

Microwave absorptivity by sulfuric acid in the Venus atmosphere derived from the Venus Express Radio Science Experiment VeRa

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Abstract

Earth's nearest planetary neighbour Venus is shrouded within a roughly 22 km thick three-layered cloud deck, which is located approximately 48 km above the surface and extends to an altitude of about 70 km. The clouds are mostly composed of sulfuric acid. The latter is responsible for a strong absorption of radio signals at microwaves, which is observed in radio occultation experiments.

The absorption of the radio signal intensity is used to determine the abundance of H_2SO_4 . This way a detailed study of the H_2SO_4 height distribution within the cloud deck is possible.

The Venus Express spacecraft is orbiting Venus since 2006. The Radio Science Experiment VeRa onboard probes the atmosphere with radio signals at 3.4 cm (X-Band) and 13 cm (S-Band).

Absorptivity profiles of the 3.4 cm radio wave and the resulting vertical sulfuric acid profiles in the cloud region of Venus' atmosphere are presented. The three-layered structure and a distinct latitudinal variation of H_2SO_4 are observed. Convective atmospheric motions within the equatorial latitudes, which transport absorbing material from lower to higher altitudes, are clearly visible. Results of the Venus Monitoring Camera (VMC) and the Visible and Infrared Thermal Imaging Spectrometer (VIRTIS) are compared with the VeRa results.

