

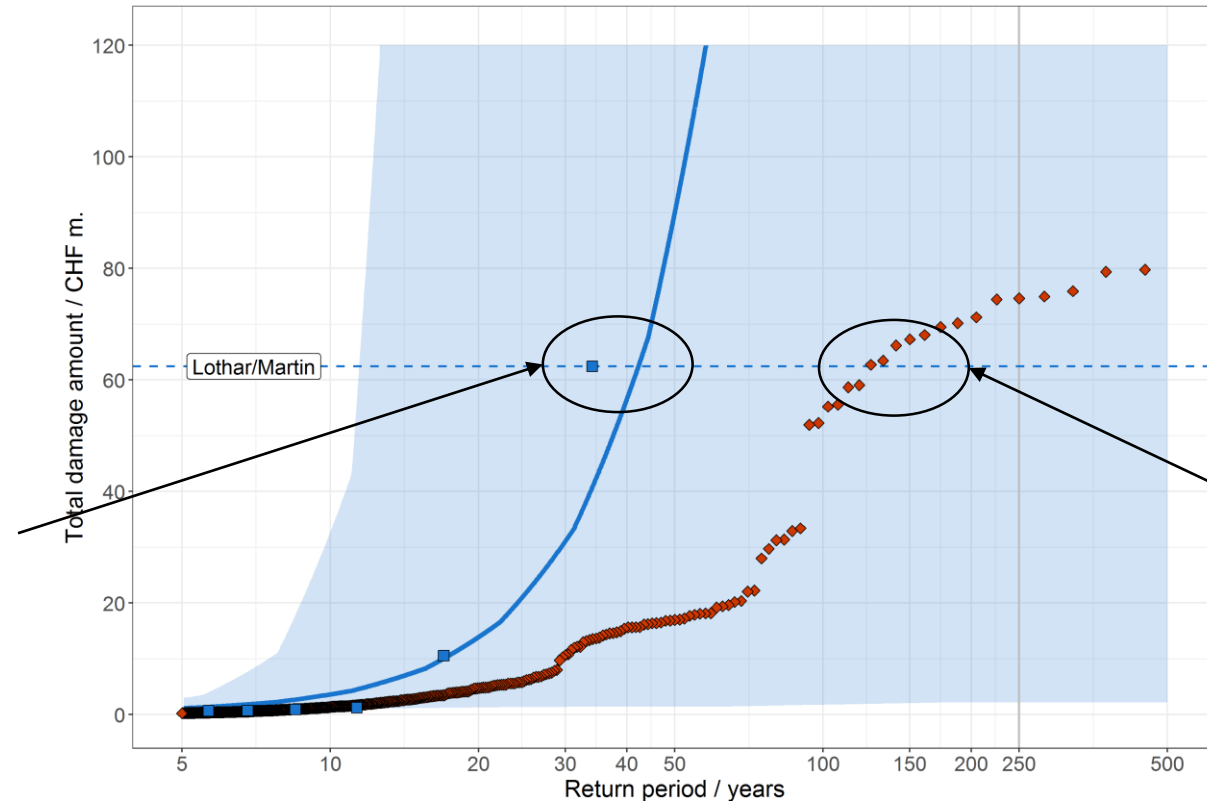
How representative is a local building insurer's claims data to assess winter windstorm risk?

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in public review in NHESS-D: <https://doi.org/10.5194/nhess-2020-115>

What is the **return period** of a damage event like Lothar/Martin in Zurich, Switzerland?

Insurance claims:
Is such an event happening every **34 years**?



Modelled damages:
The return period is **above 100 years**

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How representative is a local building insurer's claims data to assess winter windstorm risk?

In our case study of Zurich (Switzerland), we use a **risk model** for windstorm building damages and compare three different inputs: insurance **claims**, **historical** and **probabilistic** windstorm datasets.

Key findings:


- We find that long-term risk is **more robustly assessed based on windstorm datasets** than on claims data only.
- For both claims and windstorm datasets the **uncertainty** for an extrapolation to rare events **is large**.
- We present an open-access **probabilistic hazard event set** for Europe, which allows **testing the sensitivity of the risk** for events of a higher intensity than the observed historic events.

Data and Methods

Insurance claims


- Proprietary **claims database of the public building insurer** of the canton of Zurich (GVZ)
- Event damages extracted for the dates of the historical hazard event set

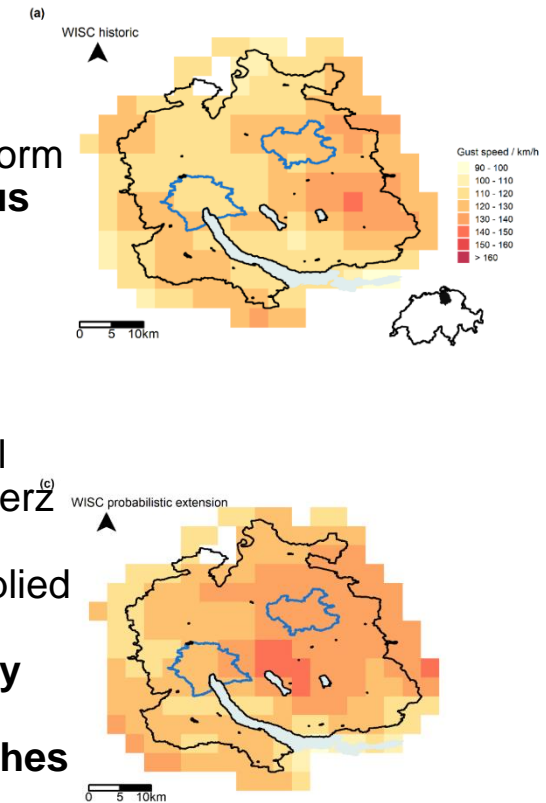
Modelled Damages

- Event damages calculated with two **hazard event sets**, exposure and vulnerability. 
- Using two models:
 - **GVZ** proprietary damage model
 - **CLIMADA** open source risk assessment platform

The event damages and their frequencies are used to calculate risk metrics and a resampling approach is used to illustrate uncertainty.

Hazard event set

- **Historical:** open access «Historic Storm Footprints» of **Copernicus Windstorm Information Service (WISC)**
- **Probabilistic:** We added 29 **perturbed events** for each historical event according to Schwierz ⁽⁶⁾ *et al.* (2010). The perturbation was applied in a way, that the pan-European **Storm Severity Index (SSI)** of the probabilistic events **matches** the distribution of the **historical events**. 



Results:

Exceedance Frequency Curve based on different approaches

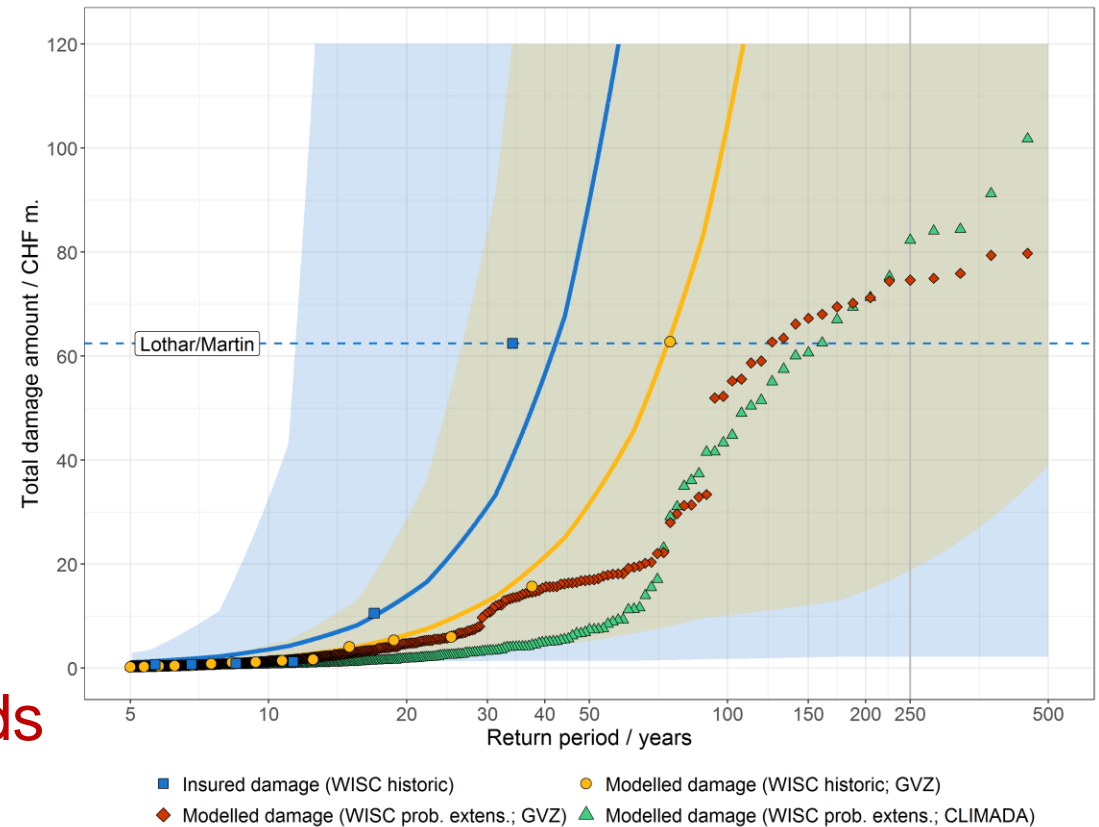
Exceedance frequency curves for building damages in the canton of Zurich based on different approaches.

The **blue squares** indicate the **insured damages** according to GVZ's database, the **blue solid line** represents a Pareto Pricing fitted to the insured damages, and the **blue ribbon** is the 90%- confidence interval produced by resampling.

The **yellow dots, solid line, and ribbon** are analogous to the blue, but for the modelled damages based on **the historical hazard event set** and the GVZ damage model.

The **red diamonds (green triangles)** show the exceedance frequency curve of the modelled damages based on **the probabilistic hazard event set** and the **GVZ** damage model (**CLIMADA**).

The combination of all approaches allows an insurance company to compare the estimates of return periods of specific events and the damage amounts for specific return periods.



Results: Pricing based on claims or modelled damages

Average Annual Damage is an important value for the insurance industry as it informs pricing decisions. How do the different approaches compare?

Insurance claims	Modelled Damages with historical hazard event set and GVZ model
CHF 2.3 million	CHF 1.4 million
Based on 18 events in 34 years	Based on 142 events in 75 years

The difference in estimated Average Annual Damage can mainly be explained with the estimated frequency of Lothar/Martin in each dataset. Lothar/Martin is the event with the largest damage amount in both datasets.

Results: Damage of a 250-year event

The damage amount of an event with a 250-year return period has a significance in the insurance industry, but it is difficult to estimate for winter windstorms. How do the different approaches compare?

Insurance claims	Modelled Damages with historical hazard event set and GVZ model	Modelled Damages with probabilistic hazard event set and GVZ model
Uncertainty too large	CHF 500 million	CHF 75 million

While all approaches show large uncertainties for rare events, the probabilistic event set suggest a lower estimate of the 250-year event than the other approaches.

Further Material:

- Paper (incl. data and code) currently in review in NHESS-Discussion:
<https://doi.org/10.5194/nhess-2020-115>
- «Historic Storm Footprints»: Windstorm Information Service (WISC):
https://wisc.climate.copernicus.eu/wisc/#/help/products#footprint_section
- Methodology probabilistic hazard event set:
Schwierz *et al.* 2010 <https://doi.org/10.1007/s10584-009-9712-1>

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