

Sulfuric acid vapor (H_2SO_4) abundance as a trace gas for atmospheric dynamics in the atmosphere of Venus derived from Venus Express Radio Science Experiment VeRa

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Abstract

A roughly 20 km thick cloud layer, mostly consisting of liquid sulfuric acid, embraces the entire planet Venus between ca. 50 and 70 km altitude. A haze layer consisting of sulfuric acid vapor exists below ca. 50 km. A decrease in the Radio signal intensity caused by defocusing and absorption is observed by radio occultation experiments within the cloud and the sub-cloud region. 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 absorption of the radio signal power is used to determine the abundance and the global distribution of H_2SO_4 in the Venus atmosphere down to an altitude of ca. 40 km. Vertical absorptivity profiles and resulting sulfuric acid vapor profiles are presented and compared with previous missions and other experiments on Venus Express. A distinct latitudinal dependence and a north/south symmetry are clearly visible. The global distribution of H_2SO_4 reflects the dynamics in the Venus atmosphere. The results are used to derive information on the transport processes in the lower and middle atmosphere.