MATISSE: Multi-purpose Advanced Tool for Instruments for the Solar System Exploration

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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 improving size of planetological 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 has been established with the aim of implementing 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.

This tool has been named MATISSE and during its first year of development has been mainly devoted to data from the ESA Rosetta mission: at the present time its architecture is ready and the database design is in its initial phase of design in order to give it "intelligent archive" characteristics.

INTRODUCTION

In planetary sciences, design, assemble and launch onboard instruments 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 the data are stored and archived, i.e., in ftp servers where no query is allowed. Therefore, 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 and of this process, the data are far from being accessible as code must be written to read and scientifically analyze them.

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 (Multi-purpose Advanced Tool for the Instruments of the Solar System Exploration), a tool software to access, visualize and analyze planetological data.

MATISSE is designed as a web tool, 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.

During the first year of development (i.e., 2013) efforts have been made mainly to use data from the ESA Rosetta mission [5], but, being implemented as a modular tool, other missions, targets and instruments could easily be added to the pipeline.

In the next year the design and implementation of a database able to allow "intelligent" queries, i.e., not

only permitting to search for geometrical features, but capable of fusing data acquired by different instruments together, is planned.

CURRENT VERSION

To encourage the collaboration with the scientific teams, MATISSE is online, in a Demo/Prototype version, since January 2013: in this way users can test its characteristics and suggest improvements to be done.

After registration the now online version 0.5 is accessible via browser at https://tools.asdc.asi.it/matisse.jsp (Fig. 1) and allows to select between some public 21 Lutetia observations of OSIRIS [6] and VIRTIS-M [7]: simulated data of GIADA [8] for the coma of 67P Churyumov-Gerasimenko to be reached in 2014 are also available.
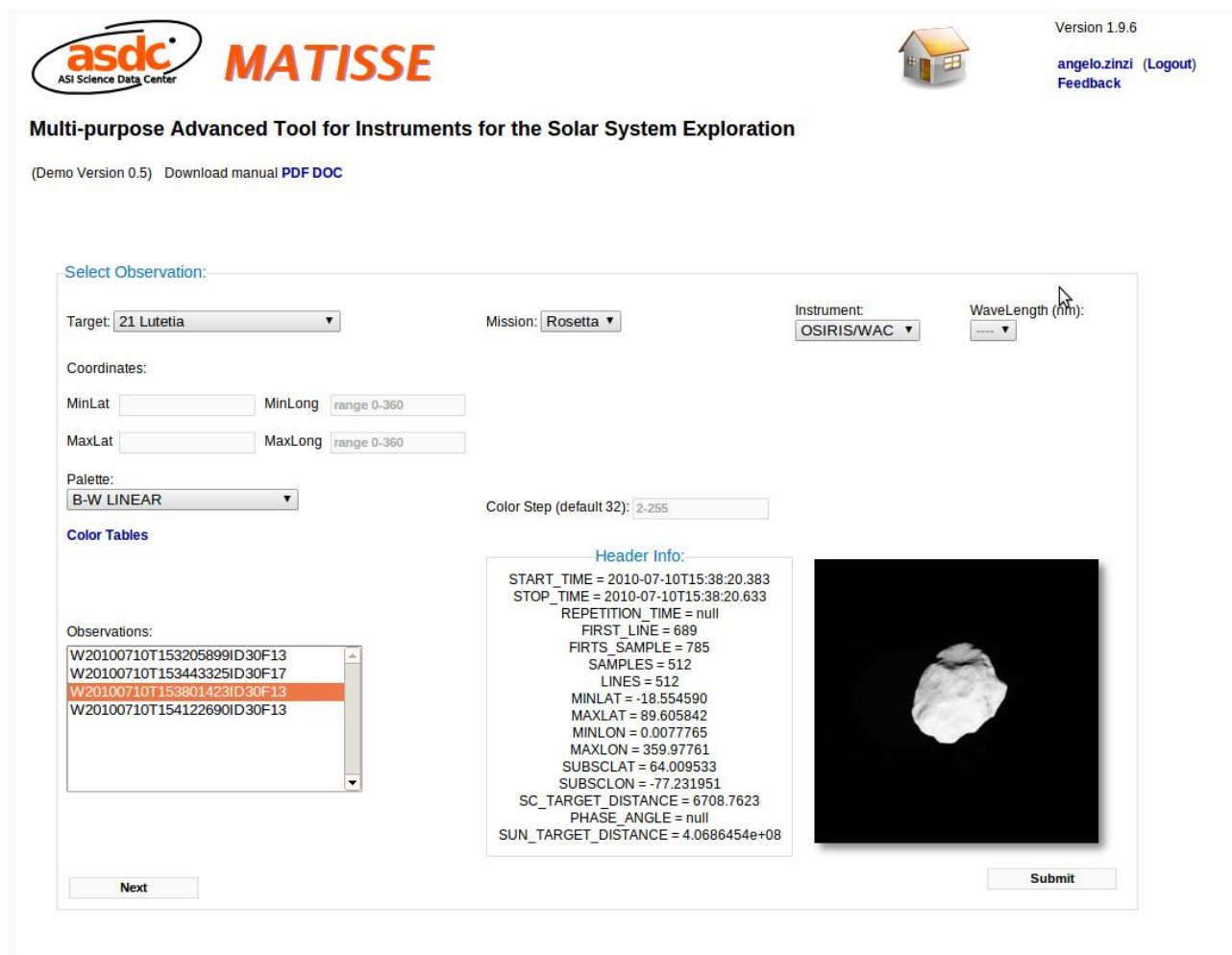

Figure 1: The homepage of MATISSE

It is possible to select the geographic area to display and the color tables to visualize the data. Once the visualization is made it is possible to interact with it using the mouse, zooming or rotating the target object to better show the data (Fig. 2), while planned upgrades include the possibility of visualize spectra and other data by clicking on the surface.

For the first time in this version data-fusion characteristics are allowed and the user can perform simple mathematical operations between several observations from different instruments.
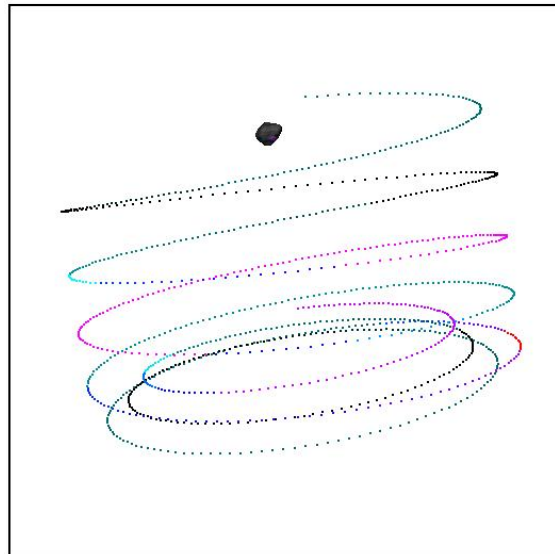
Figure 2: A visualization of GIADA simulated dust flux during an orbit of the 67P Churyumov-Gerasimenko

DATABASE CHARACTERISTICS

At the present time no searchable database is present in the MATISSE tool, but its designing is currently under study.
In particular, in order to propose MATISSE as an innovative tool, capable of raise the scientific productivity of the missions, an intelligent archive is required.
This kind of archive should be searchable for different parameters, from geographic coordinate to sophisticated atmospheric/surface characteristics.
The huge wealth of data to be managed represents a great challenge as the more detailed the granule of the database the heavier it will be to be searched.

FUTURE DEVELOPMENTS

MATISSE has been designed in a modular manner, so that improvements and upgrades will be always possible. In particular for the next year the integration of data acquired over asteroids 4 Vesta and 1 Ceres should be implemented, even if the very large shape models and Digital Elevation Models (DEMs) associated to these bodies seems to indicate that a different visualization method is needed.

CONCLUSIONS

Even if in a very early development phases MATISSE is starting to show its great capabilities and we are confident that, in collaboration with the scientific teams involved, it could sensibly enhance the capabilities of the ESA Rosetta mission to the comet 67P Churyumov-Gerasimenko during the next year.

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