Geophysical Research Abstracts
Vol. 21, EGU2019-14878-1, 2019
EGU General Assembly 2019


# The $O_2$ vertical profiles in the Martian atmosphere with the ACS-NIR onboard TGO ExoMars

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The molecular oxygen is the minor constituent of the Martian atmosphere with the mean mixing ratio of (1.56 $\pm$ 0.06) $10^{-3}$. As it is a long-lived incondensable species (with the lifetime $\sim$60 years) the $O_2$ mixing ratio should have latitudinal variations induced by condensation and sublimation of $CO_2$ from the polar caps that result in enrichment and depletion and seasonal variations following the total $CO_2$ amount in the atmosphere. The $O_2$ column-averaged mixing ratio was provided by several ground-based observations as well as by Herschel orbiting observatory. Now the high precision measurements of the $O_2$ mean surface mixing ratio were obtained by the quadrupole mass spectrometer as a part of Mars Science Laboratory at the Curiosity rover.

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. The near infrared channel (NIR) is a compact spectrometer operating in the range of 0.7–1.7 $\mu$m with a resolving power of $\lambda/\Delta\lambda \sim$ 25,000. It is designed to operate in nadir and in solar occultation modes. A vertical profiling of the $O_2$ density based on 0.76 $\mu$m band is a unique feature of the ACS NIR science in occultation. No other instrument on a Mars orbiting platform being sensitive to $O_2$ from 10 to 60 km altitude range. Here we present the first results of the $O_2$ density retrievals from the ACS/NIR solar occultations for the first year of observations and the comparison with the LMD General Circulation model.