



High-resolution loss modeling for European Windstorms

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European windstorms are a frequent and damaging natural hazard that can cause loss of human life and damage to property and infrastructure. As there is a high degree of uncertainty in climate projections, it is crucial to understand the physical risks and economic losses at regional and local scales associated with European Windstorms. In this study, we develop a simple model to estimate historical windstorm losses over the European region. The model uses winds from the ERA5 reanalysis and different exposure datasets based on countrywide total insured property values, gross domestic product, and historical population density.

We find that the estimated losses associated with major historical storms in North-western Europe and estimated average EU-wide losses are comparable to the reported estimates and those from propriety vendor models. However, estimated losses from windstorms in France and Germany are lower than reported. Differences in the estimated losses are attributed to the contrasts in the regional-level exposure within and between different exposure datasets. We also tested the sensitivity of regional-level vulnerabilities and find that accounting for regional-level vulnerability differences slightly improves the biases in countrywide losses. Further, we also find that the major contribution to the estimated losses comes from the United Kingdom, France, and Germany for most of the storm seasons, and thus it is important to correctly represent the exposure and vulnerabilities over these countries. The ability of the model to estimate reported losses is also limited by the representation of the winds in ERA5, which has limited skill in representing the hazard footprint, especially for specific storms such as the Great October Storm of 1987.

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