ATMS 545 Partial Syllabus

Week by Week Summary of lecture topics
1. Course Summary (Lectures in electronic presentation format)
   a. Overview
   b. Extratropics
   c. Tropics
2. The Kinetic Energy Cycle
   a. Available Potential Energy
   b. Energy generation and conversion processes
   c. KE cycle in a limited domain
      *Dynamics seminar on transient variability*
3. Angular Momentum Balance
   a. the balance requirement
   b. poleward transport
   c. role of exchange processes
   d. vertical transport
   e. equation for zonally averaged zonal wind
4. Total energy balance
   a. components of the total energy
   b. the balance requirement
   c. role of the ocean
   d. poleward heat transports
   e. equation for zonally averaged zonal mean temperature
5. The zonally averaged circulation
   a. role of mean meridional motions
   b. the zonally averaged tendency equation
6. The zonally averaged circulation
   a. boundary conditions
   b. Midterm
   c. Stratospheric phenomena
7. The Lagrangian-mean circulation
   a. Stokes drift
   b. the Eliassen-Palm flux
8. The zonally-varying, time-mean circulation
   a. stationary waves
   b. storm tracks
   c. waveguides
   d. feedbacks from the transients
9. Analysis of transient variability
   a. properties of low, intermediate and high frequency variations
   b. cross-frequency coupling
10. Sensitivity of the general circulation to external forcing
   a. the annual march
      i. monsoons
      ii. tropical cold point temperature
      iii. midwinter suppression of baroclinic wave activity
      iv. spring-fall asymmetries
   b. paleoclimate
      i. past 100 years
      ii. early Holocene
      iii. the Eocene
   c. mechanisms
      i. tropical forcing of stationary waves
      ii. changes in N-S baroclinicity
      iii. changes in land-sea contrast

Readings
1. Wallace and Hobbs: Section 8.1, especially 8.1.1. Presentations will be posted.
2. Chapter 1 and Appendix of Course Notes
3. Chapter 2 of Course Notes; Seminar presentation will be posted
4. Chapter 3 of Course Notes
5. Chapter 4 of Course Notes
6. Chapter 4 of Course Notes; graphics from stratosphere lecture
7. Chapter 5 of Course Notes

Assignments and Grading
Midterm (20%)
Final (40%)
Project: paper and group presentation on topic related to Week 10. (40%)

Class Schedule
May 12 Chapter 4 *Dynamics of a zonally symmetric vortex* concluded
May 14, 16, 19 Chapter 5 *Wave-mean flow interaction*
May 21, 23, 28, 30, June 2, 4 *Zonally-varying features of the general circulation*
1. Jet streams, storm tracks, interactions between transients and the background flow
2. Maintenance of the stationary waves: a global perspective
3. Contrasting structure of low, intermediate, and high frequency transients
4. Teleconnection patterns
5. The annual march
6. ENSO: an atmospheric perspective

June 4 (3:00-6:00) student presentations (meet in 406 ATG)
June 6 Take home final: due Saturday, June 7 at noon