

## **Application of the Kullback-Leibler information for the assessment of probability density functions of extreme wind speeds in the German Bight**

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This paper describes the application of the Kullback-Leibler information as a measure for the goodness of fit of two probability density functions. In the scope of a detailed analysis of the wind conditions within the German Bight measured data of several offshore locations are evaluated. To estimate extreme wind speeds with a low return period the generalised extreme value distribution and Weibull distribution are fitted to the series of monthly maximum wind speed. The goodness of the fit is estimated by using the Kolmogorov-Smirnoff test, the chi-square test, and the Kullback-Leibler information also known as relative entropy. The evaluations indicate that the Kullback-Leibler information is an adequate measure to assess the goodness of the fit. Furthermore the fits of the generalised extreme value distribution approximate the empirical data with a higher accuracy than the Weibull distribution. As a consequence the return values estimated from the Weibull distribution are systematically lower than those from the generalized extreme value distribution.

The result shows that the Kullback-Leibler information in combination with bootstrapping is generally applicable as a goodness of fit and null hypothesis test method. Furthermore the results indicate that the GEV fit represents the empirical distributions with a higher accuracy than the Weibull approximation. The return level values derived from the GEV are consistently higher and significantly different from those derived from the Weibull distribution. This knowledge should be considered for the planning of offshore wind farm projects in the German Bight.