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3.6 cm signal attenuation in Venus' lower and middle atmosphere observed by the Radio Science experiment VeRa onboard Venus Express

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Abstract

The planet Venus is shrouded within a roughly 20 km thick cloud layer, which extends from the lower to the middle atmosphere (ca. 50 – 70 km). While the clouds are mostly composed of sulfuric acid droplets, a haze layer of sulfuric acid vapor exists below the clouds. Within the cloud and the sub - cloud region Radio signal strength variations (intensity scintillations) caused by atmospheric waves and a decrease in the signal intensity caused by absorption by H_2SO_4 are observed by radio occultation experiments.

The Venus Express spacecraft is orbiting Venus since 2006. The Radio Science Experiment VeRa probes the atmosphere with radio signals at 3.6 cm (X-Band) and 13 cm (S-Band) wavelengths.

The disturbance of the radio signal intensity is used to investigate the cloud region with respect to atmospheric waves. The absorption of the signal is used to determine the abundance of H_2SO_4 near the cloud base. This way a detailed study of the H_2SO_4 abundance within the cloud and sub - cloud region is possible.

Results from the intensity scintillations within the cloud deck are presented and compared with gravity wave studies based on temperature variations inferred from VeRa soundings. Vertical absorptivity profiles and resulting sulfuric acid vapor profiles are presented and compared with previous missions. A distinct latitudinal dependence and a southern northern symmetry are clearly visible.