

## The ExoMars Rover Science Archive: Status and Plans

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### Abstract

The ExoMars program is a co-operation between ESA and Roscosmos comprising two missions: the first, launched on 14 March 2016, included the Trace Gas Orbiter and Schiaparelli lander; the second, due for launch in 2020, will be a Rover and Surface Platform (RSP).

The ExoMars Rover and Surface Platform deliveries will be among the first data in the PSA to be formatted according to the new PDS4 Standards, and will be the first rover data to be hosted within the archive at all.

The archiving and management of the science data to be returned from ExoMars will require a significant development effort for the new Planetary Science Archive (PSA). This presentation will outline the current plans for archiving of the ExoMars Rover and Surface Platform science data.

### 1. The ExoMars Rover Archive Challenge

PDS4 data are already available within the PSA, so this in itself does not present the biggest challenge for the archive. However, when this is combined with the fact that it will be delivered from a moving platform on another planet, a whole host of new challenges arise.

For example, there are significant differences in the way in which a scientist will want to query, retrieve, and use data from a suite of rover instruments as opposed to remote sensing instrumentation from an orbiter. This is well demonstrated by NASA's *Analysts Notebook*, which has developed a strong user community interaction for the exploitation of science data from their rovers. It is likely that similar approach will be needed for the future PSA, and discussions are underway with our NASA counterparts to understand how we may be able to work towards this.

Such an interface is a long way detached from the type of experience currently offered to users of the PSA data, and will require not only major updates to the front-end of the archive, but also new ways to manage and access meta-data that is specific to a rover operations. A significant amount of operational information is required by an end user to understand what the rover was doing at the time of an observation, and how it was working in connection with other instrumentation. This type of information will need to be carefully formatted and stored in an easily accessible form for the end-user.

Data and information will need to flow between the Rover and the Surface Platform as well, so ESA and Roscosmos are coordinating very closely to ensure that information is shared and interfaces are established at a very early stage to permit this.

### 2. Data Production and the Archiving Process

In addition to the archiving interface itself, there are differences with the overall archiving process being followed for ExoMars compared to previous ESA planetary missions.

For the Rover mission, the data pipelines are being developed by European industry, in close collaboration with ESA PSA experts and with the instrument teams. The first level of data processing will be carried out for all Rover instruments at ALTEC in Turin where the pipelines are developed, and from where the Rover operations will also be run. The pipelines themselves are being constructed based on software that has been developed by ESA personnel for use on the ExoMars 2016 mission.

This setup introduces additional challenges in terms of ensuring that the science products that are output from the ALTEC pipelines are compliant with the internal needs of the external ESA archive, as well as those of the end users and instrument teams.

To mitigate this, ESA are coordinating very closely with our colleagues in ALTEC to follow the pipeline development and assess the outputs wherever possible. Additionally, a 'Data Handling and Archiving Working Group' (DHAWG) has been established. Lead by ESA, this working group includes data producers from ALTEC, and members from every instrument team as well as our colleagues from Roscosmos and the Surface Platform. This forum will be used throughout the development of the mission to coordinate the data archiving activities, and will continue through the complete mission lifetime to track the archiving progress and ensure that the process from data reception through to ingestion and release in the archive is as smooth as possible.

### **3. Summary**

This presentation will focus on the challenges involved in archiving the data from the ExoMars Rover and Surface Platform, and will outline the plans and current status of the system being developed to respond to the needs of the missions.

### **Acknowledgements**

The authors would like to acknowledge the efforts of ALTEC, Roscosmos and the ES Project in their support of the ExoMars Rover archiving development.