

Study of aerosol above the upper boundary of the clouds on the night side of Venus from VIRTIS-M VEX observations

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VIRTIS-M is a mapping spectrometer on Venus Express. It worked on orbit around Venus from 2006 to 2009 years. There were obtained a lot of spectacular results on the night side of Venus in two geometries of measurements: nadir and limb modes. Night side limb images show existence of scattering radiation above the main cloud layer up to 85-90 km indicating for existence of haze above the clouds. The haze scatters the thermal radiation of the lower atmosphere in the spectral windows from 1 to 2.3 μm . In the 4-5 μm spectral range we observe both: scattered thermal emission of the upper clouds and thermal emission of the haze. This thin haze may be observed on the limb only, because of advantages in airmass by factor of 40, comparing to the nadir observations. Polar orbit of Venus Express with pericenter at 75 N latitude allows to carry out limb measurements in the northern hemisphere. From the distance of 15 000 km from the planet, the haze vertical profile is obtained with vertical resolution of 2.5 km. Detached layer is observed often in the 1.74 and 2.3 μm between 75-85 km. The parameters of aerosol in the haze are obtained by inverting the vertical limb intensity profile. We used methods of retrieval, based on inverse problem solution for transfer equation [1],[2]. The process of retrieval is fast convoluted when using single channel for the case of model and observed profiles. Vertical extinction

profile (even number density) is obtained using single window, but mode of particle sizes distribution may be found only including in consideration all windows. Detached layer is observed often in the 1.74 and 2.3 μm spectral windows on altitudes of 75-85 km, but only in some cases at 1.18 μm . We produced synthetic vertical profiles of the limb intensity taking into account multiple scattering. Source function is calculated for the case of plane parallel atmosphere by DISORT (Stammes et al.1988), it was integrated along the path afterward. The line-by-line calculation for gases is made by method of Ignatiev [3]. Vertical profiles of limb intensity were calculated for the model of Venus atmosphere and clouds with detached layers with different parameters. It was found that shape of vertical profile of limb intensity in different spectral windows depends on the shape of aerosol vertical profile (detached layer), its optical depth, mode of particles sizes distribution.

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