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MATISSE: the ASDC tool to access and visualize Solar System exploration data

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Abstract

At the present time planetary exploration data are generally stored in "old style" archives, i.e., common ftp repositories where the user needs to manually search the data by browsing into the directories.
However, because of the increasing size of archives, this method is becoming very time consuming, subtracting time to the scientific part of the work.
Therefore the ASI Science Data Center Solar System Exploration (ASDC-SSE) group started to implement a tool software to access and visualize data of the planetary exploration mission, thus reducing the time spent looking for the data and, finally, allowing data-fusion.
The tool, named MATISSE (Multi-instrument Advanced Tool for the Instruments for the Solar System Exploration), during its first year of development has been mainly devoted to data from the ESA Rosetta mission but recently, thanks to its modular structure, it has been expanded to include NASA Dawn data (VIR instrument).

1. Introduction

In planetary sciences, design, development and launch instruments in space are only preliminary steps toward the final aim of converting data into scientific knowledge, as the real challenge is the data analysis and interpretation.
Up to now the scientific capabilities of the different missions have been seriously limited by the way in which the data are stored and archived, i.e., in ftp servers where no query is allowed: in order to search for data of interest, a researcher must manually browse into ftp directories and download large files to be analyzed afterward. Finally, even at the end of this process, the data are far from being accessible as code must be written to read and scientifically analyze them.
In the recent years the number of space missions dedicated to the exploration of the Solar System sensibly raised and this have exponentially increased the quantity of scientific data. In a perspective of "data fusion" exploitation such an approach would be time consuming, eroding the time dedicated to scientific analysis.
For this reason, taking advantage of the long term experience of the ASDC in supporting the astrophysics community in manage and analyze data (e.g., [1-4]), the Solar System Exploration group is developing MATISSE, a tool software to access, visualize and analyze planetological data.
MATISSE is web based, accessible via browser and with no need of installing software, making it a really accessible tool and furthermore, in order to really have a powerful instrument, collaborations with the scientific teams of the instruments involved are ongoing.

2. MATISSE current version

During the first year of development (i.e., 2013) efforts have been made mainly to use data from the ESA Rosetta mission [5], but the modular design of the tool easily allows to add new features and now MATISSE also ingests data from the VIR spectrometer [6] onboard NASA Dawn mission [7].
To encourage the collaboration with the scientific teams, MATISSE is online, in a Prototype version, since January 2013: in this way users can test its characteristics and suggest improvements to be done.
However the tool is open to all the community: after registration it is accessible at https://tools.asdc.asi.it/matisse.jsp and allows to perform queries to its database, containing both public and private data from OSIRIS [8], VIRTIS-M [9], GIADA [10] onboard Rosetta and VIR onboard Dawn.
The searchable parameters are both geographical (e.g., latitude, longitude) and geometrical (e.g., emission, phase and incidence angles)
It is possible to select the geographic area to display and the color tables to visualize the data. Once the

visualization is made interaction with the final output is allowed using the mouse, zooming or rotating the target object to better show the data (Fig. 1), while planned upgrades include the possibility of visualize spectra and other data by clicking on the surface.
Data-fusion capabilities are already present and the user can obtain mosaics by averaging different observations by the same instrument or other higher order products by, for example, dividing one observation by another (also with different instruments).

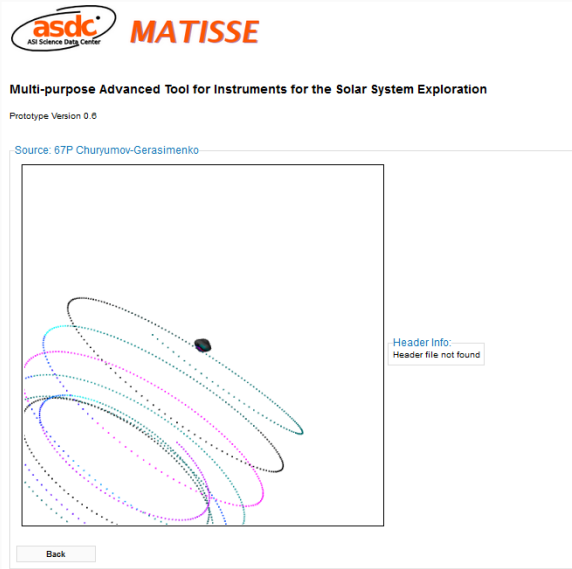

Figure 1: GIADA simulated particle flux around the comet nucleus, as shown with MATISSE.

3. Future developments

MATISSE currently easily manages data acquired over solid surfaces and in precise points in the space around them, but the current challenge is to correctly visualize the coma as seen by remote sensing instruments and some experiments are being conducted to solve this problem.
Another task to be fulfilled is the visualization of big objects, that are hardly shown in a web browser. In this case an offline solution is ready to be used, exploiting the capabilities of the Paraview [11] software, fed with downloaded data created by the online version of MATISSE.
Together with this one other web-based solutions are under study.
Finally a robust definition of the database characteristics is undergoing: this kind of archive should be searchable for different parameters, from geographic coordinate to sophisticated atmospheric/surface characteristics.
Once these problems will be solved, with the collaboration of the scientific teams directly involved, MATISSE will be ready to access virtually all the objects of the Solar System, including planets.

References

[1] Verrecchia, F. et al., The BeppoSAX WFC X-ray source catalogue, Astronomy and Astrophysics, Volume 472, Issue 2, pp.705-713, 2007.
[2] Pittori, C. et al., First AGILE catalog of highconfidence gamma-ray sources, Astronomy and Astrophysics, Volume 506, Issue 3, pp.1563-1574, 2009.
[3] Giommi, P. et al., The number counts, luminosity functions, and evolution of microwave-selected (WMAP) blazars and radio galaxies, Astronomy and Astrophysics, Volume 508, Issue 1, pp.107-115, 2009.
[4] Massaro, E. et al., Multifrequency Catalogue of Blazars (3rd Edition), Edited by E. Massaro, P. Giommi, C. Leto, P. Marchegiani, A. Maselli, M. Perri and S. Piranomonte. ARACNE Editrice, Rome, Italy, 118 pages, 2011.
[5] Glassmeier, K.-H. et al., The Rosetta Mission: Flying Towards the Origin of the Solar System, Space Science Reviews, Volume 128, Issue 1-4, pp. 1-21, 2007.
[6] De Sanctis, M. C. et al., The VIR spectrometer, Space Sci. Rev. (2010).
[7] Russell, C. T. et al. Dawn at Vesta: testing the protoplanetary paradigm. Science **336**,684–686 (2012)
[8] Thomas, N. et al., OSIRIS – The Optical, Spectroscopic and Infrared Remote Imaging System for the Rosetta orbiter, Adv. Space Res., Vol., 21, No. 11, pp. 1505-1515, 1998.
[9] Coradini, A. et al., VIRTIS an imaging spectrometer for the ROSETTA mission, Planet. Space Sci., Vol. 35, No. 9/10, pp. 1291-1304, 1998.
[10] Della Corte, V. et al., GIADA: its status after the Rosetta cruise phase and on-ground activity in support of the encounter with comet 67P/Churyumov-Gerasimenko, International Journal of Astronomical Instrumentation, Volume 3, Issue 1, id. 1350011 (2014), 10.1142/S2251171713500116., (2014).
[11] http://www.paraview.org/