

## **OCN 661: Ocean Baroclinic Waves**

This subject matter of this course alternates every other year between two topics: "Forced and Free Baroclinic Waves" and "Geophysical Instabilities." During Spring 2010, the course will consider the former topic.

The "Forced and Free Baroclinic Waves" course focuses on understanding how the ocean responds to forcing, primarily by winds: Typically, the forcing generates both a local and a remote response, the latter radiating away from the forced region as packets of baroclinic waves. First, the set of baroclinic waves possible in the ocean are derived, and then solutions are presented that show how these waves are generated by wind forcing. If time allows, solutions relevant to the 1) midlatitude, 2) equatorial, and 3) coastal oceans are considered. The course does involve obtaining solutions to differential equations, but the necessary mathematical background will be presented.

The "Geophysical Instabilities" course covers four types of common instabilities, namely, 1) barotropic, 2) Kelvin-Helmholtz, 3) baroclinic, and 4) inertial instabilities, but it will also consider less familiar ones. It will focus on *linear* instability theory, that is, the initial development of unstable waves before they have a chance to equilibrate at finite amplitude. Course material will present many of the analytic solutions that researchers have obtained to understand the dynamics of these instabilities. In addition, a general computer program that allows the dispersion relations of unstable waves to be found numerically for a wide variety of instability problems will be utilized; students will learn to use this program to explore parameter space for various instabilities. Solutions will be obtained to homogeneous, layer, and continuously stratified models, with both continuously varying and discontinuous (jump) background current profiles.

Sets of detailed notes will be handed out at the beginning of the course, and as a result many of the lectures will be presented from these notes by students themselves. There will be several problem sets, as well as a midterm and final exam.