METR 4233 – Physical Meteorology III: Radiation and Climate

Fall 2010 Syllabus

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Class time and place: Mon, Wed, Fri 12:00 – 12:50pm; NWC 5600.
Office hours: by appointment only (preferably, through e-mail).
Prerequisites: grade of C or higher in METR 3123 and METR 3223.
Textbook: Wallace, J. M., and P. V. Hobbs, 2006: *Atmospheric Science: An Introductory Survey*. Elsevier/Academic Press, 483 pp.
Web site: course information and lecture notes will be available at http://learn.ou.edu.
Proposed grading: Three intermediate tests (September, October, November): 20% each (worst grade to be dropped). Three surprise quizzes: 10% each (worst grade to be dropped). Final exam (December): 40%. No make-up tests/quizzes. Grade cutoffs: A - ≥85%, B - ≥70%, C - ≥50%, D - ≥30%, F - <30%.

General information

This course introduces students to the physical processes associated with radiative transfer in the atmosphere and energy balance at the Earth's surface. Fundamental concepts of radiative transfer are applied, in conjunction with basic ideas of atmospheric dynamics and thermodynamics, to describe and examine the general circulation of the atmosphere, surface energy budget, the mean climate of the Earth, climate variations in space and time, and climate change.

Course outline

I. The Earth system
   Components of the Earth system. Surveys of the atmosphere (meteorological variables, atmospheric composition, structure, winds, precipitation), oceans, cryosphere, biosphere, crust and mantle. Hydrologic and carbon cycles.
II. Radiation and radiative transfer in the Earth-Atmosphere system
   Radiation characteristics. Quantities and units. Radiation spectra. Emission of radiation, absorption and scattering. Solar (short-wave) radiation. Surface albedo. Long-wave radiation in the atmosphere. Greenhouse gases.
III. Energy balance
   Radiation balance of the atmosphere. Radiative fluxes. Turbulent transport and fluxes. Components of surface energy balance. Diurnal and seasonal cycles of surface temperature.
IV. Atmospheric general circulation
   Basics of large-scale atmospheric kinematics and dynamics. Atmospheric general circulation. Global atmospheric kinetic energy cycle. Atmosphere as a heat engine.
V. Climate dynamics
   A brief history of climate. Present-day climate. Climate variability. El Niño – Southern Oscillation. Climate equilibria, sensitivity, and feedbacks. Greenhouse climate change.

Note: *The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with Dr. Fedorovich as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course.*