

The Upper Polar Atmosphere Structure and dynamics

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Outline of lecture

- Aurora and auroral particles
- Interaction with the solar wind
- Polar Cap convection
- Disturbance effects

Aurora

- Colour pictures from Space Shuttle
- UV-Pictures from DE-satellite
- Auroral heights
- Auroral fine structure

Particle precipitation

- Energy spectra of precipitating electrons
- Electron density profiles
- Auroral x-rays
- Proton precipitation
- Galactic cosmic rays

EISCAT

- Introduction to radar principle
- Diurnal variation of electron density
- -electron temperature
- -ion temperature
- Sporadic E-layers
- Ion velocity measurements

Proton effects on ozon

- Electrons produced by protons in the ozon –layer form NO that act as catalyst:
- $N_2 + e \rightarrow N + N + e$
- $N_2 + e \rightarrow N^+ + N + 2e$
- $N + O_3 \rightarrow NO + O_2$
- $NO + O_3 \rightarrow NO_2 + O$
- $NO_2 + O \rightarrow NO + O_2$
- Two ozon molecules are lost.

Solar Wind interaction

- The magnetosphere
- Mapping of the polar ionosphere
- E - field mapping
- Temperature and composition variations due to E-fields
- Polar Cap convection and IMF

Dynamics

- Neutral air circulation
- Ion neutral interaction
- Joule heating
- Effects on the global circulation

Atmospheric expansion

- Auroral currents
- Auroral substorms
- Atmospheric heating(joule and particle heating)
- Space weather effects
- Satellite orbits

Non Maxwellian plasma

- Non isotropic temperature distribution
- Anomalous ion spectra
- Ion outflow
- Filamentary currents

E-region neutral wind

- Ions act as tracers
- Time constants in the atmosphere
- Measurement technique

The Polar Mesosphere

- Temperature profile
- Noctilucent clouds
- Long- time temperature variations
- Polar Mesospheric Summer Echoes (PMSE)
- The sky is falling down