MARS 8150 Ocean Waves - Fall 2004

Instructor: Dr. Daniela Di Iorio,
Rm 230 Marine Sciences Building,
phone: 542-7020
email: daniela@uga.edu
Office hours: by appointment

Lectures: Tue, Thu 9:30-10:45
Room 229 Marine Sciences Building

Textbooks: Atmosphere-Ocean Dynamics, by Adrian Gill
Waves in the Ocean and Atmosphere, by Joseph Pedlosky
many others available in the library

Course Description

This course will give an extensive treatment of wave physics and theory with emphasis on the roles of stratification, rotation, and topography. Surface gravity waves will be discussed in terms of generation, propagation and dissipation mechanisms that exist at the interface between the atmosphere and the ocean. Internal gravity waves are considered for a layered, rotating ocean with specific focus on three-dimensional propagation and reflection characteristics, and modal solutions. Acoustic waves in the ocean are used for a variety of physical and biological measurements thus an introduction to wave propagation and scattering will be presented. When wavelengths become large compared to the mean ocean depth a series of shallow water waves are formed: Laplace's tidal equations, Kelvin, Poincare', and Rossby waves. Several waves rely on variable bottom topography for their existence and so we will discuss: topographic Rossby waves and continental shelf waves. All these important types of waves that occur in the ocean (and atmosphere) are a first step to understanding many phenomena that occur over short and long spatial and temporal scales.

Grading

4 Assignments	40%
2 Exams	40%
Project report and 20 min presentation	20%

A (85-100), B (75-85), C (65-75)

Final Exam

Dec 16, Mon, 8:00-11:00 pm

Assignments

A series of problem sets will be given to enforce the ideas learned in lecture by strengthening the mathematical interpretation of waves as well as the physical description of wave theory.

Project report and presentation

Use any long term data set of your choice (for example the NOAA National Data Buoy Center (http://www.ndbc.noaa.gov/) for atmospheric, surface wave and ocean properties, the NOAA NOS CO-OPS Tides online data (http://co-ops.nos.noaa.gov/) for tidal variations along a coastline or other data sets that you find interesting such as satellite altimetery data) to present wave characteristics. You will then present your project and results in a 15 min conference style presentation with 5 min question and answer time. The project should be written up in the form of a web page for display on http://www.marsci.uga.edu/FacultyPages/Daniela/courses/MARS8150projects.html. The due date is Dec 16 - the day of the final exam.

Weekly topics

Week	Lecture Topic
Week 1	Thursday class orientation, Review concepts
Week 2	Wave properties, Boundary conditions
Week 3	Surface Gravity Waves
Week 4	Total energy and energy propagation
Week 5	Stratified fluids and internal waves
Week 6	wave group, reflection
Week 7	Normal Modes
Week 8	Ocean Acoustics
Week 9	review and Exam #1
Week 10	Acoustic propagation, Fall Break
Week 11	Acoustic Forward and Back Scatter
Week 12	Shallow water waves
Week 13	Laplace tidal equations, Poincare waves
Week 14	Kelvin Waves; Vorticity
Week 15	Rossby Waves, Thanksgiving Break
Week 16	Topographic waves, class presentations
Week 17	Tuesday review