CGD SEMINAR

NCAR

DATE: Tuesday, 22 November 2016

TIME: 11 a.m.

LOCATION: NCAR, 1850 Table Mesa Drive
Mesa Lab, Main Seminar Room

TITLE: The planetary scale circulation of the tropical upper troposphere and its influence on tropical weather

SPEAKER: Sebastian Ortega, Georgia Institute of Technology

ABSTRACT:

Through observational analyses, we suggest that the upper tropospheric potential vorticity (PV) field has an effect on the lower troposphere during the South Asian monsoon. We show that the variability of the upper tropospheric PV field during the monsoon has a strong quasi-biweekly component, and characterize the evolution of the PV field as Rossby waves that travel eastward on the subtropical jets, that break over the Pacific Ocean, and that are advected westward on the equatorial westerly winds as eddies and PV streamers that are remnants of these breaking Rossby waves. We then show that this upper tropospheric variability coevolves with the lower tropospheric quasi-biweekly oscillations of the South Asian Monsoon.

Then, through an analytical argument, we provide an explanation for the existence of the upper tropospheric variability. First, we show that the breaking Rossby waves generate equatorward fluxes of PV throughout the year, and that these fluxes are closely compensated by poleward fluxes of PV that are generated by deep tropical convection. Using the impermeability theorem of the atmosphere, we show that these advective fluxes must always occur and, if advective processes are of first order importance, they should be expected to closely balance. Moreover, we suggest that imbalances in these advective fluxes help maintain the circulation of the upper troposphere, and show how this is exactly the case for a shallow water model of the atmosphere.

Live webcast: http://www.fin.ucar.edu/it/mms/ml-live.htm

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