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Influence of storm duration on insured losses associated with European winter storms

Lars Kirchhübel (1), Joaquim G. Pinto (1), Matthias Klawa (2), and Michael Kerschgens (1)

(1) Institute for Geophysics and Meteorology, University of Cologne, Germany (lkirch@meteo.uni-koeln.de), (2) Deutsche Rück, Düsseldorf, Germany

Severe wind gusts associated with the passage of extra-tropical cyclones are one of the main causes of natural hazard related losses in Central Europe. Previous studies revealed that losses at a certain location can be primarily attributed to the local wind gust maximum during the passage of the storm. In this study, we analyse the influence of storm duration as an additional meteorological parameter which may potentially enhance loss estimation. We use wind gust fields derived with the FOOT3DK mesoscale model with a 5 km x 5 km resolution. Wind gusts are estimated using the gust parameterization from Brasseur (2001). We focus on the German state of North Rhine-Westphalia for which high resolution loss data is available for selected historical storms. The wind gust fields are used to compute storm indices for individual storms combining the information of maximum wind gusts and storm duration. Different potencies (3, 4, 5, 6) for wind gusts, different thresholds (e.g. 20 m/s, local 98th percentile) and different relative weightings are considered. Our results show that the additional influence of storm duration on the overall losses is about 10 - 30 % depending on the storm event considered. The best fit for all storms is obtained for a storm index with a 30 % weighting of storm duration and a fourth potency function for wind gusts. This approach yields an explained variance of 92 % of losses. Hence, we conclude that storm duration is a skilful parameter which should be considered to enhance the estimation of loss potentials associated with extra-tropical storms affecting central Europe.