SIO 217B (Winter 2014)

Atmospheric and Climate Sciences II: Atmospheric Dynamics

Instructor: Ian Eisenman, (office) Nierenberg Hall 223, (email) eisenman@ucsd.edu, (phone) 858-822-5176.

Lectures and assignments *(evolving)*

Lecture schedule:

- Mon 1/06: Introduction (read textbook sections 1.1-1.2) lec-01.pdf
- Wed 1/08: Basic forces, Coriolis force (1.4, 1.6.1, 1.5) lec-02.pdf
- Mon 1/13: Material derivative, momentum equation (2.1-2.4, 1.3)
- Wed 1/15: Continuity equation, energy equation, potential temperature (2.5-2.7)
- Mon 1/20: *No class, Martin Luther King Holiday*
- Wed 1/22: *No class (instructor on travel)*
- Fri 1/24 *(make-up class)*: Static stability, isobaric coordinates, governing equations (2.7, 1.6.2, 3.1)
- Mon 1/27: Balanced flow (3.2)

Topics planned for remainder of quarter
Balanced flow
Trajectories, thermal wind, vertical motion
Circulation, vorticity Potential vorticity
Propagating waves, Rossby waves
Quasi-geostrophy
Baroclinic instability

Homework assignments:

Approximately one assignment per week.

- HW-1 *(due 1/15)*
- HW-2 *(due 1/29)*
- HW-3 *(due 2/05)*
- HW-4 *(due 2/12)*
- HW-5 *(due 2/26)*
- HW-6 *(due 3/05)*
- HW-7 *(due 3/12)*

Course description

Date, time, location: Mondays and Wednesdays, 12:30-1:50pm, Spiess Hall 330.

Synopsis: The purpose of this course is to provide an introduction to the fundamental ideas of dynamic meteorology, in which the atmosphere is understood as a fluid dynamical system. This subject is unavoidably mathematical, and you will need to develop (or already have) familiarity with aspects of vector calculus and partial differential equations. We will keep the study informed by observations, but the emphasis will be on the theory of atmospheric motions.

Office Hours: Students are welcome to stop by my office anytime (knock if door is shut), but I recommend checking beforehand to make sure I am in. One ideal time is right after class.

Grading: 50% homework, 50% take-home final exam (letter grade required).

Homework: This material is best learned by working through problems, and there will be weekly problem sets. Homework problem sets may be turned in one class later than they are due (grace period), but will be accepted later than this only in exceptional circumstances. Homework will be graded on a ✓, ✓+, ✓- basis, and each student's lowest homework grade will be dropped in the calculation of the final grade. Students are encouraged to work together on homework exercises as long as each student turns in only his or her own work.

Exam: There will be a take-home final exam.

Textbook: *An Introduction to Dynamic Meteorology, Fourth Edition*, by J.R. Holton (2004) [here].

Other textbooks covering aspects of the material we cover that you may also find useful:
Atmosphere, Ocean and Climate Dynamics by John Marshall & Alan Plumb (2008) [here or here],
Mid-Latitude Atmospheric Dynamics by Jonathan Martin (2006) [here],
Global Physical Climatology by Dennis Hartmann (1994) [here],
Introduction to Geophysical Fluid Dynamics by Benoit Cushman-Roisin and Jean-Marie Beckers (2011) [here],
Atmosphere-Ocean Dynamics by Adrian Gill (1982) [here],
An Introduction to Dynamic Meteorology, Fifth Edition, by J.R. Holton and G.J. Hakim (2012).