

Technical approach to the delivery of new UK Climate Projections (UKCP18 project)

V1: 12/01/16

Motivation

Improved robust UK climate projections are needed for the Climate Change Risk Assessment (CCRA) and to equip the UK with information to help it adapt to the challenges and opportunities of climate change in line with the National Adaptation Plan.

Timing

During the last 5 years there have been a number of technical advances in climate modelling that mean additional or improved climate simulations can be made available for planning. This includes the development of convective resolving regional simulations, which include physical processes on small spatial scales in a much more realistic way, and the availability of the global resource of simulations called Coupled Model Inter-Comparison Project Phase 5 (CMIP5), which was used in the Intergovernmental Panel on Climate Change (IPCC) 5th assessment. Additionally, user feedback from the adaptation community provides a view of an evolving user need. Together these provide a driver to produce new climate scenarios for the UK. If new scenarios are to be available for the third CCRA, due to be published in 2022, then work must take place now in the UKCP18 project.

Components of the new projections

The largest component of the upgrade to UKCP09 in the UKCP18 project focuses on upgrading the future climate scenarios over land. Most emphasis will be placed on producing the spatially coherent projections, with work taking place to physically understand the simulated results. The offering for upgrades to the land simulations is organised over three main strands:

- Strand 1: New uncertainty distributions of plausible future changes in temperature, precipitation and other key variables. These will replace the Probability Distribution Function (pdfs) in the UKCP09 and will account for an expanded set of observations and new understanding, for instance from the CMIP5 models. This will provide a broad uncertainty context updating UKCP09, which will guide appropriate use of data from strands 2 and 3 below. Three emission scenarios are planned – RCP2.6, RCP8.5 and for backward compatibility, SRES A1B.
- Strand 2: New spatially coherent projections from 11 to 30 plausible pathways of future 21st century climate derived from an ensemble of the HadGEM3 global model, and designed to reflect key uncertainties. These will be placed in the context of the new distributions of strand 1. Data will be provided at a resolution of around 60km and cover the entire globe, exploiting the latest modelling capability in representing future natural variability in a changing climate. The choice of emission scenario will be made later in the project. Work will be carried out to evaluate the historical model performance and to begin to understand the future simulated changes.
- Strand 3: Production of a set of downscaled simulations of future climate, likely below 5km spatial resolution, and driven by the global simulations of strand 2. These will provide new information, beyond the capabilities of UKCP09, on how certain types of weather event of relevance to adaptation could change in the future, particularly in relation to localised heavy rainfall events in summer.

Alongside the land based projections a new package of information on sea-level rise will be provided. This will first update the large-scale time-mean projections around the UK region so that it is compatible with CMIP5 and the IPCC 5th assessment. The second aspect will investigate how large-scale sea level change signals are distorted as they pass from the open ocean onto the shelf sea around the UK. The final component will update the surge projections for coming decades.

Being able to place the future changes in a historical context is important. Updated information on the state of the UK climate, assembled elsewhere in the Met Office Hadley Centre programme, will be provided within UKCP and updated regularly for a range of land and marine variables. This will replace the “trend report” of UKCP09 and bring the observed period as near to present day as is possible.

Approach to delivery

The research, development and simulation production aspects of the Met Office project takes place in the Infrastructure, Climate Science and Translation components of the Hadley Centre Climate Programme (2015-2018). This will underpin the new climate science and model set-ups, ensure the methods are robustly peer reviewed, and produce the raw data. Whilst there are many new developments to be included, this project also makes use of much of the theoretical framework developed in UKCP09 and in the years since.

The information delivery will take place through a Climate Service, which has a number of specific aspects including: liaison with users, extraction and supply of data, production of key user-focused indicators, evaluation of the model over the UK region and the writing of guidance notes and production of website material.

As was the case for previous UK Climate Projections, this is expected to be a multi-agency activity in which this Met Office Climate Service will play a key part. In particular, we expect the Met Office contribution to focus on turning the raw data into useable products, leading the main scientific reports, and contributing to the user guidance for stakeholders. The overall philosophy will be to take a layered approach, with peer reviewed scientific reports and data as the foundation, with user guidance and pre-prepared material at intermediate layers and then summary statements and clear infographics at the top level.