



Probabilities of hazardous snow-related weather events in the present and projected future climate of Europe

Ilari Lehtonen, Matti Kämäräinen, Andrea Vajda, and Hilppa Gregow
Finnish Meteorological Institute, Helsinki, Finland (ilari.lehtonen@fmi.fi)

Extreme weather hazards pose a risk to the performance of critical infrastructure systems, such as transportation system and energy and telecommunication networks. For example, heavy snowfall may severely hamper road and railway transportation, as well as aviation, and also lead to power outages, mostly because snow-damaged trees may fall over power lines. As a part of the EU/FP7 project RAIN, we have estimated the probabilities of snow-related weather hazards in the present and projected future climate of Europe. We considered separately the occurrence of blizzards, heavy snowfall and heavy crown-snow load. The probability distributions of these phenomena were defined using a set of impact indicators with quantitative threshold levels defined in the earlier phase of the project.

The risk probabilities in present climate were derived from the ERA-Interim reanalysis and E-OBS observational data sets over the period 1981–2010. In order to assess the expected changes in the probability and severity of snow-related events, an ensemble of six EURO-CORDEX regional climate models was used (0.44° spatial resolution) under the representative concentration pathway scenarios RCP4.5 and RCP8.5. We calculated the probabilities for the near future (2021–2050) and far future (2071–2100) periods and compared the projected change to the baseline period 1971–2000.

In general, the snow-related weather hazards were found to occur the most frequently in Northern Europe and over the Alpine region on the basis of our data sets. In the future, the probabilities of these hazards were projected to decrease over a large part of Europe. However, over certain northern and north-eastern areas experiencing cold winter climate, the snow-related hazards may become more frequent during the upcoming decades according to our results.