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# Overview and first results on efforts with MPI-ESM 1.2 for Phase 2 of the Pliocene Model Intercomparison Project (PlioMIP2)

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The Pliocene Model Intercomparison Project, Phase 2 (PlioMIP2, Haywood et al., 2016) is an international coordinated effort to investigate the climate of the Mid-Piacenzian Warm Period (MPWP, ∼3.3-3.0 million years before present). In particular, a focus is set on quantifying the extent of agreement between simulations of the MPWP produced with state-of-the-art climate models and climate reconstructions that are derived from the geologic record. Based on these results the project aims at understanding reasons and mechanisms for relative warmth of MPWP climate with respect to today. This is an particularly interesting effort as the atmospheric volume mixing ratio of carbon dioxide assumed to be present during the MPWP, that is 400 parts per million (ppm) according to Haywood et al. (2016), already has been exceeded as a result of anthropogenic activity.

An additional aim is to understand to what extent MPWP climate may be a case study for climate conditions that may be prevalent at the end of the 21st century under the influence of anthropogenic forcing. As such, PlioMIP2 is of general interest both for the understanding of the climate system and for the evaluation and improvement of climate models and of climate modelling methodologies. The project is associated to the Paleoclimate Model Intercomparison Project, Phase 4 (PMIP4) and the Climate Model Intercomparison Project, Phase 6 (CMIP6).

In the first phase of PlioMIP we utilized COSMOS (ECHAM5/JSBACH/MPIOM) to simulate the climate of the MPWP. Our simulation results (Stepanek and Lohmann, 2012) are in line with those derived with other climate models. The PlioMIP ensemble reproduces many major patterns of reconstructed MPWP climate (Haywood et al., 2013; Dowsett et al., 2013; Salzmann et al., 2013) – yet, one outcome is that there are climate characteristics where models produce disagreeing results or support climate patterns that are not in line with inferences derived from the geologic archive. We have shown, for example, that a closed Bering Strait brings simulated MPWP sea surface temperatures in better agreement with the proxy record. In PlioMIP2, therefore a refined modelling methodology, an extended set of climate simulations, and updated climate models are employed in an effort to further sample the uncertainty in MPWP climate.

Here, we present first results of some of the simulations performed with MPI-ESM, version 1.2.00, in the framework of PlioMIP2. Based on these results, we will provide an outline of our future plans for climate modelling and model analysis in the framework of PlioMIP2.

References:

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