ABSTRACT

Simulating equatorial convective waves and the MJO in GCMs at GFDL

Bill Stern, Leo Donner and Ming Zhao

A new global atmosphere and land model (AM3) for climate research at the Geophysical Fluid Dynamics Laboratory (GFDL) is currently being developed. AM3 is being coupled to a version of the MOM4 ocean GCM as was done with AM2 to produce CM2. This new coupled GCM (CM3) will be used in a number of experimental studies covering time scales ranging from intra-seasonal, seasonal - interannual, decadal, to multi-century.

One key component of the atmosphere model is a new cumulus convective parameterization scheme (Donner, 1993, JAS, Donner, 2001, *J. Clim.*, Wilcox and Donner ,2007, *J. Clim*.). The deep convective parameterization involves an ensemble of deep plumes with mass fluxes and vertical velocities, simple bulk microphysics, and mesoscale updrafts and downdrafts. Shallow convection follows Bretherton *et al.* (2004, *Mon. Wea. Rev.*) with buoyancy-sorting, entraining-detraining plume and vertical velocity. Before coupling, a number of closure schemes and criteria for triggering deep convection have been investigated within AM3. The validity of mean climate structures as well as the ability to simulate equatorial convective modes including Kelvin waves and the MJO, are assessed for several different configurations of the convective parameterization. Some small sensitivity is found in the GCM simulations of mean tropical precipitation, but the intensity of Kelvin waves and the MJO appears to be quite sensitive to convective trigger criteria that control precipitation frequency and intensity. In particular, the requirement that time-integrated low-level lifting be sufficient to bring near-surface parcels to the level of free convection appears to significantly impact the equatorial Kelvin waves and the MJO.