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CO and O2 in the Martian atmosphere with ACS NIR onboard TGO.

Anna Fedorova[1], Franck Lefèvre[2], Alexander Trokhimovskiy[1], Oleg Korablev[1], Franck Montmessin[2], Francois Forget[3], Kevin Olsen[4], Mikhail Luginin[1], Alexander Lomakin[1], Nikolay Ignatiev[1], Denis Belyaev[1], Andrey Patrakeev[1], and Juan Alday[4]

[1]Space Research Institute (IKI) RAS, Physics of planets, Moscow, Russian Federation (fedorova@iki.rssi.ru)
[2]LATMOS-UVSQ, Guyancourt, France
[3]Laboratoire de Météorologie Dynamique, Sorbonne Université, Paris, France
[4]AOPP, Oxford University, Oxford, United Kingdom

The molecular oxygen (O2) and carbon oxide (CO) are minor constituents of the Martian atmosphere with the annual mean mixing ratio of (1560 ± 60 ppm) and (673 ± 2.6 ppm), respectively (Krasnopolsky, 2017). Both are non-condensable species and their latitudinal variations are induced by condensation and sublimation of CO_2 from the polar caps that result in enrichment and depletion and seasonal variations are following the total CO_2 amount in the atmosphere.

The Atmospheric Chemistry Suite (ACS) is a set of three spectrometers (-NIR, -MIR, and -TIRVIM) intended to observe Mars atmosphere onboard the ESA-Roscosmos ExoMars 2016 Trace Gas Orbiter (TGO) mission (Korablev et al., 2018). The near infrared channel (NIR) is a compact spectrometer operating in the range of 0.7–1.7 μm with a resolving power of λ/Δλ ~ 25,000. It is designed to operate in nadir and in solar occultation modes. The simultaneous vertical profiling of the O_2 and CO density at altitudes of 10-60 km based on 0.76 μm and 1.57 μm bands, respectively, is a unique feature of the ACS NIR science in occultation. In this work we present the seasonal and latitudional distribution of the O_2 and CO mixing ratios obtained for period of 2018-2020 (MY34 and35) and the comparison with the LMD General Circulation model. We report the averaged mixing ratio for CO of ~950 ppm and for O2 of~1800 ppm at low altitudes (~20 km). Also, we detected extremely enriched CO layer at 10-15 km in the southern polar region at Ls=100-200° both for MY34 and MY35.