



## **A storm severity index based on return levels of wind speeds**

Nico Becker, Katrin M. Nissen, and Uwe Ulbrich

Freie Universität Berlin, Berlin, Germany (nico.becker@met.fu-berlin.de)

European windstorms related to extra-tropical cyclones cause considerable damages to infrastructure during the winter season. Leckebusch et al. (2008) introduced a storm severity index (SSI) based on the exceedances of the local 98th percentile of wind speeds. The SSI is based on the assumption that (insured) damage usually occurs within the upper 2%-quantile of the local wind speed distribution (i.e. if the 98th percentile is exceeded). However, critical infrastructure, for example related to the power network or the transportation system, is usually designed to withstand wind speeds reaching the local 50-year return level, which is much higher than the 98th percentile. The aim of this work is to use the 50-year return level to develop a modified SSI, which takes into account only extreme wind speeds relevant to critical infrastructure.

As a first step we use the block maxima approach to estimate the spatial distribution of return levels by fitting the generalized extreme value (GEV) distribution to the wind speeds retrieved from different reanalysis products. We show that the spatial distributions of the 50-year return levels derived from different reanalyses agree well within large parts of Europe. The differences between the reanalyses are largely within the range of the uncertainty intervals of the estimated return levels.

As a second step the exceedances of the 50-year return level are evaluated and compared to the exceedances of the 98th percentiles for different extreme European windstorms. The areas where the wind speeds exceed the 50-year return level in the reanalysis data do largely agree with the areas where the largest damages were reported, e.g. France in the case of “Lothar” and “Martin” and Central Europe in the case of “Kyrill”.

Leckebusch, G. C., Renggli, D., & Ulbrich, U. (2008). Development and application of an objective storm severity measure for the Northeast Atlantic region. *Meteorologische Zeitschrift*, 17(5), 575-587.