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Observations of the ultraviolet nitric oxide nightglow emission with SPICAM/MEx in the stellar occultation mode

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The SPICAM instrument on board Mars Express confirmed the presence of nightglow as a feature of the Martian atmosphere through a clear detection of the hydrogen Lyman-α and the nitric oxide (NO) δ and γ bands (Bertaux et al., 2005)[1]. Cox et al. (2008)[2] analyzed 21 orbits containing limb observations of the NO ultraviolet emissions: the maximum brightness of these observations is in the range 0.2 to 10.5 kR and it peaks between 55 and 92 km in altitude. The NO γ and δ emissions arise from the recombination of O(^{3}P) and N(^{4}S) at night which forms excited NO.

We here report on the analysis of the NO observations by SPICAM in the stellar occultation mode without slit, which is 50 times more sensitive than when the slit is used. A method, using a forward model and an inverse algorithm to estimate the vertical structure of the emission brightness, was developed by Royer et al. (2010)[3] to analyse such type of observations from the analogue instrument on Venus Express, SPICAV. The method has been adapted to extract useful information from the SPICAM data sets and the results from the processing of several orbits will be shown.

Moreover, a total inversion algorithm is being implemented to retrieve the vertical structure of the observed airglow emission. This approach gets rid of the assumption that a Chapman layer is the preferred vertical structure, which is not necessarily appropriate for analysing observations from a limb-viewing geometry. The method will be explained and preliminary results from the analysis of several orbits will be shown and contrasted with the results using the foward/inverse approach.

[1] J. L. Bertaux et al. Nightglow in the upper atmosphere of Mars and implications for atmospheric transport. *Science*, 307(5709):566–569, 2005.

[2] C. Cox et al. Distribution of the ultraviolet nitric oxide Martian night airglow: Observations from Mars Express and comparisons with a one-dimensional model. *Journal of Geophysical Research-planets*, 113(E8):E08012, 2008.

[3] E. Royer, et al. NO emissions as observed by SPICAV during stellar occultations. *Planetary and Space Science*, 58(10):1314–1326, 2010.