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How important is serial clustering in seasonal losses from severe windstorms in Europe?

Matthew Priestley (1), Helen Dacre (1), Len Shaffrey (2), Kevin Hodges (1), and Joaquim Pinto (3)

(1) Department of Meteorology, University of Reading, Reading, UK, (2) NCAS, Department of Meteorology, University of Reading, Reading, UK, (3) Institute of Meteorology and Climate Research, Karlsruhe Institute of Technology, Karlsruhe, Germany

Extratropical cyclones are the most damaging natural hazard to affect western Europe. Serial clustering is when many intense cyclones affect one area in a short period of time with potentially very large seasonal losses. Previous studies have shown statistically how intense cyclones are more likely to cluster than less intense cyclones during wintertime (DJF). We revisit this topic from a dynamical perspective and aim to answer how important clustering is for windstorm related losses.

This question will be approached using a quantifiable loss-based metric (storm severity index (SSI)) based on near-surface meteorological variables (10-metre wind speed) that is used to convert a wind footprint into losses for individual windstorms or seasons. 918 years of high resolution coupled climate model data from the High-Resolution Global Environment Model (HiGEM) are compared to ERA-Interim re-analysis. HiGEM is able to successfully reproduce the DJF North Atlantic/European circulation, and represent the large-scale set up associated with the serial clustering of European windstorms.

The contribution of a single event to the total accumulated seasonal losses is inferred from the ratio of the single event loss (SSI calculated over 72 hours) to the total season (DJF) loss. A low contribution of the single event loss to the total season loss implies more smaller/moderate sized cyclones occurring to make up the difference. Our results indicate that as return period increases the importance of a single event to the accumulated seasonal loss also increases. When compared to randomised samples of the HiGEM data, there is also an increase in the number of cyclone events above a 3 year return period, implying more severe seasons also have an increased number of cyclone events compared to an equally severe random realisation.

This result appears to contradict previous results in the literature and provides evidence that the importance of clustering may decrease for longer return periods.