Weekly CEAFM Seminar: Spring 2015

JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Date: **Friday, April 17, 2015**

Time: 11:00 AM

Location: Gilman Hall # 132

Speaker: **Prof. John P. McHugh** (University of New Hampshire)

Title: ***"Internal Waves Near Interfaces"***

Abstract

Internal waves are ubiquitous in the environment, both atmosphere and oceans. These waves play an important role in the overall dynamics of the environment, and sometimes a dominant role in microscale events such as turbulent patches. Recent results indicate that waves in a continuously stratified fluid have unusually violent behavior near regions with rapid changes in N. Sudden changes in N occur at the tropopause, near the thermocline, at the boundaries of inversion layers, and elsewhere. These regions are treated here using a two- layer model with a jump in N at the interface, a so-called 'density gradient interface'. The approach is direct numerical simulations and weakly nonlinear theory. The results indicate that internal waves impinging on a density gradient interface will be partially reflected with strong mean flows and scattered higher harmonics. The theory treats inviscid flow and results in three nonlinear Schrodinger equations. The inviscid results show that the mean flow is discontinuous at the interface, directly related to wave reflection. The incident waves and reflected waves together interact and form an oscillatory component to the mean flow near the interface. Overall waves are more likely to overturn under the interface.

Bio

Prof. McHugh has interests in fluid mechanics and applied math. He has held full-time positions at the David Taylor Research Center and the Transocean. He is a frequent visitor to the National Center for Atmospheric Research, and he has held visiting positions at the Air Force Geophysics Lab, the Jet Propulsion Lab, MIT, and University College London. Prof. McHugh is primarily interested in analytical and computational solutions to physical problems. His current research topics include internal waves in the atmosphere of earth and other planets, origins of the deep ocean circulations, and non-linear waves on the surface of a fluid.