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SPICAV/SOIR mesospheric aerosols observations and characterization

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SPICAV/SOIR on-board Venus Express is able to target the layer of aerosols above the cloud layer at the terminator in the 118–320 nm (SPICAV-UV), the 0.65–1.7 μm (SPICAV-IR) and the 2.2-4.3 μm (SOIR) spectral region. From independent retrievals for the 3 channels of the SPICAV/SOIR instrument, it has been postulated that the upper haze on Venus includes, in some instances, a bimodal population, one type of particle with a radius comprised between $\sim$0.1 and 0.3 μm and the second type, detected in the IR, with a radius varying between $\sim$0.4 and 1 μm [1].

In this work, the retrieval of the size distribution of aerosols in the upper haze of Venus was refined through a unique retrieval procedure combining the data from the 3 channels of the instrument. It is based on Mie theory and on the observed spectral dependence of light extinction in the spectra. A dependence on altitude of the aerosol particles size distribution and of aerosol composition is also investigated.

We will present the analysis of a subset of SPICAV/SOIR orbits with simultaneous solar occultation transmission spectra for the 3 channels. The optical model was built using mean radius values (r1 and r2) between 0.01 μm and 1.0 μm. For bimodal size distributions, the ratio between the number of bigger particles and the number of smaller particles can vary between 10^{-4} and 10^{-1}. Values of the refractive index for H_2SO_4/water droplets were found in the literature for concentrations between 64% and 87% H_2SO_4.

First results show that the H_2SO_4 concentration in the particles decreases with increasing altitudes and that in some instances the fit of the extinction over the whole spectral range is improved when using a bimodal size distribution. At the equator, the upper haze is found at higher altitudes than near the North Pole and the H_2SO_4 concentration found is lower for a given aerosol loading.

Next, we plan to extend the analysis to the full data set and to build an H_2SO_4 concentration gradient with altitude and with latitude in order to retrieve only the size distribution when fitting the spectral dependence of the extinction.

References

[1] Wilquet, V., A. Fedorova, F. Montmessin, R. Drummond, A. Mahieux, A.C. Vandaele, E. Villard, O. Korablev, and J.-L. Bertaux. J. Geophys. Res., 114 (E00B42), doi:10.1029/2008JE003186, 2009.