

## THE EXOMARS 2016 DATA ARCHIVE WITHIN THE PSA

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**Introduction:** The ExoMars (Exobiology on Mars) programme is a joint programme of the European Space Agency and Roscosmos with a contribution from NASA. It is comprised of two missions. ExoMars 2016, is the first of these missions and was launched in March 2016. The main element is the Trace Gas Orbiter (TGO) which is aimed at studying trace gasses in the Mars atmosphere and their context. The spacecraft also carried the test lander Schiaparelli mainly aimed at demonstrating landing technology but carrying a small science payload. The second mission, the ExoMars 2020 Rover and Surface Platform (RSP) mission is due to be launched in July 2020. This will carry full scientific payloads on both the landing platform and a rover. The mission will investigate the Mars surface and sub-surface context for biological signatures for a duration of six months.

After arrival of the Exomars 2016 mission at Mars in October 2016 the TGO and Schiaparelli separated and a landing attempt was made. Successful demonstrations of many technologies resulted but the landing failed at the final stages due to a sensor error. In January 2017 the TGO transitioned to its aerobraking phase. The aerobraking has been nominal and this is expected to be complete in March/April 2018 reaching a final 400 Km, circular, 2 hour, science orbit inclined at around 74 degrees. A six week commissioning phase will follow aerobraking where Nadir only observations will be made. The following sixteen weeks will consist of Nadir plus Solar Occultation measurements with a limited set of pointing modes as the spacecraft transitions to normal science observations. Currently the mission is due to end in early-2020.

**ExoMars 2016 in the PSA:** The ExoMars 2016 data is hosted by the ESA Planetary Science Archive (PSA) and it is the first operational mission to use the PDS4 standard within the PSA. This has presented a number of challenges. Unlike other PDS archives, the PSA is both a cross-mission and a cross-discipline archive, so PDS4 implemented for ExoMars 2016 needs to also accommodate other types of mission and instrument data. Hence the development of PSA schema and Exomars 2016 data structures has been done in collaboration with the teams from the Bepi-Columbo, the ExoMars 2020 RSP and the JUICE missions.

The introduction of the PDS4 standard to a multi-mission archive made the development of a new data

model necessary and it soon became clear that a new PSA, able to host both PDS3 data from ongoing and legacy missions and the new PDS4 data, was required. The new PSA was released publicly in January 2017. It currently has two user interfaces, an FTP interface allowing users to browse public data, and a GUI user interface which enables guided cross-mission searches of both proprietary and public data. Data can be downloaded directly from this interface and a login is required for proprietary data download.

Currently almost all ExoMars 2016 products in the PSA are Raw and Partially Processed data produced at the ExoMars 2016 Science Operations Centre at ESAC from raw telemetry received from the ESA Mission Operations Centre at ESOC, Darmstadt, and are immediately sent to the PSA. This has presented a further challenge as, for the first time, the PSA is being used as an operational archive with deliveries of data to the archive being made daily.

Most of the cruise and early orbit data will not undergo higher processing by the instrument teams. Therefore calibrated and higher level data products will only be delivered to the PSA during the science phase and most of these products are still in definition.

Following public release the PSA has undergone several enhancements, mainly to the backend and in support of changes made by the Exomars 2016 mission team to data structures and labels.

**Summary:** This presentation will describe the PSA from a user perspective and will describe current functionality and planned improvements to be made in 2018 and 2019. It will also detail the implementation of PDS4 in the PSA and cover the cross-mission aspects of this design, and challenges with the approach. It will further describe the implementation and status of the ExoMars 2016 specific data design.