OS/ES 172/272 Geophysical Fluid Dynamics Spring 2014

Instructor: Christopher Edwards
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Class location: E&MS D250
Class time: MWF 11-12:10

Office Hours: MF 3:30-5
Other times are also possible if I'm in my office and available, or by appointment. I'm usually not available just before class.

Topics covered:
Review non-rotating fluid dynamics, Coriolis force, geostrophy, potential vorticity, shallow-water dynamics, linear barotropic waves, the effect of friction, wind-driven ocean circulation, stratification and static stability, internal waves, quasigeostrophic dynamics, barotropic and baroclinic instability.

Grading:
4 or 5 homework sets, 1 midterm problem set, and 1 final problem set or exam will count equally toward the grade.

Homework policy
Students often learn effectively through talking with other students. Discussion about the homework is encouraged, but the work you turn in must be (1) in your own words and (2) reflect the degree to which you understand or think you understand the material. Verbatim copying of homework is NOT allowed. It is all right to work through a problem with other students, including understanding which equation is used and why and how it is solved. Also, communication is an important part of any profession. It is very important to be clear; please write in complete sentences, reasonably thorough phrases, or clearly explained sequences of mathematical expressions. Homework that is hard to follow or does not clearly show how you arrived at your answer will be marked down, EVEN if it includes the right answer.

Midterm and Final Problem Sets are to be entirely your own work.

Late Homework: Homeworks are due as listed on the assignments (usually 1 week after they are distributed). Late homeworks will be accepted for a grade only 1 class day following the day it's due.

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Books

Cushman-Roisin, B. and J. M. Beckers, ***Introduction to geophysical fluid dynamics, Physical and Numerical Aspects***, Academic Press, 2011.
Pedlosky, J., ***Geophysical Fluid Dynamics***, Springer-Verlag, 1987.
Gill, A. E., ***Atmosphere-Ocean Dynamics***, Academic Press, 1982.
Holton, J. R., ***An Introduction to Dynamic Meteorology***, Elsevier, 2004.
P. K. Kundu, I. M. Cohen, H. H. Hu, ***Fluid Mechanics***, Academic Press, 2004.
Salmon, R., ***Lectures on Geophysical Fluid Dynamics***, Oxford University Press, 1998.
Vallis, G. K., ***Atmospheric and Oceanic Fluid Dynamics***, Cambridge University Press, 2004.

Approximate Schedule:

Week 1: Review non-rotating fluid dynamics and Coriolis force.
Week 2: Geostrophy and Shallow-water dynamics.
Week 3: Potential vorticity and viscosity.
Week 4: Kelvin, Rossby, and Poincare waves.
Week 5: Friction, topographic waves.
Week 6: Wind-driven ocean circulation.
Week 7: Barotropic instability.
Week 8: Stratification and internal waves.
Week 9: stratified geostrophic flow and quasigeostrophic dynamics.
Week 10: Baroclinic instabilty.