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Simulation of wind damages associated with the PRIMAVERA European windstorm event set

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Winter windstorms are one of the major natural hazards affecting Europe, potentially causing large damages. The study of windstorm risks is therefore particularly important for the insurance industry. Physical natural catastrophe models for the insurance industry appeared in the 1980s and enable a fine analysis of the risk by taking into account all of its components (hazard, vulnerability and exposure). One main aspect of this catastrophe modeling is the production and validation of extreme hazard scenarios. As observational weather data is very sparse before the 1980s, estimates of extreme windstorm risks are usually based on climate models, despite the limited resolution of these models. Even though this limitation can be partially corrected by statistical or dynamical downscaling and calibration techniques, new generations of climate models can bring new understanding of windstorm risks.

In that context, PRIMAVERA, a European Union Horizon2020 project, made available a windstorm event set based on 21 tier 1 (1950-2014) highresSST-present simulations of the High Resolution Model Intercomparison Project (HighResMIP) component of the sixth phase of the Coupled Model Intercomparison Project (CMIP6). The events were identified with a storm tracking algorithm, footprints were defined for each event as maximum gusts over a 72 hour period, and the footprints were re-gridded to the ERA5 grid and calibrated with a quantile mapping correction method. The native resolution of these simulations ranges from 150km (typical resolution of the CMIP5 models) to 25km.

We have studied the applicability of the PRIMAVERA European windstorm event set for the modeling of European windstorm risks for the insurance sector. Preliminary results show that losses simulated from the event set appear to be consistent with historical data for all of the included simulations. The event set enables a better representation of attritional events and storm clustering than other existing event sets. An alternative calibration technique for extreme gusts and potential future developments of the event set will be proposed.