



JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Weekly CEAFM Seminar: Spring 2012

Friday, March 30, 2012

11:00 a.m. – 12:00 p.m.

Gilman 50 (Marjorie M. Fisher Hall)

***"EQUATORIAL PLANETARY WAVES, THE TROPICAL
TROPopause, AND CLIMATE VARIABILITY"***

Presented by

Dr. Kevin Grise

(McGill University, Quebec)

Abstract: Quasi-stationary equatorial planetary waves are a fundamental component of the tropical climate system. Forced by the latent heat release from deep convection, the waves are not only relevant for understanding zonal asymmetries in the tropics but also play an important role in the zonal-mean momentum balance of the atmosphere. Several recent studies have linked the momentum forcing associated with the equatorial planetary waves to long-term mean upwelling at the tropical tropopause.

In this study, we develop a statistical index that describes temporal variability in the amplitude of the climatological-mean pattern of equatorial planetary waves. The pulsation of the equatorial planetary waves is associated with a distinct pattern of equatorially symmetric climate variability that also emerges from empirical orthogonal function analysis of various tropical dynamical fields. The variability is apparent in association with opposing phases of El Niño-Southern Oscillation and select phases of the Madden-Julian Oscillation.

It is argued that the equatorial planetary wave index is relevant to a wide range of climate phenomena. Here, we apply the index to high vertical resolution COSMIC GPS radio occultation satellite temperature measurements near the tropical tropopause. The results reveal a distinct linkage between variability in zonal-mean temperatures and the equatorial planetary waves, but only within a narrow ~ 1 -km layer near the tropical tropopause. Potential applications of the equatorial planetary wave index to the Madden-Julian Oscillation and the width of the tropical belt are also discussed.