CARTA: Cube Analysis and Rendering Tool for Astronomy

Using CARTA for proposal preparation

Kuo-Song Wang (ASIAA) and the CARTA development team
Korean ARC Townhall Meeting for Cycle 9 Proposal Preparation
March 30, 2022

Outline

- Why you may consider to use CARTA for proposal preparation?
- ALMA Science Archive (ASA) and CARTA
- CARTA feature highlight
- Obtaining CARTA

Outline

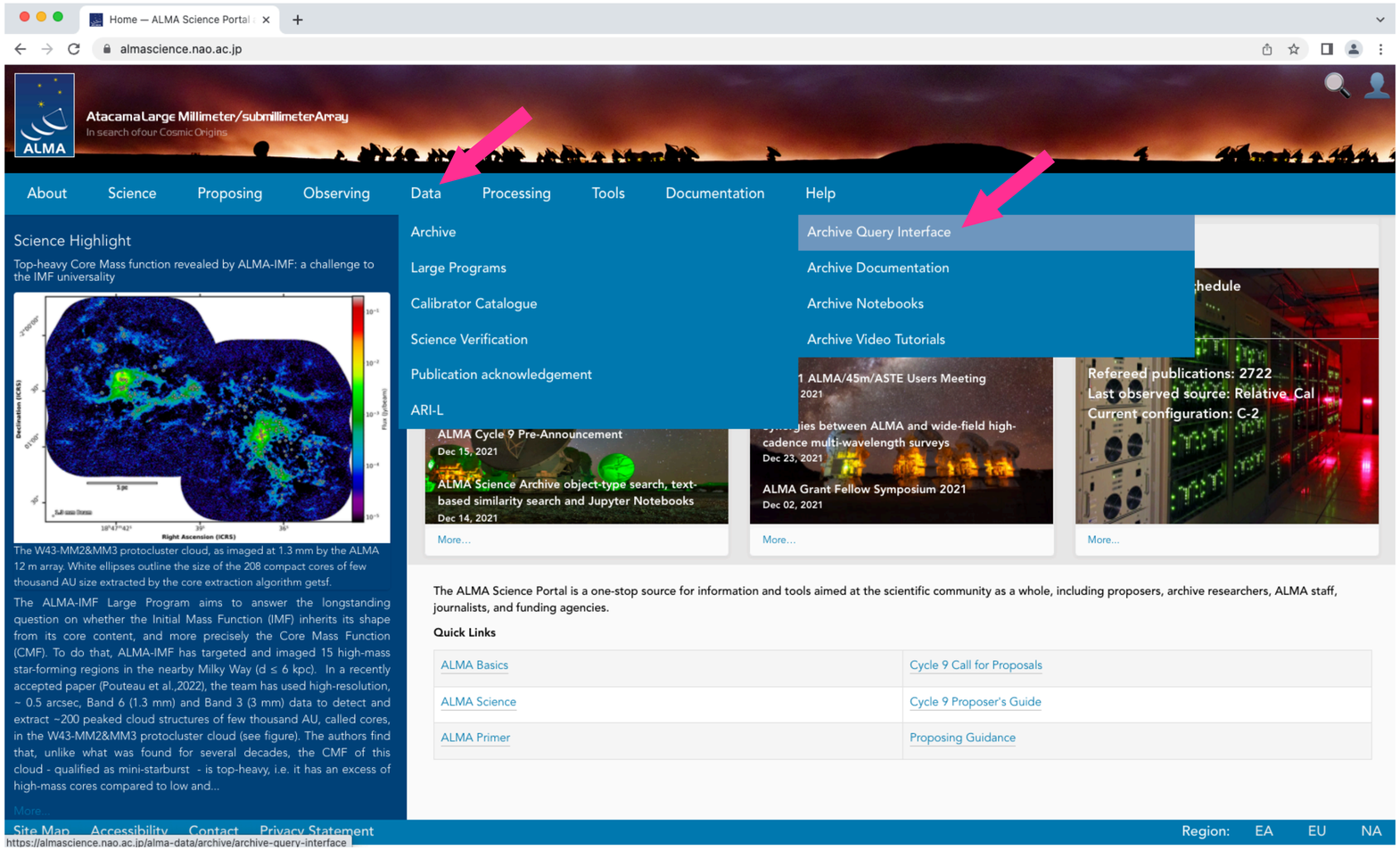
- Why you may consider to use CARTA for proposal preparation?
  - It saves a significantly large amount of your time
    - when checking duplicated observations and deciding which datasets to download from the archive for detailed analysis
    - when working with large image cubes
- ALMA Science Archive (ASA) and CARTA
- CARTA feature highlight
- Obtaining CARTA

ALMA Science Archive and CARTA

ALMA Science Archive

A great resource for verifying your great ideas

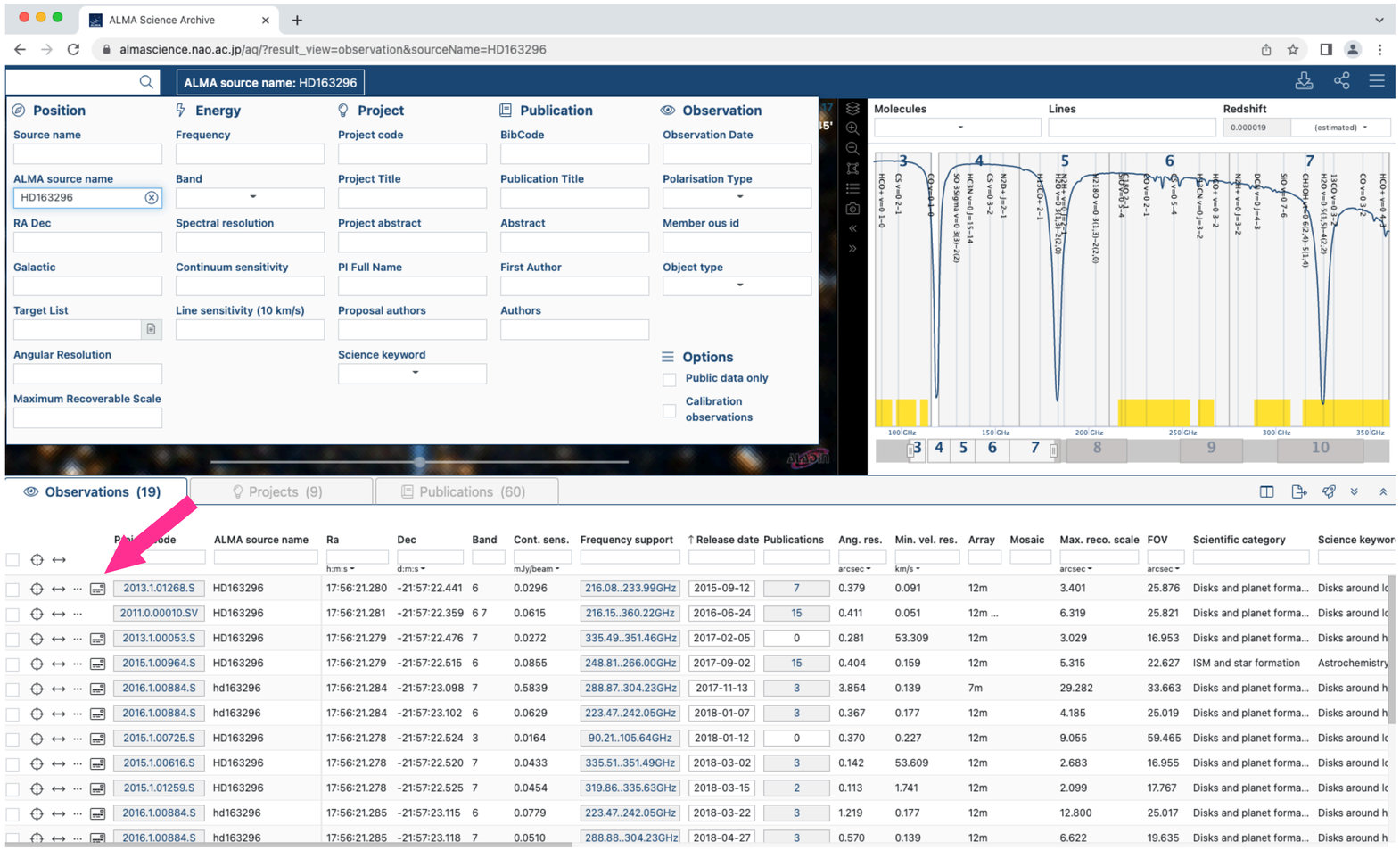
- ALMA Science portal https://almascience.nao.ac.jp/ https://almascience.nrao.edu/ https://almascience.eso.org/
- Data -> Archive -> Archive Query Interface



ALMA Science Archive

Archive Query Interface

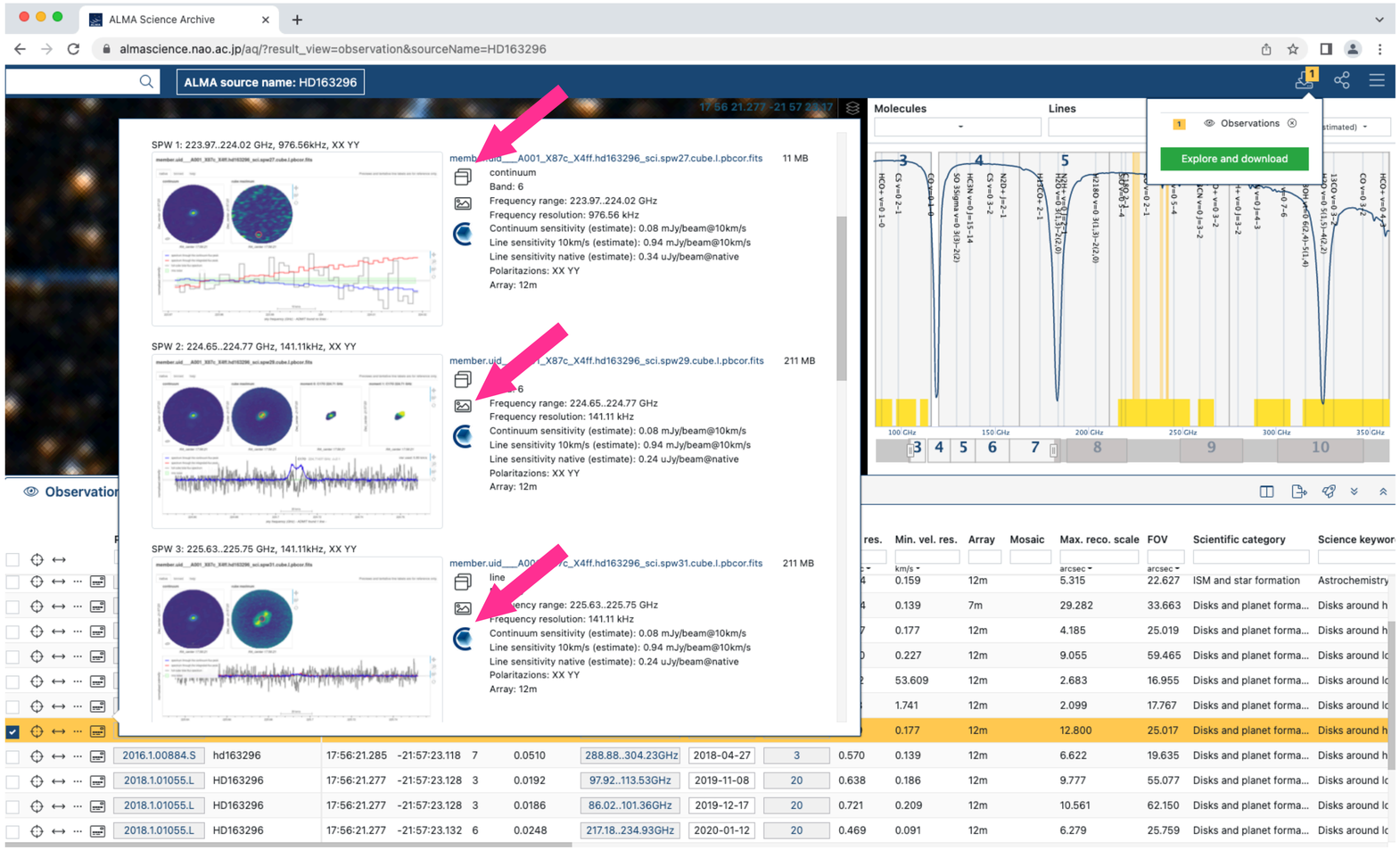
- Search for your targets of interests with various query parameters
- Matched projects will be displayed in the table below
- Preview is now available (the icon just to the left of the project code)



ALMA Science Archive

Preview per spw per target source per project

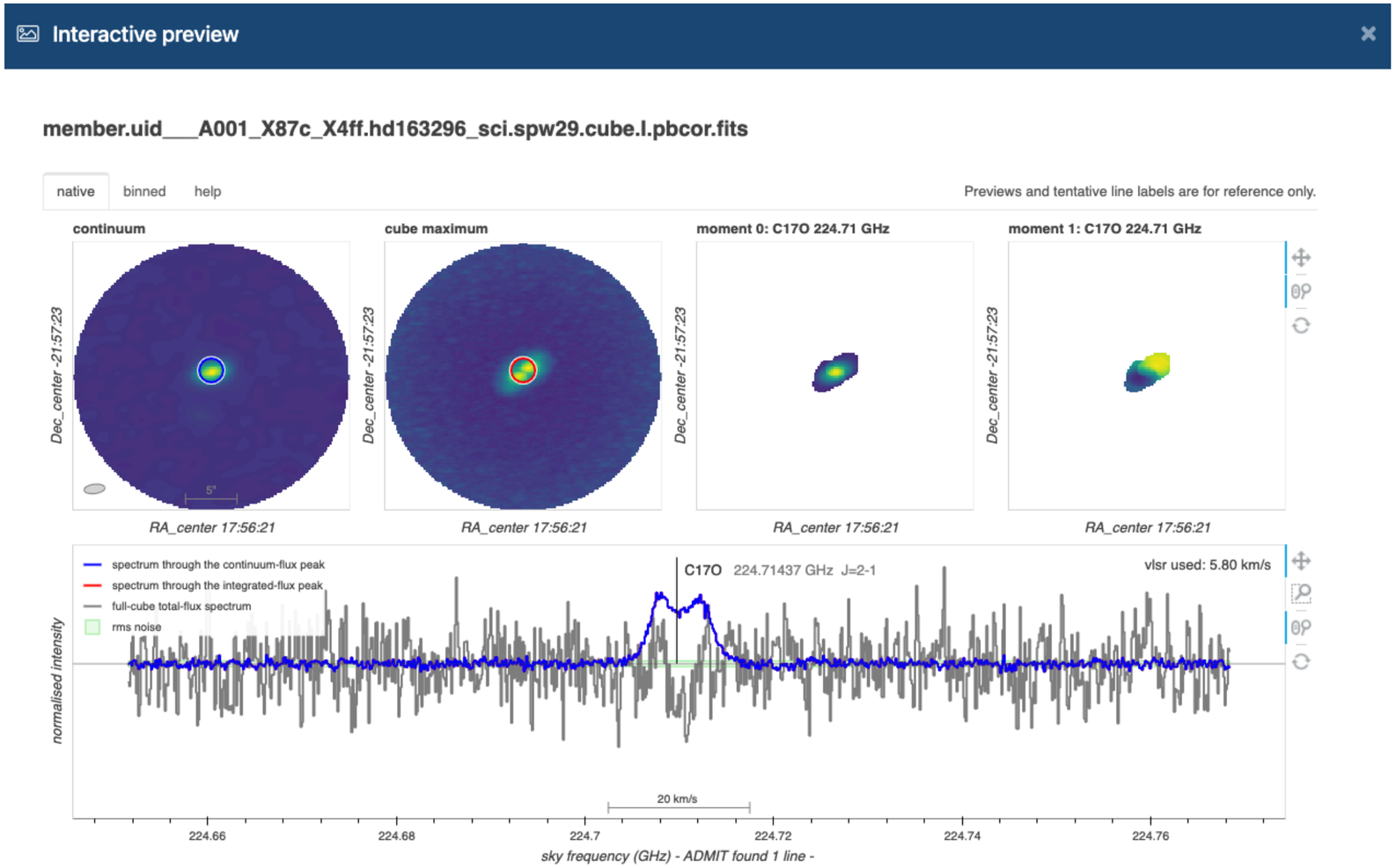
- Preview
  - A fixed set of images and spectra are produced from the cube.
  - Interactive view (HTML)
  - Static view (PNG)
- View a given product image cube with CARTA (embedded)



ALMA Science Archive

Preview per spw per target source per project

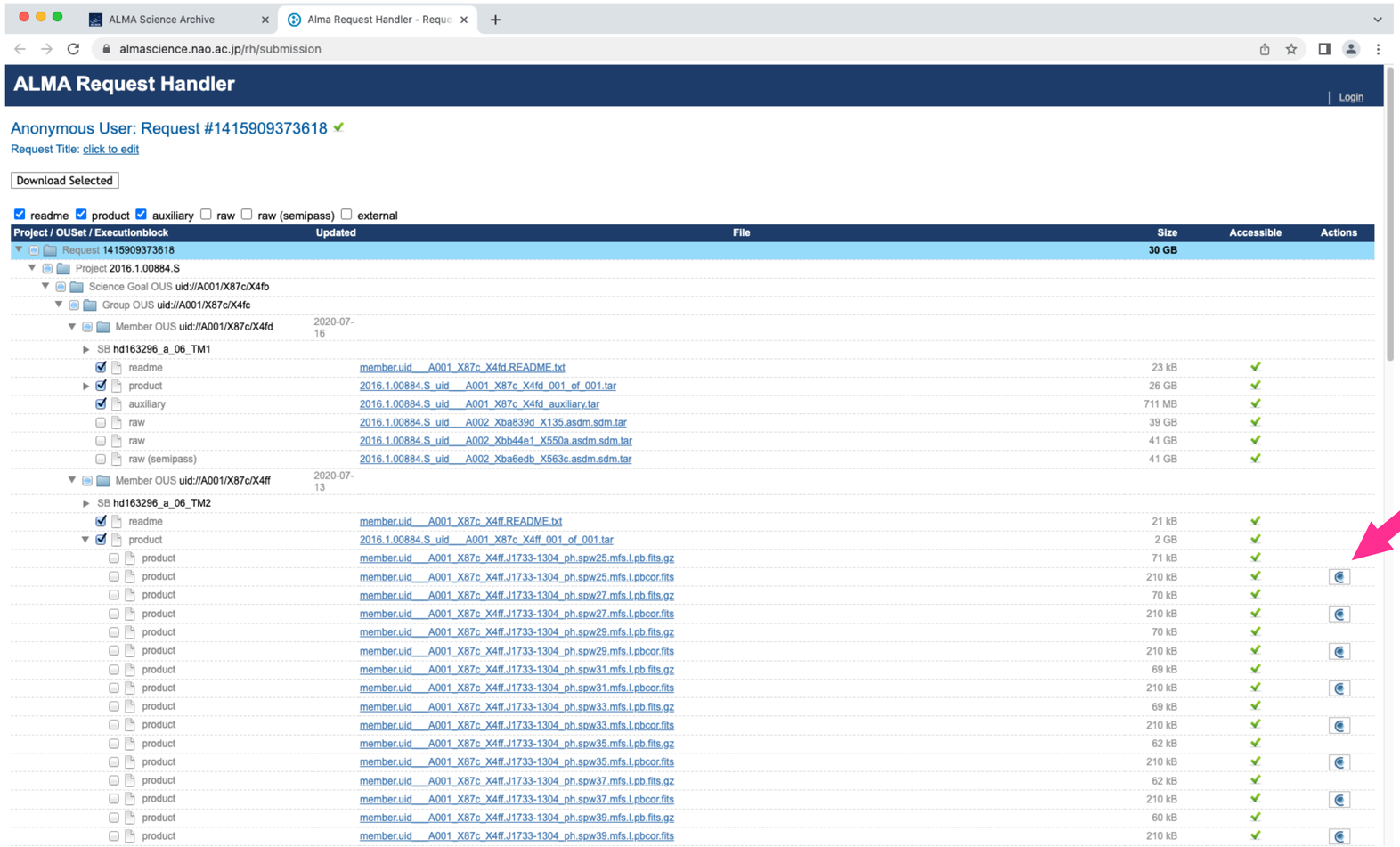
- Preview
  - Continuum image
  - Intensity maximum image
  - Moment 0 and 1 images of the strongest line identified by ADMIT
  - Spectra: continuum peak, cube moment 0 peak, integrated
  - ADMIT line ID labels



ALMA Science Archive

Request Handler: view images and download data

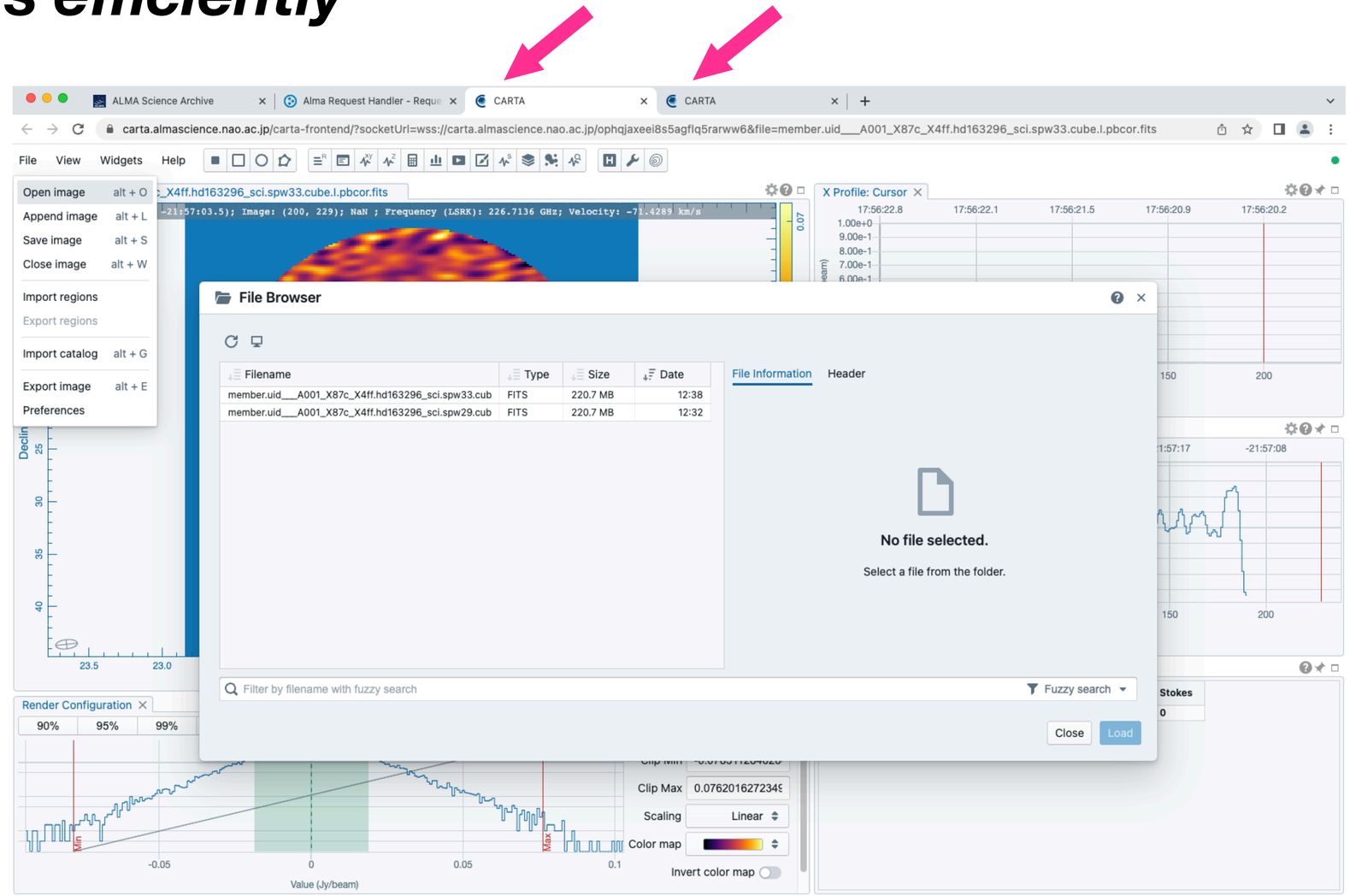
- FITS images in the product folder can be visualized via CARTA remotely.
- View images with CARTA then decide if you need to download the data for detailed analysis offline.



ALMA Science Archive + CARTA v2.0

Verifying your great ideas *efficiently*

- Each click will bring up a new CARTA session with the image loaded as a new browser tab. (Note: your browser may block it)
- All the clicked images will be accessible via File -> Open image in CARTA.
- A read/write-able temporary folder (timeout 9h IIRC) is created to set up symbolic links of your selected images from the storage.

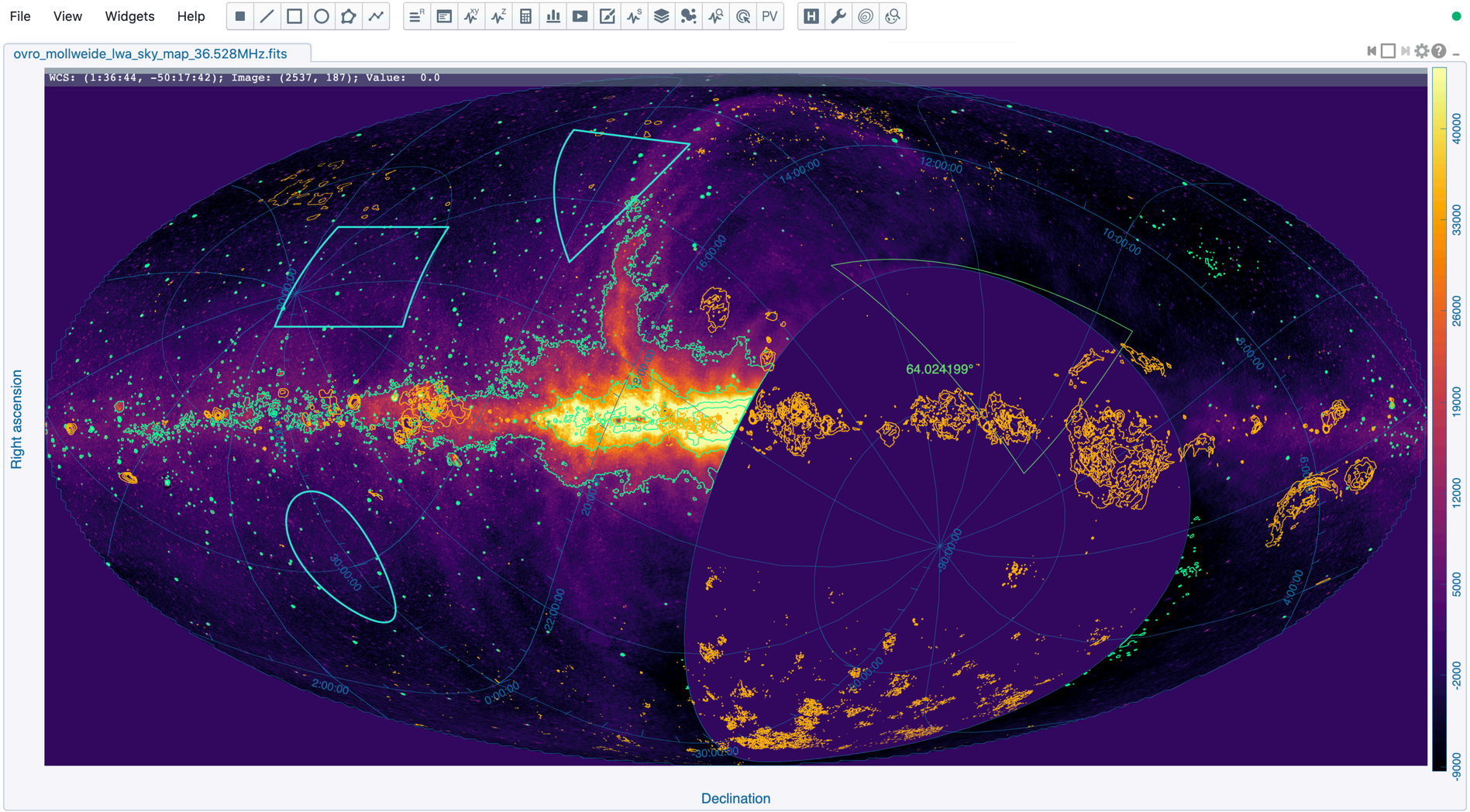


CARTA feature highlight

Based on v3-beta2

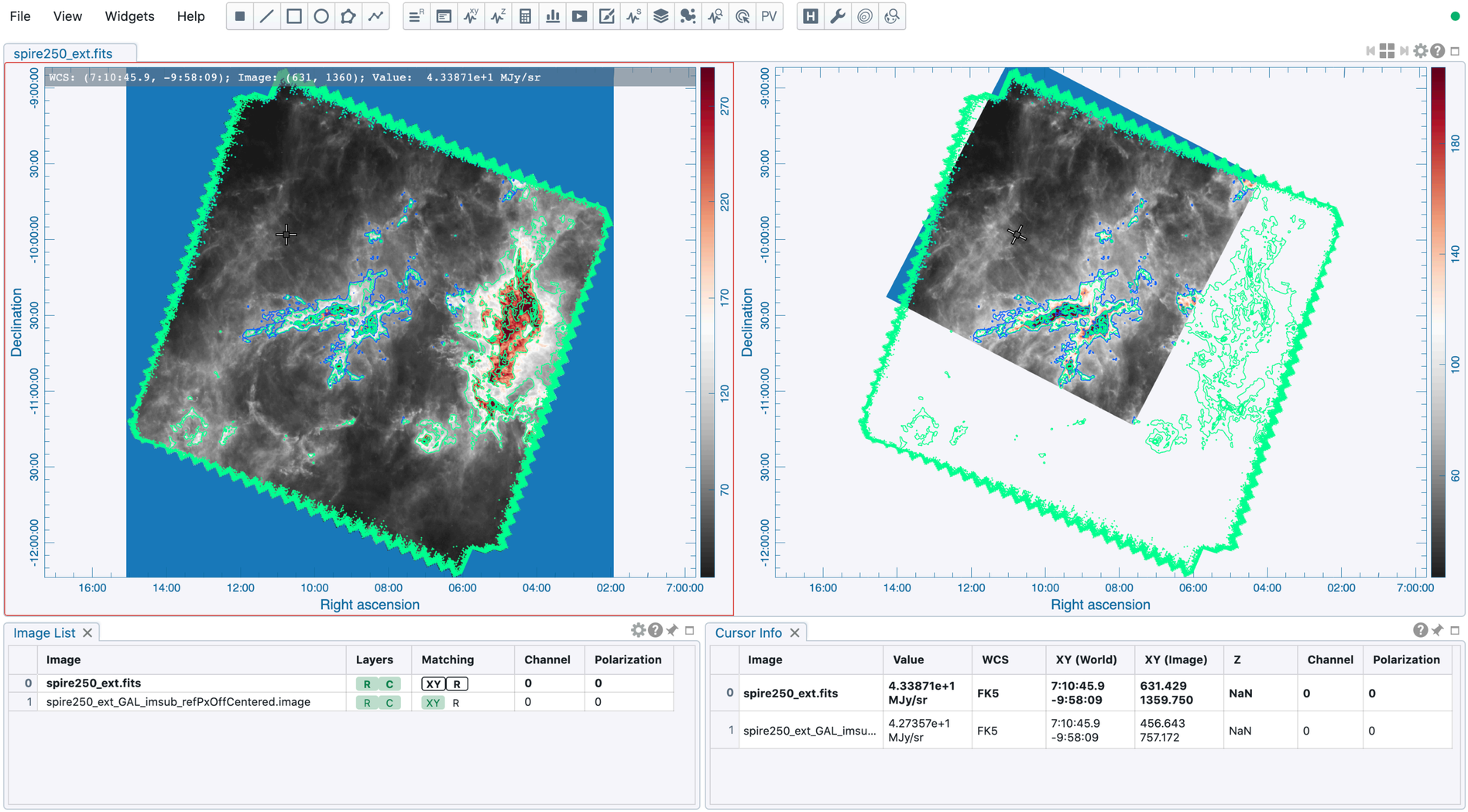
Image rendering

Rasters, contours, regions, and geodesic



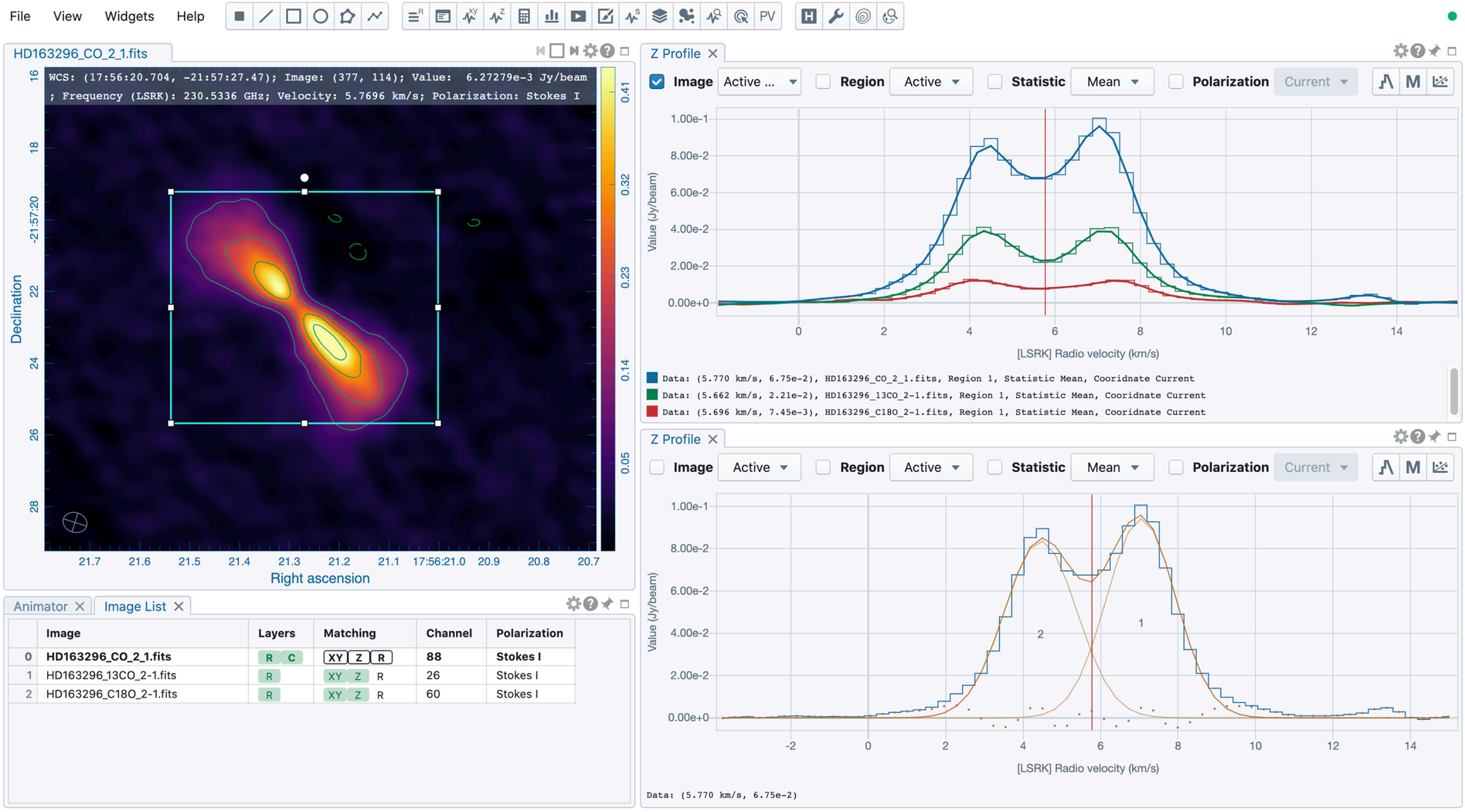
Multi-panel view

With or without image matching



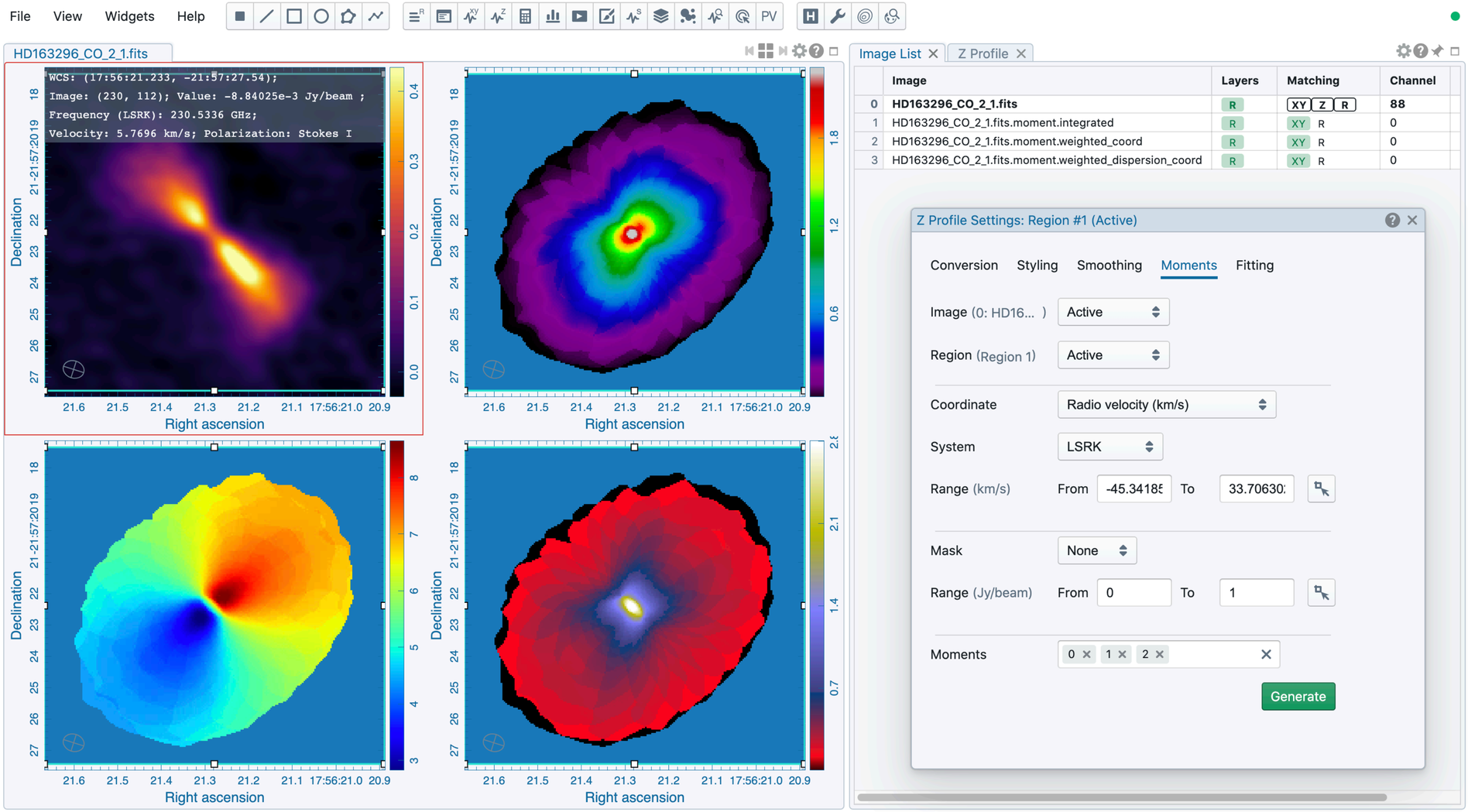
Spectral line analysis

Multi-profile plot, smoothing and fitting



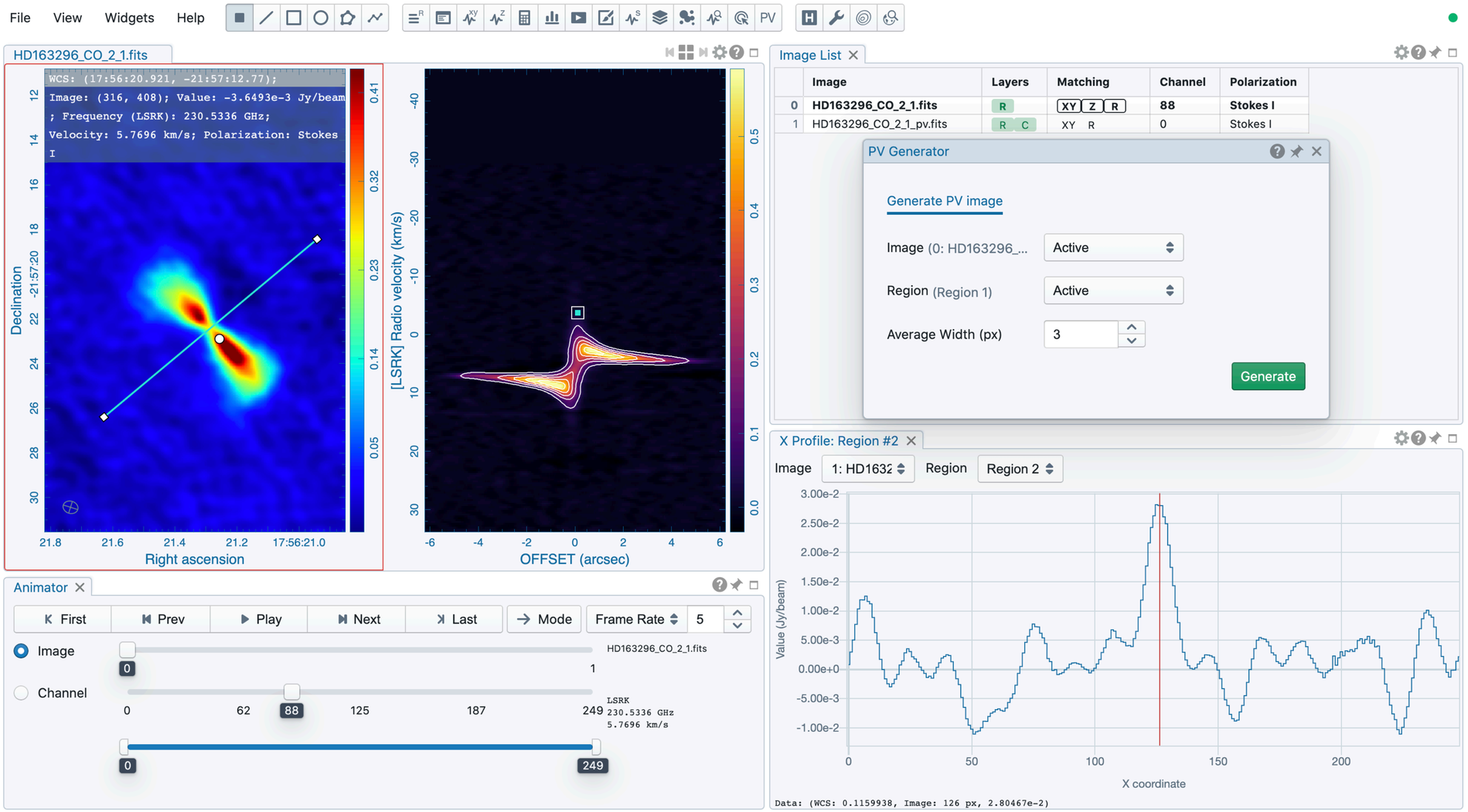
Moment map generator

Visualization with multi-panel view



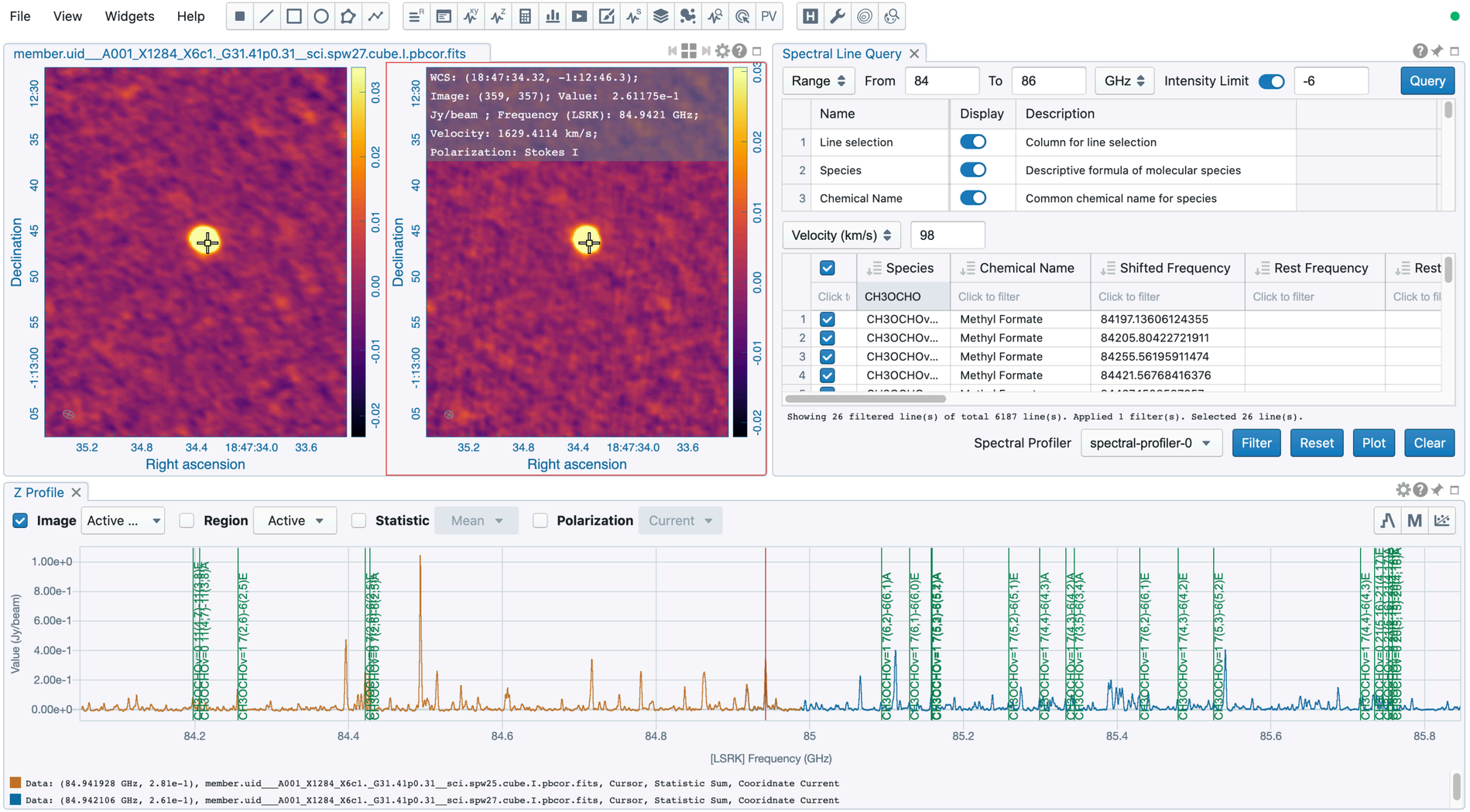
Position-velocity map generator

Performance boosted



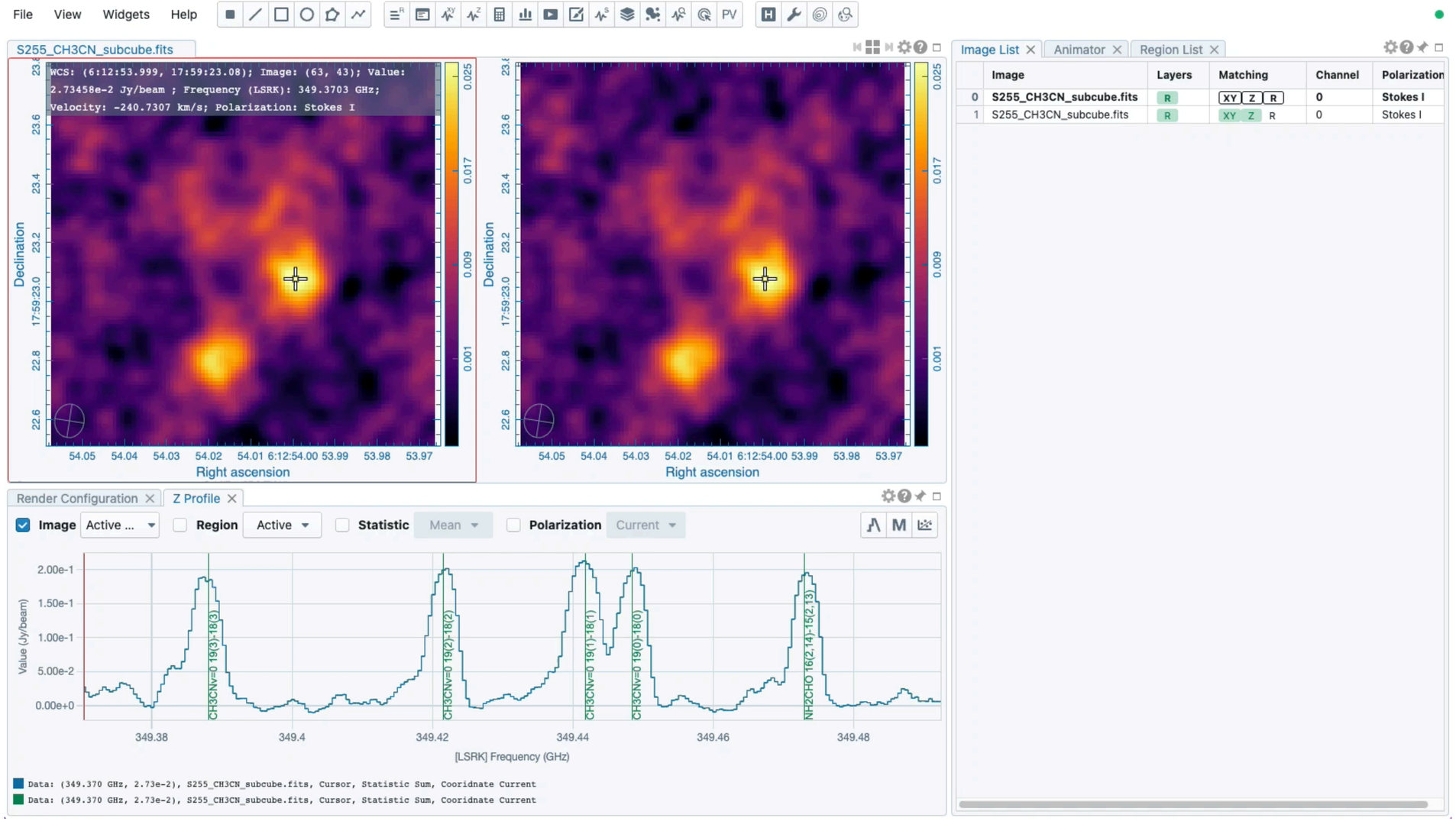
Spectral line ID

Online Splatalogue query



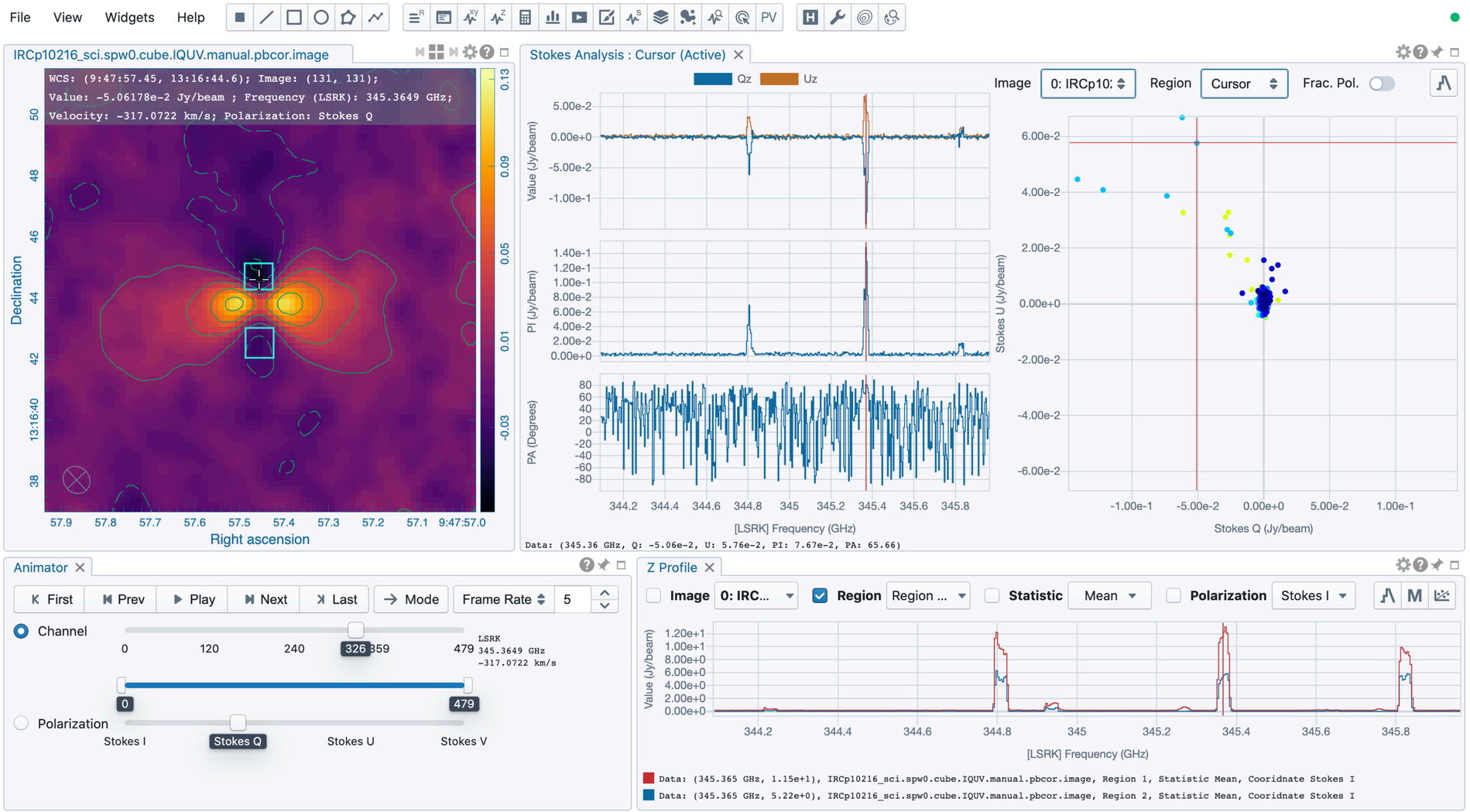
Matching spectral lines in velocity space

Rest frequency reconfiguration



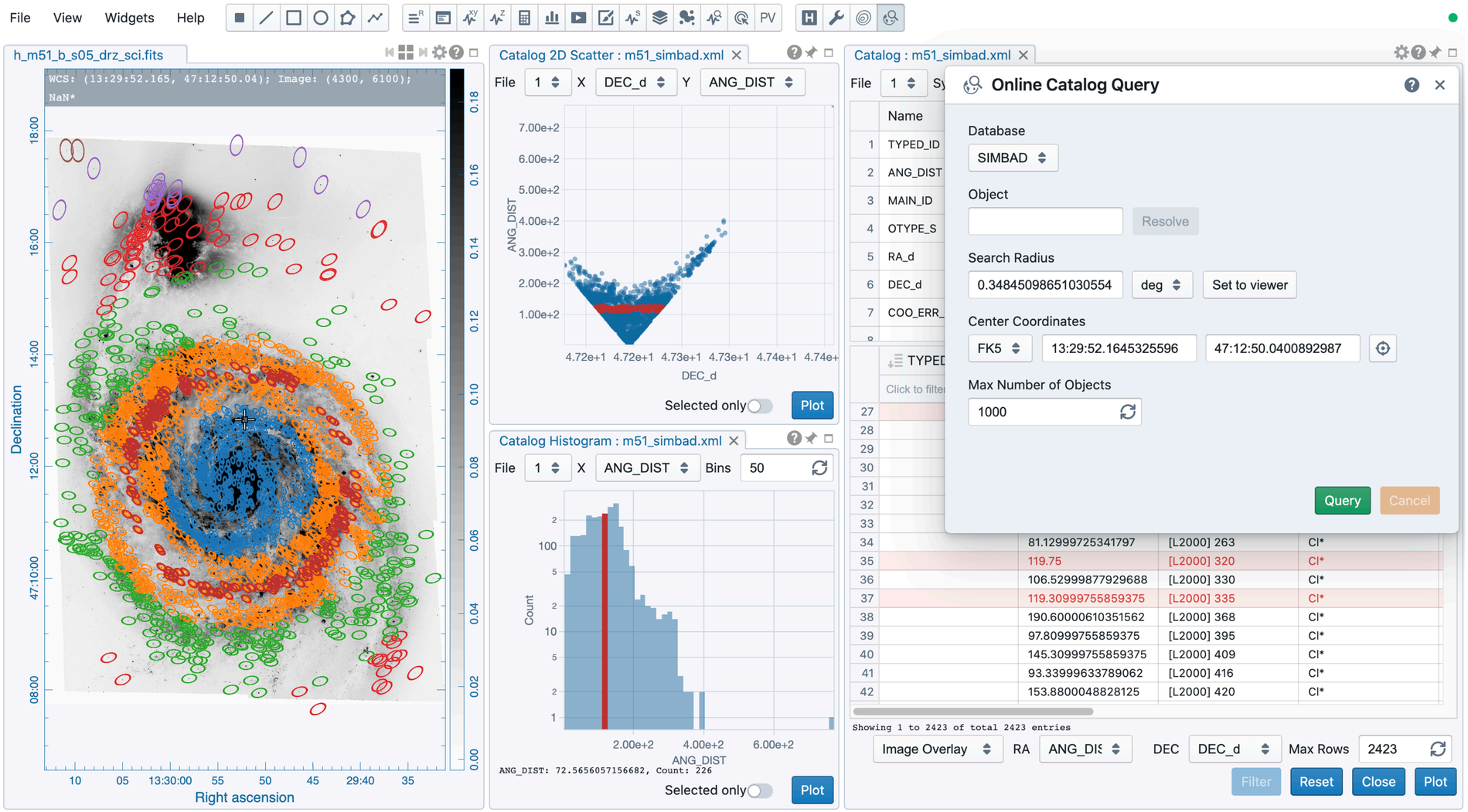
Stokes analysis widget

Visualization of a 3D+1 Stokes cube



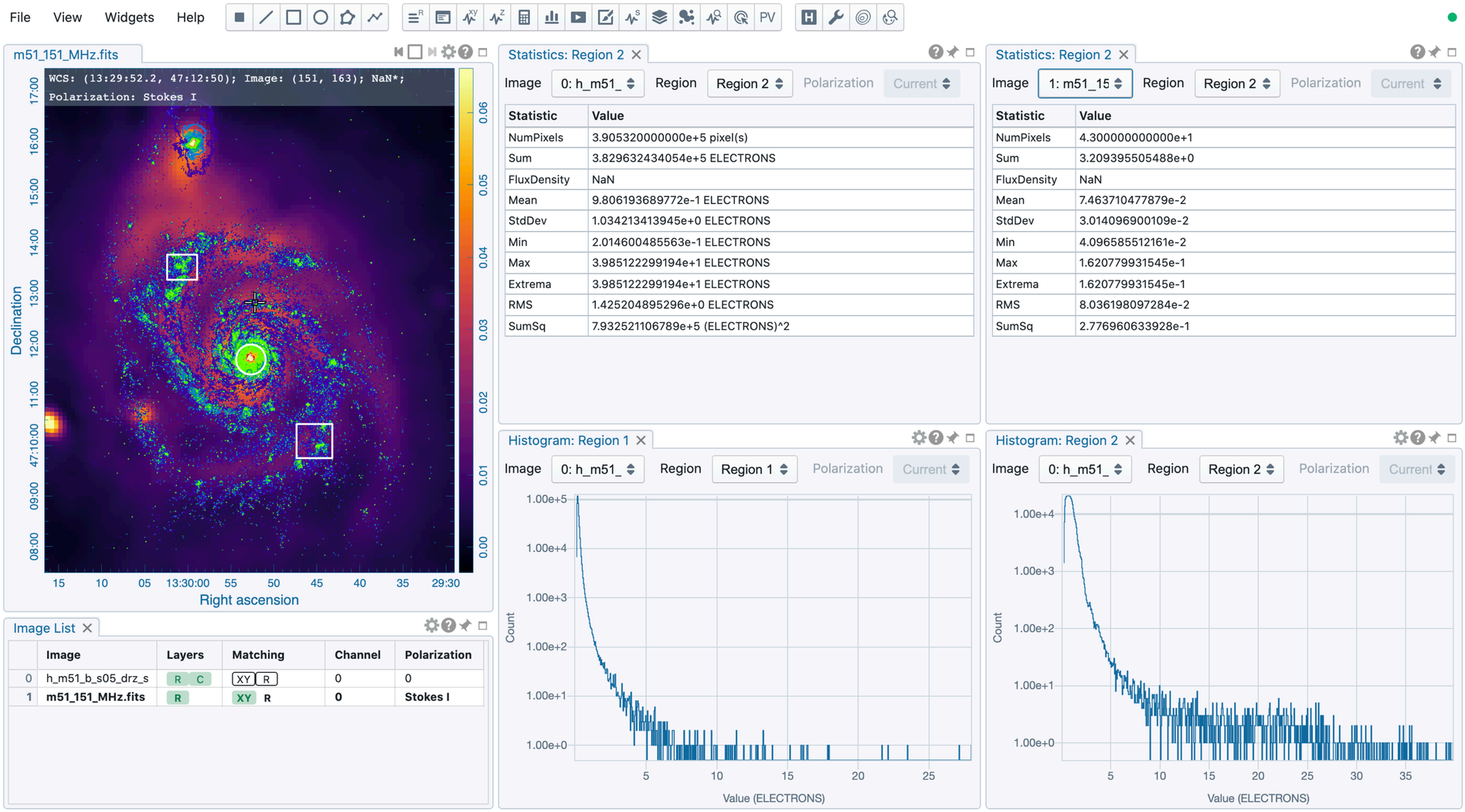
Catalog visualization

Marker-based rendering and online catalog query



Flexible and reusable GUI

Different layouts can be saved for different purposes



Obtaining CARTA

CARTA deployment modes

UDM vs SDM

Check the controller user manual https://carta-controller.readthedocs.io/en/latest/
Or contact support@carta.freshdesk.com for help

- User Deployment Mode (UDM)
  - Ideal for a single user with a local computer or a remote server
  - Supported OS: RHEL7/8, Ubuntu 18.04/20.04/22.04(up coming), and macOS Catalina, Big Sur, and Monterey

A common use case

STEP1: ssh to the remote server, then do

> carta --no_browser

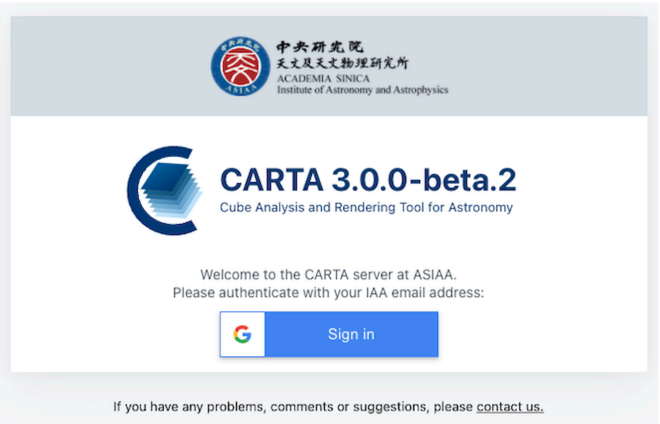
…

[2022-02-15 10:57:50.230] [CARTA] [info] CARTA is accessible at http://localhost:3002/?token=10E3735B-3E42-43C1-A1E5-3B324885B0F6

STEP2: copy and paste the displayed URL to your *local* browser

NOTE: We do not recommend users to use CARTA via VNC as GPU-accelerated techniques may not work so that images may not be displayed properly or efficiently.

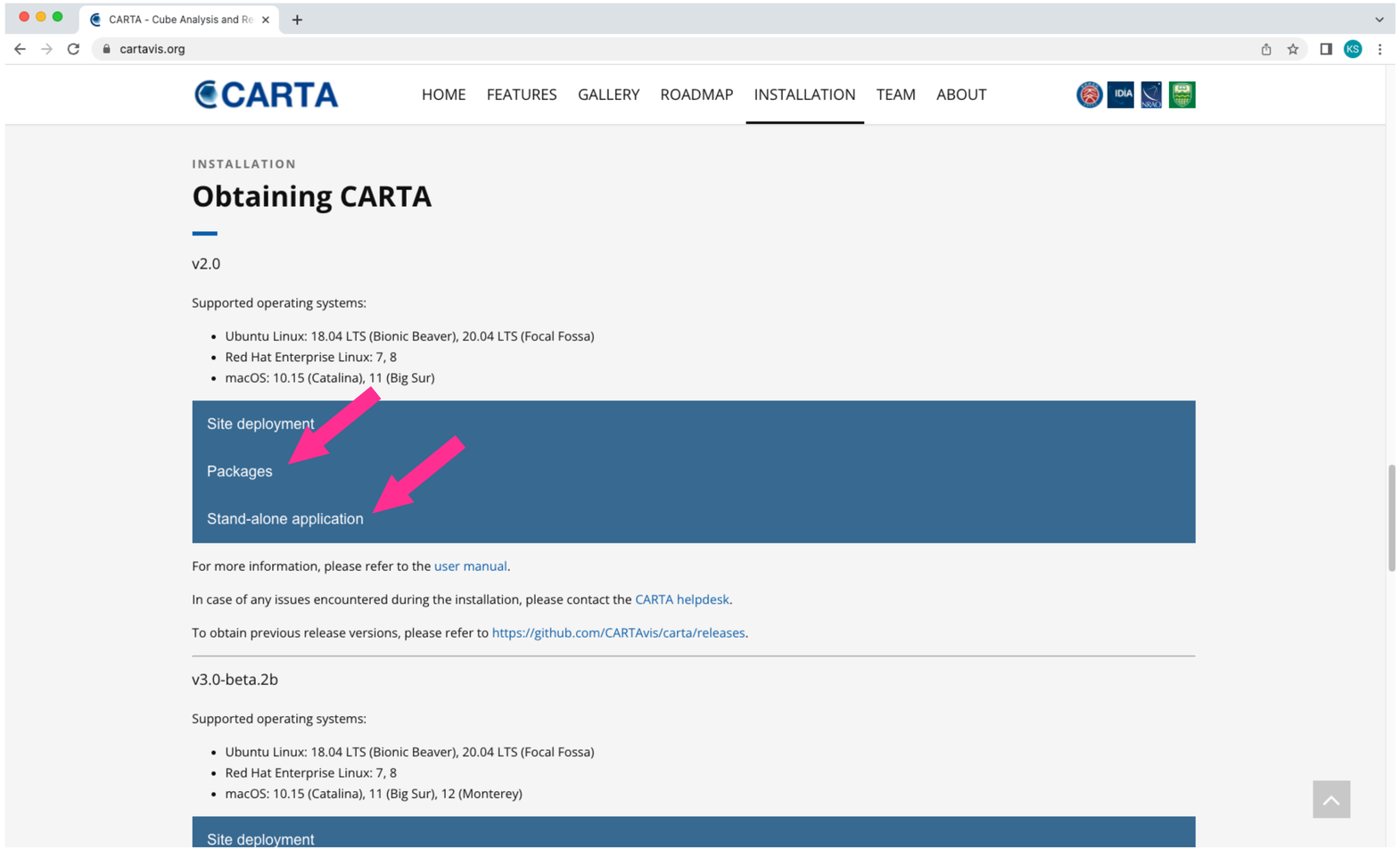
- Site Deployment Mode (SDM)
  - Ideal for institute-wide deployment to support multiple users with a shared file system (note: there will be upcoming SDM-only collaborative tools)
  - Supported OS: RHEL7/8, Ubuntu 18.04/20.04/22.04(up coming)



Check https://cartavis.org

v2.0 and v3.0-beta2 are available

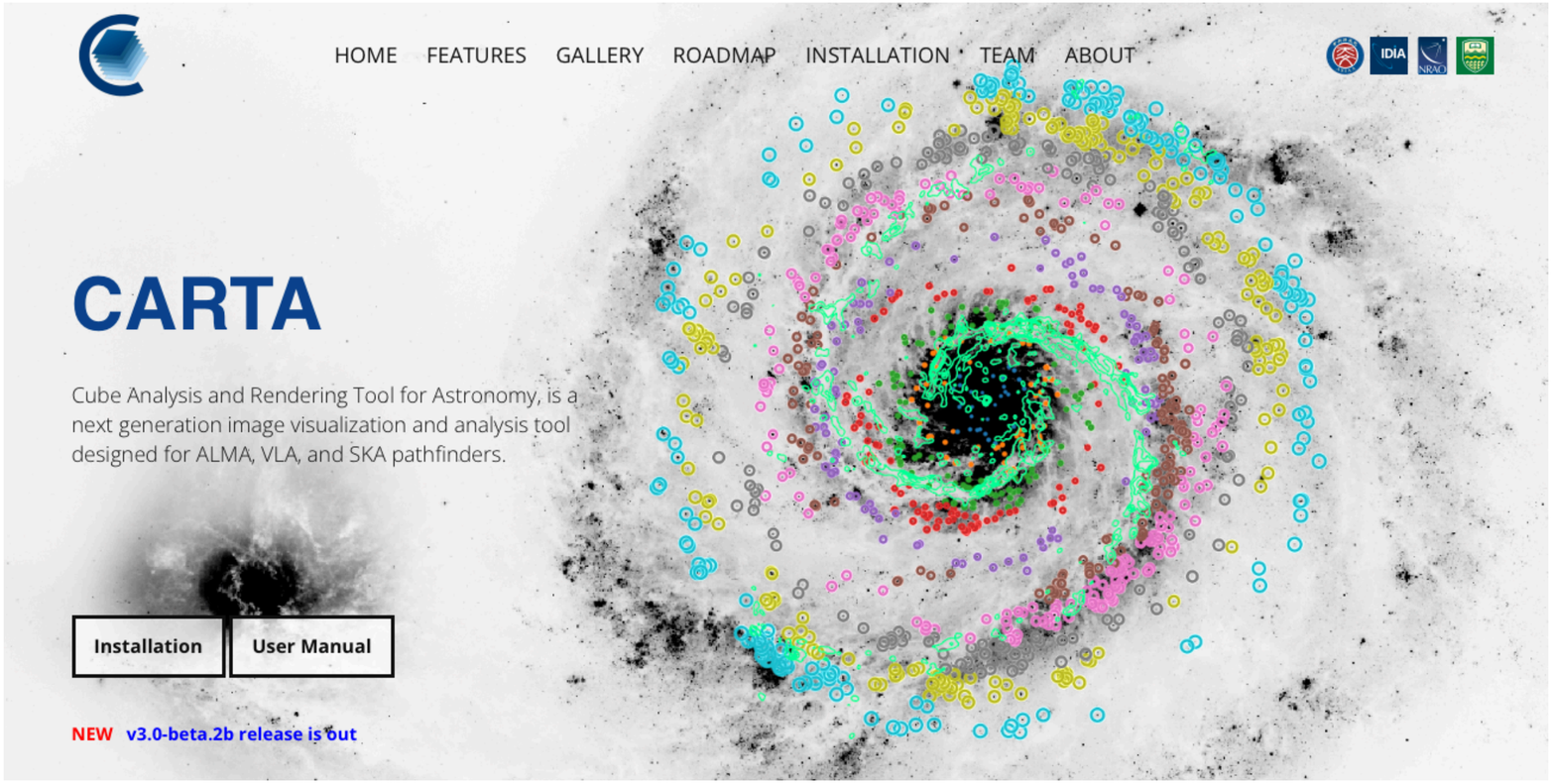
- UDM installation
  - Package managers (yum, apt, brew)
  - Linux AppImage
  - macOS dmg



Online information

CARTA info

- Homepage
  https://cartavis.org
- User manual
  https://carta.readthedocs.io/en/latest
- Controller user manual (for site deployment)
  https://carta-controller.readthedocs.io/en/latest/
- Helpdesk
  Email to
  support@carta.freshdesk.com
- Codebase
  https://github.com/CARTAvis



Thank you~

We hope CARTA can make your life easier 😀

https://cartavis.org