



# FIELD TESTS FOR THE ESPRESSO DATA ANALYSIS SOFTWARE



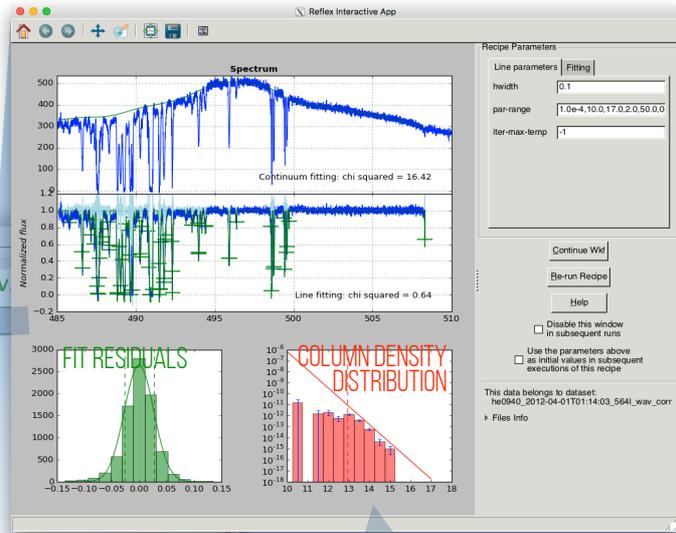
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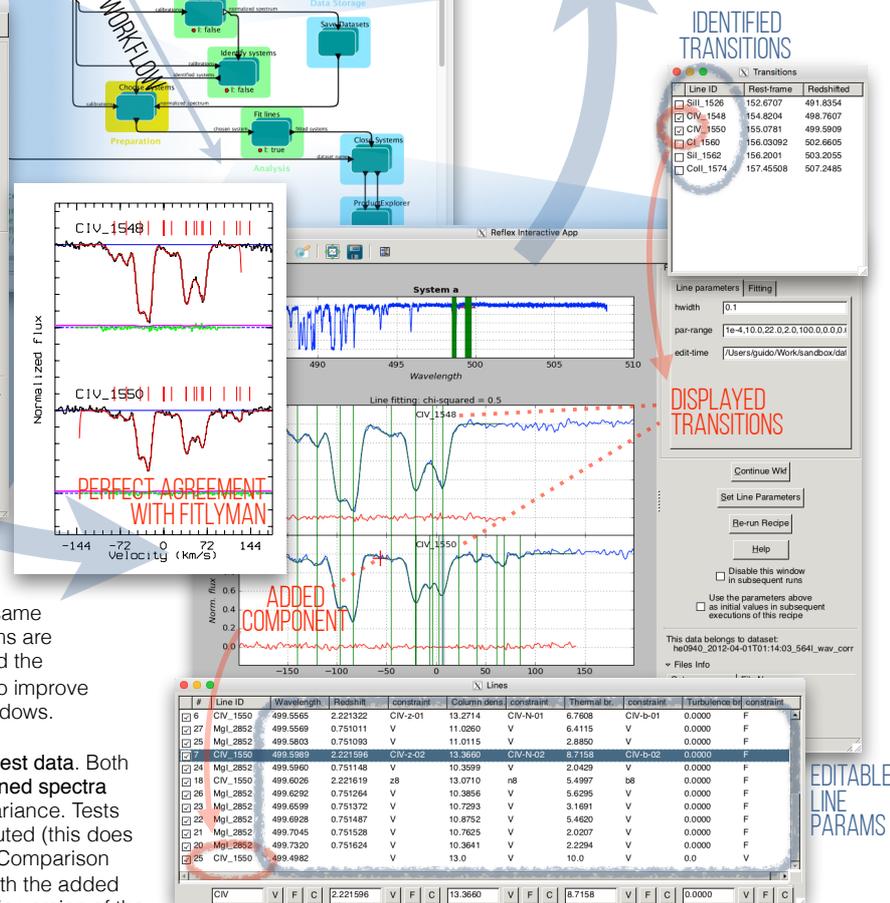
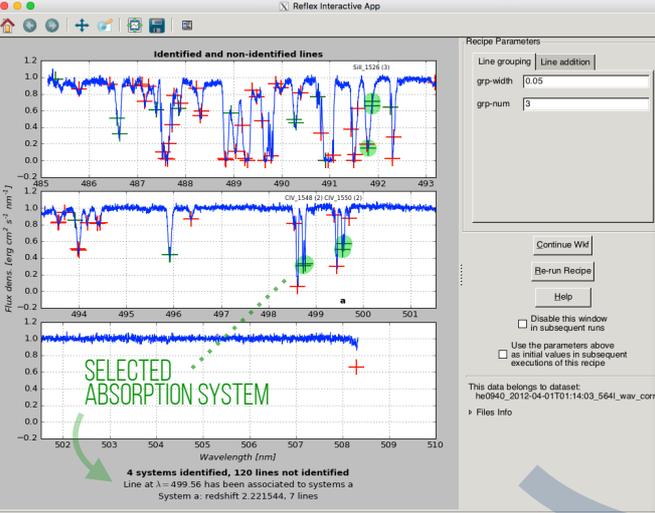
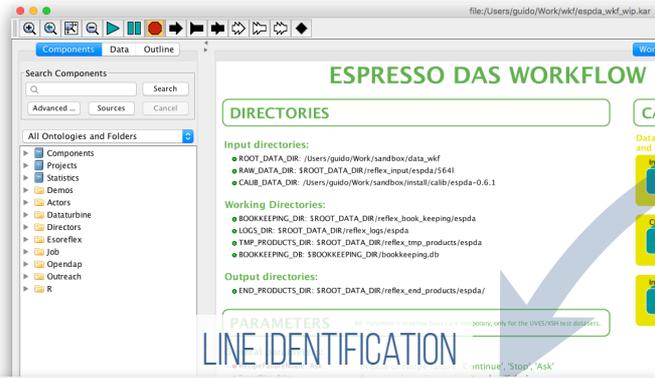
ESPRESSO is an ultra-stable, high-resolution spectrograph for the coude combined focus of the ESO VLT, now at the integration phase. ESPRESSO will mainly 1) search for **Earth-like exoplanets** and 2) constrain a possible variation of the **fundamental constants**  $\alpha$  and  $\mu$  using quasars as background sources. The absorption features produced by the **inter-galactic and circum-galactic medium** on quasar spectra allow to study the **physical and chemical state of the baryonic matter** for most of the cosmic time, from the end of the reionization epoch onwards, and its interplay with the galaxy formation and evolution mechanisms.

The dedicated **Data Analysis Software (DAS)** for ESPRESSO is meant to set a benchmark in the treatment of spectroscopic data towards the ELT era, providing **carefully designed, fully interactive recipes** to take care of **complex analysis operations** (e.g. radial velocity estimation in stellar spectra, interpretation of the absorption features in quasar spectra). The DAS is written in **ANSI-C** and has a graphical interface based on the **ESO Reflex workflow engine**, with **Python scripts** for data visualization and user interaction. The figure shows the procedures implemented by the quasar workflow.

## CONTINUUM FITTING



## QUASAR SPECTRAL ANALYSIS



The analysis of the absorption features is **iterative** by nature. The **continuum** is estimated through a first fit and removal of the lines. Associated lines, corresponding to different atomic transitions at the same redshift, are selected to define **absorption systems**. Absorption systems are then **fit with Voigt profiles**, adjusting the number of components and the constraint among line parameters. The results of this fit can be used to improve the continuum estimation. All is done **interactively** through pop-up windows.

The quasar branch of the DAS is being tested on **UVES** and **HARPS** test data. Both continuum and line fitting are validated (by a  $\chi^2$  test) on the **non-rebinned spectra** coming from data reduction, to allow a correct modelling of the flux variance. Tests on simulated lines show that the output  $\chi^2$  values are correctly distributed (this does not happen if the fit is performed on rebinned data: see Cupani+16). Comparison with **ESO MIDAS FITLYMAN** and **VPFIT** show perfect consistence, with the added valued provided by the **user-friendly graphical interface**. The first public version of the DAS is foreseen for the ESPRESSO commissioning (2017).

## LINE FITTING

EDITABLE LINE PARAMS