Departmental Colloquium

Speaker:

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Northward Propagation, Initiation, and Termination of Boreal Summer Intraseasonal Oscillations in a Zonally Symmetric Model

Abstract:

A simple multilayer-zonally symmetric model, using a multicloud convective parameterization and coupled to a dynamical bulk atmospheric boundary layer, is used here to simulate boreal summer intra-seasonal oscillations (BSISO) in the summer monsoon trough and elucidate the underlying main physical mechanisms responsible for their initiation, propagation, and termination. Northward-moving precipitating events initiated near the equator propagate northward at roughly 1 \textdegree~day $^{-1}$ and terminate near 20\textdegree~N. Unlike earlier findings, the northward propagation of precipitation anomalies, in this model, is due to the propagation of positive moisture anomalies in the northward direction, resulting from an asymmetry in the meridional velocity induced by the beta effect. From a moisture budget perspective, advection constitutes a biased intrusion of dry air into the convection center, forcing new convection events to form north of the wave disturbance, while moisture convergence supplies the precipitation sink. The BSISO events are initiated near the equator when the competing effects between first-baroclinic divergence and second-baroclinic convergence, induced by the descending branch of the Hadley cell and in situ congestus heating, respectively, become favorable to convective intensification. The termination often near 20\textdegree~N and halfway stalling of these precipitating events occur when the asymmetry in the first-baroclinic meridional winds weakens and when the negative moisture gradient to the north of the convection center becomes too strong as the anomaly exits the imposed warm pool domain.