



## Interannual wind variation from observations and numerical weather analyses

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Wind energy resource assessments primarily focus on the long term average wind speed for a specific location or region. The variations of the wind speed on all timescales will affect the actual wind power produced. A rule-of-thumb variability of 6% annual variation at each site is often used. We examine the long term recorded winds at meteorological stations and numerical weather model data to verify this claim.

We determine the variability of the interannual wind speed, as a percentage of the mean, from observations at Met Office stations throughout the UK, with time series of at least 20 years, and at meteorological stations throughout the rest of Europe. This is compared, for a shorter time period of 2001 to 2010, with the 4km and 12km Met Office Unified Model (UM) data. The UM is also used to investigate how the variability changes with height. In addition, the long term interannual variability at these sites as determined from ECMWF reanalyses is investigated. Finally, we consider the regional interannual variability for regions throughout Europe, using the reanalyses and UM data.

Both regional and site-specific results imply less than 6% variability in recent years, while long term observations broadly support the 6% rule. Observations at orographically complex sites have a larger variation of 7-8%. The regional statistics generally indicate percentage variability of less than 6%, in both the re-analyses and the UM. Specifically northern European regions have variability of around 4-5%, while southern European regions have lower variability of around 3%.

Both the mean wind speed and the standard deviation increase with height. When these are combined to form a percentage variability, this does not vary much with height. The UM, however, shows a somewhat larger percentage variation at 10m, compared with 30m or 60m. Given that there is little height variation we can have some confidence in the ability of the UM to capture the interannual variability at higher altitudes, where less observational data is available.