UNIVERSITY of HAWAI'I MĀNOA

Department of Atmospheric Sciences Seminar Announcement

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SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

Interactions between water vapor, potential vorticity, and vertical wind shear in rotational tropical disturbances: Insights from a simple model

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Date: **Wednesday, October 21, 2020**
Time: **3:30pm HST**
Zoom Meeting: **https://hawaii.zoom.us/j/97454168193**
Meeting ID: 974 5416 8193
Passcode: 207183

Abstract:

A linear two-layer model is used to elucidate the role of prognostic moisture on quasi-geostrophic (QG) motions in the presence of a mean thermal wind. Solutions to the basic equations reveal two instabilities. The well-documented baroclinic instability is characterized by growth at the synoptic scale (horizontal scale of~1000 km) and systems that grow from this instability tilt against the shear. Moisture-vortex instability —an instability that occurs when moisture and lower-tropospheric vorticity exhibit an in-phase component— exists only when moisture is prognostic. The instability is also strongest at the synoptic scale, but systems that grow from it exhibit a vertically-stacked structure. When moisture is prognostic, baroclinic instability exhibits a pronounced weakening when the thermal wind is easterly. On the other hand, moisture-vortex instability is strongest in this mean state. Based on these results, it is hypothesized that moisture-vortex instability is the dominant instability in humid regions of easterly thermal wind such as the South Asian and African monsoons.