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EuroPlaNet VO use case: comet spectroscopy

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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. Cometary spectra

High-resolution spectral observations of comets have been performed in the recent past (Deep Impact / Epoxi missions) and are scheduled for the close future (Rosetta mission). Spectra of the coma are expected to include many narrow features related to molecular species. A typical workflow using such data could be:

1) A quick look phase; the signal is studied to identify possible features present either in absorption or in emission.

2) A detection phase; spectral features are measured, correlated, and checked for consistency.

3) A modeling phase; the observed spectra are modeled using reference data to tune physical parameters (abundances, temperatures…).

3. Use case

Once the data are available in a handy format and correctly described, a complete data set can be searched for specific observing conditions (viewing angles, sun distance…) and functioning mode (S/N ratio…).

The data files fitting the request can be sent directly to a specialized spectral plotter such as ESA's VOSpec [1]. This tool also provides access to all data services using SLAP (Spectral Line Access Protocol), which are typically databases of atomic and molecular transitions.

The user can select the data services of interest for him. The transitions will then be indicated according to the position of the pointer on the plot, which allows the user to immediately identify the spectral features detected.

The current system will be improved by implementing a little more versatility in VOSpec (so as to handle reflectance and absorption spectra), and by implementing SLAP on top of several databases of interest for comet observations — in particular Basemole, the molecular transition database developed in LESIA [2]. The characteristics of the identified transitions can be retrieved automatically and sent to a computation service, e.g. to fit the spectrum and retrieve physical parameters.

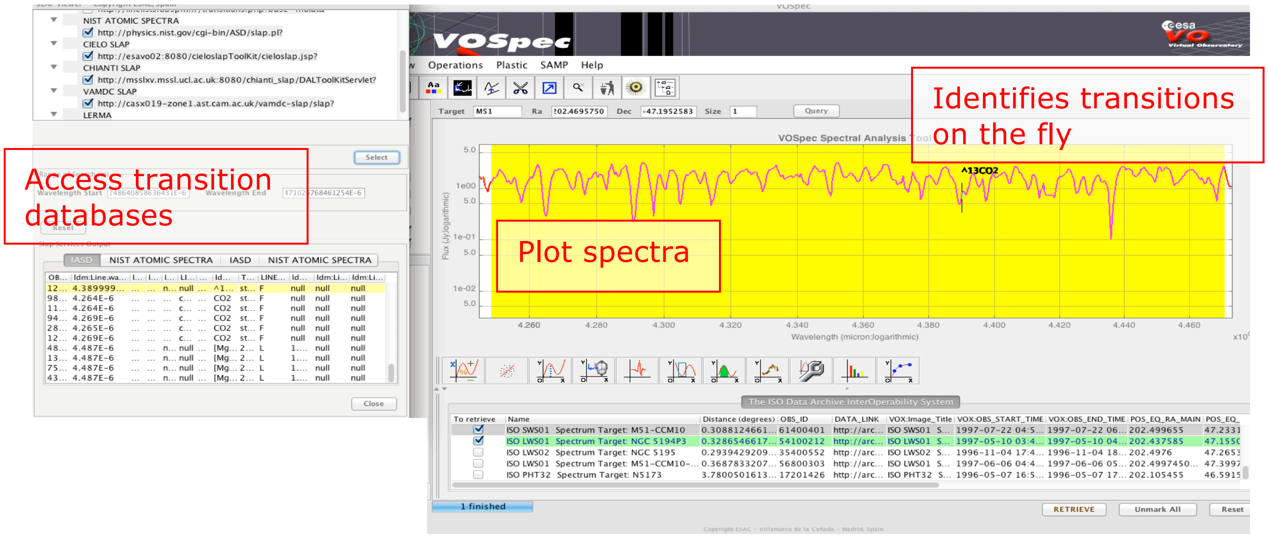

Fig. 1: A narrow spectral range is enlarged in VOSpec, and databases of spectral transitions are queried with SLAP. The identified transitions are indicated on the plot with the species responsible for the absorption (example on a galaxy spectrum)

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References

[1] VOSpec is described on this page: http://www.sciops.esa.int/index.php?project=SAT&page=vospec

[2] Crovisier J. et al, 2002 — Basemole is available here: http://www.lesia.obspm.fr/perso/jacques-crovisier/basemole/