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Introduction: In this presentation, we will focus on the first series of results obtained by the Imaging Ultraviolet Spectrograph (IUVS) while performing stellar occultations observations. In the IUVS wavelength range, CO2 possesses a distinct and broad signature shortward of 200 nanometers which allows one to retrieve CO2 concentration and subsequently to deduce atmospheric pressure and temperature profiles from 30 to 150 km of altitude (upper troposphere up to the thermosphere) as well as the concentration of other atmospheric constituents (clouds/aerosols, ozone).

IUVS observations: IUVS is one of the nine science instruments flying onboard the Mars Atmosphere and Volatile and Evolution (MAVEN) that was inserted in Mars orbit on September 21st, 2014. Among several sounding modes [1], IUVS has the ability to perform stellar occultation the same way as the SPICAM instrument on Mars Express [2,3].

The occultation technique relies on the determination of atmospheric transmission at various altitudes above the surface. Only relative measurements are needed to infer species abundances, and thus the method is self-calibrated. An occultation sequence requires a change of the MAVEN Articulated Payload Platform attitude to allow the instrument target a specific star and place it at the desired location on the focal plane. Along the orbital trajectory of MAVEN, the spacecraft maintains this attitude long enough to let a spectrum be acquired both from outside and through the atmosphere. The slant path to be outside the atmosphere when the tangential altitude is sufficiently high so that absorbing species are not scarce they do not affect the appearance of the light source. This is the altitude range at which a reference spectrum of the star will be collected. The ratio of spectra taken through and outside the atmosphere gives an atmospheric transmission at each altitude above the point on the surface that is closest to the IUVS line of sight. If any absorbing or/and scattering species are present along the optical path between the star and the spacecraft, photons are lost and resulting transmissions are lower than 1.

The sampling frequency yields a vertical resolution typically greater than 3 km once projected in the limb plane. For Mars, the sounded region inside which a quantity of atmospheric constituents can be derived lies generally between 20 and 140 km. Above 140 km, the signature of species is known from SPICAM to be too weak to be separated from instrumental noise. Below 20 km, the tangential opacity of the planetary haze is in principle too large to let IUVS cannot collect photons at any wavelength.

Temperature retrieval: Using standard hydrostatic equilibrium, vertical distribution of CO2 concentration permits further inversion of the temperature profile from above 50 km to above 140 km depending on the dusty conditions encountered at the times of the measurements [3,4].

Before Mars Express and Mars Climate Sounder missions, the state of the Martian atmosphere above 40 km was poorly constrained. Interestingly, the EDL-phase measurements performed by the ASI/MET experiment onboard Pathfinder revealed that the temperature around 80 km was below the freezing point of CO2. Several observations since then have shown the existence of mesospheric CO2 ice cloud layers, consistent with the earlier findings of Pathfinder. One of the objectives of the IUVS stellar observations will be the further characterization of the atmospheric conditions that are associated with the occurrence of these mesospheric clouds.

First results: On January 23rd, 2014; the first campaign of stellar occultations will be conducted with IUVS, yielding a first snapshot of the Martian atmospheric state a few months after MAVEN orbit insertion. These observations will be analyzed and presented at the conference.