Summary and Prediction of European Windstorm Footprint Characteristics

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This study has investigated how best to summarise windstorm footprints, and how well such summary statistics can be predicted from simpler track information. As part of the Extreme WindStorm (XWS) catalogue project, footprints of 43 historic extreme storms have been created using reanalysis-forced runs of the Met Office 25km resolution regional model. The footprint is defined as the maximum 3s gust at each grid point over Europe/E. Atlantic over a 72 hour period covering the passage of the storm.

Footprints have often been summarised using Storm Severity Indices (SSIs) defined as the cube of the excess wind speed above a threshold summed over the spatial domain. This study has found that for each of the 43 storms, the wind speed excesses at each grid point are well characterised by the 2-parameter Generalised Pareto distribution. These two parameters vary considerably from storm to storm and provide a good summary of the mean cubed wind speed excesses for each storm.

Linear regression has been used to try to predict SSI from simple track variables such as maximum wind speed and/or minimum pressure for each storm. The best predictor was found to be maximum wind speed over land but it fails to account for much variance in SSI most likely due to the spatial complexity of the footprints. Furthermore, a simple loss model involving population density in Europe shows that SSI alone is not a good predictor of loss due to the large spatial variation in population density (i.e. a severe storm could easily miss heavily populated areas).