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The probability of occurrence of high-loss windstorms

Neil Massey
(neil.massey@ouce.ox.ac.uk)

Windstorms are one of the largest meteorological risks to life and property in Europe. High—loss windstorms, in terms of insured losses, are a result of not only the windspeed of the storm but also the position and track of the storm. The two highest loss storms on record, Daria (1990) and Lothar (1999) caused so much damage because they tracked across highly populated areas of Europe.

Although the frequency and intensity of high—loss wind storms in the observed record is known, there are not enough samples, due to the short observed record, to truly know the distribution of the frequency and intensity of windstorms over Europe and, by extension, the distribution of losses which
could occur if the atmosphere had been in a different state due to the internal variability of the atmosphere. Risk and loss modelling exercises carried out by and for the reinsurance industry have typically stochastically perturbed the historical record of high—loss windstorms to produce distributions of potential windstorms with greater sample sizes than the observations.

This poster presents a new method of generating many samples of potential windstorms and analyses the frequency of occurrence, intensity and potential losses of these windstorms. The large ensemble regional climate modelling project weather@home is used to generate many regional climate model representations (800 per year) of the weather over Europe between 1985 and 2010. The regional climate model is driven at the boundaries by a free running global climate model and so each ensemble member represents a potential state of the atmosphere, rather than an observed state.

The winter storm season of October to March is analysed by applying an objective cyclone identification and tracking algorithm to each ensemble member. From the resulting tracks, the windspeed within a 1000km radius of the cyclone centre is extracted and the maximum windspeed over a 72 hour period is derived as the storm windspeed footprint. This footprint is fed into a population based loss model to estimate the losses for the storm.

Additionally the same analysis is performed on data from the same regional climate model, driven at the boundaries by ERA—Interim. This allows the tracks and losses of the storms in the observed record to be recovered using the same tracking method and loss model. A storm track matching function is applied to the storm tracks in the large ensemble and so analogues of the observed storms can be recovered. The frequency of occurrence of the high—loss storms in the large ensemble can then be determined, and used as a proxy for the frequency of occurrence in the observations.