



Is the Weibull distribution really suited for wind statistics modeling?

Philippe Drobinski (1), Corentin Coulais (2), Bénédicte Jourdier (1,3)

(1) Institut Pierre Simon Laplace, Laboratoire de Météorologie Dynamique, Palaiseau, France
(philippe.drobinski@lmd.polytechnique.fr, +33-(0)169-335108), (2) Kamerlingh Onnes Lab, Universiteit Leiden, Leiden, The Netherlands, (3) French Environment and Energy Management Agency, Angers, France

Wind speed statistics is generally modeled using the Weibull distribution. This distribution is convenient since it fully characterizes analytically with only two parameters (the shape and scale parameters) the shape of distribution and the different moments of the wind speed. However, the Weibull distribution is based on empirical rather than physical justification and might display strong limitations for its applications. In this article, we analyze wind speed distributions of meteorological stations and report that they deviate from the Weibull distribution. We further investigate wind components rather than the wind speed statistic. This approach provides more physical insights on the validity domain of the Weibull distribution as a possible relevant model for wind statistics and the quantification of the error made by using such a distribution. We thereby propose alternative expressions of more suited wind speed distribution by using super-statistical distributions.