GEOG C139 / EPS C181
Introduction to Atmospheric Physics and Dynamics [3 units]

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Office hours: MW 11a - 12 noon, or by appt
Time and location: MW 9:30-11a, 145 McCone

Midterm: likely week 8 (week of Mar 7), but +/- 1 week, in class. Exact date TBA. If you are going to have a potential conflict, let me know ASAP.
Final exam date: TBA

Grades (subject to change): Homeworks ~30%; Midterm ~30%; Final ~40%

Course home page (check regularly for updates, homeworks etc.)**:** **http://geography.berkeley.edu/ProgramCourses/CoursePagesSP2005/GeogC139.html** (or: Go to the geography dept home http://geography.berkeley.edu, hit on 'Program and Courses', and follow the links)

Purpose: This course examines the processes that determine the structure and circulation of the Earth's atmosphere. The approach is deductive rather than descriptive: to figure out the properties and behavior of the Earth's atmosphere based on the laws of physics and fluid dynamics. Roughly 1/3 of the course will cover atmospheric thermodynamics and radiation, and 2/3 on atmospheric dynamics.

Prerequisites: Solid background in advanced calculus and general physics. Some previous knowledge of the atmosphere is useful, but not necessary. Please check with me if you are unsure of your background.

Recommended texts (on 1-day reserve in the Earth Sciences Library)
Andrews, D.G. "An introduction to atmospheric physics". Cambridge Univ Press, 2000
Goody R.M. and J.C.G. Walker "Atmospheres", Prentice-Hall, Englewood NJ 1972
Hartmann, D.L. "Global Physical Climatology", Academic Press, 1994
Holton, J.R. "An Introduction to Dynamic Meteorology", 3rd edition, Academic Press, San Diego, 1992 ***[recommend buying]***
Wallace, J. M. and P.V. Hobbs, "Atmospheric Science: An Introductory Survey" Academic Press, 1977.

Rough outline (subject to change)

1. ***Introduction to the atmosphere***
    - Atmospheric length and timescales; atmospheric composition; thermal and circulation structure
2. ***Thermodynamics***
    - Equation of state
    - Laws of thermodynamics.
    - Adiabatic processes
    - Thermodynamics of atmospheric water.
    - Adiabatic processes of saturated air.
    - Hydrostatic equilibrium
    - Convection.
    - Cloud formation
3. ***Radiation***
    - Nature of electromagnetic radiation
    - Absorption and emission of radiation by molecules
    - Blackbody radiation. Planck's law, Wien's displacement law, Stefan-Boltzmann law
    - Atmospheric absorption and scattering of solar radiation
    - Atmospheric absorption and scattering of terrestrial radiation
    - Radiative transfer
    - Radiative and radiative-convective equilibrium
    - Energy budget of earth
4. ***Dynamics***
    - Fundamental and apparent forces
    - Conservation laws: momentum equation, continuity equation, thermodynamics energy equation
    - Scale analysis
    - Elementary applications of basic equations: geostrophic balance, thermal wind.
    - Circulation and vorticity
    - Quasigeostrophic analysis
    - Planetary boundary layer
    - Atmospheric oscillations
    - Baroclinic instability (time permitting)
    - Tropical dynamics (time permitting)