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From cyclone tracks to the costs of European winter storms: A probabilistic loss assessment model

Dominik Renggli, Thierry Corti, Stefan Reese, Marc Wueest, Elisabeth Viktor, and Peter Zimmerli
Swiss Re Ltd, Group Underwriting, Zurich, Switzerland (dominik_renggli@swissre.com)

The quantitative assessment of the potential losses of European winter storms is essential for the economic viability of a global reinsurance company. For this purpose, reinsurance companies generally use probabilistic loss assessment models.

This work presents an innovative approach to develop physically meaningful probabilistic events for Swiss Re's new European winter storm loss model. The meteorological hazard component of the new model is based on cyclone and windstorm tracks identified in the 20th Century Reanalysis data. The knowledge of the evolution of winter storms both in time and space allows the physically meaningful perturbation of properties of historical events (e.g. track, intensity). The perturbation includes a random element but also takes the local climatology and the evolution of the historical event into account.

The low-resolution wind footprints taken from 20th Century Reanalysis are processed by a statistical-dynamical downscaling to generate high-resolution footprints of the historical and probabilistic winter storm events. Downscaling transfer functions are generated using ENSEMBLES regional climate model data.

The result is a set of reliable probabilistic events representing thousands of years. The event set is then combined with country- and risk-specific vulnerability functions and detailed market- or client-specific exposure information to compute (re-)insurance risk premiums.