



First observations of SO₂ above Venus' clouds by means of solar occultation in the infrared

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The experiment SOIR (Solar Occultation in the Infra-Red) – a part of the Venus Express mission – is performed for study of gaseous and aerosol vertical structure in Venus' mesosphere. The instrument of SOIR is an acousto-optical (AO) echelle spectrometer that operates at wavelengths 2.2-4.3 μm with high spectral resolution ($\lambda/\Delta\lambda \sim 30000$). The spectrometer is capable to detect important minor gaseous constituents such as CO, SO₂, HCl, HF, H₂O and HDO at altitudes 65-110 km. Here we report results from 6 occultation sessions with observation of 4 μm SO₂ band at latitudes 69°-88° N and 23°-30° N. It's the first time of SO₂ vertical distribution retrieval above Venus' clouds by means of solar occultation. Since sulfur dioxide spectrum of transmission is measured on a background of abundant CO₂ band around 4 μm , it is impossible to retrieve any separate SO₂ line for observing and fitting. This fact forces us to do modeling of combined spectrum (CO₂*SO₂) and to perform fitting with appropriate mixing ratio of SO₂ by comparison between the combined model and a measured spectrum (using least-squares method). As result, just a few points of a SO₂ vertical profile can be detected clearly (~ 0.1 ppm at high latitudes and ~ 1 ppm at low latitudes at the altitude about 70 km). All the rest points provides upper limit of the gas' mixing ratio (< 0.05 ppm at 75 km and higher).