Syllabus

Atmospheric Dynamics (EAS3420): Spring 2010
Describes the fundamental physics of atmospheric dynamics, including conservation laws and governing equations

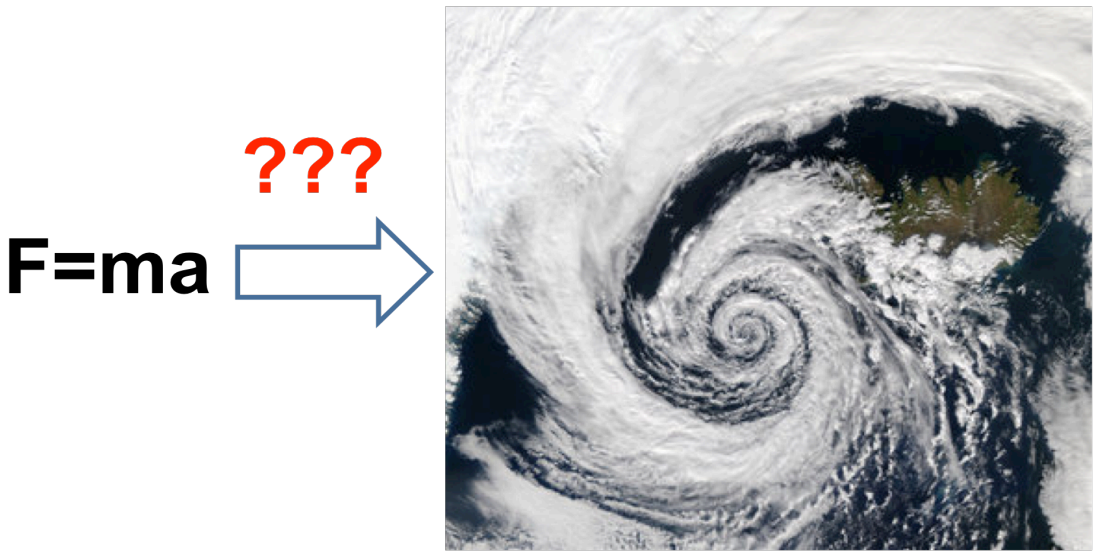
- Derive equations of motion, continuity equation, and thermodynamic energy equation for the atmosphere
- Explain atmospheric phenomena quantitatively from physical equations.

Instructor: Gang Chen, Bradfield 1115, (607)255-1503, gchen@cornell.edu
http://sunspot.eas.cornell.edu/~gc352/
Time: MWF 11:15AM – 12:05PM
Location: Bradfield 1102
Office hours: MWF 1-2pm or by appointment
Course web site: http://blackboard.cornell.edu/
Teaching Assistant: Eowyn Connolly-Brown, ecc37@cornell.edu
Office hours by appointment

Grading:
25% homework (approximately weekly)
50% two preliminary exams (25%×2)
25% final exam
100%
Class attendance/participation is expected throughout the course

Textbook (required):
An Introduction to Dynamic Meteorology, Fourth Edition, by James Holton.

Honor Code:
The Cornell code of academic integrity is expected.



Schedule

Jan 25, Jan 27: Review of mathematical tools and kinematics of fluids

Jan 29, Feb 1, Feb 3, Feb 5, Feb 8: Holton 1.2-1.6: Fundamental and apparent forces:
Pressure gradient, gravitation, viscosity, inertial and non-inertial reference frames, Coriolis force, and hydrostatic balance

Feb 10, Feb 12, Feb 15: Holton 1.6-2.3: Coordinate systems:
Pressure as a vertical coordinate, material derivatives and advection, spherical coordinates

Feb 17, Feb 19, Feb 22: Holton 2.4: Scale analysis of the equation of motion:
Scales of motion in atmosphere, horizontal and vertical equations of motion

Feb 24: Prelim #1

Feb 26, Mar 1: Holton 2.5: The continuity equation
Eulerian derivation, Lagrangian derivation, Scale analysis

Mar 3, Mar 5, Mar 8, Mar 10: Holton 2.6-2.7: Thermodynamic energy equation:
Lagrangian derivation, potential temperature, static stability, scale analysis

Mar 12, Mar 15, Mar 17, Mar 19: Holton 3.1-3.3: Elementary applications I
Governing equations in pressure coordinates, balanced flow in natural coordinates, trajectories and streamlines

Spring break

Mar 29, Mar 31, Apr 2, Apr 5, Apr 7, Apr 9: Holton 3.4-3.6: Elementary applications II
Thermal wind, diagnosing vertical velocity, predicting surface pressure

Apr 12: Prelim #2

Apr 14, Apr 16, Apr 19: Holton 4.1: Circulation theorem

Apr 21, Apr 23, Apr 26, Apr 28, Apr 30, May 3: Holton 4.2-4.6: Vorticity
Relative, planetary, and absolute vorticities; relative vorticity equation; potential vorticity

May 5, May 7: Holton 7.1, 7.7: Atmospheric waves
The wave equation and solution, Rossby waves

May 12, Wed, 7:00-9:30 pm: Final exam