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Date: Wednesday, August 30, 2017
Refreshments: 3:00pm at MSB lanai
Free Cookies, Coffee & Tea Provided
(Please Bring Your Own Cup)
Seminar Time: 3:30pm
Location: Marine Sciences Building, MSB 100

Abstract:

As the dominant mode of sub-seasonal variability in tropical precipitation, convective activity associated with the Madden-Julian Oscillation (MJO) has important impacts on weather throughout the tropics and the rest of the world. Yet representation of the MJO and the processes governing its development and subsequent eastward propagation in global atmospheric models generally remains poor, and no existing theory that describes the MJO captures all of its fundamental features. In this talk, I will describe a proposed mechanism for initial MJO convective onset over the central Indian Ocean that is supported by radar and rawinsonde observations collected during the DYNAMO/AMIE/CINDY field campaign in 2011, reanalysis, and regional model simulations of the observed MJO cases.

Specifically, the MJO takes the form of a planetary scale equatorially trapped wave that extends through the depth of the troposphere and changes form as it enters or exits the tropical warm pool. The wave takes on characteristics of a convectively coupled Kelvin wave as it moves over the Western Hemisphere, but begins to move more slowly—perhaps as a moisture wave—over the warm pool. As the MJO in its Kelvin wave form approaches the Indian Ocean, a slight reduction in subsidence—on the order of a few mm s^{-1}—occurs throughout the troposphere. This results in a reduction in the adiabatic heating rate associated with clear-air descent and a subsequent drop in temperature on the order of less than 1K. The seemingly small temperature drop is particularly important just above the boundary layer between 700 and 850 hPa because it reduces convective inhibition and deceleration of convective updrafts there, allowing for persistent shallow convection rooted in the boundary layer to overcome entrainment of unsaturated environmental air and grow into moderately deep congestus-like cumuliform clouds. The moderately deep clouds then moisten the free troposphere for approximately 3–7 days. When relative humidity up to 500 hPa reaches at least 60–70%, large