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European Wind Variability over 140 Years

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We present a study on the variability of wind speeds across Europe, over the past 140 years, making use of the recent 20th Century Reanalysis data set (20CR), which includes uncertainty estimates from an ensemble method of reanalysis. The map of the standard deviations of daily mean wind speeds shows expected features, such as highly-variable wind in the North Atlantic, as well as limitations of the data: the wind appears unrealistically calm over highly mountainous regions such as the Alps. The unprecedentedly long time scale of the 20CR data set allow us to study the how the wind speed distribution over decades itself varies with time, showing decadal-scale periods with greater and lesser variability, describing the evolution of wind climatologies over Europe.

Understanding past natural wind variability is of much interest to the wind power industry, to help understand future power potential at a particular location. Key diagnostics of interest such as the frequency of high or low wind conditions, and the clustering and autocorrelation of low wind periods are investigated to understand their evolution over the last 140 years.