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Retrieving exospheric temperatures from dayglow emissions at Mars

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The Martian dayglow has been recorded by the UV spectrometer SPICAM onboard Mars Express since 2004. A new data analysis of the SPICAM limb dataset is presented following the description of Simon et al. (2009), with emphasis on the main emissions such as the CO Cameron bands, the $CO_2^+(B-X)$ ultraviolet doublet and OI (2972Å) as well as their discretisation versus solar longitude, solar zenith angle and latitude. These emissions depend on photoexcitation, electron impact excitation and dissociation processes, and could be good tracers of the CO_2 density profiles.

Exospheric temperatures are then retrieved from the individual dayglow altitude profiles using two different techniques. The first one uses a direct fit of the emission profiles by a set of barometric, Chapman-beta and Epstein functions to derive a scale height and hence an associated temperature. The second technique uses a forward kinetic transport model, called *aeroplanet*, in combination with inverse techniques to reproduce the emissions: the CO_2 densities are then adjusted dynamically and an exospheric temperature is derived from them.

Results suggest that the CO_2^+ emission is the best candidate for an accurate retrieval of exospheric temperatures and that, at the altitudes considered between 120 and 180 km, the isothermal behaviour of the atmosphere may not always be reached.

Variations with solar longitude of the exospheric temperatures are investigated by the MTGCM global circulation model and compared with the observations. Good agreement with observations is found for solar longitudes ranging from 140° and 300°, for solar minimum to moderate conditions.