

Preliminary results on carbon dioxide and temperature profiles from NOMAD SO

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Introduction

NOMAD (Nadir and Occultation for MArS Discovery) [1, 2] is one of the four instruments on-board the ExoMars 2016 Trace Gas Orbiter (TGO). It consists of three high-resolution spectrometers, SO, LNO and UVIS. It can operate in different geometries: solar occultation, limb and nadir. The SO channel started to make solar occultation measurements on April 21, 2018. It is performing optimally and is now regularly making solar occultation measurements of the atmosphere of Mars.

1. The NOMAD SO channel

The SO channel is dedicated to solar occultation measurements, and is a copy of the SOIR instrument [3] that operated successfully during the entire Venus Express mission. It is an infrared spectrometer working in the 2.2 to 4.3 μm spectral range (2325-4545 cm^{-1}) with a spectral resolution that varies from 0.15 to 0.2 cm^{-1} . The instrument is composed of an echelle grating in a near Littrow configuration, and an Acousto-Optical Tunable Filter (AOTF) for the diffraction order selection [4].

The orbit of TGO is circular at an altitude of 400 km. During a solar occultation, six diffraction orders are scanned every second. The spectra are recorded for each order at a one second interval and are summed in 4 bins. In this configuration, the vertical sampling of the SO channel is always smaller than 1 km.

2. Profiles retrievals

One of the radiative transfer code used to retrieve NOMAD vertical profiles is ASIMUT-ALVL [5]. This code, developed at BIRA-IASB, is based on the Optimal Estimation Method [6] and includes the

analytical calculation of the Jacobians [6]. It can be used for different geometries including solar occultations. From CO₂ vertical profiles, temperature profiles are obtained using the hydrostatic equation and the ideal gas law, similar to the work that was accomplished using the SOIR instrument spectra [7].

The preliminary results of retrieved CO₂ and temperature vertical profiles from the SO channel will be presented, discussed, and compared to results obtained by other instruments as well as models.

Acknowledgements

The NOMAD experiment is led by the Royal Belgian Institute for Space Aeronomy (BIRA-IASB), assisted by Co-PI teams from Spain (IAA-CSIC), Italy (INAF-IAPS), and the United Kingdom (Open University). This project acknowledges funding by the Belgian Science Policy Office (BELSPO), with the financial and contractual coordination by the ESA Prodex Office (PEA 4000103401, 4000121493), by MICIIN through Plan Nacional (AYA2009-08190 and AYA2012-39691), as well as by UK Space Agency through grant ST/P000886/1 and Italian Space Agency through grant 2018-2-HH.0. The research was performed as part of the “Excellence of Science” project “Evolution and Tracers of Habitability on Mars and the Earth” (FNRS 30442502). This research was supported by the FNRS CRAMIC project under grant number T.0171.16 and by the BrainBe SCOOP project.

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