

# SIOC 250 Advanced Atmospheric Dynamics (Fall 2016)

*Instructor:* Joel Norris      327 MESOM      822-4420      [jnorris@ucsd.edu](mailto: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:* On UCSD Ted

*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. Frontogenesis (Holton 6.4.2-3, 9.2)
4. General wave characteristics, atmospheric gravity waves (Holton 7.1-2, 7.3.2, 7.4.1)
5. Topographic forcing of gravity waves, mountain waves, vertical propagation of waves, critical level, wavebreaking (Holton 7.4.2, 9.4.1-2)
6. Inertial motions, inertial instability, inertia-gravity waves (Holton 7.5)
7. Rossby waves, topographic forcing of Rossby waves (Holton 7.7, 10.5.1)
8. Baroclinic instability and energetics, Eady model (Holton 8.1-4)
9. Conventional Eulerian mean circulation (Holton 10.1, 10.2.1)
10. Transformed Eulerian mean circulation, potential vorticity (Holton 10.2.2-3)
11. Momentum and energy cycles (Holton 10.3-4)
12. Role of waves in general circulation (Held 2000 pp. 1-23)
13. Tropical dynamics and circulation (Holton 11.1-2)
14. Condensational heating and steady circulation (Holton 11.3, 11.5)
15. Equatorial waves (Holton 11.4)
16. Circulation of the middle atmosphere (Holton 12.1-2)
17. Extratropical vertical wave propagation, sudden stratospheric warming (Holton 12.3-4)
18. Equatorial vertical wave propagation, quasi-biennial oscillation (Holton 12.5-6)