GFD II: BALANCED DYNAMICS

ATM S 542, Spring 2016
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PURPOSE OF THE COURSE

To develop

1. Understanding of and own perspective on dynamics of the large-scale flows in the atmosphere

2. Ability to interpret real atmospheric circulation
1. **QG Theory**: Scale analysis, 2D QG theory and planetary waves, Ekman modification, 3D QG theory for a compressible fluid; potential vorticity, Potential vorticity and inversion

2. **Baroclinic Instability**: Brief review of mid-latitude eddies, Baroclinic instability in a channel, Rayleigh necessary condition for instability, Barotropic instability, Baroclinic instability: Eady and Charney, Energetics of baroclinic growth

3. **Wave Mean Flow Interaction**: EP Flux and potential vorticity, Wave-mean flow interaction, Maintenance of axisymmetric zonal mean motions

4. **Extratropical Planetary Waves**: Vertical propagation (Charney-Drazin), Horizontal propagation and group velocity, Forcing of barotropic stationary waves by orography, Waves in a slowly varying mean state

5. **Tropical Dynamics**: Scale Analysis, Equatorially trapped modes (Matsuno), Forced solutions and teleconnections
TEXTBOOK

• Textbook:

• Other textbooks:
  Vallis, G. K., 2006: Atmospheric and Oceanic Fluid Dynamics.
GRADING

- **Homework (reading + problem solving): 60%**
  - reading - submit a 1-page document (single-spaced, font size:12) that summarizes what you learned from reading the paper. Focus on fundamental question, key idea, and conclusions.
    1. Charney (1948) - due 04/15
    2. Eady (1949)
    3. Simmons and Hoskins (1978)
    4. Edmon et al. (1980)
    6. Matsuno (1966)
  - problem solving - after each chapter (total 5)

- **Final exam (take home): 40%**
COURSE WEBSITE

- http://www.atmos.washington.edu/~daehyun/class/542/home.html