

## UKCP18 Guidance: UKCP18 for UKCP09 users

This document is for those who are familiar with the products available for UKCP09. It summarises the main similarities and differences in the UKCP09 and UKCP18 products. If you require information on the differences in the results, please refer to the Science Overview Report, Land Projections Science Report and Marine Projections Science Report available from the [UKCP18 website](#).

The document explains:

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### **1 What is happening to the UKCP09 website, User Interface and User Interface**

The current UKCP09 site will be available from the launch of UKCP18 until the end of December 2018 from: <http://ukclimateprojections-ukcp09.metoffice.gov.uk>. At the end of December 2018, the current service providing UKCP09 will close. The UKCP09 website will then be available in an archived format only and the underlying UKCP09 data available from the Centre for Environmental Data Analysis (CEDA) [catalogue](#). After December 2018, there will be no further updates to material on the UKCP09 website and no further access to the UKCP09 helpdesk or User Interface. If you have previously run jobs in the UKCP09 User

Interface, please make sure you save them to an offline location before the end of December.

In their place will be the UKCP18 web pages (<https://ukclimateprojections.metoffice.gov.uk>), UKCP18 User Interface (<https://ukclimateprojections-ui.metoffice.gov.uk>) and Helpdesk (see UKCP18 web pages).

## 2 Which emissions scenarios are used in UKCP18

UKCP18 uses new emissions scenarios, called Representative Concentration Pathways (RCPs). RCPs are the emissions scenarios used in the Intergovernmental Panel on Climate Change’s latest 5th assessment report. UKCP09 used the SRES (Special Report on Emissions Scenarios) emissions scenarios which were reported on in the IPCC’s 4th assessment report. RCPs specify the concentrations of greenhouse gases that would result in target amounts of radiative forcing at the top of the atmosphere by 2100, relative to pre-industrial levels. Four forcing levels have been set: 2.6, 4.5, 6.0 and 8.5 W/m<sup>2</sup>. These create four RCPs that are used in UKCP18; RCP 2.6, RCP 4.5, RCP 6.0 and RCP 8.5.

The global mean temperature increase associated with each RCP is shown in Table 1.

RCP	Increase in global mean surface temperature (°C) by 2081-2100	Most similar SRES scenario (in terms of temperature)
RCP2.6	1.6 (0.9-2.3)	None
RCP4.5	2.4 (1.7-3.2)	SRES B1 (low emissions scenario in UKCP09)
RCP6.0	2.8 (2.0-3.7)	SRES B2 (between the low and medium emission scenarios in UKCP09)
RCP8.5	4.3 (3.2-5.4)	SRES A1F1 (high emissions scenario in UKCP09)

Table 1: The increase in global mean surface temperature averaged over 2081-2100 compared to the pre-industrial period (average between 1850-1900) for the RCPs (best estimate, 5-95% range) and the most similar SRES scenario in terms of global mean temperature. Based on Table 12.3 of IPCC (2013).

The UKCP18 probabilistic projections include SRES A1B so that you can directly compare them with the UKCP09 probabilistic projections. For further information on RCPs, please see UKCP18 Guidance on Representative Concentration Pathways and the box in the Science Overview Report.

### 3 Which data products have been updated and which are new

A summary of the products that were available in UKCP09 is compared to similar UKCP18 products in Table 1. Products that are new in UKCP18 are written in bold.

Product	UKCP09	UKCP18
<b>Observations</b>	5km 25km in rotated pole grid* to match probabilistic projections Administrative regions and river basins	5km 25km in Ordnance Survey's British National Grid* to match probabilistic projections <b>Countries</b> , administrative regions and river basins 12km and 60km in in Ordnance Survey's British National Grid* to match global and regional projections
	Daily, monthly, long-term averages No daily precipitation	Daily, monthly, long-term averages <b>Daily precipitation</b>
<b>Probabilistic projections</b>	25km in rotated pole grid* Administrative regions and river basins	25km in Ordnance Survey's British National Grid* <b>Countries</b> , administrative regions and river basins
	Monthly, seasonal, annual	Same
	30-year averages	30-year averages and <b>monthly time series</b>
	SRESB2 (low) SRESA1B (medium) SRESA1FI (high)	SRESA1B RCP2.6, RCP4.5, RCP6.0, RCP8.5
	10,000 samples	<b>3,000</b> samples
<b>Spatially-coherent climate model data</b>	25km in rotated pole grid* Daily time series	<b>60km global projections (daily+)</b> 12km regional projections over Europe (daily+) <b>2.2km regional projections over UK (sub-daily+)</b>
<b>Spatially coherent projections</b>	25km in rotated pole grid* 30-year averages	No longer available. Replaced by spatially coherent <ul style="list-style-type: none"> <li>• <b>60km global projections</b></li> <li>• 12km regional projections over Europe</li> <li>• <b>2.2km regional projections over UK</b></li> <li>• <b>60km derived projections over UK</b></li> </ul>
<b>Weather generator</b>	Daily and hourly	No longer available. Replaced by <ul style="list-style-type: none"> <li>• Daily data from global and regional models</li> <li>• Sub-daily data from 2.2km regional projections</li> </ul>
<b>Marine Projections</b>	Time-mean sea level to 2100	Time-mean sea level to 2100 <b>Exploratory time-mean sea level to 2300</b>
	H++	Not updated but are still valid
	Storm-surge trend	Best estimate is for zero storm-surge trend, see <b>Extreme still water return levels</b>
		<b>Case studies</b>

Table 2 Summary of characteristics of UKCP09 and UKCP18 products. New items are in bold. \*The rotated pole grid is the coordinate system used in UKCP09 \*See Ordnance Survey (2018) for further details.

The additional components of the UKCP18 land projections mentioned in Table 2 are:

- **Global projections** - a set of 28 climate futures at 60km grid resolution, showing how the 21st Century climate may evolve under the high emission scenario RCP8.5. It incorporates 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 projections** - a set of 12 high resolution projections at 12km downscaled from the PPE-15 over the UK and Europe. At a later date, a further set of 10 projections at 2.2km over the UK will be made available.
- **Derived projections** - a set of climate futures for the UK at 60km grid resolution for RCP2.6 and a global warming level of 2°C and 4°C.

#### **4 The rotated-pole grid and Ordnance Survey's British National Grid**

In UKCP09, the probabilistic projections were provided in the same co-ordinate system as the climate model, i.e. rotated-pole. This has proved to be difficult for those users who are more familiar with the Ordnance Survey's British National Grid co-ordinate system (OSGB). In UKCP18, we provide the data in both OSGB (which requires post-processing involving interpolation) as well as the original climate model's coordinate system where appropriate. See guidance on data availability, access and formats for further details.

#### **5 Why there is no weather generator**

UKCP09 provided a Weather Generator which is a tool for providing long synthetic series of daily climate variables. This was used for risk analysis of impacts that depend upon the sequence of weather conditions (e.g. river flows and plant growth). It also provided a convenient tool for statistical analysis of the joint effects of multiple climate variables. A Weather Generator has not been provided in UKCP18. If you are interested in the effects sequences of events and multiple variables, data is available from the regional and the derived projections.

In UKCP18, we have chosen to provide data from a physically-based modelling system that can be better evaluated against real world observations rather than the statistical approach of the weather generator.

## 6 Why the baseline period 1981-2000 is used

The UKCP18 science reports, key messages, maps and graphs use a different baseline period from UKCP09. UKCP18 uses a 20-year baseline period of 1981-2000, as opposed to the 1961-1990 baseline period in UKCP09. This is to maintain consistency across UKCP18 products where due to computational constraints, the high resolution 2.2km projections will only be available for 20-year time periods (a baseline of 1981-2000 and future periods of 2021-2040 and 2061-2080). Note that you can obtain results for other baselines (1961-1990 and 1981-2010) from the UKCP18 User Interface.

## 7 Where can the data be downloaded and what formats are available

There are two main ways to download the data: the UKCP18 User Interface and the CEDA Data Catalogue. The UKCP18 User Interface is designed for those who need quick access to data through a graphical user interface. At present, **only UK data** is available from the interface. The UK region has been extracted from the global 60km and European 12km model. Data for the UK region is available from the user interface in comma-separated value files that can be used in software such Microsoft EXCEL and also as netCDF format.

The [CEDA Data Catalogue](#) is designed for those who are familiar with coding and handling large climate datasets. It hosts all UKCP18 datasets in netCDF format. See the guidance on data availability, access and formats for more detail (Fung et al, 2018).

## 8 The methodology used for the probabilistic projections

The methods used to produce the probabilistic projections are similar to those used in UKCP09. We have updated them using additional climate models (e.g. Met Office Hadley Centre and CMIP5 earth system models) as well as more recent observations. The probabilistic projections in UKCP18 are presented at the monthly, seasonal and annual time steps, whereas their UKCP09 counterparts were only available for 30-year average changes. You can find a detailed description of the method in section 2.2 of Murphy et al (2018).

## 9 Why H++ has not been updated

Our summary interpretation of the recent evidence is that the H++ scenario of UKCP09 can still be considered a useful plausible but unlikely high-end sea level pathway for decision-making. It should not be considered a theoretical maximum rate of sea-level rise. The scientific community will further update the potential for higher sea-level rise scenarios in the

coming months but this is likely to be in a different format to the previous scenario, reflecting an emerging need for tailored high-end scenarios for different users. Details will be provided on the [UKCP18 website](#) when available.

## **10 Why the administration and river basin regions are different from those used in UKCP09**

In UKCP09, the shapefiles for the administration and river basin regions were not freely available as they required a licence. To make it easier to share and use the shapefiles, we have created the administration and river basin region as well as country shapefiles from open-source datasets. The shapefiles are available with an Open Government Licence. The main differences between UKCP09 and UKCP18 administration region shapefiles are in Scotland where Eastern, Western and Northern Scotland are based on aggregating regions from [OS Boundary Line](#). There are also some small changes to river basins which are based on the European Environment Agency's [European river catchments](#). Further details can be found in the UKCP18 guidance on data availability, access and formats.

## **11 Why there is no wind speed and relative humidity for the probabilistic projections**

For the probabilistic projections, all variables were checked for credibility by comparing them against the suite of global climate model simulations used in their construction. For relative humidity and near-surface wind speed, the tails of the probability distribution often showed outcomes beyond the most extreme of the climate model responses. This is contrary to one of the key assumptions in the methodology and so these variables were rejected. More details are provided in Appendix C of the Land Projections Science Report.

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