Atmopsheric Radiative Transfer Class: Schedule for Fall 2005

Date			Required Reading
23-Aug	Lecture 1	Introduction&Logistics	
25-Aug	Lecture 2	The roles of radiative transfer processes in the climate system	
30-Aug	Lecture 3	Basic radiometric quantities. Concepts of scattering, absorption, and emission. Introduction to radiative transfer.	L02: 1.1, 1.4
1-Sep	Lecture 4	Blackbody radiation. Main laws. Sun as an energy source. Solar spectrum and solar constant.	L02: 1.2, 2
6-Sep	Lecture 5	Composition and structure of the atmosphere. Basic properties of radiatively active species.	L02: 3.1, 5.1
8-Sep	Lecture 6	Gaseous absorption/emission: Concepts of a spectral line and a band. Line shapes. Absorption coefficient and transmittance.	L02: 1.3
13-Sep	Lecture 7	Absorption by atmospheric gases in IR, visible and UV HITRAN spectroscopic database.	L02: 4.2.1, 3.2
15-Sep	Lecture 8	Terrestrial infrared radiative processes. Part 1: Fundamentals of thermal IR radiative transfer Line-by-line method	L02: 4.2.2-4.2.3
20-Sep	Lecture 9	Terrestrial infrared radiative processes. Part 2: K-distribution approximations.	L02: 4.3
22-Sep	Lecture 10	Terrestrial infrared radiative processes. Part 3: Gaseous absorption/emission: Band models. Curtis-Godson Approximation.	L02: 4.4
27-Sep	Lecture 11	Terrestrial infrared radiative processes. Part 4: Infrared radiation transfer in the cloudy atmosphere. IR radiative cooling rates	L02: 4.5-4.7
29-Sep	Lecture 12	Review for Exam 1: IR radiative transfer processes	
4-Oct		Mid-term Exam 1	
6-Oct	Lecture 13	Scattering. Part 1: Main concepts. Stokes matrix. Polarization. Scattering by gases.	L02: 3.3, 5.3
11-Oct	Lecture 14	Scattering. Part 2: Lorenz-Mie theory of scattering by spherical particles.	L02: 5.2
13-Oct	Lecture 15	Scattering. Part 3: Scattering and absorption by an ensemble of spherical particles	L02: 5.2, 3.3.2

18-Oct		Fall Break	
20-Oct	Lecture 16	Scattering. Part 4: Scattering by nonspherical particles	L02: 5.4, 5.5
25-Oct	Lecture 17	Principles of multiple scattering in the atmosphere. Radiative transfer equation in a plane-parallel atmosphere.	L02: 3.4, 3.5, 6.1
27-Oct	Lecture 18	Methods for solving the radiative transfer equation. Part 1: Approximations.	L02: 6.5
1-Nov	Lecture 19	Methods for solving the radiative transfer equation. Part 2: Effects of surface reflection on the atmospheric radiation field.	
3-Nov	Lecture 20	Methods for solving the radiative transfer equation. Part 3: Discrete-ordinate method.	L02: 6.2
8-Nov	Lecture 21	Methods for solving the radiative transfer equation. Part 4: Principles of invariance. Adding method.	L02: 6.3-6.4
10-Nov	Lecture 22	Methods for solving the radiative transfer equation. Part 5: Radiative transfer methods for inhomogeneous clouds	L02: 6.7.2
15-Nov	Lecture 23	Net radiative heating/cooling rates	L02: 4.7, 3.5, 8.2.4
17-Nov	Lecture 24	Radiation and climate. Radiation budget.	L02: 8.1, 8.2, 8.4
22-Nov	Lecture 25	Energy balance models Radiative-convective equilibrium.	L02: 8.3, 8.5
24-Nov		NO CLASS: Thanksgiving	
29-Nov	Lecture 26	Direct and indirect radiative forcings	L02: 8.6
1-Dec	Lecture 27	Review for Exam 2: Solar radiative transfer processes. Radiation and climate	L02: 8.6
6-Dec		Class research project	
8-Dec		Class research project	
13-Dec		Mid-term Exam 2	

Reading:

L02: Liou, An introduction to atmospheric radiation, 2002.