# ATMOSPHERIC PHYSICS

- Introduction. Blackbody Radiation laws. Absorption line formation and line shape. Atmospheric radiation extinction (scattering and absorption). Emission of radiation. Reflection of radiation. Cloud effect.
- Mathematical development of radiative transfer (RT) equation – RT equation in local thermodynamic equilibrium – RT equation in plane-parallel atmospheres – RT equation for inhomogeneous 3D media – Azimuthal dependence of the radiation field in RT equation.
- Adjustment of RT equation for (a) absorption and emission and (b) scattering and absorption.
- Line shapes as a function of energy.
- Radiative transfer in the infrared. Atmospheric transmission. Mean transmission in homogeneous media (Lorentz line, Elsasser band model, statistical model). Mean transmission in inhomogeneous media, line by line method.
- Radiative heating and cooling rates calculations in the atmosphere.
- Radiative-convective atmospheric models - Application of RT equation for climate studies.
- First and Second law of thermodynamics.
- Applications of First and Second thermodynamic law.
- Water in the atmosphere (Clausius - Clapeyron equation, Saturated vapour pressure calculation, Humidity variables, Wet static energy).
- Vertical structure of wet atmosphere (moist adiabatic temperature rate, Entropy budget of wet air, Types of atmospheric stability. Thermodynamic diagrams).
- Mixtures and solutions Chemical dynamics, Ideal gas mixtures and ideal solutions, Raoult law, boiling and coagulation of solution).