



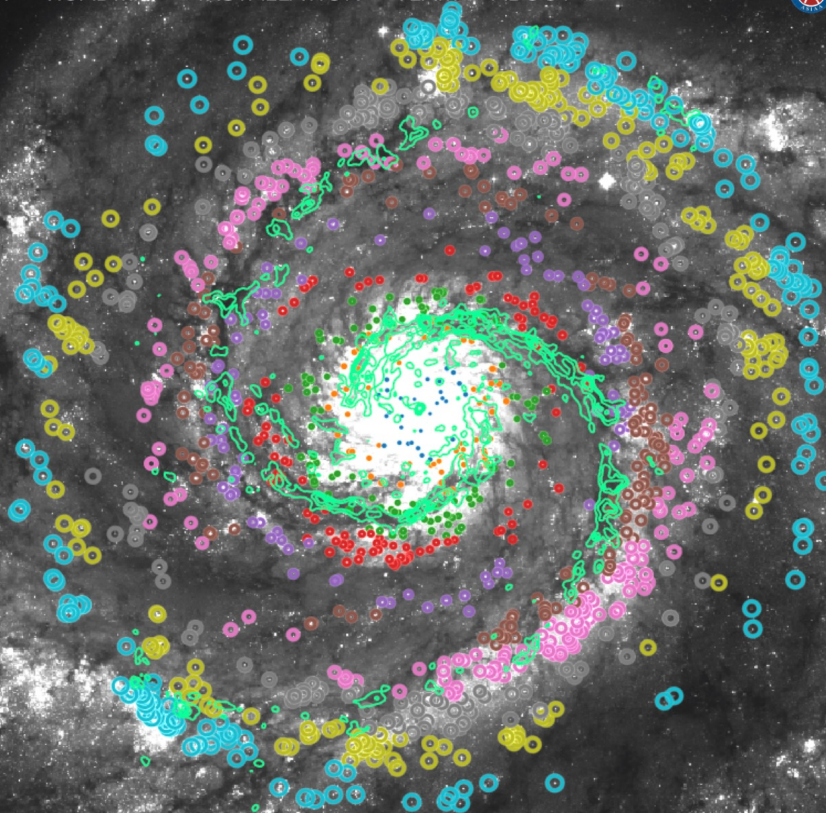
CARTA

Cube Analysis and Rendering Tool for Astronomy, is a next generation image visualization and analysis tool designed for ALMA, VLA, and SKA pathfinders.

[Installation](#)

[User Manual](#)

NEW v3.0-beta.2b release is out



CARTA

Juergen Ott

CARTA

Cube Analysis and Rendering Tool for Astronomy

Project: ASIAA, IDIA, NRAO, U Alberta

Webpage: <https://cartavis.org>; Github: <https://github.com/CARTAVIS>

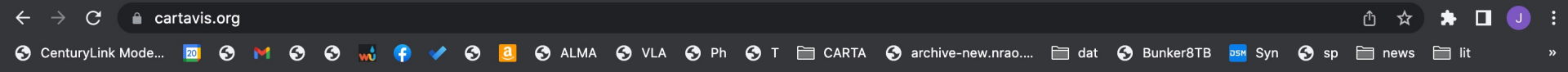


Current release version 4.1

Image viewer for multiple image (cube) formats

- high performance
 - versatile
 - analysis tool
 - collaborative tool
 - publication ready files
 - focus is on radio astronomy data but other data will be displayed as well (fits)
-
- Replaces the CASA viewer (except visibilities)
 - serves as archive interface for SKA (precursors), ALMA, NRAO SRDP
 - Server – client architecture allows for remote image viewing
 - Interactive and scriptable interfaces (python; development in progress)

CARTA on cartavis.org



[HOME](#) [FEATURES](#) [GALLERY](#) [ROADMAP](#) [INSTALLATION](#) [TEAM](#) [ABOUT](#)



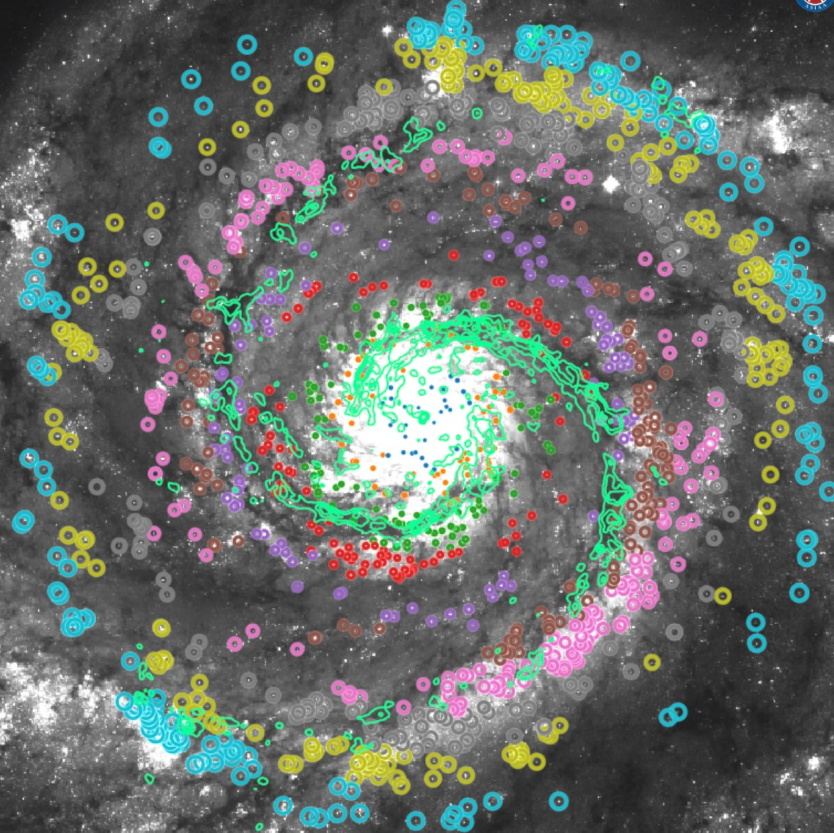
CARTA

Cube Analysis and Rendering Tool for Astronomy, is a next generation image visualization and analysis tool designed for ALMA, VLA, and SKA pathfinders.

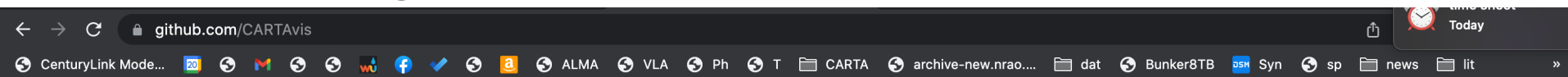
[Installation](#)

[User Manual](#)

NEW v3.0-beta.2b release is out



CARTA on github.com/CARTAviz



Product Team Enterprise Explore Marketplace Pricing

Search

Sign in

Sign up



CARTavis

<https://cartavis.org/> support@carta.freshdesk.com

Overview

Repositories 33

Packages

 **People**

Projects 1

Pinned



carta Public

To CARTA users, this repo holds the CARTA release packages. Please use this repo to log bugs and feature requests. These will be triaged by the development team and prioritised as necessary in the ...

☆ 11

Repositories

🔍 Find a repository...

Type ▾

Language ▼

Sort ▼






carta-backend Public

Source code repository for the backend component of CARTA, a new visualization tool designed for the ALMA, the VLA and the SKA pathfinders.

● C++ ☆ 14 🍷 3 ☉ 82 🧩 6 Updated 4 hours ago

carta-frontend Public

Source code repository for the frontend component of CARTA, a new visualization tool designed for the ALMA, the VLA and the SKA pathfinders.

 TypeScript
  14
  4
  196 (1 issue needs help)
  5
 Updated 8 hours ago

People

This organization has no public members.
You must be a member to see who's a part of
this organization.

Top languages

● C++ ● Python ● TypeScript
● JavaScript ● Shell

CARTA

- The focus is on performance for large datasets
 - Memory efficient image loading (1 TB cubes in seconds)
 - Parallelization and GPU-accelerated rendering
 - Progressive and responsive update of spectral profile
 - Tiled image rendering
- Works on CASA, fits, gzipped fits, MIRIAD, HDF5 image (cube) formats
- Image analysis tasks frequently (but not always) use CASA code to ensure consistency
- In remote version (recommended) it is run as a server, and connected to by one or multiple frontends in a browser; the server can but does not have to be at a remote site
- A stand-alone version launches electron (which is a standalone browser replacement)
- OS: MacOS, Ubuntu, RHEL

CARTA Features

Viewing:

- Image rendering with (global) min/max clipping, scaling functions and color maps
- Image panning, zooming, etc.
- Multi-panel (3beta)
- Hardcopy
- Image/region saving
- Image blinking
- Image WCS matching spatially and spectrally
- Support of projections
- Contours with different generators, colors, color maps
- Catalog overlays
- Setting of rest frequency
- Complex image support
- pV image support
- FT image support
- Vector overlays

CARTA Features

Tools/Analysis:

- Regions: rotating box, ellipses, polygons (line, point, polyline)
- X,Y and Z profiles
- Spectral profiles can convert spectral axis labels (velocity, frequency, wavelength)
- Histogram
- Image/Region Statistics
- Image fitting
- Stokes analysis widget
- Moment generator
- Position Velocity Plots (interactive and saving)
- Spectral line labelling
- Spectral smoothing
- Distance measuring tool
- Intensity conversion
- Server authentication
- Inserting rest frequencies of lines

CARTA Features

Other:

- Server-client infrastructure for remote image access
- Tiled rendering for performance
- Docking and Preferred layouts and layout saving
- Workspaces
- Saving subsections of images
- Basic python scripting is under active development

CARTA – Start

MacOS installed stand-alone:

carta (or click the icon in the Applications folder).



Linux or remote:

```
jott@rocky carta> carta --no_browser
```

```
[2024-05-14 17:01:33.373Z] [CARTA] [info] Writing to the log file: /users/jott/.carta-beta/log/carta.log
```

```
[2024-05-14 17:01:33.378Z] [CARTA] [info] /tmp/.mount_cartadHINdA/bin/carta_backend: Version 4.1.0
```

```
[2024-05-14 17:01:33.391Z] [CARTA] [info] Serving CARTA frontend from
```

```
/tmp/.mount_cartadHINdA/share/carta/frontend
```

```
[2024-05-14 17:01:33.391Z] [CARTA] [info] Listening on port 3002 with top level folder /, starting folder  
/lustre/aoc/projects/vlass/jott/gridder/casa-versions. The number of OpenMP worker threads will be  
handled automatically.
```

```
[2024-05-14 17:01:33.391Z] [CARTA] [info] CARTA is accessible at http://146.88.1.42:3002/?token=de1fd985-  
4c43-40a5-a859-106dcbe08ecb
```

→ **Copy and past this URL in your local browser**

(For NRAO, see <https://info.nrao.edu/computing/guide/cluster-processing/software>)

First Screen

File View Widgets Help



No image loaded

Collection of Widgets on a canvas

Buttons to launch widgets



No file loaded

Load a file using the menu

Render Configuration 



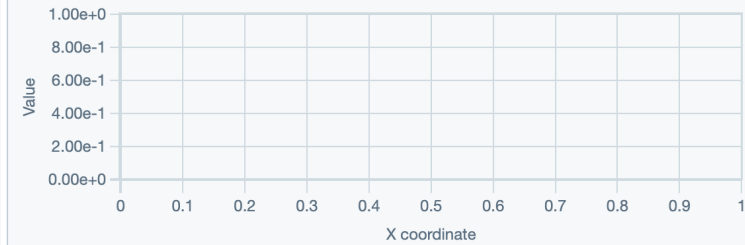
No file loaded

Load a file using the menu

X Profile: Cursor ✕

Image

Region



Y Profile: Cursor ✕

Image

Region

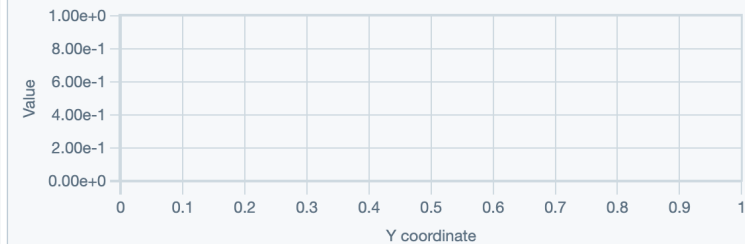


Image List

Animator ✕

Region List ✕



No file loaded

Load a file using the menu

File loading

Selecting multiple images can be applied as stack of images or as a Stokes IQUV hypercube if images are the individual Stokes planes

File View Widgets Help

Open Image alt + O
Append Image alt + L
Save Image alt + S
Close Image alt + W

Import Regions
Export Regions
Import Catalog alt + G
Export Image

Open Workspace
Save Workspace

Preferences
Server

Render Configuration X

File Browser

Users > jott > Documents > CARTA >

Filename	Type	Size	Date
NGC_628_NA_MOM0_THINGS.fits	FITS	4.3 MB	7 Oct 2020
NGC_628_NA_MOM0_THINGS.im	CASA	4.4 MB	6 Apr 2022
NGC_628_NA_MOM0_THINGS.mir	Miriad	4.2 MB	6 Apr 2022
NGC_628_NA_MOM0_THINGS.mir.tgz	Unknown	2.7 MB	9 Oct 2023
VLA-ANGST_HI_NGC3109-rob-Mom0.fits.gz	FITS	2.7 MB	29 Apr 2022
VLA-ANGST_HI_NGC3109-rob-Mom0CD.fits.gz	FITS	2.7 MB	29 Apr 2022

FITS
CASA
MIRIAD
HDF5
Gzipped fits

Image type, size, date

Simplified or full header display, without image loading

File Information Header

```
Name = VLA-ANGST_HI_NGC3109-rob-Mom0.fits.gz
HDU = 0
Data type = float
Shape = [2048, 2048, 1, 1] (RA, DEC, STOKES, FELO)
Number of channels = 1
Number of polarizations = 1
Coordinate type = Right Ascension, Declination
Projection = SIN
Image reference pixels = [1024, 1025]
Image reference coords = [10:03:06.9000, -026.09.34.0000]
Image ref coords (deg) = [150.779 deg, -26.1594 deg]
Pixel increment = -1", 1"
Pixel unit = Jy/B*M/S
Celestial frame = FK5, J2000
Spectral frame = HEL
Velocity definition = OPTICAL
Restoring beam = 7.60356" X 5.0328", 8.82 deg (extracted from H
RA range = [10:01:50.656, 10:04:23.070]
DEC range = [-26.26.36.755, -25.52.29.750]
Stokes coverage = [I]
```

Filter mom0

Fuzzy search

Filter: unix, fuzzy, regex

Close

Load

NO FILE LOADED

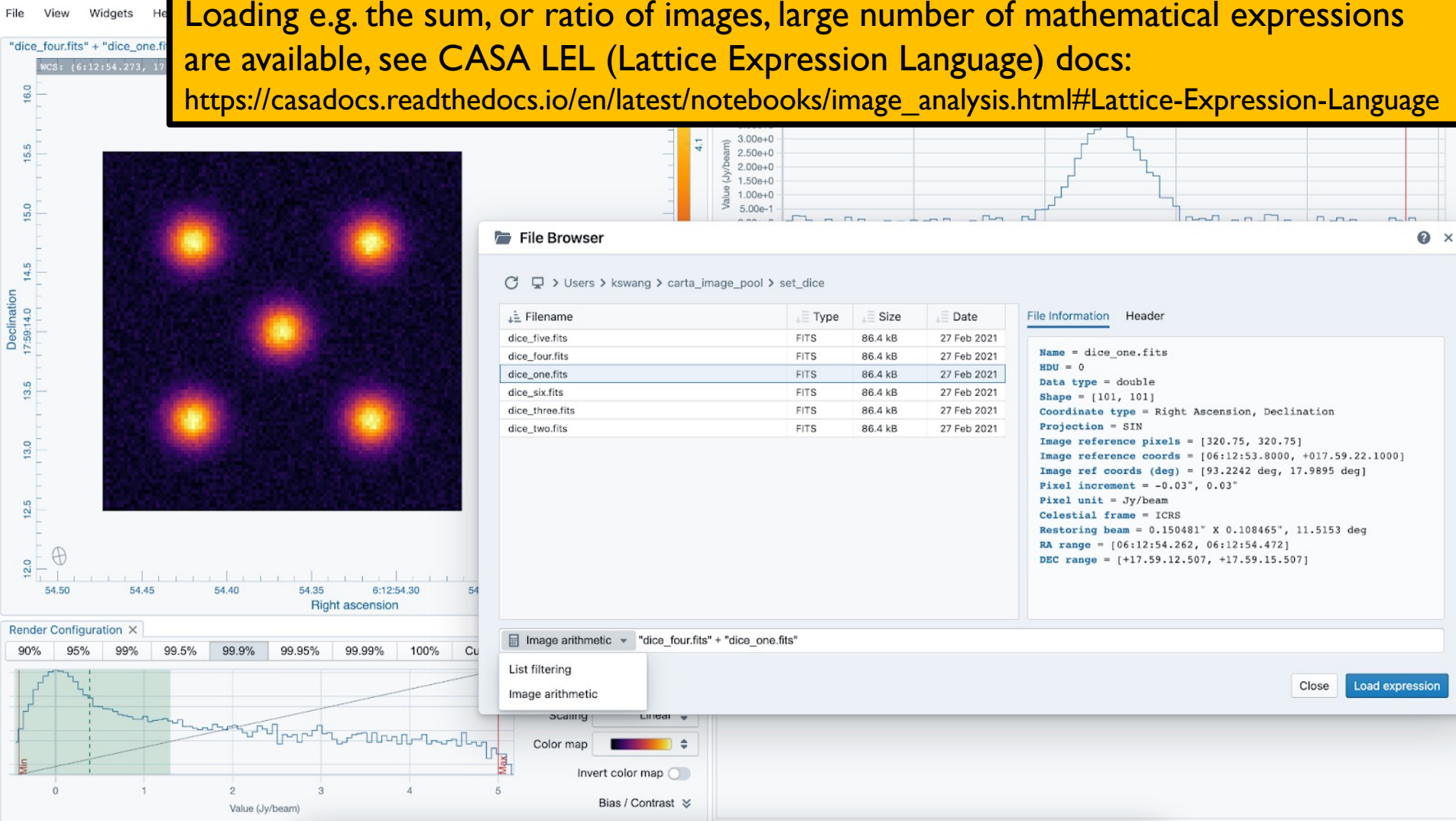
Load a file using the menu

NO FILE LOADED

Load a file using the menu

LEL image loading (mathematical expressions)

Loading e.g. the sum, or ratio of images, large number of mathematical expressions are available, see CASA LEL (Lattice Expression Language) docs:
https://casadocs.readthedocs.io/en/latest/notebooks/image_analysis.html#Lattice-Expression-Language

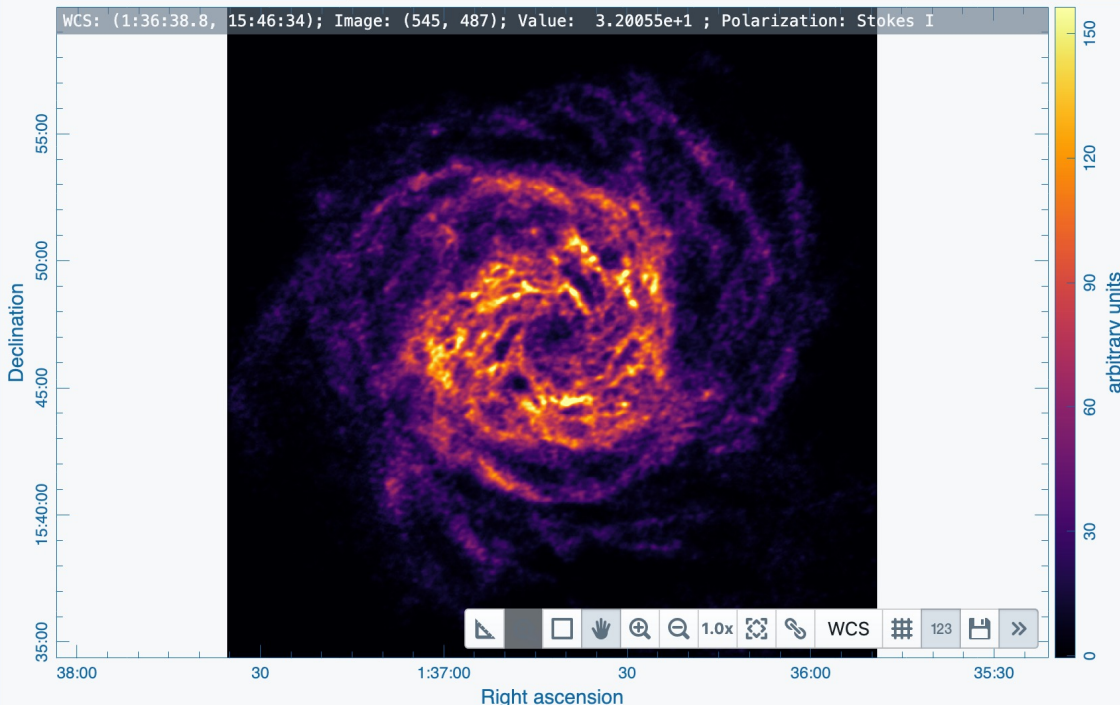


First Look

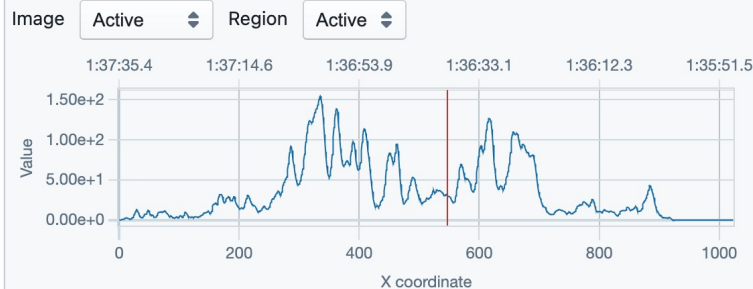
File View Widgets Help



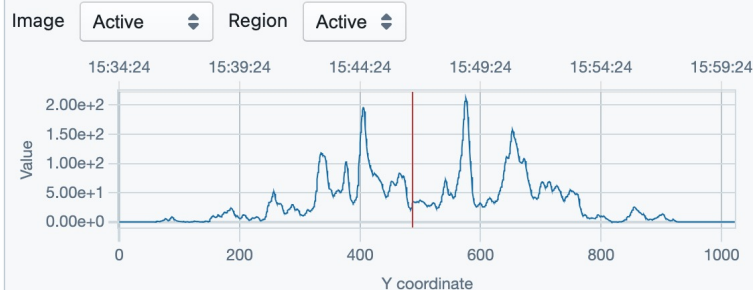
NGC_628_NA_MOM0_THINGS.mir



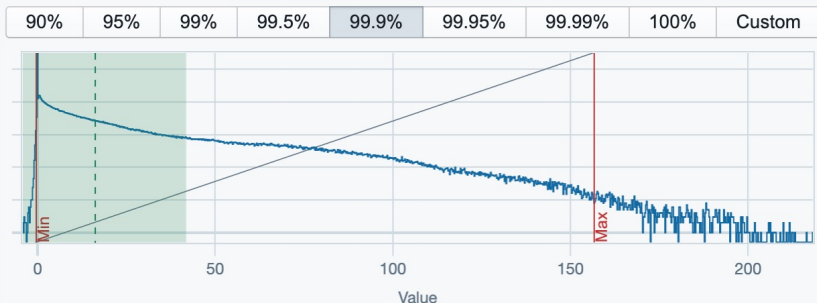
X Profile: Cursor



Y Profile: Cursor



Render Configuration



Clip min -0.527750086472

Clip max 156.32054201615

Scaling Linear

Colormap

Invert colormap

Bias / Contrast

NaN color

Image List

Animator

Region List

Image	Layers	Matching	Channel	Polarization
0 NGC_628_NA_MO	R	XY R	0	Stokes I

Help

File View Widgets Help

NGC_628_NA_MOM0_THINGS.fits

WCS: (1:36:42.3, 15:47:11); Image: (512, 512); NaN*; Polarization: Stokes I

X Profile: Cursor X

Image Active Region Active

Declination

55.00

50.00

45.00

15:40:00

35.00

38.00 30 1:37:00

Right ascension

0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

X coordinate

0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

Y coordinate

Animator X Region List X

Layers	Matching	Channel	Polarization
28_NA_MO	XY R	0	Stokes I

90% 95% 99% 99.5% 99.9% 99.95% 99.99%

Min

Max

Value (Jy/B*M/S)

0 50 100 150 200

Bias / Contrast

NaN color

? = help menu

1) Navigation

- Pan image: click
- Pan image (inside region): middle-click
- Pan image (inside region): ⌘ cmd click
- Zoom image: mouse-wheel

2) Regions

- Toggle region creation mode: C
- Toggle current region lock: L
- Unlock all regions: ⬆ shift L
- Delete selected region: del
- Delete selected region: backspace
- Deselect region/Cancel region creation: esc
- Switch region creation mode: ⌘ cmd
- Symmetric region creation: ⬆ shift
- Region properties: double-click

3) Frame controls

- Next image: ⌘ alt]
- Previous image: ⌘ alt [
- Next channel: ⌘ alt ⬆ up
- Previous channel: ⌘ alt ⬇ down

Help

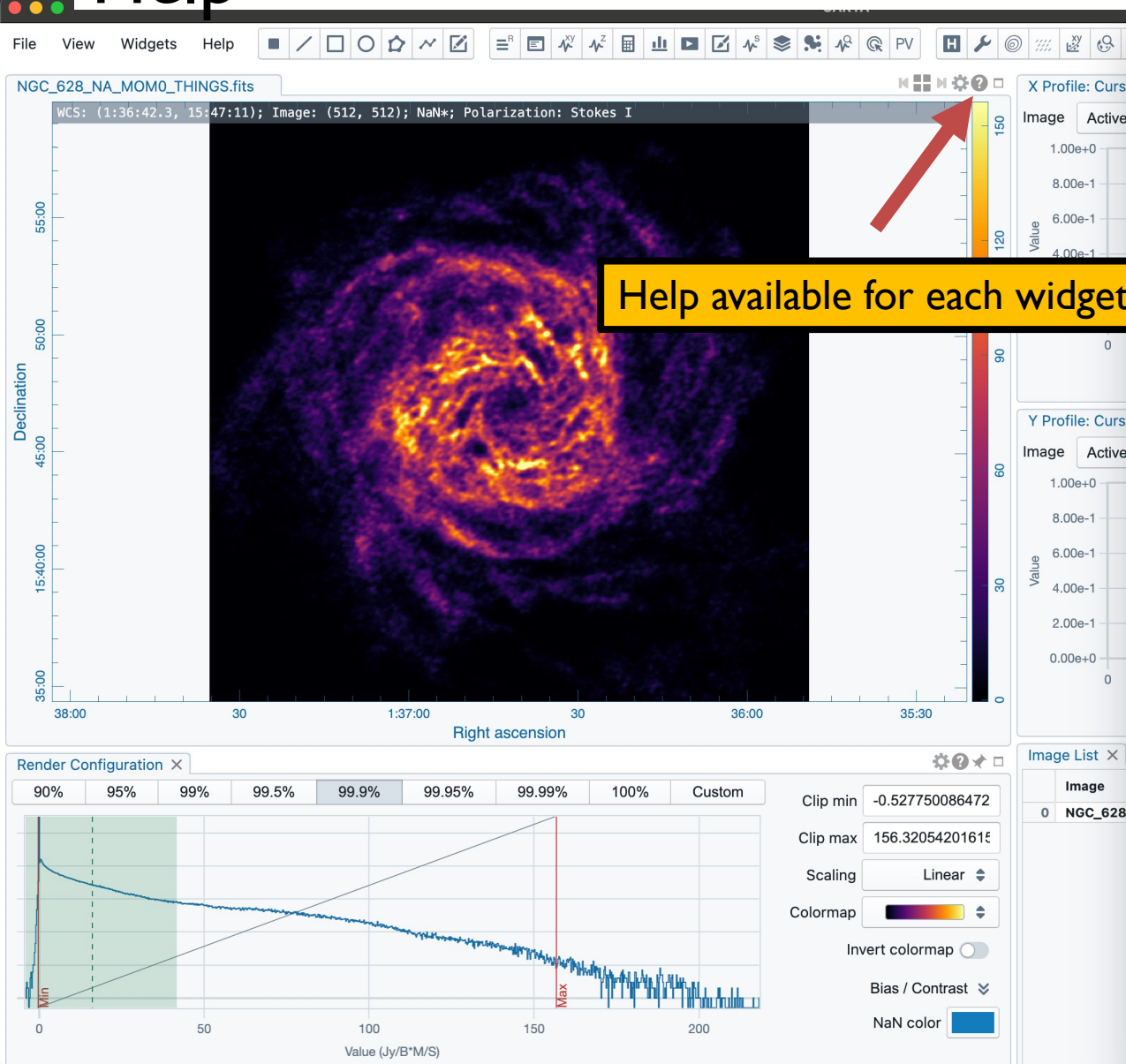


Image View

The Image Viewer Widget serves as the core component of CARTA. It allows you to visualize images as rasters, contours, or vector fields. Regions of interest can be defined interactively with the Image Viewer and subsequent image analysis can be performed collaboratively with other widgets. Catalog files can be loaded and visualized in the Image Viewer as catalog overlays via the Catalog Widget.

Images can be loaded via **File -> Open Image** (will close all loaded images first). You may append more images via **File -> Append Image**. All images are rendered as raster by default. Contour layers can be defined in the Contour Configuration Dialog. Vector field layers can be defined in the Vector Overlay Dialog.

The Preferences Dialog (**File -> Preferences**) provides many options related to the Image Viewer Widget that you can adjust to fit your tastes and workflow.

Image view mode

The Image Viewer has two modes: single-panel view and multi-panel view (default). You can use the **Panel mode** button at the top right corner of the widget to switch to the other mode. When the current view mode cannot display all the loaded images at once, you can also use the **Page** buttons at the top-right corner of the widget to navigate through pages of images. The grid layout of the multi-panel view mode can be configured in the **Global** tab of the Image Viewer Settings Dialog. The active image is highlighted with a red box in the multi-panel view mode. With the multi-panel view mode, the loaded images are rendered in order from left to right and then from top to bottom. To rearrange the images, use the Image List Widget to drag-and-drop image rows to the desired positions.

Cursor information

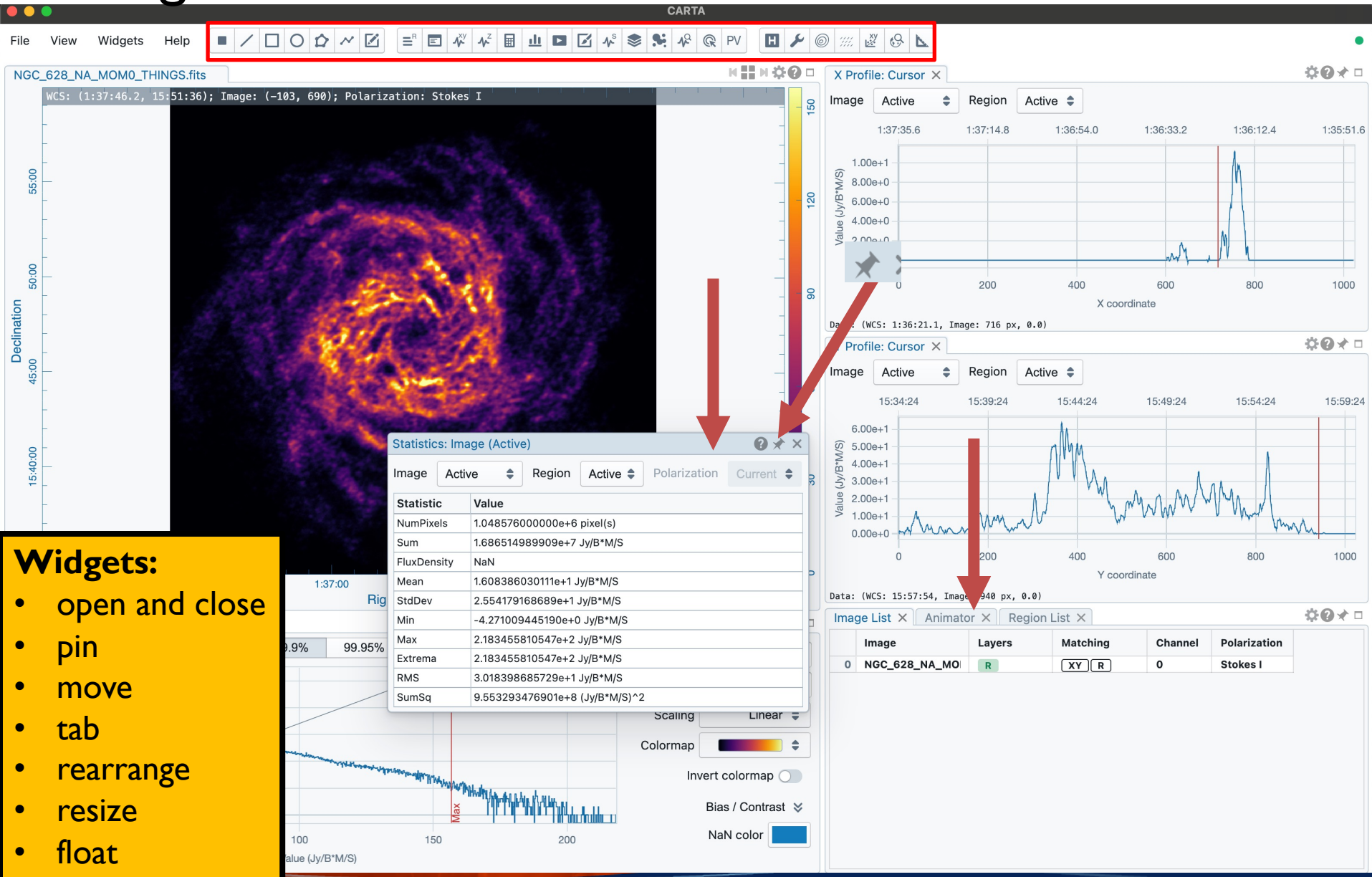
Information about the world coordinates and image coordinates at the cursor position is shown at the top of the Image Viewer. Pixel value, spectral information, and polarization information are also displayed. To freeze/unfreeze the cursor position, press the F key. To mirror cursor position on spatially matched images, press the G button. Different modes to display the cursor information are available in the **WCS and Image Overlay** tab of the Preferences Dialog (**File -> Preferences**). Alternatively, you can use the Cursor Information Widget to view cursor data from multiple images in one centralized place.

Image toolbar

A set of tool buttons appears in the bottom-right corner when you hover over the Image Viewer. You may use these buttons to

- Measure angular distance on image
- Select a source from catalog overlay
- Create regions
- Change image zoom scale
- Trigger WCS matching

Widgets



- Widgets:**
- open and close
 - pin
 - move
 - tab
 - rearrange
 - resize
 - float

Widgets - Layouts

The screenshot displays the CARTA software interface. The 'Layouts' menu is open, showing options: Existing Layouts (Default, Cube View, Cube Analysis, Continuum Analysis), Save Layout, Rename Layout, and Delete Layout. A 'test layout' button is visible at the bottom of the menu. The main window shows a radio telescope image of NGC 628 with axes for Right ascension and Declination. A color bar on the right indicates intensity from 90 to 150. A 'Statistics: Image (Active)' panel shows various statistical values for the image. A 'Render Configuration' panel at the bottom left shows a histogram of the image data. A 'X Profile: Cursor' panel at the top right shows a line plot of intensity versus position. A 'Layers' panel at the bottom right shows the current image and its properties.

Layouts:

- Pre-defined layouts
- Any layout can be saved and restored

Statistic	Value
NumPixels	1.048576000000e+6 pixel(s)
Sum	1.686514989909e+7 Jy/B*M/S
FluxDensity	NaN
Mean	1.608386030111e+1 Jy/B*M/S
StdDev	2.554179168689e+1 Jy/B*M/S
Min	-4.271009445190e+0 Jy/B*M/S
Max	2.183455810547e+2 Jy/B*M/S
Extrema	2.183455810547e+2 Jy/B*M/S
RMS	3.018398685729e+1 Jy/B*M/S
SumSq	9.553293476901e+8 (Jy/B*M/S)^2

Image	Layers	Matching	Channel	Polarization
0 NGC_628_NA_MO	R	XY R	0	Stokes I

Widgets - Workspaces

File View Widgets Help

Open Image alt + O
Append Image alt + L
Save Image alt + S
Close Image alt + W

Import Regions
Export Regions
Import Catalog alt + G
Export Image
Open Workspace
Save Workspace
Preferences
Server

Statistics: Image (Active)

Statistic	Value
NumPixels	1.048576000000e+6 pixel(s)
Sum	1.686514989909e+7 JY/B*M/S
FluxDensity	NaN
Mean	1.608386030111e+1 JY/B*M/S

Open Workspace

Name	Last modified
hello	12 Mar 2024
workspace1	11:52

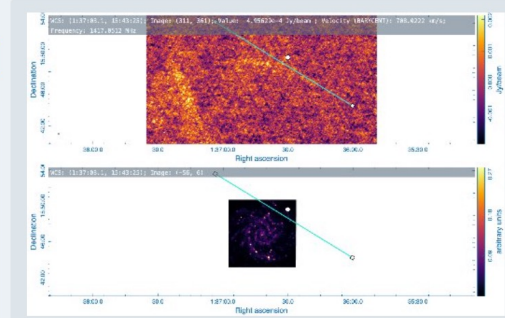
Render Configuration

90% 95% 99% 99.5% 99.9% 99.95% 99.99% 100% Custom

Cursor: 194.49 JY/B*M/S

Workspaces:
Layouts but with
images, color
schemes, regions,
etc. included.

**They can be shared
with others through
an URL (server
version)**



Name hello
Number of regions 1
Spatial reference NGC_628_CUBE.image
Spectral reference NGC_628_CUBE.image
Reference image NGC_628_CUBE.image

Delete Open

Widgets

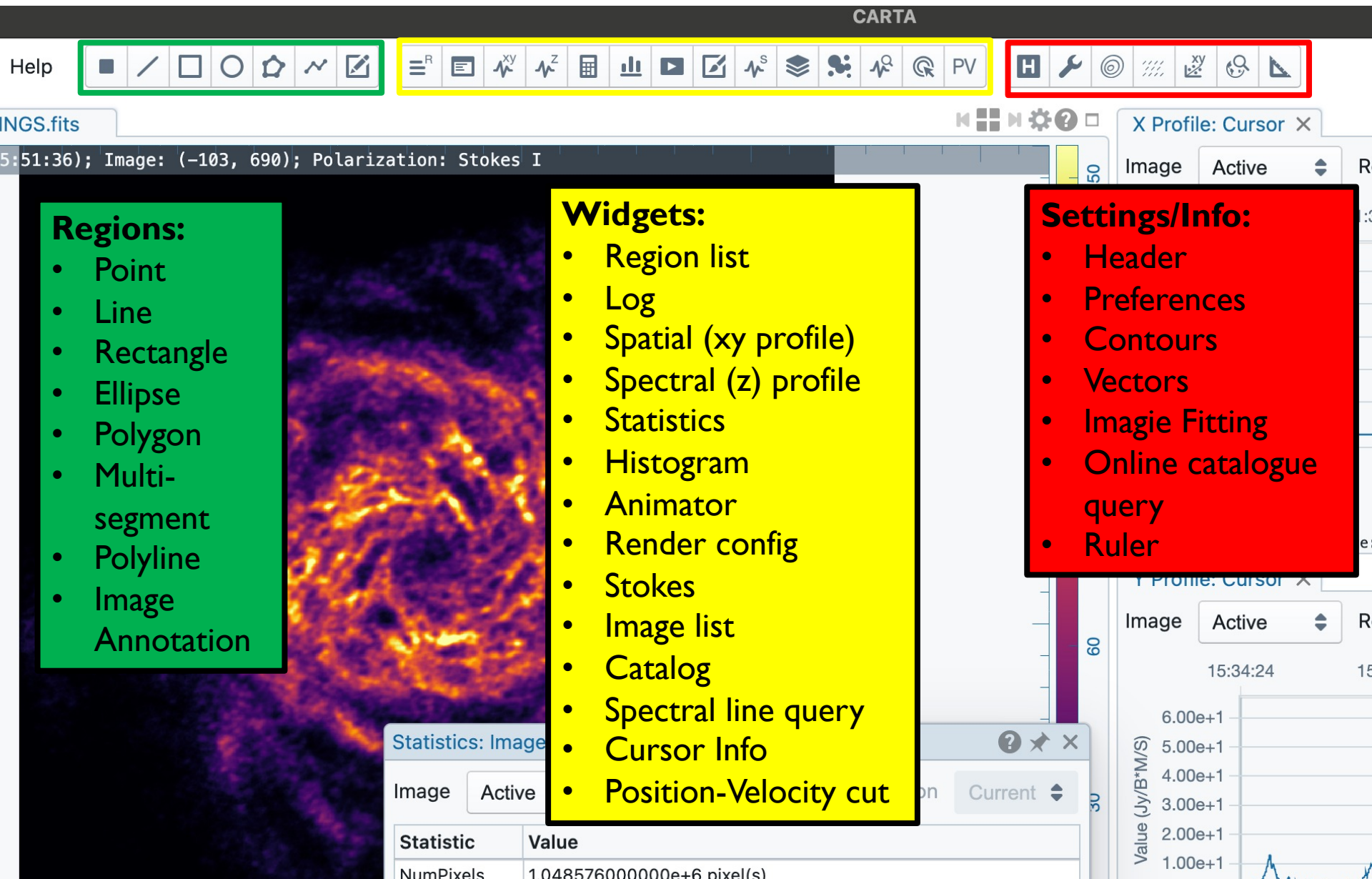
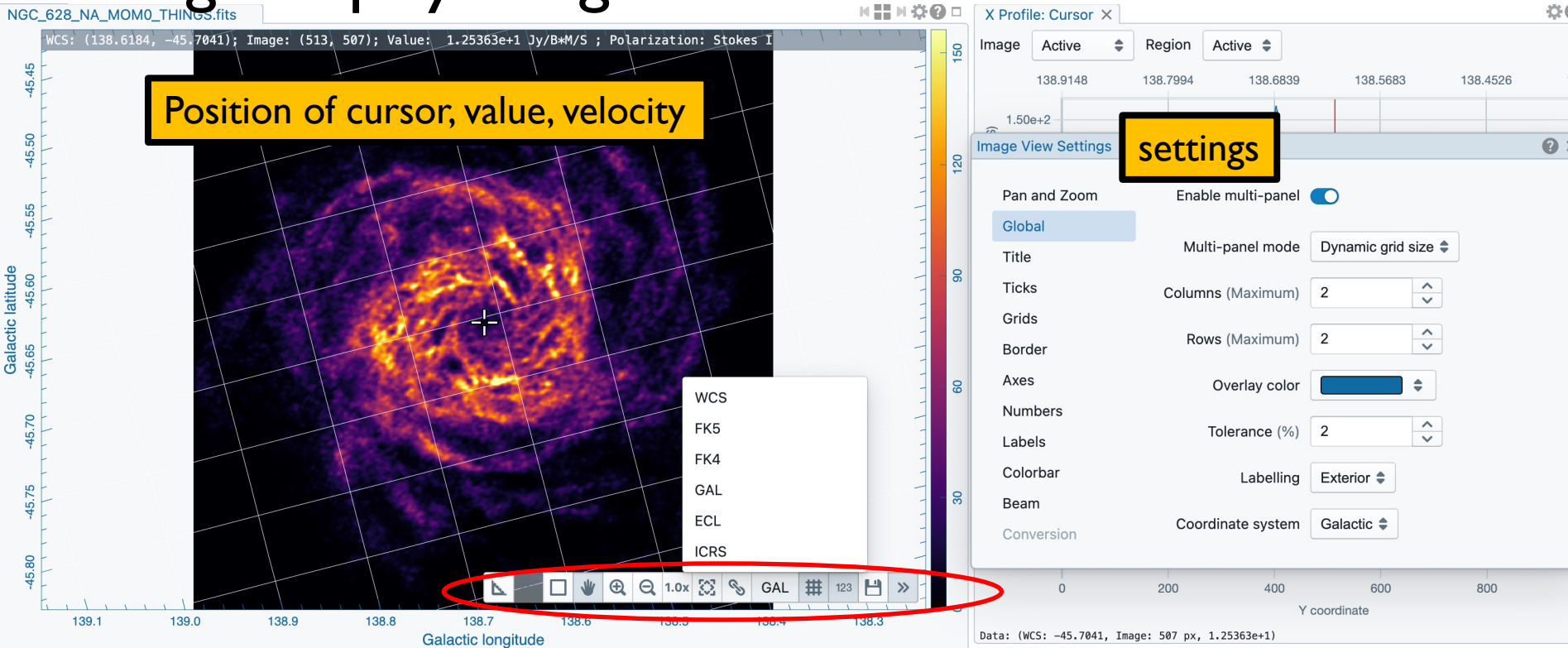


Image display widget



- distance tool
- catalog source selection
- Regions
- Pan
- Zoom in
- Zoom out

- Zoom to 1x
- Zoom to fit
- WCS matching
- Overlay coordinate
- Grid
- Labels
- Export

Image display widget - multipanel

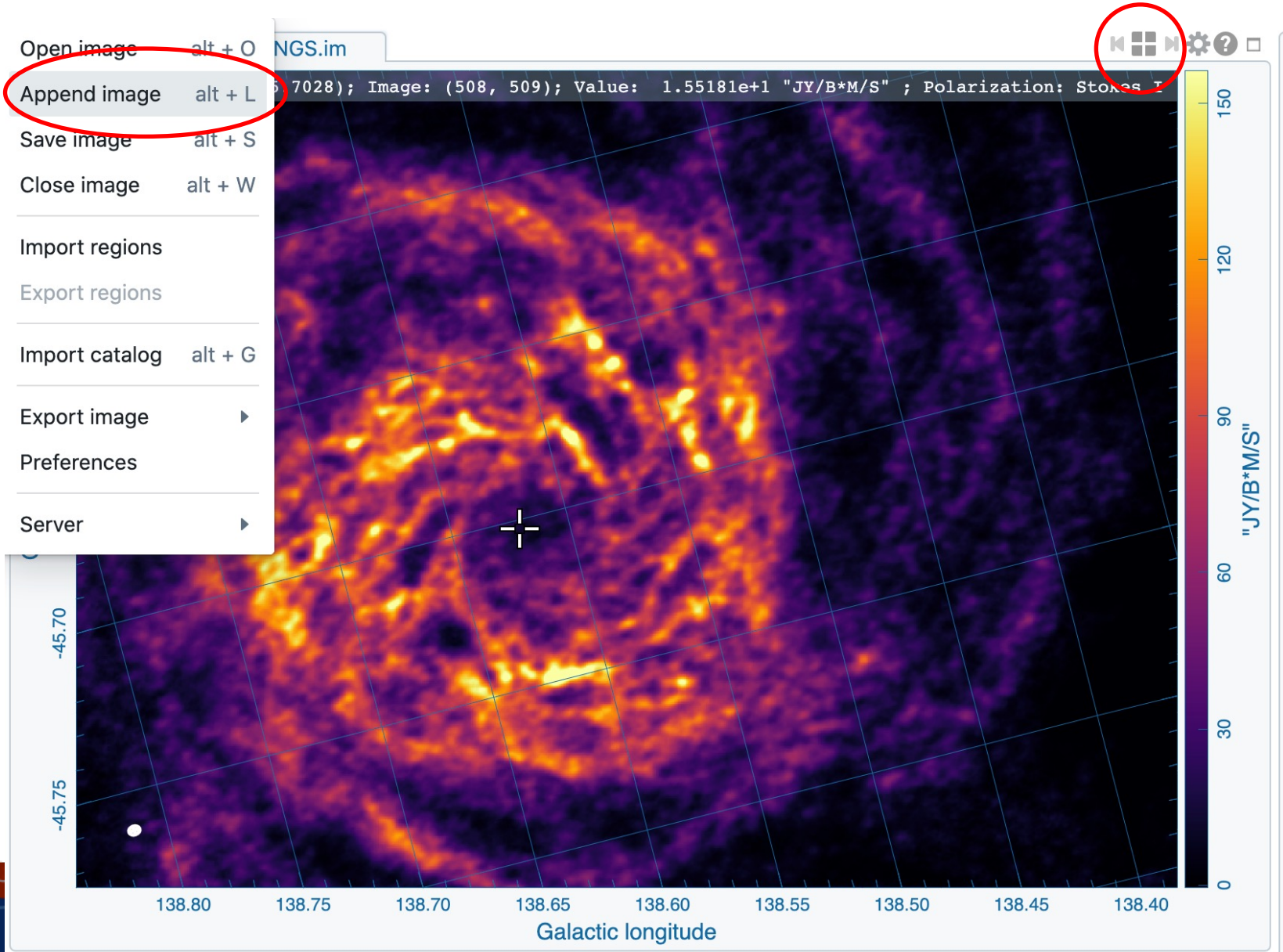


Image display widget - multipanel

WCS unmatched

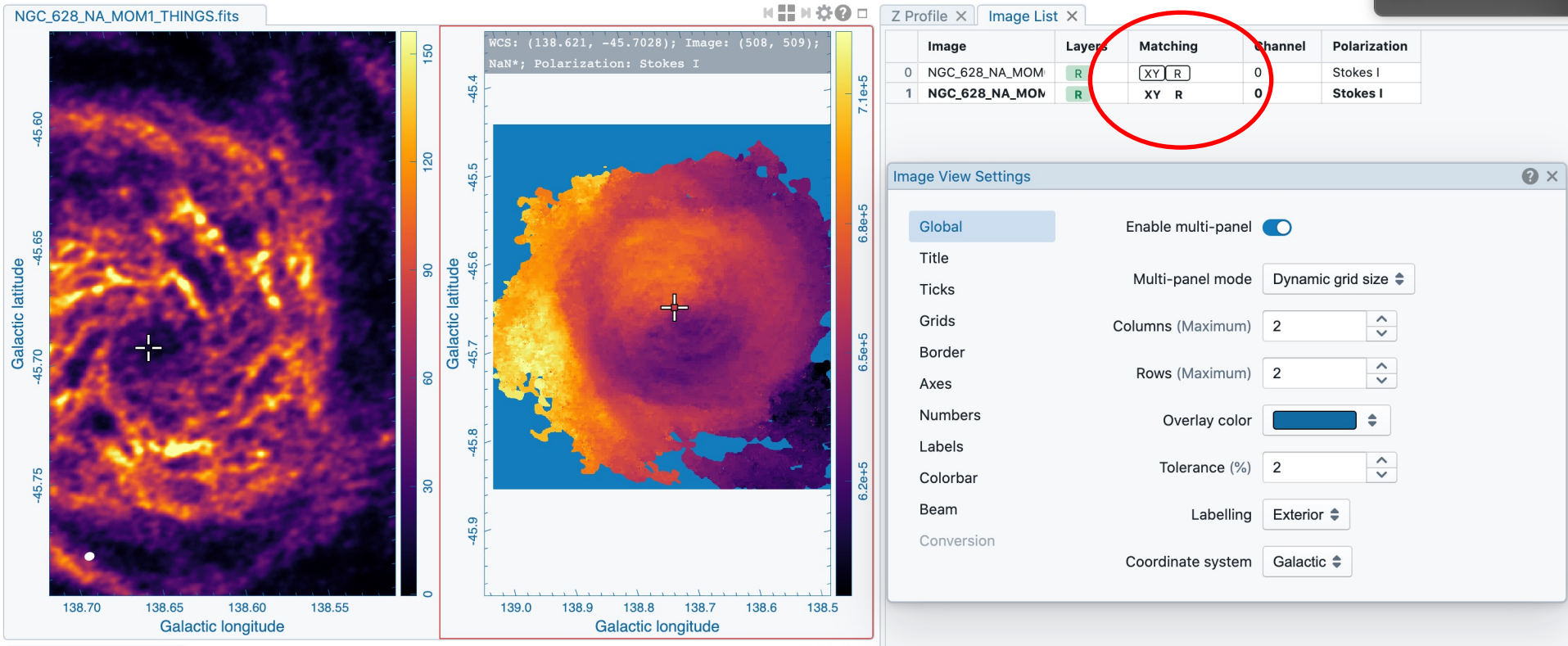


Image display widget - multipanel

WCS matched (xy)

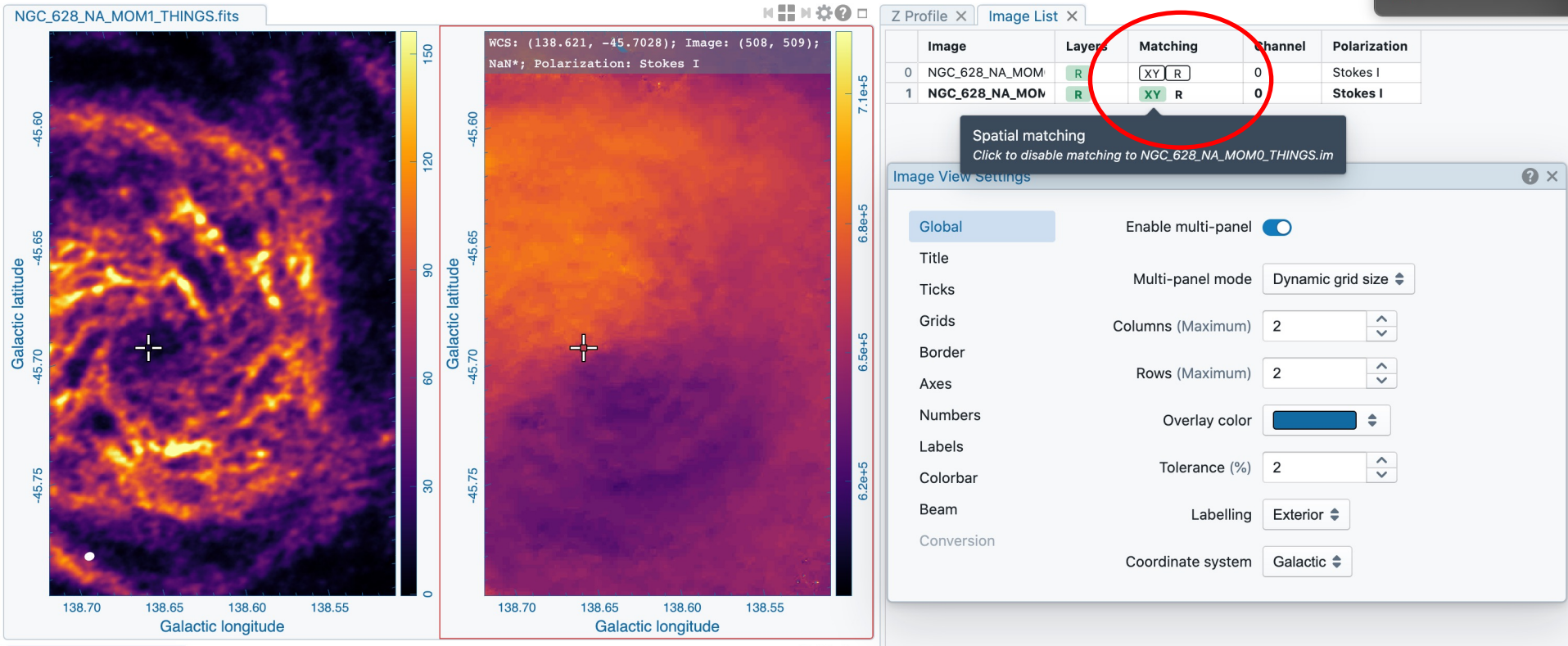
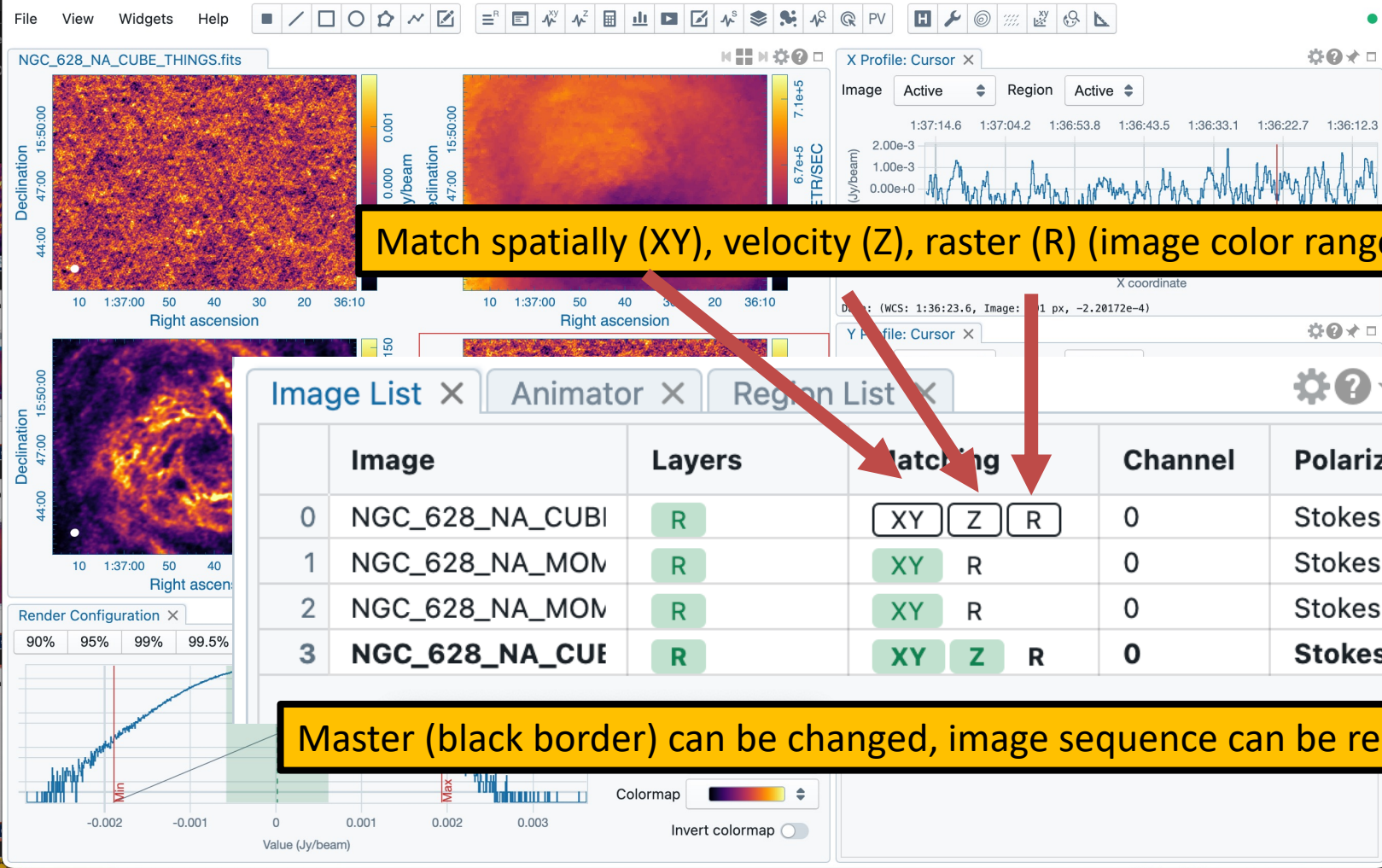


Image display widget - multipanel

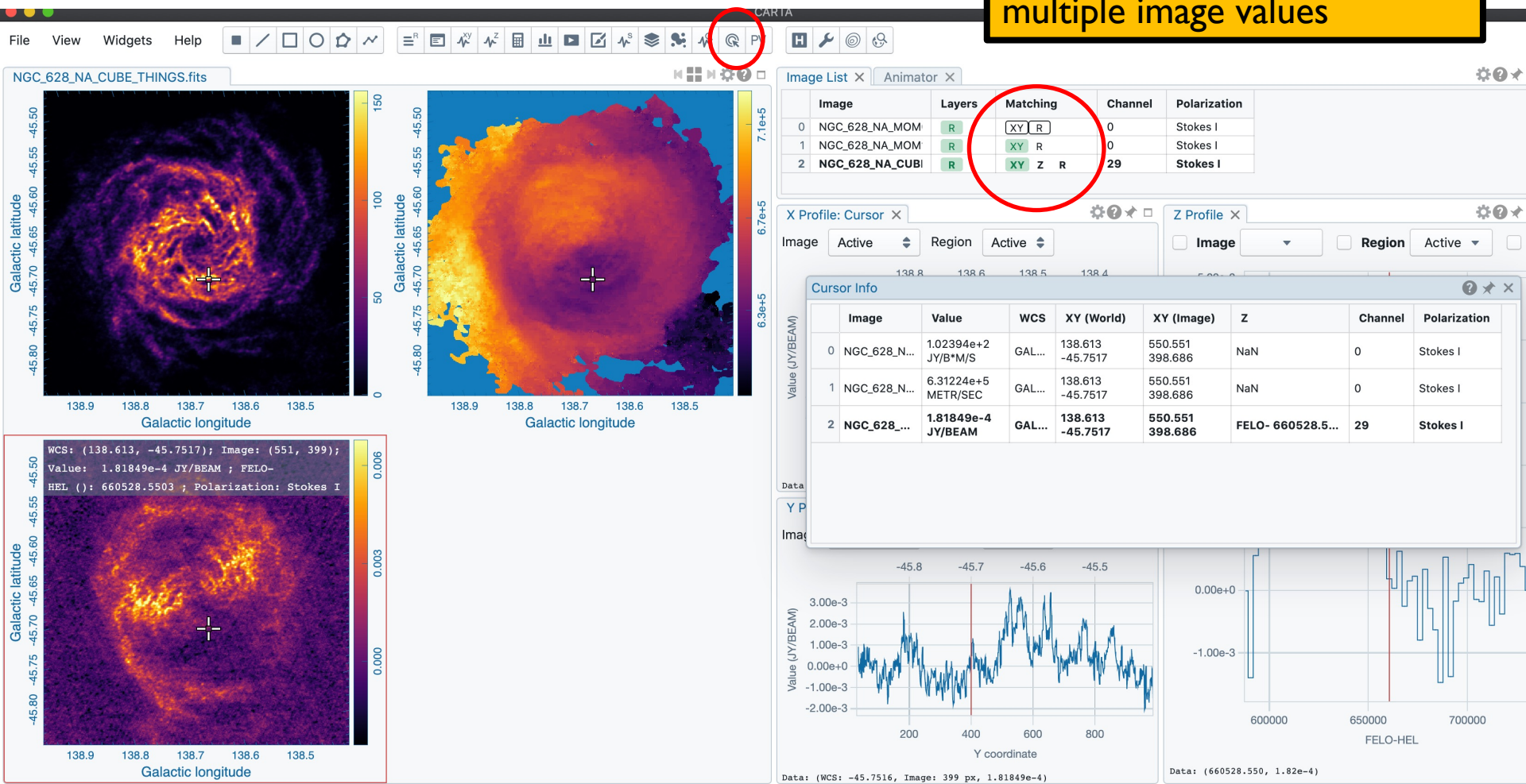


Match spatially (XY), velocity (Z), raster (R) (image color range properties)

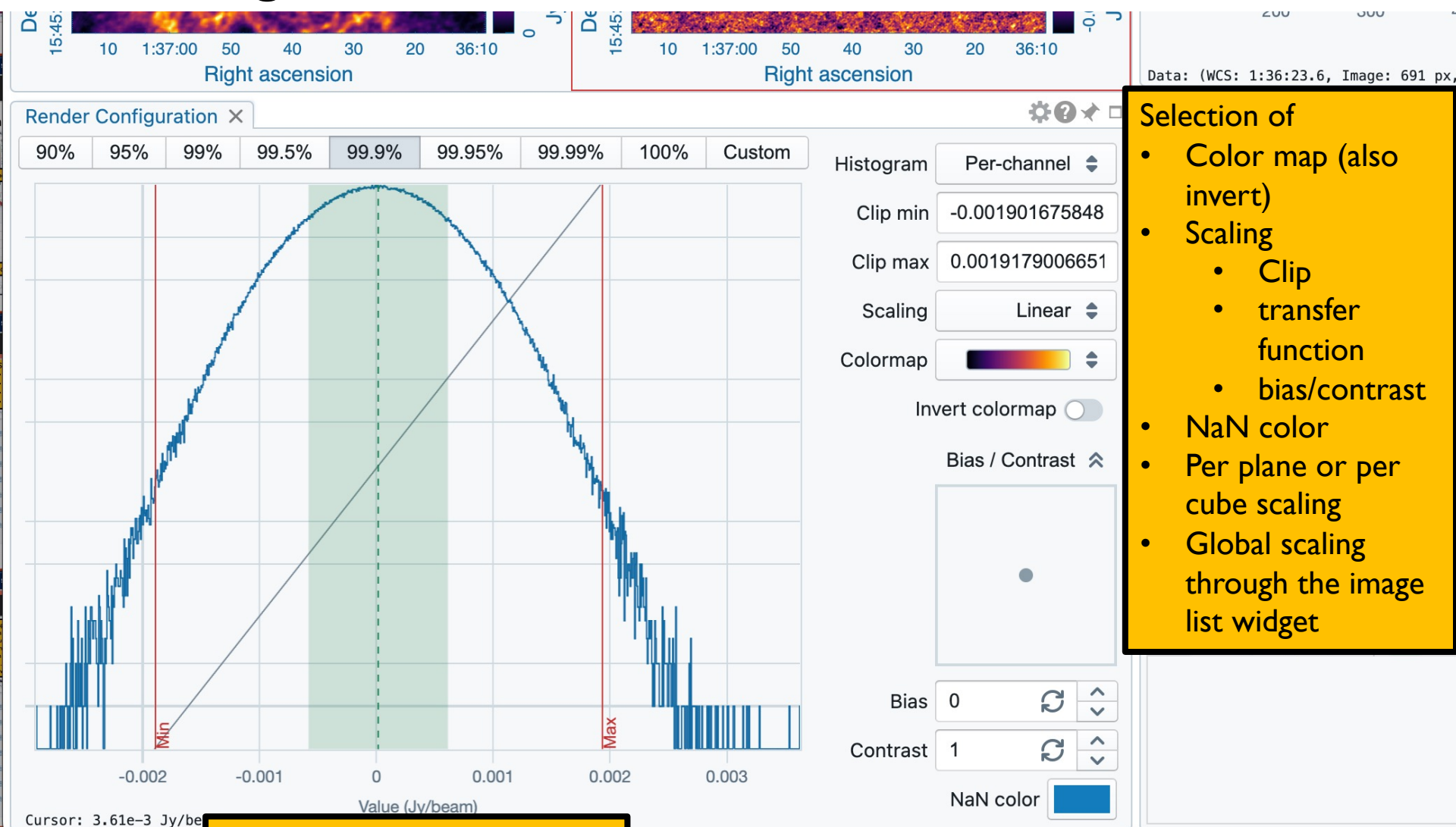
Master (black border) can be changed, image sequence can be reordered

Cursor Widget

Match WCS first to see multiple image values



Rendering



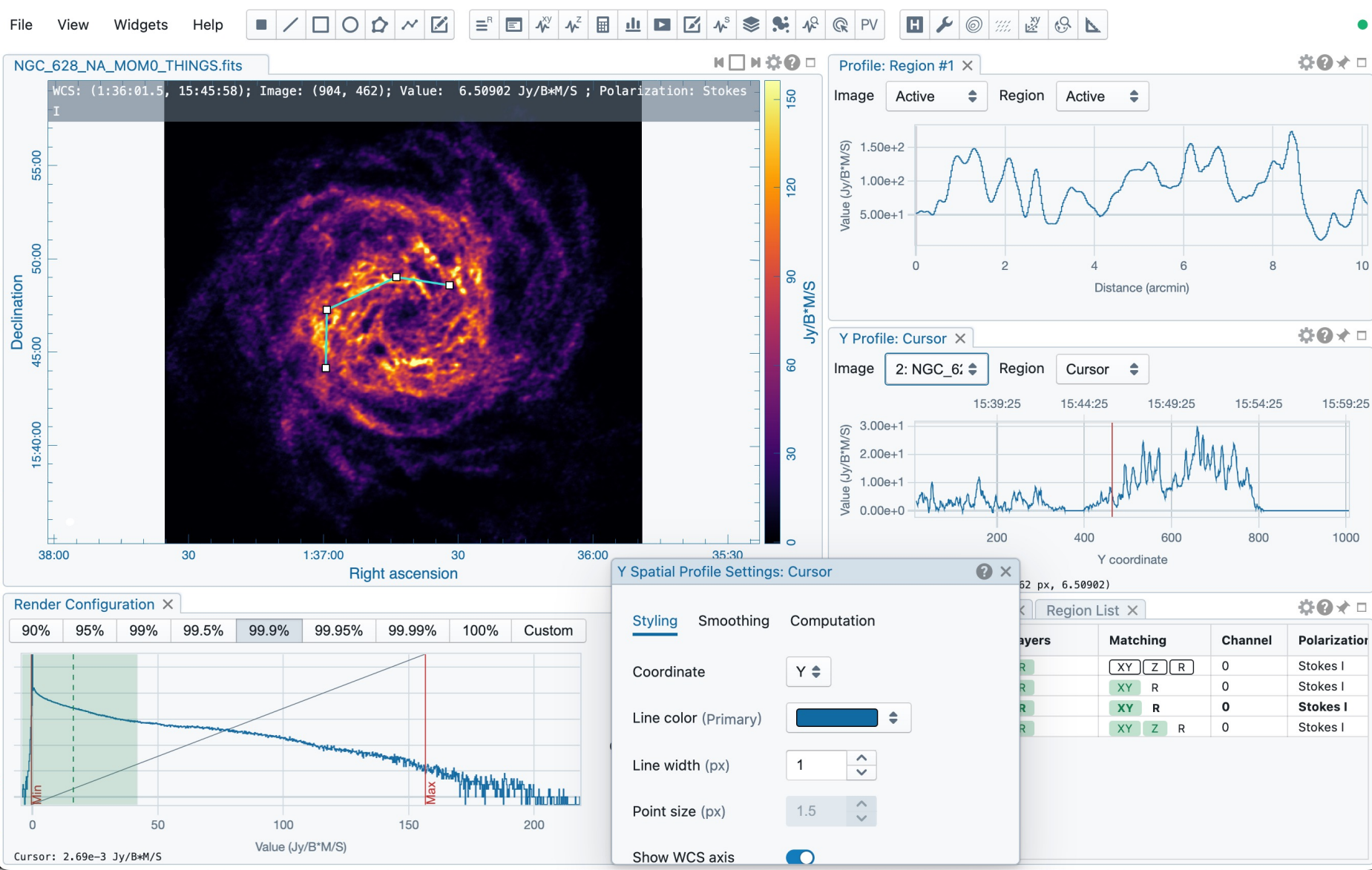
Selection of

- Color map (also invert)
- Scaling
 - Clip
 - transfer function
 - bias/contrast
- NaN color
- Per plane or per cube scaling
- Global scaling through the image list widget

Image statistics, setting the cuts manually or by percentage or by values

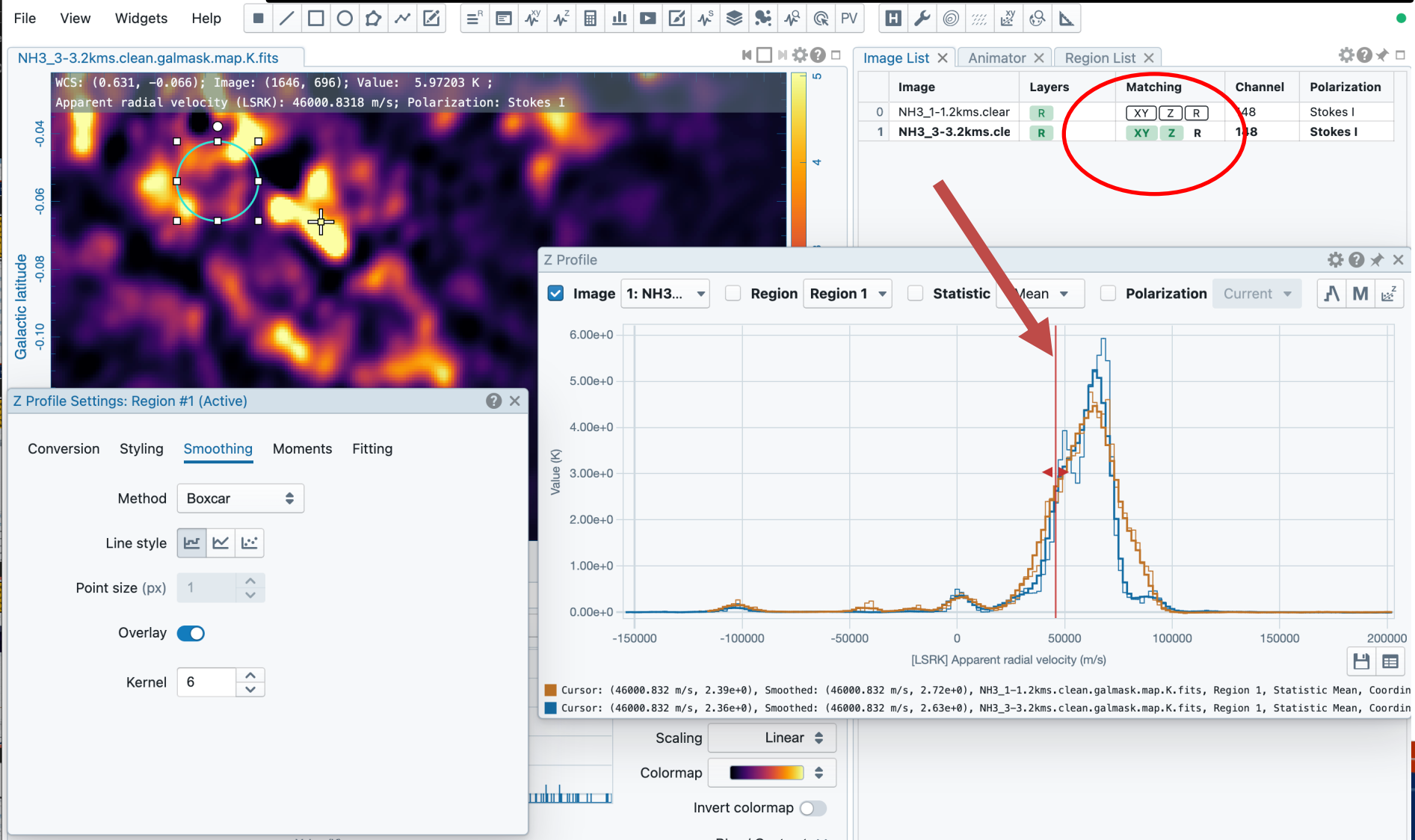
Profiles

- Spatial/Spectral profile: Line shape can be changed (color, steps/connect/points), spectral smoothing; data can be saved as ascii (or png)
- Marker is the position of the cursor/animator (freeze with 'f')
- Selection of region and image in each widget
- Spatial: cut along a segmented line or simply x and y

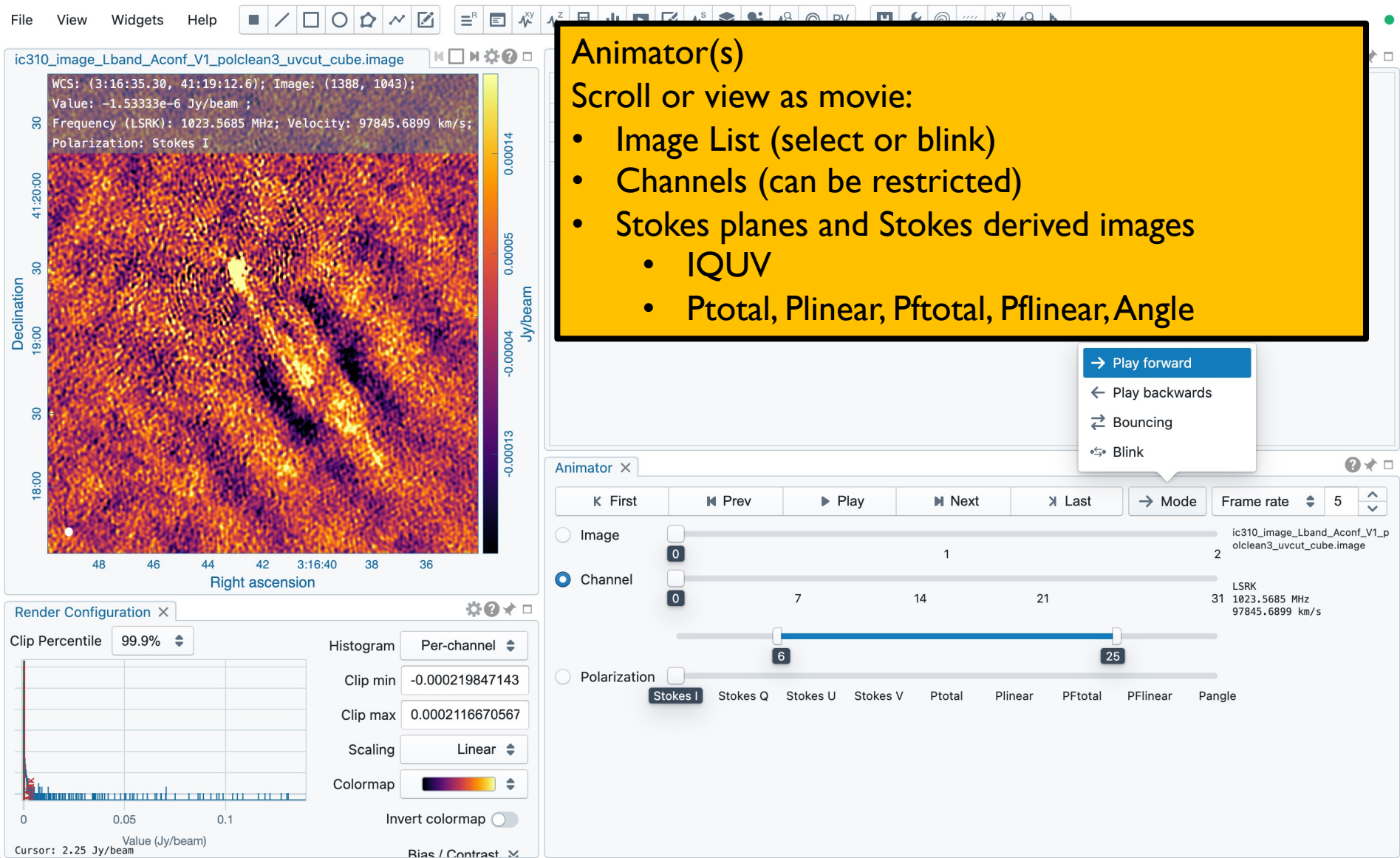


Profiles

- Spatial/Spectral profile: Line shape can be changed (color, steps/connect/points), spectral smoothing; data can be saved as ascii (or png)
- Marker is the position of the cursor/animotor (freeze with 'f')
- Selection of region and image in each widget
- Spectral: Multiple line overlay / changing of units

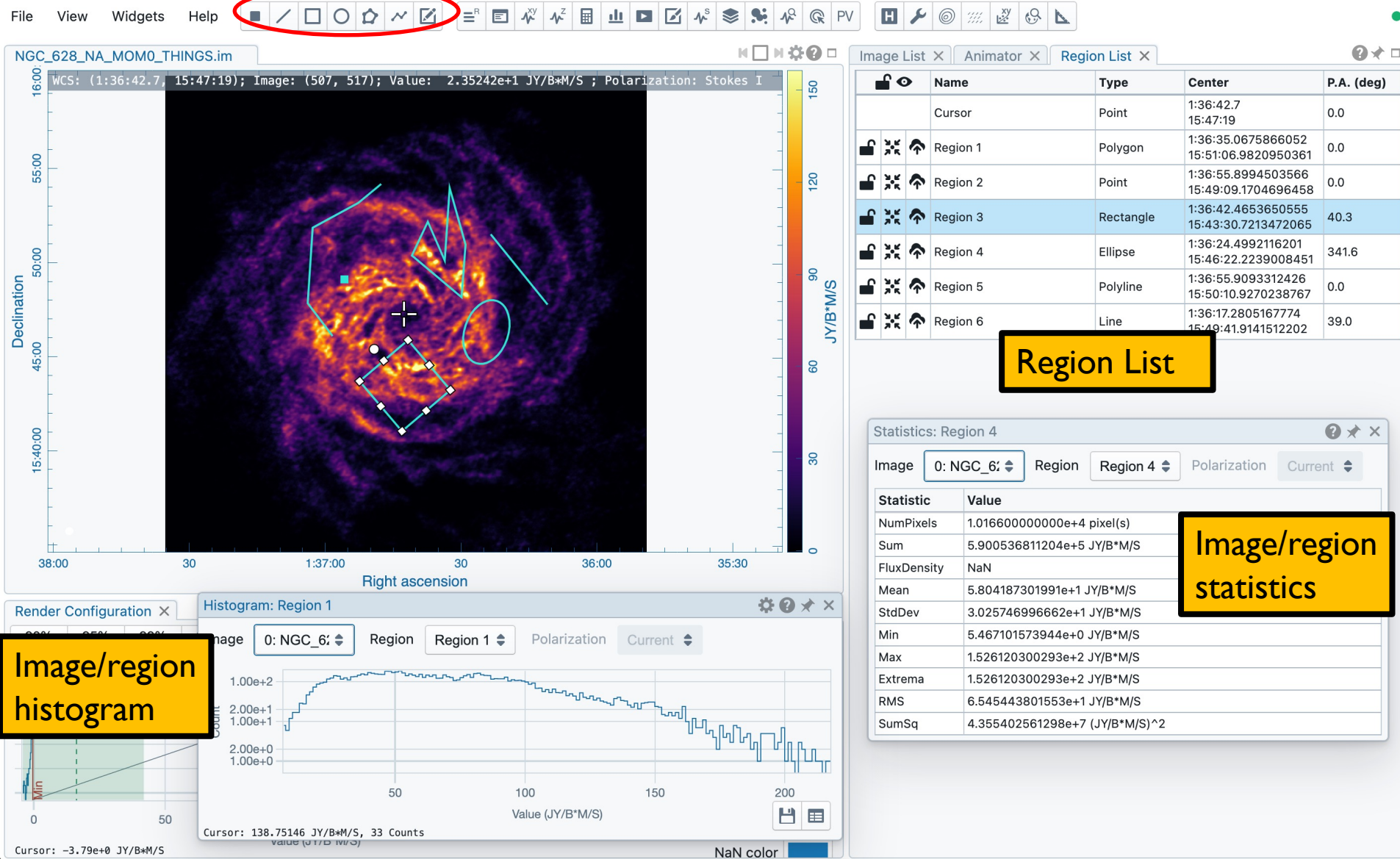


Animator



Regions

Regions can be created, deleted, rotated, modified, moved.
Analysis can be done on selected regions
Save regions as CRTF of ds9



CARTA

Projection handling:

To avoid regridding, WCS matching shifts and rotates the image to the master image
This produces a small error for large fields, only visible in blinking
But images are projected correctly when overlaid as contours

Spectral matching: Nearest interpolation

Regions: They project correctly when moving across the sky in different coordinate systems

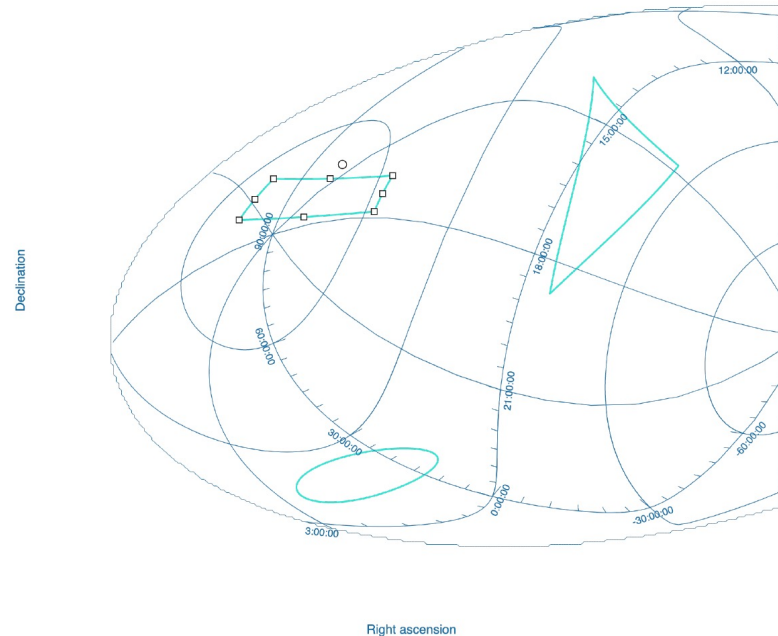
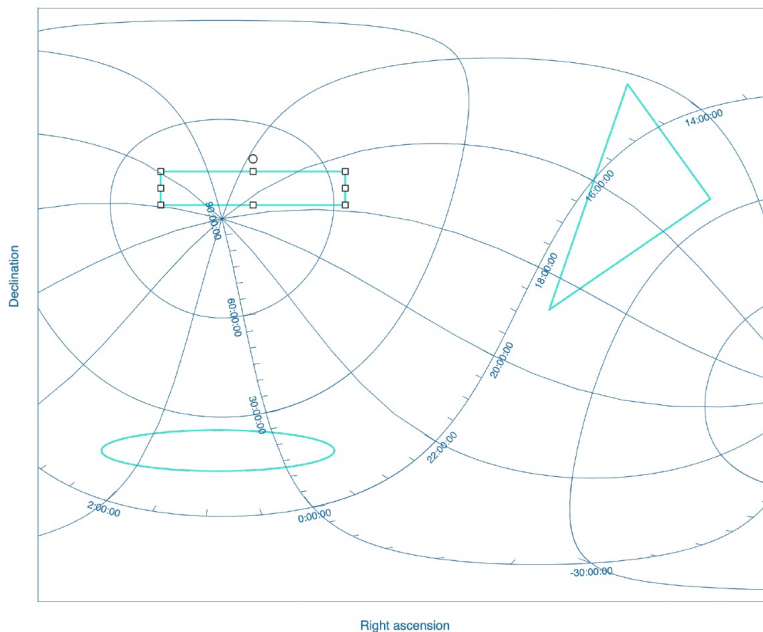


Image annotation

Annotations appear in region list
Save as CRTF annotation in regions file

File View Widgets Help

Render Configuration X

90% 95% 99% 99.5% 99.9% 99.95%

Cursor: 190.34 JY/B*M/S

Value (JY/B*M/S)

NGC_628_NA_MOM0_THINGS.im

WCS: (1:36:42.3, 15:47:11); Image: (512, 512); NaN

Decination

58:00

56:00

54:00

52:00

15:50:00

48:00

46:00

44:00

42:00

40:00

30 20 10 1:37:00 50 40 30 20 10 36:00 35:50

Right ascension

120

90

60

30

0

JY/B*M/S

Point

Line

Rectangle

Ellipse

Polygon

Polyline

Vector

Text

Compass

Ruler

Region List

Name	Type	Center	P.A. (deg)
Cursor	Point	1:36:42.3 15:47:11	0.0
Region 1	Rectangle	1:36:58.9203933520 15:46:17.2992279367	324.0
Region 3	Ellipse	1:36:40.7154653824 15:44:05.6097147701	339.4
Region 4	Polyline	1:36:28.0039387671 15:45:36.2150772846	0.0
Region 6	Point	1:36:42.3 15:47:11	0.0
Annotation 7	Vector - Ann	1:36:42.3 15:47:11	0.0
text1	Text - Ann	1:36:42.3 15:47:11	0.0
Annotation 10	Compass - Ann	1:36:42.3 15:47:11	0.0
Annotation 11	Ruler - Ann	1:36:42.3 15:47:11	0.0

Editing text1 (NGC_628_NA_MOM0_T... ? X)

Configuration Styling

Annotation name text1

Text This is my favorite blob

Coordinate ☐ Image ☒ World Auto

Center 1:36:25.4850534 15:51:03.230810
Image: (673.351 px, 666.128 px)

Size 10.6601903617' 3.8629829246'
Image: (426.408 px, 154.519 px)

Bottom-left 1:36:47.6308981 15:49:06.725696
Image: (460.147 px, 588.868 px)

Top-right 1:36:03.3320628 15:52:59.595942

Delete Close

Saving subimages

IRC10216_HC3N.cube_r0.5.image

WCS: (9:47:57.47, 13:16:46.2); Image: (147, 164); Value: -1.3649e-2 Jy/beam ;
Frequency (LSRK): 36.3957 GHz; Velocity: -28.0890 km/s; Polarization: Stokes I

024

30
13:17:00
30
16:00
Decination

01 9:48:00 59 58 57 56 55 47:54
Right ascension

File Browser

Users > jott > Documents > CARTA > demo

Filename	Type	Size
fft-cube.im	CASA	251.0 MB
fft.test	CASA	4.4 MB
IRC10216.36GHzcont.image.fits	FITS	368.6 kB
IRC10216_HC3N.cube_r0.5.image	CASA	19.4 MB
IRC10216_HC3N.cube_r0.5.image-copy	CASA	19.4 MB
IRC10216_HC3N.cube_r0.5.image.fits	FITS	18.7 MB
IRC10216_HC3N.cube_r0.5.image.mir	Miriad	19.3 MB
m82-car-2000.fits	FITS	4.0 MB
m82-tan-2000.fits	FITS	4.0 MB
NGC628_dss.fits	FITS	371.5 kB
NGC628_galex.fits	FITS	371.5 kB
NGC_628_CUBE-bin3.image	CASA	79.8 MB
NGC_628_CUBE.image	CASA	251.0 MB
NGC_628_NA_CUBE_THINGS.copy.fits	FITS	247.7 MB
NGC_628_NA_CUBE_THINGS.copy.mir	Miriad	243.3 MB
NGC_628_NA_CUBE_THINGS.copy.mir-manipulated	Miriad	243.3 MB

IRC10216_HC3N.cube_r0.5.image

CASA

Close Save

Select portion of image

Save Image

File Information Header

Source IRC10216_HC3N.cube_r0.5.image

Region 1 (RECTANGLE)

Range unit Frequency (GHz)
LSRK

Range from 36.39235438064446 (GHz)

Range to 36.39873012520509 (GHz)

☒ Drop degenerate axes

No catalog file loaded

Load a catalog file using the menu

No catalog file loaded

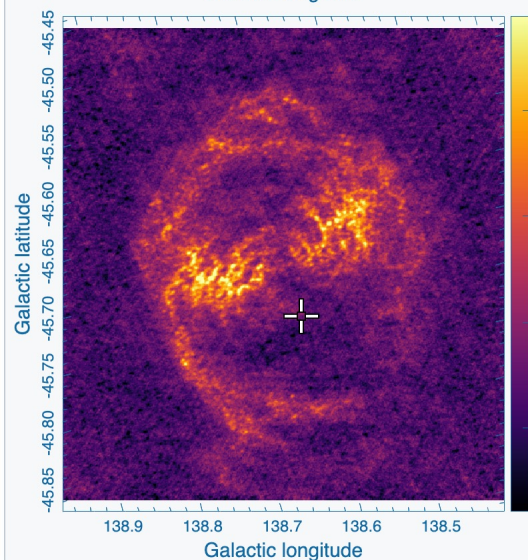
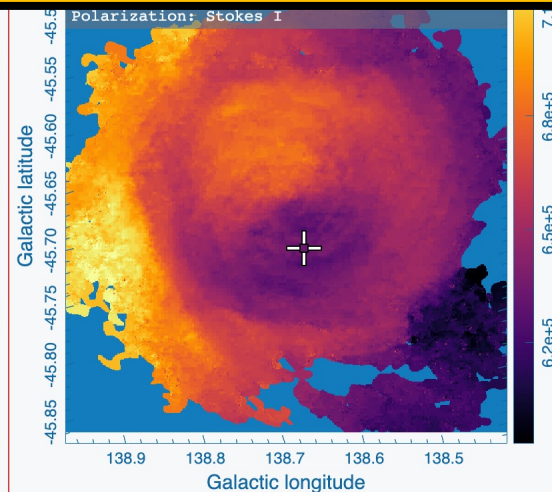
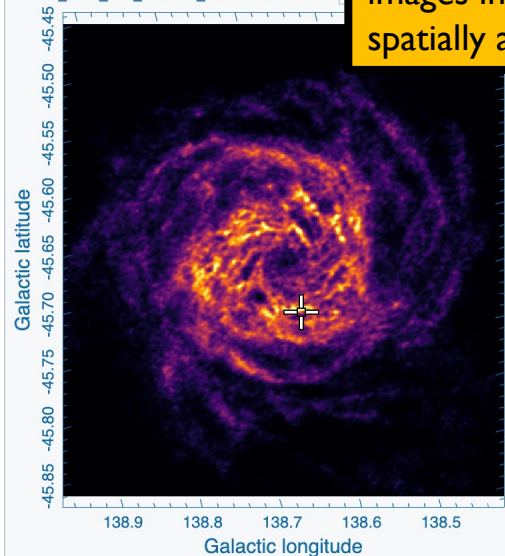
Load a catalog file using the menu

Contours

File View Widgets Help

Append and match the coordinates for multiple images in the image list. This can be done spatially and spectrally

NGC_628_NA_MOM1_THINGS.fits



Contour overlay:
2 steps: 1) generate and 2) apply
1) Select method to generate levels: percentage, min max, scaling, direct input, etc. and Generate the contour levels are shown on an image histogram and can be moved.

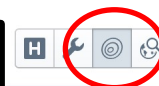
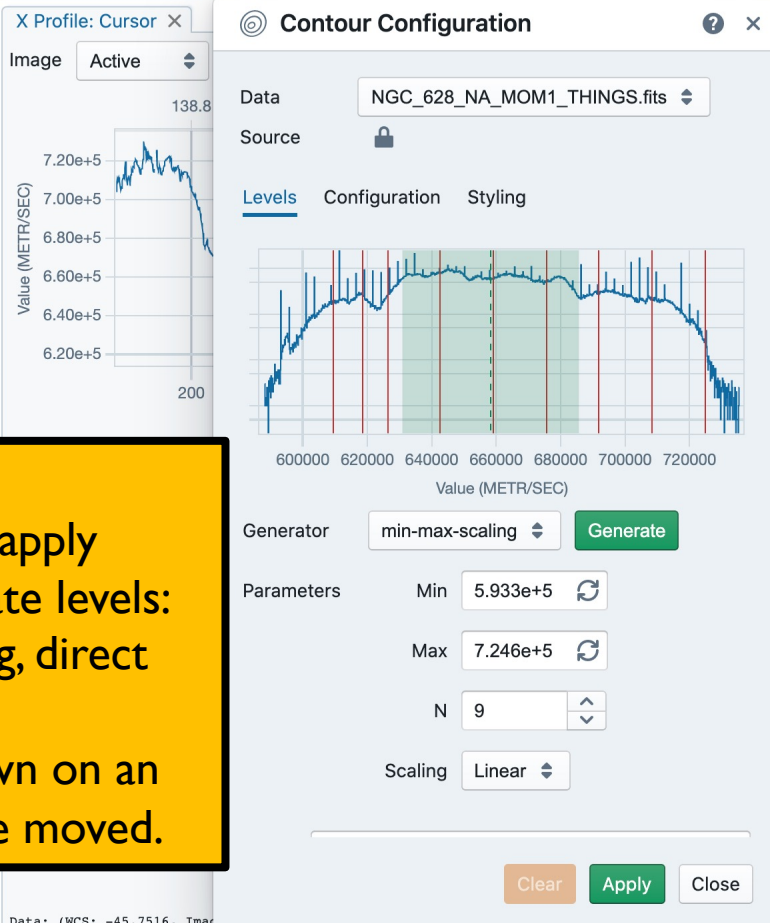
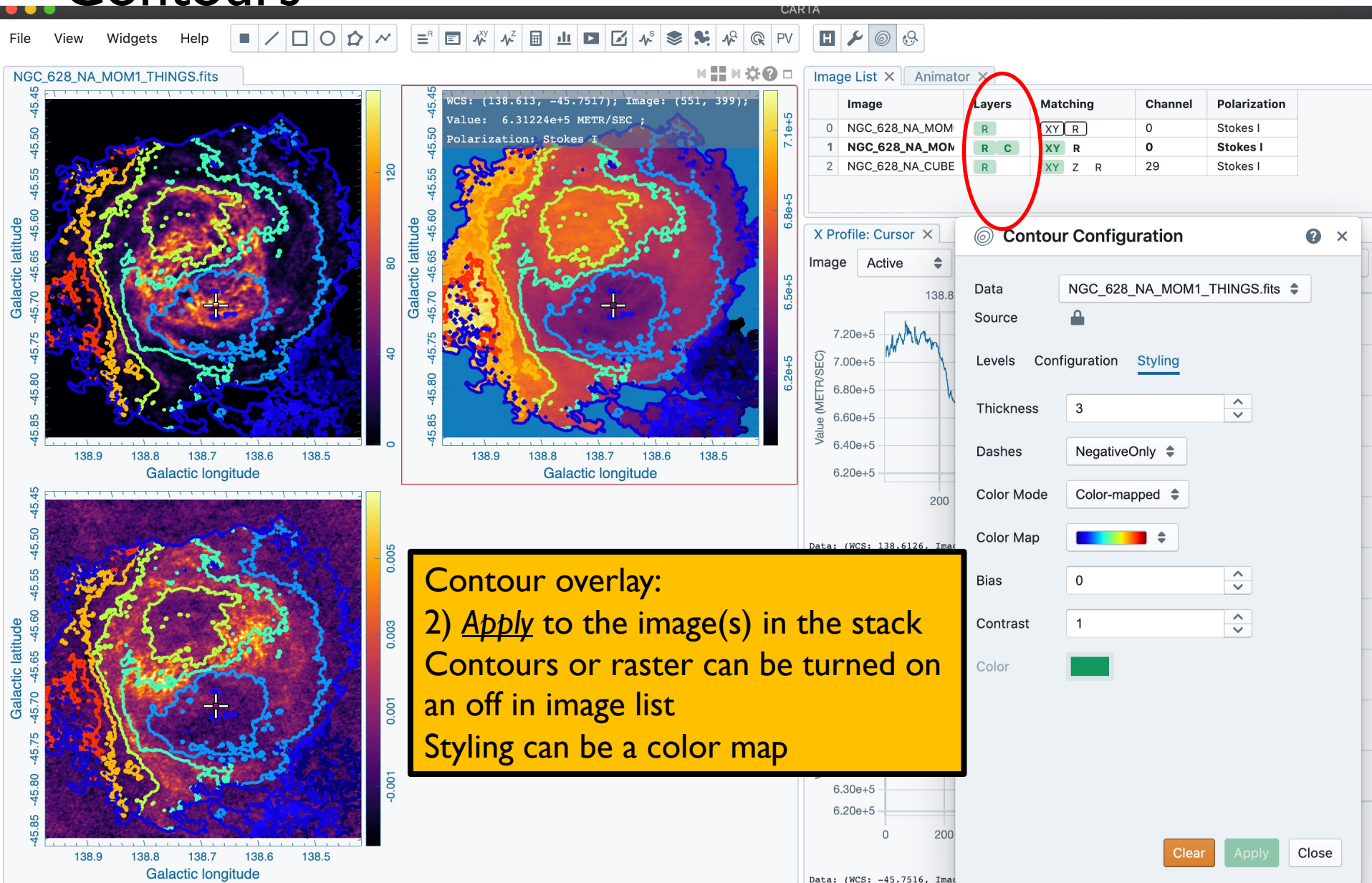


Image	Layers	Matching	Channel	Polarization
0 NGC_628_NA_MOM1_THINGS.fits	R	XY R	0	Stokes I
1 NGC_628_NA_MOM1_THINGS.fits	R	XY R	0	Stokes I
2 NGC_628_NA_CUBE	R	XY Z R	29	Stokes I

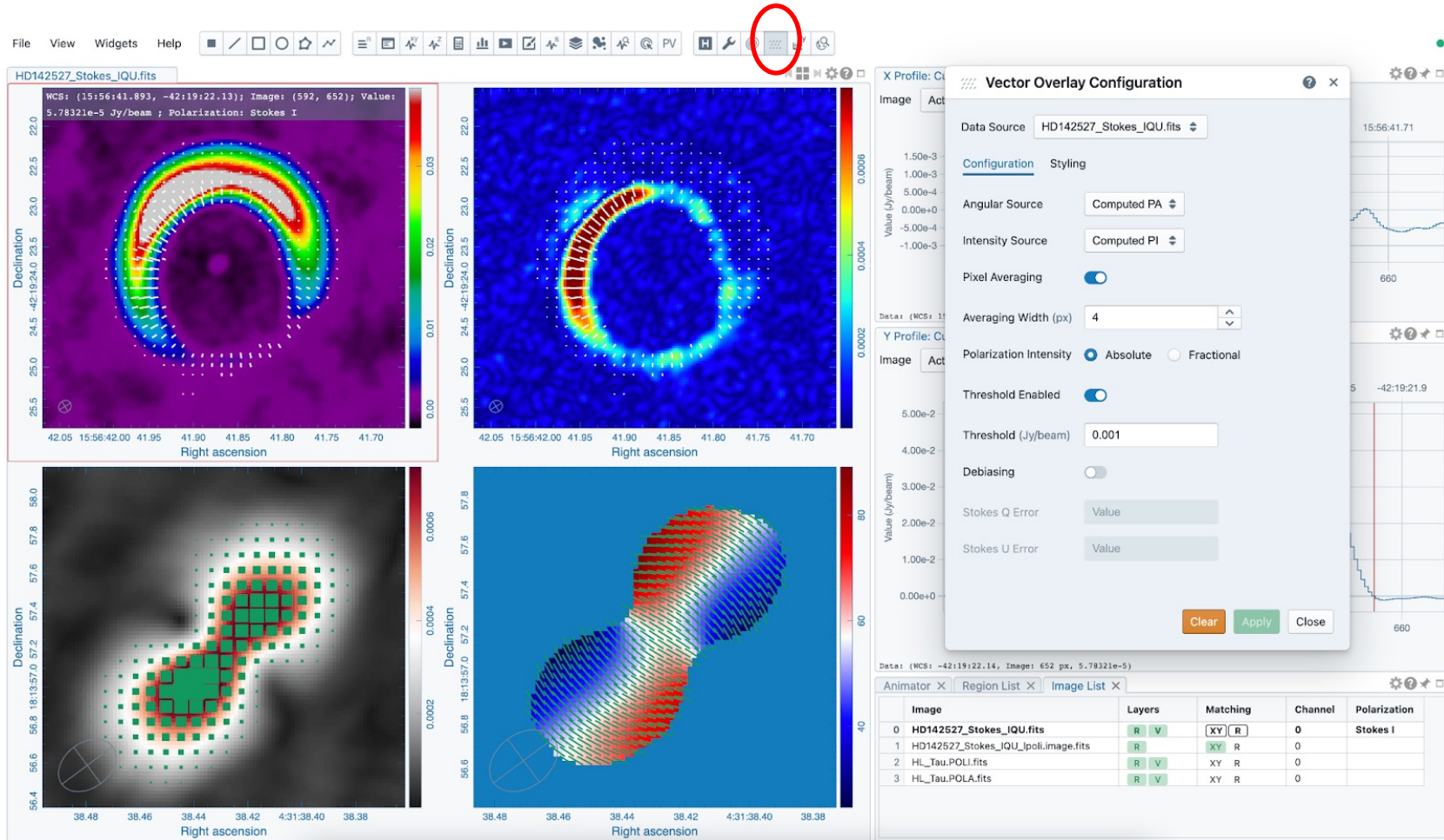


Contours

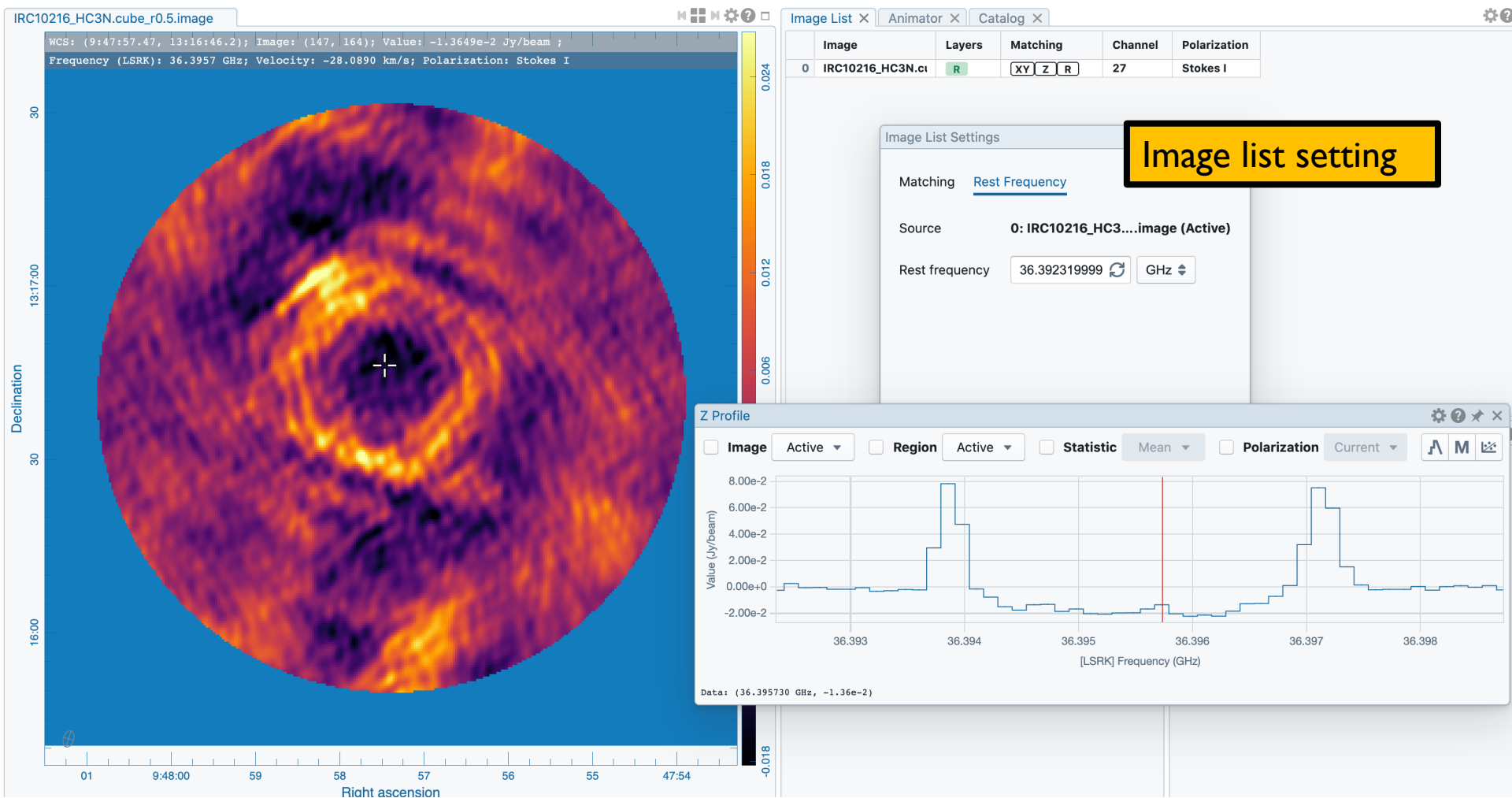


Vector field rendering

Define images for a) intensity and b) angle

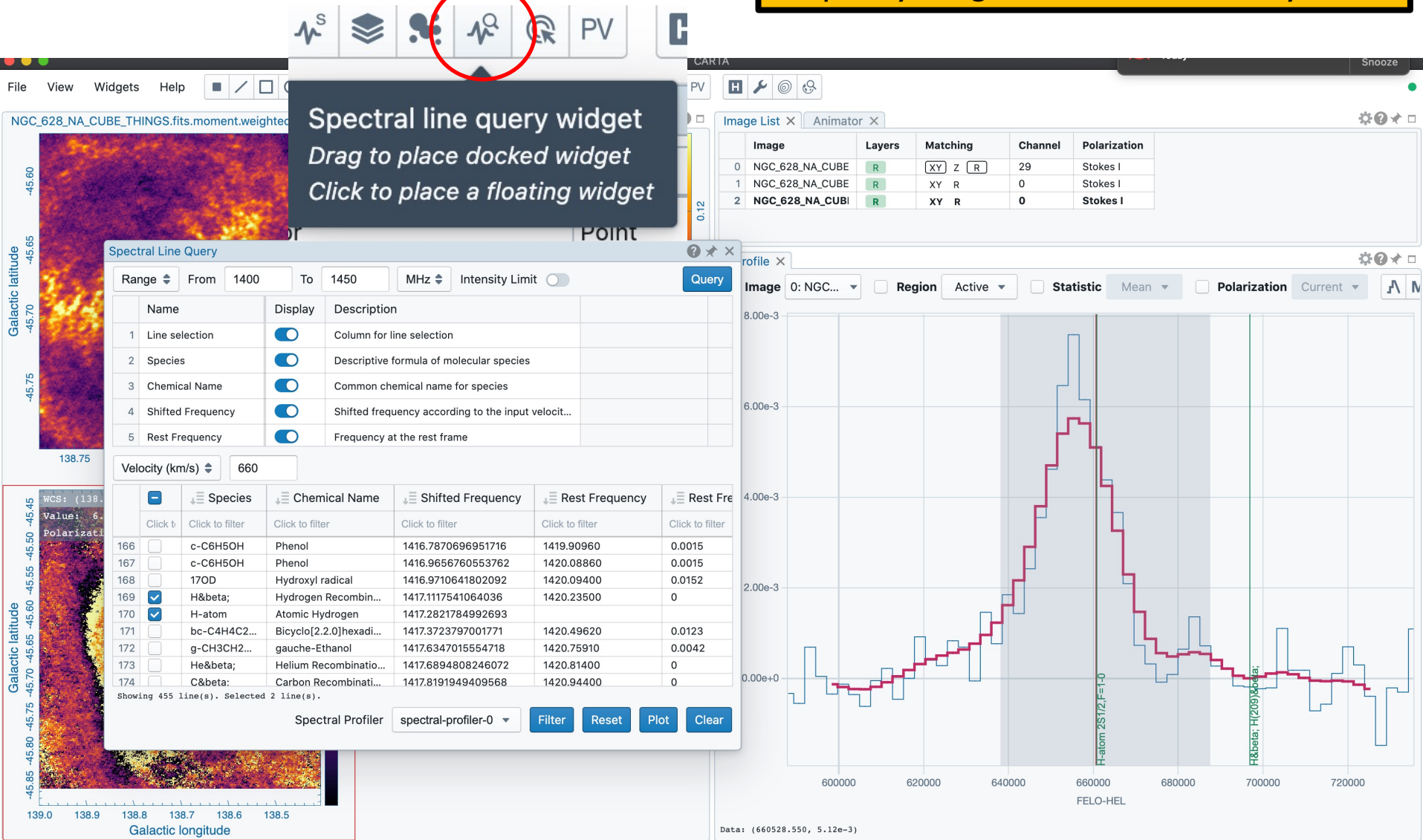


Set new rest frequency



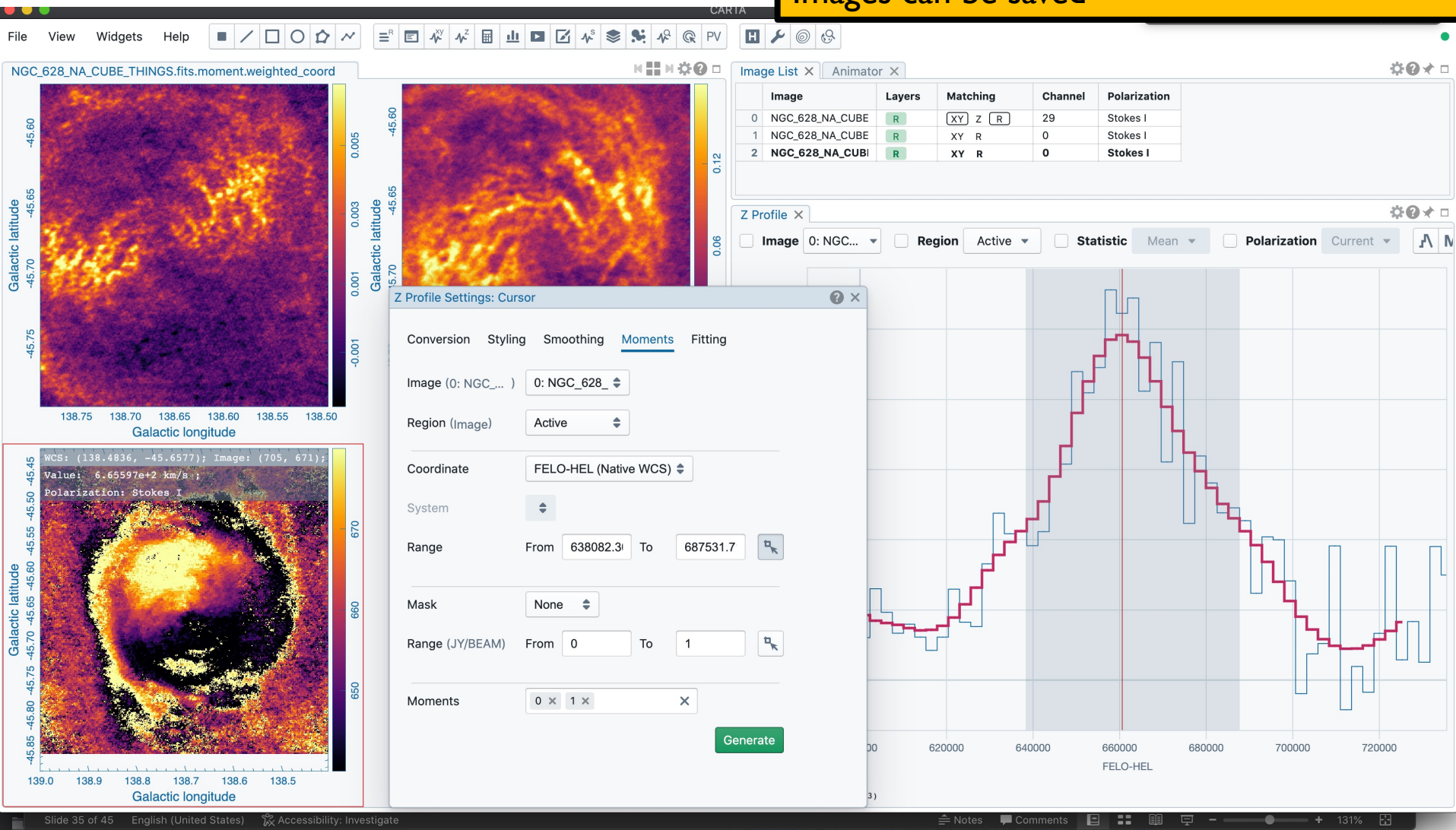
Spectral line labeling

Based on splatalogue, select line strength, frequency range and redshift/velocity



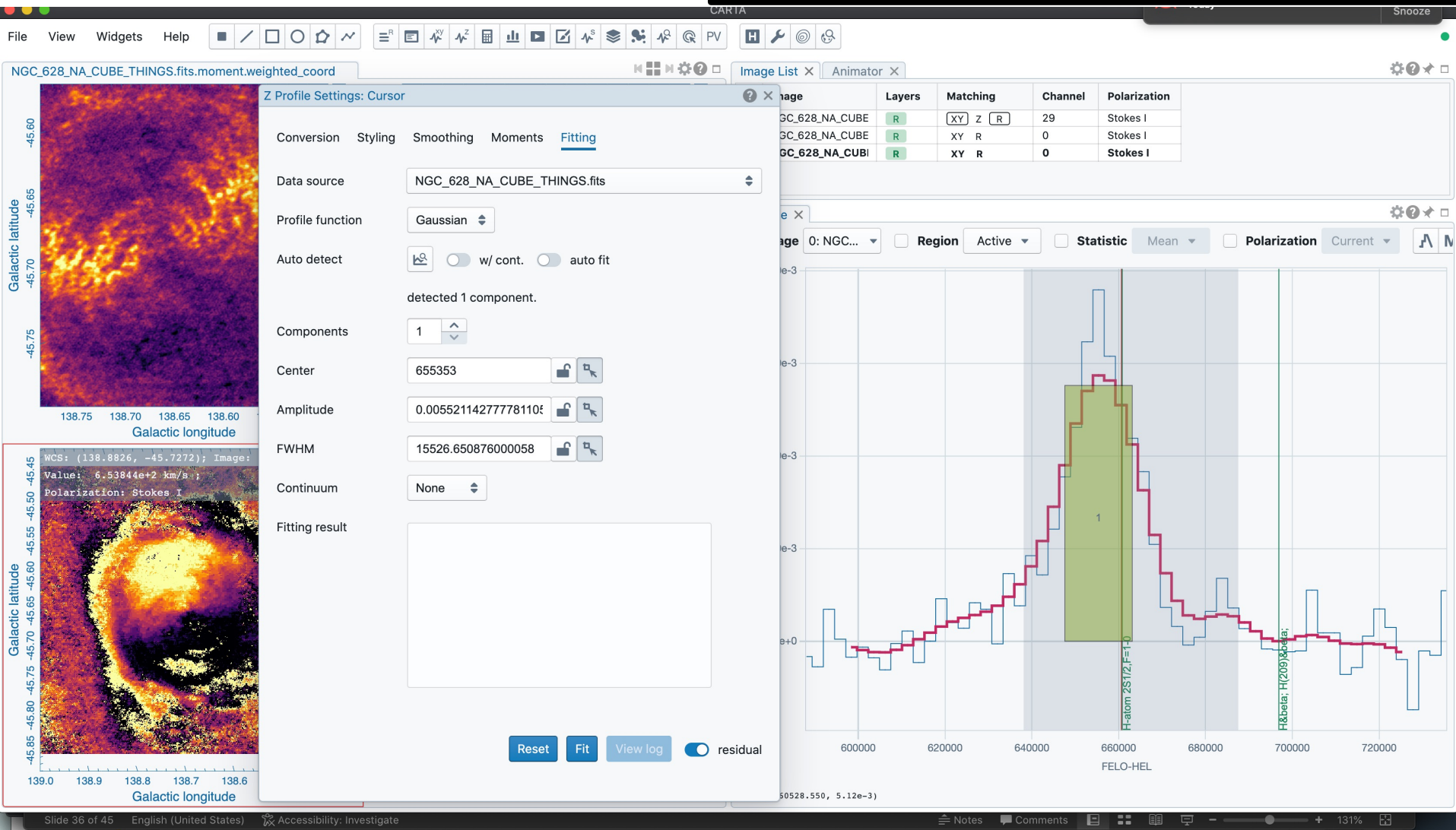
Moment maps

Spectral selection can be done interactively, including clip (uses CASA's immoments). Images can be saved



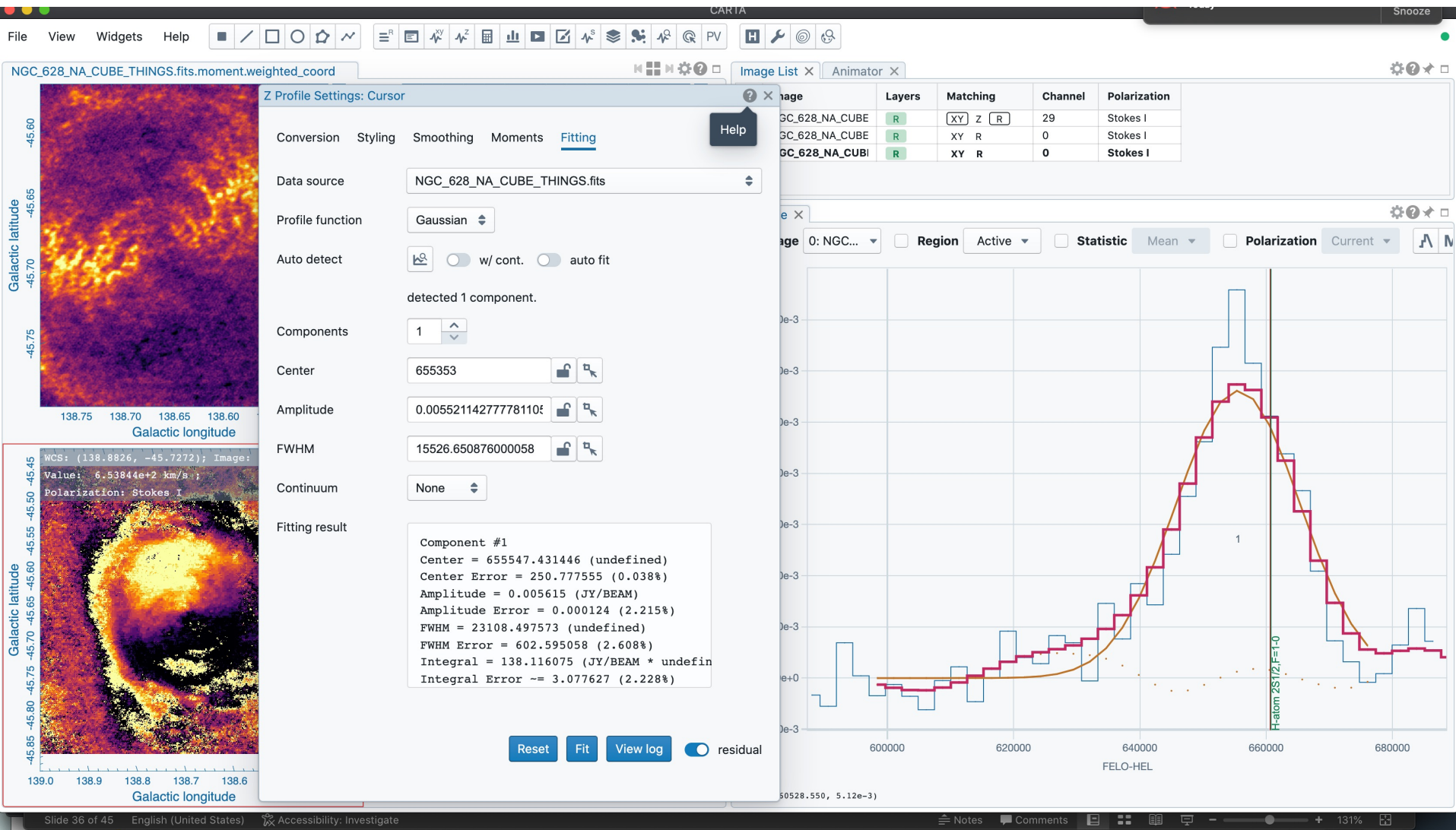
Spectral Line Fitting

Autodetection of line (can also be set manually.
Options: Gaussians, Lorentzians

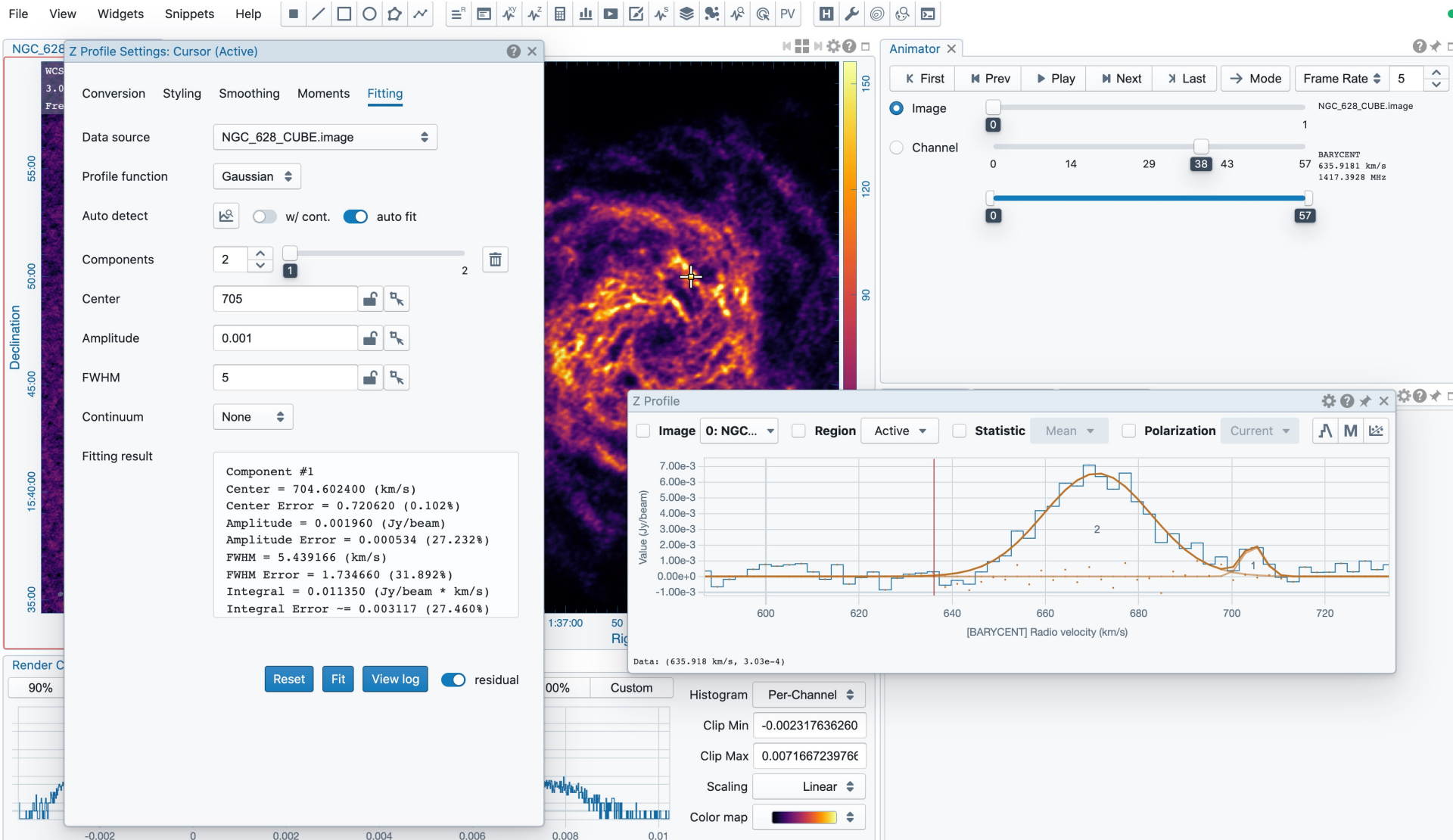


Spectral Line Fitting

Fit results can be copied/pasted/saved/displayed



Spectral Line Fitting



Position-Velocity

Interactive display, slice can be rotated, moved, stretched, displayed on other matched images.
Save as a an pV image file (will appear in stack and can be exported)

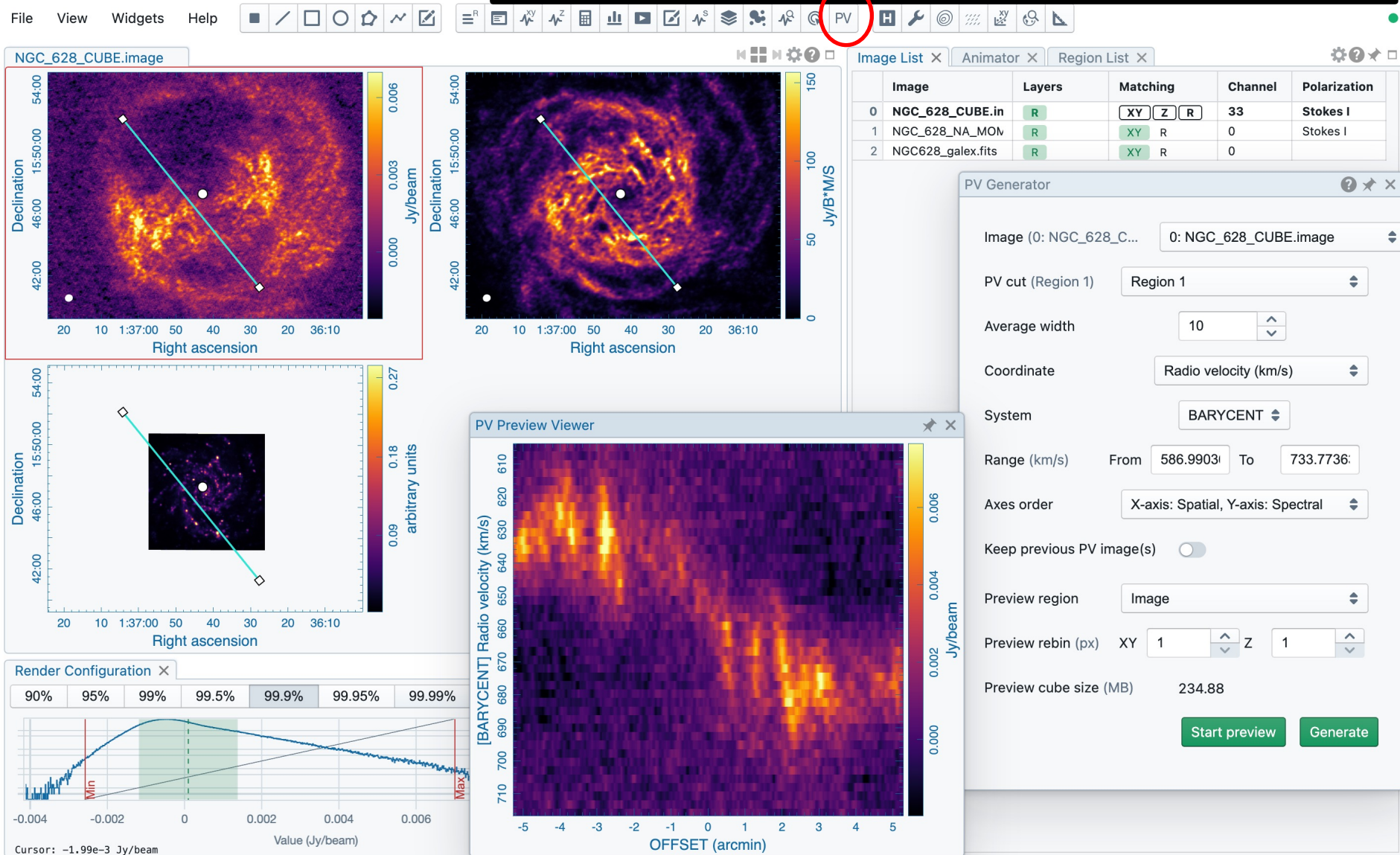
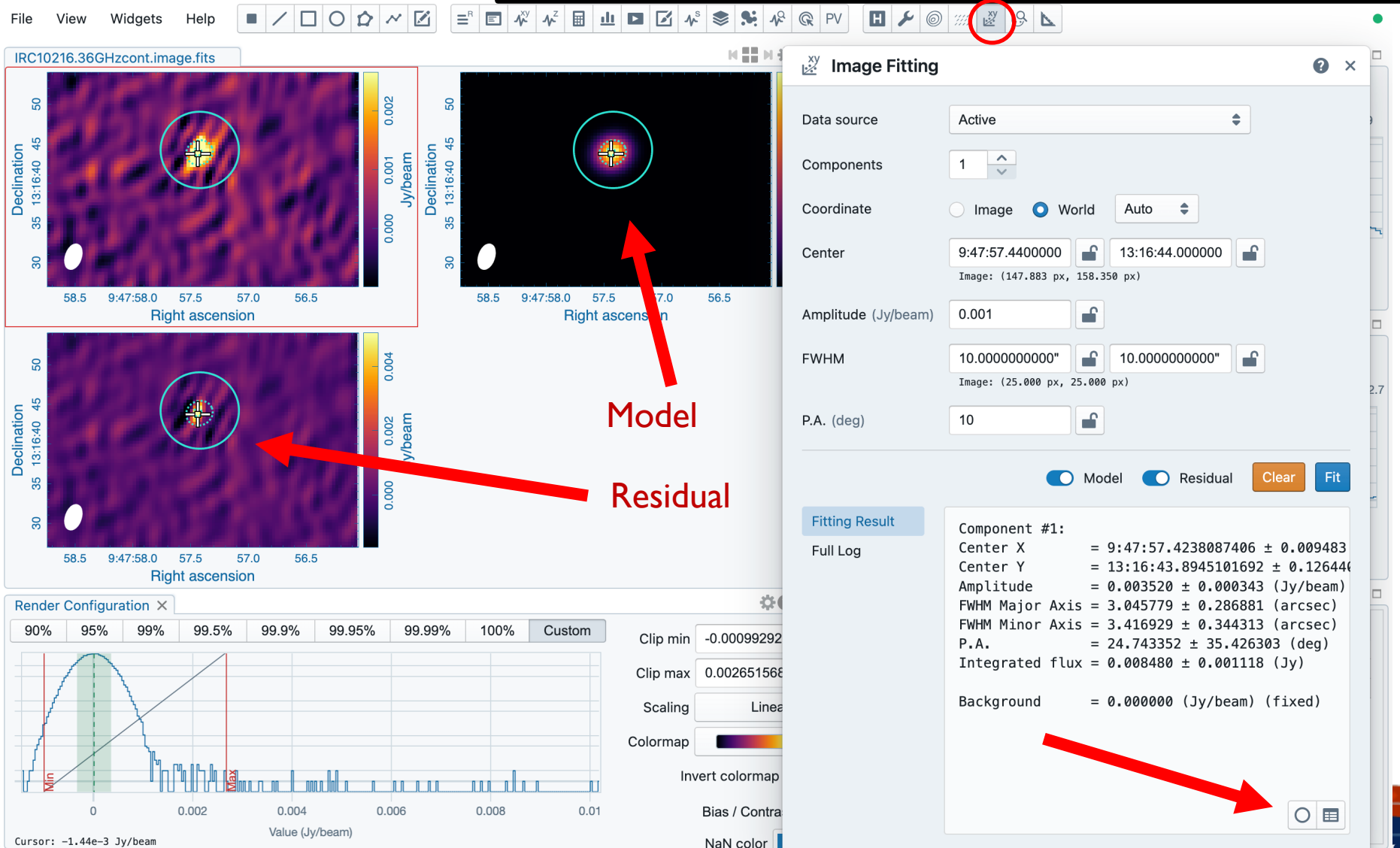


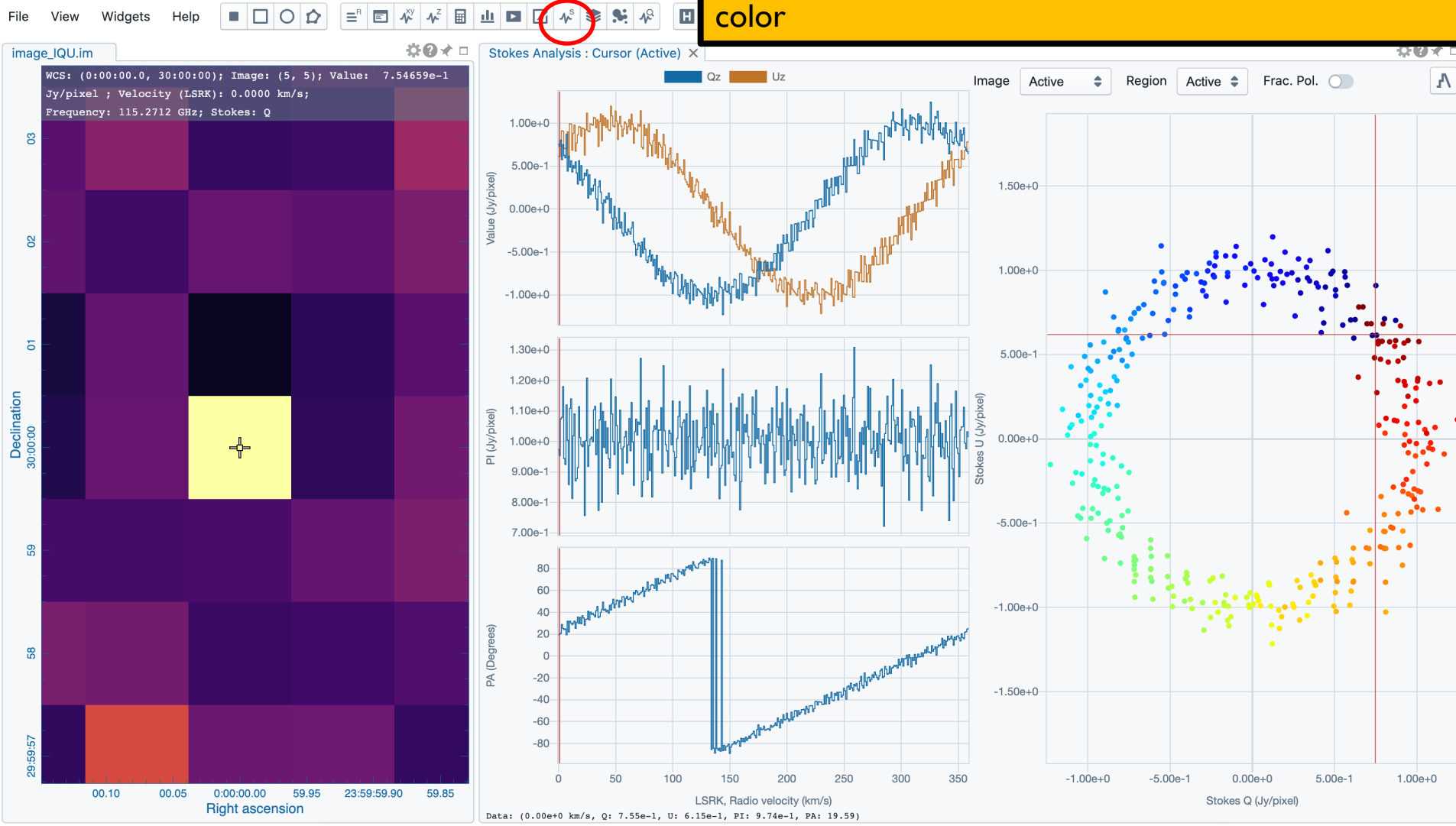
Image Fitting

Specify #components and initial starting values for the fit.
Each value can be specified as fixed or variable.
Display of Model and Residual, plus region made from fit results
Copy/paste or save fit results and regions.



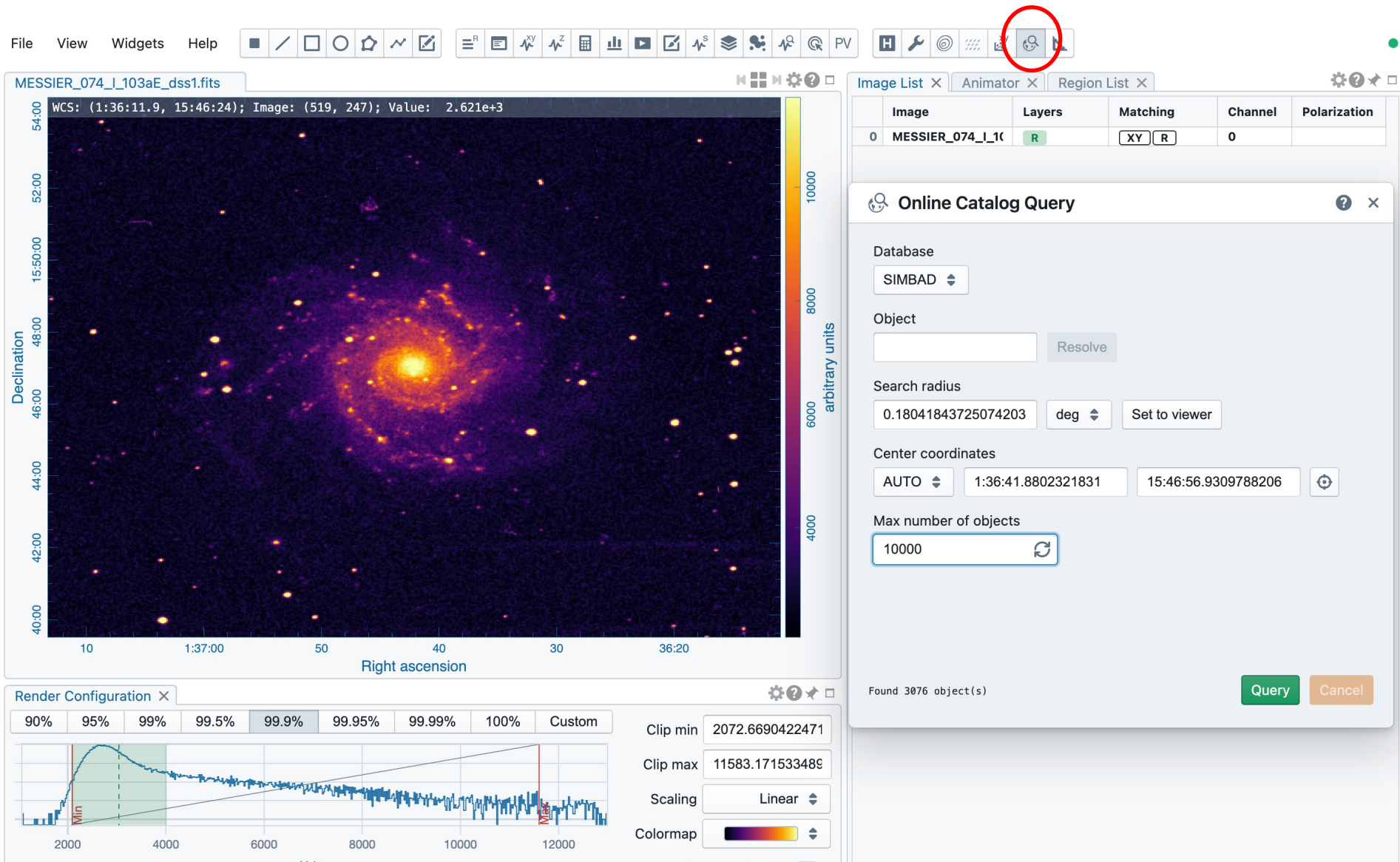
Stokes Analysis Widget

Stokes cubes (or hypercubes):
Calculate Polarization properties (Polarized Intensity, Angle) per plane; display as spectrum or velocity in color



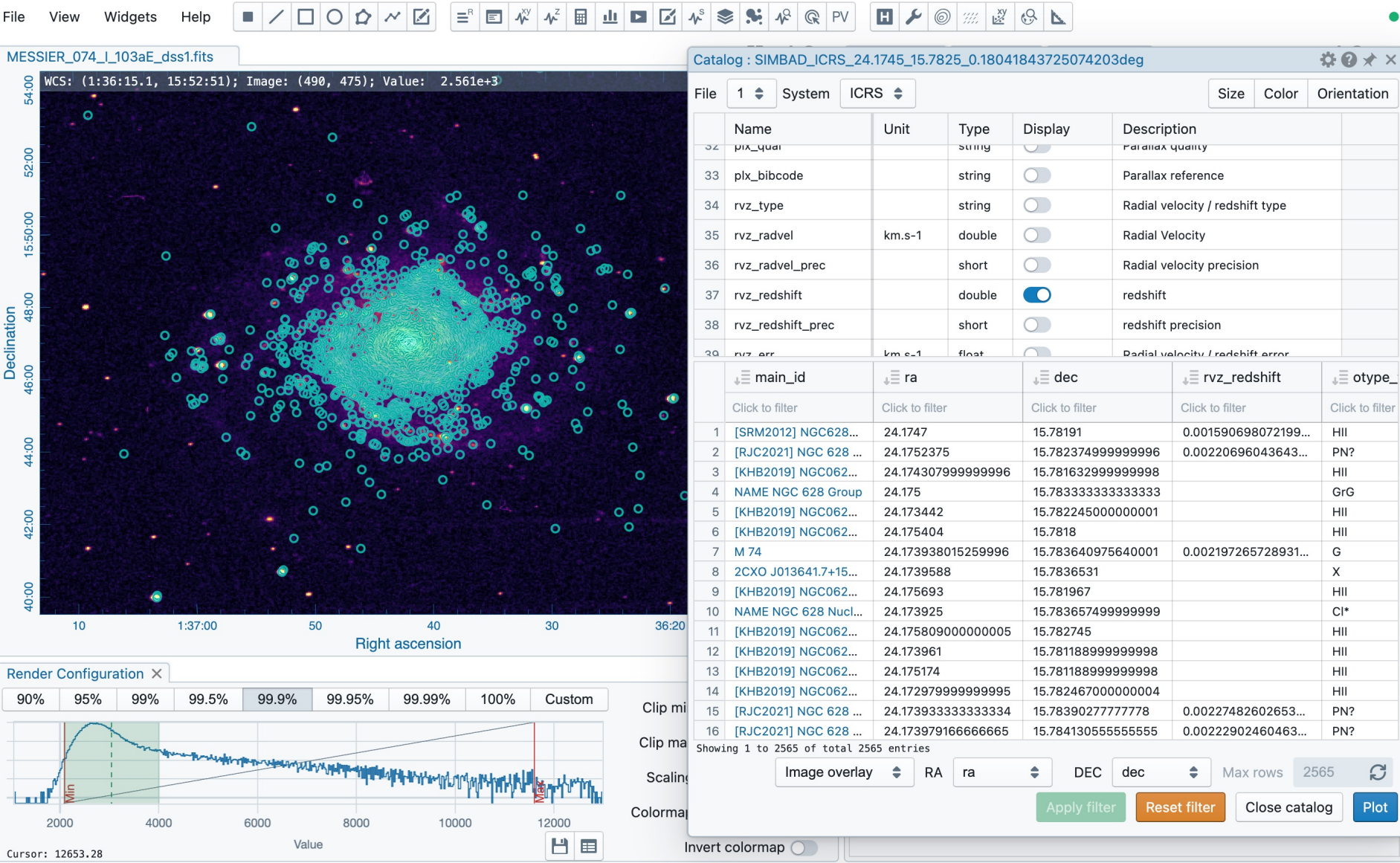
Catalog tool

Upload your own or search online, e.g. in Simbad for Catalogs



Catalog tool

The catalog result display can show or hide entries (similar to spectral line labelling tool)



Catalog tool

Labels or ranges can be selected (e.g. “HII”, “<24”, “24...26”, ...)

FileViewWidgetsHelp

MESSIER_074_I_103aE_dss1.fits

WCS: (1:36:22.5, 15:40:29); Image: (431, 37); Value: 2.744e+3

Declination

54:00

52:00

15:50:00

48:00

46:00

44:00

42:00

40:00

10

1:37:00

50

40

30

36:20

Right ascension

Render Configuration

90%95%99%99.5%99.9%99.95%99.99%100%Custom

Min

Max

2000

4000

6000

8000

10000

12000

Value

Cursor: 12653.28

Catalog : SIMBAD_ICRS_24.1745_15.7825_0.18041843725074203deg

File1SystemICRS

SizeColorOrientation

	Name	Unit	Type	Display	Description	
32	plx_qual		string	<input type="checkbox"/>	Parallax quality	
33	plx_bibcode		string	<input type="checkbox"/>	Parallax reference	
34	rvz_type		string	<input type="checkbox"/>	Radial velocity / redshift type	
35	rvz_radvel	km.s-1	double	<input type="checkbox"/>	Radial Velocity	
36	rvz_radvel_prec		short	<input type="checkbox"/>	Radial velocity precision	
37	rvz_redshift		double	<input checked="" type="checkbox"/>	redshift	
38	rvz_redshift_prec		short	<input type="checkbox"/>	redshift precision	
39	rvz_err	km.s-1	float	<input type="checkbox"/>	Radial velocity / redshift error	

main_idra

dec

rvz_redshift

otype

Click to filter

Click to filter

Click to filter

Click to filter

HII

1	[SRM2012] NGC628...	24.1747	15.78191	0.001500698072199	HII
2	[KHB2019] NGC062...	24.174307999999996	15.78163		
3	[KHB2019] NGC062...	24.173442	15.78224		
4	[KHB2019] NGC062...	24.175404	15.7818		
5	[KHB2019] NGC062...	24.175693	15.781967		HII
6	[KHB2019] NGC062...	24.175809000000005	15.782745		HII
7	[KHB2019] NGC062...	24.173961	15.781188999999998		HII
8	[KHB2019] NGC062...	24.175174	15.781188999999998		HII
9	[KHB2019] NGC062...	24.172979999999995	15.782467000000004		HII
10	[KHB2019] NGC062...	24.175000000000004	15.780855999999998		HII
11	[KHB2019] NGC062...	24.172690999999997	15.781911000000001		HII
12	[KHB2019] NGC062...	24.174596	15.780633000000002		HII
13	[KHB2019] NGC062...	24.176444000000004	15.782467000000004		HII
14	[KHB2019] NGC062...	24.175116	15.784356000000002		HII
15	[KHB2019] NGC062...	24.173729999999995	15.780688999999997		HII
16	[KHB2019] NGC062...	24.176039	15.783799999999998		HII

Showing 1 to 1634 of top 1634 entries. Total 2565 entries

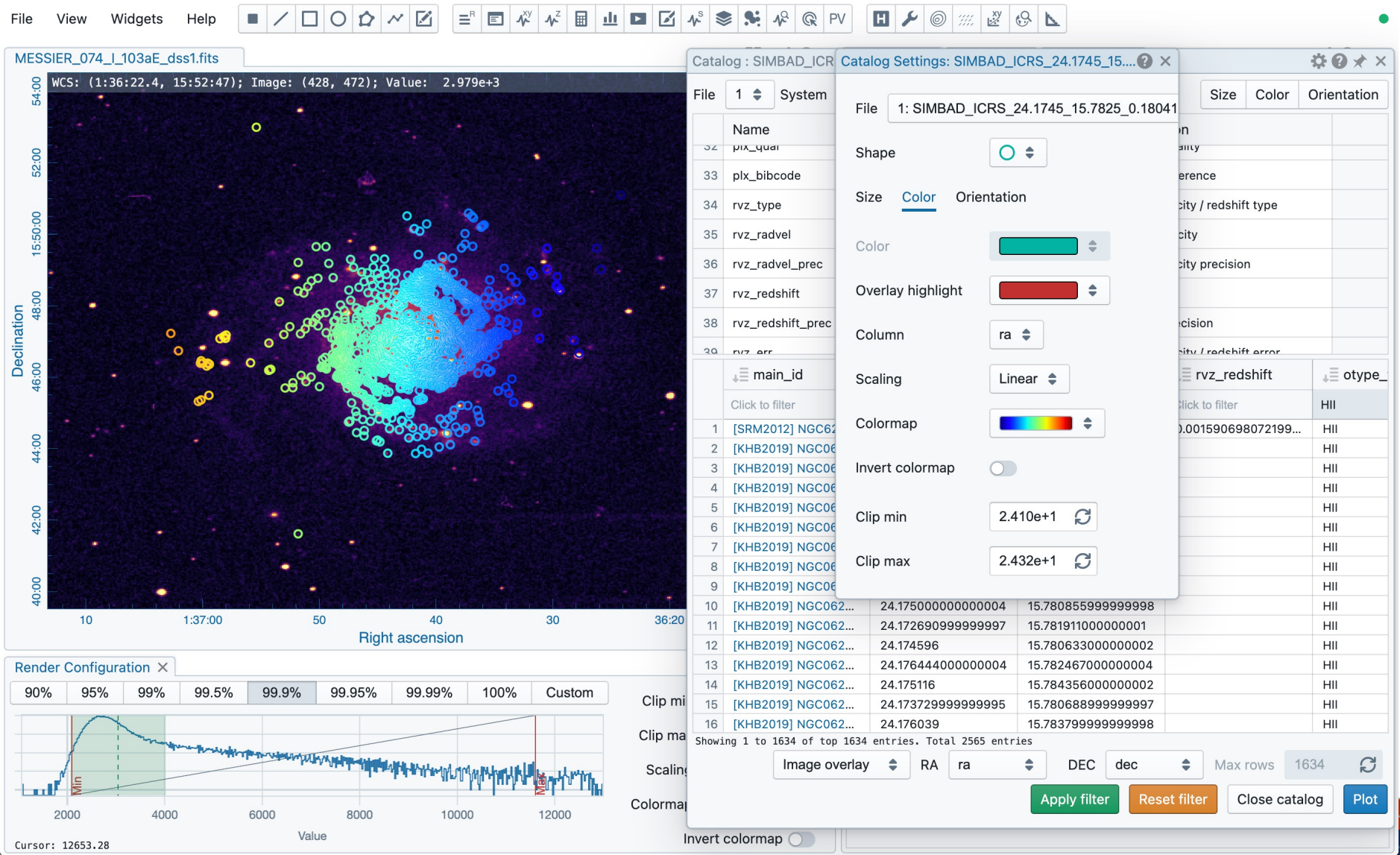
Image overlayRAraDECdecMax rows1634

Apply filterReset filterClose catalogPlot

Invert colormap

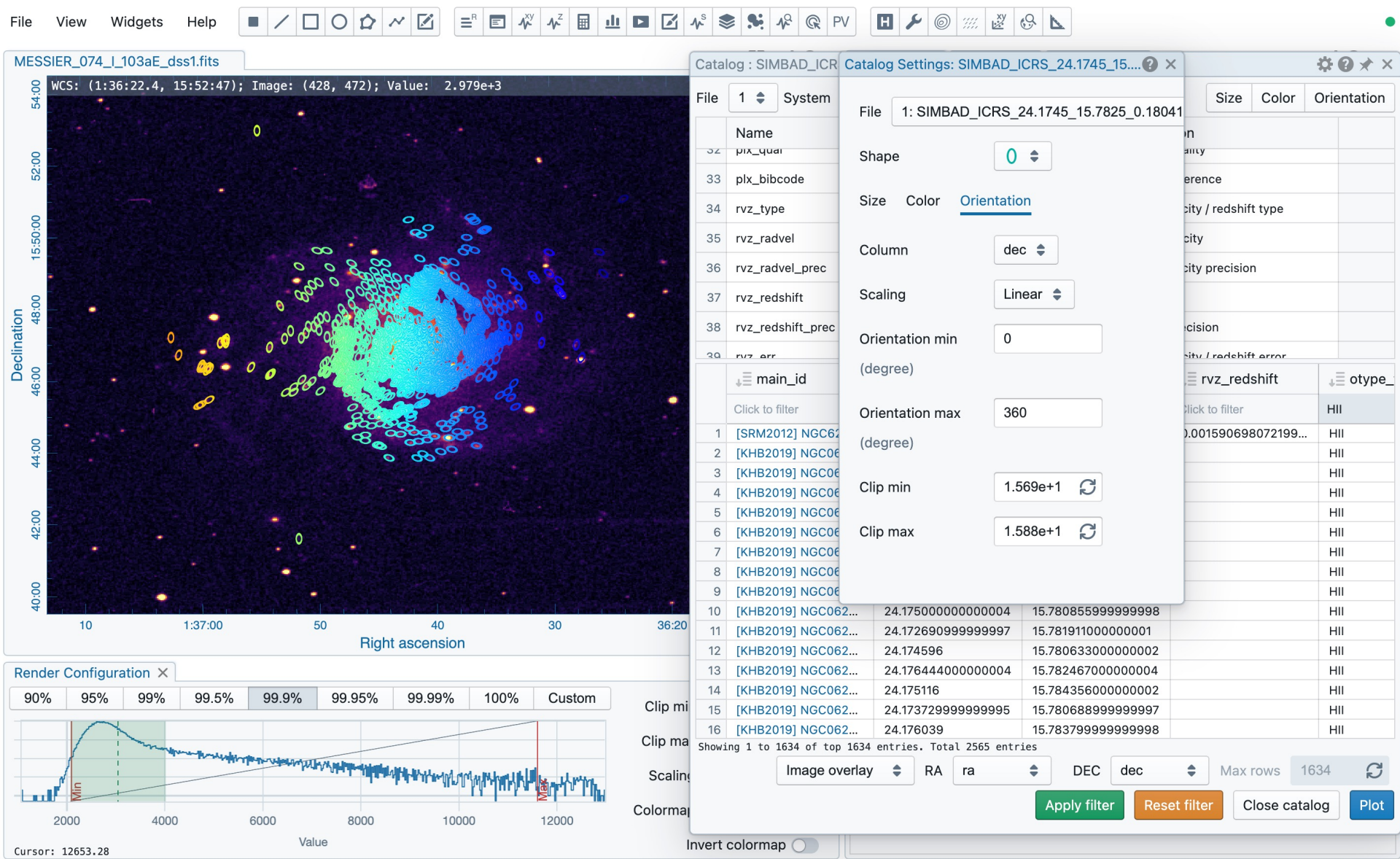
Catalog tool

Colorize your symbols by a catalog quantity



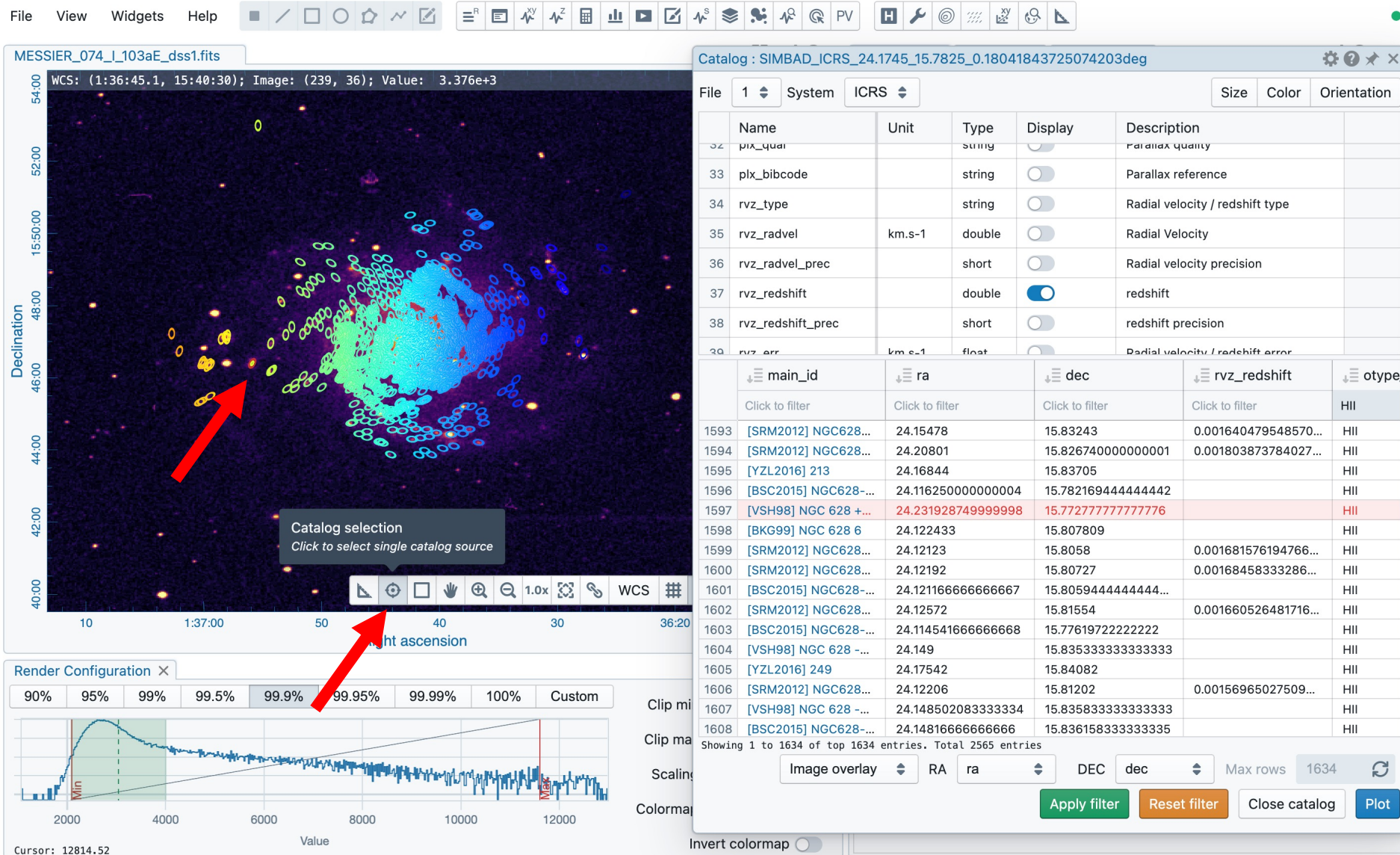
Catalog tool

Orientation of shapes can also be specified from a catalog entry



Catalog tool

Select symbol in image shows the corresponding entry in the catalog



Catalog tool

In turn, selecting catalog entry (single or multiple), highlights the symbol in the image

FileViewWidgetsHelp

MESSIER_074_I_103aE_dss1.fits

WCS: (1:36:45.1, 15:40:30); Image: (239, 36); Value: 3.376e+3

Declination

54:00

52:00

15:50:00

48:00

46:00

44:00

42:00

1:37:00

50

40

30

20

10

Right ascension

Render Configuration

90%95%99%99.5%99.9%99.95%99.99%100%Custom

Min

Max

2000

4000

6000

8000

10000

12000

Value

Cursor: 12814.52

Catalog : SIMBAD_ICRS_24.1745_15.7825_0.18041843725074203deg

File1SystemICRS

SizeColorOrientation

Name	Unit	Type	Display	Description
plx_qual		string		Parallax quality
plx_bibcode		string		Parallax reference
rvz_type		string		Radial velocity / redshift type
rvz_radvel	km.s-1	double		Radial Velocity
rvz_radvel_prec		short		Radial velocity precision
rvz_redshift		double		redshift
rvz_redshift_prec		short		redshift precision
rvz_err	km.s-1	float		Radial velocity / redshift error

main_id	ra	dec	rvz_redshift	otype
Click to filter	Click to filter	Click to filter	Click to filter	HII
1593 [SRM2012] NGC628...	24.15478	15.83243	0.001640479548570...	HII
1594 [SRM2012] NGC628...	24.20801	15.826740000000001	0.001803873784027...	HII
1595 [YZL2016] 213	24.16844	15.83705		HII
1596 [BSC2015] NGC628-...	24.116250000000004	15.782169444444442		HII
1597 [VSH98] NGC 628 + ...	24.231928749999998	15.772777777777776		HII
1598 [BKG99] NGC 628 6	24.122433	15.807809		HII
1599 [SRM2012] NGC628...	24.12123	15.8058	0.001681576194766...	HII
1600 [SRM2012] NGC628...	24.12192	15.80727	0.00168458333286...	HII
1601 [BSC2015] NGC628-...	24.121166666666667	15.80594444444444...		HII
1602 [SRM2012] NGC628...	24.12572	15.81554	0.001660526481716...	HII
1603 [BSC2015] NGC628-...	24.114541666666668	15.77619722222222		HII
1604 [VSH98] NGC 628 -...	24.149	15.835333333333333		HII
1605 [YZL2016] 249	24.17542	15.84082		HII
1606 [SRM2012] NGC628...	24.12206	15.81202	0.00156965027509...	HII
1607 [VSH98] NGC 628 -...	24.148502083333334	15.835833333333333		HII
1608 [BSC2015] NGC628-...	24.148166666666666	15.836158333333335		HII

Showing 1 to 1634 of top 1634 entries. Total 2565 entries

Image overlayRAraDECdec

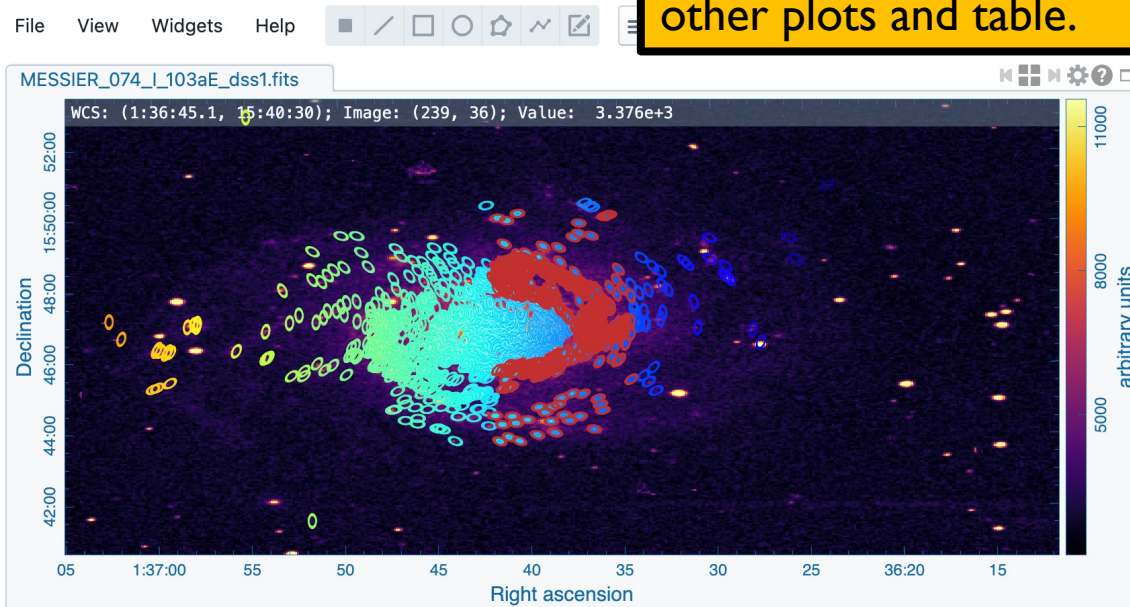
Max rows1634

Apply filterReset filterClose catalogPlot

Invert colormap

Catalog tool

Scatter plots and histograms can be made. Highlighting a portion in these diagrams will highlight corresponding data in other plots and table.



Catalog

File 1 System ICRS Size Color Orientation

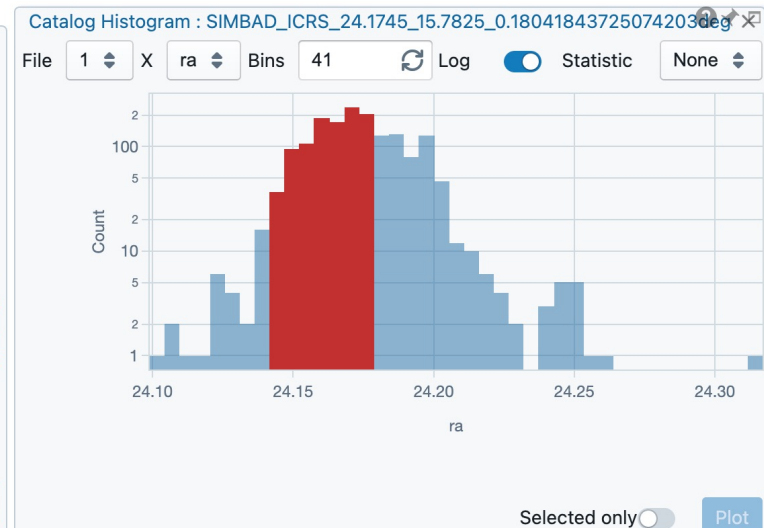
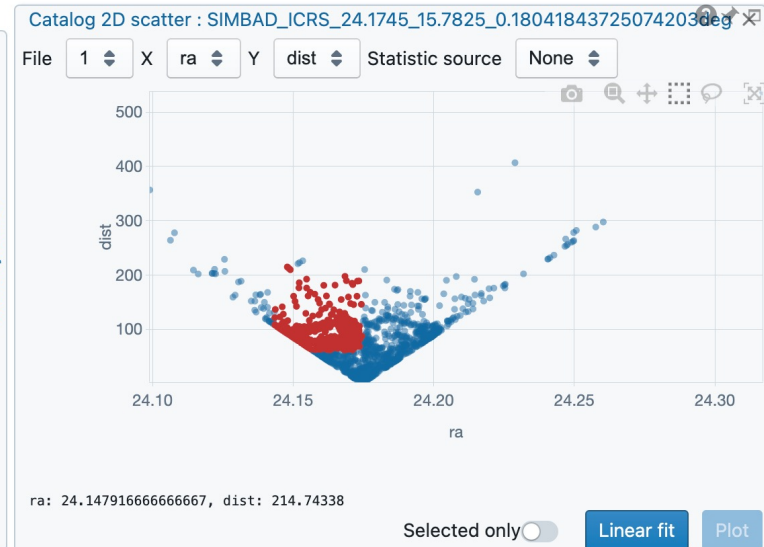
	Name	Unit	Type	Display	Description
1	main_id		string	<input checked="" type="checkbox"/>	Main identifier for an object
2	nbref		short	<input type="checkbox"/>	number of references

	main_id	ra	dec	rvz_redshift	otype_txt	dis
	Click to filter	Click to filter	Click to filter	Click to filter	HII	Click to
590	[KHB2019] NGC062...	24.168478	15.766355		HII	61.752
591	[KHB2019] NGC062...	24.171133	15.765632999999996		HII	61.831
592	[KHB2019] NGC062...	24.162991	15.795633		HII	61.845
593	[KHB2019] NGC062...	24.186546	15.7698		HII	61.902
594	[KHB2019] NGC062...	24.177078	15.760532		HII	61.826

Showing 1 to 1634 of top 1634 entries. Total 2565 entries

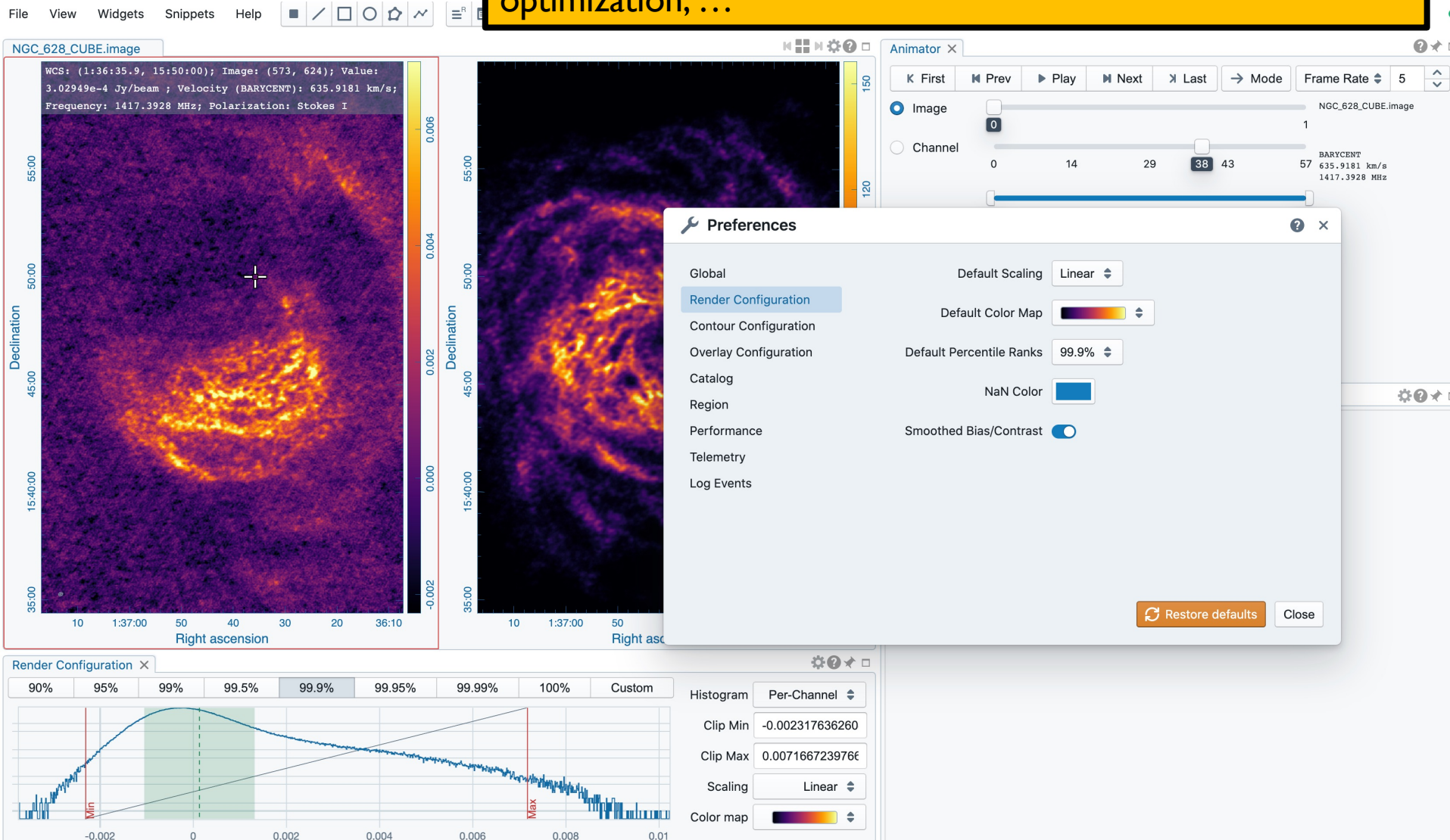
Histogram X ra Y dist Max rows 1634

Apply filter Reset filter Close catalog Plot



Preferences

Many settable parameters, incl. startup behavior, preferred color map, contour config, color scheme, performance optimization, ...



ALMA archive – CARTA Integration

1 column filter active

[Explore and download](#)

00 47 36.912 -25 18 43.17
FoV: 34.25'

VO

Molecules

Lines

Redshift
0.0008636
estimated

Previews for NGC253

ALMA

[README](#)
[QA2 report](#)
[Weblog](#)

SPW 0: 476.316-478.315GHz, 976.563 kHz, XX YY

Band: 8
Frequency type: line
Frequency range: 476.316-478.315
Frequency resolution: 976.563 kHz
Continuum sensitivity: 4.944
Line sensitivity 10km/s (estimate): 100.853 mJy/beam@10km/s
Line sensitivity native (estimate): 8.998 uJy/beam@native
Polarizations: XX YY
Array: 7m

SPW 1: 478.21-480.209GHz, 976.563 kHz, XX YY

Band: 8
Frequency type: line
Frequency range: 478.21-480.209
Frequency resolution: 976.563 kHz
Continuum sensitivity: 4.944
Line sensitivity 10km/s (estimate): 80.343 mJy/beam@10km/s
Line sensitivity native (estimate): 7.183 uJy/beam@native
Polarizations: XX YY
Array: 7m

Molecules

Lines

Redshift
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ALMA

[README](#)
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Molecules

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ALMA

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Frequency resolution: 976.563 kHz
Continuum sensitivity: 4.944
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Molecules

Lines

Redshift
0.0008636
estimated

ALMA

[README](#)
[QA2 report](#)
[Weblog](#)

SPW 0: 476.316-478.315GHz, 976.563 kHz, XX YY

Band: 8
Frequency type: line
Frequency range: 476.316-478.315
Frequency resolution: 976.563 kHz
Continuum sensitivity: 4.944
Line sensitivity 10km/s (estimate): 100.853 mJy/beam@10km/s
Line sensitivity native (estimate): 8.998 uJy/beam@native
Polarizations: XX YY
Array: 7m

SPW 1: 478.21-480.209GHz, 976.563 kHz, XX YY

Band: 8
Frequency type: line
Frequency range: 478.21-480.209
Frequency resolution: 976.563 kHz
Continuum sensitivity: 4.944
Line sensitivity 10km/s (estimate): 80.343 mJy/beam@10km/s
Line sensitivity native (estimate): 7.183 uJy/beam@

ALMA archive – CARTA Integration

CARTA v1.4 | CARTA - Cube Arch | CARTA - Cube Arch | Survey of missing | CARTAVIS - GitHub | ALMA Science Arch | ALMA Science Arch | Alma Request Handler | CARTA





almascience.eso.org/rh/submission

ALMA Request Handler

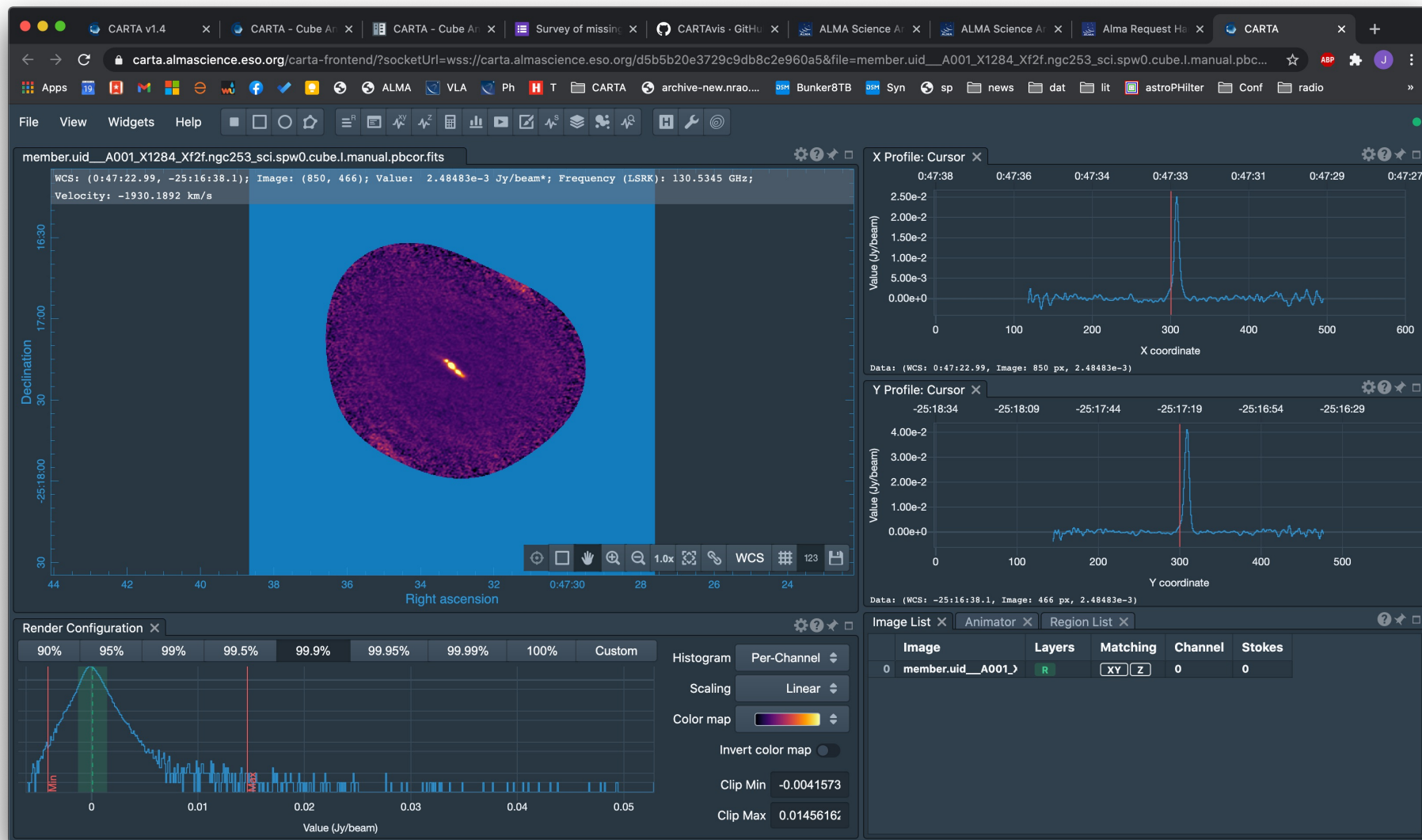
Anonymous User: Request #2154992946764 ✓
Request Title: [click to edit](#)

Download Selected


☒ readme ☒ product ☒ auxiliary ☐ raw ☐ raw (semipass) ☐ external

Project / OUSet / Executionblock	File	Size	Accessible	Actions
Request 2154992946764		3 GiB		
Project 2017.1.00161.L				
Science Goal OUS uid://A001/X1284/Xf2d				
Group OUS uid://A001/X1284/Xf2e				
Member OUS uid://A001/X1284/Xf2f				
SB ngc253_b_04_TM1				
<input checked="" type="checkbox"/> readme	member.uid_A001_X1284_Xf2f.README.txt	3 KiB	✓	
<input checked="" type="checkbox"/> product	2017.1.00161.L_uid_A001_X1284_Xf2f_001_of_001.tar	3 GiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw0.cube.l.manual.mask.tgz	720 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw0.cube.l.manual.pb.fits.gz	133 MiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw0.cube.l.manual.pbcor.fits	527 MiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw1.cube.l.manual.mask.tgz	720 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw1.cube.l.manual.pb.fits.gz	130 MiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw1.cube.l.manual.pbcor.fits	527 MiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw2.cube.l.manual.mask.tgz	720 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw2.cube.l.manual.pb.fits.gz	120 MiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw2.cube.l.manual.pbcor.fits	527 MiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw3.cube.l.manual.mask.tgz	720 KiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw3.cube.l.manual.pb.fits.gz	119 MiB	✓	
<input type="checkbox"/> product	member.uid_A001_X1284_Xf2f.ngc253_sci.spw3.cube.l.manual.pbcor.fits	527 MiB	✓	
<input checked="" type="checkbox"/> auxiliary	2017.1.00161.L_uid_A001_X1284_Xf2f_auxiliary.tar	210 MiB	✓	
<input type="checkbox"/> raw	2017.1.00161.L_uid_A002_Xd10f82_Xd1a.asdm.sdm.tar	134 GiB	✓	
<input type="checkbox"/> raw	2017.1.00161.L_uid_A002_Xd12f5c_Xad8f.asdm.sdm.tar	129 GiB	✓	
Member OUS uid://A001/X1284/Xf31				
SB ngc253_b_04_7M				
<input type="checkbox"/> readme	member.uid_A001_X1284_Xf31.README.txt	3 KiB	✓	
<input type="checkbox"/> product	2017.1.00161.L_uid_A001_X1284_Xf31_001_of_001.tar	1 GiB	✓	
<input type="checkbox"/> auxiliary	2017.1.00161.L_uid_A001_X1284_Xf31_auxiliary.tar	561 MiB	✓	
<input type="checkbox"/> raw	2017.1.00161.L_uid_A002_Xc6d2f9_X3fc.asdm.sdm.tar	4 GiB	✓	

ALMA archive – CARTA Integration



SRDP image archive – CARTA Integration

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version: 4.1.0

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 0/50: selected (0/10.0 TB)

 View Selection(s)  Clear All  Download  View In Carta

	↕ Project	↕ Longitude	↕ Latitude	↕ Band	Sp Resolution	Beam Axis Ratio	↕ File Name
 	VLASS1.1	0h2m28.328s	-36°30'0.000"	S	2.520	2.554	VLASS1.1.q1.T01t01.J000228-363000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
 	VLASS1.1	0h2m30.256s	-37°30'0.000"	S	2.460	1.975	VLASS1.1.q1.T01t01.J000230-373000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
 	VLASS1.1	0h2m32.282s	-38°30'0.000"	S	2.486	1.534	VLASS1.1.q1.T01t01.J000232-383000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
 	VLASS1.1	0h2m34.411s	-39°30'0.000"	S	2.621	1.270	VLASS1.1.q1.T01t01.J000234-393000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
 	VLASS1.1	0h7m24.984s	-36°30'0.000"	S	2.518	2.440	VLASS1.1.q1.T01t01.J000724-363000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
 	VLASS1.1	0h7m30.769s	-37°30'0.000"	S	2.455	1.881	VLASS1.1.q1.T01t01.J000730-373000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
 	VLASS1.1	0h7m36.847s	-38°30'0.000"	S	2.502	1.462	VLASS1.1.q1.T01t01.J000736-383000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
 	VLASS1.1	0h7m43.233s	-39°30'0.000"	S	2.645	1.224	VLASS1.1.q1.T01t01.J000743-393000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits

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version: 4.1.0

Launch Workflow Task on: VLASS1.1

User Email (required): blubb@bla.com

Request Description: Image Processing Request

Destination Directory: ☐ Specify directory (must be logged in & staff)
/lustre/

Create tar file: ☐ Return results as a tar file

Visualize with CARTA: ☒ Visualize Images with CARTA


Cancel Submit Request

1/50: selected (55.4 MB)

View Selection(s) Clear All Download View In Carta

	Project	Longitude	Latitude	Band	Sp Resolution	Beam Axis Ratio	File Name
	VLASS1.1	0h2m28.328s	-36°30'0.000"	S	2.520	2.554	VLASS1.1.q1.T01t01.J000228-363000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
	VLASS1.1	0h2m30.256s	-37°30'0.000"	S	2.460	1.975	VLASS1.1.q1.T01t01.J000230-373000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
	VLASS1.1	0h2m32.282s	-38°30'0.000"	S	2.486	1.534	VLASS1.1.q1.T01t01.J000232-383000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
	VLASS1.1	0h2m34.411s	-39°30'0.000"	S	2.621	1.270	VLASS1.1.q1.T01t01.J000234-393000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
	VLASS1.1	0h7m24.984s	-36°30'0.000"	S	2.518	2.440	VLASS1.1.q1.T01t01.J000724-363000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
	VLASS1.1	0h7m30.769s	-37°30'0.000"	S	2.455	1.881	VLASS1.1.q1.T01t01.J000730-373000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
	VLASS1.1	0h7m36.847s	-38°30'0.000"	S	2.502	1.462	VLASS1.1.q1.T01t01.J000736-383000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits
	VLASS1.1	0h7m43.233s	-39°30'0.000"	S	2.645	1.224	VLASS1.1.q1.T01t01.J000743-393000.10.2048.v1.l.iter1.image.pbcor.tt0.subim.fits

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Request #996152768 by Anonymous User

Image Processing Request

— *Initializing request...*

Requested Projects / OUSets / Executionblocks

Project / OUSet / Executionblock	File	Size
----------------------------------	------	------

Please wait; requested datasets list under construction....

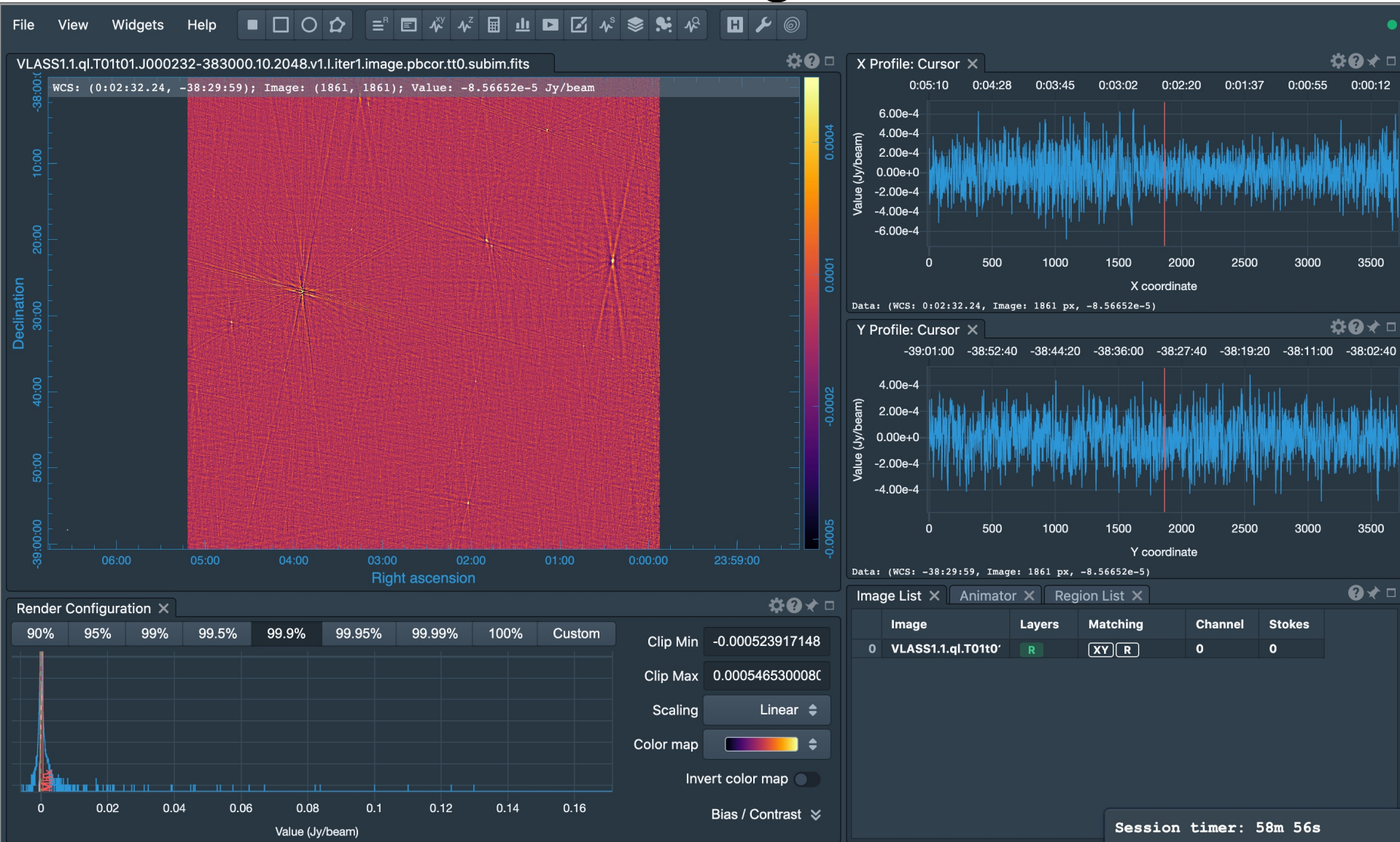
Data entities 1-1 of 1



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Python Scripting in progress/Code snippet

The screenshot displays the CARTA software interface. At the top, a navigation menu shows 'Examples' and 'Tutorial' tabs. The 'Tutorial' tab is active, displaying a list of sections: '01. Basics', '02. Functions', and '03. Loading images'. Below this, a 'Create new snippet' button is visible.

The 'Edit code snippet' window is open, showing a Python script for loading images. The script includes comments and function calls like `carta.showSplashScreen()`, `await carta.delay(1000)`, and `app.hideSplashScreen()`. It also includes comments about the 'frames' array and the 'activeFrame' property. The script ends with a comment about the `openFile` function arguments.

The 'Preferences' dialog is open, showing the 'Global' tab. The 'Theme' is set to 'Light'. The 'Enable Code Snippets' toggle is turned on. The 'Auto-launch File Browser' toggle is also turned on. The 'File List' is set to 'Filter by file content'. The 'Initial Layout' is set to 'Default'. The 'Initial Cursor Position' is set to 'Tracking'. The 'Initial Zoom Level' is set to 'Zoom to fit'. The 'Zoom to' option is set to 'Cursor'. The 'Restore defaults' and 'Close' buttons are at the bottom right.

The main workspace area shows two panels, each with a folder icon and the text 'No catalog file loaded'. Below this text, it says 'Load a catalog file using the menu'.

CARTA v5 plan, available this fall 2024

- Readiness for ALMA WSU
 - python scripting (maybe available earlier)
 - rgb image overlay
 - distance measure incl. x, y
 - Astronomical filters in spectra line library
 - pV along a polyline
 - Catalog density plots
 - Image fitting guess of initial values
 - Copy/paste regions
 - Histogram fitting
 - Spatial profile fitting
 - Support of non-radio fits files
 - Full support of workspaces and workspace sharing
 - Channel-map view
-
- RHEL8 resolves the issues we had with vnc/slim desktops
-
- Homepage: Cartavis.org; organizations: ASIAA, IDIA, NRAO, U Alberta
 - **At NRAO:** check <https://info.nrao.edu/computing/guide/cluster-processing/software> for information best: server 'carta -no_browser' at NRAO machine, then past URL in browser, may need VPN if not at NRAO.

CARTA

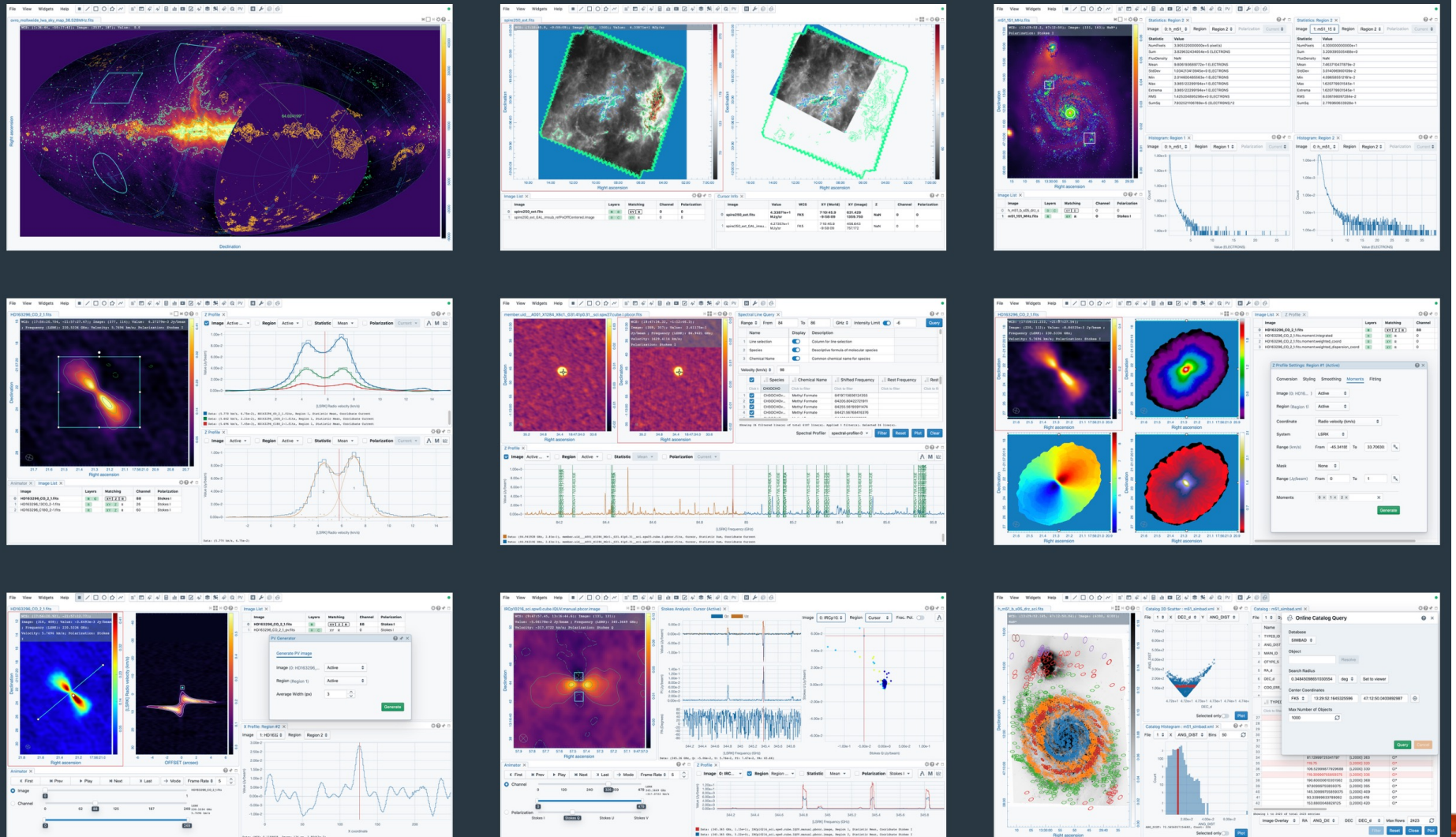


- CARTA is a fairly new, powerful, fast image viewer, analysis and collaborative tool
- It is pretty intuitive to use and the upcoming python scripting will make it very flexible for many applications, including publication readiness
- CARTA is ready to tackle the image cubes of the current and next generation of telescopes, including ALMA WSU/2030, ngVLA, SKA
- CARTA is already implemented in various data archives (ALMA, NRAO, SKA precursors)
- CARTA is replacing the CASA viewer (which is sunsetting and will be removed from CASA soon)
- CARTA is the ASASS Software price winner 2024!
- For questions, comments, suggestions, please contact either the CARTA helpdesk (support@carta.freshdesk.com), Juergen (jott@nrao.edu), or John Hibbard (jhibbard@nrao.edu) at NRAO





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