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Climate modeling for the mid-Pliocene warm period and model-model intercomparison

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The mid-Pliocene warm period (mPWP; 3.3~3.0 Ma) is the most recent interval when global climate was substantially warmer than the present-day for a sustained time with the modern geographical distribution of continent and ocean. The effort for simulating the climate in this interval would advance validations of climate models predicting future climate change and to the estimation of ”Earth system sensitivity”.

As a part of the United State Geological Survey (USGS) Global Changes Research effort, the Pliocene Research Interpretation and Synoptic Mapping (PRISM) Project has documented the characteristics of climate in mPWP on a global scale by use of various types of proxy records. The PRISM datasets have been used to drive numerical simulations designed to explore the impact of climate forcing and feedback during the Pliocene and assess the reproducibility of climate simulations derived by general circulation models (GCMs) in this period. The Paleoclimate Modeling Intercomparison Project (PMIP), a worldwide framework for studying on the paleoclimate reconstructions and simulations, has focuses on mPWP as one of new target intervals in its latest phase (PMIP3). By applying the latest version of the PRISM dataset (PRISM3D, Dowsett et al. 2010) for prescribed boundary forcings, Pliocene modeling intercomparison project (PlioMIP) was proposed to access the reproducibility of global climate models for mPWP climate simulations (Haywood et al. 2010, 2011). PRISM3D dataset contains all surface boundary conditions, topography, vegetation, land ice, and also deep ocean temperature for initial condition in air-sea coupled climate simulations. Under the experimental protocols, several results derived by climate models had already been reported.

We conducted the PlioMIP Experiments 1 (with atmospheric general circulation model, AGCM) and 2 (with atmosphere-ocean coupled general circulation model, AOGCM) using with MRI-CGCM2.3 (Yukimoto et al. 2001, 2006), which was also used in the third phase of the Coupled Model Intercomparison Project (CMIP3) and the second phase of the PMIP [1, 3, 4]. We also represent Pliocene biome prediction over the land using with equilibrium biogeography model, BIOME4, under the climate state simulated by the AGCM and AOGCMs [2, 4]. The biome simulations could help to compare general characteristics of surface climate patterns among the simulations by a single index translated from some elemental climate parameters and facilitate quantitative model-model or data-model comparisons.

References

[1] Kamae, Y., H. Ueda, and A. Kitoh, 2011: Hadley and Walker circulations in the mid-Pliocene warm period simulated by an atmospheric general circulation model. J. Meteor. Soc. Japan, 89, 475-493.

[2] Kamae, Y., and H. Ueda, 2011: Evaluation of simulated climate in lower latitude regions during the mid-Pliocene warm period using paleovegetation data. SOLA, 7, 177-180.

[3] Kamae, Y., and H. Ueda, 2012a: Radiative balance at top of the atmosphere in mid-Pliocene climate simulation prescribing PRISM3 boundary conditions. Tellus A, submitted.

[4] Kamae, Y., and H. Ueda, 2012b: Mid-Pliocene global climate simulation with MRI-CGCM2.3: set-up and initial results of PlioMIP Experiments 1 and 2. Geosci. Model Dev., submitted.

Keywords: paleoclimate, mid-Pliocene, climate model, PRISM, PlioMIP, biome