Diagnostic of Venus aerosols from SPICAV /AOTF polarization measurements 0.6 to 1.7 -µm day side

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Looking at nadir the solar light scattered by ground and aerosols, the SPICAV AOTF NIR spectrophotometer (0.6 to 1.7 µm,) records the intensity and the polarization as a function of wavelength

To investigate the nature of Venus cloud particles, Kawabata et al. (1980) have compared the measured polarization from Pioneer Venus Orbiter to theoretical values from Mie theory, computed for single scattering of unpolarized light by poly-dispersed spherical particles, as a function of Phase angle and the Mie parameter $2 \pi r_{eff}/\lambda$ (r_{eff}, effective radius of particle). Only the value of 1.45 for the refraction index was fitting the observations of Venus, supporting the H_2SO_4 composition of Venus cloud droplets at 85 % concentration.

Because of bi-refringent properties of TeO_2 crystal, the AOTF separates the incoming beam into two beams which illuminates two detectors. The two beams are fully linearly polarized, with orthogonal directions. The crystal is mounted on the S/C (body X,Y,Z), looking nadir in the Z direction, with the polarization axis of the crystal coinciding with the S/C axis X and Y.

The nominal attitude of VEX on the day side when looking at nadir is “solar optimized”, which means that the sun is kept always in the XZ plane; the solar panels are rotated around Y, to place them always perpendicular to the sun. This is an ideal situation to measure the polarization of the solar light scattered by particles, because the light is polarized with axis in the plane of scattering (XZ) and perpendicular to the plane of scattering (YZ). Therefore, the degree of polarization P is recorded for each nadir measurement, for the whole range of wavelength (0.6 to 1.7 µm), in addition to the total flux. The phase angle is the local SZA (Solar Zenith Angle). Variations of P with phase angle may be obtained on a statistical basis, or during special "latitude track" observations.

In order to reach a high accuracy, the two channels must be cross-calibrated in intensity response. This may be done when the phase angle =0, because in such case P=0 for symmetry reasons. Polarization measurements made with SPICAV will be presented.