



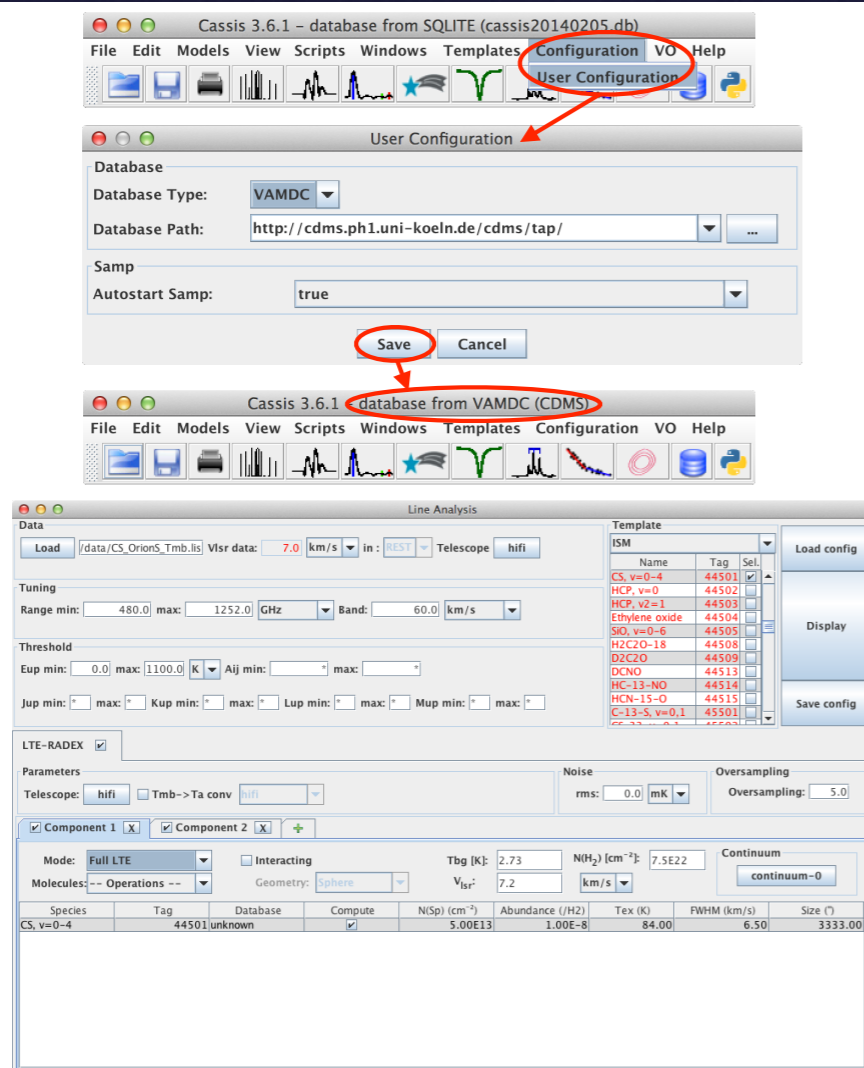
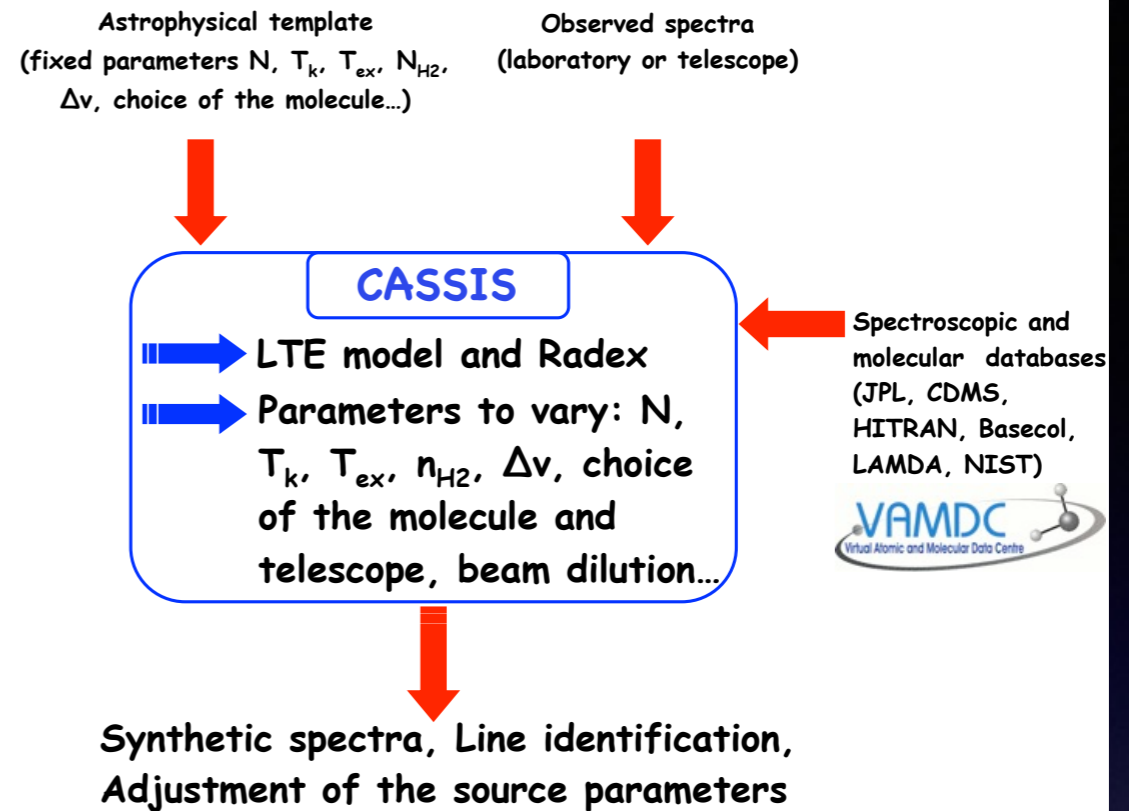
Science Use Cases for the Interstellar Medium CASSIS; MyXCLASS for CASA; SPECTCOL

CASSIS Team : M. Boiziot, S. Bottinelli, E. Caux, J.M. Glorian, C. Vastel: IRAP, Toulouse
MyXCLASS-VAMDC Team : C. Endres*, T. Möller, P. Schilke: University of Cologne
***VAMDC Consortium** : Y.A. Ba*, M.L Dubernet, N. Moreau*, C.M. Zwölf*: LERMA, VO-PDC
(Développements, Support, Tutoriaux, Qualité)



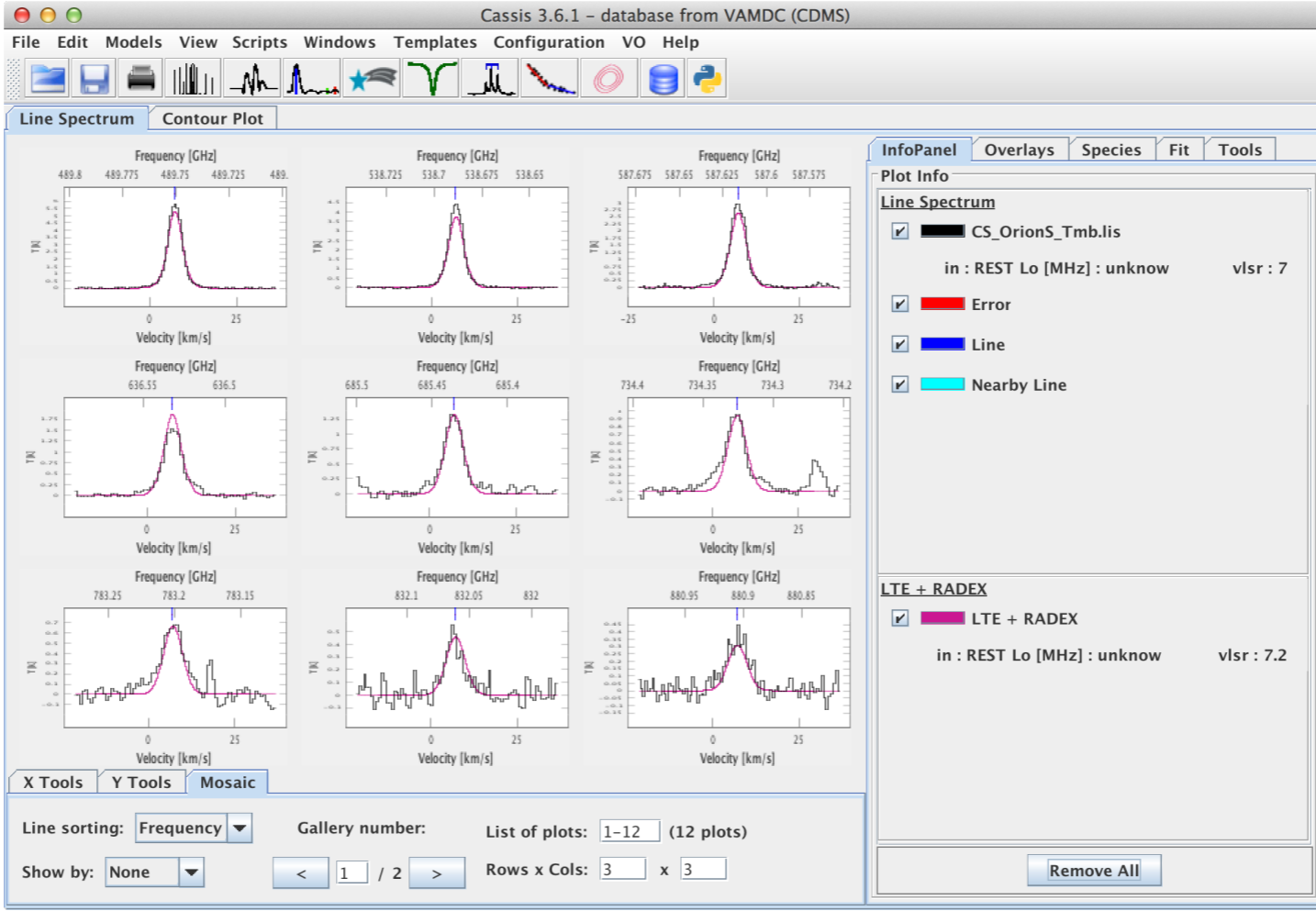
CASSIS uses the Single Spectral Access (SSA) Protocol to access the IVOA services in order to retrieve any spectra (Hubble, Corot, ISO, Pollux, etc) via our SSA module. Also CASSIS uses the SAMP messaging protocol that enables astronomy software tools to interoperate and communicate.

CASSIS is able to retrieve some useful information for the modeling (LTE or non-LTE) or identification from databases (CDMS, JPL, BASECOL) through the VAMDC TAP protocol. TAP provides virtual data and allows to plug in the query language VSS2 and the data model VAMDC-XSAMS (the latter being an output format).



The top panels show how to change the user configuration in order to swap from a local SQLite database to the VAMDC database.

The bottom panel is a snapshot of the Line Analysis module with parameters such that CASSIS will search all the CS transitions having an Eup < 1100 K, potentially present in the selected data file and will overlay an LTE model. The result is displayed in Figure 2.



Link from myXCLASS Interface for CASA

Spectroscopic data as it is accessible via VAMDC is essential to model and analyze astronomical spectra. VAMDC has supported the development of a toolbox¹⁾ for the Common Astronomy Software Applications package (CASA) in order to include access to its databases. The toolbox contains the myXCLASS program, which is used to model astronomical spectra by solving the radiative transfer equation for an isothermal object in one dimension, whereas the finite source size and dust attenuation are considered as well.

The spectroscopic data, such as transition frequencies, state energies, Einstein A coefficients, degeneracies and partition functions, required for the modeling, is retrieved via the VAMDC infrastructure from the CDMS and the JPL catalog and stored in a local database. Besides the access to the databases, the toolbox also includes the model optimizer package MAGIX²⁾ (Modeling and Analysis Generic Interface for eXternal numeric codes). This optimizer helps to find the best description of the data using a certain model, i.e., finding the parameter set that most closely reproduces the data.

A recent example, where the toolbox has been successfully used, is the analysis of spectra recorded towards the Sgr B2(M) cloud core which exhibit strong absorption features of gas located in the spiral arms of our galaxy. One of these spectra is shown in Fig.1. It shows a spectrum of $^{36}\text{ArH}^+$ (1-0) (blue) recorded towards the star forming region SrgB2(M). The optimizer has been used to fit the spectrum (red) and to derive column densities and excitation temperatures as a function of relative velocity of the molecular gas. The derived column density per velocity as shown in Fig.2 for the above example including other species investigated by Schilke et al.³⁾ provides important insights into the physical, chemical and structural composition of these objects.

- 1) <http://www.astro.uni-koeln.de/projects/schilke/myXCLASSInterface>
- 2) Möller et al. A&A, 549, A21 (2013)
- 3) Schilke et al., ArXiv e-prints, 1403.7902 (2014)

