MARS 8170 Ocean Mixing Processes

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Office Hours: by appointment

Lectures: Tue, Thu 2:00-3:15
Room 229 Marine Sciences Building

Textbooks: Small Scale Processes in Geophysical Fluid Flows by L.H. Kantha and C.A Clayson
A First Course in Turbulence, by Tennekes and Lumley
others available in the library

Course Description

This course will give an extensive treatment of statistical turbulence theory with emphasis on the roles of stratification and rotation. Oceanic boundary layer dynamics will be discussed in terms of the role of surface exchange processes and the interaction of flow over the sea bottom. Boundary-free processes will be discussed in terms of the role of internal waves for mixing in the interior of the ocean. Finally, conservative scalar fluxes will be analyzed for the physical mechanisms that result in horizontal transport via advection, diffusion and dispersion.

Grading

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

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

Assignments

As the statistical theory of turbulence is developed you will apply the theory to existing data submitting plots and graphs periodically. Due dates are flexible but it is recommended that they are submitted weekly.

Project report and presentation

Use existing data to analyze ocean mixing and/or turbulent events and write this up as the foundation for a future article. Your assignments will guide you through the data processing steps and your report will focus on the physical interpretation. You will then present your paper in a 20 min conference style presentation.

Weekly topics

Week	Lecture Topic
Week 1	Thursday - class orientation
Week 2	Tensor calculus review and turbulence definition
Week 3	Navier Stokes Equation and Reynolds decomposition
Week 4	length scales and Energetics
Week 5	Scalar variance
Week 6	Spectral dynamics and Isotropy
Week 7	Boundary layer shear flows - surface
Week 8	boundary layer shear flows - benthic/bottom
Week 9	review and Exam #1
Week 10	Spring break
Week 11	Internal Waves
Week 12	Mixing Mechanisms
Week 13	Transport processes
Week 14	Salt fluxes
Week 15	float Dispersion
Week 16	float Diffusion
Week 17	project presentation and review

Exam # 2

Tuesday, May 4, 2004 3:30 - 6:30 pm