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SOIR/VEX mesospheric aerosols observations and modelling

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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 (Wilquet et al., 2009). A high temporal variability in the aerosol content in Venus' atmosphere was inferred from SOIR observations, as well as a latitudinal dependency of the aerosol loading (Wilquet et al., 2012). This is in agreement with results from previous missions and with the facts that (i) H2SO4 aerosol particles are formed through SO_2 photo-oxidation and hydration at the cloud top of Venus, (ii) SO_2 photolysis is more efficient at low latitudes, (iii) the altitude of the cloud top is up to one scale height lower in the polar region than at the equator.

A increasing SO_2 abundance with increasing altitude was recently observed with SPICAV-UV at altitudes of $\sim$ 85-105 km (Belyaev et al., 2012) but also from microwave ground-based spectra in the Venus mesosphere (Sandor et al., 2010), which suggest a source of SO_2 at high altitudes. Zhang et al. (2012) proposed a one dimensional photochemistry-diffusion model in order to reconcile these puzzling findings; he suggested that H2SO4 might be a source of SO_2 above 90 km through aerosol evaporation followed by SO_3 photolysis. This model and the observations are however disputed by others demonstrating the necessity for a more global interpretation of the observations and for modelling of the upper haze layer. For example, the variations in aerosol loading can be compared to other key parameters of the atmosphere retrieved from the same SOIR spectra such as water and SO_2 composition or temperature. In addition, a microphysical model is being developed that will calculate the time dependent haze particle size distributions assuming an initial size distribution of background sulphate aerosols. The model will simulate the formation, growth, evaporation, and sedimentation of particles. Results of this on-going research will be presented and discussed.

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