

The MARS EXPRESS Limbs Observations Database.

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The capability to orient Mars Express makes it possible to implement a great diversity of observations modes, in particular nadir and limb (fig 1). During day and night limb's observations, 4 out of 7 MEX instruments (the spectrometers: SPICAM[1], OMEGA [2], PFS [3] and the high-resolution camera HRSC [4]) work together to provide spectra (.12 μm to 45 μm) of the Martian atmosphere (dust and clouds detached layers, day and night emissions), at each altitude step, with the associated image.

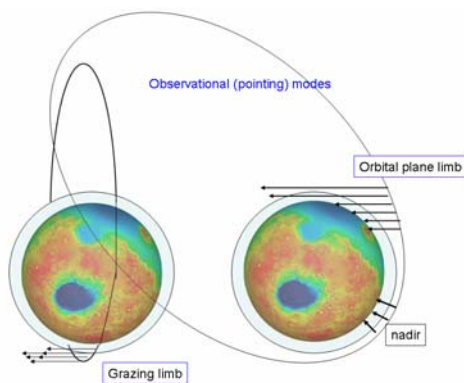


Fig 1 : Mars Express pointing modes relevant for limb observations by remote sensing instruments.

Until now, the data reduction of observations of the limb from each Mars Express instrument had been done separately. Examples of the potential of each data set are given in Figures 2,3,4,5). We present here a database which makes it possible to retrieve the limb observations from different Mars Express instruments relevant for a given location and time frame. The limb database is now accessible to the scientific community via the ESA/PSA website (www.rssd.esa.int/PSA).

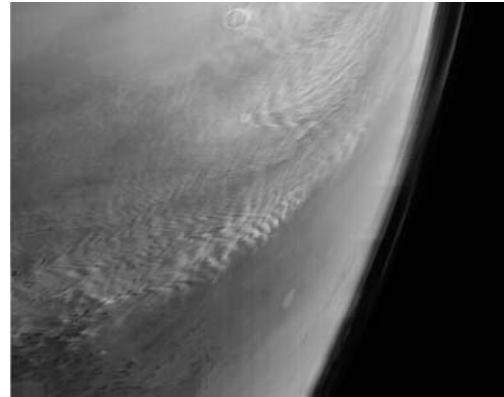


Fig 2: detached layer observed by HRSC

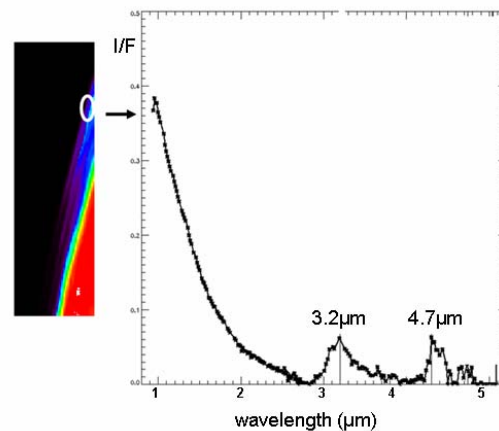


Fig 3: image (left) and spectrum (right) of a dust detached layer (~ 40 kms) observed over the Hellas basin by OMEGA (L_s : 310°, local time: 18h). Two major emission lines are observed at 3.2 μm (H_2O ice) and 4.7 μm (CO)

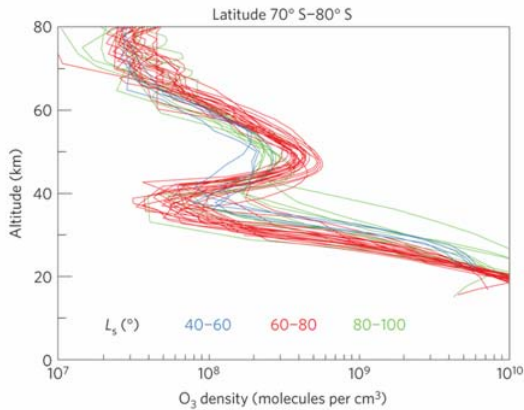


Fig 4: a synthesis of SPICAM data showing the prominent southern polar ozone layer around 50km

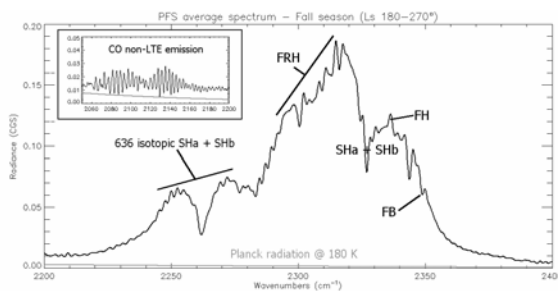


Fig 5: An average of about 3000 PFS limb spectra, selected during the fall season ($180^\circ < L_s < 270^\circ$), in the southern hemisphere (latitude $< 0^\circ$), and for tangent altitudes between 50 and 200 km. Several emission bands can be easily identified in the spectrum. FB, FH, SH, TH, and FRH mean fundamental, first hot, third hot, and fourth hot bands, respectively. The small top-left panel shows the CO emission spectrum at $4.7 \mu\text{m}$ for the same average. The gray curve is the Planck radiation at 280 K.

The cross-linking of observations of clouds and detached dust layers in the Martian atmosphere at different wavelengths as provided by the “limbs” database in the ESA Mex archive should constitute a useful reference for interpreting each data set and modeling processes in the upper atmosphere of Mars.

Reference: [1] Bertaux, J.L. ., et al., SPICAM: Observing modes and overview of UV spectrometer data and scien-

tific results, JGR vol 111 , 2006 ; [2] Bibring, J.P. ., et al., OMEGA: Observatoire pour la Minéralogie, l’Eau, les Glaces et l’Activité, ESA SP 1240, 37-49, 2004a ; [3] Formisano, V. et al, PFS onboard the European Mars Express Mission PSS 40, 963-974, 2005 ; [4] Neukum, G. et al HRSC: The High Resolution Stereo Camera of Mars Express ESA SP 1240, 2004b