Séminaire ven 18 Fév 2011 11h / Seminar Fri Feb 18th 2011 11h

Conférencier/Lecturer:	Francis Poulin (U. Waterloo)
Sujet/Subject:	The Generation of Submesoscale Dynamics in Wind-Driven Gyres
Présentation/Presentation:	Anglais / English
Lieu/Room:	Salle des vents (Dorval)

iweb: http://web-mrb.cmc.ec.gc.ca/mrb/rpn/SEM/
web: http://collaboration.cmc.ec.gc.ca/science/rpn/SEM/index.php

Abstract

Across the globe, the atmospheric winds are one of the primary forces that drive the general circulation of the ocean, providing it with energy on synoptic length-scales, O(1,000 km). This energy then cascades down to smaller length-scales, until it is eventually dissipated by molecular viscosity on length-scales less than a centimeter. The means by which the ocean transfers energy through this vast range of scales are only well understood at the two extremes of the spectrum.

The winds are responsible for the generation of Western Boundary Currents (WBCs) throughout the world's oceans, such as the Gulf Stream and the Kuroshio. These energetic currents generate vortical motions on the mesoscale, O(100 km), that are crucial in mixing and transporting physical and biological properties throughout the ocean. The ocean has a multitude of smaller scale processes that can extract energy from the large-scales and thereby create a direct energy cascade from the mesoscale, to the next smaller length scale, the submesoscale, O(10 km). The dynamics on this length-scale is quasi-three-dimensional, composed of both vortical and filament-like structures and cascades an abundance of energy to smaller length-scales where viscosity can eventually act to dissipate it.

Any model of WBC formation requires a dissipative force at the western boundary that can extract energy in the basin to balance the vorticity added by the atmospheric winds. The two most famous examples are due to Henry Stommel (1948) and Walter Munk (1950). These, as well as other models, can produce large-scale gyre dynamics that are qualitatively correct. However, they all share the same short coming in that it is unclear how to pick the strength of the parameterizations in a consistent fashion. Indeed, it is very surprising that even today there is no dynamical theory that explains the origin of WBCs without making ad hoc assumptions. In this seminar I will present current research that aims to unveil some of the mysteries behind the formation of western intensification in ocean basins. In particular, through a series of numerical simulations of the Rotating Shallow Water equations with various resolutions we quantify the transient motions that are generated and as well

compute the energy spectrum of the equilibrated state.