EPSC Abstracts
Vol. 13, EPSC-DPS2019-1692-1, 2019
EPSC-DPS Joint Meeting 2019


EPSC
EPSC-DPS Joint Meeting 2019
15–20 September 2019 | Geneva, Switzerland

# SULFURIC ACID VAPOR IN THE ATMOSPHERE OF VENUS AS OBSERVED BY THE VENUS EXPRESS RADIO SCIENCE EXPERIMENT VERA

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## Abstract

The main cloud deck within Venus' atmosphere, which covers the entire planet between approx. 50 and 70 km altitude, is believed to consist mostly of liquid sulfuric acid. Below the main clouds the temperature is high enough to evaporate the $H_2SO_4$ droplets into gaseous sulfuric acid forming a haze layer which extends to altitudes as deep as 35 km. Gaseous sulfuric acid in Venus' lower atmosphere is responsible for a strong absorption of radio waves as seen in Mariner, Pioneer Venus, Magellan and Venera radio science observations. Radio wave absorption measurements can be used to derive the amount of $H_2SO_4$ in Venus' atmosphere. The radio science experiment VeRa onboard Venus Express probed the atmosphere of Venus between 2006 and 2014 with radio signals at 13 cm (S-band) and 3.6 cm (X-band) wavelengths. The orbit of the Venus Express spacecraft allowed to sound the atmosphere over a wide range of latitudes and local times providing a global picture of the sulfuric acid vapor distribution. We present absorptivity and $H_2SO_4$ profiles derived from X- and S-band signal attenuation for the time of the entire Venus Express mission. More than 600 $H_2SO_4$ profiles show the global sulfuric acid vapor distribution covering the northern and southern hemisphere on the day- and night side of the planet. A distinct latitudinal $H_2SO_4$ gradient and a southern northern symmetry are clearly visible. Observations over 8 years allow to study also long-term variations. Indications for temporal $H_2SO_4$ variations are found, at least at northern polar latitudes. The results shall be compared with observations retrieved by other experiments (VIRTIS, SPICAV) onboard Venus Express as well as with previous observations like Mariner, Pioneer Venus and the Magellan spacecraft. Additionally, the observed $H_2SO_4$(g) distribution will be compared with results achieved from a 3D mass transport model.

## 1. Acknowledgements

This work was funded by the European Union Seventh Framework Program (FP7/2007-2013) and by the German Space Agency (DLR) under grant 50QM1401.