Geophysical Research Abstracts, Vol. 6, 04880, 2004
SRef-ID: 1607-7962/gra/EGU04-A-04880

ATMOSPHERIC, IONOSPHERIC, SURFACE, AND RADIO WAVE PROPAGATION STUDIES WITH THE VENUS EXPRESS

B. Häusler (1), M. Pätzold (2), G. L. Tyler (3), R. A. Simpson (3) and D. Hinson (3) M.K. Bird (4), R.A. Treumann (5)

(1) Institut für Raumfahrttechnik, Universität der Bundeswehr München, (Bernd.Haeusler@unibw-muenchen.de), (2) Institut für Geophysik und Meteorologie, Universität Köln, (3) Department of Electrical Engineering, Stanford University, (4) Radioastronomisches Institut, Universität Bonn, (5) Max-Planck-Institut für extraterrestrische Physik, Garching

The Venus Radio Science experiment (VeRa) onboard the Venus Express Orbiter is designed to make use of the spacecraft radio carrier signals at X-and S-band. An onboard ultrastable oscillator (USO) will serve as a highly stable reference frequency source (Allan deviation $\sim$10 ^{Ű13}) integrated into the onboard transponder system. Ground-based observations of VeRa will provide atmospherically / ionospherically induced Doppler frequency shifts, and fluctuations of the signal intensity and polarisation angles during bistatic radar measurements. From the observations, VeRa investigators will derive the vertical structure of the atmosphere above $\sim$37 km, the vertical structure of the ionosphere from 80 km to the ionopause (300km to 600 km) and infer roughness and dielectric properties of the Venusian surface.
Although atmospheric effects result from integrated effects over long distances along the ray path, Abel inversion of the observations yields a vertical resolution of 0.5-1 km, limited by diffraction. Atmospheric disturbances will be detected by variations in temperature at the 1 K level. The results are also expected to reveal the vertical structure of localized buoyancy waves, and the presence and properties of planetary waves. Signal intensity variations will provide information on the structure of H2SO4 vapor in the atmosphere, which can be seen as a tracer for atmospheric motions. Scintillation effects caused by diffraction of the radio wave within the atmosphere provide information of small scale turbulence effects in the atmosphere.

Observations of obliquely incident VeRa signals specularly reflected from the surface of Venus can provide insight into the surface roughness properties, and also clarify our understanding of its anomalous radio wave scattering properties, particularly the source of the apparent phase changes of materials in higher terrain.