



## **Return period of wind storms over Europe in ERA-40**

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Accurate assessment of the magnitude and frequency of extreme wind speed is of fundamental importance for many safety, engineering and financial applications. We utilize the spatial and temporal consistency of the European Centre for Medium Range Forecasts ERA-40 reanalysis data to determine the frequency of extreme winds over the eastern North Atlantic and Europe. Two parameters are investigated: 10m wind gust and 850hPa geostrophic wind speed. The analysis of extreme winds follows two different view points: In a spatially distributed view, wind storm statistics are determined individually at each grid-point over the domain, resulting in recurrence estimates of storms for each reanalysis grid-point. In an integral, more generalised view, the storm statistics are determined from extreme wind indices (EWI) that summarise storm magnitude and spatial extent. We apply classical peak over threshold (POT) extreme value analysis techniques and fit a generalised Pareto distribution (GPD) to the EWI and grid-point wind data. The climatologies are used to estimate the return periods of 200 prominent European wind storms. The EWI based return period estimates of storms range from approximately 0.3 to 300 years. These return periods show a high dependence on the domain over which the indices are calculated, with generally higher returns periods when considering land grid-points compared to return periods derived using whole domain. Both the uncertainties in EWIs and grid-point based return periods show a greater dependence on the wind parameter used than on the uncertainty associated with the extreme value analysis. An evaluation of the EWIs shows that they can explain up to 50% of the variability of grid-point return periods. References: Della-Marta et al. (2008) Return period of wind storms over Europe, Int. J. Climatol. (Submitted), Della-Marta et al. (2007) Extreme wind storms over Europe:

Statistical Analyses of ERA-40, MeteoSwiss Technical Report.