Structure and Dynamics of the Upper Ionosphere of Venus

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Investigation of the magnetization states of the ionosphere

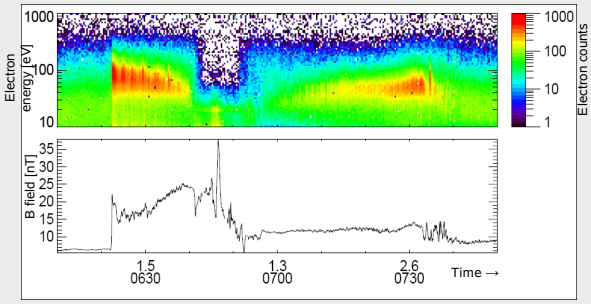
PVO results (Luhmann & Cravens, SSR 55 (1991)**:**

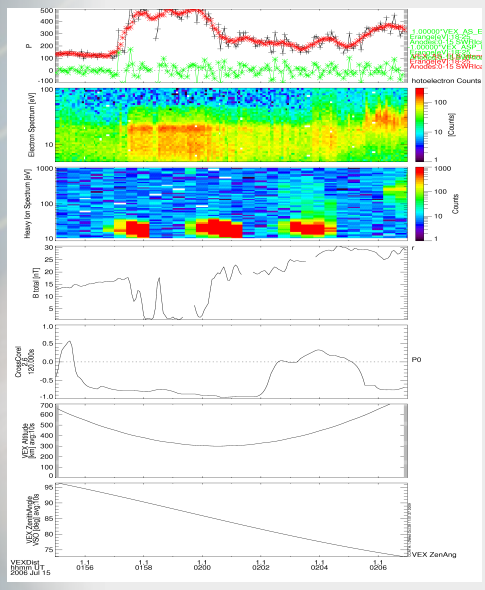
The ionosphere can be either magnetized or unmagnetized, depending on the balance between thermal ionospheric pressure and solar wind dynamic pressure.

For the magnetized states, large-scale magnetic fields up to 150 nT were found. Generally, the ionopause was situated below 300 km altitude and rather broad (~ 80 km).

In the unmagnetized states, the overall field strength was low, but small-scale magnetic structures, so-called *flux ropes*, were observed. The ionopause was high (altitude > 300 km) and narrow (~ 20 km).

ASPERA-4 and MAG measurements





„unmagnetized“

Electron Counts (18 - 25 eV)

Electron Spectrum

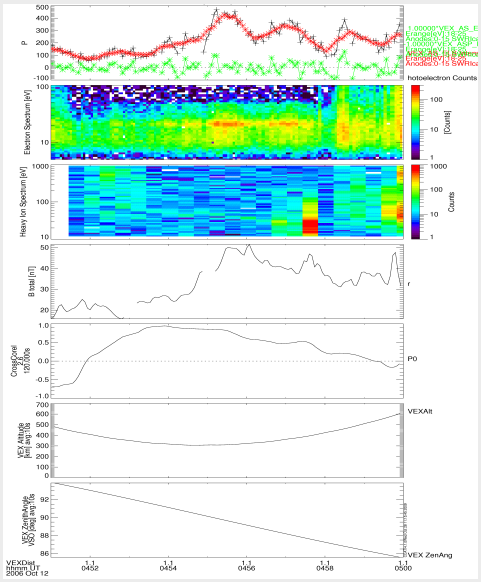
Heavy Ions

B_{total}

Cross Correlation (Electron Counts, B_{total})

Altitude

Zenith Angle



„magnetized“

Interpretation of the correlation between photoelectron density and B field strength:

In several orbits, the magnetic field strength is low (< 10 nT) and there are possible flux ropes to be seen. These flux ropes are characterized by high field strengths and low photoelectron density. Thus, the correlation function is usually negative on these orbits which we would classify as unmagnetized.

For orbits with a strong magnetic field (~ 25 - 80 nT), the photoelectron density is usually high. The correlation function is found to be positive in most of these cases.

However, there are orbits in which this does not hold true; for these, other influences (day/nightside, incomplete B field measurements, very low photoelectron densities) have to be investigated.

Outlook

The next goal is to develop a procedure to automatically identify magnetized and unmagnetized ionospheric states, taking into account the correlation between B field and photoelectron density, the absolute value of the magnetic field, the solar zenith angle and other effects that might have an influence on the variables involved. The results can then be compared to those from PVO; however, one has to take into account that the PVO observations took place during solar maximum. Another aspect to explore is the electron and ion transport in the ionosphere, which is strongly related to the magnetic field configuration.

In order to verify the ionopause altitudes derived from ASPERA-4 electron density measurements, they will be compared to the VeRa radio occultation results (*M. Pätzold, Köln*).