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Windstorm gust footprints at high spatial resolution

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Winter windstorms are responsible for 75-80% of all European insured losses since 1970. Realistic modelling of UK and European storm gust footprints at high spatial resolution will enable more accurate: post-event gust footprints and damage estimates, gust return periods (at any location), and insurance pricing. We present a method to interpolate hourly 10-minute wind speed and peak 3-second gust data from a network of sparse and irregularly-space stations onto a high spatial resolution 100m grid. Our method models and accounts for the (often significant) effects of upstream surface roughness and upstream topography on the locally measured wind and gust speeds. We estimate these upstream effects through a combination of linear modelling and statistical methods, and then normalise the station gusts to a constant surface roughness and flat terrain. The normalised station gusts are spatially interpolated onto a high resolution 100 m grid using inverse distance weighting. The resultant gridded gust field is de-normalised to obtain an interpolated gridded gust field which includes the effects of surface roughness and topography. The uncertainty in the interpolated high spatial resolution gust speeds is quantified by randomly removing a fixed percentage of stations, applying the normalisation and interpolation methods to the remaining stations and comparing the interpolated gust values at the removed station locations to the station observations. This is repeated many times to obtain a distribution of errors. This technique can be applied to any historical windstorm affecting Europe for which hourly 10-minute (or mean) wind and hourly peak 3-sec station data are available. Our presentation will include examples for recent UK windstorms.