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## Hunting for Methane on Mars: one Martian year of survey with ACS on TGO

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## Hunting for Methane on Mars: one Martian year of s on TGO

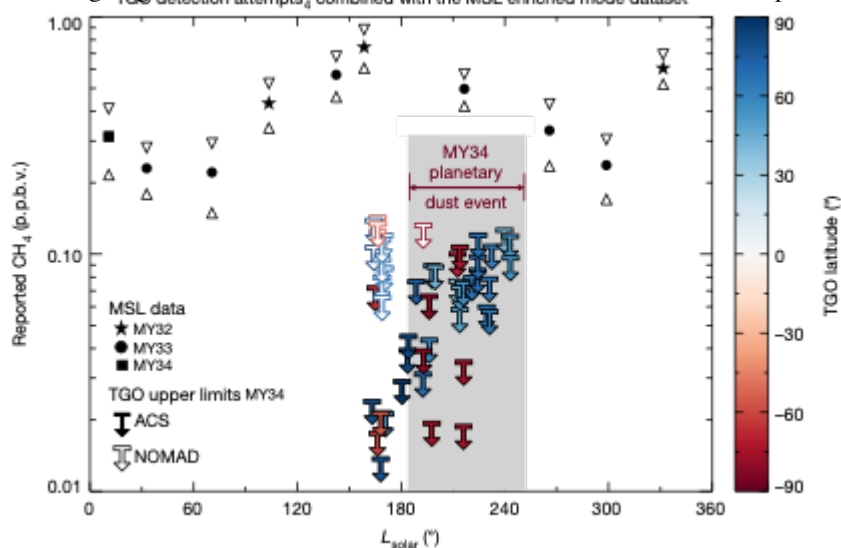
**Franck Montmessin** et al.

### Abstract

The Atmospheric Chemistry Suite (ACS) [1], one of the four science experiments on board ESA-Rosetta Orbiter (TGO) mission has started science operations in March 2018. ACS consists of 3 infrared unambiguous detection of trace gases of potential geophysical or biological interest. The dataset reports detection attempts conducted during the first complete Martian year (almost two Earth years) of occultation observing mode in orbit around Mars.

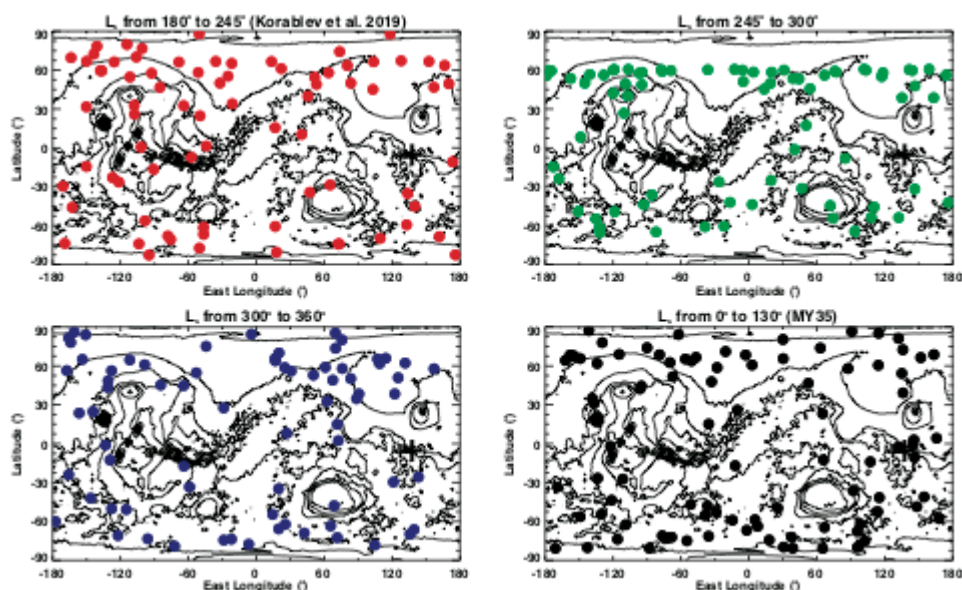
The Trace Gas Orbiter (TGO) of the ESA-Roscosmos ExoMars mission has ended its trip to Mars, reached Mars. After a year-long aerobraking phase, its scientific mission has begun on April 22<sup>nd</sup>, 2018 with the execution of the primary objective of TGO is to detect, map and locate trace gas sources, possibly revealing biological activity on Mars. The instrument of interest here is the infrared spectrometer Atmospheric Chemistry Suite (ACS) covers a wavelength range from 0.7 to 17  $\mu\text{m}$  at very high spectral resolution ( $\lambda / \Delta\lambda$  from 5,000 to 50,000) during solar occultation. Its performances complete the TGO trace gas detection arsenal together with NOMA and TGO.

A large part of the first months of the ACS observing mission has enabled the sensitive search of gas composition and fraction of the Martian globe. The results from the first occultation up until early September 2018 incidentally covered the onset, the full development, and the demise of the Planetary Encircling Dust Storm (PEDS) instruments orbiting currently around Mars. Observing conditions proved more favourable than anticipated cases to probe the Martian atmosphere close to the surface (<5 km) where the MSL Curiosity rover has detected seasonally varying background level of CH<sub>4</sub> concentrations ranging between 240 and 650 pptv [2].



The first five months of ACS CH<sub>4</sub> detection attempts were reported in [3], revealing the absence of methane on the Martian globe (Figure 1). Part of the attempts at that time was impaired by the presence of abundant dust, which prevented observing the lower troposphere of Mars (<30 km) where methane, if detectable, presumably would be found.

The ACS dataset analyzed here covers a period of more than 25 months, which is five times more data than was previously analyzed. This gives us a chance to perform a deeper exploration into the potential presence of methane on Mars, which may have implications for our understanding of active geophysical and physicochemical processes prevailing at Mars.



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