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Extreme European Winter Storm: Detection And Characterization Of Events Impacting The Insurance Industry

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A methodology aimed at detecting extreme European winter storms has been developed using a catalogue of eleven reference storms known as extremes for the insurance industry. Using the ERA-Interim Reanalysis dataset (0.75x0.75°, October – March 1987-2010), we defined thresholds in order to detect these storms from the 850 hPa Relative Vorticity field. Indeed, this variable was found to be selective enough to capture extreme events, including the eleven storms that all have maxima above the 98th percentile of the 4xdaily distribution. A catalogue of extreme events of Relative Vorticity containing all the reference storms and other events is obtained.

The large-scale environment associated to the extreme events of the catalogue is analyzed. The comparison between the climatology over the whole period and the composite of the extreme events shows that during such extreme events the wind speed is increased and the jet stream extends to Western Europe. We obtain that only around half of the events of the catalogue yield strong winds and suggest a false detection.

Thus, we used Mean Sea Level Pressure (MSLP) and the 10 m wind speed to characterize the surface signature of each event of the catalogue. The anomaly of MSLP is computed and the minimum of the anomaly over the event lifespan characterizes the event. A Storm Severity Index is computed to take into account the geographical imprint, the duration and the intensity (i.e. wind speed) of each event. A classification analysis indicates that it is possible to discriminate between two groups of events: one with a strong surface signature (and containing all the reference storms) and another one composed of events with weak or no surface signature.

This methodology has been tested with other reanalysis data sets (e.g. NCEP2) in order to evaluate the impact of spatial resolution on the detection of extreme storms.