EPSC Abstracts
Vol. 12, EPSC2018-790-1, 2018
European Planetary Science Congress 2018

Performance and the sensitivity of the ACS MIR channel, first months of solar occultations

Alexander Trokhimovskiy (1), Anna Fedorova (1), Andrey Patrakeev (1), Nikita Kokonkov (1), Jean-Loup Bertaux (1,2), Alexey Shakun (1), Franck Montmessin (2), Oleg Korablev (1)
(1) Space Research Institute (IKI), Moscow, Russia, (2) LATMOS/CNRS, Guyancourt, France (a.trokh@gmail.com)

Abstract

The Atmospheric Chemistry Suite (ACS) package is a part of Russian contribution to ExoMars 2016 Trace Gas Orbiter (TGO) ESA-Roscosmos mission for studies of the Martian atmosphere and climate [1]. The cross-dispersion ASC MIR spectrometer was designed to meet major scientific goal of the mission – precise observations of known and trace atmospheric components. Having both, high spectral resolution and signal to noise ratio (SNR) of acquired spectra, MIR channel operates in solar occultation only. The spectral range of MIR is 2.3-4.24 μm. Regular observations from Martian orbit have started in April 2018. For the upper layers of the atmosphere the standard deviation of the calibrated transmittance spectra calculated for a single detector line is better than 0.02%. Detector lines coadding can be used to obtain a further increase of the SNR yet at the expense of a decrease in vertical resolution. The tangent altitude range of observations through the Martian atmosphere starts from several kilometers above the surface, increasing up to 200 kilometers where strong CO_2 lines can still be detected in the thermosphere.

The most tantalizing goal of ACS MIR is to do sensitive measurements of methane with detection threshold at ppt level. Besides methane, ACS MIR will be able to establish new results for a number of minor species: C_2H_2, C_2H_4, C_2H_6, HO_2, H_2O_2, H_2CO, HCl, SO_2, OCS etc. For the first time in Mars exploration of the vertical profile of the HDO/H2O ratio in Martian atmosphere will be performed. The spectral range of spectrometer includes several CO_2 absorption bands allows to measure density, temperature profiles and isotopic ratios. The short-wavelength side of MIR's spectral range is extended to cover almost the whole carbon monoxide band.

The general performance, sensitivity levels and further observation plans of the ACS MIR will be presented.

Acknowledgements

ExoMars is the space mission of ESA and Roscosmos. The ACS experiment is led by IKI Space Research Institute in Moscow. The project acknowledges funding by Roscosmos and CNES. Science operations of ACS are funded by Roscosmos and ESA. Science support in IKI is funded by Federal agency of science organizations (FANO).

References

[1] Korablev, O., Montmessin, F., and ACS Team: The Atmospheric Chemistry Suite (ACS) of three tpectrometers for the ExoMars 2016 Trace Gas Orbiter, Space Sci. Rev., 214:7, 2018.