

# UKCP18 Factsheet: Wind

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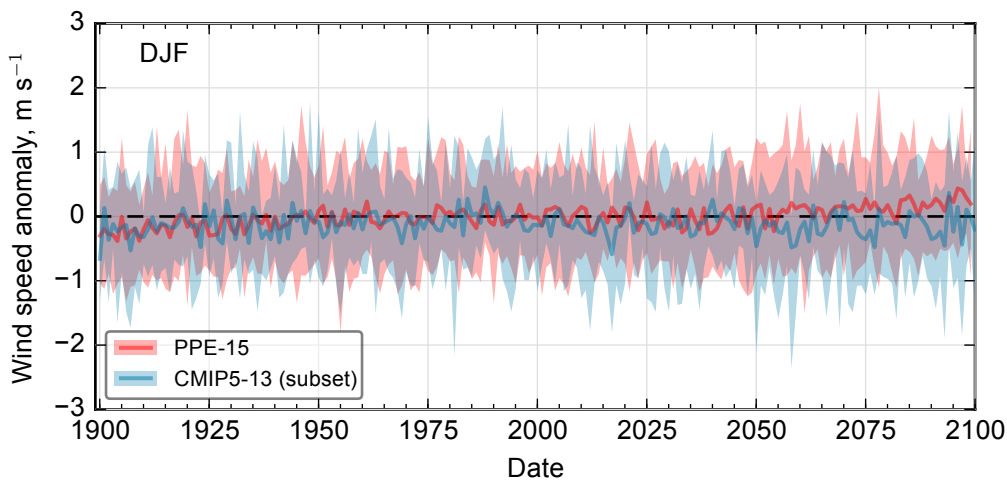
**This factsheet summarises the key information currently available on the UKCP18 projections over land for wind metrics. Read this before using any products as it describes the data availability, the key future climate changes (if any) that you should see and the caveats and limitations.**

We recommend that you read the [UKCP18 Science Overview](#) (Lowe et al, 2018) to understand the different components of the projections. For a comprehensive description of the underpinning science, evaluation and results see the [UKCP18 Land Projections: Science Report](#) (Murphy et al, 2018). Please note that the land projections consist of the following:

- **Probabilistic projections** that combine climate model data, observations and advanced statistical methods to simulate a wide range of climate outcomes for five emission scenarios (RCP2.6, RCP4.5, RCP6.0, RCP8.5 and SRESA1B) and five global warming levels (GWL1.5, GWL2.0, GWL2.5, GWL3.0, GWL4.0).
- **Global (60km) projections** - a set of 28 climate futures at 60km grid resolution, showing how the 21<sup>st</sup> Century climate may evolve under two emissions scenarios (RCP8.5 and RCP2.6). They assess the uncertainty across different models from different modelling centres as well as the parameter uncertainty. They incorporate 15 members of the Met Office Hadley Centre model, HadGEM3-GC3.05 (PPE -15), and 13 other climate models selected from the climate models that informed the Intergovernmental Panel on Climate Change's 5<sup>th</sup> Assessment Report (CMIP5-13).
- **Regional (12km) projections** - a set of 16 high resolution projections at 12km over the UK and Europe including 12 downscaled from the PPE-15 (RCM-PPE) and 4 downscaled from selected CMIP5 members. They assess the uncertainty in the regional model parameters, as well as uncertainty in the large-scale conditions from the driving global model.
- **Local (2.2km) projections** – a set of 16 very high-resolution projections at 2.2km (CPM-16) downscaled from the regional projections over the UK. They assess different local conditions given the uncertainty in the driving information.
- **Derived projections** – a set of climate futures for the UK at 60km grid resolution for a low emissions scenario, RCP2.6, and a global warming level of 2 °C and 4 °C. These have been derived from the global projections using statistical techniques.

## Results overview

- There are no compelling trends in storminess, as determined by maximum gust speeds, from the UK wind network over the last four decades.
- The global projections over the UK show:
  - an increase in near surface wind speeds over the UK for the second half of the 21<sup>st</sup> century for the winter season when more significant impacts of wind are experienced (see Figure 1). This is accompanied by an increase in frequency of winter storms over the UK. However, the increase in wind speeds is modest compared to interannual variability for the PPE-15.
  - no trend in the wind speed over the UK for the mean of the CMIP5-13.



**Figure 1** Global projections for changes in winter (DJF) mean near surface wind speed over the UK for 1900-2100 with respect to 1981-2000. The red line is the mean of the PPE-15 and blue line is the mean of the CMIP5-13. The red and blue shading represents the range of values from PPE-15 and CMIP5-13 respectively. Note that only 9 of the 13 models in CMIP5-13 have wind speed data for 1900-2100.

## The importance of near-surface wind

The motion of the air near the surface is characterised by the mean wind speed at a height of 10 metres, and its mean components in the eastward and northward directions.

Winds associated with major storm events can be some of the most damaging and disruptive events for the UK with implications for property, power networks, road and rail transport and aviation.

Calm periods with little wind, particularly over prolonged periods, can affect air quality whilst winds from a particular direction can be a critical factor in the spread of pathogens. Both of these cases are also examples where the combination of factors such as wind, temperature and precipitation can exacerbate their impacts (e.g. air quality issues tend to be worse under conditions of light winds and higher temperatures; pathogen spread can require wind, temperature and precipitation conditions to be favourable).

Wind direction, as characterised using weather types (see the UKCP18 Factsheet on Weather Types), has a significant influence on the conditions experienced in different parts of the UK. For example, winds blowing in from continental Europe during winter can lead to substantially colder and often drier weather.

## What data are available and where can you find it?

You can find the data availability summarised in Table 1. Note that wind speed is not available for the probabilistic projections as they did not pass our credibility checks. Further details are described in Appendix C of Murphy et al, (2018). All wind speed data are in metres per second:

	Observations	Probabilistic projections	Global (60km) projections	Regional (12km) projections	Local (2.2km) projections	Derived projections
Wind variables near the surface (at 10m)	Wind speed	Not available	Wind speed Wind speed eastwards/ northwards	Wind speed Wind speed eastwards/ northwards	Wind speed Wind speed eastwards/ northwards Wind gusts	Wind speed Wind speed eastwards/ northwards
Geographical extent	UK, Ireland, Channel Islands, Isle of Man	Not available	UK, Ireland, Channel Islands, Isle of Man Global	UK, Ireland, Channel Islands, Isle of Man Europe	UK, Ireland, Channel Islands, Isle of Man	UK, Ireland, Channel Islands, Isle of Man
Spatial resolution	1km † 5km † 12km † 25km † 60km †	Not available	60km	12km	2.2km (5km in OSGB)	60km
Temporal resolution	Monthly Seasonal Annual	Not available	Daily Monthly Seasonal Annual 20/30-year means	Daily Monthly Seasonal Annual 20/30-year means	Hourly 3-Hourly Daily Monthly Seasonal Annual 20/30-year means	Monthly Seasonal Annual 20/30-year means
Period of data	1969-present**	Not available	1900-2100	1981-2080	1981-2080	1900-2100
Emissions scenarios	Not applicable	Not available	RCP2.6 RCP8.5	RCP8.5 GWL1.0 GWL1.5 GWL2.0 GWL2.5 GWL3.0 GWL4.0	RCP8.5	RCP2.6 2°C world 4°C world

**Table 1:** Summary of available wind variables for UKCP18. Data is provided in (i) the Ordnance Survey's British National Grid (OSGB) for UK areas and (ii) in the climate models' original grid for areas outside of the UK (see UKCP18 Guidance: data availability, access and formats). †based on observation network. \*\*The data for the previous year gets released annually.

You can access the data and visualisations via the [UKCP18 User Interface](#). The observations data detailed in Table 1 are available through the [HadUK-Grid webpage](#).

You can access the simulations and all other datasets via the [CEDA Data Catalogue](#) but note that this requires the technical skill to analyse large datasets.

## How do the results compare to other models?

We have compared the near surface wind speeds for the global projections with observations<sup>1</sup> to understand how consistent they are. The large spread in the probabilistic projections and global projections (PPE-15 and CMIP5-13) during the historical period is consistent with that in the observed wind speed. Preliminary results for the regional projections show similar behaviour.

The comparisons presented in this factsheet show that there are similarities and differences between UKCP18 projections and other sources of data. The reasons for the differences are often complex and not easily summarised in this format of document. For further discussion of this topic and some of the explanations for the difference please refer to Section 2 of the [Science Overview report](#) (Lowe et al, 2018) in the first instance.

## What do you need to be aware of?

Whilst the projections represent the latest scientific understanding and the results have been peer reviewed by independent experts, keep in mind the caveats and limitations of the projections. Although our understanding and ability to simulate the climate is advancing all the time, our models are not able to represent all of the features seen in the present day real climate. This means that when including the climate projections in your decision-making, consider how best to factor the capabilities and limitations of UKCP18. This should be informed by a thorough understanding of the consequences of different climate outcomes – perhaps including those beyond the ranges of uncertainty presented in UKCP18.

High-resolution or high frequency events cannot be captured in the global models. These are very localised variations that can result from interactions with the land surface, especially for locations that are particularly exposed or sheltered. Local wind gusts can also result from small-scale weather features such as thunderstorms and these effects can be most pronounced in high wind speed situations.

The damaging effects of wind are related to the wind power. Small increases in wind speed can result in large increases in wind power and a higher risk of damage from strong winds.

If you are interested in analysing wind direction then use the simultaneous changes in the eastward and northward components of wind.

See [UKCP18 Guidance: How to Use the Land Projections](#) for further information on the caveats and limitations and appropriate use.

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<sup>1</sup> We use a reanalysis dataset ERA-Interim ([www.ecmwf.int/en/forecasts/datasets/archive-datasets/reanalysis-datasets/era-interim](http://www.ecmwf.int/en/forecasts/datasets/archive-datasets/reanalysis-datasets/era-interim)). It provides a comprehensive synthetic historical record of climate and is produced using observations and numerical models.

## Where can you find more information?

For further information on UKCP18:

- For further information about storm tracks – paths that experience a much higher frequency of storms – see section 3.4b of the [UKCP18 Land Projections Science Report](#) (Murphy et al, 2018).
- Download the wind speed and wind direction data from the [UKCP18 User Interface](#) at and the [CEDA Data Catalogue](#).
- Find out more about the Derived Projections for monthly wind speed and wind direction (Gohar et al, 2018) that provide results at the 60km scale over the UK for RCP2.6 and 2°C and 4°C worlds.

This document is citable as Fung F, Bett P, Maisey P, Lowe J, McSweeney C, Mitchell JFB, Murphy J, Rostron J, Sexton D and Yamazaki K. UKCP18 Factsheet: Wind. Met Office Hadley Centre, Exeter.

## References

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