Impact-based storm warnings using a natural catastrophe impact model

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1 Introduction

Socio-economic impacts of Storms in Switzerland are mainly infrastructure damage, danger in forests, interruption in traffic and electricity blackouts. We focus on infrastructure damage. Additionally to the general weather warnings, we are working towards user-specific impact warnings.

Partner: GVZ (public building insurer of the canton Zurich)
Warning interests:

- How many clients will issue a damage claim two days from now?
- Where will loss assessors be most needed two days from now?
- How much financial damage will GVZ face two days from now?

2 Method overview

Risk = Hazard x Exposure x Vulnerability

Hazard:

- COSMO-E forecast
- Wind gust [m/s]
- 2 days lead time

Exposure:

- Asset value [CHF]
- 0.5 x 0.5 km resolution

Vulnerability:

- impact function of insurance loss model
- mean impact ratio [%] per intensity [m/s]

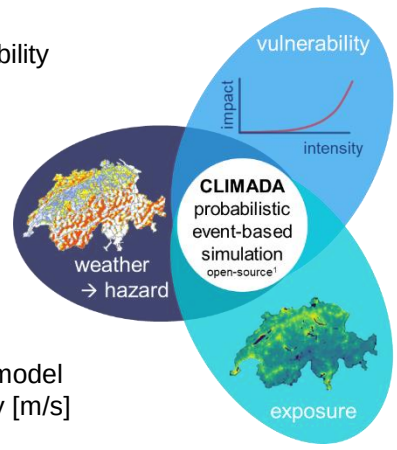

Fig. 1. Illustration adapted from: IPCC, AR5

3 Results: warnings for storm event Burglind

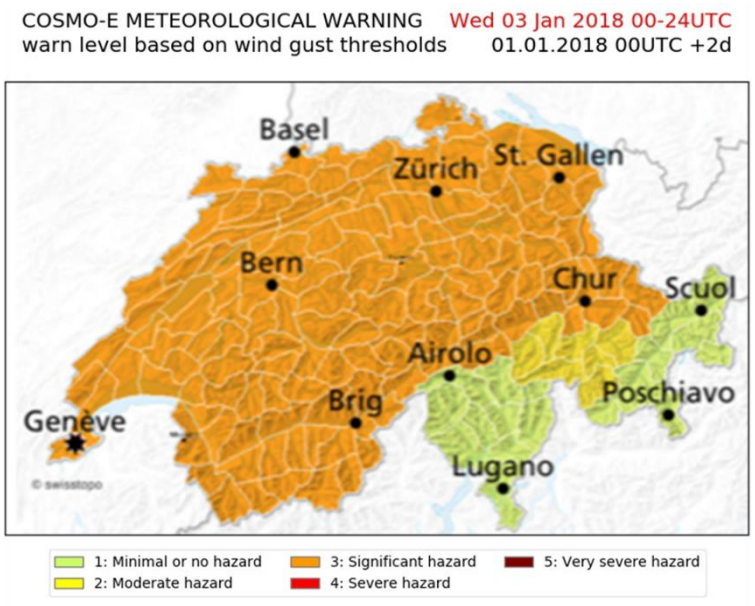

Fig. 2. Meteorological wind warning issued by MeteoSwiss for Storm Burglind 03 Jan 2018

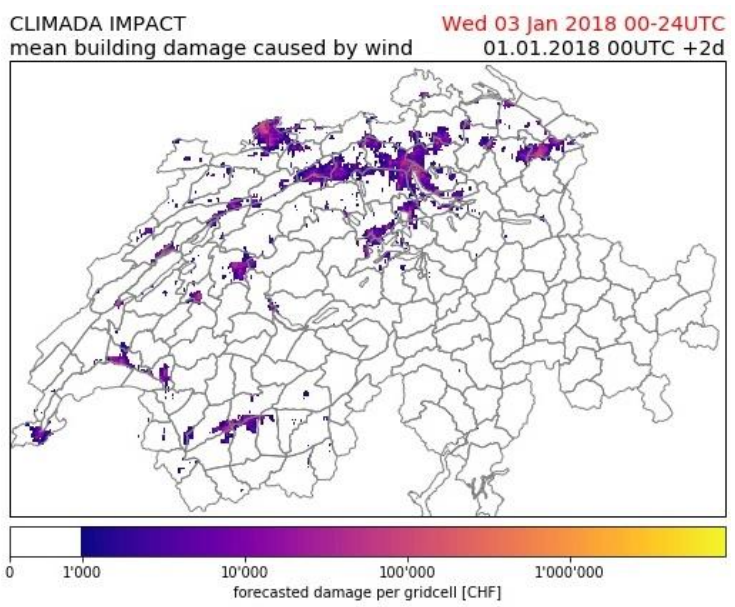

Fig. 3. Forecasted mean building damage for 03 Jan 2018 based on the forecast run of COSMO-E with lead time of 2 days

4 Results: ensemble spread and other events

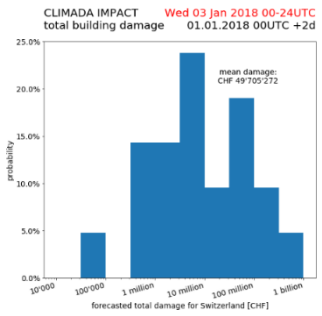

Fig. 4. The meteorological uncertainty is captured in the calculated impacts for the 21 ensemble members: each bar shows the percentage of ensemble members with forecasted total building damage for Switzerland in a specific range

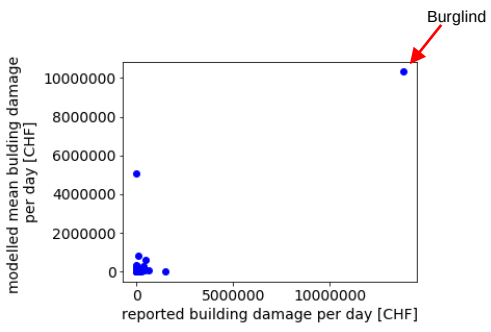

Fig. 5. Burglind/Eleanor clearly stands out in time span Jan 2018 - Mar 2019: each point in the graph is one day with reported damage by GVZ (x-axis) and forecasted building damage for the canton of Zurich on y-axis.

5 Outlook

- Validate model for other strong storm events
- Explicitly model the uncertainty of exposure and vulnerability in our risk assessment model and compare to the meteorological uncertainty of weather forecasts
- Include further sectors/users: deep dialog with users needed
- Integrate storm warnings with other hazard types to arrive at impact warnings for compound events

6 References

1. **https://github.com/CLIMADA-project/climada_python**
2. **WMO Guidelines on Multi-hazard Impact-based Forecast and Warning Services**
3. **Aznar-Siguan, G., and D. N. Bresch, 2019: CLIMADA v1: a global weather and climate risk assessment platform. Geoscientific Model Development Discussions, 1–18, doi:10.5194/gmd-2018-338.**
4. **Schwierz, C., P. Köllner-Heck, E. Z. Mutter, D. N. Bresch, P. L. Vidale, M. Wild, and C. Schär, 2010: Modelling European winter wind storm losses in current and future climate. Climatic Change, 101 (3), 485–514, doi:10.1007/s10584-009-9712-1.**
5. **Eberenz, S., Stocker, D., Röösli, T., and Bresch, D. N.: Exposure data for global physical risk assessment, Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2019-189, in review, 2019.**