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Observing and modelling Mars' airglow

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Abstract

SPICAM is the UV spectrometer onboard ESA's Mars Express, which has been recording for more than four years upper atmospheric emissions ([1], [2]). 70000 dayglow limb spectra were analysed using an updated and variable point spread function, yielding altitude profiles of the Cameron bands ($a^3\Pi - X^1\Sigma$) of CO, the CO_2^+ ultraviolet doublet ($B^2\Sigma_u^+ - X^2\Pi_g$) at 289 nm and the oxygen emission at 297.2 nm. The seasonal evolution of these emissions (Fig. 1) exhibits an unexpected increase around $L_S = 140$ degrees, which is correlated with a sudden increase of neutral densities due to a dust storm event. A comparison with a newly-developed kinetic electron and airglow model ([3], [4]) yields promising results on emission altitude profiles. Improvements on the neutral atmosphere and cross sections are discussed. The new data analysis performed enables the search for faint emissions underlying the main Cameron emission bands. This comparison and analysis work is being extended to nightside auroral emissions using multi-instrument data on Mars Express.

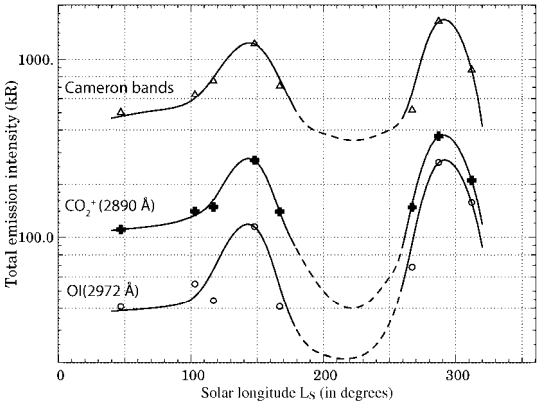


Fig. 1 Seasonal evolution of the total emission intensities (in kR) of the Cameron bands, the CO_2^+ ultraviolet doublet and OI(2972Å). L_S is the Solar Longitude expressed in degrees. Two peaks are present, one near perihelion ($L_S \sim 290°$), the other during northern spring ($L_S \sim 140°$) which is correlated with an unexpected dust storm event.

References

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