Updated guidance on the use of UKCP09 products

Introduction

This note provides guidance on the use of UKCP09 products in the lead up to the update of projections to be launched in March 2018. The advice has been developed by the UKCP18 project team: Met Office Hadley Centre, Defra, BEIS and the Environment Agency. You will find advice on whether you should continue to use UKCP09 products, consider additional information or use a different source of information altogether during this period

This document complements technical notes that have already been published on the UKCP09 website on the probabilistic climate projections for land and the marine projections.

No further update to this note is planned until March 2018. You can stay in touch with project developments by subscribing to the UKCP18 project newsletter via ukcpproject@metoffice.gov.uk.

UKCP product guidance

Product	Guidance
Probabilistic climate projections over land	Continue to use unless your decision is sensitive to summer rainfall extremes. If it is, you may need to consider the CMIP5 ensemble and seek expert advice. See the technical note on the UKCP09 land projections for more information.
Spatially coherent projections (SCP) – 11 member ensemble	Continue to use. Bear in mind that the SCPs should not be treated as a replacement for the probabilistic projections. This is because the SCPs still under-sample the full set of possible outcomes available through the probabilistic results (see here for further guidance). In addition, as with the probabilistic projections, care must be taken if your decision is sensitive to summer rainfall.
Regional climate model ensemble (RCM) - 11 member ensemble	Continue to use. The caveats on the use of the 11 member ensemble still hold, i.e. the ensemble does not sample the full range of changes in time-averaged climate expressed in the UKCP09 probabilistic projections. The ensemble members inherit biases at larger scales from the global climate models used to drive them, which contribute to limitations in their ability to represent regional extremes. See here for further information.
Weather Generator	Continue to use as there is currently no new information at daily and sub-daily scales. This information will be provided in the UKCP18 project from March 2018. Caveats on its use still hold and can be found in Table 2.
Sea level rise projections	**Do not use**. If possible, wait for the updated UKCP18 projections to become available Follow advice from Chapter 13 of the IPCC's Fifth Assessment Report (IPCC, 2013). For more information please also see the technical note on the marine projections**.**

[1] CMIP5 is the Climate Model Intercomparison Project Phase 5 that fed into the latest Intergovernmental Panel on Climate Change's 5th Assessment Report.

Storm surge	**Continue to use**. Changes in climate projections of mid-latitude Atlantic storms are less different between IPCC AR4 and AR5 than the assessment of time-mean sea level. We recommend that users continue to use projections of storm surge changes reported in UKCP09 as a minimum estimate of the range, until new information becomes available from the UKCP18 Project updates. The winds and surface pressure from the RCM ensemble are used to drive the storm surge model and the caveats on the use of the 11 member ensemble still hold. See Regional Climate Model above for further guidance.
Waves	**Continue to use.** This will not be updated as part of UKCP18. The regional wave model is driven by three members of the regional climate model ensemble, representing low, mid and high climate sensitivity. See Regional Climate Model above for further guidance. Global wave projections are available for RCP4.5 and RCP8.5 as part of the Coordinated Ocean Wave Climate Project (COWCLIP) from https://data.csiro.au/dap/landingpage?pid=csiro:13500
Projections for shelf sea water properties	**Supplement with MINERVA project dataset.** Shelf sea projections of temperature, salinity and circulation will not be updated as part of UKCP18. UKCP09 provided a single projection for shelf sea water properties. More recently a similar modelling system has been used to generate an ensemble of projections under the MINERVA project (Tinker et al, 2016). We recommend that users make use of the full MINERVA data set (which includes the UKCP09 projections) when considering potential changes in shelf water properties over the 21st Century. These data are available from http://catalogue.ceda.ac.uk/uuid/c92a088715184487a2eab79949dfe497
H++ Scenarios for Time-Mean Sea Level	**Continue to use.** New H++ scenarios for time-mean sea level over the 21st Century will be developed during the UKCP18 project period in collaboration with the UK academic community. Users should continue to use the H++ scenarios developed for UKCP09 and also refer to the IPCC AR5 statement on potential additional sea level rise (above their "likely ranges") associated with possible collapse of the West Antarctic Ice Sheet. The relevant section of IPCC AR5 is available from: http://www.climatechange2013.org/images/report/WG1AR5_Chapter13_FINAL.pdf. We do note that the science relevant to H++ scenarios is evolving quickly with new information on ice sheets becoming available.

Table 1. Guidance on the transition from UKCP09 to UKCP18

Further Information

Characteristic	RCM Ensemble	Weather Generator
Geographic coverage?	Land and marine areas (see Murphy et al (2009), Chapter 3, Figure 3.8).	Land only. UK plus Isle of Man, but not Channel Islands.
Spatial Resolution?	25 km	5 km, but with no additional climate change information above projections at 25 km resolution.
Temporal resolution?	Daily	Synthetic daily data. No climate change information additional to that at monthly resolution in the probabilistic projections. Daily data is also disaggregated to hourly.
Continuous?	Yes, from 1950 to 2099.	7 standard UKCP09 30-yr time periods, plus 1961–1990.
Can users average daily time series from different grid squares to obtain time series for larger regions?	Yes, any number of grid squares can be averaged by users.	No, but users can configure the WG to produce time series for a single region of any size, up to a maximum area of 1000 km2.
Temporal averaging?	Yes, can be done by users.	Yes
Consistency between variables?	Yes	Yes
Spatial coherence between grid squares?	Yes	No
Can a relative probability be attached to the projected daily time series?	No. Daily time series from particular RCM variants should be interpreted as plausible realisations, but are subject to additional modelling caveats which preclude the assumption that we can assign some level of probability to them, based on the corresponding changes in time-averaged climate.	No. Weather Generator time series are also subject to additional caveats, associated with their internal statistical assumptions. Again, they should be regarded as plausible realisations consistent with current knowledge, but should not be treated as results to which some level of probability can be attached.
Samples the UKCP09 probabilistic projections?	Partially. Designed to sample a range of possible responses, but not the full range expressed in UKCP09, for reasons explained above.	Yes: can be driven by prescribed climate changes sampled from the full range of possibilities captured in the UKCP09 probability distributions.
Projections of climate or climate change?	Daily climate, but with model biases in the historical simulations. Such biases can be empirically removed by expressing the future projections as changes relative to the model baseline climate, and then adding them onto an observed baseline. This does not guarantee that the projected changes are free from error.	Daily synthetic climate. Historical baseline simulations are generated using statistics based on observations, which should (by construction) reduce biases in their characteristics, though the extent to which this is achieved depends on the characteristics in question. Future simulations are obtained by prescribing change factors obtained from the UKCP09 probability distributions, giving future time series whose characteristics can be differenced relative to the historical

		simulations to obtain projected changes
Variables?	Many, at several levels.	Nine surface variables.
Threshold analysis of daily data?	No tool provided, but can be done by users offline.	Yes, using UKCP09 User Interface Threshold Detector.
Visualisation of results?	None provided, but can be done by users offline.	Yes, using extensive capability in UKCP09 User Interface.
Emission scenarios?	Medium	Low, Medium, High

Table 2. Some characteristics of the data from the RCM ensemble and from the Weather Generator (Table 5.1 from Murphy et al, 2009).

References

IPCC, 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp, doi:10.1017/CBO9781107415324. Available at: www.ipcc.ch/report/ar5/wg1

Murphy JM, Sexton DMH, Jenkins GJ, Booth, B, Brown CC, Clark RT, Collins M, Harris GR, Kendon EJ, Betts RA, Brown SJ, Humphrey KA, McCarthy MP, McDonald RE, Stephens A, Wallace C, Warren R, Wilby R, Wood RA, 2009. UK Climate Projections Science Report: Climate change projections. Met Office. Available at: http://ukclimateprojections.metoffice.gov.uk/media.jsp?mediaid=87894&filetype=pdf.

Tinker J., J. Lowe, A. Pardaens, J. Holt and R. Barciela (2016), Uncertainty in climate projections for the 21st century northwest European shelf seas, Progress in Oceanography, http://dx.doi.org/10.1016/j.pocean.2016.09.003.