The Rosetta Science Archive: Enhancing the Scientific Content

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Abstract

This presentation will outline the current status of the Rosetta archive, as well as highlighting some of the ‘enhanced archiving’ activities that have been completed in 2019.

1. Introduction

On 30 September 2016, Rosetta completed its incredible mission by landing on the surface of comet 67P/Churyumov-Gerasimenko. Although this marked an end to the spacecraft’s active operations, intensive work is still ongoing, with the instrument teams updating their science data in response to recent scientific reviews and delivering them for ingestion into ESA’s Planetary Science Archive (PSA) \cite{1}. In addition to this, ESA is working with a number of instrument teams to produce new and enhanced data products and to improve documentation in an effort to provide the best long-term archive possible for the Rosetta mission.

2. Rosetta Science Archive Status

All science data from the Rosetta mission are hosted jointly by the Planetary Science Archive (PSA) at ESA (http://psa.esa.int) \cite{1}, and by NASA’s PDS Small Bodies Node (SBN).

The long duration of the Rosetta mission, along with its diverse suite of instrumentation and the range of targets observed throughout its lifetime combine to make this an extremely challenging mission to archive \cite{2}. A number of independent data reviews have taken place over the course of the mission in an attempt to track the evolution of the data pipelines from each instrument and ensure that the science data are documented and formatted in the best possible way to allow end-users to exploit them. The last of these took place in May 2019, and focused on final deliveries to close the archive content. The outcome of the review was very positive; the Rosetta archive is clearly in good scientific shape. There were nevertheless several issues raised, and the instrument teams and the PSA are working to implement the fixes requested this year.

It should be noted that teams have been asked to re-run all of their older data through the new pipelines to ensure we have consistently the best and most up to date data available in the final archive.

3. Rosetta Enhanced Archiving

Once the resources from the operational mission came to an end, ESA established a number of joint
activities with the Rosetta instrument teams to allow them to continue to work on enhancing their archive content. The updates planned were focused on key aspects of an instrument’s calibration or the production of higher-level data / information, and are therefore very specific to each instrument’s needs.

Almost all instrument teams have now provided a Science User Guide for their data, which have been highly appreciated by the scientists in the recent reviews. Many teams have also updated their calibrations to deliver higher level and/or derived products.

For example, OSIRIS has delivered data with improved calibrations, as well as straylight corrected, I/F corrected, and three-dimensional georeferenced products. These are all already available in the archive. They now also provide data in FITS format, and have added quicklook versions of their products to allow an end-user to more easily identify the images they may be interested in. Internal straylight data and boresight corrected / full frame data were also added to the archive early this year. A full re-delivery of all pre-comet data using the latest pipelines has also been made and is currently being prepared for ingestion.

Similarly, the VIRTIS team will update both their spectral and geometrical calibrations, and deliver mapping products to the final archive.

The Rosetta Plasma Consortium (RPC) instrument suite has worked on cross-calibrations that will greatly improve the final data to be delivered from each experiment, as well as a number of activities individual to each instrument. The RPC team has also produced an illumination map of the comet to help with their cross-calibration work.

The MIDAS team has similarly been working on instrument cross-calibrations and has produced a dust particle catalog from the comet coma.

The GIADA team has delivered higher-level products in the form of dust environment maps, with omnidirectional plus time.

The COSIMA team recently delivered a ground-based catalog of spectra for comparison to help calibrate and understand their in-flight data.

A separate activity has also been established to produce and deliver data set(s) containing supporting ground-based observations of the comet. These data were taken simultaneously with Rosetta operations and could provide some important contextual information. Samples of these products were included in the recent scientific review, and it is clear that the development is on the right track. This activity will be closed out this autumn.

In addition, the Rosetta ESA archiving team is producing calibrated data sets for the NAVCAM instrument, will archive the radiation monitor data produced by the SREM instrument on Rosetta and will be working to include the latest shape models from the comet into the final Rosetta archive. The last of the Philae lander science data will also soon be added to the archive. Finally, a spacecraft housekeeping volume is being developed with key parameters from the operations.

### 4. Final Archive Reviews

The last big ‘mission archive review’ was held with independent reviewers in May 2019 to assess the final deliverables from the archive enhancement phase. A number of additional small reviews will be needed for upcoming deliveries such as the Spacecraft Housekeeping and SREM data. Together, these reviews will ensure that the ultimate Rosetta archive within the PSA will allow for scientists to fully exploit the data holdings for decades to come.

### 5. Summary

With the support of the instrument teams and the completion of the archive enhancement, the Rosetta archive can become an immensely valuable resource for scientists in years to come, and the full scientific potential of the mission can be realized.
References
