

Long term trends and variability of observed winds from operational meteorology

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1. Introduction

To estimate future wind resources available at a location there is a need to account for the likely variation due to interannual and longer term variations over the lifetime of the wind farm. The current practise has been based on estimates of the interannual variation from 10m wind observations used in operational meteorology. These studies are several years old and here a new look is taken at comprehensive datasets from around the globe collected by meteorological and climatological services. The oft quoted 6% annual variation of wind speed is critically re-evaluated.

2. Approach

Well-maintained long-term conventional meteorological observations are examined, including surface (10m) winds and upper air winds from radiosondes. We attempt to differentiate between trends which have observational support and likely spurious ones due to changes in observing site location and/or exposure.

3. Main body of abstract

There are now a number of quality-controlled datasets compiled by climate monitoring institutes. Two of these are examined to identify trends and interannual variability in windspeed. The 2 databases are HadISD, 2014 from which conventional 10m observations have been extracted, and RAOBCORE, for upper air radiosonde observations (Ramella-Pralungo, L et al. ,2013).

Also used is a homogenised 43 year UK gridded climatology (Met Office UK Climate Impacts data) based on 10m winds.

Problems of changes in exposure, instrument or location of some meteorological stations makes clear identification of trends and variability difficult or impossible at some sites. Excluding these percentage changes in mean annual wind are calculated . Observations have large differences in percentage variation because of wide variation in the mean speed at sites. Standard deviation is a better indicator of variability and is more coherent and closely related to the larger-scale changes in atmospheric circulation as determined from atmospheric reanalyses.

4. Conclusion

Using a global figure of 6% of the annual mean wind speed to allow for interannual variation is generally misleading. Many locations have greater

percentage variability. The percentage variation should be replaced by the standard deviation of windspeed, especially in low windspeed areas where the percentage variation is misleading.

Upper air observations generally show smaller annual percentage variations of 5% or less and generally little or no trend.

5. Learning objectives

The objective of this work is to identify which wind trends and variation are most reliable and supported by observations, and to propose revised estimates to be used in long term adjustments to the estimation of mean wind climatologies.

References

- [1] Met Office UK Climate Impacts data
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- [2] HadISD is a global sub-daily surface dataset based on the Integrated Surface Database (ISD) dataset from NOAA's NCDC version 1.0.3.2014f
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- [3] Ramella-Pralungo, L et al. (2013) RAOBCORE ,
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