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Update on CO2 and temperature profiles from NOMAD-SO on board ExoMars TGO

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The NOMAD-SO channel [1, 2] is an infrared spectrometer working in the 2.2 to 4.3 µm spectral range (2325-4545 cm^{-1}). The instrument is composed of an echelle grating coupled to an Acousto-Optical Tunable Filter for the diffraction order selection [3]. NOMAD started to perform solar occultation measurement on April 21, 2018. As TGO is on a quasi-circular orbit at around 400 km of altitude, it performs one orbit every two hours. During a solar occultation measurement, SO scans six diffraction orders each second. These diffraction orders are recorded on four bins leading to a vertical sampling below 1 km. The calibration of the SO channel is described in [4] and is being refined.

NOMAD-SO regularly scans different diffraction orders containing CO2 lines to allow CO_2 retrievals from low to high altitudes. For each solar occultation measurement, we derive a slant column profile of CO_2 using ASIMUT-ALVL [4]. ASIMUT is a radiative transfer program developed at BIRA-IASB and based on the Optimal Estimation Method [5]. The GEM-Mars GCM provides the a priori profiles of CO_2 local density, pressure and temperature. We then apply Tikhonov linear regularization on the slant column to derive a smoothed local density. We finally apply the hydrostatic equilibrium equation and the ideal gas law to derive the temperature profiles [6-8]. That derived temperature profile serves then in a new loop where we perform again the previous steps until the profiles converge [8]. Several comparisons are ongoing with joint or co-located measurements from MAVEN-EUVM, Maven-NGIMS, and TGO-ACS-NIR as well as with GCM derived profiles from GEM-Mars and LMD-MGCM. We derived the NOMAD-SO CO_2 and temperature profiles for MY34 with solar longitudes (Ls) extending from 298° to 326°. That time range contains the regional dust storm of MY34 that started at Ls 317°. We will present the updated CO2 and temperature profiles from NOMAD-SO measurements

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