

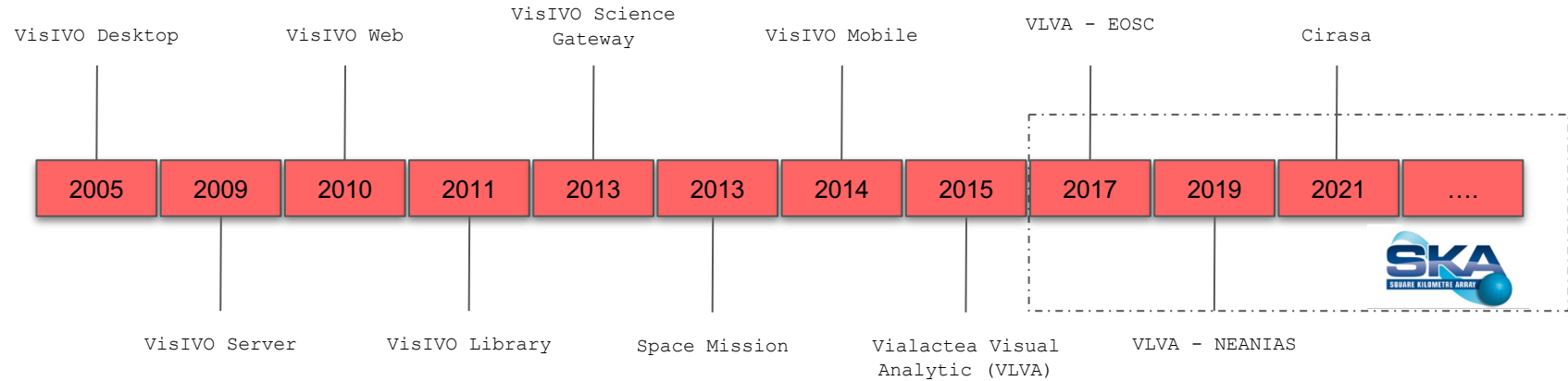


Analysis and visualization tools in INAF

Fabio Vitello



VisIVO Suite: History

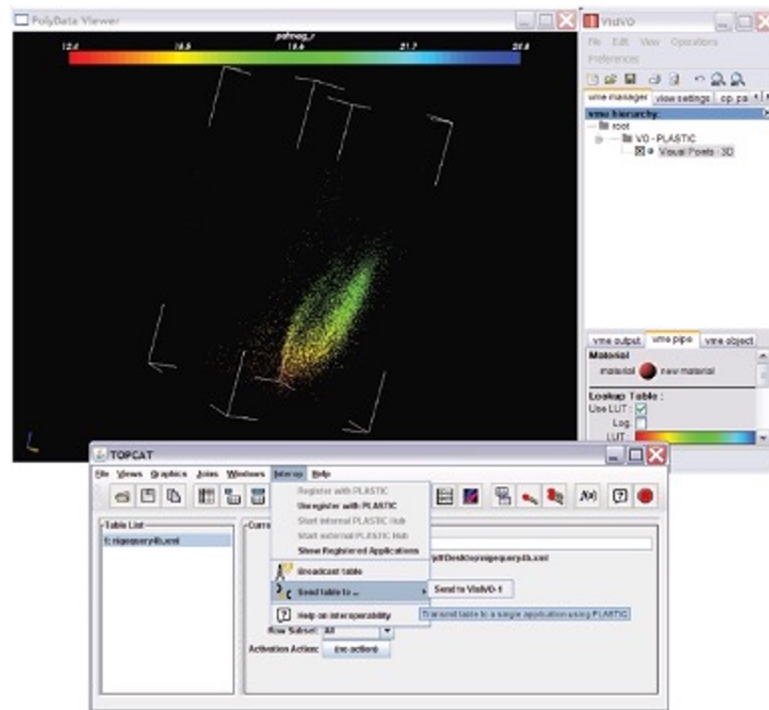


VisIVO Desktop

VisIVO Desktop was our **first experience** of a Visualisation and Data Analysis Tool developed as a collaboration between the Italian National Institute for Astrophysics - Astrophysical Observatory of Catania and CINECA.

Supports **different kinds of file formats**: VOTables, FITS, HDF5, ASCII, raw binaries, GADGET, etc.

The capabilities of VisIVO were extendable through an application **interoperability** protocol called PLASTIC (Platform for Astronomy Tool Interconnection) to leverage the abilities of different desktop applications in a seamless way.

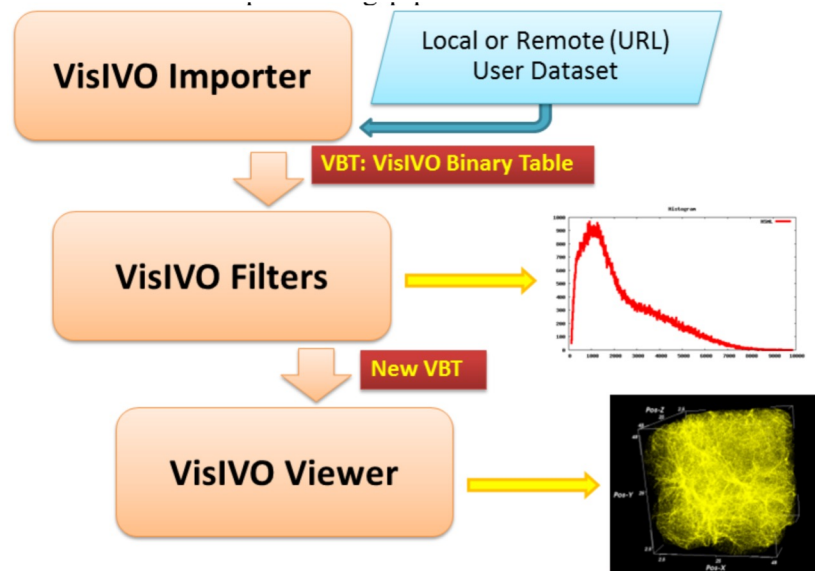


VisIVO Server

VisIVO Server is an **open source** collection of visualization modules for **fast rendering** of 3D views of astrophysical datasets.

VisIVO Server is built upon the VisIVO Desktop functionality and supporting Unix platforms.

The defining characteristic of VisIVO Server compared to VisIVO Desktop is support for very **large-scale datasets**; no fixed limits (in principle) are imposed for visualization.



VisIVO Library

The VisIVO Library is an API written in **C++**

Allows a job running on HPC system to produce a set of **images or movies** directly using VisIVO with its internal data arrays without the need to produce intermediate files.

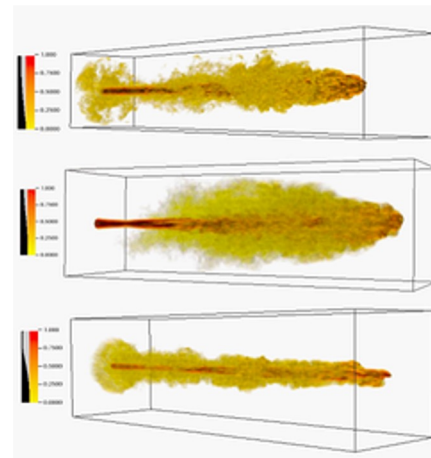
This is particularly important when running on DCIs and running large simulations, where the user wants to have a **quick look to the results** during the data production phase.

```
1 #include "visivo.h"
2 #include <string.h>
3 #include <stdio.h>
4 #include <stdlib.h>
5 #include <math.h>
6 #include <time.h>
7
8
9 #define NB 16777
10 #define NVOL 262144
11
12 int main(int argc, char*argv[])
13 {
14     int errorCode;
15
16     char filename[256];
17
18     //*****
19     //*****
20     //***** VisIVOImporter
21     VisIVOImporter envVI1;
22
23     errorCode=VI_Init(&envVI1);
24     errorCode=VI_SetAtt(&envVI1,VI_SET_FFORMAT,"ascii");
25     errorCode=VI_SetAtt(&envVI1,VI_SET_FILEPATH,"mrvt16.ascii");
26     errorCode=VI_SetAtt(&envVI1,VI_SET_OUTFILEVBT,"mrvt16.bin");
27
28     VI_Import(&envVI1);
29     //*****
30     //*****
31     //***** VisIVOFiler
32     VisIVOFiler envVF1;
33
34     char operation[256];
35     strcpy(operation,"pointproperty");
36
37     errorCode=VF_Init(&envVF1);
38     errorCode=VF_SetAtt(&envVF1,VF_SET_OPERATION,operation);
39     errorCode=VF_SetAtt(&envVF1,VF_SET_FILEVBT,"mrvt16.bin");
40     errorCode=VF_SetAtt(&envVF1,VF_SET_RESOLUTION,"32 32 32");
41     errorCode=VF_SetAtt(&envVF1,VF_SET_POINTCOLUMNS,"X Y Z");
42     errorCode=VF_SetAtt(&envVF1,VF_SET_APPEND,"");
43     errorCode=VF_SetAtt(&envVF1, VF_SET_OUTCOL,"density");
44     ..
```

VisIVO Server @ Pluto

Creating a visualization environment for **Pluto Code** (<http://plutocode.ph.unito.it>)

PLUTO is a freely-distributed software for the **numerical solution** of mixed hyperbolic/parabolic **systems of partial differential equations** (conservation laws) targeting high Mach number flows in astrophysical fluid dynamics. The code is designed with a modular and flexible structure whereby different numerical algorithms can be separately combined to solve systems of conservation laws using the finite volume or finite difference approach based on Godunov-type schemes.



credits:
<http://plutocode.ph.unito.it/>

VisIVO Server @ Pluto

Creating **readers** to import static grid produced by pluto into VisIVO Server:

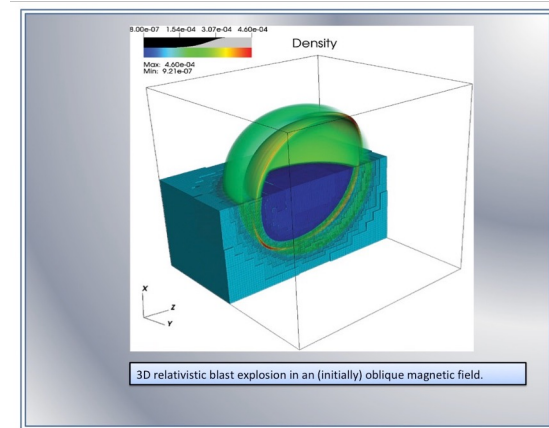
```
VTK format file format using structured or rectilinear grids (serial/parallel);
```

```
HDF5 double-precision (8 byte) HDF5 data (serial/parallel);
```

```
HDF5 single-precision (4 byte) HDF5 data (serial/parallel);
```

Support for **Adaptive Mesh Refinement** (AMR)

Python Wrapper for VisIVO Library



credits: <http://plutocode.ph.unito.it/>

Visualization Gateway

- Fully based on **JupyterHub** framework and including **VisIVO Server** and **Splotch** as two visualization environments.
- Integrated **Data Sharing Service** with auto-mount containing demo data (read-only).
- Fully containerized running on the **GARR Kubernetes Cluster**

More details @ E. Sciacca et al
Journal of Grid Computing

Next Talk: M. Raciti «The advantages of
<https://www.youtube.com/watch?v=1ZUkdXAAyz>
Notebooks on the cloud»

U

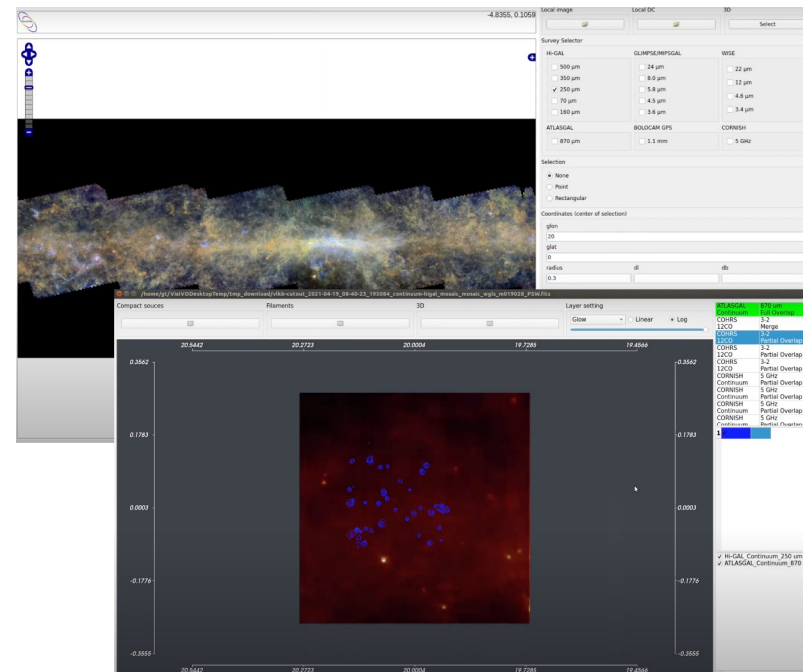
The screenshot displays the JupyterHub interface. At the top, the header shows 'jupyterhub Home Token' and a user email 'eva.sciacca@istnazastrofisica.onmicrosoft.com' with a 'Logout' button. Below the header, the 'Server Options' panel is visible, showing 'Remote storage mode' with two options: 'Auto-mount' (selected) and 'Other'. The 'Auto-mount' option is described as 'Auto-mount to remote reference-data fiestore (Nextcloud)'. The 'Other' option is described as 'Mount to other fiestore via WebDAV'. Below the server options, the Jupyter notebook interface is shown. The notebook has a menu bar with 'File', 'Edit', 'View', 'Insert', 'Cell', 'Kernel', 'Widgets', and 'Help'. The code area contains two input cells. The first cell (In [4]) contains a Jupyter magic command to load a 3D image from a remote storage location. The second cell (In [5]) contains a Jupyter magic command to display the image. The output of the second cell (Out [5]) shows a 3D visualization of a complex, multi-colored object, likely a galaxy or a cluster of stars, with axes labeled X, Y, and Z. A color bar at the bottom indicates the intensity of the data, ranging from 0 to 255.

VLVA: Vialactea Visual Analytic



3D visual analytics systems

- Provides access to **radio & infrared surveys** of the Galactic Plane archived in the Knowledge Base (VLKB)
- Supporting **visualization** of **2D images** and **3D velocity datacubes** (vol. renderings, slices), loaded locally or from VLKB
- Enabling **visualization** of **compact sources** and **filaments** from VLKB
- Currently **being integrated** with source **finding services**
- Available as **desktop application** for Mac OS and Ubuntu and also as **Docker container**.



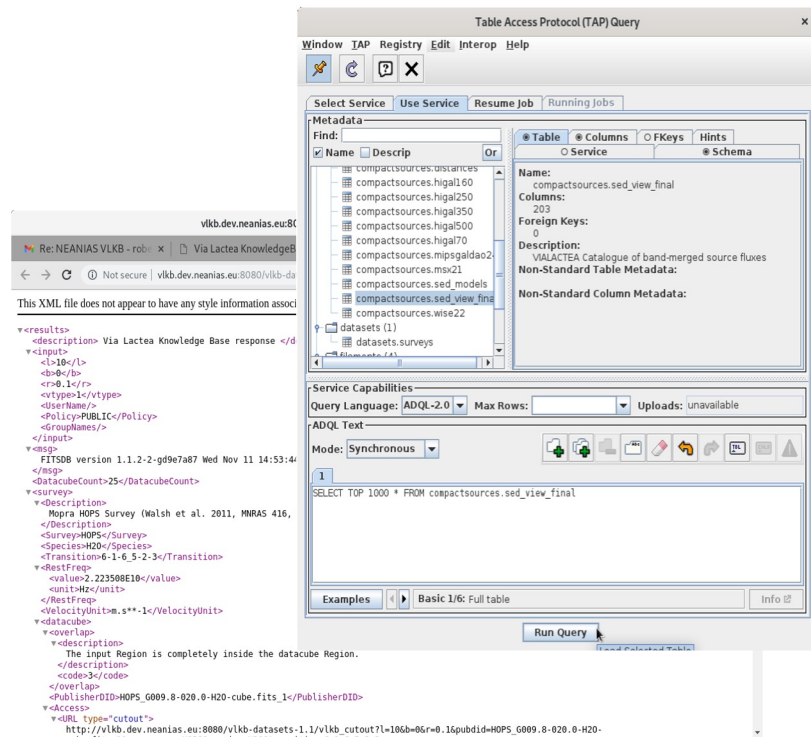
More details @ Vitello, F., et al. *PASP* (2018)

<https://github.com/NEANIAS-Space/ViaLacteaVisualAnalytics>

<https://vlva.readthedocs.io/en/latest/>

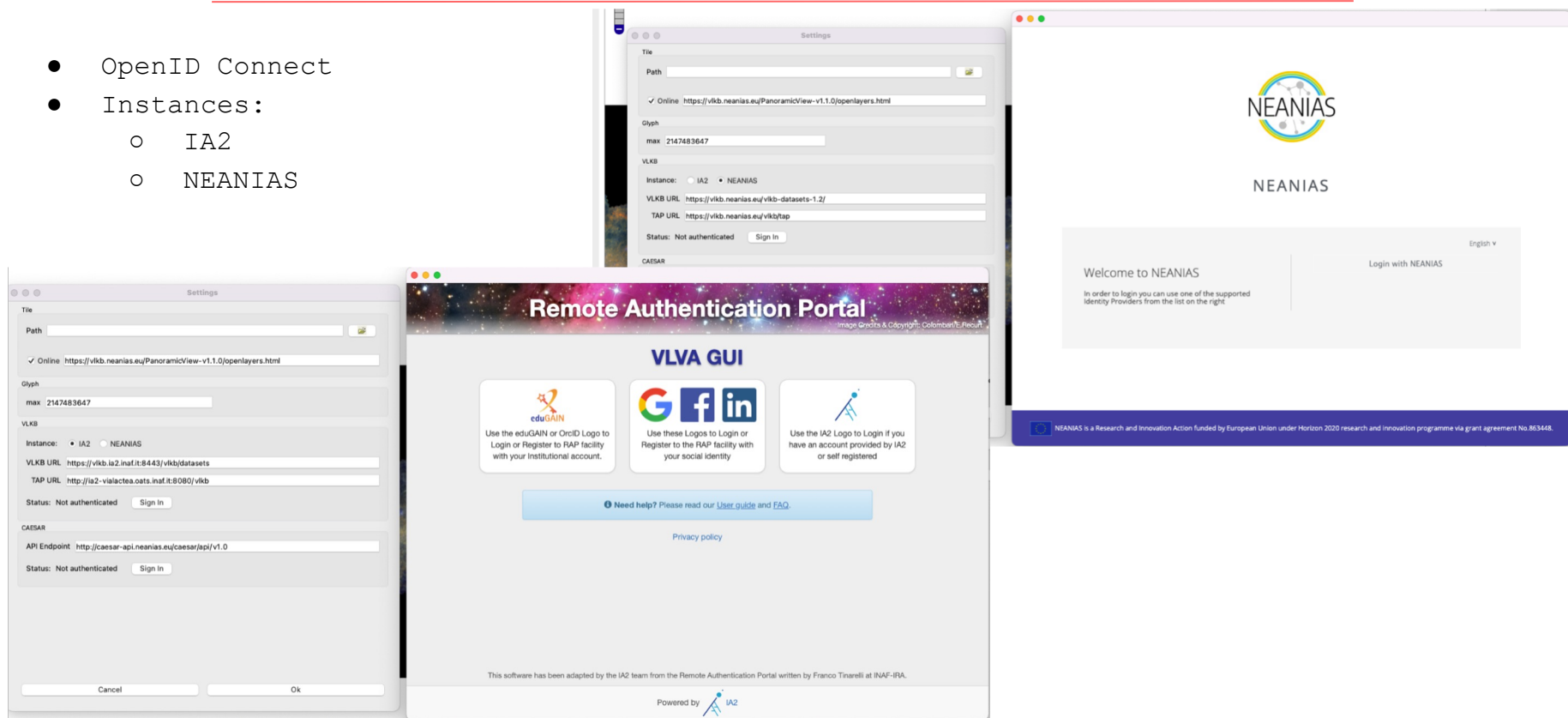
VLKB: Vialactea Knowledge Base

- Provides discovery services and access to **data collections** and **catalogues** of the galactic plane, initially made available by the EU FP7 VIALACTEA Project.
- Accessible through a **Virtual Observatory** enabled infrastructure (by the TAP protocol).
- Data access available through REST-API services: search, cutout and merge.
- Also provides information about compact sources, filament structures and numerical SED models
- Fully exploited by ViaLactea Visual Analytic client tools (desktop and web).
- Secured under Authentication and Authorization Infrastructure (**AAI**)
- Handles user privacy **roles** regarding access to specific surveys.



VLVA: AAI and VLKB Instances

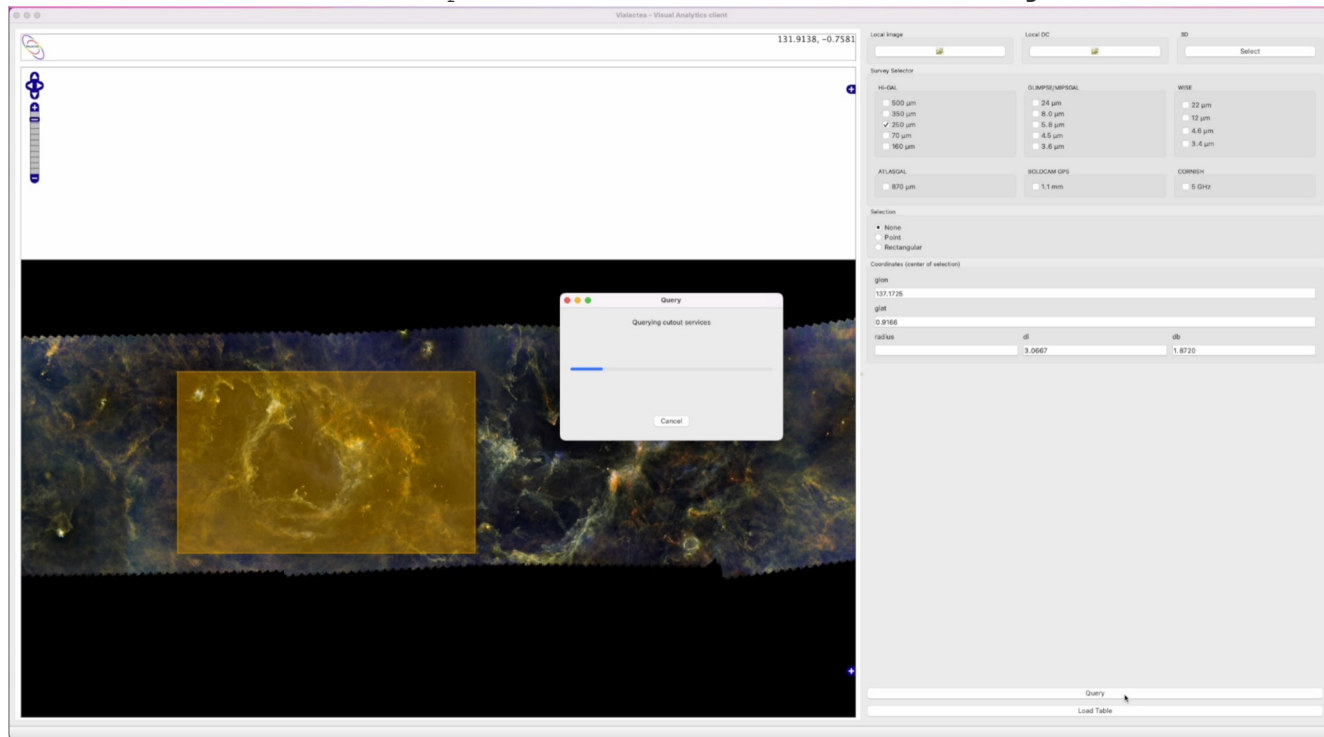
- OpenID Connect
- Instances:
 - IA2
 - NEANIAS



VLVA: Interactive view of the GP

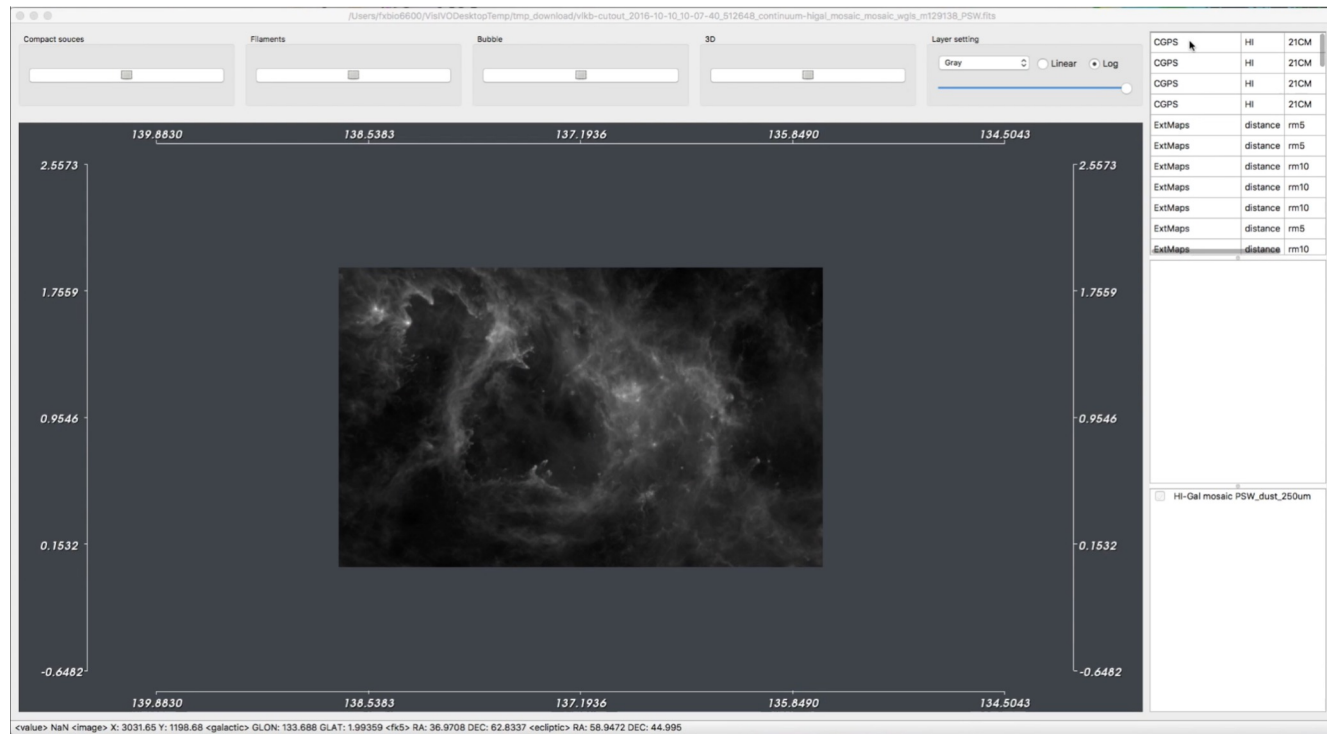
Interactive view of the galactic plane (longitude from -180° to $+180^\circ$ and latitude from -2° to 2°).

This view can be used to perform a **visual selection** of the region of interest.



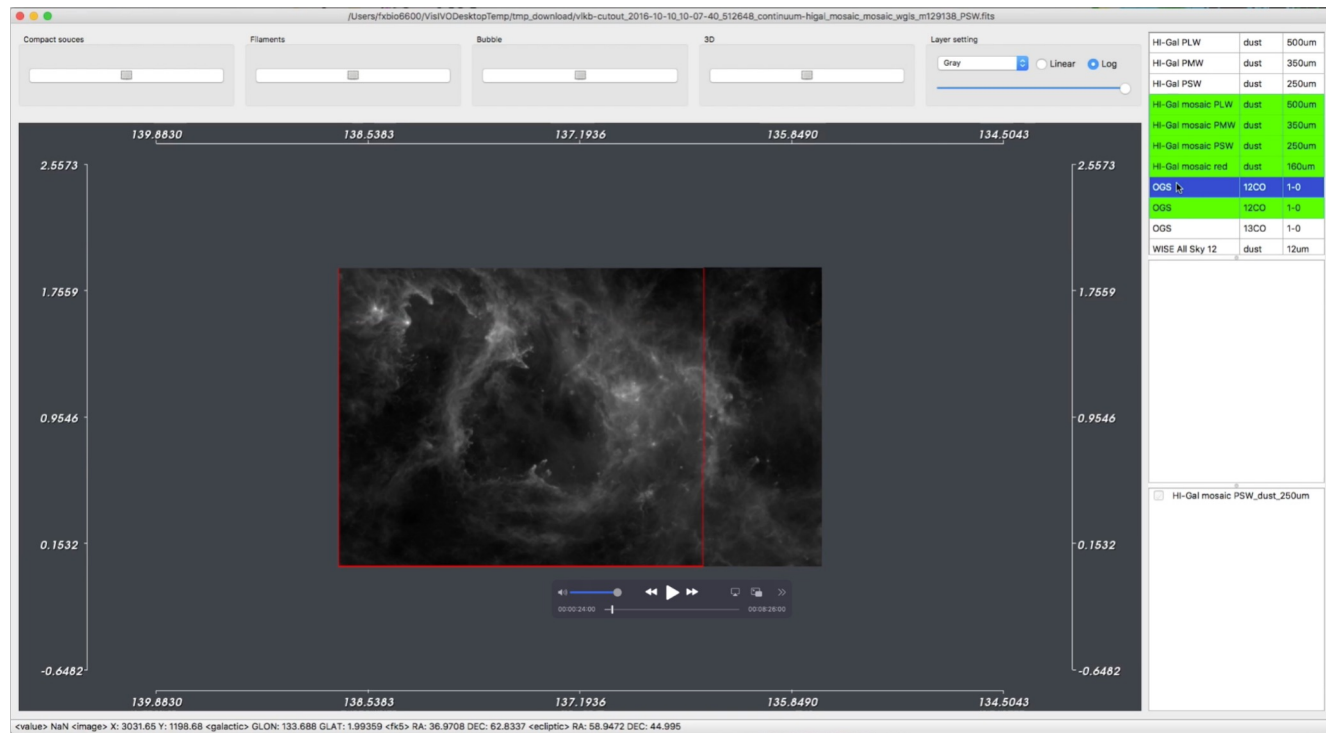
VLVA: 2D Visualization

Once the selected region has been downloaded or locally loaded, the **2D visualization** window is shown.



VLVA: VLKB Data overview

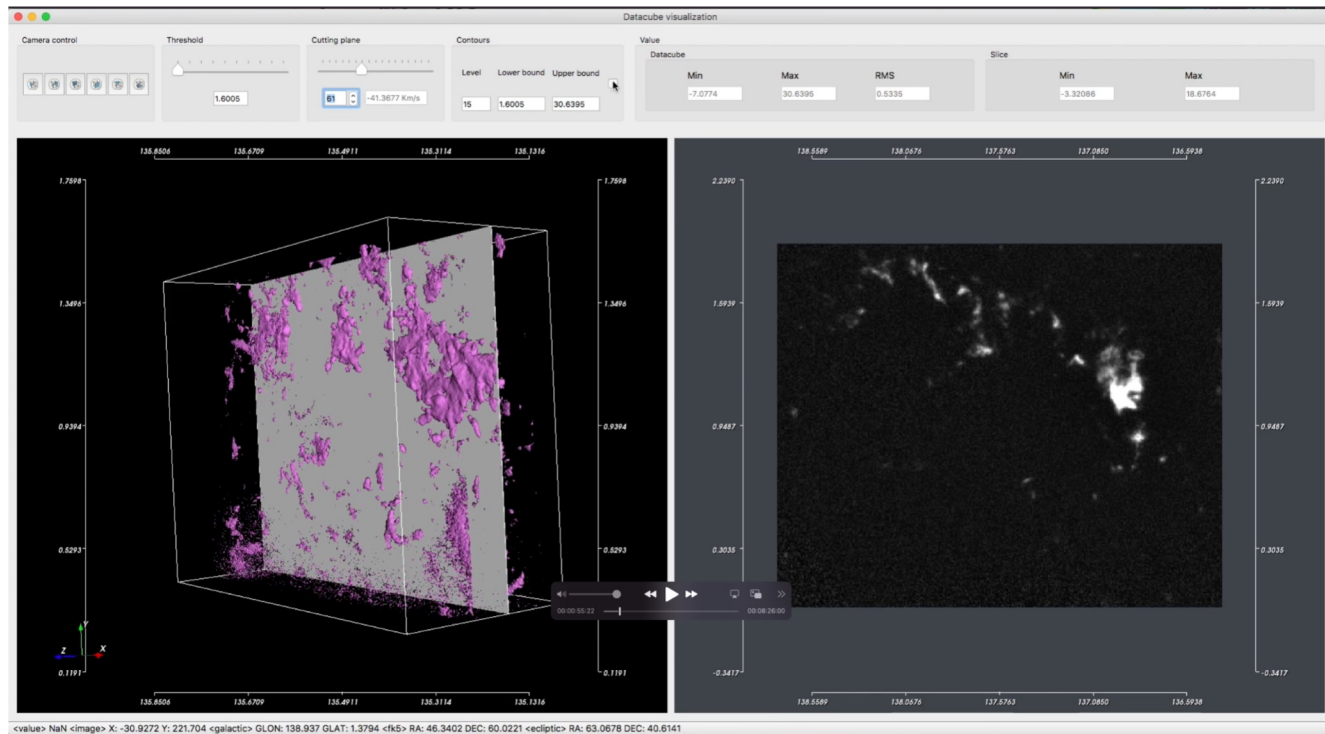
Clicking on the VLKB inventory a **footprint** of the selected item is shown



<https://youtu.be/BfIFQGnVPM>

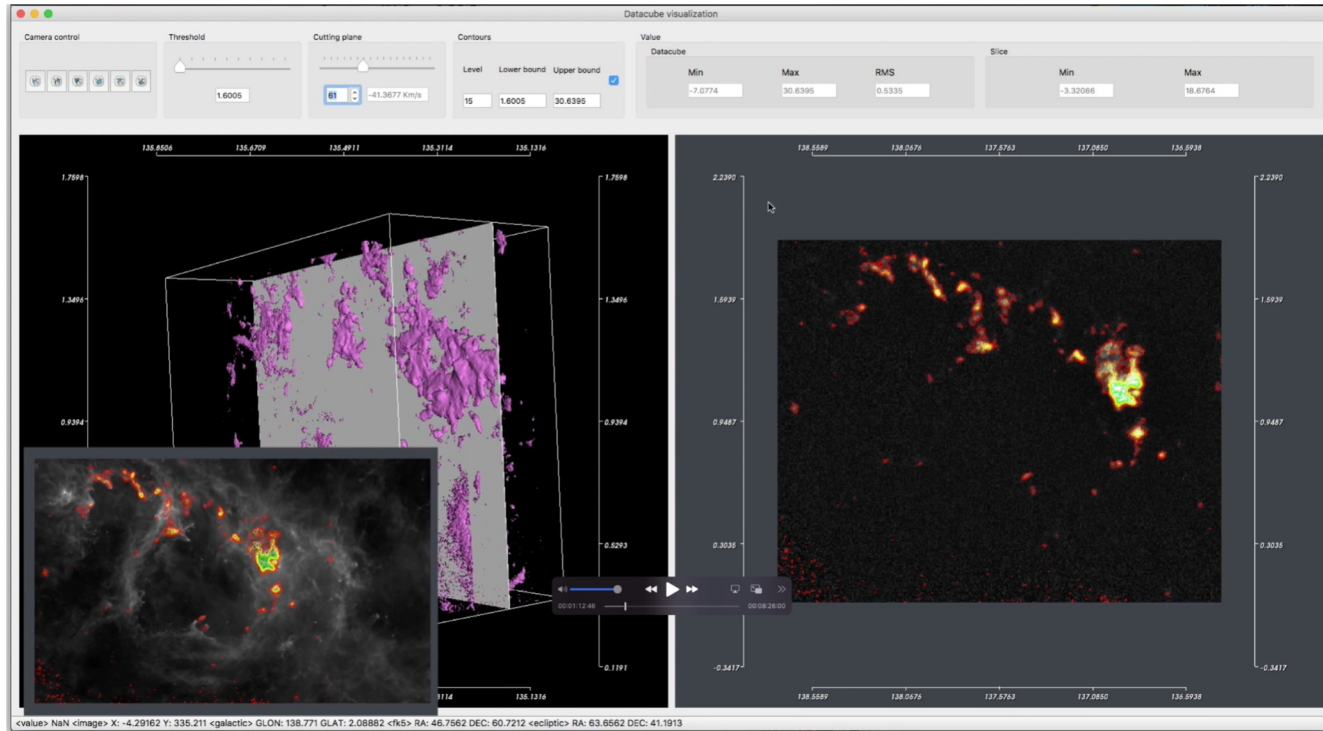
VLVA: Datacube Visualization

The **3D rendering of the datacube** is shown on the left panel. The right panel shows the selected **slice** of the velocity datacube.



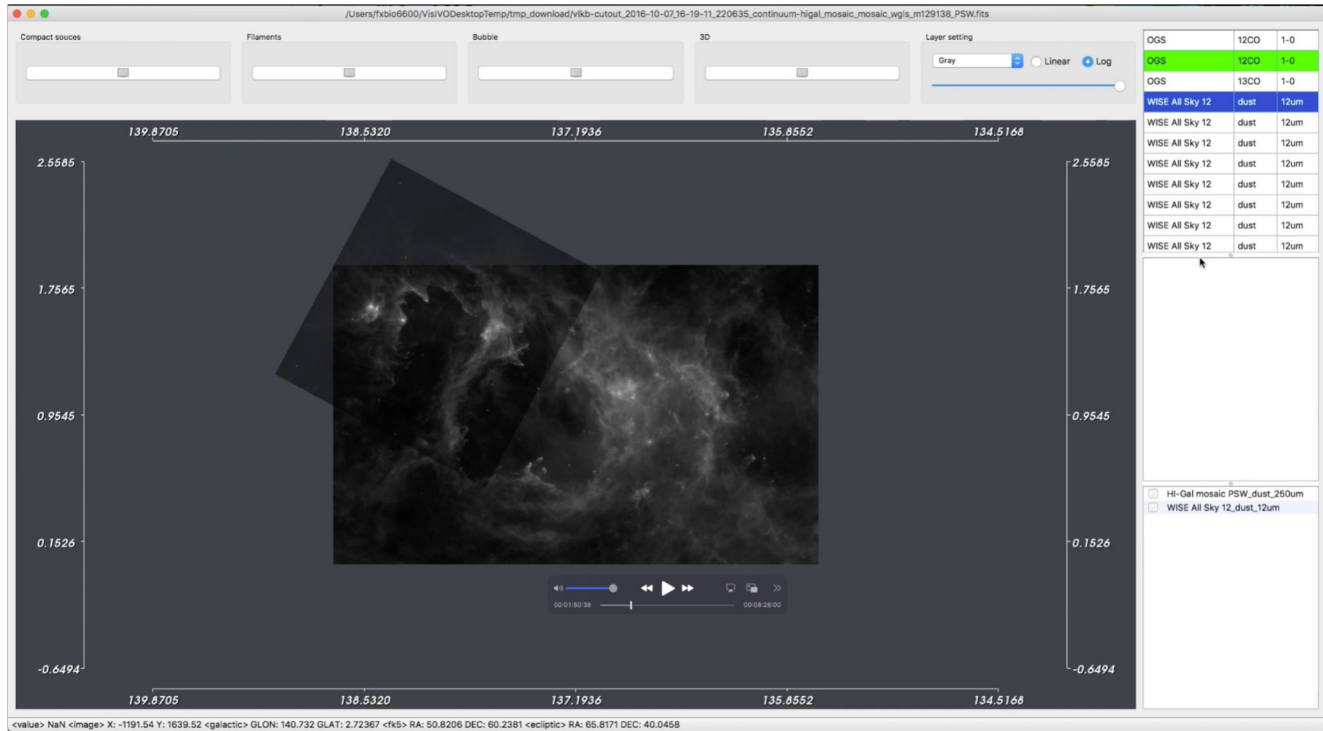
VLVA: Datacube Visualization - isocontours

If the Contours checkbox is enabled, the **isocontours** are displayed on top of the selected slice. The contours are also reported on the 2D map image.



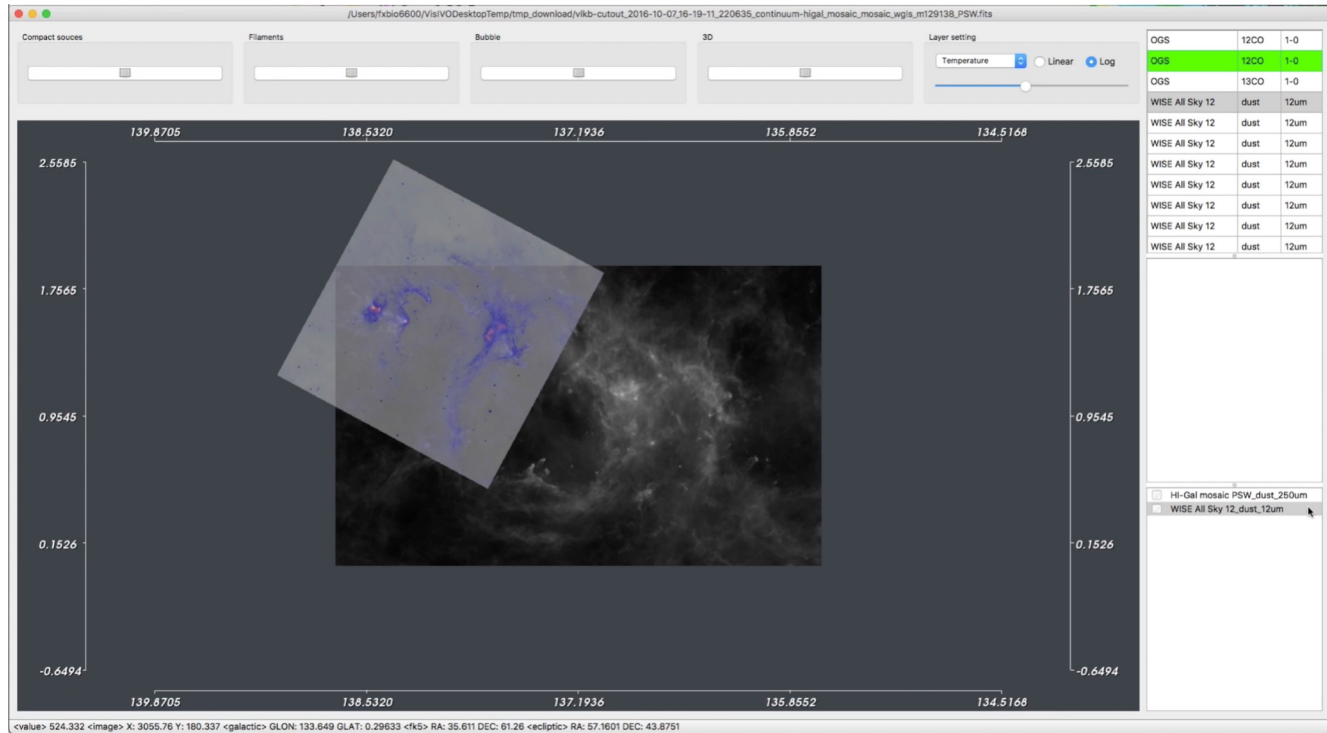
VLVA: Vialactea Visual Analytic

New layers are aligned (position, scaling pixel size, rotation) to the "base image" using the information contained in their header.



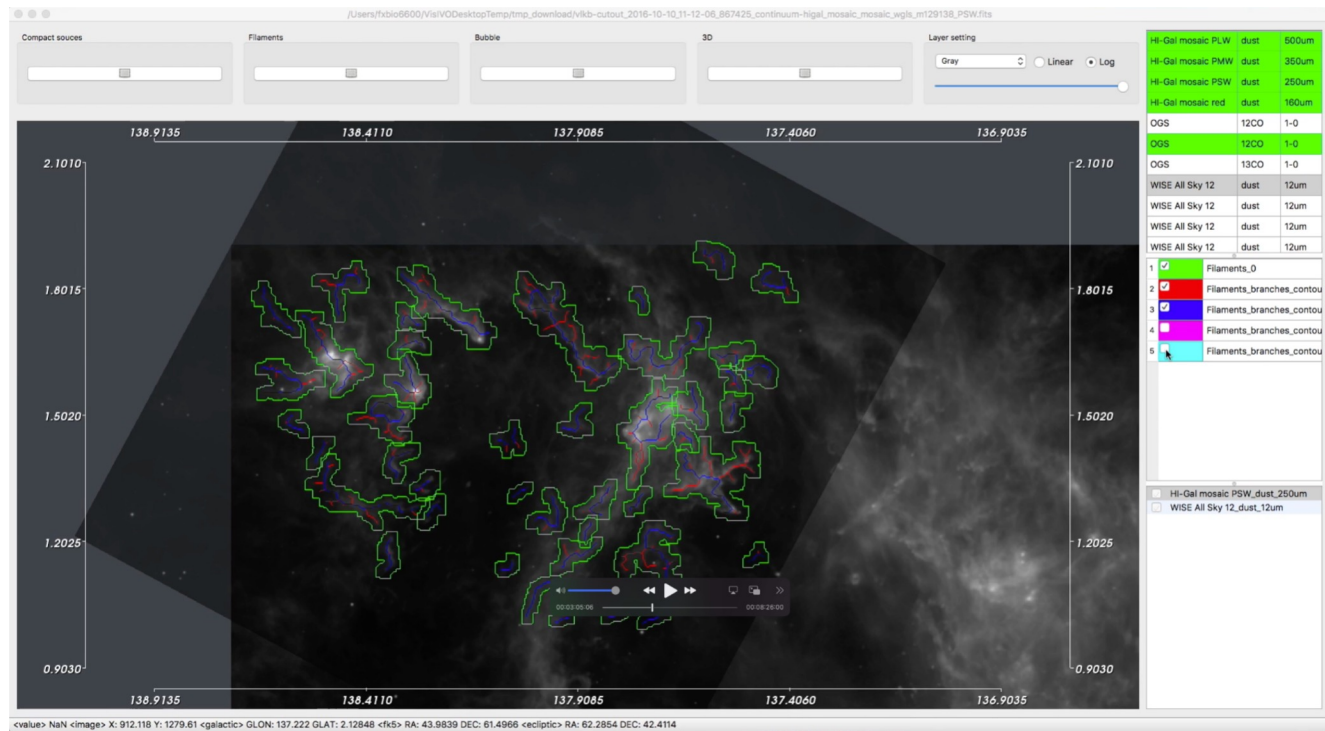
VLVA: 2D layers

By default, a grey color palette is used to visualize the image. The **color palette** can be changed using a predefined one embedded in the tool, selecting whether to use **linear** or **logarithmic scale**.



VLVA: Filament structures visualization

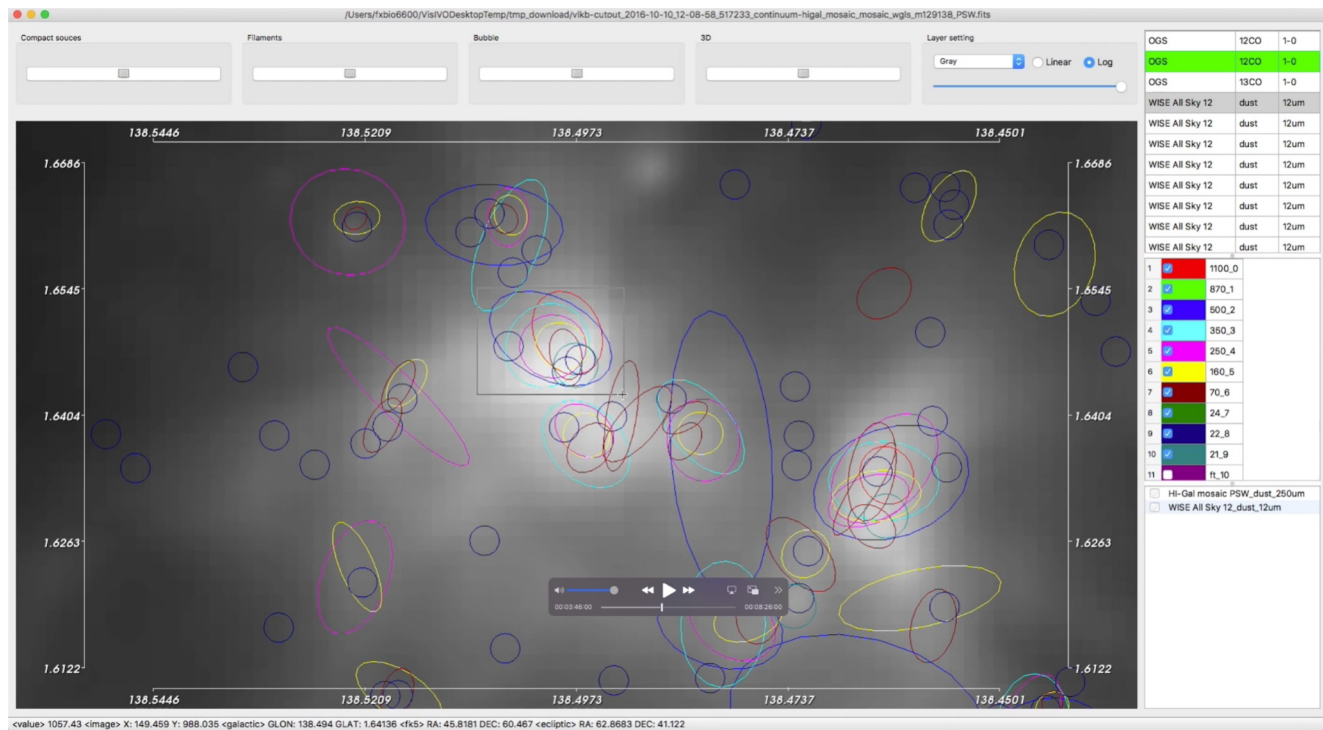
Filament structures can be visualized by selecting the Filaments button on top of the window and making a rectangular selection. The filaments are displayed with **contour** and **spine** on top of the image



<https://youtu.be/BfIFQGnVPFM>

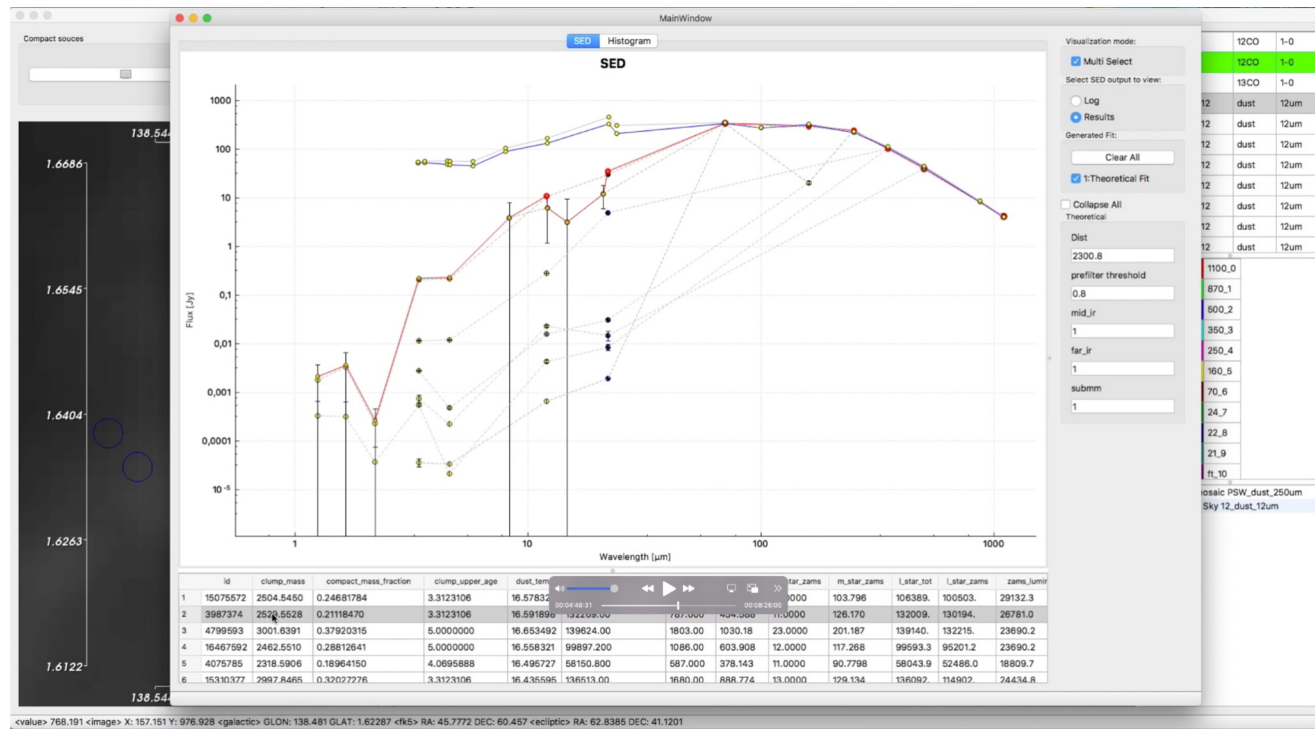
VLVA: Compact sources visualization

VLVA allows to visualize **compact sources** overlapped to the fits image. The compact sources are shown in different colors on the image depending on the relative wavelength.



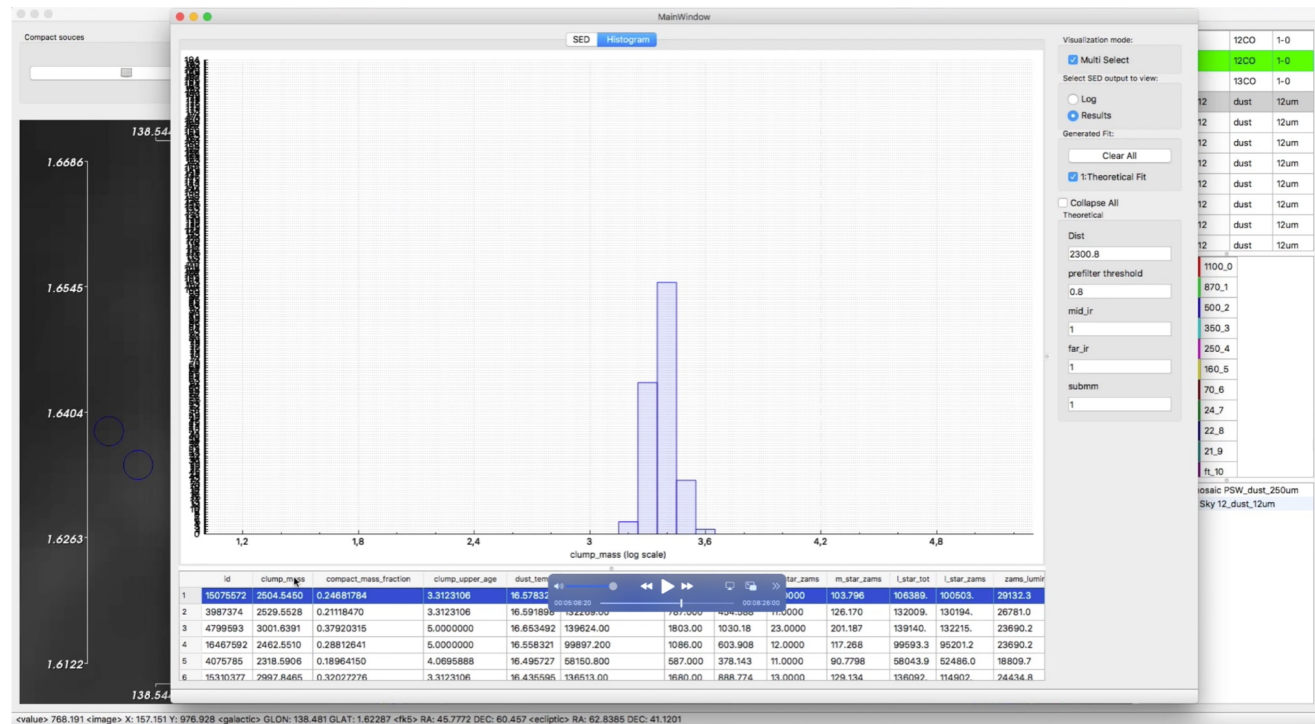
VLVA: SED Analysis

Fitting operations are performed in a transparent way for the user **locally** using integrated python routines or **remotely**.



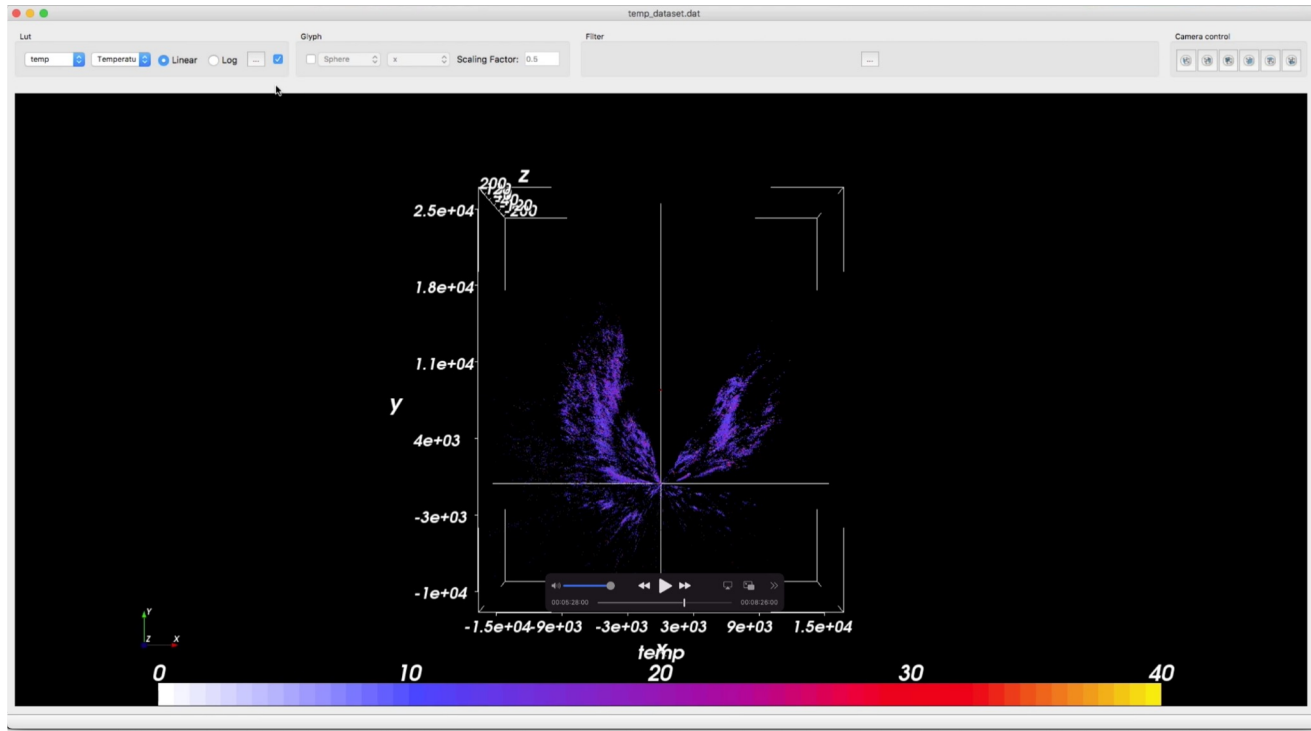
VLVA: SED Analysis

Fitting operations are performed in a transparent way for the user **locally** using integrated python routines or **remotely**.



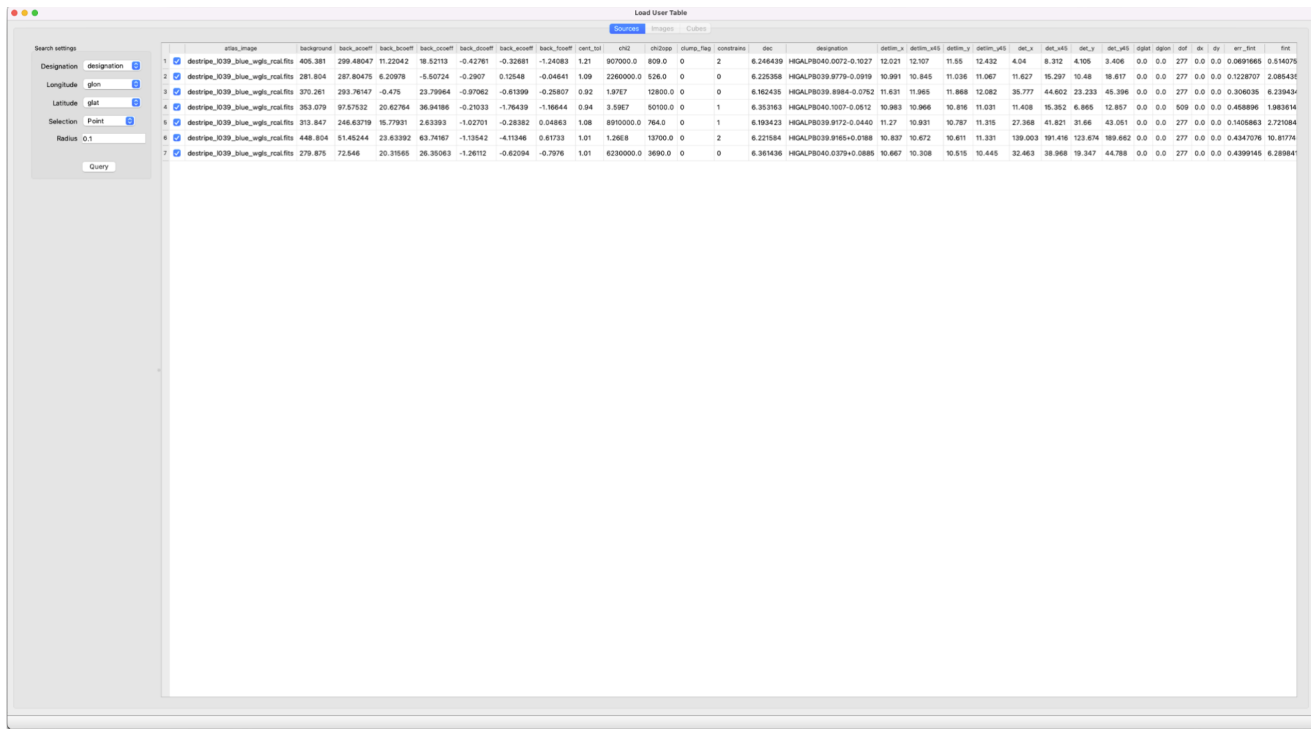
VLVA: 3D visualization

VLVA allows to explore a **3D visualization** of compact source **distributions** on the galactic plane



VLVA: Local catalogs

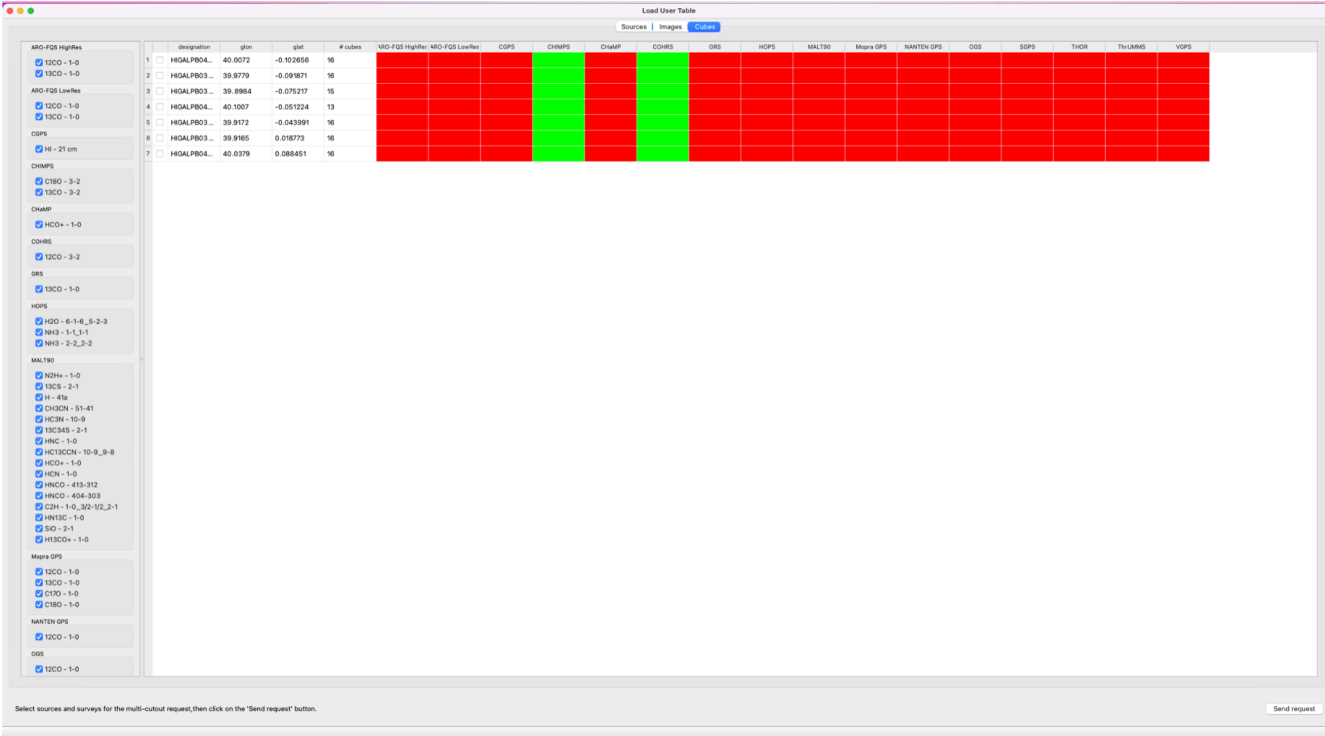
VLVA has recently been extended with support for **loading local catalogs**



The screenshot displays the VLVA web interface. On the left, a 'Search settings' panel includes fields for 'Designation' (set to 'designation'), 'Longitude' (set to 'glon'), 'Latitude' (set to 'glat'), 'Selection' (set to 'Point'), and 'Radius' (set to '0.1'). A 'Query' button is located below these settings. The main area is titled 'Load User Table' and contains a table with 30 columns. The columns are: 'id', 'glon', 'glat', 'background', 'back_anc1', 'back_anc2', 'back_anc3', 'back_anc4', 'back_anc5', 'cont_1st', 'vrb', 'ch1obj', 'ch2obj', 'ch3obj', 'ch4obj', 'ch5obj', 'ch6obj', 'ch7obj', 'ch8obj', 'ch9obj', 'ch10obj', 'ch11obj', 'ch12obj', 'ch13obj', 'ch14obj', 'ch15obj', 'ch16obj', 'ch17obj', 'ch18obj', 'ch19obj', 'ch20obj', 'ch21obj', 'ch22obj', 'ch23obj', 'ch24obj', 'ch25obj', 'ch26obj', 'ch27obj', 'ch28obj', 'ch29obj', 'ch30obj'. The table contains 5 rows of data, each starting with a blue square icon and a number in a blue box. The first row is: 1, 405.381, 299.48047, 11.22042, 18.5213, -0.42761, -0.32681, -1.24083, 1.21, 907000.0, 809.0, 0, 2, 6.246439, HGALP8040.0072-0.1027, 12.021, 12.107, 11.55, 12.432, 4.04, 8.312, 4.105, 3.406, 0.0, 0.0, 277, 0.0, 0.0, 0.0691665, 0.514076. The second row is: 2, 281.804, 287.80475, 6.20078, -5.50724, -0.2907, 0.12048, -0.04641, 1.09, 2260000.0, 526.0, 0, 0, 6.225358, HGALP8039.9779-0.0919, 10.901, 10.845, 11.036, 11.067, 11.627, 15.297, 10.48, 18.617, 0.0, 0.0, 277, 0.0, 0.0, 0.1220707, 2.085430. The third row is: 3, 370.261, 293.76147, -0.475, 23.79964, -0.97062, -0.61399, -0.25807, 0.92, 1.9767, 12800.0, 0, 0, 6.162435, HGALP8039.8994-0.0762, 11.631, 11.965, 11.888, 12.082, 35.777, 44.602, 23.233, 45.396, 0.0, 0.0, 277, 0.0, 0.0, 0.306035, 6.239434. The fourth row is: 4, 353.079, 97.57532, 20.62764, 36.94186, -0.21033, -1.76439, -1.16644, 0.94, 3.5967, 50100.0, 0, 1, 6.353163, HGALP8040.1007-0.0512, 10.963, 10.966, 10.816, 11.031, 11.408, 15.352, 6.865, 12.857, 0.0, 0.0, 509, 0.0, 0.0, 0.458896, 1.983614. The fifth row is: 5, 313.847, 245.63719, 16.77931, 2.63393, -1.02701, -0.28382, 0.04864, 1.08, 8910000.0, 764.0, 0, 1, 6.193423, HGALP8039.9172-0.0440, 11.27, 10.831, 10.787, 11.315, 27.368, 41.821, 31.66, 43.051, 0.0, 0.0, 277, 0.0, 0.0, 0.1405863, 2.721084. The sixth row is: 6, 448.804, 51.45244, 23.63392, 63.74167, -1.13542, -4.11346, 0.61733, 1.01, 1.2658, 13700.0, 0, 2, 6.221584, HGALP8039.9165-0.0188, 10.837, 10.472, 10.811, 11.331, 139.003, 191.416, 123.674, 189.662, 0.0, 0.0, 277, 0.0, 0.0, 0.4347076, 10.81774. The seventh row is: 7, 279.875, 72.546, 20.31565, 26.35063, -1.26112, -0.62094, -0.7976, 1.01, 6230000.0, 3690.0, 0, 0, 6.361436, HGALP8040.0379+0.0885, 10.667, 10.308, 10.515, 10.445, 32.463, 38.968, 19.347, 44.788, 0.0, 0.0, 277, 0.0, 0.0, 0.4399145, 6.289841.

VLVA: Local catalogs

When a local catalog is loaded, an **overview** of the **images** and **cubes** stored in the VLKB covering the region of the catalog is shown



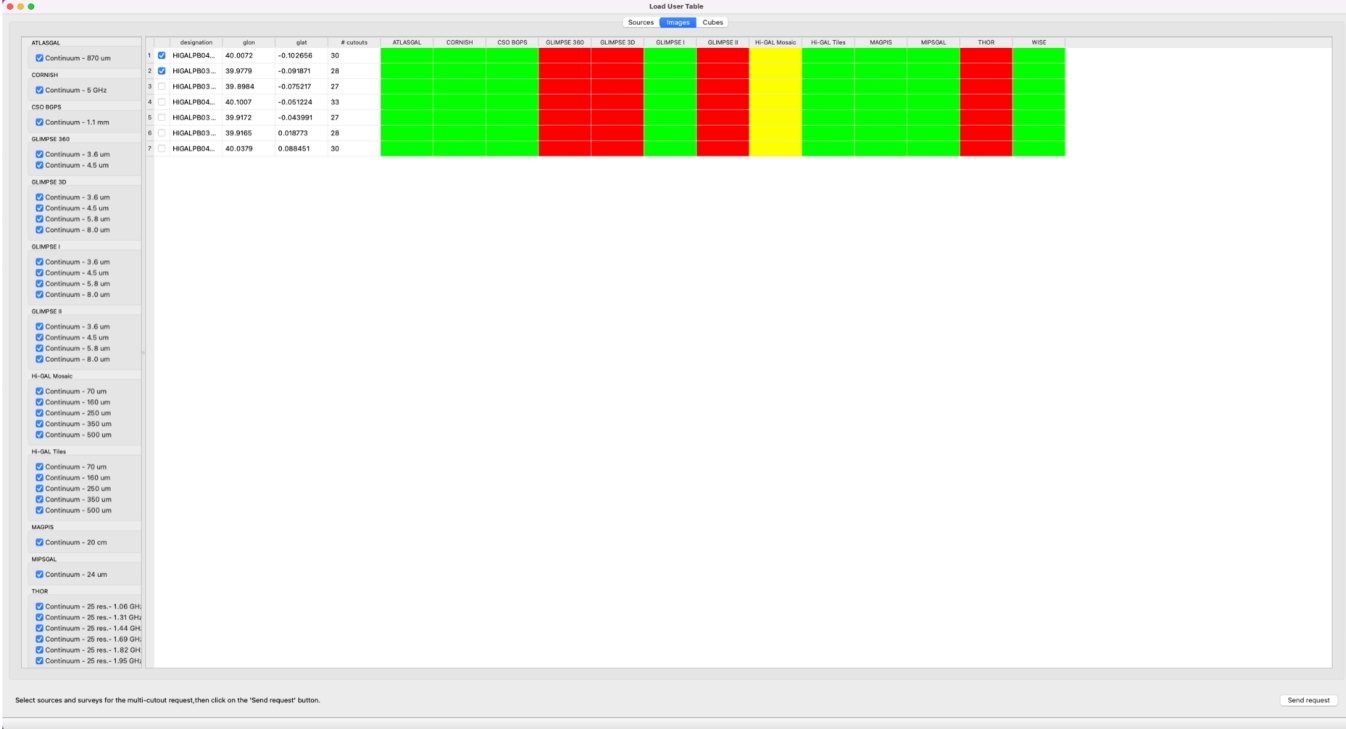
The screenshot displays the VLVA Local Catalogs interface. On the left, there is a sidebar with a list of sources and their associated images and cubes. The main area shows a table of sources with columns for designation, glon, glat, # cubes, and various survey names. The table is titled 'Load User Table' and has tabs for 'Sources', 'Images', and 'Cubes'. The 'Sources' tab is selected, showing a list of sources with their coordinates and the number of cubes. The 'Images' and 'Cubes' tabs are also visible. The table has columns for various surveys: VLBA-F22 HighRes, VLBA-F22 LowRes, COPS, CHIMP, CHAMP, COHRS, GRS, HOPS, MALTO, Mopra OPS, NANTEN OPS, OOS, SIGPS, THOR, THIMAS, and VOPS. The table shows 7 sources, with the first source having 16 cubes, the second 15, and the third 13. The table is filtered to show only sources with a designation starting with 'HSDLPB04...'.

	designation	glon	glat	# cubes	VLBA-F22 HighRes	VLBA-F22 LowRes	COPS	CHIMP	CHAMP	COHRS	GRS	HOPS	MALTO	Mopra OPS	NANTEN OPS	OOS	SIGPS	THOR	THIMAS	VOPS
1	HSDLPB04...	40.0072	-0.102656	16																
2	HSDLPB03...	39.9779	-0.099571	15																
3	HSDLPB04...	39.9964	-0.075237	13																
4	HSDLPB04...	40.1007	-0.051024	13																
5	HSDLPB03...	39.9772	-0.043991	16																
6	HSDLPB03...	39.9165	0.018773	16																
7	HSDLPB04...	40.0379	0.088451	16																

<https://youtu.be/BfIFQGnVPM>

VLVA: Local catalogs

When a local catalog is loaded, an **overview** of the **images** and **cubes** stored in the VLKB covering the region of the catalog is shown



The screenshot displays a web application titled "Load User Table" with tabs for "Sources" and "Cubes". The "Sources" tab is active, showing a table with columns for "description", "RA", "DEC", "# entries", and a grid of colored squares representing different data products. The left sidebar contains a list of categories with checkboxes for various parameters.

	description	RA	DEC	# entries	ATLASGAL	CORNHSH	CSO BGPS	GLIMPSE 360	GLIMPSE 30	GLIMPSE 1	GLIMPSE 6	H-GAL Maps	H-GAL Tiles	MADPIS	MIPSGAL	THOR	WISE
1	<input checked="" type="checkbox"/> HDALPR04... Continuum - 870 um	40.0072	-0.102056	20													
2	<input checked="" type="checkbox"/> HDALPR03... Continuum - 5 GHz	39.9779	-0.091871	28													
3	<input checked="" type="checkbox"/> HDALPR03... Continuum - 1.1 mm	39.9964	-0.075217	27													
4	<input checked="" type="checkbox"/> HDALPR04... Continuum - 3.6 um	40.1007	-0.051224	33													
5	<input checked="" type="checkbox"/> HDALPR03... Continuum - 4.5 um	39.9472	-0.043991	27													
6	<input checked="" type="checkbox"/> HDALPR03... Continuum - 5.8 um	39.9465	0.018773	28													
7	<input checked="" type="checkbox"/> HDALPR04... Continuum - 8.0 um	40.0379	0.088451	30													

Left sidebar categories and options:

- ATLASGAL
 - ☒ Continuum - 870 um
- CORNHSH
 - ☒ Continuum - 5 GHz
- CSO BGPS
 - ☒ Continuum - 1.1 mm
- GLIMPSE 360
 - ☒ Continuum - 3.6 um
 - ☒ Continuum - 4.5 um
- GLIMPSE 30
 - ☒ Continuum - 3.6 um
 - ☒ Continuum - 4.5 um
 - ☒ Continuum - 5.8 um
 - ☒ Continuum - 8.0 um
- GLIMPSE 1
 - ☒ Continuum - 3.6 um
 - ☒ Continuum - 4.5 um
 - ☒ Continuum - 5.8 um
 - ☒ Continuum - 8.0 um
- GLIMPSE 6
 - ☒ Continuum - 3.6 um
 - ☒ Continuum - 4.5 um
 - ☒ Continuum - 5.8 um
 - ☒ Continuum - 8.0 um
- H-GAL Maps
 - ☒ Continuum - 70 um
 - ☒ Continuum - 160 um
 - ☒ Continuum - 250 um
 - ☒ Continuum - 380 um
 - ☒ Continuum - 500 um
- H-GAL Tiles
 - ☒ Continuum - 70 um
 - ☒ Continuum - 160 um
 - ☒ Continuum - 250 um
 - ☒ Continuum - 380 um
 - ☒ Continuum - 500 um
- MADPIS
 - ☒ Continuum - 20 cm
- MIPSGAL
 - ☒ Continuum - 24 um
- THOR
 - ☒ Continuum - 25 res - 1.06 GHz
 - ☒ Continuum - 25 res - 1.31 GHz
 - ☒ Continuum - 25 res - 1.44 GHz
 - ☒ Continuum - 25 res - 1.69 GHz
 - ☒ Continuum - 25 res - 1.82 GHz
 - ☒ Continuum - 25 res - 1.95 GHz

Bottom status bar: Select sources and surveys for the multi-cubout request, then click on the "Send request" button. [Send request]

<https://youtu.be/BfIFQGnVPMF>

VLVA: VLVA: Local catalogs

User can easily **select** and **download** all the datasets that cover the region of sources loaded from local catalog

The screenshot displays the VLVA Local Catalogs web interface. The main window, titled 'Load User Table', contains a table with columns for designation, glm, gbt, # cutouts, and various survey names (ATLASGAL, CORNISH, CSO BOPS, GLIMPSE 360, GLIMPSE 3D, GLIMPSE 1, GLIMPSE 6, H-GAL Mosaic, H-GAL Tiles, MAGPIS, MIPSAL, THOR, WISE). The table lists several sources, including HGLR604... and HGLR603..., with their respective coordinates and the number of cutouts. To the left of the table, there are checkboxes for selecting specific surveys and their parameters (e.g., Continuum - 870 um, Continuum - 5 GHz, Continuum - 1.1 mm, Continuum - 3.6 um, Continuum - 4.5 um, Continuum - 5.8 um, Continuum - 8.0 um). A 'Send request' button is located at the bottom right of the main window.

An 'MCutout summary' dialog box is open in the foreground, showing a 'Summary table (44 cutouts)' with columns for 'PubID' and 'Status'. The table lists various cutouts, including 'continuum-hgal-pmw_destripe_039_PMW_wgh_rcal.fits_1', 'continuum-hgal-psw_destripe_039_PSW_wgh_rcal.fits_1', 'continuum-hgal-red_destripe_039_red_wgh_rcal.fits_1', 'continuum-hgal-blue_destripe_039_blue_wgh_rcal.fits_1', 'continuum-magpis_magpis_40_0_0_2.fits_1', 'continuum-mipsal_MOC400x05_024.fits_1', 'continuum-wisa_285Sp060_ac1-w4-int-3.fits_1', 'continuum-wisa_285Sp060_ac1-w3-int-3.fits_1', 'continuum-wisa_285Sp060_ac1-w2-int-3.fits_1', and 'continuum-wisa_285Sp060_ac1-w1-int-3.fits_1'. Below the table, there are fields for 'Cutout details' (PublisherID, Longitude, Latitude, r, g, b, Status) and a 'Please wait...' progress bar. A 'Confirm' button is located at the bottom right of the dialog box.

<https://youtu.be/BfIFQGnVPMF>

VLVA: Local catalogs

User can easily **select** and **download** all the datasets that cover the region of sources loaded from local catalog

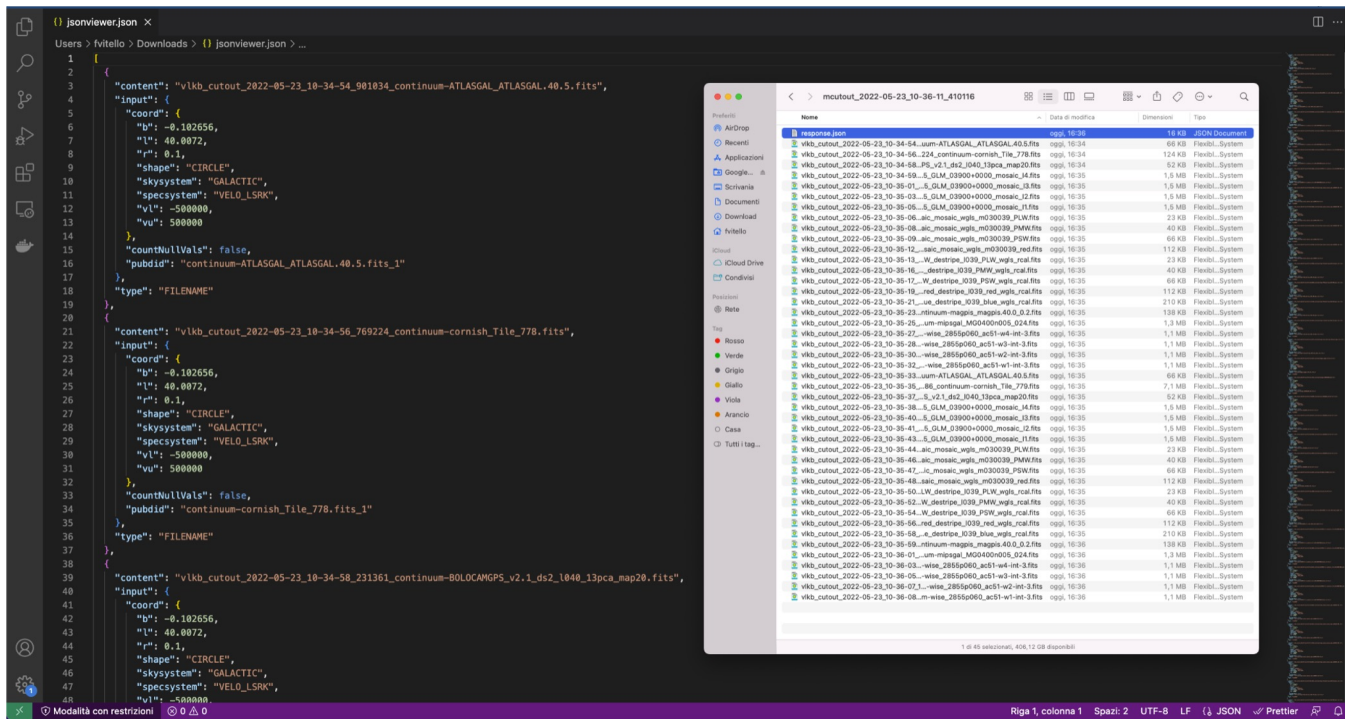
The screenshot displays the VLVA Local Catalogs web interface. The main window shows a table of sources with columns for designation, glm, gbt, # cutsout, and various instrument categories (ATLASGAL, CORNISH, CSO ROPS, GLIMPSE 360, GLIMPSE 3D, GLIMPSE 1, GLIMPSE 8, H-GAL Mosaic, H-GAL Tiles, MAGPIS, MIPSAL, THOR). The table is filtered to show sources with a designation starting with 'HIGALR604...'. The 'Status' column indicates the download status of each source.

A dialog box titled 'MOutput summary' is overlaid on the table, showing a summary table of 44 cutsouts. The dialog includes a 'Download archive...' button and a 'Cancel' button. Below the summary table, there is a section for 'Cutsout details' with fields for PublisherID, Longitude, Latitude, ℓ , b , db , and Status.

At the bottom of the interface, there is a footer that reads: 'Select sources and surveys for the multi-cutsout request, then click on the "Send request" button.' and a 'Send request' button.

VLVA: Local catalogs

The downloaded **archive** contains all the fits file (images and datacubes) plus a **metadata** file that can be used to load the dataset into VLVA



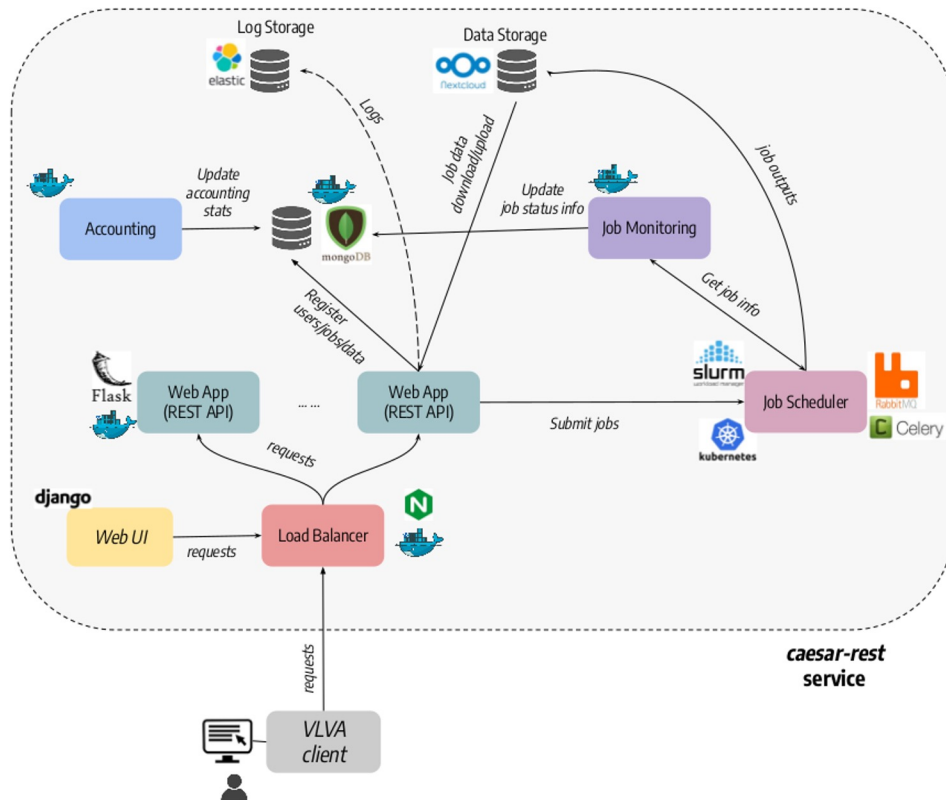
<https://youtu.be/BfIFQGnVPFM>

SFinder service - Source Finding



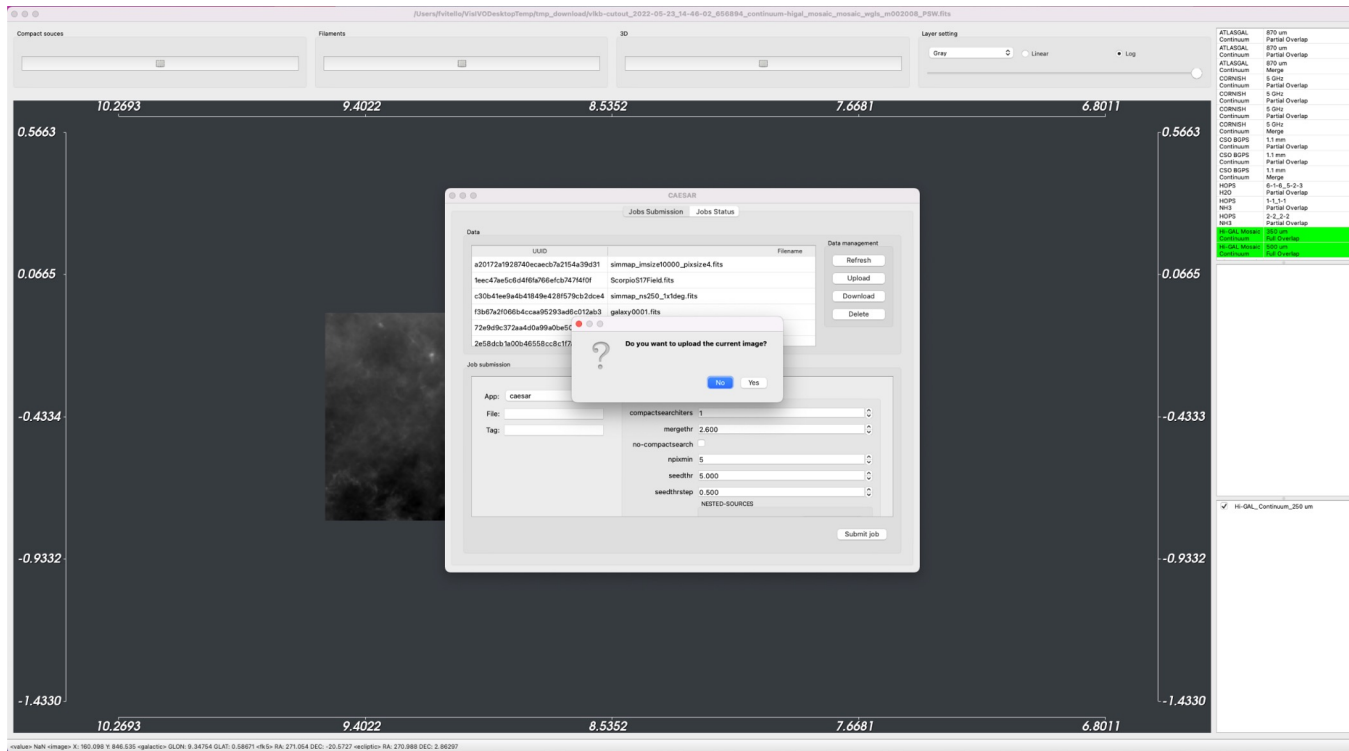
- A REST-ful web service based on Flask framework for running **CAESAR source finding** jobs
- Deployed and tested on **GARR OpenStack Kubernetes** cluster + CIRSA dedicated resources
- Multiple run strategies
 - Kubernetes Jobs (Docker)
 - Slurm Jobs (Singularity)
 - Celery async tasks
- Integrated with NEANIAS EOSC services (AAI, Logging, Accounting)
- Other source finders (ASGARD, CUTEX, Aegean) under integration
- Integrated with ViaLactea visualization

More details @ Riggi, S., et al. (2021)
Astronomy and Computing
<https://github.com/SKA-INAF/caesar-rest>



VLVA: SFinder integration

Upload the visualised image to the SFinder service



VLVA: SFinder integration

Configuring the job, selecting the source finder to run

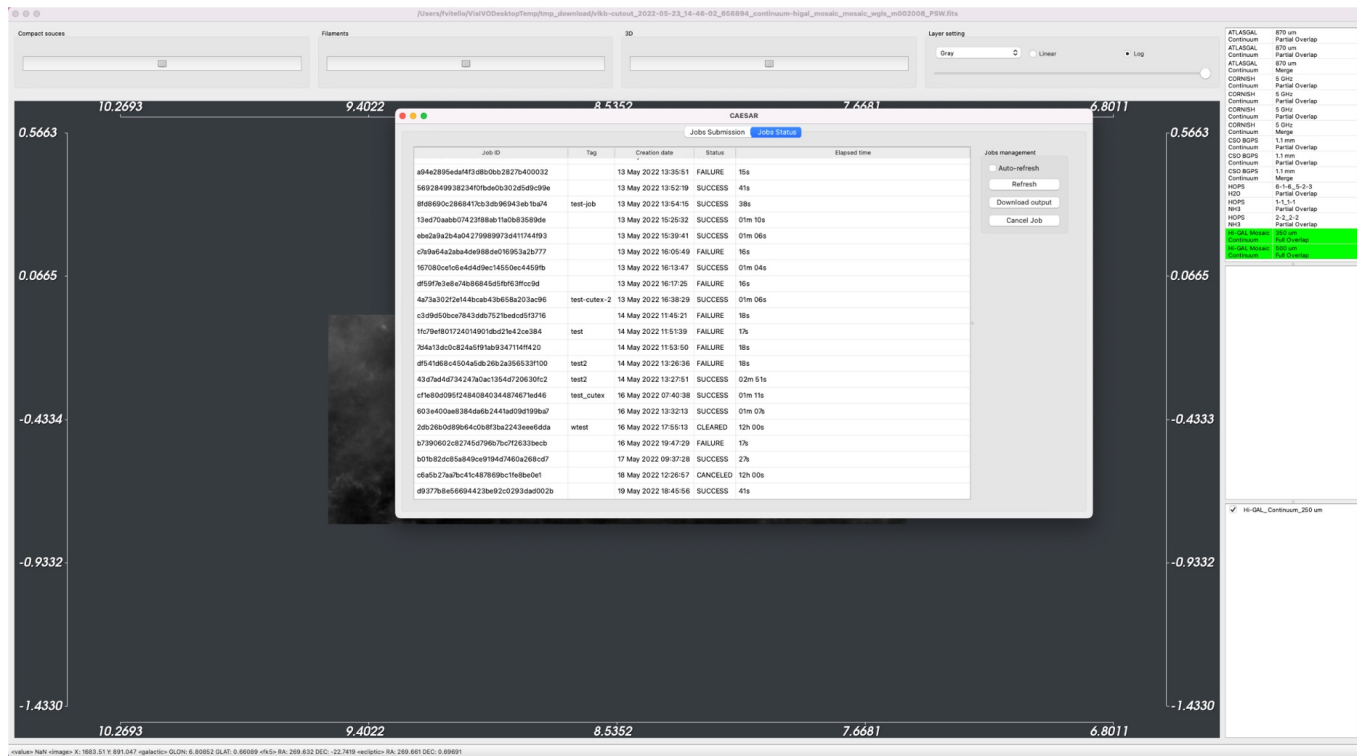
The screenshot displays the VLVA SFinder integration interface. The main window shows a dark field with a central image of a galaxy cluster. The interface is divided into several sections:

- Top Bar:** Contains input fields for 'Compact sources', 'Filaments', and '3D'. It also includes a 'Layer setting' dropdown set to 'Gray' and a 'Log' button.
- Left Panel:** A vertical axis with numerical labels: 0.5663, 0.0665, -0.4334, -0.9332, and -1.4330.
- Right Panel:** A vertical axis with numerical labels: 0.5663, 0.0665, -0.4333, -0.9332, and -1.4330. It also contains a list of sources with columns for 'Name', 'RA', 'DEC', and 'Type'. The 'HI-GAL_Continuum_200 um' source is highlighted in green.
- Central Window (CAESAR):** A modal window for job submission and status. It includes a 'Data' table with columns for 'UID', 'Filename', and 'Data management'. The table lists several data files. Below the table, there are sections for 'Job submission' and 'COMPACT-SOURCES' with various configuration options like 'compactsearchers', 'margintr', 'no-compactsearch', 'nplmin', 'seedtr', and 'seedtrisp'. A 'Submit job' button is at the bottom right.

The bottom of the interface shows a status bar with coordinates: 'x: 160.089 Y: 848.525 -galactic- GLON: 9.34754 GLAT: 0.58571 -R&S- RA: 271.054 DEC: -20.5727 -resolution- RA: 270.888 DEC: 2.86297'.

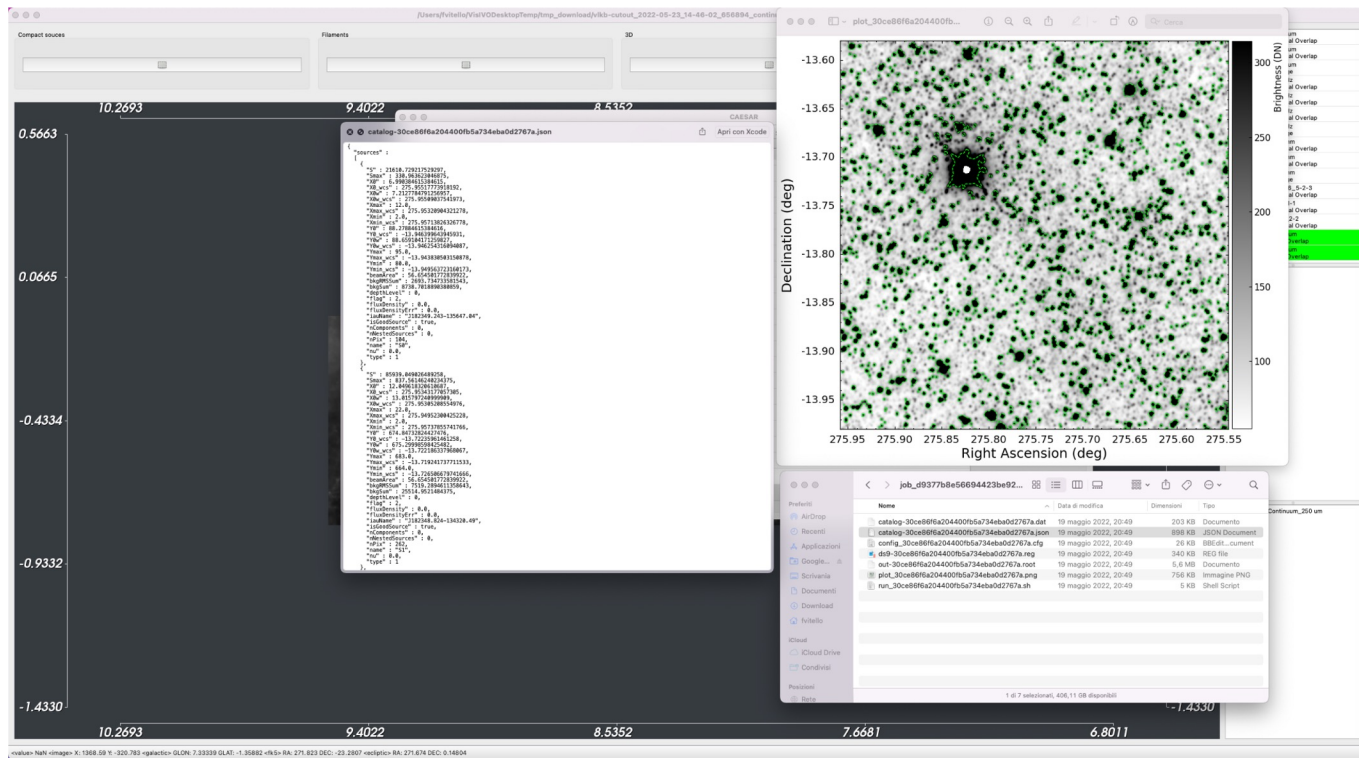
VLVA: SFinder integration

Monitoring the job, and download the output



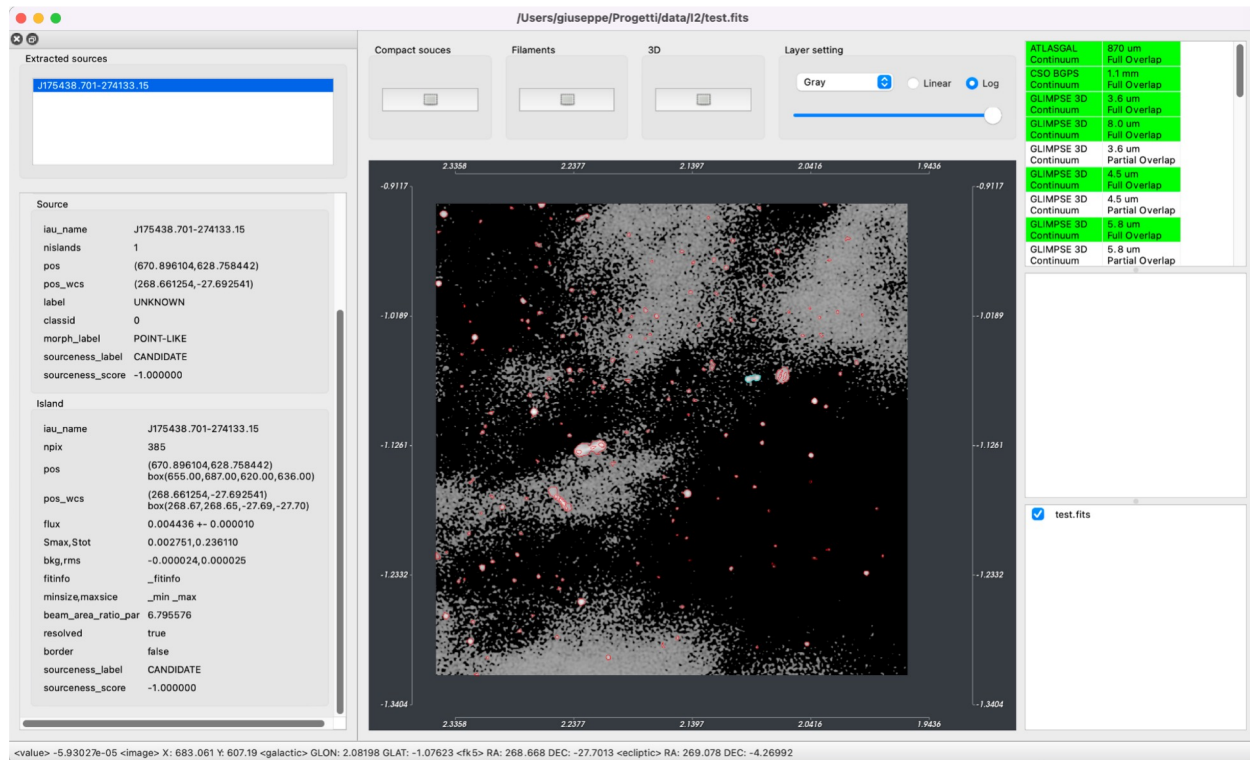
VLVA: SFinder integration

Outputs includes a PNG of extracted sources and region file (DS9 and JSON format)



VLVA: extracted sources refinement

Analysis of source finder results with VLVA application



VLVA: extracted sources refinement

Refinement of extracted source

The screenshot displays the VLVA software interface for source refinement. The main window shows a grayscale image of a star field with two sources highlighted: one in green and one in red. The interface is divided into several panels:

- Extracted sources:** A list of sources, currently showing J175438.701-274133.15.
- Operations:** Buttons for Rename, Add, Delete, and Save.
- Source:** Metadata for the selected source, including IAU name, position, label, class, and flux.
- Island:** Metadata for the island, including IAU name, position, flux, and background RMS.
- Compact sources, Filaments, 3D:** Checkboxes for different source types.
- Layer setting:** A slider and radio buttons for Gray, Linear, and Log scales.
- Table:** A table listing various sources and their properties, including beam size, resolution, and overlap status.

Source	Beam size	Resolution	Overlap
ATLASGAL	870 um	Full Overlap	
CSO BGPS	1.1 mm	Full Overlap	
Continuum	3.6 um	Full Overlap	
GLIMPSE 3D	8.0 um	Full Overlap	
Continuum	3.6 um	Full Overlap	
GLIMPSE 3D	3.6 um	Partial Overlap	
Continuum	4.6 um	Full Overlap	
GLIMPSE 3D	4.6 um	Full Overlap	
Continuum	4.6 um	Partial Overlap	
GLIMPSE 3D	5.8 um	Full Overlap	
Continuum	5.8 um	Partial Overlap	

<value> 2.63247e-06 <image> X: 587.885 Y: 672.24 <galactic> GLON: 2.12165 GLAT: -1.04913 <fk5> RA: 268.664 DEC: -27.6534 <ecliptic> RA: 269.074 DEC: -4.22203

Prototype 4 - SKA Regional Centres

Visualization of SKA data with high volume of users and high amount of data

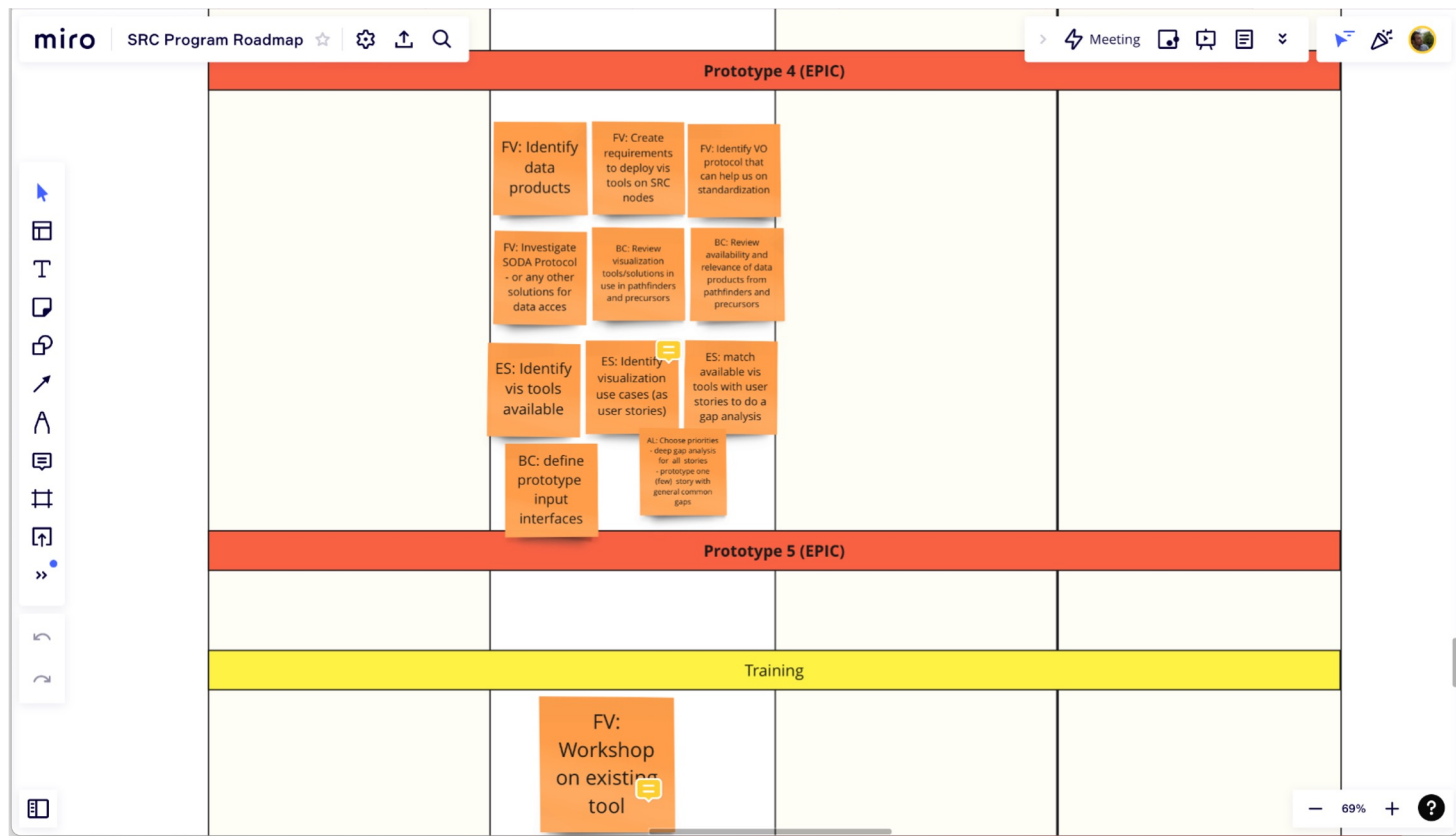
Team Orange

Italy SRC:

- Fabio Vitello (product owner) 0.5 FTE
- Giuseppe Tudisco (scrum master) 0.8 FTE
- Eva Sciacca 0.3 FTE
- Andrea Lorenzani 0.3 FTE
- Matteo Canzari 0.2 FTE
- Franco Tinarelli 0.2 FTE
- Claudio Gheller 0.2 FTE
- Alessandra Zanichelli 0.1 FTE
- Vincenzo Galluzzi 0.1 FTE

		FTE	SRC
Scrum Master	@Tudisco, Giuseppe	80%	IT
Product Owner	@Vitello, Fabio	50%	IT
Team Members	@Sciacca, Eva	30%	IT
	@Lorenzani, Andrea	30%	IT
	@Tinarelli, Franco	20%	IT
	@Gheller, Claudio	20 %	IT
	@Das, Arpan	40%	SWI
Observers	@Xu, Zhijun		China
	@Zanichelli, Alessandra	10%	IT
	@Galluzzi, Vincenzo	10%	IT
	@Kirkham, Kechil		SA
	@Pandey, Vishambhar Nath	10%	FR
	@Allen, Mark	5%	FR
	@Boch, Thomas	5 %	FR
	@Fernique, Pierre	5 %	FR
	@Bonnarell, Francois	5 %	FR
	@Salome, Philippe	10 %	FR
	@Cecconi, Baptiste	10 %	FR
	@Loh, Alan	10 %	FR
	@Vilotte, Jean-Pierre		FR
	@Moreau, Nicolas	10 %	FR
	@Yaye-Awa, Ba	10 %	FR
	@Salgado, Jesus		SKAO

Prototype 4 - SKA Regional Centres



Remote Visualization

Rendering close to the datasets

Scale Up resources

Prototypes:

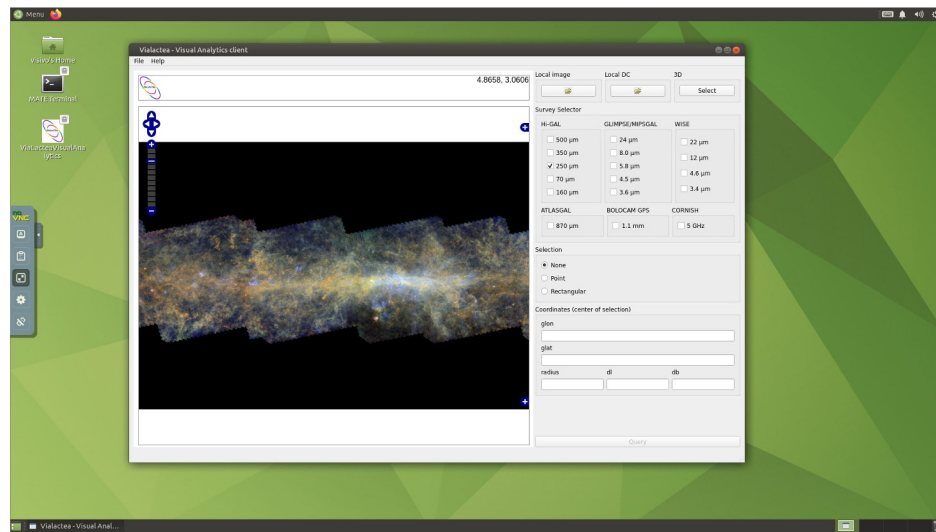
- Docker + noVNC
 - Remote Rendering + web interface
 - Remote Rendering + Desktop interface
-

VLVA@Docker

- Run VLVA in a docker container
- Accessible through VNC via web browser
- Based on [NVIDIA Container Toolkit](#)

PROS: Easier to develop

CONS: Vertical Scalability

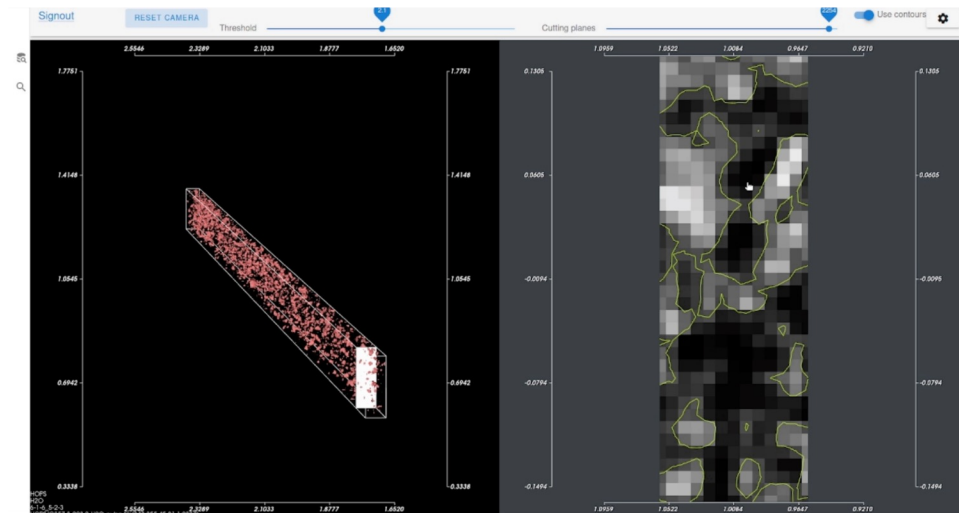


<https://vlva.readthedocs.io/en/latest/install.html#docker-container>

Vialactea Web - VLW

<https://youtu.be/F6Q4xiMbHqg>

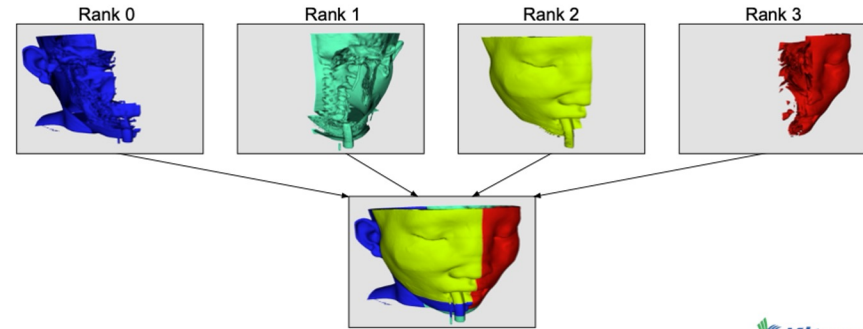
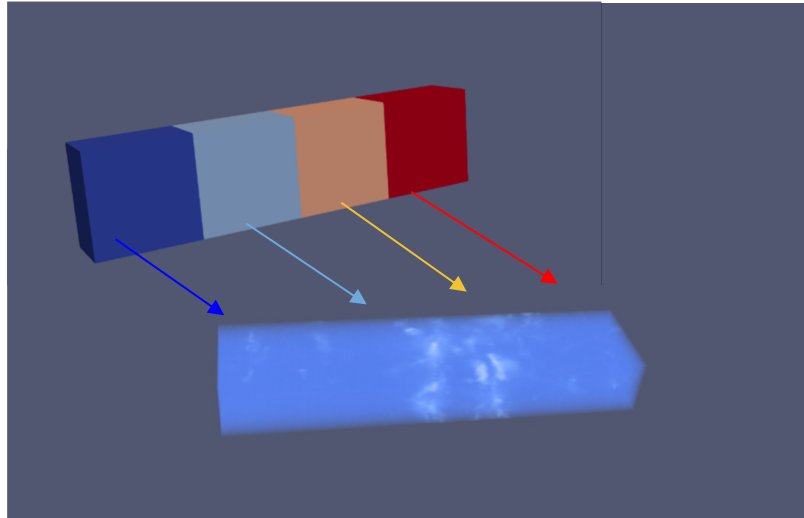
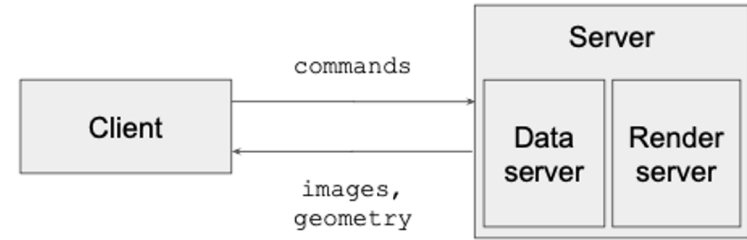
- Work-in-progress [simplified web version](#) of the VISUAL ANALYTICS TOOL, developed in collaboration with University of Portsmouth (UK)
- Multi-user support within web environment
- Provides efficient offscreen visualisation (GPU and CPU rendering) on remote server



- Web browser solution with desktop/mobile/tablet support that is flexible for future functional extension
- Working on full containerization for optimized deployment on cloud and distributed infrastructures

Remote Rendering + Desktop interface

- Based on Kitware Paraview
- Vertical and Horizontal Scalability
- Data Parallel Pipelines
 - MPI Based readers

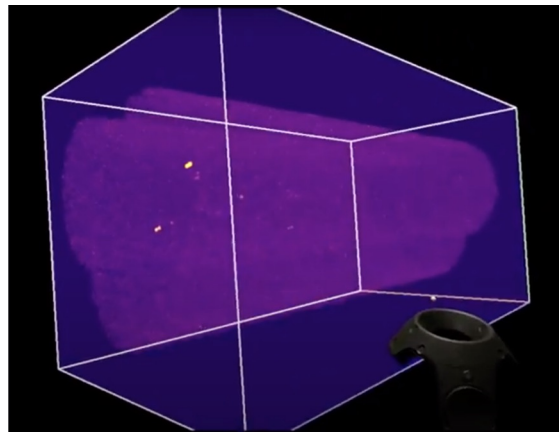


iDaVIE: immersive Data Visualisation Interactive Explorer

iDaVIE is a VR software allows **data cube investigation** from an immersive perspective with several operations on the data such as **source identifications**, **mask visualization** and **mask editing** on the fly.

Involved Persons:

- **IDIA teams:** Prof. Tom Jarrett (PI) and Prof. Russ Taylor (Co-PI), both directors of the IDIA Viz Lab, Dr. Lucia Marchetti (Project Scientist and Project Manager) , Dr. Angus Comrie (Lead Developer), Alexander Sivitilli (Developer), Prof. Mattia Vaccari (Italy-South Africa Bilateral Program representative);
- **ICT-VR-Lab and MeerKAT Fornax Survey teams:** Dr. Ugo Becciani (Co-PI), Dr. Fabio Vitello (lead the design and development of the user interface), Dr. Paolo Serra (Co-Project Scientist, HI expert and HI Community Representative)



Webinar



NEANIAS SPACE SERVICES Webinar Series

June 8th 2022, 15:00 CEST



NEANIAS SPACE ViaLactea
Exploring our Galaxy with Visual Analytic
Giuseppe Tudisco, Marco Molinaro,
Evgenia Malikova



<https://forms.gle/iWkjcbHwQ3VTcliy9>

Thank you

fabio.vitello@inaf.it

Giuseppe Tudisco, Eva Sciacca, Simone Riggi, M. Molinaro , R. Butora S.
Molinari, M. Benedettini, S. Mordini, E. Malikova, C. Gheller, U.
Becciani

+

Ecogal, CIRASA & NEANIAS collaborators
