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First retrievals of ozone vertical profiles from NOMAD-UVIS

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Abstract

The NOMAD (Nadir and Occultation for MArs Discovery) – operating on board the ExoMars 2016 Trace Gas Orbiter mission – started to acquire the first scientific measurements on 21 April 2018.

Here, we will present first retrievals of ozone vertical profiles obtained with NOMAD UVIS solar occultations.

1. The NOMAD UVIS channel

NOMAD is a spectrometer operating in 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 <1.5nm. In the solar occultation mode it will be mainly devoted to study the climatology of ozone and aerosols content [3].

2. Ozone retrievals

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]. NOMAD will help us improve our knowledge of the climatology of ozone and of its complex photochemistry.

We will present first retrievals of ozone vertical profiles. NOMAD-UVIS spectra will be simulated using the line-by-line radiative transfer code ASIMUT-ALVL developed at IASB-BIRA [5], and the NEMESIS code [10] developed for use on NOMAD-UVIS data at the Open University. 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 will follow 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 will use 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.

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