Weekly Seminar: Fall 2009

Date: October 23

Time: 11:00 AM

Location: Maryland Hall 110

Speaker: Marcello Magaldi

Earth & Planetary Sciences, Johns Hopkins University

Title:*"Turbulent coherent structures near coastal capes"*

Abstract

Coastal circulation is influenced by the complex shape of the coastline. In particular, prominent coastline features like headlands and capes are responsible for the creation of turbulent coherent structures. Various flow regimes can be observed around coastal capes: in some cases the structures can merge to form large lee eddies while, in other cases, they cascade to smaller ones. Understanding under which conditions different flow regimes appear in the vicinity of coastal capes is important since they affect the dispersion of dissolved pollutants, floating organisms, nutrients and sediments. From a dynamical perspective, the same regimes are also associated with enhanced mixing, drag and dissipation.

In this talk, idealized and more realistic numerical simulations run both in barotropically and baroclinically-driven systems are presented. In the idealized cases, a steady barotropic and geostrophic current impinges on a triangular cape. It is shown that flow regimes are dependent on the Burger number and the obstacle slope. The realistic cases model the effects of wind forcing for the Western Adriatic Current (WAC) in the Adriatic Sea. The WAC becomes unstable in the absence of wind as it separates from the coast for the presence of capes along its path. Downwelling favorable winds narrow and thicken the coastal buoyant current, suppressing large instabilities. Upwelling favorable winds enhance mesoscale instabilities via the opposite mechanism. The impacts of the regimes are quantified in terms of integral quantities like mixing, current transport and form drag.