

**Dependence of the CCSM4 simulated hydrological cycle to horizontal resolution**

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Changes in Earth's hydrological cycle are of great scientific and societal importance. Simulating Earth's hydrological cycle remains a great challenge due to the multiple temporal and spatial scales and physical processes involved in Earth's hydrological system. We present analysis of a series of Community Climate System Model (CCSM4) climate simulations carried out at low resolution (~3 degrees), two moderate resolutions (1 and 2 degrees) and high resolution (1/2 degree) and investigate the dependence of the simulated present day hydrological cycle (precipitation, evaporation, transport and runoff) to changes in horizontal resolution. We compare these simulations to a range of observational data sets for specific processes. We analyze the dependence on resolution of the statistical variance of precipitation in both time and space for the present day simulations. We also analyze the RCP8.5 CMIP simulated change in the hydrological cycle for the various resolutions. Here we look at how changes in the regional patterns of the hydrological cycle differ depending on resolved scales of motion. Finally, we consider how the simulated changes in the regional hydrological cycle vary among the suite of ensemble members from the CCSM4 resolution simulations.