Boulder Fluid Dynamics Seminar Series

Tuesday, January 13, 2015
3:30pm-4:30pm (refreshments at 3:15pm)
Bechtel Collaboratory in the Discovery Learning Center (DLC)
University of Colorado at Boulder

Paused Global Warming – Does the Fossil Record Constrain Variability in the Oceans' Abyss?

Baylor Fox-Kemper, *Brown University*

Observations of the ocean below 2km are few. Is this abyss quiet, or is it changing? Do abyssal waters trend in the same way as waters above? Recent observations suggest that there may be trends in the temperatures of abyssal waters, which is a possible explanation for the recent “pause” in global warming. But, how much variability is to be expected, and what are the timescales involved? A brief presentation will illustrate some of the issues involved, what can (and can't) be inferred from models, and whether paleorecords can be used to infer levels of baseline variability.

The Influence of Stokes Drift on Baroclinic Instabilities in the Ocean Mixed Layer

Sean Haney, *University of Colorado, Boulder*

Surface gravity waves can change the stability of the ocean mixed layer by altering the near surface shear. A wave-averaged current, called Stokes drift, induces a Stokes Coriolis force and a Stokes shear force that change the horizontal and vertical momentum balances respectively. In geostrophically balanced flows, such as the submesoscale density fronts occurring in the ocean mixed layer, the Stokes Coriolis force reduces the burden on the Eulerian Coriolis force to balance the pressure gradient force. This effectively induces an Eulerian flow opposing the Stokes drift, while maintaining the Lagrangian (Eulerian plus Stokes) flow. The criteria for geostrophic instabilities is unchanged with the appropriate reinterpretation of the Lagrangian shear, however the size, growth rate, and vertical structure of these instabilities is slightly changed. The flow remains symmetrically unstable when the potential vorticity (PV; the dot product of Eulerian vorticity with the buoyancy gradient) is negative. Since the Stokes drift induces an opposing Eulerian flow, it alters the PV, thereby favoring or suppressing symmetric instabilities (SI) depending on the alignment between the Stokes drift and the front. Since SI reduce the shear and increase the stratification of a front, this is a mechanism by which wave forcing may induce restratification rather than mixing as is commonly thought.