6141
		N	63	63	63	63	63	63	63	63	63	63
	MAM	Person's r	0.0024	-0.5336	-0.5168	0.0024	-0.1546	-0.4276	-0.4751	0.0578	-0.4122	-0.4617
		N	63	63	63	63	63	63	63	63	63	63
	JJA	Person's r	-0.2139	-0.3505	-0.2867	-0.2139	-0.2122	-0.3529	-0.4821	-0.2029	-0.2540	-0.3797
		N	63	63	63	63	63	63	63	63	63	63
	SON	Person's r	-0.1957	-0.6187	-0.6037	-0.1957	-0.3549	-0.5116	-0.5699	0.0287	-0.5367	-0.5919
		N	63	63	63	63	63	63	63	63	63	63
Temperature HadCRUT3	Jan	Person's r	-0.1334	-0.4927	-0.7046	-0.1334	-0.3285	-0.4477	-0.3331	0.5105	-0.3945	-0.2665
		N	63	63	63	63	63	63	63	63	63	63
	Feb	Person's r	-0.1983	-0.7002	-0.4595	-0.1983	-0.3706	-0.6835	-0.7436	0.1009	-0.4767	-0.5233
		N	63	63	63	63	63	63	63	63	63	63
	Mar	Person's r	0.1372	-0.1910	-0.5420	0.1372	0.0507	-0.0881	0.0172	0.3796	-0.1786	-0.0752
		N	63	63	63	63	63	63	63	63	63	63
	Apr	Person's r	-0.0265	-0.4848	-0.5244	-0.0265	-0.1863	-0.4466	-0.4317	0.1914	-0.1980	-0.1704
		N	63	63	63	63	63	63	63	63	63	63
	May	Person's r	-0.3916	-0.4632	-0.6893	-0.3916	-0.3971	-0.4352	-0.2727	0.6617	-0.6416	-0.4744
		N	63	63	63	63	63	63	63	63	63	63
	Jun	Person's r	-0.5886	-0.8036	-0.6187	-0.5886	-0.6625	-0.8038	-0.7686	0.4142	-0.5716	-0.5053
		N	63	63	63	63	63	63	63	63	63	63
	Jul	Person's r	-0.2832	-0.6488	-0.8076	-0.2832	-0.5151	-0.5465	-0.5090	0.3314	-0.5759	-0.5374
		N	63	63	63	63	63	63	63	63	63	63
	Aug	Person's r	-0.0678	-0.6775	-0.6557	-0.0678	-0.3554	-0.5438	-0.5459	0.1973	-0.5649	-0.5690
		N	63	63	63	63	63	63	63	63	63	63
	Sep	Person's r	-0.3581	-0.4505	-0.4733	-0.3581	-0.3853	-0.4577	-0.4898	0.1069	-0.3891	-0.4107
		N	63	63	63	63	63	63	63	63	63	63
	Oct	Person's r	-0.2252	-0.5293	-0.5834	-0.2252	-0.3830	-0.4508	-0.4918	0.0513	-0.4320	-0.4696
		N	63	63	63	63	63	63	63	63	63	63
	Nov	Person's r	-0.3054	-0.7510	-0.6381	-0.3054	-0.5427	-0.6123	-0.5773	0.3243	-0.5476	-0.4983
		N	63	63	63	63	63	63	63	63	63	63
	Dec	Person's r	-0.1697	-0.5688	-0.7102	-0.1697	-0.2999	-0.4489	-0.3653	0.4349	-0.5843	-0.4976
		N	63	63	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	-0.2903	-0.6911	-0.7454	-0.2903	-0.4600	-0.6179	-0.5731	0.3781	-0.5689	-0.5125
		N	63	63	63	63	63	63	63	63	63	63
	DJF	Person's r	-0.1899	-0.6683	-0.6819	-0.1899	-0.3765	-0.6066	-0.5676	0.3604	-0.5388	-0.4881
		N	63	63	63	63	63	63	63	63	63	63
	MAM	Person's r	-0.1525	-0.4633	-0.7170	-0.1525	-0.2410	-0.3987	-0.2744	0.5320	-0.4503	-0.3202
		N	63	63	63	63	63	63	63	63	63	63
	JJA	Person's r	-0.3974	-0.7872	-0.7650	-0.3974	-0.5918	-0.7148	-0.6846	0.3676	-0.6248	-0.5803
		N	63	63	63	63	63	63	63	63	63	63
	SON	Person's r	-0.3417	-0.6559	-0.6425	-0.3417	-0.4986	-0.5780	-0.5900	0.1911	-0.5177	-0.5186
		N	63	63	63	63	63	63	63	63	63	63
SOI		Person's r	-0.2686	-0.1484	-0.0493	-0.2686	-0.1863	-0.3646	-0.1338	0.8314	-0.0873	0.1785
		N	60	60	60	60	60	60	60	60	60	60
El Niño 3		Person's r	0.4581	0.6596	0.4236	0.4581	0.6374	0.8229	0.6907	-0.6562	0.3196	0.1395
		N	61	61	61	61	61	61	61	61	61	61
SAB		Person's r	-0.2035	-0.1800	-0.0405	-0.2035	-0.3133	-0.3060	-0.3757	-0.1486	-0.0525	-0.1012
		N	57	57	57	57	57	57	57	57	57	57

A17 (continued) Correlation matrix of Laguna del Inca. 9-year filtered data

			Bsi					C, N und C/N				
			Si µg/g	Bsi µg/g	Bsi Flux	Fe µg/g	Al µg/g	N %	TOC %	TOC/N	TOC Flux	N Flux
Precipitation HadCRUT3	Jan	Person's r	0.1057	0.3303	0.5372	0.1057	0.2691	0.0405	-0.1515	-0.5374	0.4989	0.3034
		N	63	63	63	63	63	63	63	63	63	63
	Feb	Person's r	0.0215	-0.1685	-0.2151	0.0215	-0.0311	-0.0557	-0.1971	-0.4148	-0.2464	-0.3993
		N	63	63	63	63	63	63	63	63	63	63
	Mar	Person's r	0.0951	-0.1746	-0.2317	0.0951	0.1915	-0.0417	0.0033	0.1451	-0.1880	-0.1285
		N	63	63	63	63	63	63	63	63	63	63
	Apr	Person's r	0.0139	0.0812	-0.0854	0.0139	0.1057	0.1024	-0.0054	-0.2112	-0.2548	-0.4034
		N	63	63	63	63	63	63	63	63	63	63
	May	Person's r	-0.2014	0.5068	0.4152	-0.2014	0.3536	0.2754	0.2967	0.0789	0.1161	0.1276
		N	63	63	63	63	63	63	63	63	63	63
	Jun	Person's r	0.3499	0.8253	0.7185	0.3499	0.6197	0.7167	0.7033	-0.2907	0.5131	0.4774
		N	63	63	63	63	63	63	63	63	63	63
	Jul	Person's r	0.1796	0.0326	0.0468	0.1796	-0.0185	0.0979	0.0954	-0.1196	0.1172	0.1310
		N	63	63	63	63	63	63	63	63	63	63
	Aug	Person's r	0.4887	0.0105	0.0880	0.4887	0.2507	-0.0204	-0.1743	-0.4597	0.1181	-0.0475
		N	63	63	63	63	63	63	63	63	63	63
	Sep	Person's r	0.1762	0.6338	0.4179	0.1762	0.4686	0.6743	0.7199	-0.0365	0.2766	0.2842
		N	63	63	63	63	63	63	63	63	63	63
	Oct	Person's r	0.0058	0.0186	0.0970	0.0058	-0.0615	0.0328	-0.0531	-0.3528	0.1406	0.0689
		N	63	63	63	63	63	63	63	63	63	63
	Nov	Person's r	-0.1611	0.0441	-0.0429	-0.1611	-0.2312	0.1957	0.1506	-0.2076	-0.0041	-0.0554
		N	63	63	63	63	63	63	63	63	63	63
	Dec	Person's r	0.1701	-0.0093	0.1716	0.1701	0.2072	-0.1933	-0.2453	-0.0916	0.1952	0.1706
		N	63	63	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	0.2938	0.7473	0.6368	0.2938	0.6117	0.6088	0.5352	-0.3824	0.3894	0.2941
		N	63	63	63	63	63	63	63	63	63	63
	DJF	Person's r	0.1557	0.0789	0.2589	0.1557	0.2320	-0.1127	-0.3004	-0.5042	0.2387	0.0592
		N	63	63	63	63	63	63	63	63	63	63
	MAM	Person's r	-0.1707	0.4581	0.3375	-0.1707	0.3549	0.2651	0.2660	0.0399	0.0376	0.0227
		N	63	63	63	63	63	63	63	63	63	63
	JJA	Person's r	0.4846	0.4629	0.4460	0.4846	0.4334	0.4216	0.3462	-0.4122	0.3816	0.2968
		N	63	63	63	63	63	63	63	63	63	63
	SON	Person's r	0.0716	0.5105	0.3476	0.0716	0.2342	0.6100	0.5855	-0.2803	0.2763	0.2271
		N	63	63	63	63	63	63	63	63	63	63
Precipitation CRU TS 2.1	Jan	Person's r	0.1487	-0.1008	-0.1583	0.1487	0.2303	-0.0210	-0.0398	0.0242	-0.1426	-0.1707
		N	63	63	63	63	63	63	63	63	63	63
	Feb	Person's r	-0.1868	0.3558	0.4729	-0.1868	-0.0363	0.0117	-0.0688	-0.2030	0.2798	0.2022
		N	63	63	63	63	63	63	63	63	63	63
	Mar	Person's r	0.1290	-0.0361	-0.1516	0.1290	0.1921	0.1539	0.2328	0.1614	-0.0964	-0.0064
		N	63	63	63	63	63	63	63	63	63	63
	Apr	Person's r	-0.5032	-0.2777	-0.3587	-0.5032	-0.3863	-0.3567	-0.3722	0.1926	-0.5444	-0.5717
		N	63	63	63	63	63	63	63	63	63	63
	May	Person's r	-0.7537	-0.1063	0.0015	-0.7537	-0.3460	-0.4514	-0.4504	0.2525	-0.2285	-0.2065
		N	63	63	63	63	63	63	63	63	63	63
	Jun	Person's r	0.4503	0.4027	0.3058	0.4503	0.4878	0.5115	0.4660	-0.3253	0.2988	0.2312
		N	63	63	63	63	63	63	63	63	63	63
	Jul	Person's r	0.1212	0.2010	0.2375	0.1212	0.0017	0.1791	0.1875	-0.1077	0.2647	0.2909
		N	63	63	63	63	63	63	63	63	63	63
	Aug	Person's r	0.3437	-0.0599	-0.0085	0.3437	0.1717	-0.1027	-0.2557	-0.4130	-0.0430	-0.2094
		N	63	63	63	63	63	63	63	63	63	63
	Sep	Person's r	-0.3126	0.5332	0.5388	-0.3126	0.0978	0.2259	0.1970	-0.0739	0.2871	0.2425
		N	63	63	63	63	63	63	63	63	63	63
	Oct	Person's r	0.0540	-0.1306	0.0261	0.0540	0.0020	-0.1781	-0.2375	-0.2107	0.0933	0.0601
		N	63	63	63	63	63	63	63	63	63	63
	Nov	Person's r	-0.1317	-0.1085	-0.1730	-0.1317	-0.3064	0.0544	0.0361	-0.0981	-0.1129	-0.1256
		N	63	63	63	63	63	63	63	63	63	63
	Dec	Person's r	0.3984	-0.3113	-0.1656	0.3984	0.0628	-0.1799	-0.2118	-0.1081	0.1356	0.1240
		N	63	63	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	-0.3824	0.0545	0.1431	-0.3824	-0.1090	-0.2364	-0.3275	-0.1239	-0.0825	-0.1636
		N	63	63	63	63	63	63	63	63	63	63
	DJF	Person's r	0.1591	0.0761	0.2440	0.1591	0.1300	-0.1136	-0.2174	-0.2408	0.2648	0.1713
		N	63	63	63	63	63	63	63	63	63	63
	MAM	Person's r	-0.7703	-0.1589	-0.0893	-0.7703	-0.3805	-0.4690	-0.4667	0.2763	-0.3307	-0.3119
		N	63	63	63	63	63	63	63	63	63	63
	JJA	Person's r	0.5473	0.2803	0.2729	0.5473	0.4041	0.3066	0.1801	-0.5148	0.2568	0.1156
		N	63	63	63	63	63	63	63	63	63	63
	SON	Person's r	-0.1732	0.1243	0.2258	-0.1732	-0.0770	-0.0037	-0.0740	-0.2486	0.1755	0.1205
		N	63	63	63	63	63	63	63	63	63	63

A17 (continued) Correlation matrix of Laguna del Inca. 9-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec surf	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Temperature CRU TS 2.1	Jan	Person's r	-0.6890	-0.9000	-0.2453	0.2784	0.5799	0.4211	-0.0396	-0.4467	-0.5859	-0.0391	-0.3829	0.5368	-0.8016	-0.7525
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Feb	Person's r	-0.5965	-0.7579	-0.2097	0.2395	0.5188	0.3671	-0.0641	-0.4327	-0.5355	-0.0636	-0.3712	0.4640	-0.7411	-0.6681
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Mar	Person's r	-0.4807	-0.5495	-0.0996	0.1208	0.3547	0.2130	-0.1437	-0.4005	-0.4451	-0.1432	-0.3531	0.2205	-0.5988	-0.4279
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Apr	Person's r	-0.3794	-0.2371	0.3081	-0.2923	-0.1310	-0.2456	-0.4278	-0.4670	-0.4230	-0.4273	-0.4600	-0.2246	-0.3962	-0.1638
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	May	Person's r	-0.5656	-0.6674	-0.0464	0.0686	0.3016	0.1830	-0.1474	-0.4387	-0.5328	-0.1467	-0.3978	0.3355	-0.6414	-0.6613
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Jun	Person's r	-0.6010	-0.5299	0.2981	-0.2790	-0.0880	-0.1996	-0.4227	-0.5443	-0.5598	-0.4227	-0.5320	-0.0158	-0.5321	-0.4300
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Jul	Person's r	-0.6237	-0.5143	0.3348	-0.3080	-0.0572	-0.2147	-0.5180	-0.6311	-0.6186	-0.5178	-0.6137	-0.1795	-0.6302	-0.3084
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Aug	Person's r	-0.0545	0.0138	0.0659	-0.0695	-0.0168	-0.0557	-0.1353	-0.1476	-0.1014	-0.1350	-0.1381	-0.1084	-0.1272	0.0035
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Sep	Person's r	-0.7134	-0.5888	0.3902	-0.3617	-0.0860	-0.2562	-0.5915	-0.7215	-0.6985	-0.5910	-0.7004	-0.1949	-0.7178	-0.3915
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Oct	Person's r	-0.7755	-0.6783	0.3386	-0.3069	0.0102	-0.1911	-0.5855	-0.7472	-0.7480	-0.5851	-0.7216	-0.1880	-0.7854	-0.3848
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Nov	Person's r	-0.4370	-0.5992	-0.2872	0.3122	0.5507	0.4094	0.0202	-0.2950	-0.3735	0.0208	-0.2356	0.3881	-0.6005	-0.4508
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Dec	Person's r	-0.5934	-0.7941	-0.2827	0.3129	0.6001	0.4437	-0.0083	-0.3900	-0.5068	-0.0076	-0.3248	0.4763	-0.7451	-0.6346
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	-0.7132	-0.7701	0.0162	0.0152	0.3268	0.1451	-0.2965	-0.6007	-0.6629	-0.2959	-0.5502	0.2158	-0.8092	-0.6006
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	DJF	Person's r	-0.6467	-0.8430	-0.2527	0.2848	0.5837	0.4228	-0.0399	-0.4383	-0.5613	-0.0393	-0.3726	0.5082	-0.7881	-0.7081
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	MAM	Person's r	-0.5818	-0.6080	0.0374	-0.0131	0.2450	0.0921	-0.2700	-0.5218	-0.5664	-0.2693	-0.4807	0.1649	-0.6735	-0.5243
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	JJA	Person's r	-0.6187	-0.5081	0.3316	-0.3112	-0.0799	-0.2225	-0.5035	-0.6237	-0.6104	-0.5032	-0.6061	-0.1225	-0.6089	-0.3706
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	SON	Person's r	-0.7337	-0.7207	0.1468	-0.1141	0.2054	0.0086	-0.4251	-0.6659	-0.6911	-0.4246	-0.6236	0.0226	-0.8080	-0.4761
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
Temperature HadCRUT3	Jan	Person's r	-0.0511	-0.2592	-0.4987	0.5163	0.6341	0.5522	0.2921	0.0783	0.0293	0.2928	0.1325	0.3226	-0.2469	-0.0507
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Feb	Person's r	-0.6555	-0.7518	-0.0577	0.0847	0.3651	0.2126	-0.1943	-0.5304	-0.6169	-0.1937	-0.4782	0.3717	-0.7594	-0.7132
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Mar	Person's r	0.1117	-0.0112	-0.3804	0.3852	0.4325	0.3865	0.2482	0.1354	0.1193	0.2489	0.1693	0.1738	-0.0616	0.0775
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Apr	Person's r	-0.2844	-0.4248	-0.2272	0.2429	0.3807	0.3110	0.0787	-0.1700	-0.2468	0.0793	-0.1291	0.3950	-0.3877	-0.4586
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	May	Person's r	-0.1624	-0.2955	-0.2665	0.2829	0.4098	0.3343	0.1034	-0.0783	-0.1184	0.1042	-0.0379	0.2160	-0.3092	-0.1801
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Jun	Person's r	-0.5199	-0.6975	-0.2331	0.2537	0.4861	0.3685	0.0020	-0.3455	-0.4544	0.0027	-0.2896	0.4985	-0.6420	-0.6733
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Jul	Person's r	-0.3083	-0.4507	-0.2539	0.2825	0.4616	0.3508	0.0495	-0.1860	-0.2425	0.0503	-0.1382	0.2852	-0.4453	-0.2930
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Aug	Person's r	-0.5130	-0.6396	-0.1691	0.2004	0.4536	0.3063	-0.0815	-0.3884	-0.4686	-0.0808	-0.3355	0.3265	-0.6511	-0.5209
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Sep	Person's r	-0.5176	-0.4693	0.1856	-0.1629	0.0450	-0.0874	-0.3596	-0.4927	-0.4879	-0.3589	-0.4684	-0.0537	-0.5426	-0.3241
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Oct	Person's r	-0.5804	-0.5564	0.1590	-0.1291	0.1110	-0.0410	-0.3596	-0.5268	-0.5390	-0.3589	-0.4976	-0.0228	-0.6146	-0.3638
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Nov	Person's r	-0.3545	-0.5738	-0.4227	0.4471	0.6732	0.5396	0.1480	-0.1847	-0.2793	0.1486	-0.1199	0.4633	-0.5518	-0.3980
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Dec	Person's r	-0.3399	-0.4666	-0.2563	0.2786	0.4958	0.3594	0.0030	-0.2511	-0.2956	0.0039	-0.1971	0.2384	-0.5224	-0.2941
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	-0.4303	-0.5744	-0.2409	0.2671	0.4976	0.3608	-0.0106	-0.3032	-0.3715	-0.0098	-0.2476	0.3308	-0.5858	-0.4361
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	DJF	Person's r	-0.4233	-0.5788	-0.2792	0.3046	0.5416	0.4007	0.0130	-0.2939	-0.3641	0.0138	-0.2344	0.3551	-0.5960	-0.4344
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	MAM	Person's r	-0.1353	-0.2938	-0.3485	0.3637	0.4905	0.4126	0.1690	-0.0464	-0.0981	0.1699	-0.0001	0.3042	-0.3067	-0.2154
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	JJA	Person's r	-0.4840	-0.6520	-0.2473	0.2755	0.5138	0.3807	0.0004	-0.3258	-0.4175	0.0012	-0.2686	0.4197	-0.6272	-0.5504
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	SON	Person's r	-0.5395	-0.6006	-0.0442	0.0728	0.3255	0.1691	-0.2017	-0.4437	-0.4838	-0.2010	-0.3983	0.1579	-0.6402	-0.4090
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
SOI		Person's r	0.3820	0.1209	-0.6945	0.6861	0.6064	0.6500	0.6340	0.5161	0.4562	0.6344	0.5565	0.3927	0.1980	0.1727
		N	60	60	60	60	60	60	60	60	60	60	60	60	60	60
El Niño 3		Person's r	0.1850	0.4746	0.5990	-0.6135	-0.7387	-0.6754	-0.3838	-0.0604	0.0548	-0.3843	-0.1265	-0.5662	0.3539	0.3136
		N	61	61	61	61	61	61	61	61	61	61	61	61	61	61
SAB		Person's r	-0.4951	-0.4194	0.2486	-0.2444	-0.0748	-0.1697	-0.3836	-0.4726	-0.4709	-0.3839	-0.4677	-0.0594	-0.4178	-0.2954
		N	57	57	57	57	57	57	57	57	57	57	57	57	57	57

A17 (continued) Correlation matrix of Laguna del Inca. 9-year filtered data

			Grain size													
			D [4, 3]	Uniformity	Spec surf	D [3, 2]	d (0.1)	d (0.2)	d (0.5)	d (0.8)	d (0.9)	Mediane	Mean	Mode	Sorting	Skewness
Precipitation HadCRUT3	Jan	Person's r	0.0188	0.1668	0.3147	-0.3220	-0.4027	-0.3498	-0.1892	-0.0795	-0.0320	-0.1898	-0.1069	-0.1170	0.1375	-0.0509
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Feb	Person's r	-0.7637	-0.5179	0.7222	-0.6971	-0.4603	-0.6025	-0.8146	-0.8170	-0.7749	-0.8146	-0.8293	-0.4423	-0.6279	-0.3476
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Mar	Person's r	-0.4204	-0.3555	0.1590	-0.1488	0.0643	-0.0724	-0.3514	-0.4485	-0.4358	-0.3511	-0.4278	-0.1821	-0.4921	-0.1356
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Apr	Person's r	-0.1202	0.0290	0.2902	-0.2852	-0.2491	-0.2790	-0.2927	-0.2413	-0.1762	-0.2925	-0.2488	-0.2132	-0.1097	-0.0364
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	May	Person's r	0.2036	0.4189	0.3842	-0.4041	-0.5261	-0.4548	-0.2294	-0.0044	0.1030	-0.2294	-0.0429	-0.3874	0.2795	0.2189
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Jun	Person's r	0.4481	0.6866	0.3459	-0.3654	-0.5671	-0.4731	-0.1417	0.2346	0.3812	-0.1423	0.1785	-0.6546	0.5701	0.7333
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Jul	Person's r	-0.1377	-0.0987	0.0868	-0.0851	-0.0251	-0.0802	-0.1474	-0.1154	-0.1105	-0.1476	-0.1206	-0.2153	-0.0919	0.1440
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Aug	Person's r	-0.3720	-0.2664	0.2782	-0.2638	-0.1388	-0.2208	-0.3543	-0.3940	-0.3865	-0.3545	-0.3938	-0.1413	-0.3237	-0.1916
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Sep	Person's r	0.6595	0.7588	-0.0087	-0.0155	-0.2511	-0.1343	0.1924	0.4708	0.5677	0.1922	0.4335	-0.3127	0.6592	0.6576
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Oct	Person's r	-0.3270	-0.2123	0.4172	-0.4137	-0.3715	-0.3800	-0.3588	-0.3094	-0.3178	-0.3592	-0.3351	-0.1849	-0.1547	-0.1944
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Nov	Person's r	0.1289	0.1637	0.1327	-0.1354	-0.2344	-0.1686	0.0056	0.1246	0.1224	0.0054	0.0958	-0.0808	0.2368	0.1024
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Dec	Person's r	-0.2489	-0.2432	0.0315	-0.0354	0.0662	0.0098	-0.1287	-0.2373	-0.2608	-0.1290	-0.2229	0.0950	-0.2704	-0.2625
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	0.1445	0.4729	0.6017	-0.6176	-0.7246	-0.6847	-0.4439	-0.1058	0.0426	-0.4445	-0.1635	-0.7299	0.2998	0.4757
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	DJF	Person's r	-0.4795	-0.2910	0.5033	-0.4975	-0.3719	-0.4425	-0.5381	-0.5456	-0.5161	-0.5385	-0.5567	-0.2079	-0.3709	-0.3299
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	MAM	Person's r	0.1248	0.3539	0.4172	-0.4332	-0.5185	-0.4714	-0.2939	-0.0890	0.0218	-0.2939	-0.1235	-0.4062	0.1894	0.1786
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	JJA	Person's r	0.0144	0.2066	0.3474	-0.3508	-0.3767	-0.3877	-0.2992	-0.0995	-0.0152	-0.2997	-0.1319	-0.5135	0.1222	0.3774
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	SON	Person's r	0.4002	0.5448	0.2459	-0.2639	-0.4639	-0.3520	-0.0215	0.2629	0.3319	-0.0220	0.2104	-0.3596	0.5260	0.4511
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
Precipitation CRU TS 2.1	Jan	Person's r	-0.1664	-0.1398	0.0604	-0.0529	0.0381	-0.0135	-0.1355	-0.2083	-0.2044	-0.1352	-0.1945	0.0143	-0.2330	-0.1709
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Feb	Person's r	0.1789	0.3210	0.2180	-0.2206	-0.3262	-0.2853	-0.1185	0.0957	0.1953	-0.1190	0.0681	-0.3729	0.2843	0.4242
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Mar	Person's r	-0.2409	-0.1322	0.1871	-0.1784	-0.0325	-0.1475	-0.3315	-0.3071	-0.2478	-0.3311	-0.3002	-0.3998	-0.2839	0.1822
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Apr	Person's r	-0.2838	-0.2491	0.1087	-0.0980	0.0186	-0.0520	-0.2082	-0.2961	-0.2861	-0.2078	-0.2796	0.0098	-0.3234	-0.2428
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	May	Person's r	-0.1475	-0.1066	0.1165	-0.1187	-0.0842	-0.0917	-0.1353	-0.1673	-0.1457	-0.1353	-0.1608	0.0280	-0.1468	-0.1823
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Jun	Person's r	0.2231	0.3073	0.2079	-0.2221	-0.3690	-0.2604	-0.0072	0.1411	0.1527	-0.0076	0.1028	-0.1002	0.3298	0.0643
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Jul	Person's r	0.0787	0.1201	0.0402	-0.0470	-0.0799	-0.0818	-0.0293	0.0847	0.1121	-0.0297	0.0690	-0.2573	0.1476	0.3422
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Aug	Person's r	-0.4952	-0.3567	0.3814	-0.3606	-0.1923	-0.2970	-0.4784	-0.5253	-0.5049	-0.4786	-0.5232	-0.2057	-0.4427	-0.2461
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Sep	Person's r	0.5205	0.6112	0.0669	-0.0926	-0.3405	-0.1922	0.1591	0.3884	0.4638	0.1585	0.3512	-0.1314	0.5935	0.3573
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Oct	Person's r	-0.5627	-0.4732	0.3944	-0.3845	-0.2328	-0.3044	-0.4447	-0.5119	-0.5435	-0.4450	-0.5181	-0.1082	-0.4368	-0.4082
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Nov	Person's r	-0.0090	-0.0263	0.0637	-0.0610	-0.0965	-0.0635	0.0101	0.0500	0.0184	0.0100	0.0349	0.0029	0.0780	-0.0139
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Dec	Person's r	-0.2922	-0.4262	-0.2160	0.2210	0.3625	0.2835	0.0630	-0.1658	-0.2703	0.0631	-0.1357	0.3450	-0.3527	-0.3981
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	Annual Mean	Person's r	-0.3236	-0.1614	0.4340	-0.4322	-0.3709	-0.3952	-0.4206	-0.3832	-0.3423	-0.4210	-0.3972	-0.2112	-0.2201	-0.1988
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	DJF	Person's r	-0.1092	-0.0490	0.0964	-0.0916	-0.0505	-0.0904	-0.1418	-0.1285	-0.1007	-0.1420	-0.1274	-0.1171	-0.0865	0.0465
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	MAM	Person's r	-0.2094	-0.1587	0.1391	-0.1381	-0.0721	-0.1019	-0.1873	-0.2338	-0.2088	-0.1872	-0.2240	0.0018	-0.2205	-0.2043
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	JJA	Person's r	-0.1696	-0.0095	0.3963	-0.3934	-0.3802	-0.3876	-0.3388	-0.2358	-0.2039	-0.3393	-0.2634	-0.3042	-0.0428	0.0137
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63
	SON	Person's r	-0.1875	-0.0762	0.3781	-0.3823	-0.4032	-0.3704	-0.2709	-0.1899	-0.1898	-0.2715	-0.2204	-0.1535	-0.0121	-0.1496
		N	63	63	63	63	63	63	63	63	63	63	63	63	63	63

Endprodukt, Tomi Ungerer

Erklärung

gemäss Art. 28 Abs. 2 RSL 05

Name/Vorname:	von Gunten Lucien
Matrikelnummer:	00-113-167
Studiengang:	PhD of Science in Climate Sciences
	Bachelor ☐ Master ☐ Dissertation ☒
Titel der Arbeit:	High-resolution, quantitative climate reconstruction over the past 1000 years and pollution history derived from lake sediments in Central Chile
Leiter der Arbeit:	Prof. Dr. Martin Grosjean, Geographical Institute, Universität Bern, Erlachstrasse 9a, CH-3012 Bern

Ich erkläre hiermit, dass ich diese Arbeit selbständig verfasst und keine anderen als die angegebenen Quellen benutzt habe. Alle Stellen, die wörtlich oder sinngemäss aus Quellen entnommen wurden, habe ich als solche gekennzeichnet. Mir ist bekannt, dass andernfalls der Senat gemäss Artikel 36 Absatz 1 Buchstabe o des Gesetztes vom 5. September 1996 über die Universität zum Entzug des auf Grund dieser Arbeit verliehenen Titels berechtigt ist.

Bern, 31.10.2008

Ort/Datum Unterschrift

Curriculum vitae

Name	**Lucien von Gunten**
Date of birth	25.03.1980
Place of birth	Bern

Education

2005-2009	**Doctoral studies** in climate sciences at the Geographical Institute and Oeschger Centre for Climate Change Research, University of Bern, Switzerland. Dissertation title: "High-resolution, quantitative climate reconstruction over the past 1000 years and pollution history derived from lake sediments in Central Chile". Advisor: Prof. Dr. M. Grosjean, External referee: Dr. F. Anselmetti ETH and EAWAG, Faculty Member: Prof. Dr. H. Wanner
2000–2005	**Biology studies** at the University of Bern, Master of Science, specialisation: Plant ecology. Thesis title: "Diatomeen eines Hochgebirgssees (Lej da la Tscheppa, Oberengadin) als Umweltindikatoren der letzten 400 Jahre"
1995–1999	**Gymnase Cantonal de Neuchâtel** (today: Lycée Denis-de-Rougemont, NE), baccalauréat type C (Natural sciences)
1990–1995	**Établissement Secondaire d'Avenches** (VD)