



The UK contribution to paleoclimate modelling for CMIP6/PMIP4: Preliminary results of the mid-Holocene and the Last Interglacial experiments, two “warm climate” simulations, and comparison to the preindustrial era

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The use of physically-based tools, such as Global Climate Models (GCMs) or Earth System Models (ESMs), to better understand environmental and climate changes during the geological past (such as the late Quaternary) is a well-established technique. Moreover, the modelling of paleoclimate is regarded as an excellent way to test the GCMs/ESMs currently being used for future climate change projections, by providing an out-of-sample test for the models. By simulating past climates, and comparing these simulations to existing proxy data, the models' ability to reproduce climates that were radically different from our own can be assessed. Due to this, the Paleoclimate Modelling Intercomparison Project (PMIP, now at phase 4) spearheads the paleoclimate contribution to the current phase of the Coupled Model Intercomparison Project (CMIP6).

In preparation for the forthcoming IPCC Assessment Report (AR6), PMIP4 is coordinating the modelling of 5 separate time periods: the Last Millennium (past1000), the Last Glacial Maximum (LGM), the mid-Pliocene Warm Period (midPliocene), the mid-Holocene (MH) and the Last Interglacial (LIG). Concerning the UK contribution to these 5 experiments, using the UK Met Office's most recent GCM (HadGEM3.1), the MH and LIG have now been completed, and the others are currently underway or imminently about to start. Some of these will be repeated in the near future using the UK Met Office's most recent ESM (UKESM1).

Here, we will present preliminary results from the MH and LIG simulations (~6kya and ~127kya, respectively), grouped together as they both represent, in very general terms, a warmer world with greater seasonal temperature variations in the Northern Hemisphere, primarily due to changes in the Earth's orbital configuration. Both of these will be compared to the preindustrial control simulation (piControl), concerning firstly their spin-up runs (to test whether the simulations have reached acceptable equilibrium) and secondly their production runs (to test, via model-data comparisons, whether the simulations are correctly reproducing the expected climate during these periods).