Geophysical Research Abstracts
Vol. 21, EGU2019-15643, 2019
EGU General Assembly 2019

Ozone vertical profiles from NOMAD-UVIS: a preliminary analysis

Arianna Piccialli (1), Ann Carine Vandaele (1), Yannick Willame (1), Cedric Depiesse (1), Loïc Trompet (1), Lori Neary (1), Sebastien Viscardy (1), Frank Daerden (1), Ian R. Thomas (1), Bojan Ristic (1), Jon P. Mason (2), Manish R. Patel (2), Giancarlo Bellucci (3), and Jose-Juan Lopez-Moreno (4)

(1) Belgian Institute for Space Aeronomy (BIRA-IASB), Planetary Aeronomy, Uccle, Brussels, Belgium (arianna.piccialli@aeronomie.be), (2) Open University, UK, (3) INAF, Istituto di Astrofisica e Planetologia Spaziali, Italy, (4) IAA/CSIC, Granada, Spain

Ozone is a highly reactive species on Mars. In particular, it displays steep gradients across the terminator due to photolysis [4]. Odd hydrogen radicals play an important role in the destruction of ozone. This results in a strong anti-correlation between O_3 and H_2O [4].

Here, we will present first retrievals of ozone vertical profiles obtained from NOMAD-UVIS solar occultations. NOMAD will help us improve our knowledge of the climatology of ozone and of its complex photochemistry.

The NOMAD (Nadir and Occultation for MArs Discovery) – operating onboard the ExoMars 2016 Trace Gas Orbiter satellite – started to acquire the first scientific measurements on 21 April 2018.
It is a spectrometer composed of 3 channels: 1) a solar occultation channel (SO) operating in the infrared (2.3-4.3 μm); 2) a second infrared channel LNO (2.3-3.8 μm) capable of doing nadir, as well as solar occultation and limb; and 3) an ultraviolet/visible channel UVIS (200-650 nm) that can work in the three observation modes [1,2]. The UVIS channel has a spectral resolution <1.5 nm. In the solar occultation mode it is mainly devoted to study the climatology of ozone and aerosols content [3].

We will present first retrievals of ozone vertical profiles. NOMAD-UVIS spectra are simulated using the line-by-line radiative transfer code ASIMUT-ALVL developed at IASB-BIRA [5]. In a preliminary study based on SPICAM-UV solar occultations (See [6]), ASIMUT was modified in order to take into account the atmospheric composition and structure at the day-night terminator. We followed the same method described in [7] to check that the spectra are correctly calibrated and accurately normalized to the solar spectrum. As input for ASIMUT, we used gradients predicted by the 3D GEM-Mars v4 Global Circulation Model (GCM) [8,9] and the UK version of the LMD GCM. UVIS ozone profiles will also be compared to SPICAM-UV retrievals.

References:
[1] Vandaele, A.C., et al., Planetary and Space Science, Vol. 119, pp. 233–249, 2015.
[2] Neefs, E., et al., Applied Optics, Vol. 54 (28), pp. 8494-8520, 2015.
[3] M.R. Patel et al., In: Appl. Opt. 56.10 (2017), pp. 2771–2782. DOI: 10.1364/AO.56.002771.
[4] Lefèvre, F., et al., Aug. 2008. Nature 454, 971–975.
[5] Vandaele, A.C., et al., JGR, 2008. 113 doi:10.1029/2008JE003140.
[6] Piccialli, A., EPSC 2018.
[7] Trompet, L., et al., 2016. Applied Optics 55, 9275-9281.
[8] Neary, L., and F. Daerden (2018), Icarus, 300, 458–476, doi:10.1016/j.icarus.2017.09.028.
[9] Daerden, F.; et al., GRL, 2015, 42, 18, 7319-7326.