

# **SIO 217B (Winter 2009)**

## *Atmospheric and Climate Sciences II: Atmospheric Dynamics*

*Instructor:* Joel Norris      440 NH      822-4420      [jnorris@ucsd.edu](mailto:jnorris@ucsd.edu)

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

*Textbook:* Holton's "An Introduction to Dynamic Meteorology", 4th Edition.

*Website:* You should frequently check the website for class information, supplemental notes, the reading schedule, and homework assignments:

<http://meteora.ucsd.edu/~jnorris/sio217B/sio217B.html>.

*Grading:* 40% final exam, 30% weekly quizzes, 30% homework exercises

*Reading:* Students are expected to read the assigned material *before* class time.

*Homework Exercises:* Students will use a software package of their choice to carry out calculations and plot meteorological data. 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 weekly quizzes and a final.

*Discussion Section:* There will be a weekly discussion section that will be focused on developing a physical understanding of dynamical processes through conceptual pictures, synoptic maps, and current weather.

### Course Topics:

- Navier-Stokes equations and fundamental forces (Holton 1.1-1.5.2)
- Pressure as a coordinate (Holton 1.6)
- Coriolis force (Holton 1.5.3-4, 2.2)
- Total derivative and advection (Holton 2.1)
- Scale analysis (Holton 2.4)
- Continuity equation (Holton 2.5)
- Energy equations (Holton 2.6-7)
- Perturbation method and waves (Holton 7.1-2)
- Single-layer shallow water gravity wave (Holton 7.3.2)

- Equations in pressure coordinates (Holton 3.1)
- Balanced flow (Holton 3.2)
- Thermal wind (Holton 3.4)
- Two-layer shallow water internal gravity wave (lecture notes)
- Vertical motion (Holton 3.5-6)
- Circulation and vorticity (Holton 4.1-2)
- Inertial instability (Holton 7.5.1)
- Potential vorticity (Holton 4.3)
- Vorticity equations (Holton 4.4-5)
- Geostrophic adjustment (Holton 7.6)
- Single-layer gravity waves with rotation (lecture notes)
- Turbulent flux, surface layer, Ekman layer (Holton 5.1-4)
- Quasi-geostrophic equations (Holton 6.1-2)
- Q-G potential vorticity (Holton 6.3)
- Barotropic Rossby waves (Holton 7.7.1)
- Barotropic instability (lecture notes)
- Omega equation and Q-vectors (Holton 6.4-5)
- Forced topographic Rossby waves (Holton 7.7.2)
- Two layer baroclinic instability (Holton 8.1-2)
- Energetics of baroclinic waves (Holton 8.3)
- General circulation (lecture notes and Holton 10)
- Hurricanes (lecture notes and Holton 9.7)
- Tropical dynamics (lecture notes and Holton 11.1-3,11.5)