GUIpsy
VO compliant kinematic modeling GUI

AMIGA

Analysis of the interstellar Medium of Isolated GAlaxies

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ALMA DEMO WORKSHOP
A VO COMPLIANT TOOL FOR KIMEMATICAL MODELING
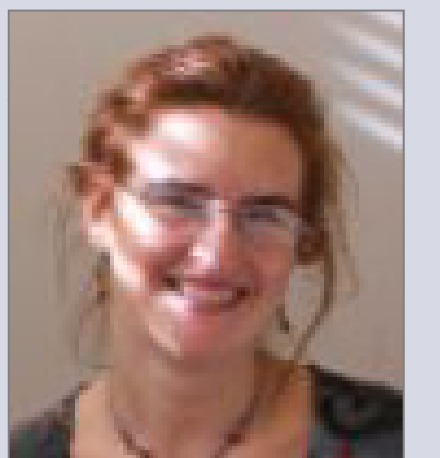
Abstract

The scientific goals of the AMIGA project (http://amiga.iaa.es/) are based on the kinematic analysis and modeling of a significant amount of 3D data. With the aim to make this work easier we have developed a Virtual Observatory (VO) compliant GUI wrapper for the Groningen Image Processing System (GIPSY), based on feedback received from a users survey. GUIpsy is a framework where the end user may find together rich documentation and interoperable tools, either a GIPSY task or VO software, in an integrated graphical environment, supporting different kind of file formats (3D FITS, VOTables, ASCII Tables, Python and COLA scripts, etc.), and keeping track of the steps performed in a session work. GUIpsy is a work-in-progress collaborative development, please contact us if you would like to participate !

GIPSY

The Groningen Image Processing System (GIPSY, van der Hulst et al. 1992, Vogelaar & Terlouw 2002, http://www.astro.rug.nl/~gipsy/), developed at the Kapteyn Astronomical Institute, is one of the more mature and powerful systems available in order to perform kinematical analysis and modeling of 3D data, for the study of HI content in galaxies in particular.

Analysis Tasks
- Tilted ring fitting
- Interactive velocity fitting
- Kinematic modeling
- 3D Data manipulation

Data Inspection
- Channel and moment maps
- Position-velocity maps
- Movie loops and blinking

Interfaces
- Batch and Interactive
- COLA scripting language
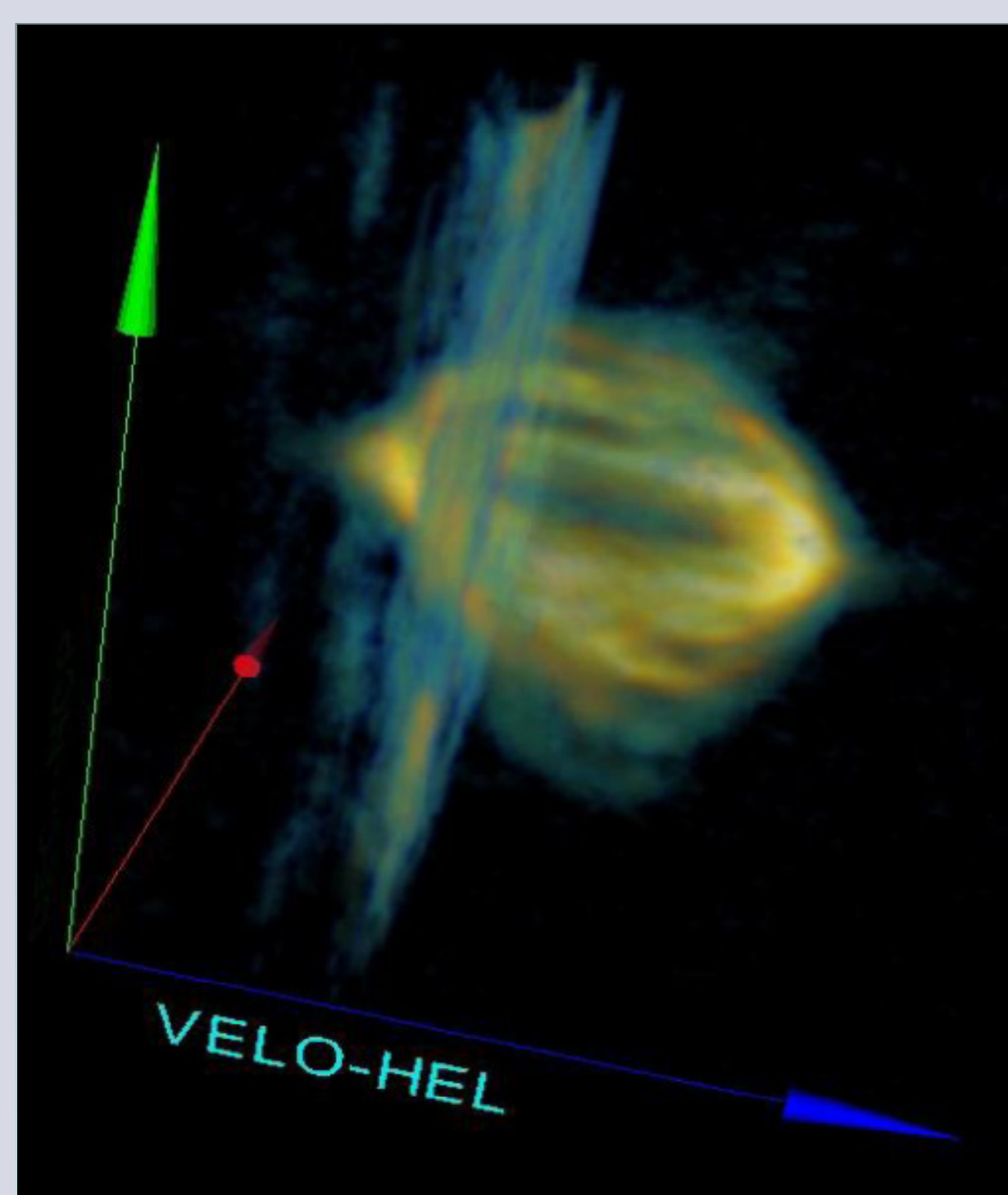- Python programmatic interface

Figure
Example display of a 3D WSRT dataset (NGC6946) made with GIPSY application **vtkvolume**, based on the Virtualization Toolkit (VTK). It allow users to rotate, zoom, pan and clip the data using the mouse.

VO Software

In order to make GIPSY available to a larger scientific user base than the specialized radio astronomy community it is essential to make a proper connection to the Virtual Observatory (VO) environment.

Simple Access Message Protocol (SAMP; Allan et al. 2008) provides instant local connectivity and datasets sharing among applications. SAMP connectivity with VO software (e.g. Topcat, Aladin, VOSpec) and access to **VO-archives** allows efficient multi-wavelength datasets comparisons, as well as the possibility to contribute to and benefit from the growing ecosystem of VO software, services and data.

Figure
SAMP Local connectivity with VO Software. GUIpsy, Aladin, Topcat and ROTCUR windows.

Visualization

VISIONS is a visualization tool for N-dimensional data structures (FITS files or GIPSY sets). It can display two dimensional slices of this data in side panels. Movie loops are supported to inspect a sequence of images, and animations can be saved to disk. The program allows a user to enter multiple data cubes for comparison. Images can be compared either using split options or transparency. Profiles in the z-direction at the cursor position can also be used for inspection and comparison. A powerful system for coordinate transformations allows a user to overlay data with different world coordinate systems.
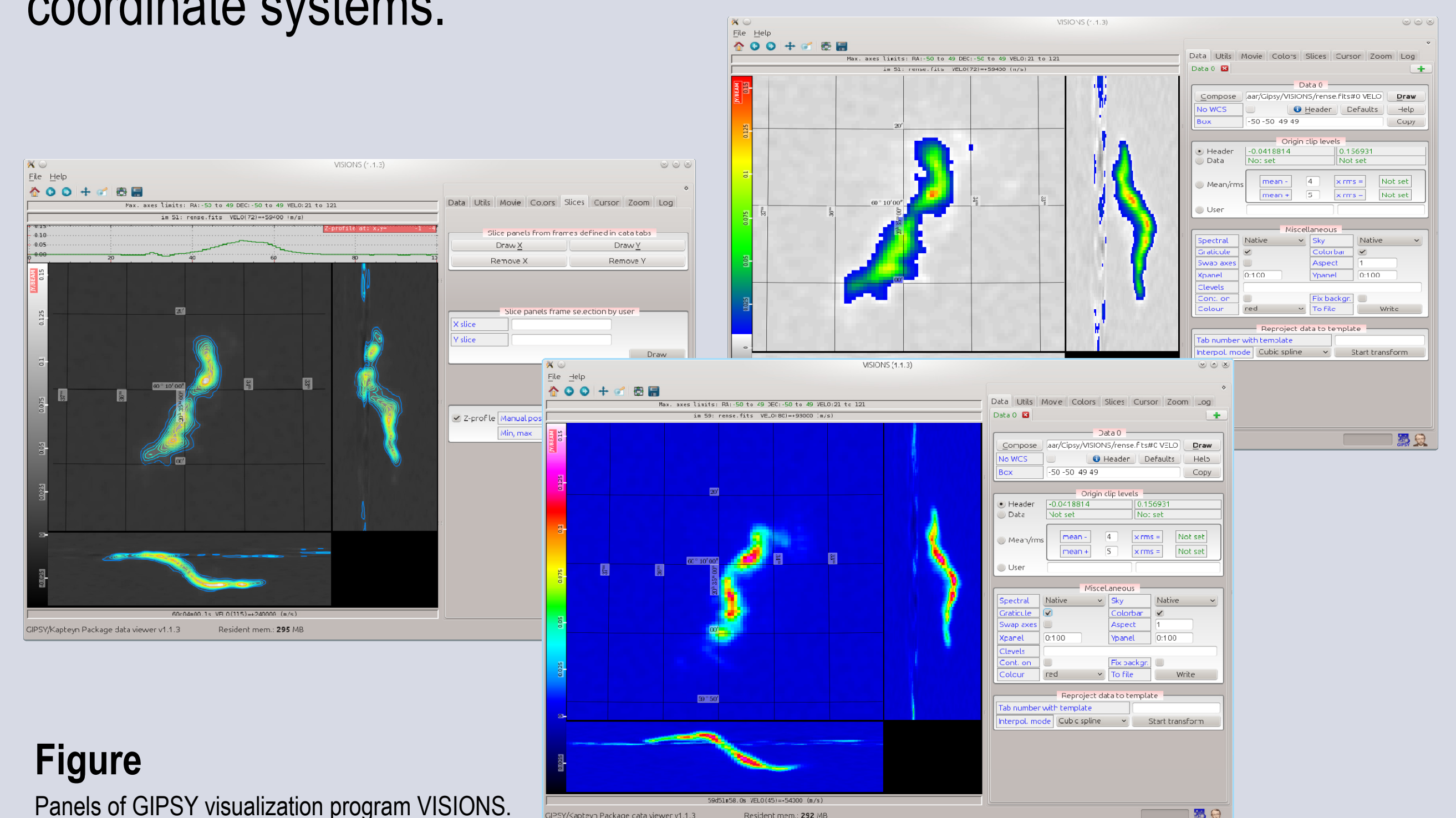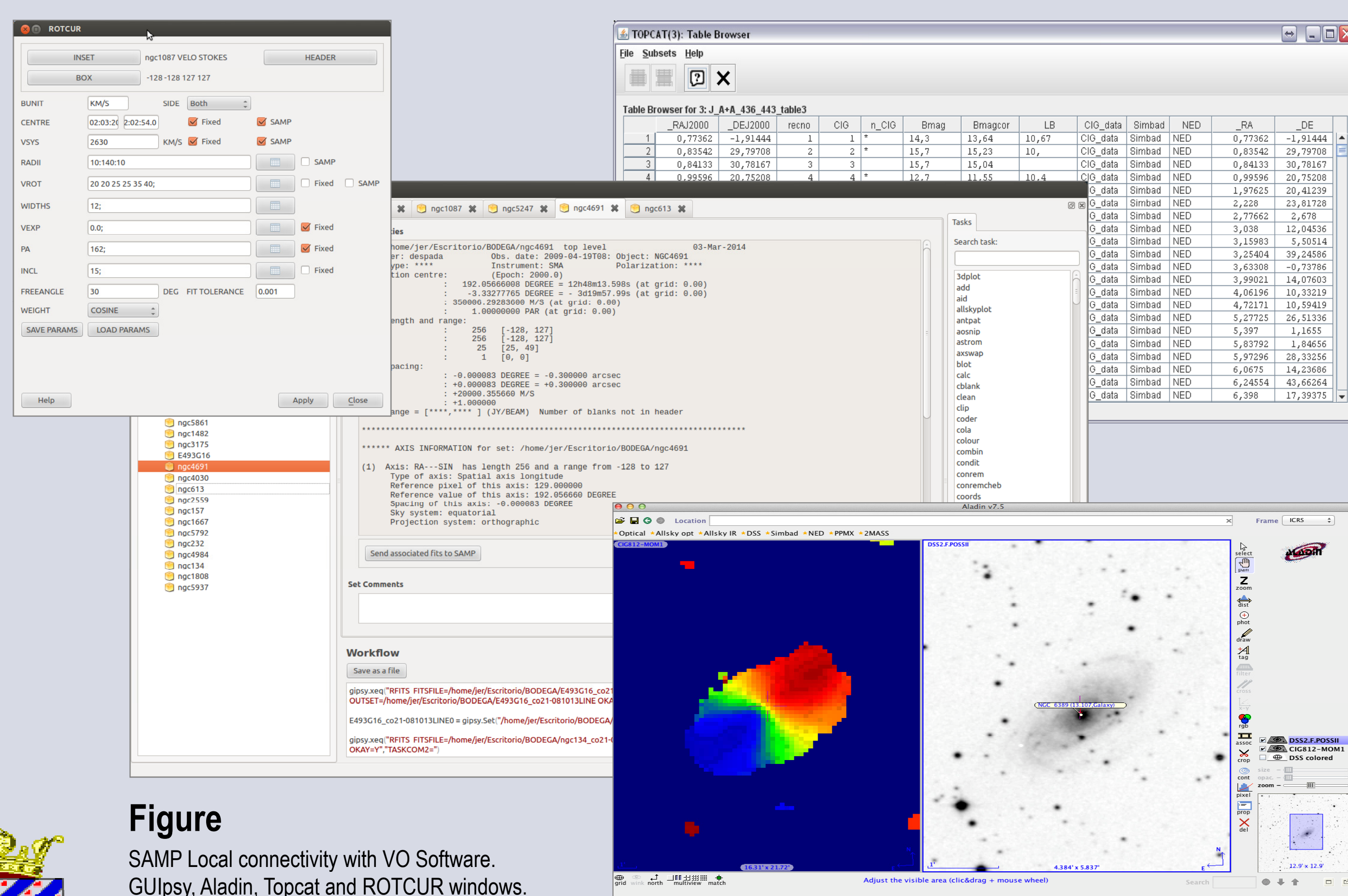

Figure
Panels of GIPSY visualization program VISIONS.

Usability

GIPSY needs and provides a wealth of physical parameters in order to set up a detailed kinematical study of the gas. Paradoxically, the large number of parameters that can be fixed and determined in the analysis process is at the same time its power and its bane. GUIpsy wrapper integrates a seamless **discovery and access to richly documented GIPSY tasks**, together with assistive generic recipes in Python and COLA scripting languages.

Reproducibility and understanding

The digital capture into Python commands of otherwise lost manually performed procedural steps, allows the automatic creation of an editable **Python script-log**, improving reproducibility and understanding of the whole process by other users.

Session saving and recovering gives the possibility to retrieve snapshots of **working sessions** with files scattered all along the file system.

Datasets products issued from analysis and modelling tasks are displayed in a **input/output hierarchy** that helps grasping the provenance of the process.