



Ground-based high-resolution IR spectroscopy of Mars: H₂O, H₂O₂ and a search for CH₄

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Infrared spectroscopic observations of Mars have been obtained in June 2003 around 8 microns ($L_s = 209$ deg.), at high spatial and spectral resolution ($R = 70000$), using the Texas Echelon Cross Echelle Spectrograph (TEXES) (Lacy et al., 2002) mounted at the 3-m NASA/Infrared Telescope Facility (IRTF). These observations led to the first mapping of H₂O₂ at 8 microns (Encrenaz et al., 2004), a mapping of H₂O, a search for CH₄ and a determination of the ¹⁸O/¹⁷O and ¹³C/¹²C in martian CO₂ (Encrenaz et al., 2005). New measurements have been obtained on Nov. 30 - Dec. 4, 2005 ($L_s = 332$ deg.). A preliminary reduction seems to indicate that both H₂O₂ and H₂O are globally less abundant than in 2003 by about 30-50 percent. In all spectra, the CO₂ martian lines also show an interesting peculiarity : in the dark side of the planet, close to the East limb (morning side), the lines appear in emission. This probably indicates a temperature inversion between the surface and the atmosphere, the surface being colder before dawn. These data will be used to constrain the diurnal variations of the thermal profile over the martian disk. The H₂O map will be compared to Mars Express results, and the H₂O₂ map adds yet another constraint to its local and seasonal behaviour. A new search for CH₄ will be performed ; the expected sensitivity limit of the methane mixing ratio is a few tens of ppb.

References : Encrenaz T et al., 2004. Hydrogen peroxide on Mars : evidence for spatial and temporal variations. *Icarus* 170, 424-429. Encrenaz et al., 2005. Infrared imaging spectroscopy of Mars : H₂O mapping and determination of CO₂ isotopic ratios. *Icarus* 179, 43-54. Lacy J H et al., 2002. A sensitive high-resolution grating spectrograph for the mid-infrared. *Pub. Astron. Soc. Pacific* 114, 153-168.