Global evaluation of the RSM simulated precipitation through transferability studies during CEOP

I. Meinke, J. Roads, M. Kanamitsu
Experimental Climate Prediction Center, Scripps Institution of Oceanography,
University of California San Diego, La Jolla, CA 92093-0224 USA

Abstract

Precipitation simulated by the Regional Spectral Model (RSM) is globally evaluated by transferring the RSM to seven different regions of the globe. These regions cover the eight Continental Scale Experiments (CSEs) of the Global Energy and Water-cycle EXperiment (GEWEX) and encompass a broad variety of physical and dynamical meteorological processes. Global Precipitation Climatology Project (GPCP) and Global Precipitation Climatology Center (GPCC) gridded observation as well as Coordinated Enhanced Observation Period (CEOP) reference site precipitation observations are used to evaluate the RSM precipitation simulations for the first half of the CEOP Enhanced Observation Period (EOP) III (October 2002 to March 2003). After estimating the uncertainty ranges of both the model and the observations, model deficiencies in the amount of precipitation simulation have been identified for all model domains, except for the Mackenzie GEWEX Study (MAGS) region. Although the RSM simulates the seasonal evolution and the spatial distribution well, the RSM has an almost uniform positive bias (RSM greater than observations), except for the domain over the BALTic sea EXperiment (BALTEX) CSE, where the RSM has a negative bias. Most of the positive bias is either connected with the Intertropical Convergence Zone (ITCZ) convection or with monsoon convection (Southeast Asia). Stratiform precipitation is also excessive over high orography. Since the control simulations used the Relaxed Arakawa Schubert scheme (RAS), sensitivity tests with 3 additional convection schemes were then carried out to see if the simulations could be improved. The additional convection schemes included: 1) the Simplified Arakawa Schubert scheme (SAS); 2) the Kain-Fritsch scheme (KF); and 3) the National Centers for Atmospheric Research (NCAR) Community Climate Model (CCM) scheme. It was found that the precipitation simulation could be significantly improved for almost all domains using either the KF scheme or the SAS scheme. The best results for the ITCZ convective precipitation were achieved with the SAS convection scheme. For the monsoon convective precipitation the KF convection scheme had the best results.