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Basic evaluation of the physical climate of BNU-ESM

Duoying Ji, Lanning Wang, Jinming Feng, Qizhong Wu, and Huaqiong Cheng

College of Global Change and Earth System Science, Beijing Normal University, Beijing, China (duoyingji@bnu.edu.cn, 86-10-58800156)

An earth system model (Beijing Normal University Earth System Model, BNU-ESM), based on several well evaluated climate model components, has been developed to study mechanisms of ocean-atmosphere interactions, natural climate variability and carbon-climate feedback at interannual to interdecadal time scales. In the framework of BNU-ESM, besides the central component coupler, there are four separate models simultaneously simulating the earth's atmosphere, ocean, sea ice and land surface, which are based on the Community Atmospheric Model version 3.5 (CAM3.5) from National Center for Atmospheric Research, the Modular Ocean Model version 4p1 (MOM4p1) from Geophysical Fluid Dynamics Laboratory, the Los Alamos sea ice model version 4.1 (CICE4.1) from Los Alamos National Lab, and the Common Land Model (CoLM) developed at Beijing Normal University. Here, a first-order assessment of the mean model state and the internal variability based on the model experiments made available to CMIP5 are presented. The globally averaged sea surface temperature difference from observations (Hurrel et al., 2008) and model simulation covering the period 1976-2005 is 0.07K, and the root-mean-square error is 1.21. The magnitude of tropical precipitation is overestimated in the model, which presents the well-known double ITCZ problem. The simulated geographic distribution of sea ice is fairly realistic on summer season, but a large areal coverage on winter season. The main power of the $NINO_3$.4 index of historical simulation is on timescales of 3-5 year, while observations (Hurrel et al., 2008) covering the same period show a peak on 3-7 year. Further evaluations on annual cycle of surface air temperature and precipitation on selected regions, tropical Pacific sea surface temperature and ocean meridional overturning circulation are also performed.