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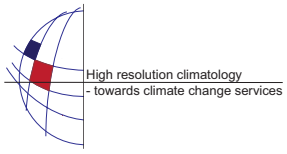

Assessment of possible changes in return period and ranking of losses associated with European wind storms in a future climate

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Winter storms are one of the major natural hazards affecting Europe. Possible changes in return periods and ranking of European wind storms in a future climate are investigated based on transient GCM simulations. The intensity of a storm is quantified by the associated estimated loss, which is derived using the storm loss model originally developed by Klawa and Ulbrich (2003), here adapted to estimate losses for individual storms. Daily maximum wind speeds are used to compute the estimated loss for each storm considering exceedences of the local 98th wind percentile. If a storm affects Europe during more than one day, the largest daily loss is considered. The total estimated loss for a single storm is then given by the sum estimated loss values for all grid points affected by the storm. We focus our investigation on Western and Central Europe, particularly in the "core Europe" countries (Germany, France, Netherlands, Belgium, Denmark, United Kingdom and Ireland).

The method is first tested for wind storm losses based on ERA40 data. Results reveal that the method is able to estimate well the spatial extension and ranking of losses associated with historical storms. We use robust Extreme Value Analysis (EVA) techniques which fit an extreme value distribution to data above a high threshold to estimate the return periods of storm losses. In order to estimate possible changes in return periods and rankings of storm loss in a future climate, GCM data for recent (20C, 1960-2000) and future climate conditions (SRES A1B and A2, 2001-2100) is considered. Results show that both the number and intensity of extreme losses increases under future climate conditions. There is a strong shift of storm loss rankings, with a present day top 1 becoming a rank 6 (A1B) or rank 8 (A2) event. In particular, we found storms with estimated losses exceeding almost two times the largest events identified for the 20th century. Accordingly, a significant shortening of return periods of European wind storm losses is found for the end of the 21th century, particularly for the A1B-scenario. This indicates an enhanced risk of occurrence of destructive winter storms over Europe.