GIPSY 3D

Analysis, visualization and VO-Tools for datacubes

Ruiz, J.E.[1], Santander-Vela, J.D.[1], Espigares, V.[1], Verdes-Montenegro, L.[1], van der Hulst, J.M[2]

(1) Instituto de Astrofísica de Andalucía – CSIC, Camino Bajo de Huétor 50, 18008, Granada, Spain
(2) University of Groningen - Kapteyn Astronomical Institute, Landleven 12, NL-9747 AD, Groningen, The Netherlands

Abstract

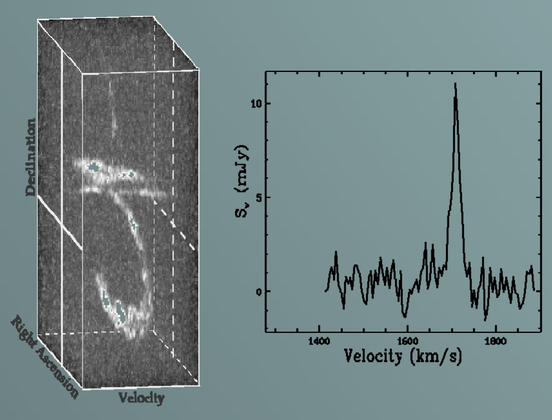
email: jer@iaa.es

The scientific goals of the AMIGA project are based on the analysis of a significant amount of 3D data. In order to perform this work we present an initiative to develop a new VO compliant package, including present core applications in Groningen Image Processing System (GIPSY) and new ones based on use cases elaborated in collaboration with advanced users. One of the main goals is to provide local interoperability between GIPSY (visualization and data analysis) and other VO tools. In addition, the connectivity with the VO environment will provide general access to 3D data VO archives and supply on-line analysis and VO services, maximizing the potential for scientific discovery.

The AMIGA project

The AMIGA project (http://www.iaa.es/AMIGA.html) is an international scientific collaboration led from the Instituto de Astrofísica de Andalucía - CSIC. It focuses on a multiwavelenght analysis of a statistically significant sample of isolated galaxies, in order to provide a pattern of behaviour to the study of galaxies in denser environments.

Since intensive analysis of 3D data at all wavelengths is needed, the group has started a collaboration with the Kapteyn Institute for upgrading the GIPSY software, producing a friendly VO-integrated package for high-level analysis of datacubes.



Figure

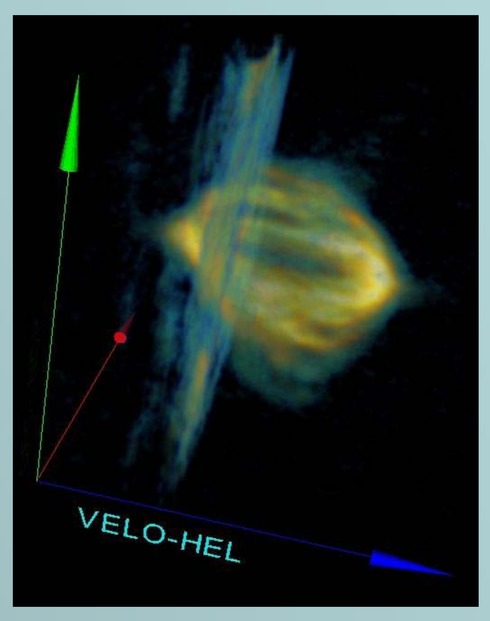
3D datasets are the result of obtaining spectral information over a two-dimensional field of view.

Present and future spectroscopic instrumentation, such as radio interferometers (including ALMA as well as other future radio facilities), Fabry Perot instruments and Integral Field Units in optical and NIR telescopes provides 3D information on gas and stars in galaxies.

GIPSY

The Groningen Image Processing System (GIPSY, van der Hulst et al. 1992, Vogelaar & Terlouw 2002), developed at the Kapteyn Astronomical Institute, is one of the oldest and most powerful systems available in order to analyze and visualize 3D data and the study of HI content in galaxies in particular.

- **Data inspection**
  - **Channel maps**
  - **Position-velocity maps**
- **Display techniques**
  - **Movie loops and blinking**
- **Analysis**
  - **Parameters fitting and model**
  - **Interactive velocity fitting**
  - **Tilted ring parameters fitting**
  - **Flux calculation**
  - **Statistics**
- **3D Visualization**



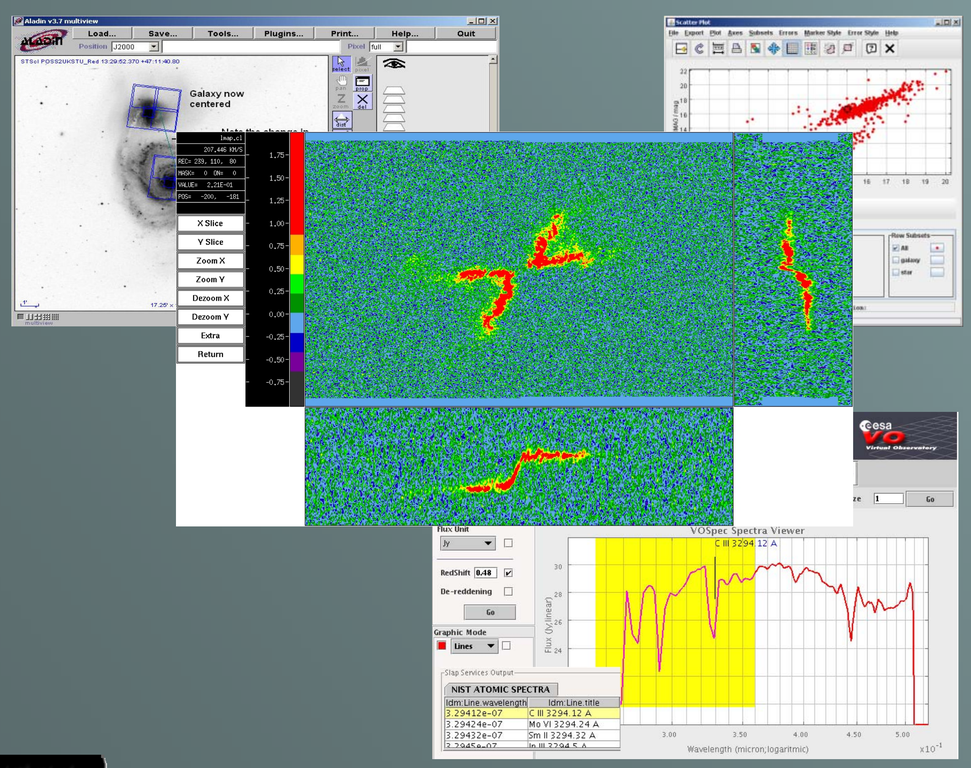
Figure

Example display of a 3D WSRT dataset (NGC6946) made with GIPSY application *vtkvolume*. This application is based on the 'Virtualization Toolkit' (VTK) and allow users to rotate, zoom, pan and clip the data using the mouse. It shows the HI in NGC6946 and in addition, as a wall at zero radial velocity, the foreground HI of the Milky Way which is present in only a small number of channels.

VO Tools

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 VO environment.

Interoperability with other VO software and access to VO archives will allow not only efficient multi-wavelength datasets comparisons but also the possibility to contribute to and benefit from the growing ecosystem of VO software, services and data.



SAMP/PLASTIC
Local VO interoperability

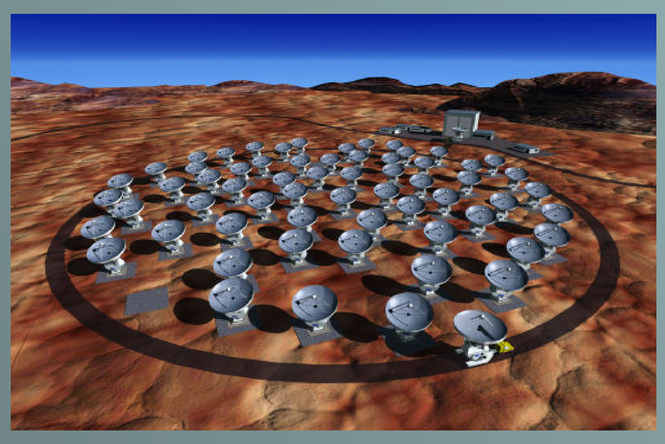
3D VO Archives and Services

3D files in VO archives can be really huge, so it is important to allow the possibility to extract regions of a dataset.

Data providers should supply on-line processing and analysis, and at the same time must have the capacity to store huge volumes of datacubes.

To-Do List

- **Standard data description model for datacubes in the VO**
- **Standard storage format unification for 3D files**
- **3D VO archive development**
- **Discovery and data transmission 3D VO standard protocols**
- **GIPSY server implementation**
  - **3D VO services**
  - **Spectral and Image VO services**
  - **Load balancing strategy**
  - **Distributed storage for 3D files**
- **Web interface for access and on-line analysis**



Figure

ALMA at Chajnantor
ESO PR Photo 06b/03 (25 February 2003)
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AMIGA

Analysis of the interstellar Medium of Isolated GAlaxies