Geophysical Research Abstracts
Vol. 17, EGU2015-9956, 2015
EGU General Assembly 2015

Matching current windstorms to historical analogues

Bernd Becker, Paul Maisey, Claire Scannell, Emilie Vanvyve, Lorna Mitchell, and Hamish Steptoe
Met Office, Applied Climate Science, United Kingdom (claire.scannell@metoffice.gov.uk)

European windstorms are capable of producing devastating socioeconomic impacts. They are capable of causing power outages to millions of people, closing transport networks, uprooting trees, causing walls, buildings and other structures to collapse, which in the worst cases has resulted in dozens of fatalities. In Europe windstorms present the greatest natural hazard risk for primary insurers and result in the greatest aggregate loss due to the high volume of claims. In the winter of 2013/2014 alone storms Christian, Xaver, Dirk and Tini cost the insurance industry an estimated EUR 2.5 bn.

Here we make use of a high resolution (4 km) historical storm footprint catalogue which contains over 6000 storms. This catalogue was created using the 35 year ERA-Interim model reanalysis dataset, downscaled to 12 km and then to 4.4 km. This approach was taken in order to provide a long term, high resolution data set, consistent with Met Office high resolution deterministic forecast capability for Europe. The footprints are defined as the maximum 3 second gust at each model grid point over a 72 hour period during each storm.

Matches between current/forecast storm footprints and footprints from the historical catalogue are found using fingerprint identification techniques, by way of calculating image texture derived from the gray-level-co-occurrence matrix (Haralick, 1973). The best match is found by firstly adding the current or forecast footprints to the stack of the historical storm catalogue. An “identical twin” or “best match” of this footprint is then sought from within this stack. This search is repeated for a set of measures (15 in total) including position of the strongest gusts, storm damage potential and 13 Haralick measures. Each time a candidate is found, the nearest neighbours are noted and a rank proximity measure is calculated. Finally, the Frobenius norm (distance between the two fields at each grid-point averaged) is calculated. This provides an independent assessment of the goodness of fit made by the rank proximity measure. Using this technique a series of potential historical footprints matching the current footprint is found. Each potential match is indexed according to its closeness to the current footprint where an index rating of 0 is a perfect match or “identical twin”.

Such pattern matching of current and forecast windstorms against an historical archive can enable insurers estimate a rapid prediction of likely loss and aid the timely deployment of staff and funds at the right level.