PHYSICAL MATHEMATICS SEMINAR

THE DIURNAL CYCLE AND THE MERIDIONAL EXTENT OF THE TROPICS

ESTEBAN G. TABAK

Courant Institute of Mathematical Sciences
New York University

ABSTRACT:

This talk proposes an explanation for the sharp transition between tropics and extra-tropics at a latitude of 30 degrees. This transition, at the outer edges of the Hadley cells, is marked by a steep jump in the height of the troposphere, from sixteen kilometers in the tropics to nine in the mid and high latitudes. The tropics, equatorwards of 30 degrees, are characterized by easterly surface winds -the Trades- and a strong diurnal signal in the wind, pressure and temperature. Polewards of 30 degrees, the winds are westerly, and the weather systems have longer spatio-temporal scales.

This change of behavior can be explained in terms of diurnal baroclinic waves, created by thermal forcing and trapped equatorwards of 30 degrees by the Coriolis effect. Their effect can be illustrated in simple two-layer models for the meridional circulation, where the entrainment of stratospheric air into the troposphere is represented by energy-preserving shock waves, and convection by a simple closure for mass transfer between the boundary layer and the higher troposphere.

Tuesday, November 1, 2011
2:30 PM
Building 2, Room 105

Reception at 3:30 PM in Building 2, Room 290
(Math Dept. Common Room)

http://math.mit.edu/pms

Massachusetts Institute of Technology