Sensitivity Study of NOAH Land Model Response to Different Atmospheric Models

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Abstract

The most recent version of the NOAH land model is coupled to two atmospheric general circulation models (AGCMs): the newest version of the NOAA Global Forecast System (GFS) and the latest version of the COLA AGCM. Both GFS-NOAH and COLA-NOAH simulations reveal reasonable mean states of 2m temperature, net radiation and surface fluxes (latent and sensible). However, GFS-NOAH run over-estimates rainfall in the east of China and produces too few clouds over Southeast Atlantic and too many high clouds over the entire tropical Atlantic. Additionally, boreal summer Global Land-Atmosphere Coupling Experiment (GLACE) simulations are conducted based on these two model configurations. They suggest that subsurface soil moisture has little contribution to precipitation variability on synoptic time scales. The land-atmosphere coupling strength is relative weak for both AGCMs with NOAH. Comparison to configurations of the COLA AGCM with two other land surface schemes suggest that the parameterization of transpiration in the NOAH land model may contribute to the lack of sensitivity. Surface fluxes in NOAH do respond robustly to surface wetness and temperature variations, but these quantities carry little memory to enhance predictability. Going forward, we will couple two additional land models to GFS to assess the impact on the models' surface fluxes, water cycle, and weather and climate simulations.