SIO 250 Advanced Atmospheric Dynamics (Fall 2014)

Instructor: Joel Norris 327 MESOM 822-4420 *jnorris@ucsd.edu*

Meeting Time and Place: Spiess 330, 11:00 am to 12:20 pm on Mondays and Wednesdays

Grading Option: Letter grade or S/U.

Grading Criteria: 50% final exam, 50% homework exercises

Instructor Absence: I do not plan to have any absences.

Office Hours: Students are welcome to stop by my office at any time, but I recommend checking with me ahead of time to make sure I will be in.

Attendance Expectations: Students are expected to attend every class with exceptions only for illness and direct time conflicts such as out-of-town conferences.

Reading Expectations: Students are expected to read, though not necessarily understand, assigned material ahead of class and be prepared to ask questions and discuss topics in class.

Homework Exercises: Homework exercises must be completed on time and extensions will be granted only in exceptional circumstances.

Collaboration: Students are encouraged to collaborate on homework exercises as long as each student does his or her own work. No collaboration is allowed on exams.

Examinations: There will be a final.

Course Website: You should frequently check the website for class information, supplemental notes, and homework assignments: http://meteora.ucsd.edu/~jnorris/sio250/sio250.html

Helpful Websites:

Current weather maps: http://www.hpc.ncep.noaa.gov/html/sfc2.shtml
Current upper-level charts: http://wxmaps.org/pix/analyses.html

Registration is required for the following
QG omega equation: https://www.meted.ucar.edu/bom/qgoe/
Geostrophic adjustment: https://www.meted.ucar.edu/nwp/pcu1/d_adjust/

Textbook: Most material will be from:

An Introduction to Dynamic Meteorology, 4th Edition by J. R. Holton
UCSD only: http://www.sciencedirect.com/science/bookseries/00746142/88

Additional reading will come from Isaac Held's 2000 GFD notes

Course Topics:

Background preparation. *Students who did not take SIO 217B should study Holton 1.3, 1.6, 2.4-7, 3.1, 3.4-6, 4.3-4, 4.6, 5.1-2, 5.4, 6.1-4.*

1. Quasi-geostrophic system of equations in pressure coordinates, potential vorticity, geopotential tendency equation (Holton 6.1-2, 6.3.1-2)
2. Omega equation, large-scale motions associated with extratropical cyclones, cyclone development and dissipation (Holton 6.4.1, 6.5)
3. General wave characteristics, atmospheric gravity waves (Holton 7.1-2, 7.3.2, 7.4.1)
4. Topographic forcing of gravity waves, mountain waves, vertical propagation of waves, critical level, wavebreaking (Holton 7.4.2, 9.4)
5. Inertial motions, inertial instability, inertia-gravity waves (Holton 7.5)
6. Rossby waves, topographic forcing of Rossby waves (Holton 7.7, 10.5.1)
7. Baroclinic instability and energetics, Eady model (Holton 8.1-4)
8. Conventional Eulerian mean circulation (Holton 10.1, 10.2.1)
9. Transformed Eulerian mean circulation, potential vorticity (Holton 10.2.2-3)
10. Momentum and energy cycles (Holton 10.3-4)
11. Role of waves in general circulation (Held 2000 pp. 1-23)
12. Tropical dynamics and circulation (Holton 11.1-2)
13. Condensational heating and steady circulation (Holton 11.3, 11.5)
14. Equatorial waves (Holton 11.4)
15. Circulation of the middle atmosphere (Holton 12.1-2)
16. Extratropical vertical wave propagation, sudden stratospheric warming (Holton 12.3-4)
17. Equatorial vertical wave propagation, quasi-biennial oscillation (Holton 12.5-6)