

## Implementing the CMIP6 data request

*Jeremy Walton, Met Office Hadley Centre and UKESM core group*

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The World Climate Research Program's Coupled Model Intercomparison Project (CMIP) aims to improve our understanding of, and ability to simulate, key climate phenomena and future climate change using a coordinated multi-model approach. In CMIP, models from climate centres around the world are integrated using a common set of experiment protocols in order to address a range of key science questions. Comparison between model results helps to assess their performance and to understand common weaknesses and strengths, whilst a multi-model ensemble helps to quantify and constrain the spread amongst future climate projections. Beginning in late 2016, and scheduled to run actively till the end of 2020, CMIP6 is the next round of this Project.

The UK contribution to CMIP6 will be made through a collaboration involving the Met Office, NERC centres and UK universities. It will use the UKESM1 *earth system* climate model and the GC3.1 configuration of the HadGEM3 *physical* climate model; we note that HadGEM3-GC3.1 constitutes the coupled physical model core of UKESM1. Two resolutions of each model will be made available.

There are many aspects to the preparation for a large, multi-centre project like CMIP6; here we focus on our work with the so-called *CMIP6 data request*. This is a list of the diagnostic which are to be calculated and output in the course of each of the CMIP6 experiments. It is collated from data-requests made by each of the Model Intercomparison Projects (MIPs) that together make up CMIP6, and then made available to all participants, including contributing modeling centres. Besides being used in the setup of the model run, the data request also plays an important role in the post-processing (including automated quality checking) of the model output, since it defines the characteristics of the variables that should be present.

The data request for the previous round of CMIP was distributed as a multi-page spreadsheet. The progression to CMIP6 has seen a six-fold increase in both the number of experiments and number of diagnostics requested from models; this, coupled with feedback from user experience (which noted that, for example, it can be difficult to track or undo changes to the contents of a spreadsheet), has resulted in the selection of a different format for the CMIP6 data request, which now takes the form of an XML document.

The document has been made available as an export from a central Subversion version control repository, which facilitates the tracking and undoing of changes to the list. Part of the request (reformatted as a spreadsheet in Google Docs) is shown in Figure 1. Each row corresponds to a variable (the full request comprises about three thousand of these), and each column corresponds to a variable attribute – for example, its name, dimensions, type and frequency of temporal output, and the experiment for which it is required. Currently, each variable has twenty-two attributes.

To analyze the request, we first divided it into several scientific *domains* (e.g. aerosol, chemistry, dust, ice-sheet) and assigned each of these to an expert in that field. They then assessed each diagnostic variable in their domain, determining whether (a) it could already be produced from model output (either directly, or through post-processing), (b) should be added to the model, or (c) could not be produced by the model (either because it made no sense to do so, or would be prohibitively expensive to produce).

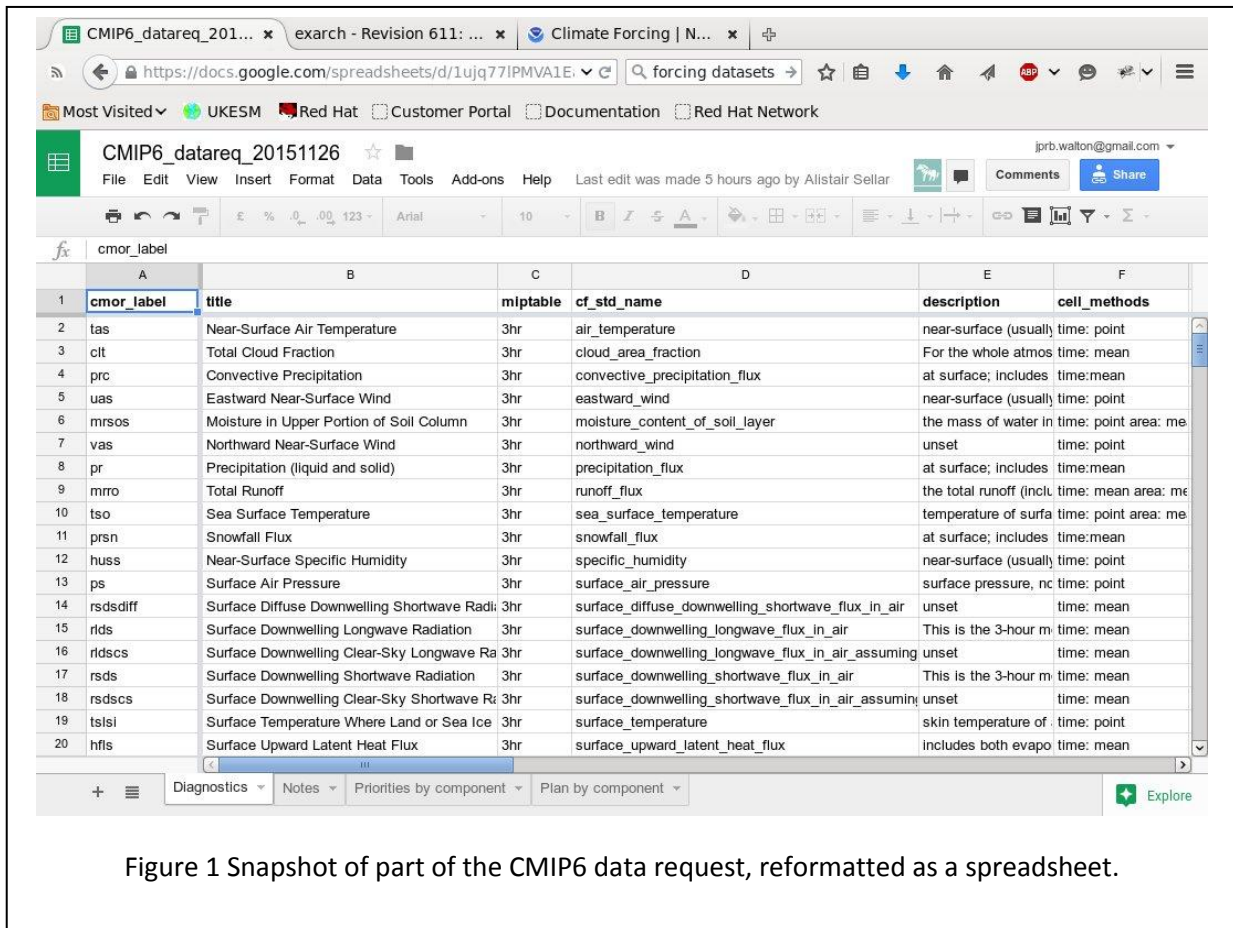


Figure 1 Snapshot of part of the CMIP6 data request, reformatted as a spreadsheet.

This analysis is currently around 75% complete; so far, around 20% of the diagnostics have been assessed as requiring addition to the model (of these, roughly half could be produced by post-processing). The next stage of this work is the implementation of these diagnostics, which is currently being prioritized to focus on the CMIP6-designated priority variables for the UK top priority MIPs.

More detailed information about the data request, and all other aspects of UK preparations for participation in CMIP6, is available at [the Met Office website](#).