Geophysical Research Abstracts
Vol. 14, EGU2012-9269, 2012
EGU General Assembly 2012

Modelling the mid-Pliocene Warm Period with the IPSLGCM: contribution to PlioMIP and feedback mechanisms from the presence of mega-lakes

C. Contoux (1), A. Jost (2), P. Sepulchre (1), and G. Ramstein (1)
(1) LSCE, Gif-sur-Yvette, 91191 France (camille.contoux@lsce.ipsl.fr), (2) Sisyphe UPMC, 75005 Paris, France

The mid-Pliocene Warm Period (mPWP, ca. 3.3 -3 Ma) is the last geological period showing a warmer climate than the preindustrial during a sustained period of time, much longer than interglacial periods of the last million years. Moreover, mPWP position of the continents and atmospheric pCO_2 are very close to present-day, both conditions making the mPWP a relevant analogue for future global warming. For these reasons, the mPWP has been the focus of Pliocene Modelling Intercomparison Project (PlioMIP), which associates data analysis and modelling.

We use the IPSLCM5 Earth System model and its atmospheric component alone (LMDZ), to simulate the climate of the mPWP. Boundary conditions such as sea surface temperatures (SSTs), topography, ice sheet extent and vegetation are the ones used within the PlioMIP framework. On a global scale we show the impact of different boundary conditions with LMDZ, and of a global coupling on the simulated climate. Results from the Earth System model are also compared to SST reconstructions, particularly in the North Atlantic Ocean, where an important warming occurs, generally poorly reproduced by models. These results will then be part of the multi-model analysis for the Pliocene.

The PlioMIP exercise is also about better understanding model/data mismatches. In the present-day desertic regions of Lake Chad (Africa) and Lake Eyre (Australia), vegetation data show the presence of tropical savanna at the expense of deserts during the mPWP. Vegetation models forced by mPWP climatic simulations fail to reproduce more humid vegetation in these locations. There might be a reason for this model/data discrepancy: geological data stand for the presence of mega-lakes in these two regions during the mPWP that are not accounted for in previous simulations. Such extended waterbodies could have important feedbacks on the hydrological cycle and regional climate. We use the LMDZ4 atmospheric model imbedding explicitly resolved lake surfaces to simulate the climate under mega-lake conditions, using a zoom on the regions of interest. This allows us to determine the viability of such waterbodies under mid-Pliocene climatic conditions as well as their feedbacks on the climate system.