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The global distribution of H_2SO_4 in the atmosphere of Venus as a trace gas for atmospheric dynamics derived from Venus Express Radio Science Experiment VeRa

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Abstract

The entire planet Venus is covered by a roughly 20 km thick cloud layer, consisting of liquid and gaseous sulfuric acid between ca. 50 and 70 km altitude. The density of the gaseous part increases and forms a ca. 15 km thick haze layer below ca. 50 km. The haze layer is responsible for the absorption of radio signals during radio occultation experiments. The absorption of the radio signal is a tool to derive the amount of H_2SO_4 as a function of altitude and latitude. The Radio Science Experiment VeRa sounds the Venus atmosphere with radio signals at 3.6 cm (X-Band) and 13 cm (S-Band) wavelengths. The derived atmospheric absorption profiles show the global H_2SO_4 distribution as a tracer of the predominant transport processes in the atmosphere of Venus. Vertical sulfuric acid vapor profiles are presented and compared with previous missions and other experiments on Venus Express. A distinct latitudinal H_2SO_4 gradient and a southern northern symmetry are clearly visible. Furthermore indications for temporal H_2SO_4 variations were found, at least at higher latitudes. The observed global H_2SO_4 distribution is used to derive information on the transport processes in the lower and middle atmosphere with respect to a 2D transport model.