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The Martian dayglow as seen by SPICAM UV spectrometer on Mars Express

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SPICAM UV spectrometer on board Mars Express performed its first observation of the Martian dayglow on the 23^{rd} January 2004, more than 30 years after the last measurements of the dayglow by Mariner 9. SPICAM UV has now operated during almost two Earth years and shall continue to observe the Martian dayglow for two more years thanks to the decided extension of the duration of Mars Express mission. In this paper, we describe a first set of measurements of the Martian dayglow obtained by SPICAM UV spectrometer between October 2004 and March 2005. A detailed description of the method used to extract the main thermospheric and exospheric parameters is given as well as a short introduction on the main mechanisms leading to the Martian dayglow emission. This first set of observations cover a period of the Martian year between Ls=100˚ and Ls=171˚, in solar zenith angle range between 14 and 105˚ and in altitudes above 100 km. The solar activity was on its decreasing phase, with F10.7 varying from 130 to 80 in average.

The typical spectra (more than 24,000 individual spectra) display the main features of the dayglow already reported more than 30 years ago by the first UV observations of the Martian upper atmosphere (Barth et al. 1971; 1972). However, some slight differences in the spectral distribution of some emissions of the Martian dayglow may be due either to calibration uncertainties in the earlier measurements or to variations of the mechanisms leading to these emissions due to changes in the Martian atmosphere and of the solar conditions. The variation vs altitude, solar zenith angle and aerocentric longitude of the intensity of the main emissions, namely the Cameron band emissions $a^3\Pi$ – $X^1\Sigma^+$, the CO_2^+ $B^2\Sigma^+$ - $X^2\Pi$ emission at 289 nm, the O 130.4 nm emission

and the H Lyman alpha illustrates the dependency of these emissions with respect to solar activity and Martian season. The exospheric temperature emission is in an average of 184 K when deduced from the CO_2^+ $B^2\Sigma^+$ - $X^2\Pi$ emission at 289 nm. The altitude of the peak of the dayglow emission varies from 120 km at low solar zenith angle (30˚) up to 132 km at high solar zenith angle (75˚). We also provided for the 24 orbits studied in this paper, the individual exospheric temperature which does not show significant variations with respect to solar zenith angle, aerocentric longitude or longitude. The presence of the crustal field seems to induce a significant increase of the temperature of the upper atmosphere. This enhancement may indicate the existence of a crustal magnetic field in the northern hemisphere. We report also the first observations of emissions which could be associated to the N_2 Vegard Kaplan band system in the Martian upper atmosphere.

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