

# Planetology in VO: Workflow for fast and simple analysis of Elodie spectra

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## A) INTRODUCTION

**Study of exoplanets:** Need a tool for fast search for signatures in large spectral data sets

**Tools:** Elodie, Simbad (via Elodie), exoplanet encyclopaedia, BASECOL, spectral analysis.

At this stage, preliminary in "home" format

Initially as an exercise for students

==> Workflow in frame of VO because of interoperability

Colours: Implemented To be implemented soon

Selection by hand

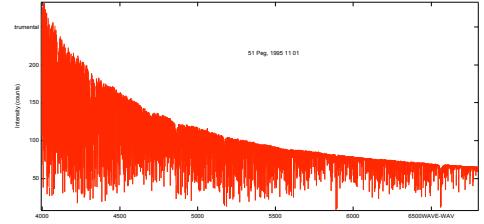
Step 1: Web Service

The screenshot shows the XoSearch Engine interface. At the top, it says 'Last update' and 'Enter an identifier or a reference code'. Below that, there's a search bar with '51 peg' entered. The results section says 'Results for "51 peg": 1 result(s)' and lists '51 Peg b' with a detailed description of its properties.

Step 2: php on elodie archive

The screenshot shows the 'The ELODIE archive' website. It features a logo for 'OHP' and 'ELODIE'. The main content area has sections for 'Access to cross-correlation results (2005/12)', 'Enter a designation or coordinates', and 'A. For Identifiers' and 'B. For coordinate and around object queries, define a radius'.

Step 3: Downloading spectra from Elodie



## B) BACKGROUND

**Detection of exoplanets by radial velocity method (Doppler shift)**

on 100 000 spectral lines on spectra (Mayor & Queloz),

spectral resolution: 6-7 m/s

We propose to look on archived data  
with a fast global automatic search

More than 200 spectra from exoplanet search program  
on Elodie (Mayor and Queloz)

<http://atlas.obs-hp.fr/elodie/E.cgi?>

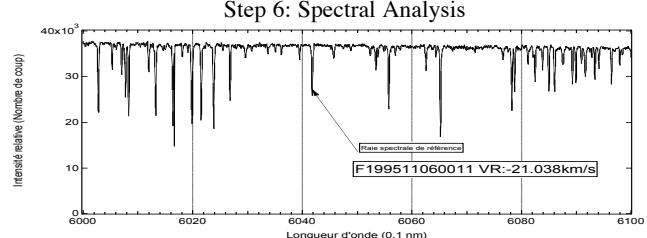
Step 4: Exoplanet's properties at Exoplanet encyclopaedia

The screenshot shows the 'The Extrasolar Planets Encyclopaedia' website. It includes a header with the site's name and a map of the solar system. Below, there's a table of planetary systems and a detailed card for 'Star : 51 Peg' with properties like mass, radius, and orbital period.

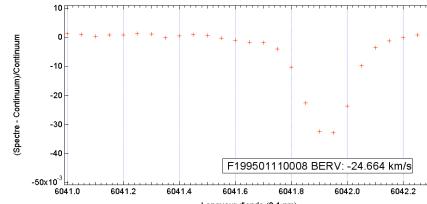
Step 5: Spectral Data Base, high resolution



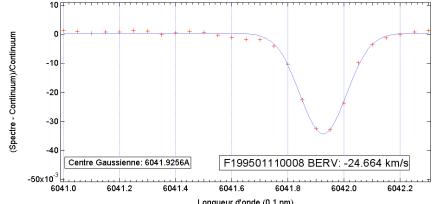
Step 5



Step 6: Spectral Analysis



Step 7: Gaussian fit at 604.2 nm



## C) WORKFLOW STEP BY STEP

1. Selection of the star: 51 Peg (known exoplanet) or other

2. Asking for existing Elodie spectra (40 for 51 Peg)

Elodie: Spectral Data Base, high resolution

More than 17 000 spectra on line

3. Download locally all existing Spectra of Elodie

4. Checking properties on Exoplanet encyclopaedia, updated daily  
(period, stellar type, etc...) and with Simbad

5. Checking reference of spectral lines at <http://amdpd.obspm.fr/>

RO-VIBRATIONAL COLLISIONAL EXCITATION Database and Utilities

6. Spectral analysis for all spectra at 6042 A

7. Fit of 6042 A by a simple Gaussian:  
=> Spectral shift for all downloaded spectra

8. Periodicity check or search

- If known exoplanet: period, intensity of  $\Delta V$  vs time.  
- If not:  $\Delta V$  versus time and search for periodicity

## D) EXTENSIONS

- Results in VO Format

- More spectral data bases

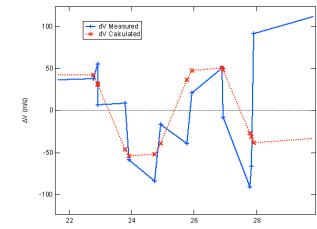
- More applications

Asteroid search in DFBS

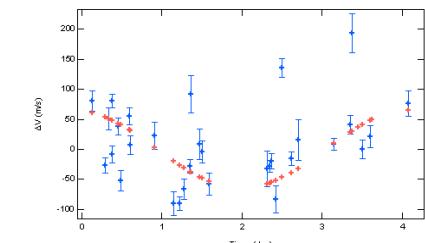
H2O in spectra

Temperature of exoplanets

Etc...



Step 8: Results



Thanks: Elodie archive, BASECOL, VO-Paris Data Centre, VO-France, Exoplanet Encyclopaedia, Mayor et al.