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# Future Changes in European windstorm loss and seasonal loss clustering in the EURO-CORDEX dataset

**Inovasita Alifdini**[1], Julia Moemken[1], Alexandre M. Ramos[1], Aleksa Stankovic[2], Rodrigo Caballero[2], and Joaquim G. Pinto[1]

[1]Institute of Meteorology and Climate Research Troposphere Research (IMKTRO), Karlsruhe Institute of Technology, Karlsruhe, Germany

[2]Department of Meteorology, Stockholm University and Bolin Centre for Climate Research, Stockholm, Sweden

European windstorms are among most important natural hazards for insurance companies. Quantifying with the impact of windstorms becomes more challenging due to seasonal loss clustering, characterized by numerous intense windstorms in a season, leading to exceptionally high seasonal losses. Climate change introduces another level of uncertainty regarding potential losses from European windstorm events.

The EURO-CORDEX dataset is designed to enhance the representation of regional and local weather conditions consists of a set of high-resolution climate simulations at 12.5 km resolution. In this context, this will allow the assessment of the impact of windstorms for recent and future climates in a finer resolution. To achieve this, we use daily maximum surface wind gusts of 20 global-to-regional climate model chains from EURO-CORDEX (EUR-11 domain). The investigation focuses on the extended winter season (ONDJFM) between the historical period (1976-2005) and future projections under global warming level (GWL) scenarios of +2°C and +3°C, following the Representative Concentration Pathway 8.5 (2006-2100).

The evaluation of windstorm impact is carried out using the Loss Index (LI) method, focusing on the country level. For the historical period, a substantial bias is observed in the 98th percentile of daily maximum wind gusts between EURO-CORDEX and ERA5. This bias is corrected through empirical quantile mapping, resulting in corrected models that show reduced biases in wind gust extremes while maintaining consistency with the climate change signal.

Under the +2°C and +3°C GWLs, the majority of models indicates a reduction in the magnitude and frequency of extreme windstorms over Western Europe and the Iberian Peninsula, leading to decreased European windstorm loss, while an increase over Eastern Europe is expected, contributing to higher loss. In the majority of countries, the occurrence of seasonal loss clustering is expected to decrease under GWL conditions compared to the current climate.

Our study provides valuable insights for insurance companies and policymakers to deal with the uncertainty of the loss of windstorm under future climate conditions.