ORGANIZED CONVECTION AND TROPICAL INTRASEASONAL OSCILLATIONS

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The large-scale organization of tropical convection is investigated using two-dimensional, 40-day-long cloud-resolving simulations. A uniform uniform sea surface temperature distribution is assumed, and a prescribed temperature tendency mimics the mean radiative cooling of the tropical troposphere. A 20,000-km-long computational domain allows interactions among moist convection, mesoscale organization and surface exchange over a wide range of scales. The simulated large-scale organization of convection resembles MJO-like envelopes observed by satellite remote sensing. Its propagation speed is representative of convectively coupled Kelvin waves. Mesoscale convective systems organized on scales of several hundred kilometers move east-to-west with the mean flow, and the envelope of convection of scale a few thousand kilometers propagates west-to-east. Convective momentum transport, and the effects of convective systems on the boundary-layer temperature and moisture, are the key processes that control the multi-scale organization of convection. A nonlinear analytic model explains the primary transport characteristics and the dynamical feedback responsible for maintaining a wind shear typical of the tropical atmosphere. In order to quantify deficiencies in existing parameterization methodology, comparisons are made between cloud-resolving simulations and a coarse-grid version of the same (nonhydrostatic) model that employs convective parameterization. Finally, comment will be made on the role of TRMM-based observations in evaluating and improving the simulated multi-scale convective hierarchy.