Geophysical Research Abstracts
Vol. 12, EGU2010-1966, 2010
EGU General Assembly 2010

Improved Representation of the Asian Monsoon in the Super-Parameterized Community Climate System Model

Charlotte DeMott, Cristiana Stan, and David Randall
Colorado State University, Dept. of Atmospheric Science, Fort Collins, United States (demott@atmos.colostate.edu)

Climate simulations using a multi-scale modeling framework (MMF), in which traditionally parameterized effects of cumulus convection are explicitly simulated with multiple realizations of a cloud resolving model, may offer new insights into the role of convection on large-scale climate variability. Analysis of MMF simulations of the Community Climate System Model (CCSM, v3.0) indicates that the "super-parameterized" CCSM, or SpCCSM, dramatically improves variability of precipitation across a broad range of temporal scales (from intra-seasonal to intra-annual) at a variety of locations compared to the traditional CCSM.

In this study, we focus on the improvements in the simulation of the Asian monsoon system in the SpCCSM compared to the traditional CCSM. In addition to a more realistic regional precipitation climatology, super-parameterization improves monsoonal rainfall intermittency, eastward and northward propagation characteristics, spatial scale (i.e., the meridional structure of the disturbance), and produces more realistic interactions between SST and precipitation anomalies.

Improvements in the SST-precipitation relationship suggest that the details of convective representation and its interaction with the sea surface may be critical to successfully simulating monsoonal behavior. We explore this interaction via monsoon life cycle composites of the surface energy budget and vertical heating and moistening profiles in models and in observations. We also explore the role of SST-precipitation feedback mechanisms (the Bjerknes and surface latent heat and shortwave radiation flux feedbacks) in each model and in observations. The goal of this analysis is to identify physical processes that lead to improvements in monsoon simulation, and to evaluate if these same processes are of similar importance in nature.