ATM 410 DYNAMIC METEOROLOGY I FALL 2008

Instructor: Chris Thorncroft TA: Brian Silvotti

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Office hours: MON/WED 12:00-13:00; or see me after class for an appointment

**Aim of Course:**

To develop dynamical tools and concepts that can explain and help us understand the nature of observed midlatitude weather systems.

To develop quantitative skills for describing these systems and how they evolve.

To provide the building blocks for developing theories to understand how midlatitude systems develop (links with ATM 411 next semester).

Course Assessment:

1. Class exam on Wednesday 15th October 15%

2. Class exam on Monday 24th November 30%

3. Problem sets (will be given one week to do these) 15%

4. Final Exam on Wednesday 10th December (3.30pm-5.30pm) 40%

**Text Books:**

I will occasionally refer to Holton when appropriate.

**Basic Course Outline**

1. Fundamentals

2. Basic Conservation Laws

3. Elementary Applications of Basic Equations

4. Vorticity and Potential Vorticity

Lecture Plan

**1. Introduction**

1.1 Air parcels and their properties

1.2 Scales and scale analysis

1.3 Forces (including non-inertial frames of reference and “apparent forces”)

1.4 Static atmosphere (hydrostatic balance, geopotential, geopotential height and thickness equation)

1.5 Vertical coordinates

1.6 Summary

**2. Equations of Motion**

 2.1 Total differentiation

 2.2 Momentum equations in rotating coordinates

 2.3 Scale analysis of the equations of motion

 2.4 Continuity equation

 2.5 First law of thermodynamics

 2.6 Summary

**3. Elementary Applications of Basic Equations**

 3.1 Isobaric coordinates

 3.2 Balanced Flow

 (i) Geostrophic balance

 (ii) Gradient wind balance

 (iii) Inertial flow

 (iv) Cyclostrophic flow

 3.3 Thermal wind

 3.4 Surface pressure tendency

 3.5 NWP discussion

 3.6 Summary

**4. Vorticity and Potential Vorticity**

4.1 Circulation theorem

 4.2 Vorticity

 4.3 The vorticity equation

 4.4 Potential vorticity

 4.5 Summary