METR 4233 - Physical Meteorology III: Radiation and Climate Syllabus

Instructor: Dr. David Karoly
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Class time and place: Monday, Wednesday, Friday 12:00 – 12:50pm; NWC 5720.
Office consultation hours: Mon, Wed 3:30 to 5:00 pm, or by appointment.
Prerequisites: Grade of C or higher in METR 3123 Atmos Dyn II and METR 3223 Phys Met II.
Textbook: Wallace, J. M., and P. V. Hobbs, 2006: *Atmospheric Science: An Introductory Survey.* 2nd Edn., Academic Press, 483 pp.
Web site: Course information and handouts will be available through http://learn.ou.edu
Laboratory sessions: Every second week, a lab session will be held in the normal Wednesday class time. More information on these lab sessions will be provided on a separate sheet.
Proposed grading: Two written tests: 20% each. Final exam: 20%. Essay: 10%.
Homework from lab sessions and problem sheets every two weeks: 30%.

General information
This course introduces the physical processes associated with radiative transfer in the atmosphere and energy balance at the earth's surface. It uses radiative transfer and simple atmospheric dynamics to explain the general circulation of the atmosphere, the mean climate of the earth, climate variations in space and time, and climate change.

Course outline
I. Composition, structure and thermodynamics of the lower atmosphere (revision).
Composition of the atmosphere. Meteorological variables. Atmospheric scales. Density and temperature stratification in the atmosphere. Atmospheric humidity. Hydrostatic stability.
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 and greenhouse gases.
III. Atmospheric energy balance
Radiation balance at the surface. Greenhouse effect. Surface energy balance. Diurnal cycle and seasonal cycle of surface temperature. Radiation balance and energy balance in the atmosphere.
IV. Atmospheric general circulation
Meridional gradient of net radiative heating. Global heat and momentum balance. Mean meridional circulation. Jet streams. Eddy heat transport.
V. Climate variability and climate change
Internal climate variability and climate feedbacks. Ice ages and solar forcing. El Niño-Southern Oscillation. Greenhouse climate change. Ozone and UV radiation. Ozone depletion.

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 Karoly 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. The Office of Disability Services is located in Goddard Health Center, Suite 166, phone 405-3253852 or TDD only 405-325 4173.*

8/18/2006