JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Weekly CEAFM Seminar: Fall 2013

Date: **Friday, December 6, 2013**

Time: 11:00 AM

Location: Gilman # 50 (Marjorie M. Fisher Hall)

Speaker: **Dr. Alberto Scotti** (University of North Carolina)

Title: ***"Stirred, Not Shaken: Mixing in the Ocean"***

Abstract

The current understanding of the mechanisms that sustain the oceanic Meridional Overturning Circulation (MOC), an important component of both present and past global-scale climate, emphasizes the role of mechanical forcing, either as wind-driven Ekmann pumping or tidally induced mixing below the main pycnocline, while downplaying the role of the thermodynamic forcing in the form of the meridional gradient in buoyancy applied at the surface. The latter is discounted based on Sandström's so-called "theorem", in reality an inference drawn from experiments, and on a theoretical result used to argue that a flow solely driven by a meridional buoyancy gradient, herein refereed to as Horizontal Convection (HC), cannot sustain a turbulent flow (Paparella and Young, 2002). In this talk, we summarize work that we have been doing to elucidate some of the issues related to Horizontal Convection. Numerical experiments spanning 7 orders of magnitude in the appropriate Rayleigh number show that part of the flow remains turbulent. However, as the Rayleigh number approaches a critical value the meridional circulation undergoes a transition, which suggests that Sandström's inference may be correct in the sense that at sufficiently large values of the Rayleigh number the overturning circulation becomes shallow. Somewhat paradoxically, the deep circulation is weakened by an excess of mixing near the surface, rather than by a lack of mixing, as the conventional energetics approach seem to imply.