



The ExoMars Trace Gas Orbiter – Status and First Results

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The ExoMars programme is a joint activity by the European Space Agency (ESA) and ROSCOSMOS, Russia. It consists of the ExoMars 2016 mission, launched 14 March 2016, with the Trace Gas Orbiter, TGO, and the Entry Descent and Landing Demonstrator, EDM, named Schiaparelli, and the ExoMars 2020 mission, to be launched in July 2020, carrying a Rover and a surface science platform to the surface of Mars.

The TGO scientific payload consists of four instruments: ACS and NOMAD, both spectrometers for atmospheric measurements in solar occultation mode and in nadir mode, CASSIS, a multi-colour camera with stereo imaging capability, and FREND, an epithermal neutron detector for search of subsurface hydrogen. The mass of the TGO is 3700 kg, including fuel and the mass of EDM was 600 kg. The EDM was carried to Mars by the TGO and was separated three days before arrival at Mars but unfortunately failed during the last stage of the descent.

TGO arrived at Mars on 19 October 2016 and used aerobraking to reach its final semi-circular 400 km altitude orbit with 74 degrees inclination. After a full check-out the science observations started on 21 April 2018. The present status of the spacecraft and its payload is excellent.

After nearly a year of science operations a wealth of data has been collected. The rise, main phase and decay, of the 2018 global dust storm, was monitored carefully and its influence on several parameters of the atmosphere has been recorded. The spectrometers have monitored the effect on water vapour, both H₂O and HDO, which is significant. Throughout the year, several trace gasses have been mapped out in three dimensions and with time, and thermal profiling has been regularly performed.

Maps of subsurface water(-ice) have been made using the results from the the FREND instrument and the radiation environment has been characterised.

The CaSSIS camera has made a high number of images over a large variety of targets, including the landing sites of the 2020 ESA and NASA rovers, Oxia Planum and the Jezero Crater. Stereo imaging has enabled topographic information and precise 3-D landscape synthesis.

TGO has, due to the vicinity of Mars in 2018, been able to operate a high data rate and has been downloading about 30-40 Gbit per day in this period. Now that Mars continues to move away and the data rate is being reduced, the task of optimising the operations is getting more demanding.