



Servei Meteorològic
de Catalunya



Generalitat
de Catalunya



UNIVERSITAT DE
BARCELONA

**Limitations and advantages of using a
NEAR REAL-TIME ALGORITHM
FOR INTERPOLATING HAIL SIZE
combining weather radar and surface observations**

Rigo, T., C. Farnell, and J. M. Vide

Preliminaries



Servei Meteorològic
de Catalunya



**Generalitat
de Catalunya**



UNIVERSITAT DE
BARCELONA

Preliminary

Using KED with radar and rain gauges



A non-parametric automatic blending methodology to estimate rainfall fields from rain gauge and radar data

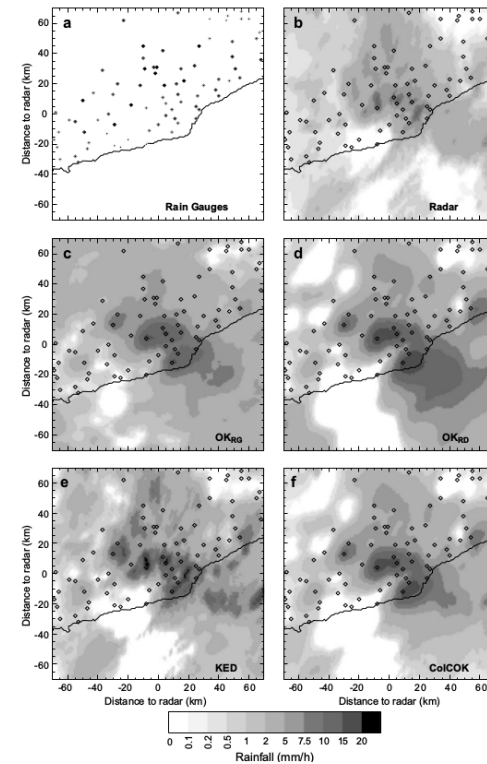
Carlos A. Velasco-Forero ^{a,*}, Daniel Sempere-Torres ^a, Eduardo F. Cassiraga ^b, J. Jaime Gómez-Hernández ^b

^aGrup de Recerca Aplicada en Hidrometeorologia, ETSECCPB, Universitat Politècnica de Catalunya, C/Gran Capità, 2-4, Edifici NEXUS 102-106, 08034 Barcelona, Spain

^bDepartamento de Ingeniería Hidráulica y Medio Ambiente, Universidad Politécnica de Valencia, C/Camino de Vera, s/n. 46071 Valencia, Spain

ARTICLE INFO

ABSTRACT



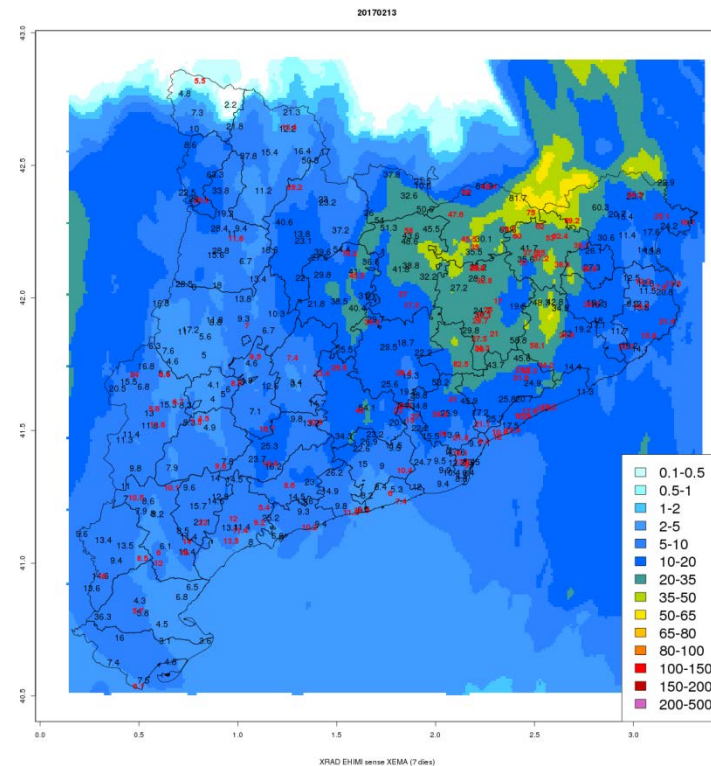
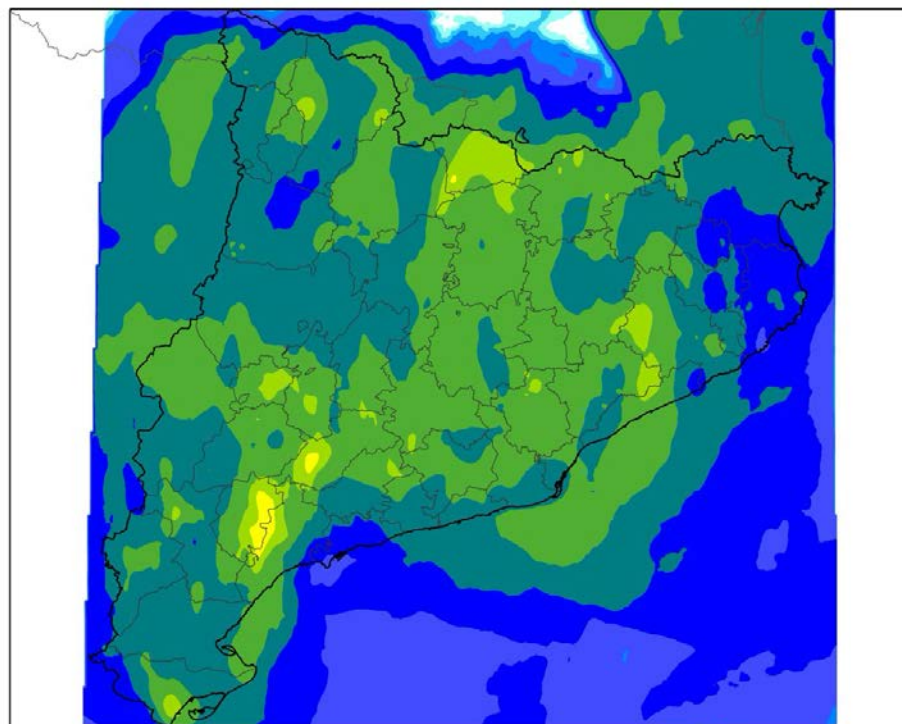
Preliminary research: integrating radar rainfall estimation with rain gauges observations

Preliminary

Operational QPE product at the SMC

Estimació de la precipitació acumulada (mm)
3 i 4 de març de 2017 (fins a les 8h)

S'obté combinant les dades dels radars de la XRAD i dels pluviòmetres de la XEMA



2 questions:

1. Can we add observers data? (red obs)
2. Why not do the same for hail?

Answer for both: future projects

Preliminary


First studies using radar and surface observations

Theor Appl Climatol
DOI 10.1007/s00704-016-1937-0

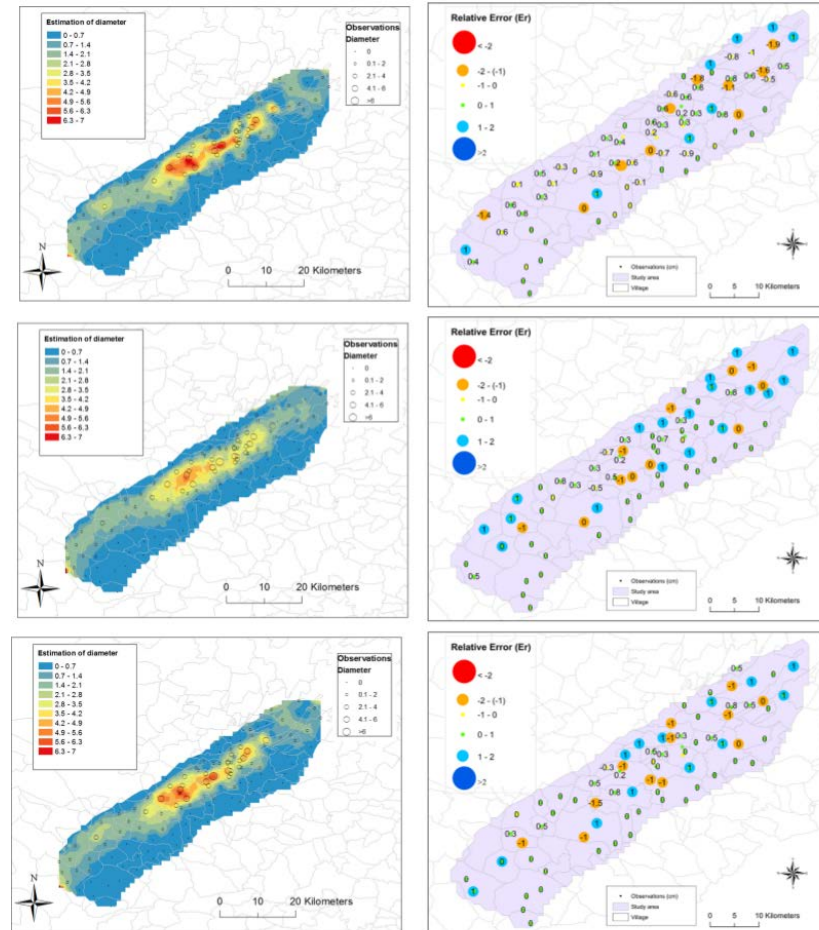


ORIGINAL PAPER

Application of cokriging techniques for the estimation of hail size

Carme Farnell¹ · Tomeu Rigo¹  · Javier Martin-Vide²

Received: 17 December 2015 / Accepted: 5 September 2016
© Springer-Verlag Wien 2016



Good results... but:

1. For a localised area, with high spatial resolution data (hailpads)
2. Not in real-time

Question: can we apply the same procedure for the whole area of Catalonia?

Area of study



Servei Meteorològic
de Catalunya



**Generalitat
de Catalunya**



UNIVERSITAT DE
BARCELONA

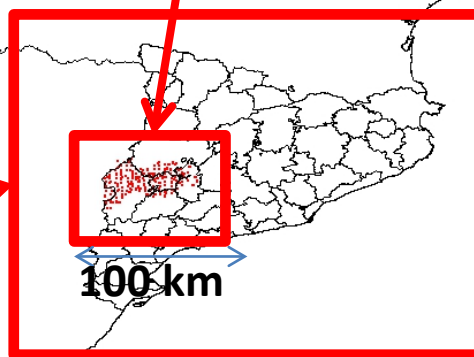
Area of analysis

Catalonia (NE of the Iberian Peninsula)



Hail-pad network

400 km



100 km

Plus 4 C-band radars (SMC)

Hail discrimination



Servei Meteorològic
de Catalunya



**Generalitat
de Catalunya**

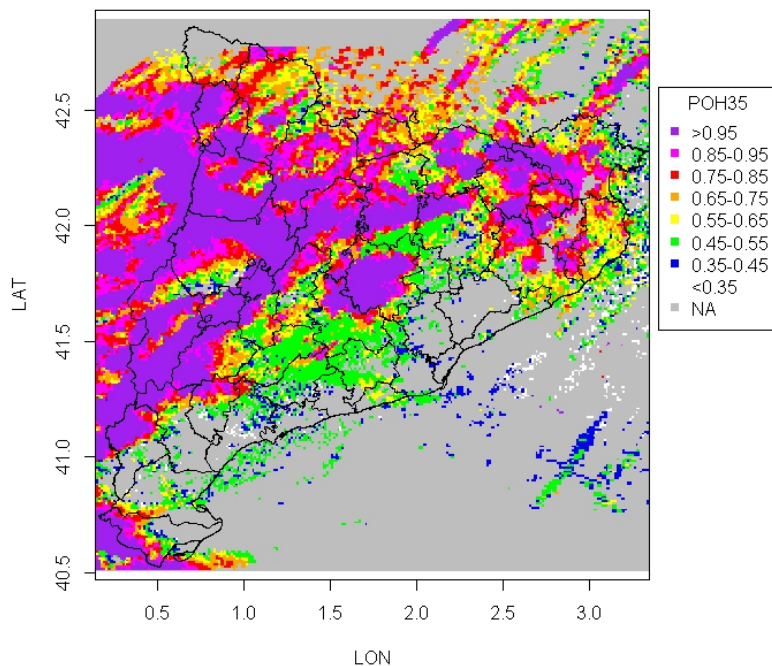


UNIVERSITAT DE
BARCELONA

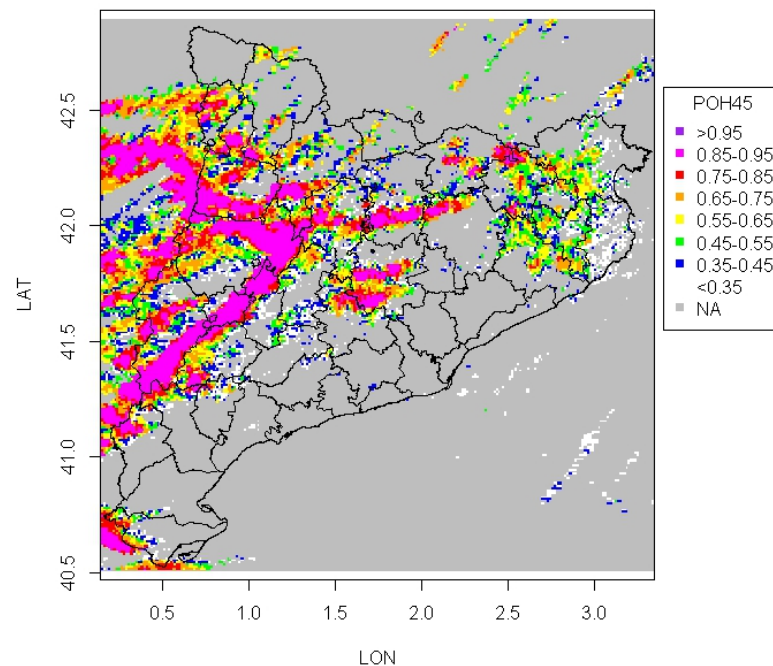
Hail discrimination

POH (35 and 45 dBZ)

July 5th, 2012

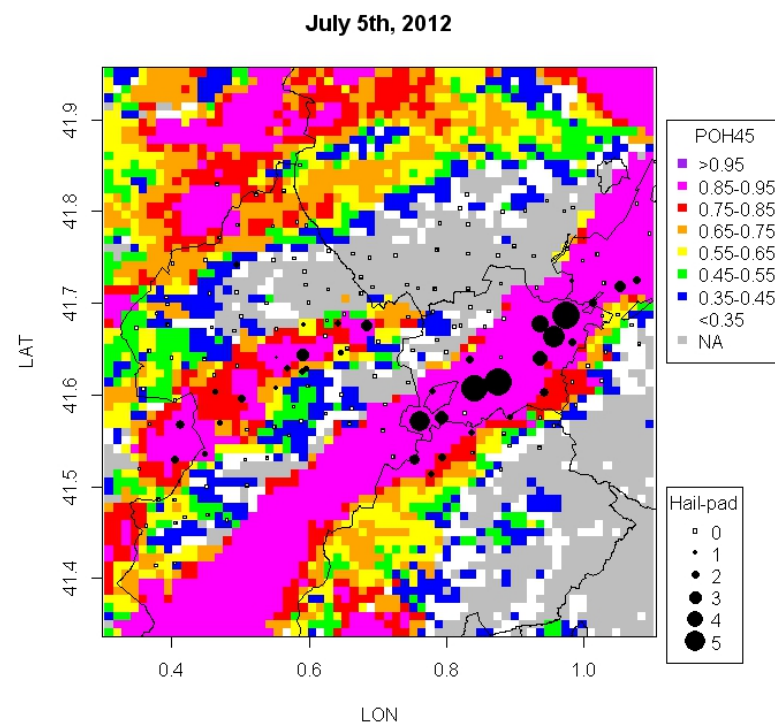
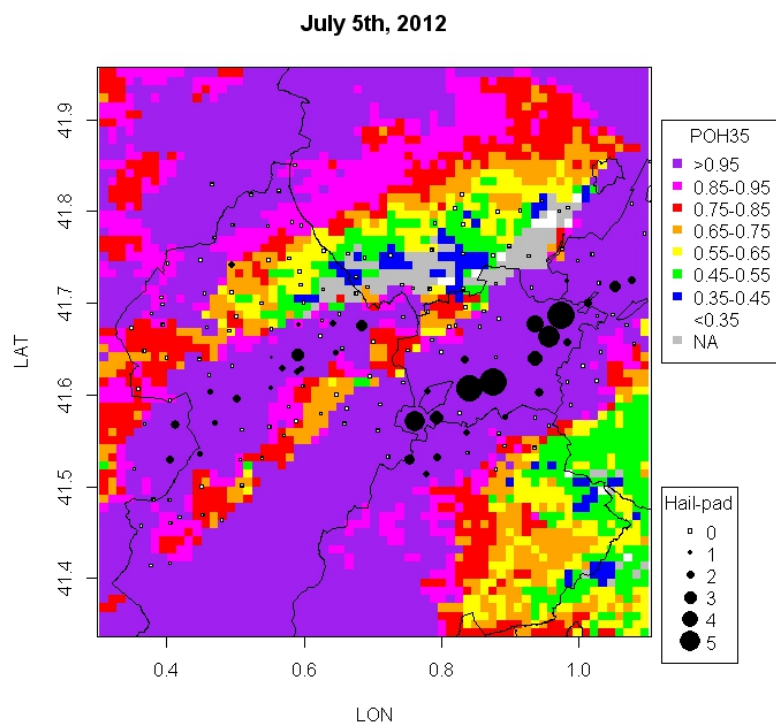


July 5th, 2012



Hail discrimination

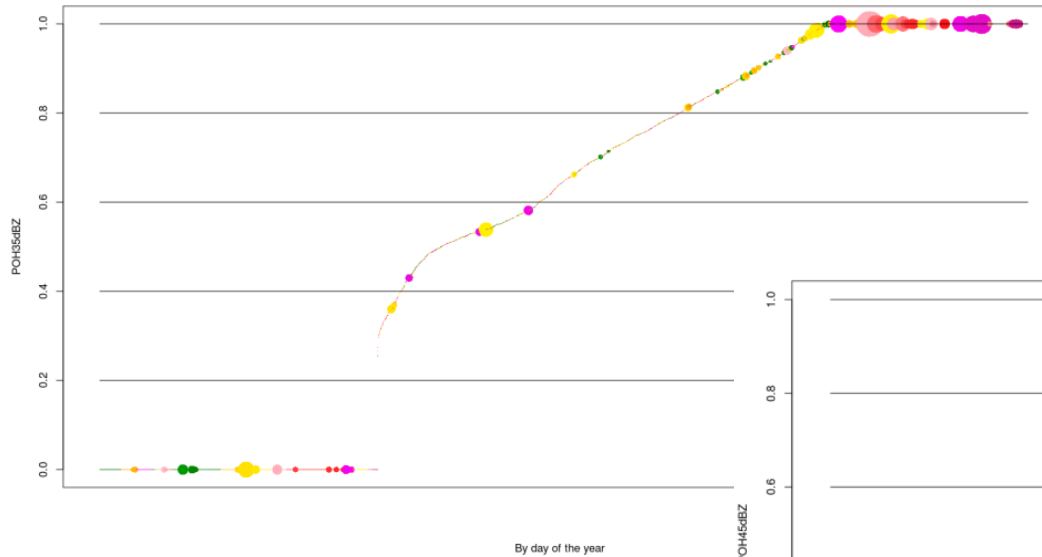
POH is based on Waldvogel (2001), but eq were adapted with hailpads



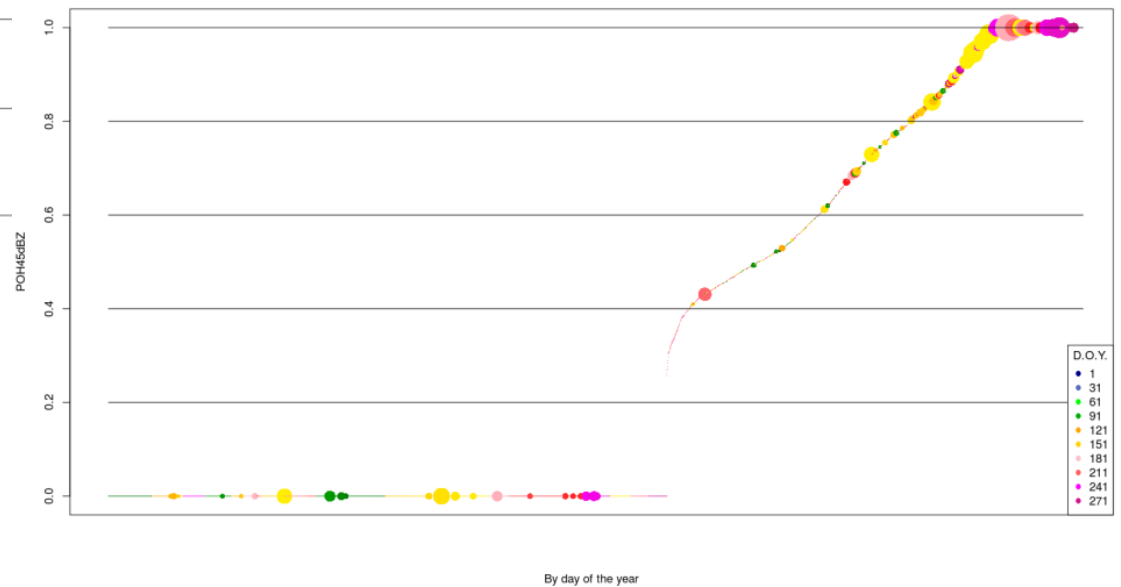
Hail discrimination

Variability of POH with the day of the year

Hail size distribution vs POH35

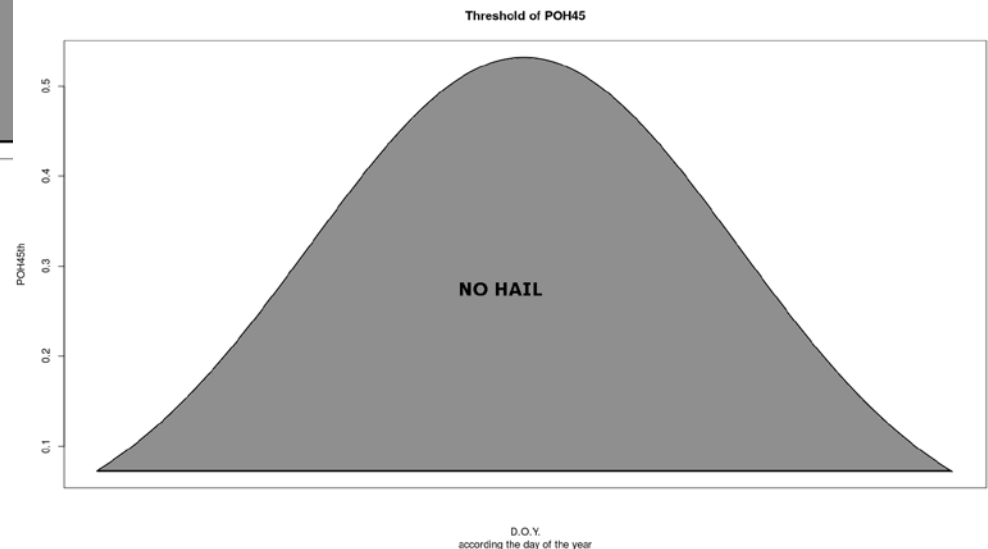
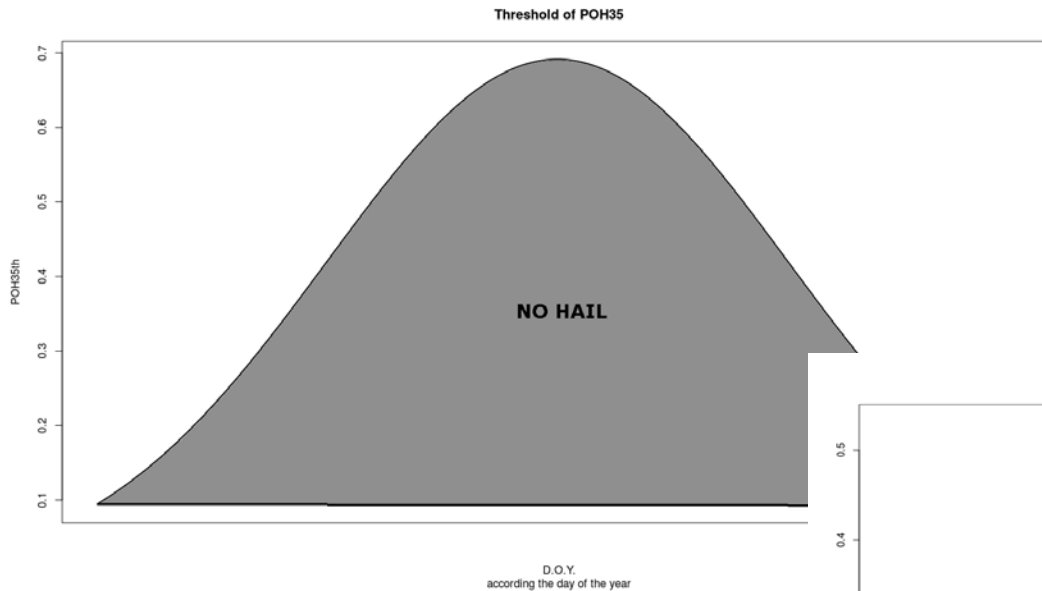


Hail size distribution vs POH45



Hail discrimination

Can we get curves for both POH, depending on the DOY?

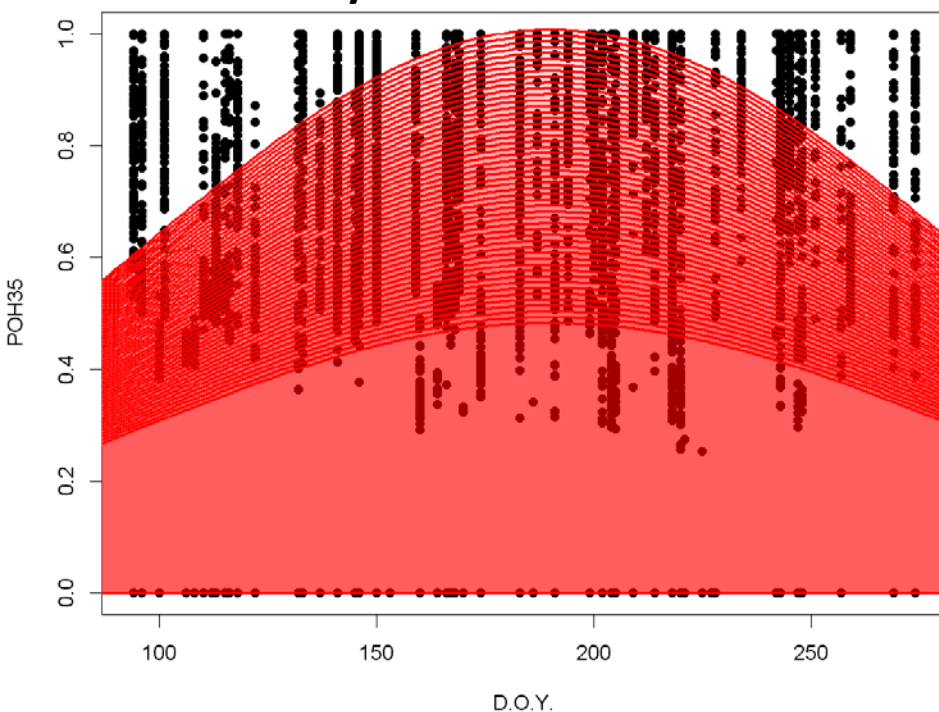


Different axis values!!!

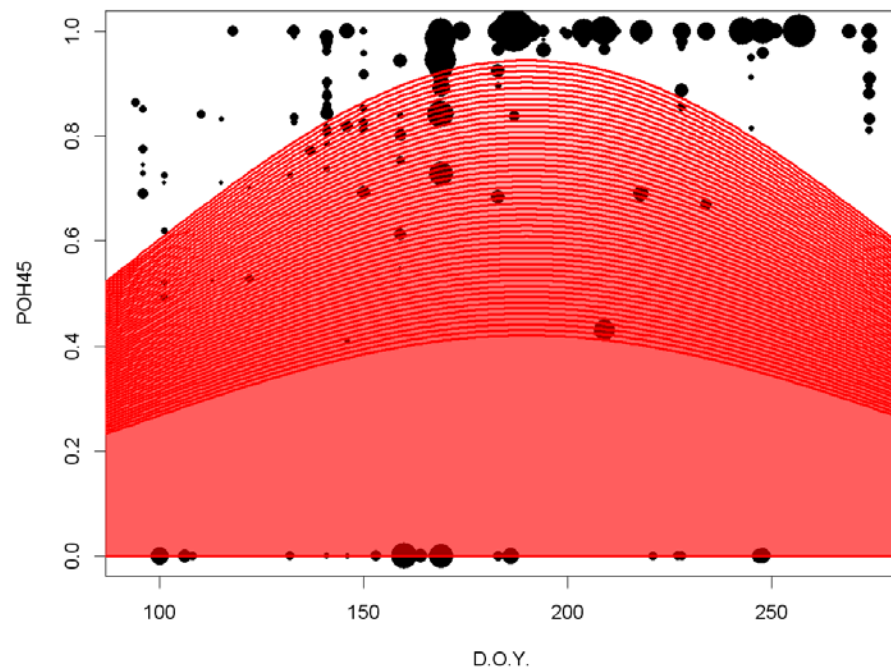
Hail discrimination

Using different curves and considering all hail-pad values (even 0 cm)

POH35 only for 0 cm cases



POH45 only for non-0 cm cases



Radar products



Servei Meteorològic
de Catalunya



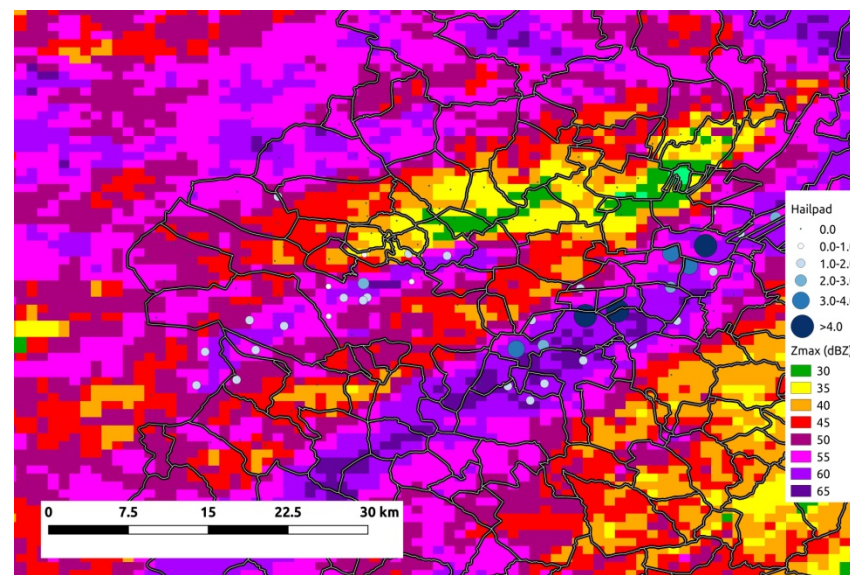
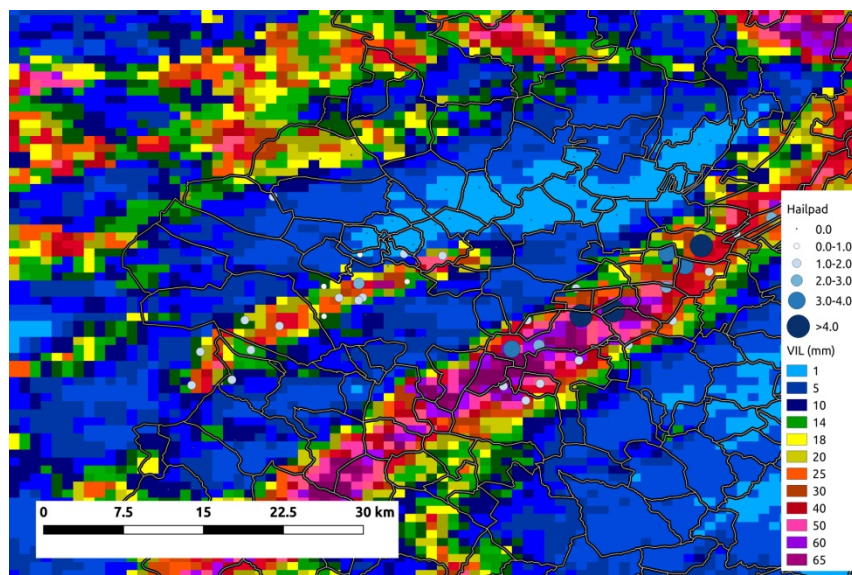
**Generalitat
de Catalunya**



UNIVERSITAT DE
BARCELONA

Radar products

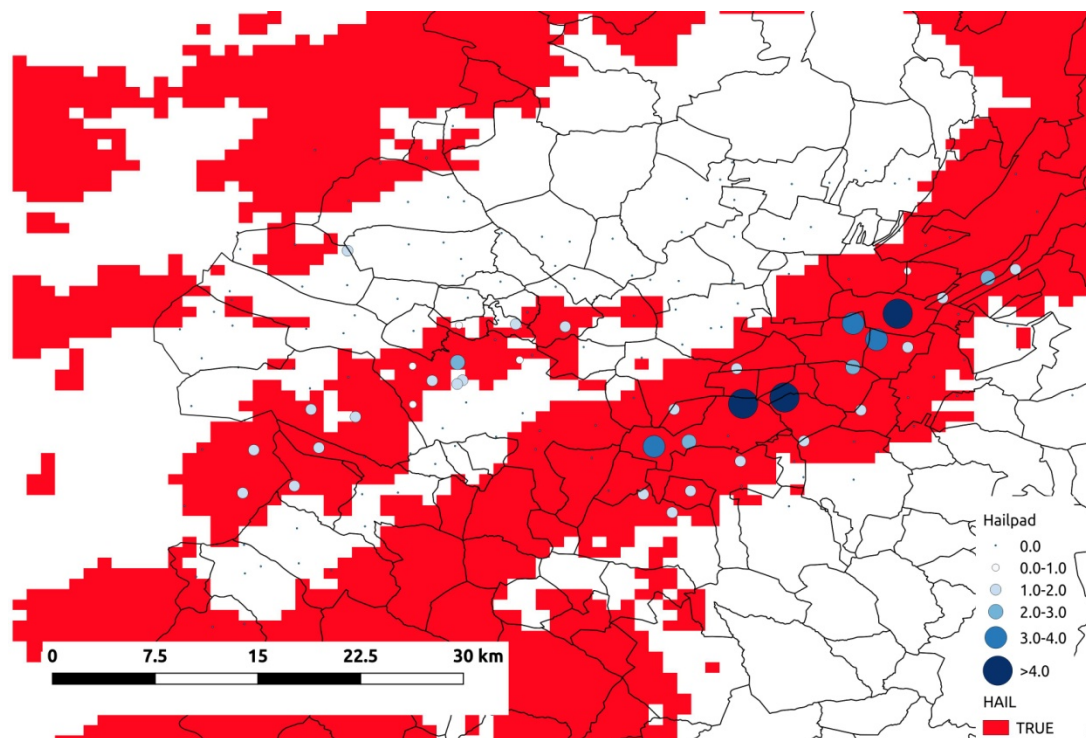
5th July 2012: original (VIL & Zmax)



Results: Example of hail size estimation

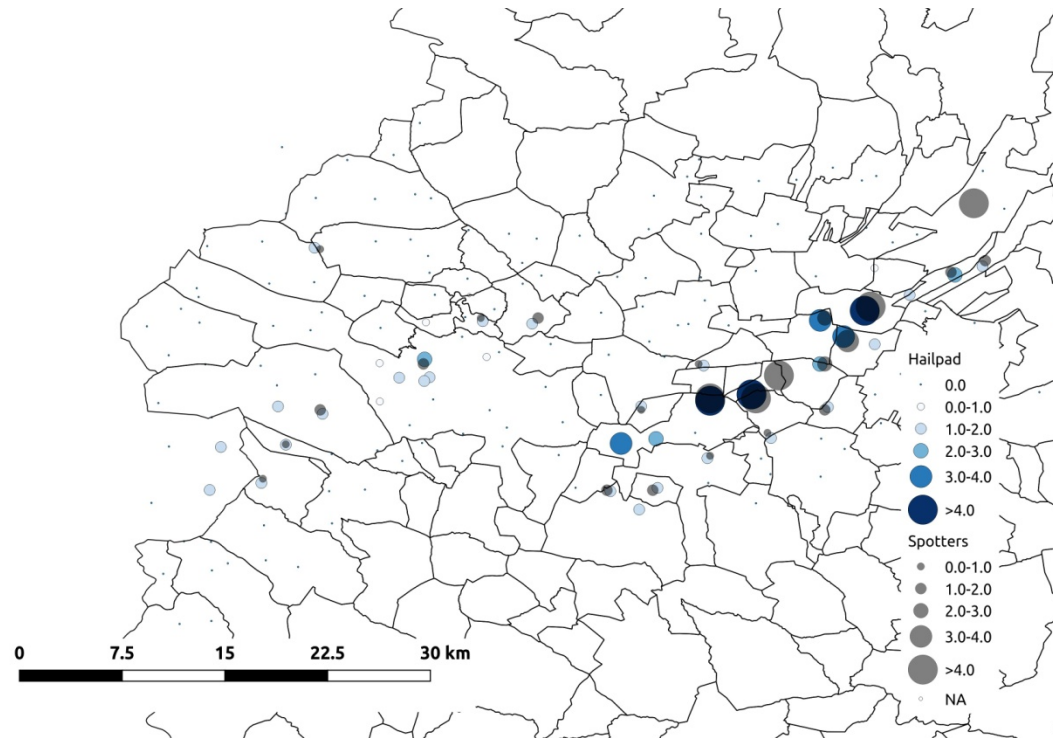
Hail YES/NO: example

POH: 5th July 2012



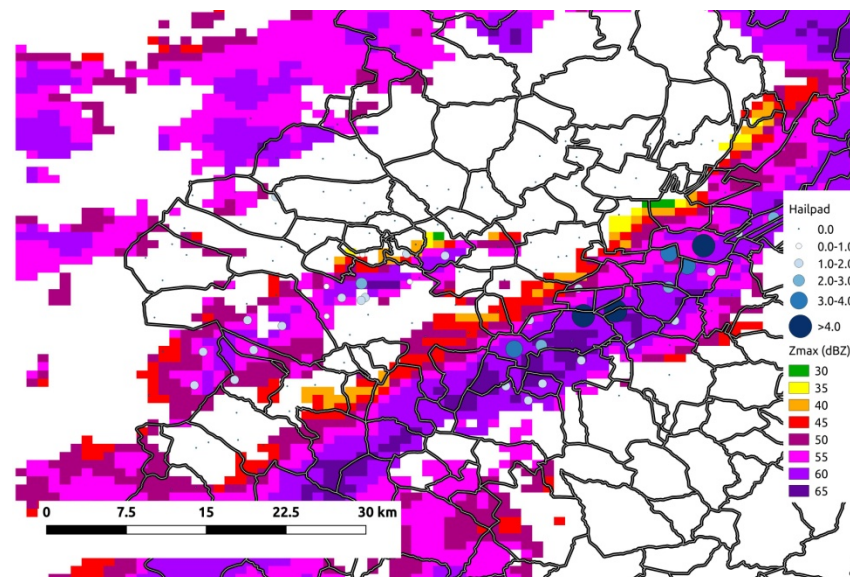
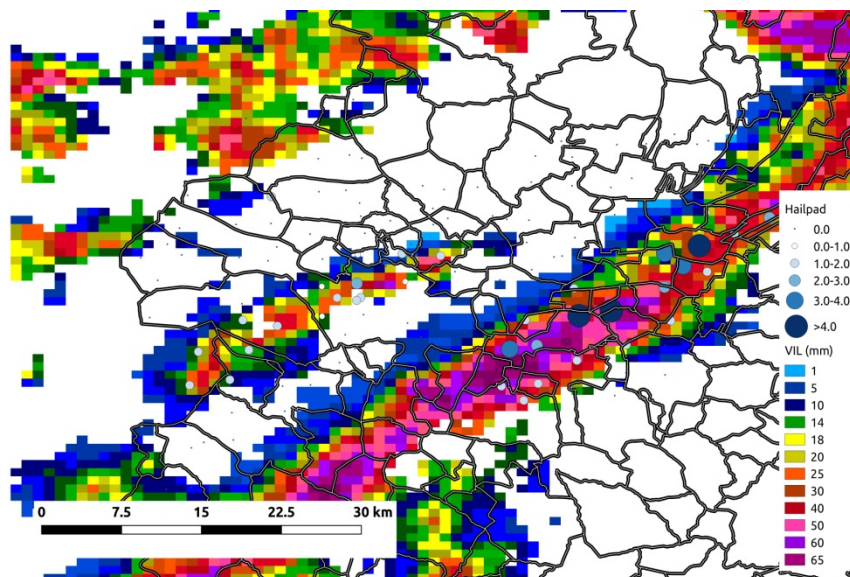
Hail YES/NO: example

Comparison of different sources



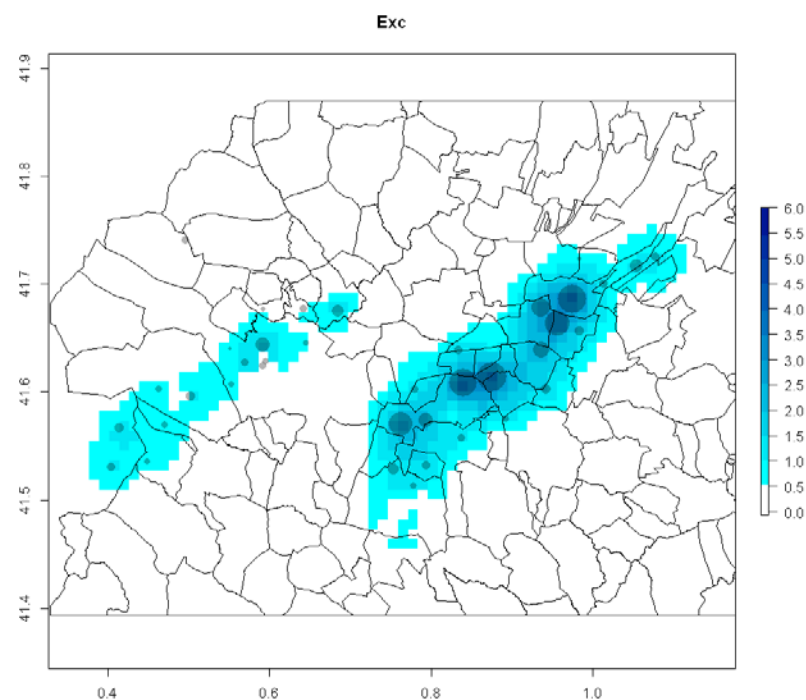
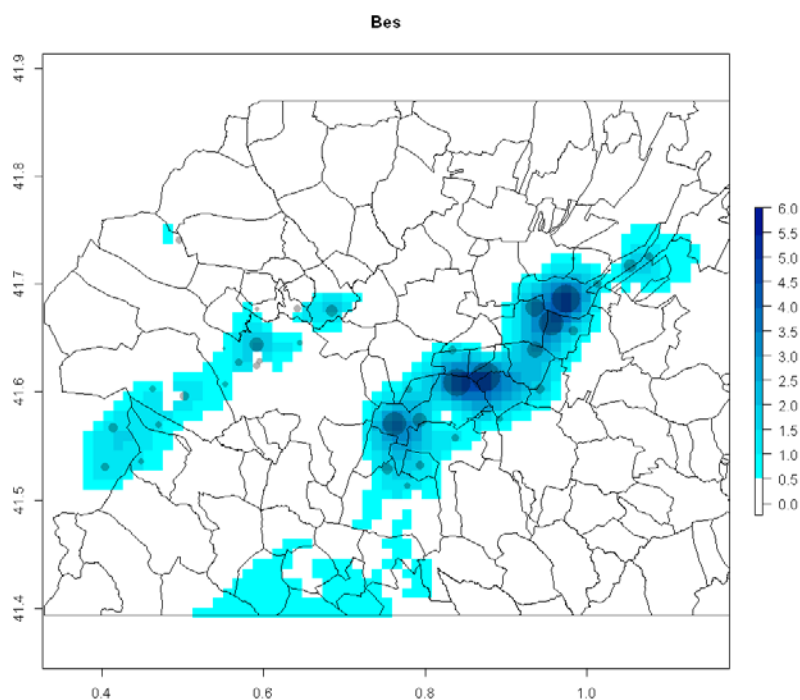
Radar products

5th July 2012: after POH processing (VIL & Zmax)



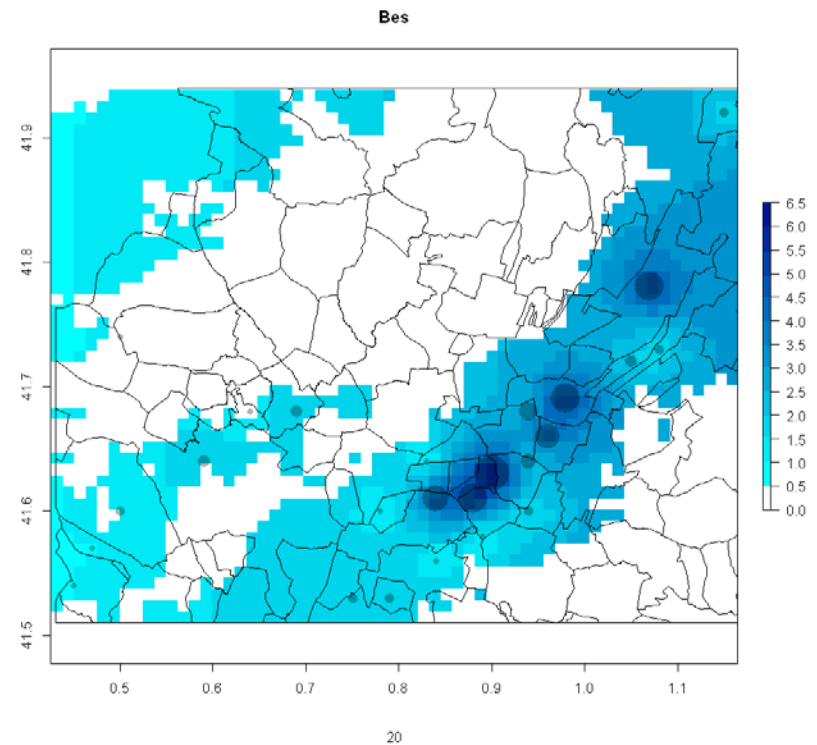
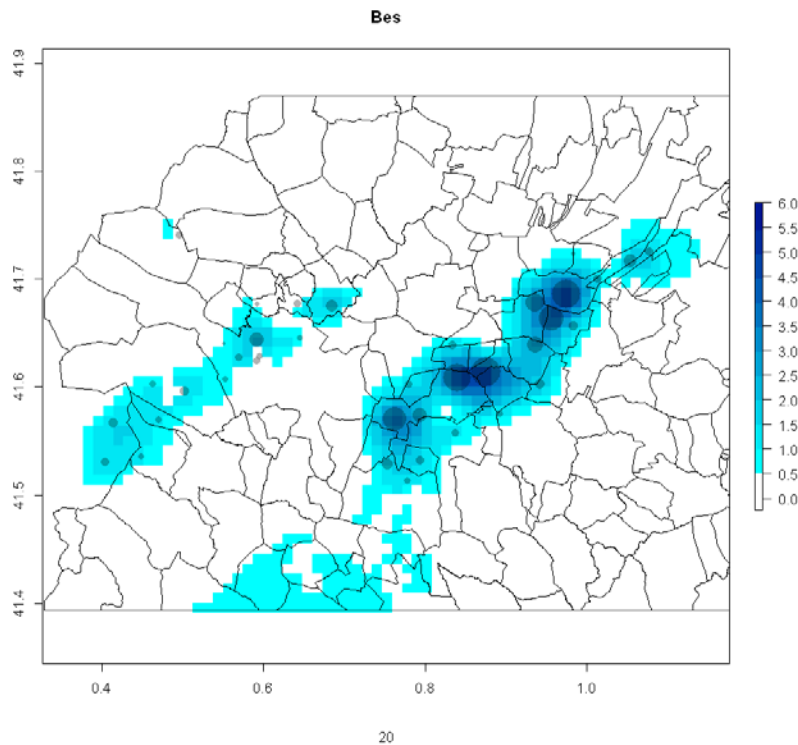
Radar products

Universal Krigging (hail-pads + VIL), different ways



Radar products

Universal Krigging (hail-pads vs spotters), using VIL (Bessel)



Conclusions

- Departing from rainfall estimation techniques (real-time) and post-processing techniques for hail size estimation, we have wondered if it is possible a near real-time technique for hail size estimation
- The conclusion is that is possible, however, some factors must be taken into account:
 - the number of observations of surface (as larger is, better is the result)
 - the type of radar product used (VIL seems to be the most adequate)
 - the day of the year (the POH threshold is larger in July)
 - the area of analysis and the resolution (more complicated for larger areas and high resolutions)
 - the type of interpolation (Bessel seems a good technique)
 - improvement of the variogram must be considered for the whole area
 - the radar products can vary depending on the calibration

Current campaign: first observations of 2017



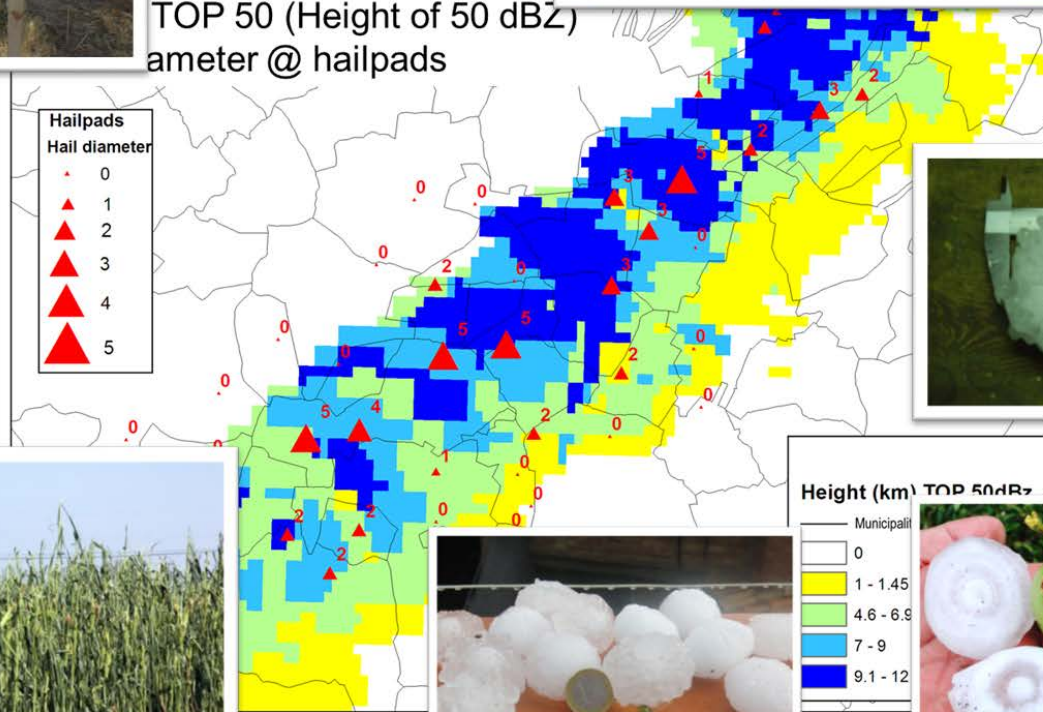
Current campaign: more observations are needed



TOP 50 (Height of 50 dBZ)
diameter @ hailpads



Hailpads
Hail diameter
0
1
2
3
4
5



Height (km)
Municipalitat
0
1 - 1.45
4.6 - 6.9
7 - 9
9.1 - 12





Servei Meteorològic
de Catalunya



**Generalitat
de Catalunya**



UNIVERSITAT DE
BARCELONA

gencat.cat