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The Structure of the Venus Neutral Atmosphere from the Radio Science Experiment VeRa on Venus Express

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The Venus Express Radio Science Experiment VeRa uses one-way radio signals at X-band and S-band for the sounding of the Venus neutral atmosphere and ionosphere. An Ultrastable Oscillator (USO) provides a high quality onboard frequency reference source for this dual-frequency one-way radio link. Simultaneous, coherent measurements at two wavelengths allow separation of dispersive media effects from the classical Doppler shift. Electron density profiles of the ionosphere and profiles of pressure, temperature and neutral number density of the neutral atmosphere can be derived via an Abel transform with an altitude resolution of only a few hundred metres from the cloud deck to $\sim$ 100 km.

Two occultation seasons took place in the first year of observation. A total number of 42 profiles occultation experiments were conducted. The polar orbit of Venus Express provides the opportunity to study the atmosphere at all planetocentric latitudes under varying illumination conditions. Special attention will be given to day-night variations of the atmospheric structure and the temperature distribution at high polar latitudes on both hemispheres (“cold collar region”) and signal absorption effects caused by the H2SO4 vapour.