Sensitivity of MJO to the CAPE lapse time in the NCAR CAM3'

Ping Liu
University of Hawaii, pliu@hawaii.edu

Weak and irregular boreal winter MJO in the NCAR CAM3 corresponds to very low CAPE background, which is caused by easy-to-occur and over-dominant deep convection indicating the deep convective scheme uses either too low CAPE threshold as triggering function or too large consumption rate of CAPE to close the scheme. Raising the CAPE threshold from default 70 J/kg to ten times large only enhances the CAPE background while fails to noticeably improve the wind mean state and the MJO. However, lengthening the CAPE lapse time from one to eight hours significantly improved the background in CAPE and winds, and salient features of the MJO. Variances, dominant periods and zonal wave numbers, power spectra and coherent propagating structure in winds and convection associated with MJO are ameliorated and comparable to the observations. Lengthening the CAPE lapse time to eight hours reduces dramatically the cloud base mass flux, which prevents effectively the deep convection from occurring prematurely. In this case, partitioning of deep to shallow convection in MJO active area is about 5:4.5 compared to over 9:0.5 in the control run. Latent heat is significantly enhanced below 600 hPa over the central Indian Ocean and the western Pacific. Such partitioning of deep and shallow convection is argued necessary for simulating realistic MJO features. Although the universal eight hours lies in the upper limit of that required by the quasi-equilibrium theory, a local CAPE lapse time for the parameterized cumulus convection will be more realistic.