

U003-24

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

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The Venus Express Radio Science Experiment VeRa performs routinely radio-sounding measurements of the Venus atmosphere and ionosphere as part of the ESA Venus Express (VEX) mission since 2006. 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. A total of more than 350 vertical scans of the Venus ionosphere and atmosphere were obtained in the first nine occultation seasons until the end of 2010.

The polar orbit of Venus Express provides the opportunity to study the troposphere and mesosphere between 40°–90° km at almost all planetocentric latitudes under varying illumination conditions.

The Venus mesosphere shows a high variability resulting from atmospheric waves and turbulence. Small scale temperature fluctuations originating from internal gravity waves with vertical wavelengths of only a few kilometers are detectable in the VeRa profiles. Standard wave theory can be used to analyze the observed wave structures with regard to their vertical and horizontal structure as a function of latitude and local time.

The ionosphere consists of a two layer structure between 115 km to 160 km. The main layer V2 is dominantly formed by solar EUV photoionisation, the lower V1 is formed by solar X-ray and dominant secondary ionization. The V1 and V2 peak altitudes and peak density show a Chapman-like behaviour through the range of solar zenith angle. The topside is highly variable and the ionopause is located at extremely low altitudes (250–330 km) during the declining phase of the solar cycle (2007-2008) and at solar minimum (2009-2010).

Keywords: Venus Express, VeRa, Venus Atmosphere, Venus Ionosphere, Atmospheric Waves, Radio Science