Weekly CEAFM Seminar: Fall 2015

JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Date: **Friday, September 4, 2015**

Time: 11:00 AM

Location: Gilman Hall # 132

Speaker: **Dr. David S. Trossman** (Earth and Planetary Science, JHU)

Title: ***"Revelations about Parameterizing Lee Waves in Ocean Models"***

Abstract

Internal lee waves are generated when geostrophic flow impinges upon rough topography. Lee wave formation, radiation, and breaking are thought to contribute substantially to the oceanic momentum, vorticity, and energy budgets and to water mass transformation in the ocean. Because the relevant horizontal length scales of lee waves are generally smaller than the grid spacing of even state-of-the-art present-day ocean general circulation models, the effects of lee waves need to be parameterized in ocean models. However, ocean models are currently lacking such a parameterization. Here, the impacts of inserting a momentum sink associated with lee wave generation and topographic blocking into a high-resolution ocean simulation as it runs are assessed. Profound impacts on the abyssal stratification and kinetic energy are seen, as the global energy dissipation rate associated with lee waves is the largest dissipative mechanical energy budget term. Given the large uncertainty in estimates of energy conversion into lee waves and the unlikelihood of directly observing the global energy generation and dissipation rates, it is critical to compare predictions from lee wave closures with the sparse observations we have. The sensitivity of existing lee wave closures to environmental parameters is assessed and a comparison of their predictions with microstructure observations is performed in two regions of the Southern Ocean where geostrophic flows dominate over tides. Characterization of the underlying topography is found to be a non-negligible factor in predicting lee wave energy conversion and dissipation rates and one of the primary differences between existing lee wave closures is their treatment of topographic blocking. Simplifications made by the lee wave closures that are inappropriate for the oceanic context and observations needed for validation are discussed.