

Mars Exploration (3)
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EXOMARS TRACE GAS ORBITER MARS ATMOSPHERE AND GRAVITY SCIENCE
EXPERIMENT SOC SUPPORT – STATUS UPDATE

Abstract

The first mission of the ExoMars program, the Trace Gas Orbiter (TGO), undertaken in partnership between ESA and Russia's Federal Space Agency (Roscosmos) studies the Martian atmosphere searching for methane and other gases that may be present in small concentrations. TGO reached Mars orbit on October 19, 2016, and after aerobraking, it started its final science and operational data relay phase in early 2018 reaching a 400 km near-circular orbit. Tracking data from all these mission phases are collected and analysed by TGO's Mars Atmosphere and Gravity Science Experiment Working Group (MAGSE WG). MAGSE WG makes use of ground infrastructure as well as spacecraft subsystems. During the orbital phase of the mission, X-band is used for uplink for commanding, and downlink for telemetry return and tracking. Deep-space ground stations from ESA, NASA and Russia's Roscosmos track TGO. Doppler shift in the radio communications signal that can be used to determine the gravitational field of Mars. The gravity field also helps determine the density of the atmosphere and track seasonal changes of carbon dioxide deposited on the surface. TGO's Doppler tracking data provides insights into the Mars exosphere and time-variable gravity (post-aerobraking). ESA's Science Operations Centre (SOC) is responsible for science planning and operation of TGO, as well as low-level processing and archiving of the resulting data in the ESAC Planetary Science Archive (PSA). The Mars Atmosphere and Gravity Science Experiment Working Group (MAGSE WG) acts as a liaison between the guest investigator and ESA. MAGSE WG coordinates the process that ensures a proper data provision mechanism to the guest investigator, starting with the data requirements to conduct the MAGSE investigation. The SOC Data Processing pipeline receives raw telemetry from the Mission Operations Centre at ESOC and generates PDS4 products for inclusion in the PSA. Products for the archive are grouped into containers known as collections and these in turn are grouped into bundles of collections, following the PDS4 standard. For TGO there are bundles for each instrument plus a separate bundle for generic mission data, with a typical instrument bundle containing separate collections for different processing levels plus calibration, documentation, ancillary and other distinct data types. This presentation will give an overview of the TGO's MAGSE investigation and ESA's support to provide the required products to the guest investigator and archiving for the working group.