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• Editorial Notes •

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Preface to Special Issue on CMIP6 Experiments: Model and Dataset Descriptions

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The Coupled Model Intercomparison Project (CMIP) supports research in climate change and assessment, including the Intergovernmental Panel on Climate Change (IPCC) Assessment Report (AR), through providing enormous datasets mainly produced by Earth system models (ESMs) and climate system models (CSMs). The newest (sixth) phase of CMIP (CMIP6) has been launched, including the DECK (Diagnostic, Evaluation and Characterization of Klima) and 23 endorsed MIP experiments, to address new scientific questions in climate fields (Eyring et al., 2016). Now, the datasets simulated by the new versions of ESMs and CSMs have been/will be published on the Earth System Grid Federation (ESGF). Hence, descriptions of the CMIP6 models, experiment designs and datasets are important for the community; evaluations and comparisons of the models with other CMIP models are useful to understand the progress and simulation biases of models.

This special issue, consisting of two parts, mainly focuses on introducing and evaluating the datasets simulated by the CMIP6 models developed in China [see Zhou et al. (2020) for a review], covering the experiment settings, descriptions and evaluations of the variables, and comparisons with other CMIP6/CMIP5 simulations. The experiment settings include the external forcings, such as greenhouses gases, aerosols and solar irradiance, integration periods, and initialization conditions for different members. The MIPs covered in this issue comprise the Paleoclimate MIP phase 4 (PMIP4), the Global Monsoons MIP (GMMIP), the Ocean MIP (OMIP), the Flux-Anomaly-Forced MIP (FAFMIP), and the Scenario MIP (ScenarioMIP), using the component and coupled models respectively. The datasets are principally described with the variable names, their physical meanings and frequencies etc. published on the ESGF. The evaluations generally involve validation using reanalysis/observation, as well as comparison with other simulations to verify whether the simulation is within a reasonable range, and showcase the strengths and weaknesses of the models.

Compared with CMIP5, the CMIP6 simulations offer substantial improvements in certain aspects—for instance, climatological temperature and precipitation, climate extreme indices for both temperature and precipitation over China, and winter monsoon—albeit some obvious biases still remain. When compared to proxy records, the two versions of FGOALS capture the large-scale climate responses to the solar insolation changes during the interglacial epochs, but disagreements between the simulations and proxy records are apparent. In some idealized experiments, e.g., FAMIP and abrupt-4×CO_2 in DECK, the simulation by a model is mostly compared with the simulations by other CMIP6 models and/or its other type of simulation, as there are no observed references.

The papers in this special issue of *Advances in Atmospheric Sciences* provide valuable datasets from different CMIP6 models and MIP experiments for the next 5–10 years of climate research, as well as useful information about the experiment settings and models. Nonetheless, more in-depth analyses and attributions are still needed for the CMIP6 simulations to further understand the physical processes and improve the models.

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