A SIMPLE BENCHMARK MODEL FOR EUROPEAN WINDSTORM LOSSES

Aspen Reinsurance

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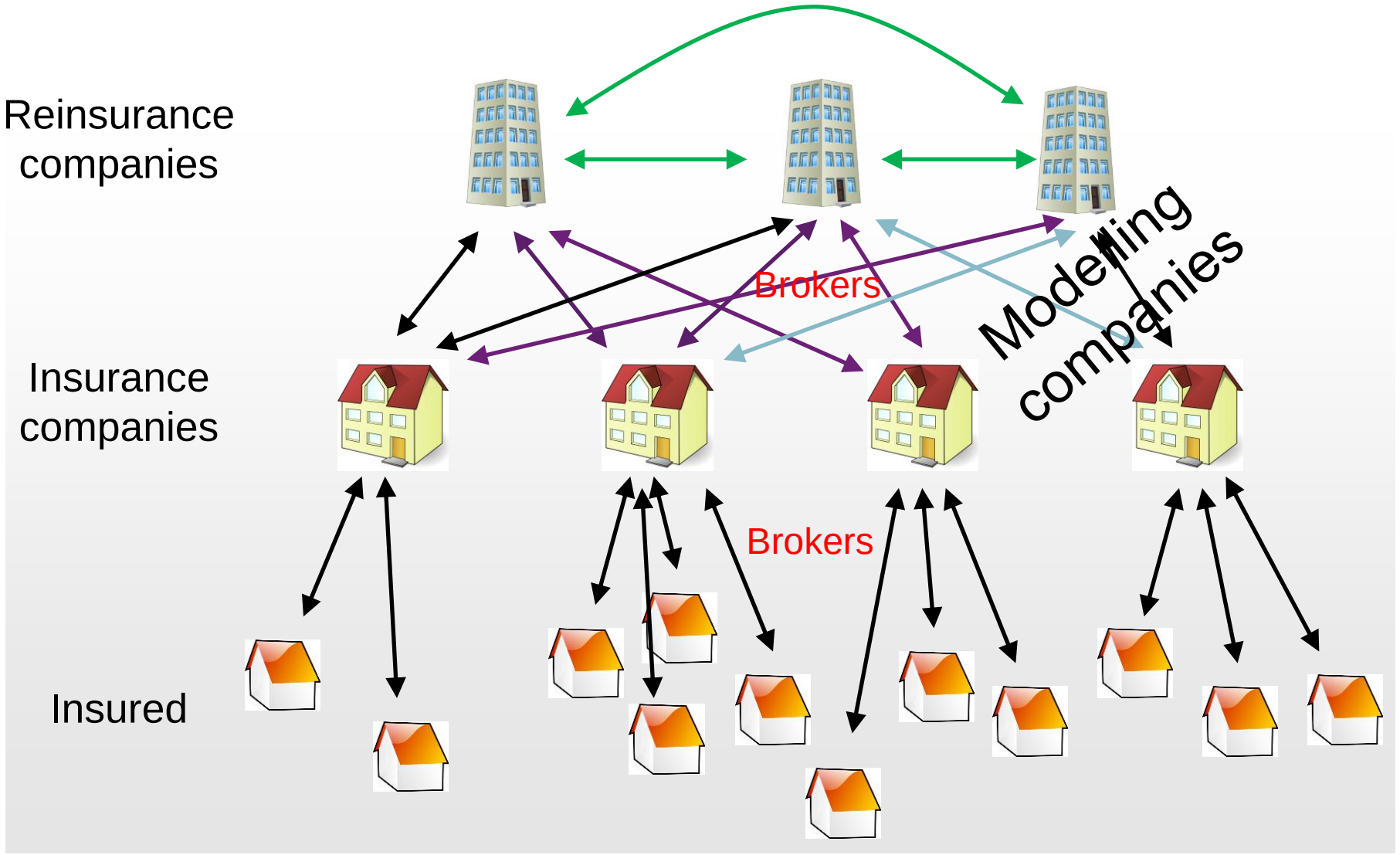
OUTLINE

- What is reinsurance?
- Risk management
- CAT models
- Exceedance probability
- Benchmark model for EU windstorms

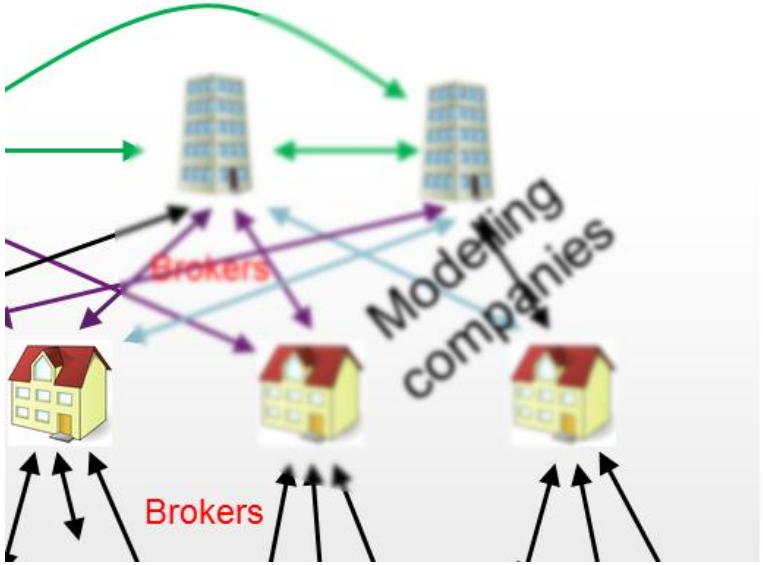
WHAT IS REINSURANCE?



WHAT IS REINSURANCE?

Things are not as clear ….

- Brokers provide services for clients
  - e.g. run cat models for them
- Most brokers develop some
  - Some even sell them!
- Many companies have both insurance and reinsurance
- A few develop their own cat models
- Others validate vendor models
- Fewer tag along ….



WHAT IS REINSURANCE?

- Insurance of insurance companies
- Most reinsurance contracts last for a year, they are renegotiated every year.
  Most insurance contracts last for 1-10 years.
- Most CATtastrophe contracts cover event losses, some cover the sum of all annual losses (aggregate contracts).
- Typically, reinsurance companies care about intense, strong, and rare storms causing significant damage.
- Some type of contracts are designed to provide financial stability
- “Globally operating”

REINSURANCE REQUIREMENTS

- Expected annual average losses
- Expected losses at certain return periods, e.g. 1, 5, 10, 25, 50,100, 250, 500, 1’000 years.
- Other metrics (eg std) for reserving

Main tool for property is «cat model»

REINSURANCE REQUIREMENTS

- Pricing:
  - The above for a client (the portfolio of one insurance company)
    - Insurance company: loss experience, strategy, etc
    - financial structure of the contract
    - Reinsurance company: expenses, admin cost, etc

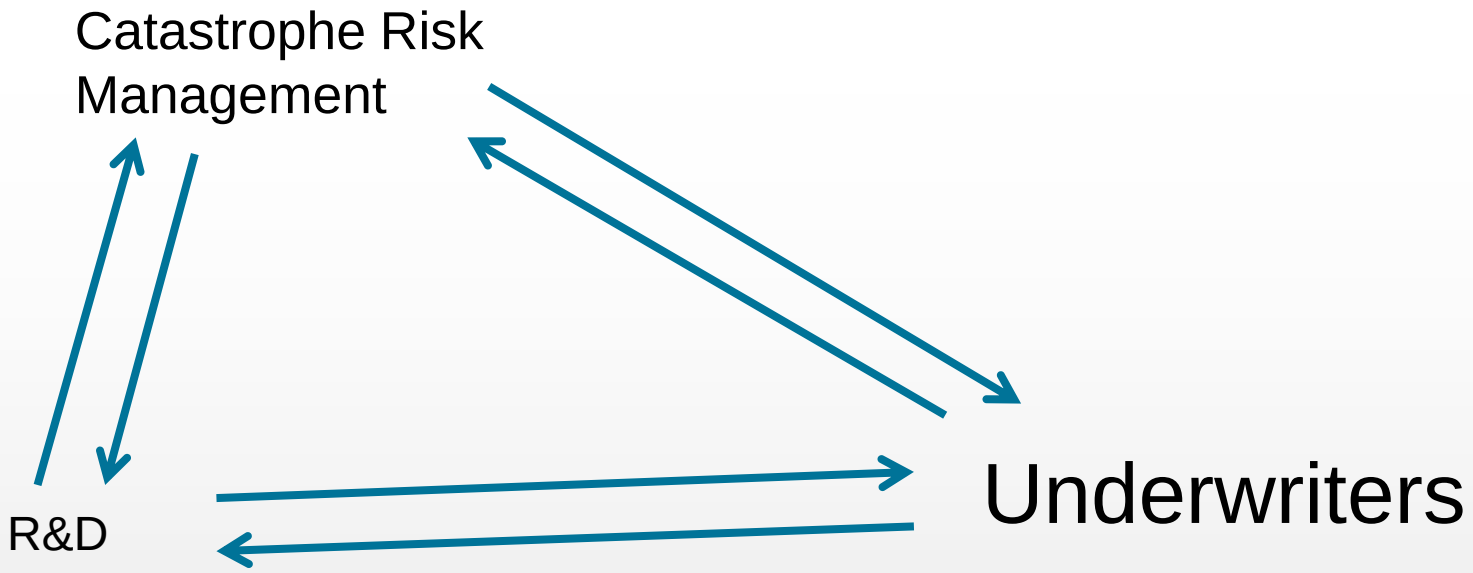
RISK MANAGMENT

Assume that each contract is well reserved,

- how about the REinsurance portfolio?
  - Includes non modelled perils and all lines of business
  - Depends on company “risk appetite” and strategy
  - Regulation: Solvency II

- Regulation, and business, requires “own view of the risk”
- Model validation is becoming increasingly trendy

CATASTROPHE RISK MANAGEMENT AT ASPEN RE



2 Atmospheric scientists
1 Seismologist
1 Hydrologist
1 Vulnerability expert

Part of “build Aspen’s view of Risk”

- Evaluate Cat models
- Have built
  - Simple model
  - Benchmark model

CAT MODEL CONCEPT

Hazard:

Event set: ~10^4
- frequency
- intensity

Vulnerability

From wind, flood height, shaking to physical damage (MDR)

Financial module

Not only single contracts, but “whole” portfolio

CAT MODEL CONCEPT

Hazard module

- Realistic wind fields with an associated probability

Variety of methods to generate events and very little rules:

- Define “windstorm”
- Intensity vs frequency
- What could *“realistically”* happen?

- Climatology needs to be well represented

- clustering

CAT MODEL CONCEPT

Issues, one for all:

- Very large uncertainties
  - Vulnerabilities
  - Frequency and intensity

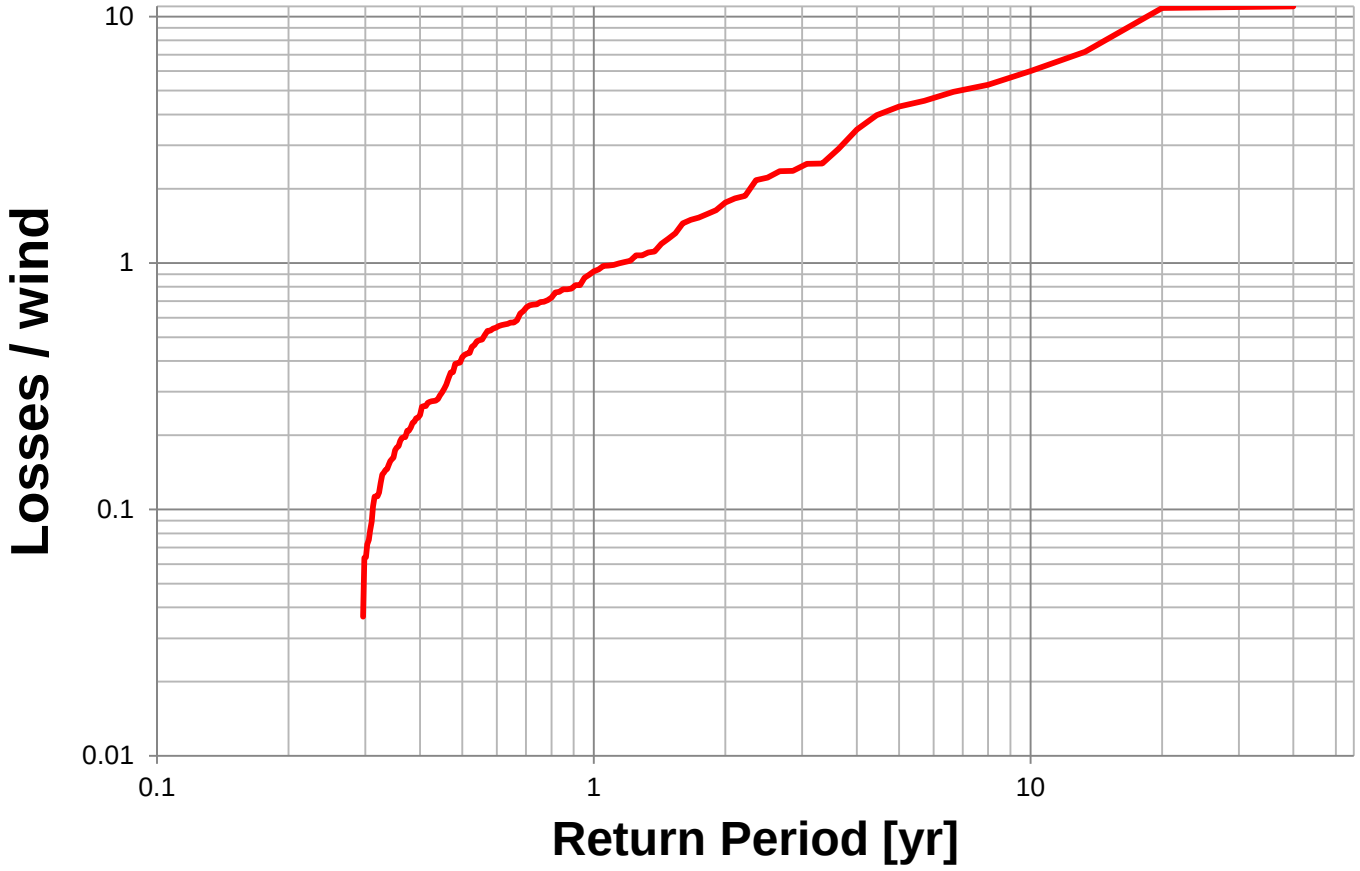
Experience, judgment calls are important for development and use

CAT MODEL CONCEPT

- Estimate the Exceedance Probability
  - $F_X(x) = P(X \leq x)$
    - X is your choice of peril or loss
  - probability associated with at least 1 event exceeding x
    - $1 - F_X(x)$
  - Take frequentist approach and use

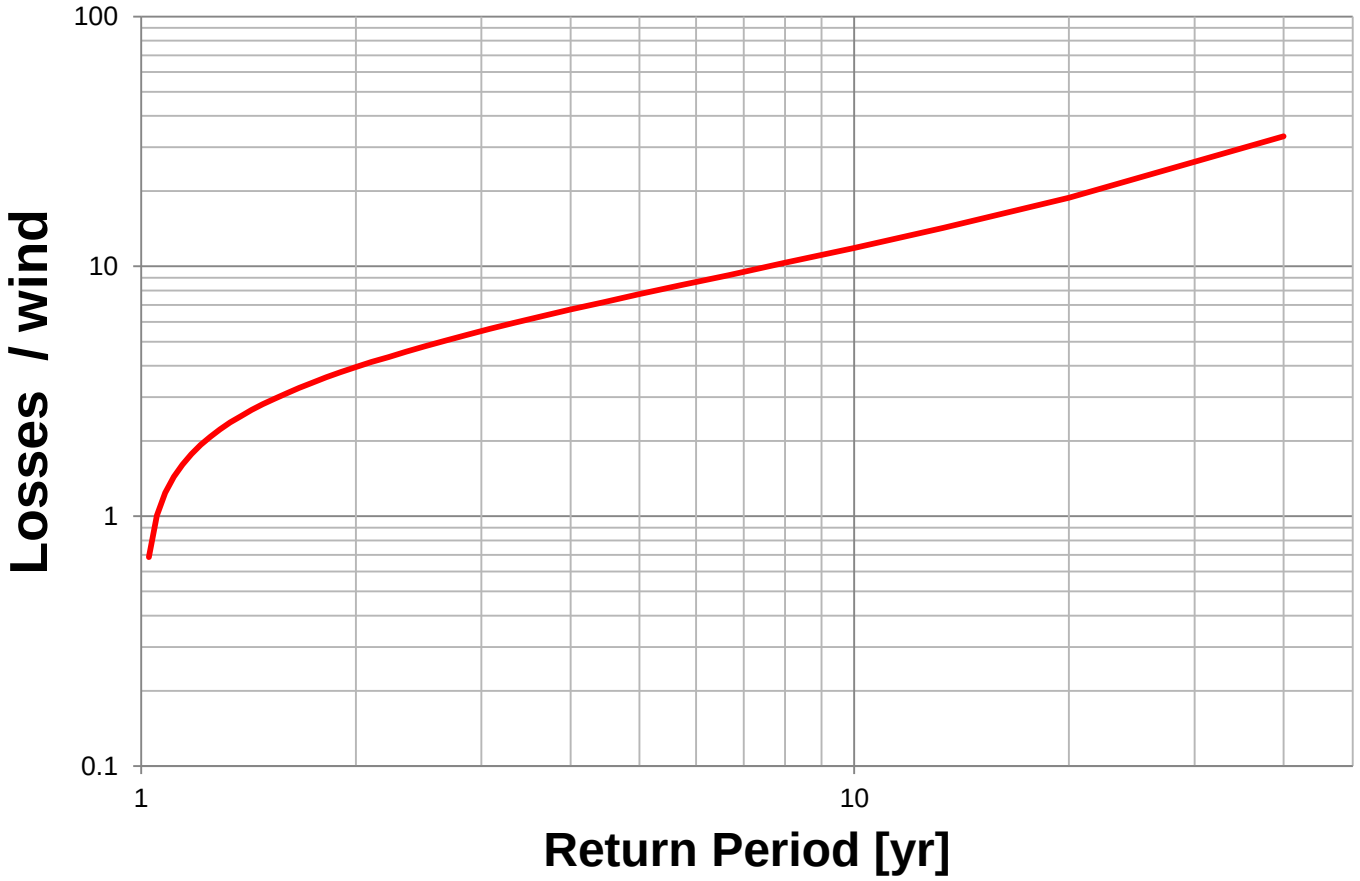
$$return\ period = \frac{1}{prob}$$

Exceedance Probability for Europe, IED



Aggregate Exceedance Probability for Europe (IED)

sum of all losses events occurred during each year



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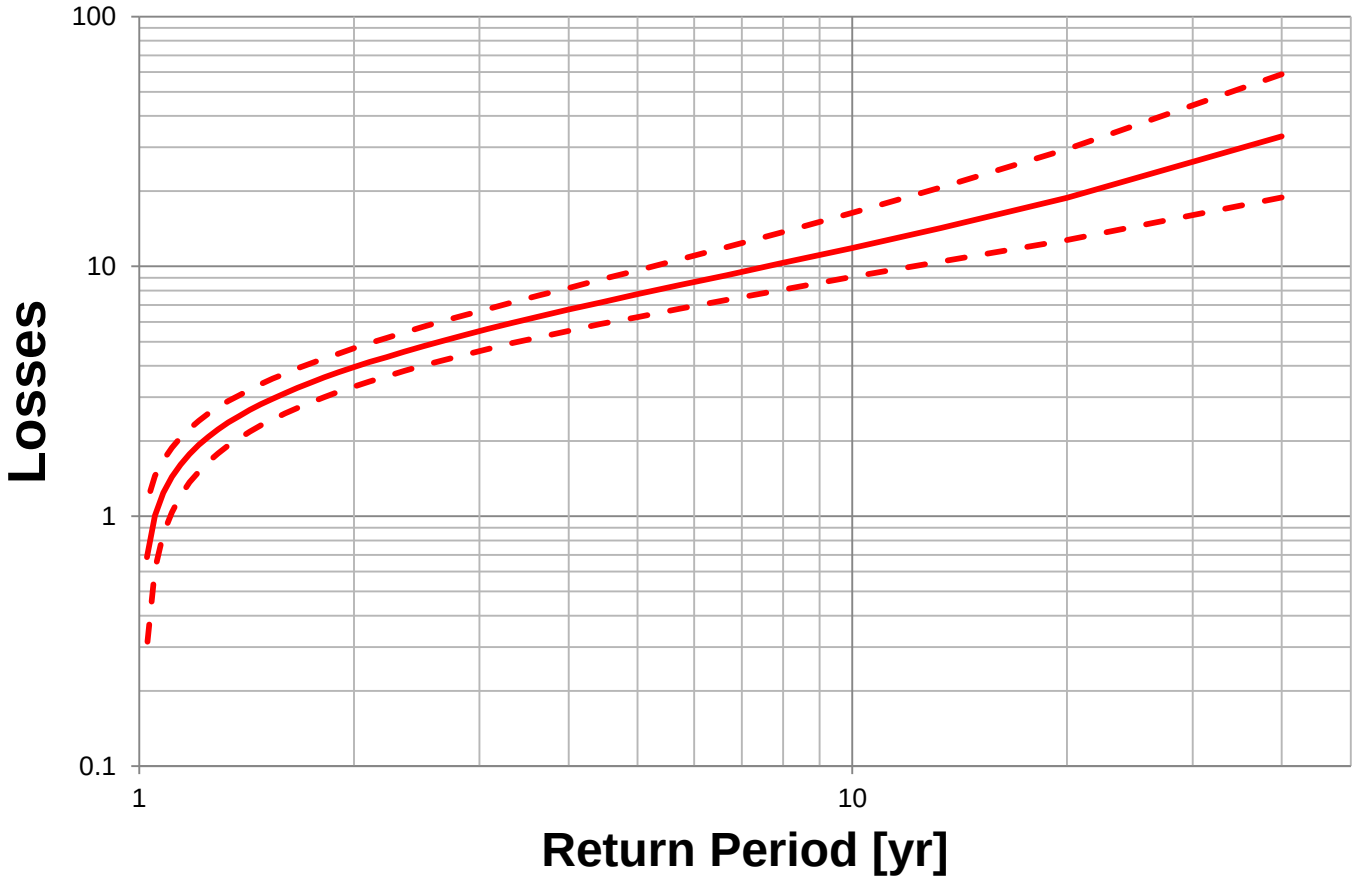
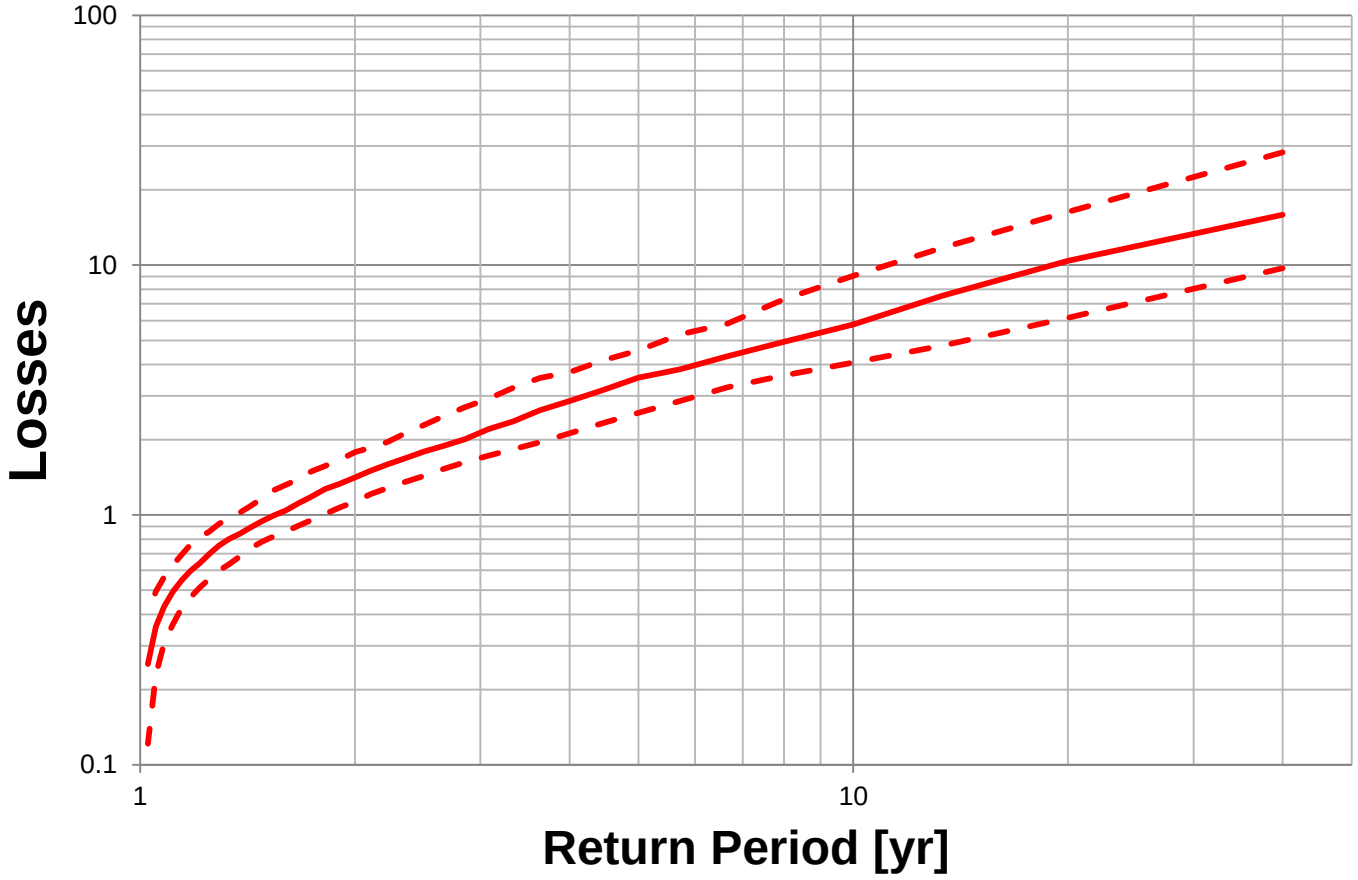


Occurrence Exceedance Probability for Europe (IED)

max of yearly losses



Benchmark model

Goal

- Provide an independent benchmark to vendor models
- Inform the use of two models

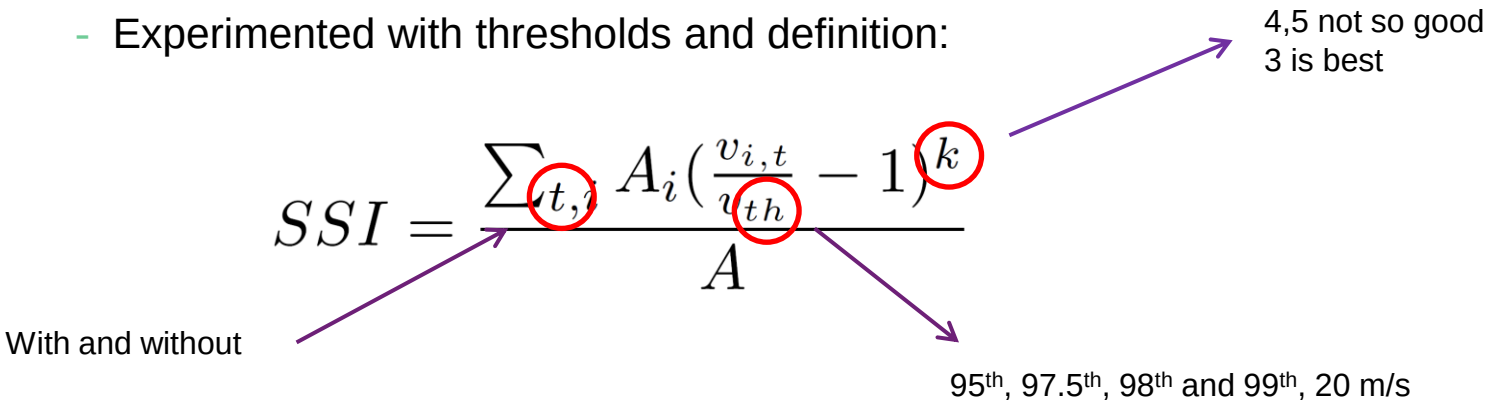
Overview of methodology

- Compute SSI using ERA-I
- Population based index
- Calibration
- Compare with two model

Benchmark model

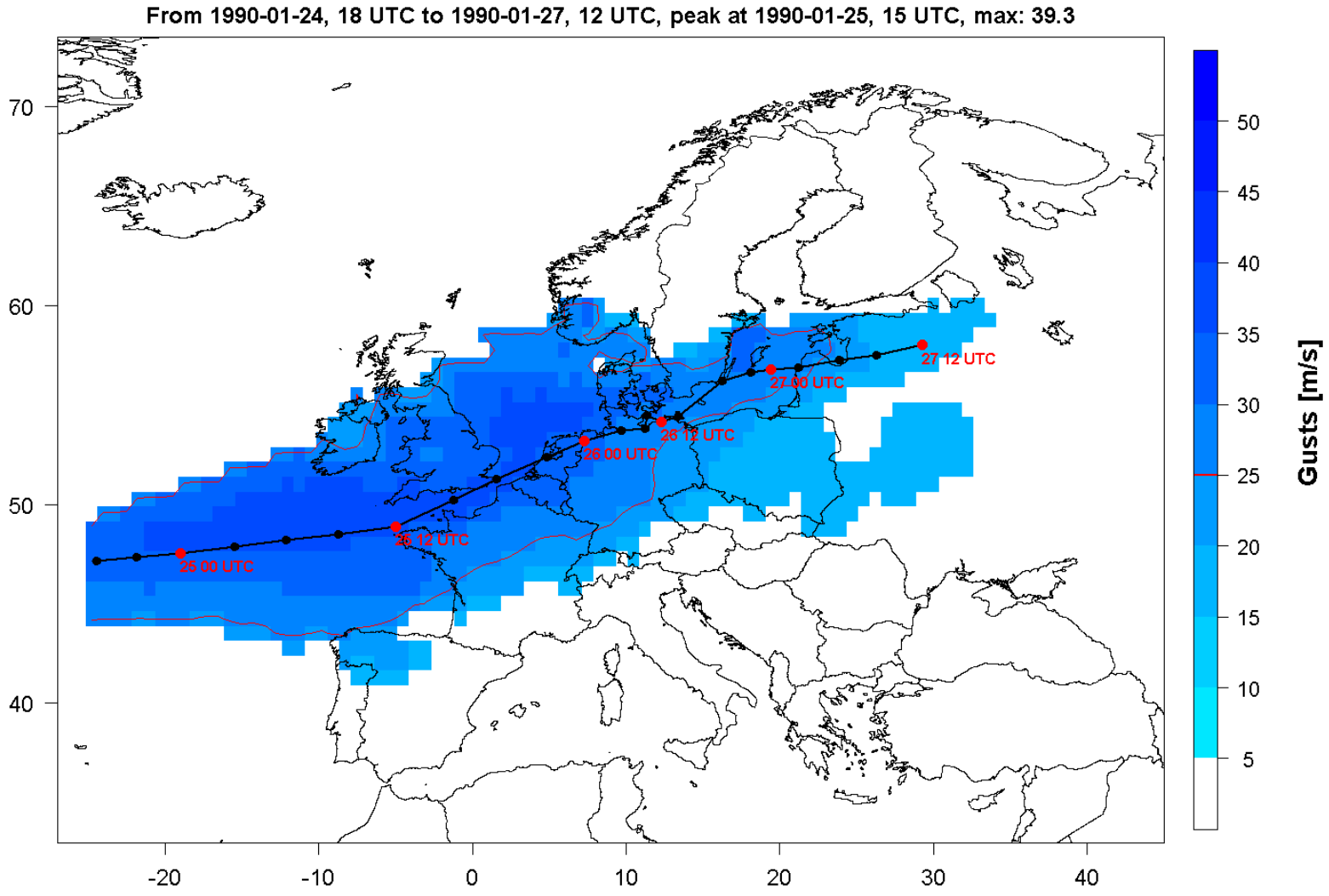
Use ERA I to

- Define events with SSI (Leckebush et al 2008)
  - Experimented with thresholds and definition:



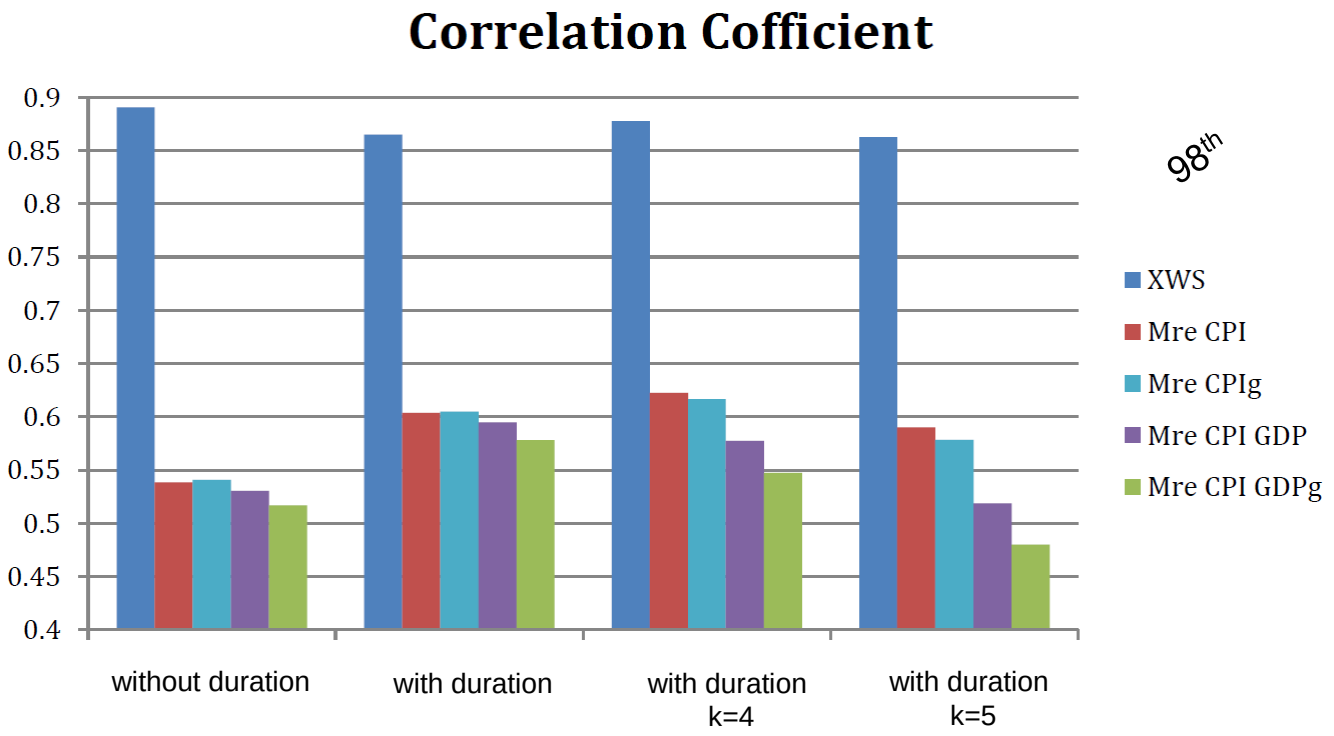
  - Rules, minimum size, duration, distance between time frames etc, are all subjective
    - Do not connect features that are not meteorologically related
    - Take as many «small» storms as possible

DARIA

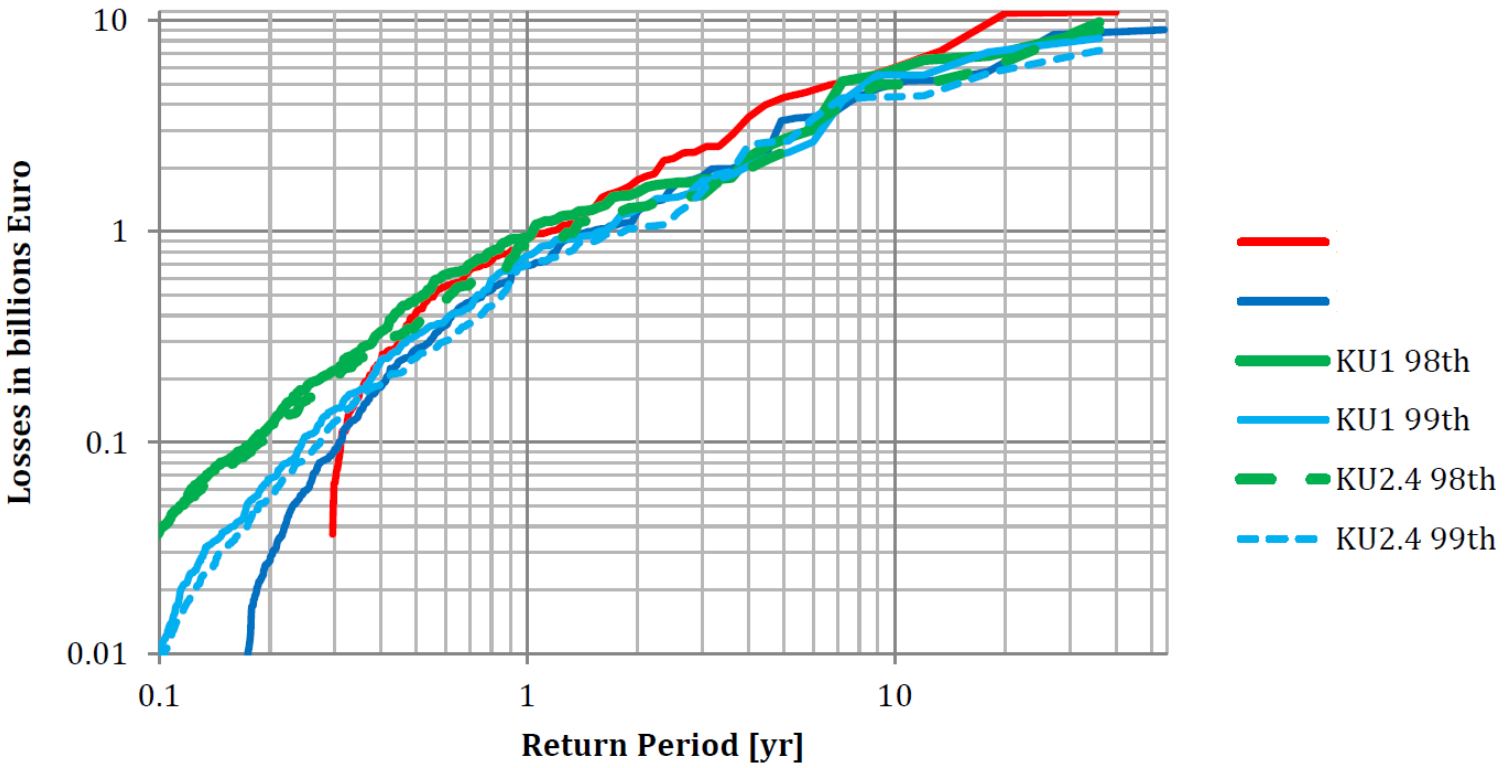

From 1990-01-24, 18 UTC to 1990-01-27, 12 UTC, peak at 1990-01-25, 15 UTC, max: 39.3
70
60
50
40
-20
-10
0
10
20
30
40
25 00 UTC
26 12 UTC
26 00 UTC
26 12 UTC
27 00 UTC
27 12 UTC
Gusts [m/s]
50
45
40
35
30
25
20
15
10
5

"OWN VERSION" OF HISTORICAL LOSSES

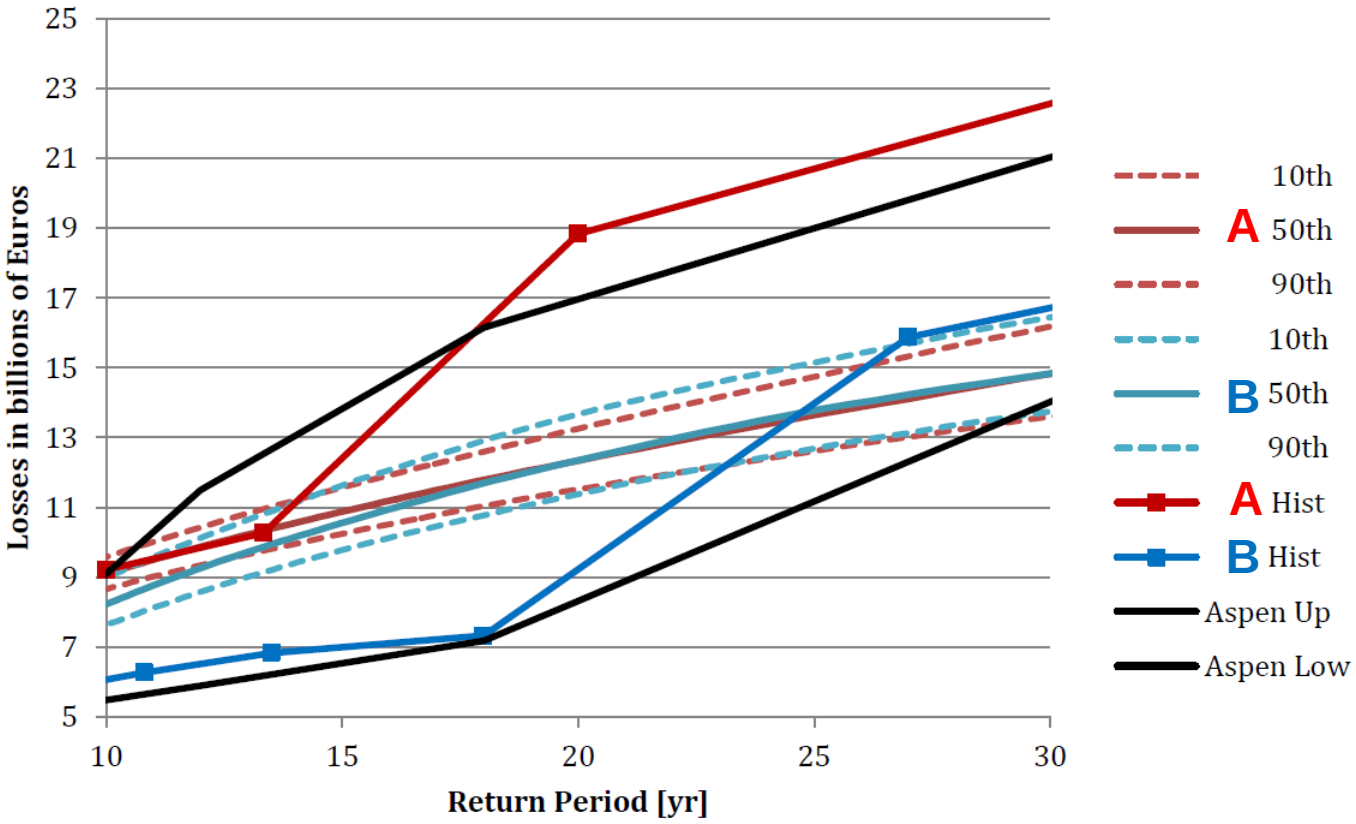
- Develop population based loss index (Klawa and Ulbrich, 2003)
  - SSI_i * population in the grid box_i
  - Calibration: log(losses) v log(SSI)



Sensitivity of losses to SSI definition



Aggregate Exceedance Probability



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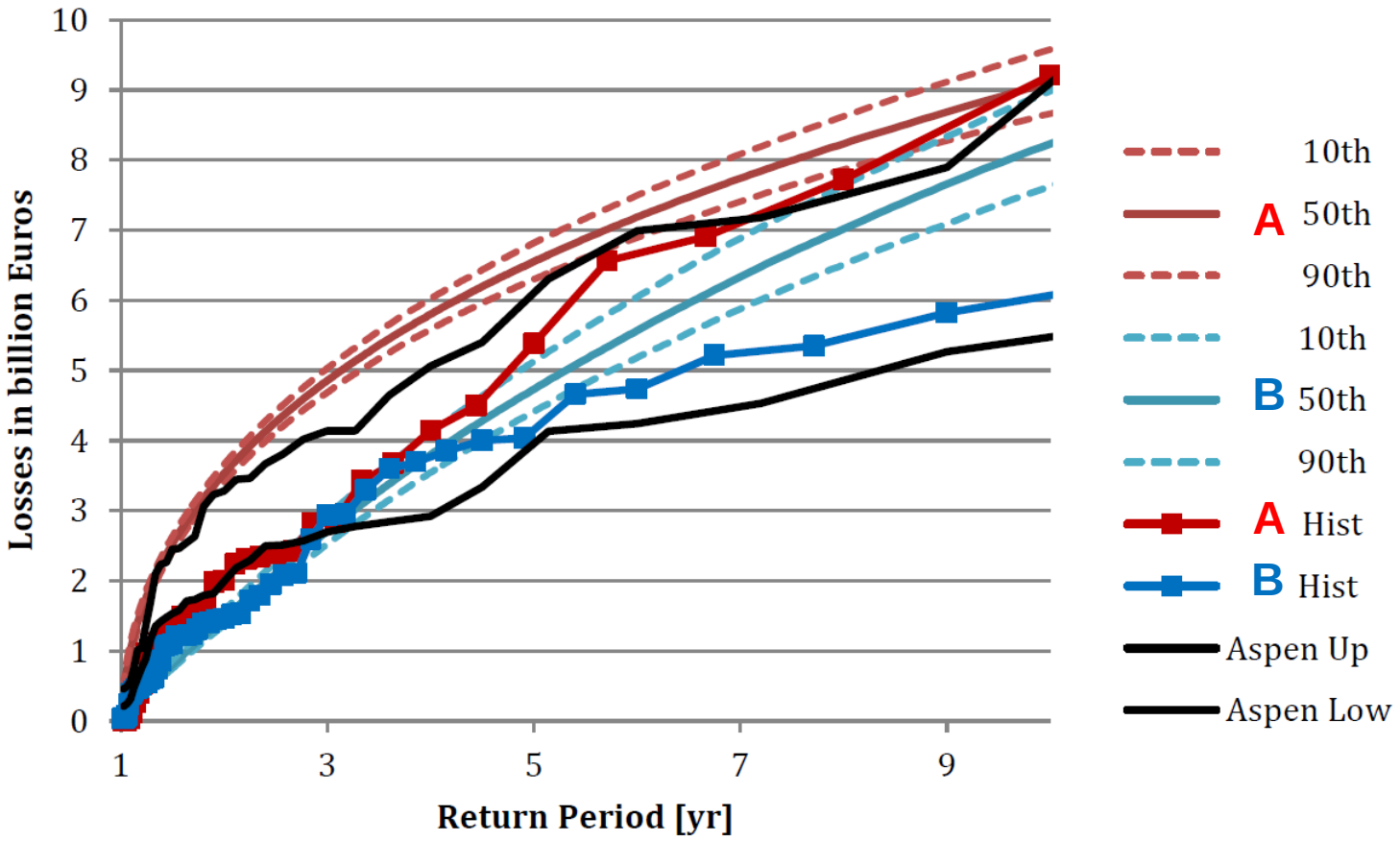

Summary of reasoning for blending

On the short return periods

- model A overestimate losses
- There is an issue with benchmark
  - Probably stretching the limits of both SSI and ERA-I

On the long return periods

- Everything seems to be within uncertainties
- A overestimates history
- B slightly underestimate history

This affects the decision of how to “blend” the two models