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Martian visible and ultraviolet dayglow: altitude, latitudinal and seasonal variations observed with NOMAD/TGO

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The OI 557.7 nm green line has been measured in the Martian dayglow for the first time with the UVIS visible-ultraviolet spectrograph on board ESA's Trace Gas Orbiter (Gérard et al., 2020). The first observations started in April 2019 in a special mode where the spacecraft is tilted to observe the limb with the UVIS nadir channel (Vandaele et al., 2015, Patel et al., 2017). The instrument detected the presence of bright green dayglow emission on every of those observations. The main peak altitude is located near 80 km, and its intensity varies as a result of the changing distance from sun, the local time and latitude of the observations. A second, less pronounced, emission peak is observed near 110 km. Photochemical model simulations (Gkouvelis et al., 2018) used the MCD density distribution (Forget et al., 1999) have been made to understand the sources of this airglow emission. It is able to reproduce the altitude and the brightness of the airglow layer. It indicates that the green line dayglow on Mars is essentially produced by photodissociation of CO_2 molecules by solar far ultraviolet radiation (Fox & Dalgarno, 1979). A fraction of the oxygen atoms is formed in the ^1S metastable state that produces the green emission.

In this presentation, we describe additional dayside observations obtained since December 2019. For this purpose, the spacecraft has been used in a special mode where it is re-oriented so that the UVIS channel observed the sunlit limb (Lopez-Valverde et al., 2018). We analyse the observed limb profile variations and the changing altitude of the peak emission resulting from the variations of the pressure levels in the mesosphere (Gkouvelis et al., 2020). The measured intensities are compared with model calculations of the $O(^1S)$ density in the conditions of the observations. The ratio of ultraviolet spectral features relative to the oxygen emission also observed with UVIS will also be analysed.

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