

Stratosphere and Troposphere Coupling (RP 4.2.23)

Structure and Composition of the Lower and Middle Atmosphere:

Atmospheric Thermal Structure: Troposphere, Stratosphere, Mesosphere, Thermosphere, Exosphere.

Properties and Variables of the atmosphere: (a) Pressure-Vertical structure of Pressure and Density, Space- Time variation of Pressure, (b) Temperature, (c) Density.

The Tropopause: Tropical Tropopause, Dynamic Tropopause, Ozone Tropopause, Tropopause folds, Importance of Tropopause to Tropospheric Weather Events.

Thermodynamics and Dynamics of the Troposphere and Stratosphere:

Thermodynamics of the Atmosphere: Scale Height, Static Stability, Thermodynamics of water vapor, Tephigram or Thermodynamic diagram, Conditional Convective Instability, Lapse Rate, DALR, SALR, Brunt-Vaisala frequency.

Basic quantities of atmospheric dynamics: Equation of State, Hydrostatic equation, Geopotential Height, Hypsometric equation.

Fundamental Laws of Conservation and Related Dynamics: Equations of motion (Conservation of momentum), Equations of Continuity (Conservation of Mass), Conservation of Energy; Primitive equation, Isoentropic lines, Brewer-Dobson Circulation and Stratosphere-Troposphere exchange.

Waves in Troposphere and Stratosphere:

Waves in the Atmosphere: Lamb waves, Rossby waves, Pure Internal gravity waves, Inertia-gravity waves, Wave-breaking, Kelvin waves, Mixed Rossby Gravity waves.

Mechanism of Quasi-Biennial Oscillation: Solar-QBO connection, Planetary wave forcing, Limitations of Planetary Wave theory.

Stratosphere-Troposphere Interactions and Implications:

Major Events S-T Interactions: Polar Stratospheric Clouds, North Atlantic Oscillation, Atmospheric tides, Sudden Stratospheric Warming, Ozone hole, Stratospheric Ozone Depletion.

Experimental techniques in the study of S-T Exchange — Radar Observations, Sounding and Remote Sensing Techniques, Implications in Global Change