The Venus Neutral Atmosphere from the Radio Science Experiment VeRa onVenus Express

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The Venus Express Radio Science Experiment VeRa performs regular radio-occultation measurements of the Venus neutral and ionized atmosphere. Observations are implemented in using 3.6 and 12 cm-wavelength transmissions referenced to an on-board ultra-stable oscillator. Observations of the received signal Doppler effects are transformed to radial profiles of atmospheric refractivity, from which we obtain profiles of electron density in the ionosphere, and of neutral atmospheric pressure, temperature, and neutral number density. The latter typically span the 40-90 km altitude range.

The polar orbit of Venus Express provides the opportunity to study the troposphere and mesosphere over all planetocentric latitudes and under varying illumination conditions. To date, more than 320 neutral atmospheric profiles have been retrieved during seven Venus Express occultation seasons through 2009.

With regard to the latitudinal and temporal variability of the thermal structure we find: i) the Venus mesosphere exhibits a high-degree of variability resulting from atmospheric waves and turbulence; ii) profiles of atmospheric static stability are latitude dependent, albeit always nearly adiabatic in the middle cloud region; iii) abrupt changes in the static stability can occur at the boundaries of the middle cloud layer, which is also latitudinal dependent. Correlations of wave activity with the static stability profile will be investigated.

Several profiles are located in the high northern latitude range providing an insight into the short and medium term changes of the vertical temperature structure near the cold collar and the polar vortices.