Session: C34 Poster: W195A

The Community Earth System Model: Activities of the Land Model Working Group

David Lawrence[†]; Zong-Liang Yang
[†] NCAR, USA
Leading author: dlawren@ucar.edu

The Community Earth System Model: Activities of the Land Model Working Group We will review developments that have been implemented for the Community Land Model version 4 (CLM4) and examine the land surface climate simulation of the Community Climate System Model version 4 (CCSM4) compared to CCSM3, and assesses new Earth system features of CLM4 within CCSM4. CLM4 incorporates a broad set of improvements including the additions of a carbon-nitrogen (CN) biogeochemical model, an urban canyon model, and transient land cover and land use change, as well as revised soil and snow submodels. Several aspects of the surface climate simulation are improved in CCSM4. Improvements in the simulation of soil water storage, evapotranspiration, surface albedo, and permafrost that are apparent in offline CLM4 simulations are generally retained in CCSM4. The global land surface air temperature bias is reduced and the annual cycle is improved in many locations, especially at high latitudes. The global land precipitation bias is larger in CCSM4, due to bigger wet biases in central and southern Africa and Australia. New Earth system capabilities are assessed. The magnitude of the simulated present-day heat island is larger than the simulated historical changes in surface air temperature due to climate or land use change. The snow albedo feedback is more realistic and the radiative forcing of snow aerosol deposition is calculated as 0.083 W m-2 for present day. The land carbon flux due to land use, wildfire, and net ecosystem production is a source of carbon to the atmosphere throughout most of the historical simulation. The prognostic vegetation state introduced by CN increases surface climate variability. CCSM4 is increasingly suited for studies of the role of land processes in climate and climate change.