ATM 410 DYNAMIC METEOROLOGY I FALL 2007

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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 Tuesday 2nd October	15%
2. Class exam on Tuesday 13th November	30%
3. Problem sets (will be given one week to do these)	15%
4. Final Exam on Wednesday 12th 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