

Earth System Science 227: Geophys Fluid Dynamics I (Winter 2011)

(<http://www.ess.uci.edu/~yu/ess227.html>)

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Tuesdays & Thursdays 9:30-10:50, CH1103

COURSE DESCRIPTION

This course introduces the student to atmospheric and oceanic fluid dynamics. Equations of motion for a rotating stratified fluid. Scaling analysis, potential vorticity dynamics, linear waves, energetics and instability theory with applications to the mean circulation and variability.

TEXTBOOKS

Jonathan E. Martin, "Mid-Latitude Atmospheric Dynamics: A First Course", Wiley, 2006.

J.R. Holton, "An introduction to Dynamic Meteorology", Academic Press.

Marshall and Plumb: "Atmosphere, Ocean and Climate Dynamics: An introductory text", Academic Press.

GRADES

Homework (40%); midterm (60%)

HOMEWORKS

Issue and due every Thursday

SYLLABUS

Week 1	1/4 & 1/6	Introduction and Review of Mathematical Tools Review of useful mathematical tools Estimating with scale analysis Fundamental and apparent forces
Week 2	1/11 & 1/13	Basic Conservation Laws Conservation of momentum: The equations of motion Conservation of energy: The thermodynamic energy equation The continuity equation Primitive equations
Week 3	1/18 & 1/20	Applications of the Equations of Motion Vertical coordinates: pressure and potential temperature Balanced (geostrophic, inertial, cyclostrophic, gradient) flows Thermal wind balance trajectories and streamlines
Week 4	1/20 & 1/25 (11:20-12:50)	Circulation, Vorticity, and Divergence The Circulation theorem Vorticity and potential vorticity The relationship between vorticity and divergence Velocity potential and stream function
Week 5	2/1 & 2/3	Waves in the Atmosphere Rossby Wave Kelvin Wave Gravity Wave
Final	2/3	