PHYSICAL MATHEMATICS SEMINAR

New dissipative modes in the troposphere

LYUBOV CHUMAKOVA

Massachusetts Institute of Technology

ABSTRACT:

Much of our understanding of tropospheric dynamics is based on the concept of discrete internal modes. Internal gravity waves, such as those associated with convective systems, propagate at definite speeds, typically associated with the first to third baroclinic vertical modes, depending on the nature of the disturbance. Even though other effects such as nonlinearity, moist convection and mean wind shear alter significantly the nature and speed of these waves, they remain nonetheless the dynamical backbone of the troposphere. At the same time, these modes are a signature of systems of finite extent, and are derived in a case when the atmosphere is bounded above by a rigid lid. In reality, the atmosphere does not have a definite top. Therefore, some argue, it should be modeled as semi-infinite, leading to a continuous spectrum. Are the discrete rigid lid modes then just a fallacy of overly simplified theoretical models?

I will present a correction to the rigid lid. We propose a boundary condition at the top of the troposphere, that allows for the energy leak -- a fraction of waves escapes to the stratosphere. The new discrete "leaky" modes, are computed analytically using this boundary condition. They decay with characteristic decay time-scales, which are in the ballpark of many important phenomena. We present both the non-rotating and rotating cases.

This is a joint work with R. R. Rosales (MIT) and E. G. Tabak (Courant, NYU).

TUESDAY, APRIL 9, 2013
2:30 PM
Building 56, Room 180

Reception following in Building 2, Room 290
(Math Dept. Common Room)

http://math.mit.edu/pms

Massachusetts Institute of Technology