



The return period of extreme winds over western Europe

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Accurate assessment of the return level and return period of extreme wind speeds is of fundamental importance for many safety, engineering and financial applications. We utilise the spatial and temporal consistency of the European Center for Medium Range Forecasts ERA40 reanalysis data to determine the properties of extreme winds over the eastern North Atlantic and western European region.

We investigated the use of ERA40 wind gust data and 850hPa geostrophic wind to estimate the wind risk over Europe. Wind gust is a parameterised forecast field, and wide areas over land are found to be unrealistic. The use of geostrophic wind further enables a comparison of ERA40 with the geostrophic wind from a gridded daily MSLP dataset over the same period.

Compound indices are defined to summarize the spatio-temporal characteristics and amplitude of extreme wind events over the target area. The extreme value analysis was then undertaken using classical peak over threshold (POT) extreme value analysis techniques to a number of extreme wind indices. The POT series were first declustered using an automatic declustering technique and then modelled using a Generalised Pareto Distribution (GPD) which was fitted using maximum likelihood estimation (MLE). The return periods based on the different data sets will be compared. The uncertainty in the return level and return period of extreme winds was calculated using a number of different methods including the standard delta method, bootstrap resampling and likelihood profile methods. A similar analysis was applied to each grid point over the domain to get an estimate of the spatial distribution of the wind risk and to be

compared with an estimate based on the compound European indices.

Further, the return periods of around 100 subjectively selected events within the same period are used to reconstruct the extreme wind statistics on a local and European scale by using the return periods as weights for the events. The feasibility of such a reconstruction is assessed in this contribution.