

The Venus Neutral Atmosphere as seen by the Radio Science Experiment VeRa on Venus Express

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Abstract

The Venus Express Radio Science Experiment VeRa is sounding the Venus neutral atmosphere and ionosphere using the spacecraft radio subsystem in the oneway radio link mode at X-band (8.4 GHz) and S-band (2.3 GHz) [1].

An Ultrastable Oscillator (USO) provides a high quality onboard frequency reference source for the derivation of electron density profiles in the ionosphere and profiles of pressure, temperature and neutral number density of the neutral atmosphere [2]. Radial profiles of neutral number density derived from the occultations cover the altitude range 40–90 km, which are converted to vertical profiles of temperature and pressure.

The polar orbit of Venus Express provides the opportunity to study the atmosphere at all planetocentric latitudes under varying illumination conditions.

More than 320 neutral atmospheric profiles could be retrieved during the first seven occultation seasons of the Venus Express mission until the end of 2009.

The thermal structure is investigated with regard to the latitudinal and temporal variability. The Venus mesosphere shows a high variability resulting from atmospheric waves and turbulence. Profiles of atmospheric static stability are found to be latitude dependent and nearly adiabatic in the middle cloud region [3] (s. Figure 1).

Abrupt changes in the static stability can occur at the boundaries of the middle cloud layer, the vertical distribution of which shows a distinct latitudinal dependence. Correlations of wave activity with the static stability profile will be investigated.

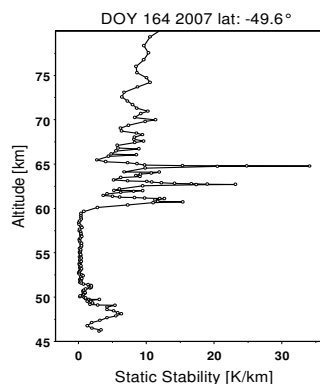


Figure 1: Static Stability $S (= dT/dz - \Gamma)$ as a function of altitude in the middle latitude region. The Atmosphere is nearly adiabatic in the middle cloud layer (s. also [3]).

References

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