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

TA for proposal preparation?

Outline

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

- when checking duplicated observations and deciding which datasets to

ALMA Science Archive and CARTA

ALMA Science Archive A great resource for verifying your great ideas

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



ALMA Basics	Cycle 9 Call for Proposals
ALMA Science	Cycle 9 Proposer's Guide
ALMA Primer	Proposing Guidance

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)





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almascience.nao.ac.jp/ag/?result_view=observation&sourceName=HD16329



Projects (9)

Publications (60)

	ALMA source name	Ra	Dec	Band	Cont. sens.	Frequency support	↑ Release date	Publications	Ang. res.	Min. vel. res.	Array	Mosaic	Max. reco. scale	FOV	Scientific category	Science keywor
		h:m:s =	d:m:s -		mJy/beam -				arcsec -	km/s -			arcsec -	arcsec -		
6	HD163296	17:56:21.280	-21:57:22.441	6	0.0296	216.08233.99GHz	2015-09-12	7	0.379	0.091	12m		3.401	25.876	Disks and planet forma	Disks around lo
V	HD163296	17:56:21.281	-21:57:22.359	67	0.0615	216.15360.22GHz	2016-06-24	15	0.411	0.051	12m		6.319	25.821	Disks and planet forma	Disks around lo
5	HD163296	17:56:21.279	-21:57:22.476	7	0.0272	335.49351.46GHz	2017-02-05	0	0.281	53.309	12m		3.029	16.953	Disks and planet forma	Disks around h
5	HD163296	17:56:21.279	-21:57:22.515	6	0.0855	248.81266.00GHz	2017-09-02	15	0.404	0.159	12m		5.315	22.627	ISM and star formation	Astrochemistry
S	hd163296	17:56:21.284	-21:57:23.098	7	0.5839	288.87304.23GHz	2017-11-13	3	3.854	0.139	7m		29.282	33.663	Disks and planet forma	Disks around h
S	hd163296	17:56:21.284	-21:57:23.102	6	0.0629	223.47242.05GHz	2018-01-07	3	0.367	0.177	12m		4.185	25.019	Disks and planet forma	Disks around h
6	HD163296	17:56:21.278	-21:57:22.524	3	0.0164	90.21105.64GHz	2018-01-12	0	0.370	0.227	12m		9.055	59.465	Disks and planet forma	Disks around lo
6	HD163296	17:56:21.278	-21:57:22.520	7	0.0433	335.51351.49GHz	2018-03-02	3	0.142	53.609	12m		2.683	16.955	Disks and planet forma	Disks around lo
6	HD163296	17:56:21.278	-21:57:22.525	7	0.0454	319.86335.63GHz	2018-03-15	2	0.113	1.741	12m		2.099	17.767	Disks and planet forma	Disks around lo
S	hd163296	17:56:21.285	-21:57:23.115	6	0.0779	223.47242.05GHz	2018-03-22	3	1.219	0.177	12m		12.800	25.017	Disks and planet forma	Disks around h
S	hd163296	17:56:21.285	-21:57:23.118	7	0.0510	288.88304.23GHz	2018-04-27	3	0.570	0.139	12m		6.622	19.635	Disks and planet forma	Disks around h



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)





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nao.ac.jp/aq/?result_view=observation&sourceNa	ame=HD163296	Ů☆ 🖬 😩 :
LMA source name: HD163296		<mark>£</mark> 1 ≪ ≡
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	and A001_X87c_X4ff.hd163296_sci.spw27.cube.l.pbcor.fits 11 MB continuum Band: 6 Frequency range: 223.97224.02 GHz Frequency resolution: 976.56 kHz Continuum sensitivity (estimate): 0.08 mJy/beam@10km/s Line sensitivity 10km/s (estimate): 0.34 uJy/beam@10km/s Line sensitivity native (estimate): 0.34 uJy/beam@10km/s Array: 12m	Explore and download HCO+ v=0 4/3 13CO v=0 $3/2$ 13CO v=0 $3/2$ 14CO v=0
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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.

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ALMA Science Archiv Verifying your great ideas efficient

- 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.

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CARTA feature highlight Based on v3-beta2



Image rendering Rasters, contours, regions, and geodesic



Declination

Multi-panel view With or without image matching



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Spectral line analysis Multi-profile plot, smoothing and fitting



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2	HD163296_C180_2-1.fits	R	XY Z R	60	Stokes I	

Data: (5.770 km/s, 6.75e-2)

Moment map generator Visualization with multi-panel view



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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



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Flexible and reusable GUI Different layouts can be saved for different purposes





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Obtaining CARTA

CARTA deployment modes UDM vs SDM

- 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 GPUaccelerated techniques may not work so that images may not be displayed properly or efficiently.

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

- Site Deployment Mode (SDM)
 - Ideal for institute-wide deployment to ulletsupport multiple users with a shared file system (note: there will be upcoming SDMonly collaborative tools)
 - Supported OS: RHEL7/8, Ubuntu lacksquare18.04/20.04/22.04(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





INSTALLATION

Obtaining CARTA

v2.0

Supported operating systems:

- Ubuntu Linux: 18.04 LTS (Bionic Beaver), 20.04 LTS (Focal Fossa)
- Red Hat Enterprise Linux: 7, 8
- macOS: 10.15 (Catalina), 11 (Big Sur)



For more information, please refer to the user manual.

In case of any issues encountered during the installation, please contact the CARTA helpdesk.

To obtain previous release versions, please refer to https://github.com/CARTAvis/carta/releases.

v3.0-beta.2b

Supported operating systems:

- Ubuntu Linux: 18.04 LTS (Bionic Beaver), 20.04 LTS (Focal Fossa)
- Red Hat Enterprise Linux: 7, 8
- macOS: 10.15 (Catalina), 11 (Big Sur), 12 (Monterey)



Online information CARTA info

- Homepage • https://cartavis.org
- User manual https://carta.readthedocs.io/en/latest
- Controller user manual (for site deployment) https://cartacontroller.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

INSTALLATION . TEAM HOME FEATURES GALLERY ROADMAP 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. **User Manual** Installation





