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EuroPlaNet VO use case: imaging spectroscopy

S. Erard (1), P. Le Sidaner (2) J. Berthier (3) and B. Cecconi (1)

(1) LESIA, Observatoire de Paris, France (2) DIO, Observatoire de Paris (3) IMCCE, Observatoire de Paris (stephane.erard@obspm.fr)

Abstract

This abstract (as well as several accompanying abstracts in this conference) presents a use case of the Virtual Observatory for Planetary Science being defined in JRA4/IDIS. The goal is to illustrate possible applications of a VO system in the context of this session.

1. Introduction

The JRA4/IDIS working group of EuroPlaNet-RI is setting the basis for a Virtual Observatory (VO) in Planetary Science. At the end of the project, a protocol will be available to access complex databases described using a specific Data Model. Any data provider will be allowed to describe their data services using this Data Model and declare them in a system of mirrored registries. The perimeter of the data accessible through this mechanism is therefore expected to increase greatly in the coming years. The preferred approach is to preserve the compatibility with tools developed in the framework of the astronomical VO (IVOA), and to save the development of specific tools in particular for visualization.

The present abstract, as well as several accompanying abstracts in this conference, illustrates a possible use of such a system in the context of this session.

2. Imaging spectroscopy

Imaging spectrometers have become standard instruments in the past 20 years, and now equip most planetary space missions. These instruments usually group data as image-cubes, which are often tricky to manipulate and visualize. In the EuroPlaNet Data Model, such data are described according to both their spatial and spectral coverage and resolution, which will allow the user to identify data products of interest.

The Aladin tool can plot cubes frame by frame [1], while other VO tools such as VOSpec, SPLAT, or TopCat have the capacity to plot spectral data, and even to perform significant spectral analysis [2]. OV-Paris has developed an imaging spectroscopy demonstrator in the framework of Europlanet/JRA4 [3]. It addresses most of the interfacing issues identified when processing planetary data.

In a first step, the demonstrator allows the user to access a PDS file from a web interface, mimicking the outcome of a query to a planetary data service (the example uses NIR night side observations of Venus by VIRTIS / Venus-Express). The file is a spectral cube stored in PDS format, and is therefore not easily accessible. The demonstrator reads it using an IDL/GDL layer on the server side, and turns it to a FITS file fed into Aladin. In Fig. 1, the cube is plotted according to X/Y coordinates to facilitate the extraction of spectra: on mouse-click, the spectra are sent to the spectral plotting tool. A sophisticated tool such as VOSpec will not only provide quicklook function but also more evolved spectral analysis capacities such as band measurements. Finally, such measurements can be used to filter data (e.g. on Mars, keep only spectra with 1 µm-pyroxene band centered longward of 0.95 µm) and send them to TopCat for correlation with properties extracted from other data sets (e.g. dune fields in the same example).

Aladin can also build images of band ratio or complex spectral parameters from the cube, plot them using geographic coordinates of the pixels, and overplot high-resolution images from a camera, allowing to superimpose compositional properties and precise morphology with minimum effort. Aladin can also handle image footprints, although using a format different from the GIS standards.

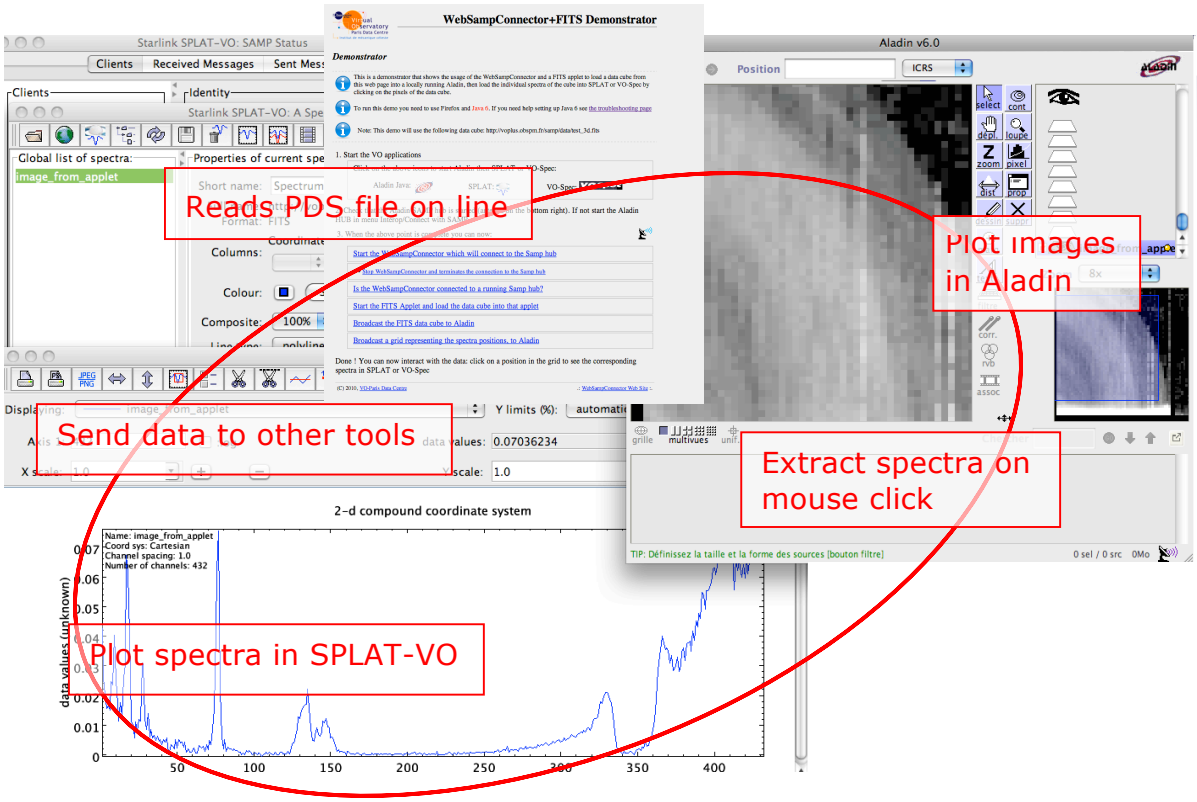

Fig. 1: Image-cube plotting demonstrator, based on Aladin and SPLAT-VO tools (NIR VIRTIS Venus-Express cube on Venus night side)

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References

[1] Aladin is described and distributed on this page: http://aladin.u-strasbg.fr/

[2] Erard et al 2012, this conference

[3] The PDS-WebSampConnector demonstrator is available here:

http://voplus.obspm.fr/samp/WebSampConnector+FITS/demo.php