GEOPHYSICAL FLUID DYNAMICS I
AOS 610 Fall 2018 3 credits
T R 11:00 – 12:15 811 AOSS Building

Professor Matt Hitchman
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Office Hours: W noon, after class, and by appointment
Course Website: http://www.aos.wisc.edu/~aos610

Recommended Texts:
(1) Tritton, D. J., *Physical Fluid Dynamics*, 2nd Edition, 1988, Oxford University Press
(2) Holton, J. R., *An Introduction to Dynamic Meteorology*, 4th Edition, 2004, Academic Press
(3) Gill, A. E., *Atmosphere - Ocean Dynamics*, 1982, Academic Press
(4) Marshall, J., and R. A. Plumb, *Atmosphere, Ocean, and Climate Dynamics*, 2008, Acad. Press

Some Classic Texts:
(1) Batchelor, G. K., *An Introduction to Fluid Dynamics*, 1967, Cambridge University Press
(2) Lighthill, J., *Waves in Fluids, 1978*, Cambridge University Press
(3) Whitham, G. B., *Linear and Nonlinear Waves*, 1974, John Wiley and Sons
(4) Pedlosky, J., *Geophysical Fluid Dynamics*, 1979, Springer-Verlag
(5) Lindzen, R. S., *Dynamics in Atmospheric Physics*, 1990, Cambridge University Press
(6) Kundu, P. K., and I. M. Cohen, *Fluid Mechanics*, 2nd Edition, 2002, Academic Press

Course Description:
Basic dynamical concepts: equations of motion, basic approximations, Coriolis force, wave motions, normal modes, gravity waves, frictional turbulence and convective processes, geostrophic adjustment, scaling arguments, Rossby waves, vorticity and potential vorticity.

We will first develop the governing equations and fundamental fluid concepts, apply them to examples from classical fluid dynamics, then to geophysical situations. Fundamental ideas in GFD include convection, stratification, rotation, waves and their interaction with the mean flow, instabilities, mixing and chemical transport. These concepts provide essential underpinnings for many disciplines, including mesoscale, synoptic, and global dynamics of the atmosphere and ocean, chemical constituent transport and mixing, numerical simulation and forecasting, climate dynamics, and the general circulation of the atmosphere, ocean, and other planets.

Grading:
40% - Four problem sets, 10% each
60% - Three Quizzes, 20% each

C**ourse Credit and Expected Outcome**: You will receive 3 credits for this course composed of 2 75 minute lectures per week in the Traditional Carnegie definition. This course will increase your understanding of the physical processes and mathematical physics governing the dynamics of the atmosphere and ocean at the graduate level.