

Lecture 14.

Review for Midterm Exam 1: Terrestrial IR radiative transfer processes

Topics to review:

- **Basic radiometric quantities: intensity and flux. Spectrum of EM radiation (Lecture 3)**

Eqs.[3.1]-[3.9]

- **Concepts of extinction (scattering + absorption) and emission. Extinction, scattering and absorption coefficients. Optical depth (Lecture 3)**

Eqs.[3.15]-[3.16], [3.19], [3.20]

- **Beer-Bouguer-Lambert law (Lecture 3)**

Differential form: Eqs.[3.13]-[3.14], [3.18]

- **Differential and integral forms of radiative transfer equation (Lecture 3)**

Eqs.[3.21]-[3.23]

- **Differential equation of radiative transfer and its solutions in a plane-parallel atmosphere (Lecture 3)**

Eqs.[3.24]-[3.26]

- **Main radiation laws. Concepts of a blackbody, thermodynamical equilibrium, and local thermodynamical equilibrium (Lecture 4).**

Planck function, Stefan-Boltzmann law, Wien's displacement law, Kirchhoff's law:

Eqs.[4.1]-[4.3], [4.8]-[4.10]

- **Absorption/emission by atmospheric gases. Concepts of rotational, vibrational and rotational-vibration transitions. Line profiles. Absorption coefficient of gases. Path length (i.e., amount of absorbing gases) and optical depth.**

Transmission function (Lectures 5, 6 and 7)

Eqs.[6.4]-[6.5], [6.6]-[6.8], [7.1]-[7.2]

- **IR absorption spectra of main atmospheric gases (H₂O, CO₂, O₃, CH₄, N₂O, CFCs) (Lecture 7)**

- **IR radiative transfer equation and its solution in a plane-parallel atmosphere (Lecture 8).**

Eqs.[8.1]-[8.3], [8.9-8.12]

- **Basics of line-by-line radiative transfer (Lecture 8)**
- **Concept of absorption band models. Equivalent width. (Lecture 9)**

Eqs.[9.1], [9.3]-[9.5]

- **Basics of the K-distribution method (Lecture 10)**

Eqs.[10.4]

- **Diffuse transmission function for fluxes. Broadband flux emissivity (Lecture 12).**

Eqs.[12.3]-[12.4]

- **IR radiative transfer equation for fluxes and its solution in a plane-parallel atmosphere (Lecture 12).**

Eqs.[12.2], [12.5], [12.11]-[12.12]

- **IR radiative heating/cooling rates (Lecture 12)**

Eqs.[12.6]-[12.8]

NOTE: Please also review lectures' required reading assignments and problem solving examples.