

Polarization signatures of Mars dust and clouds

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Abstract

The atmosphere of Mars hosts primarily three types of aerosols: H₂O ice, CO₂ ice and dust. We study the scattered polarimetric signatures of these aerosols and study their dependence on different shapes and size distribution. Several observations have been made to understand the nature and distribution of these aerosols but uncertainties still remain and there is a lack of detailed polarimetric observations of Mars. In this talk, I will present the single scattering polarimetric signatures of shapes like spheroids, cylinders, discs etc for Martian aerosols and then I will also show the polarisation signatures of realistic scenarios on Mars for various observation geometries (see figure below). It will include cases of only dust, dust with water ice clouds and dust with carbon-di-oxide clouds. I will also discuss the difference in the polarization signatures of water ice clouds and carbon-di-oxide clouds. Future observations of Mars atmosphere with ISRO's upcoming Mars mission will be able to study these polarimetric signatures with the help of PRISM (Polarisation sensitive Infrared Spectroscopy of Mars) instrument on-board MoM-2.

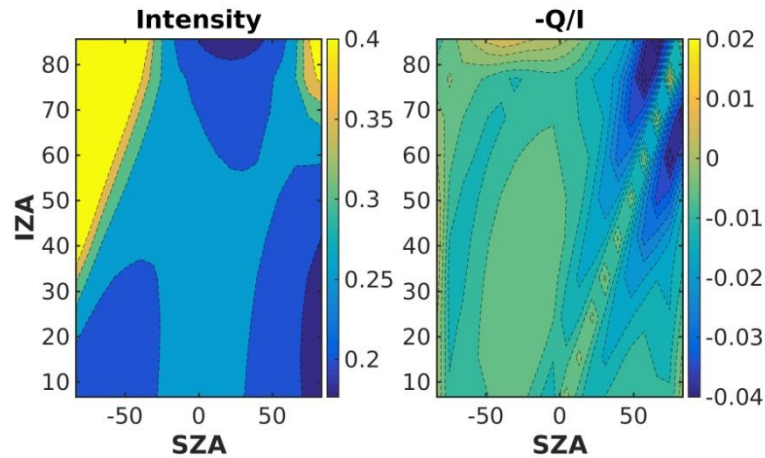


Figure: The intensity (I) and polarisation (-Q/I) signatures of cloud covered Mars atmosphere for various Instrument Zenith Angle (IZA) and Solar Zenith Angle (SZA). The water ice cloud is considered of optical depth ~ 0.6 and the total optical depth of the atmosphere is about 1.5. The dust and water ice are considered to be cylindrical in shape and the simulations are done at 1200nm.