

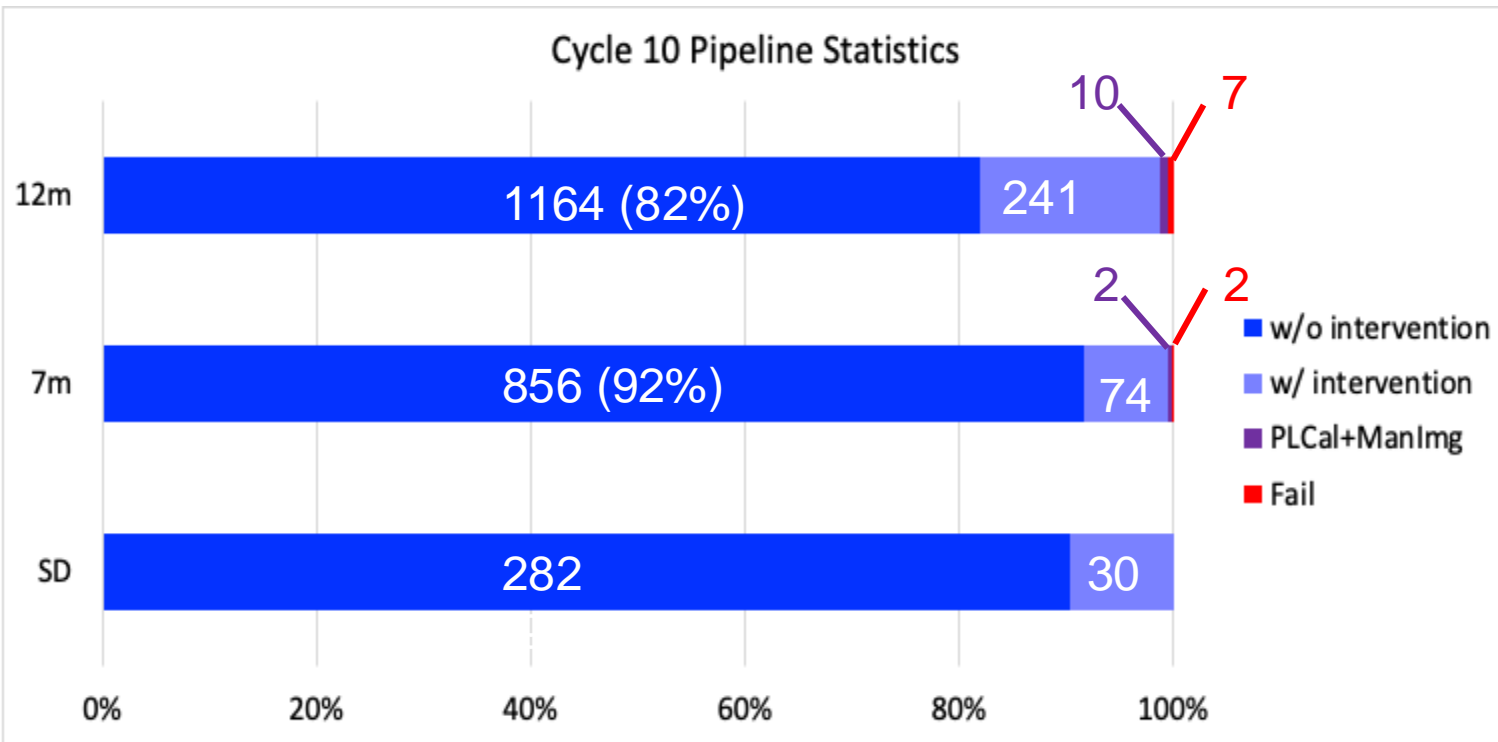
CASA/Pipeline Updates

Kotomi Taniguchi, Takeshi Nakazato, Kanako Sugimoto,
Takuma Izumi, and Satoko Takahashi (NAOJ)

on behalf of CASA and Pipeline teams

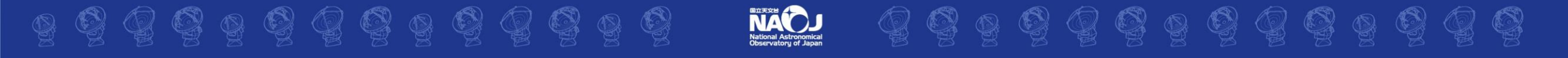
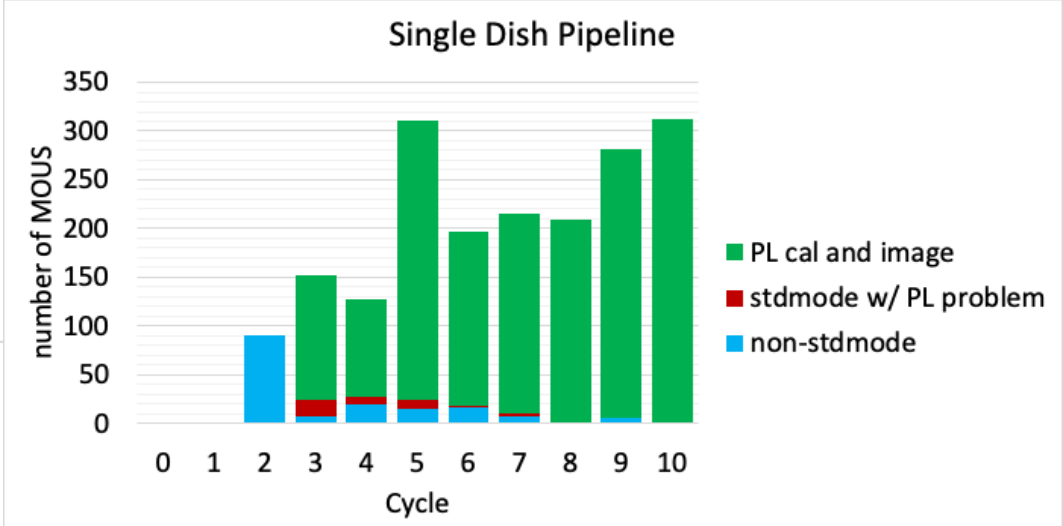
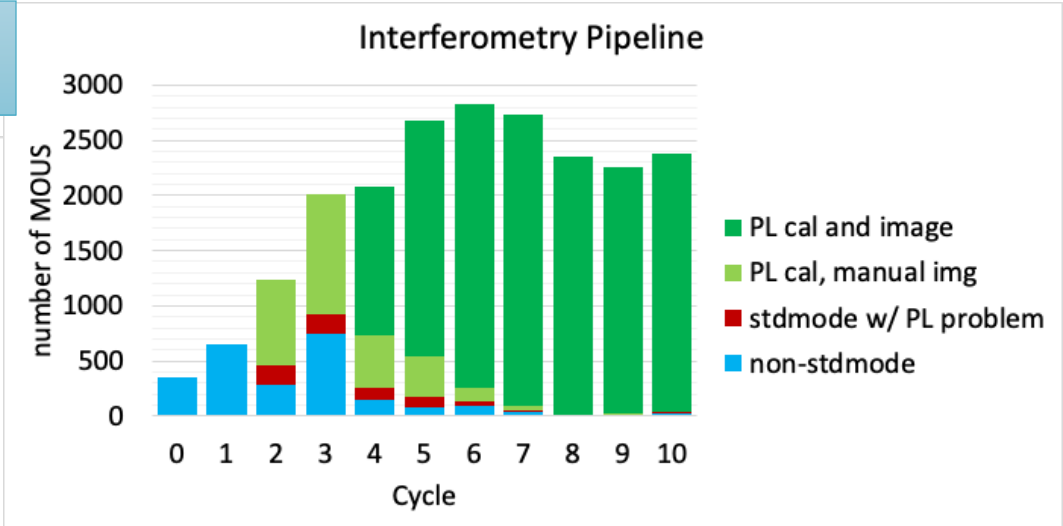
Operation of Cycle 10 Pipeline

Data processing with pipeline goes very well



NOTE: This is preliminary result as data processing is still ongoing

(As of Dec. 12th 2024)



CASA and Pipeline Releases

CASA (https://casa.nrao.edu/casa_obtaining.shtml)

- Incremental release (every 2-3 months)
- Modular (pip wheels) and monolithic (tar-ball)
- CASA 6.6.3 (Feb. 2024), CASA 6.6.4 (Jun. 2024), CASA 6.6.5 (Sep. 2024)



Pipeline (<https://almascience.nao.ac.jp/processing/science-pipeline>)

- One release/year/project
- Packaged with CASA as a tar-ball
- **2024.1.0.8 + CASA 6.6.1.17 for ALMA Cycle 11, Nobeyama**, and VLA
- 2024.1.1 will support VLA and the new SRDP (Jan/Feb 2025)





Highlights of CASA Updates (1/3)

- Please see Release Information of casadocs for details
 - CASA 6.6.5
<https://casadocs.readthedocs.io/en/v6.6.5/>

Infrastructure

- Update on platform support: see Compatibility Matrix for detail
 - **Python 3.8 is no longer supported** in the latest release, CASA 6.6.5
 - **Python 3.10 is the primary version for both modular and monolithic releases**
 - macOS ARM native build is available (Intel support might end soon)
- NB: **casaviewer** (including interactive CLEAN) is **no longer included in macOS** release
- CASA data has been managed by **casaconfig** module as of CASA 6.6.4 (see External Data section for detail)





Highlights of CASA Updates (2/3)

Interferometry

- **casaviewer:** the CASA viewer has been removed from MacOS packages; new exceptions have been added to *imview*, *msview*, and interactive modes of *tclean*, deconvolve and *sdintimaging*; the deprecated viewer tasks is now removed (CASA 6.6.5)
- **CASA Docs:** new [CASA Memo 13](#) - a guide towards achieving scalable **parallelization for imaging** large cubes. (CASA 6.6.5)
- **wvrgcal:** available in python 3.10 release, partially re-written to be compatible with python3.10. (CASA 6.6.5)
- **tclean/sdintimaging:** now sorts input list of MSes in chronological order. (CASA 6.6.3)
- **tclean/sdintimaging:** now checks for mismatches in column states when given multiple input MSs. (CASA 6.6.3)
- **getantposalma** – a new task to query ALMA antenna position web service and return list of antenna ITRF positions. (CASA 6.6.4)
- **msuvbin** - a new task to grid the visibility data onto a defined uniform grid (in the form of an ms) can be used to **reduce data volume**

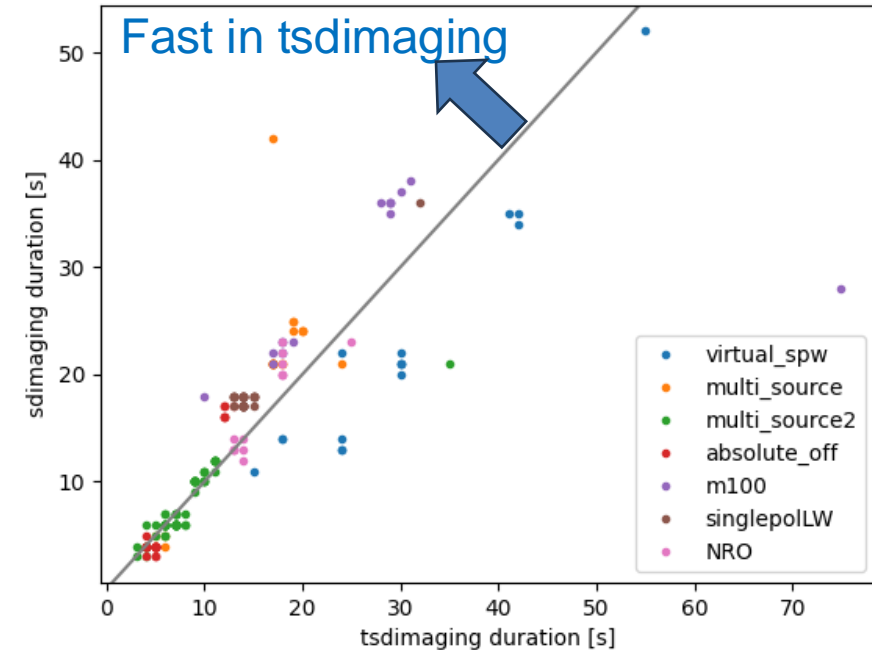
* [Information for “iclean” is available here](#)



Highlights of CASA Updates (3/3)

Single-Dish

- Imaging task in SD
 - **sdimaging/tsdimaging**: added new parameter '*interpolation*' to specify the spectral interpolation rules. Default has been changed from 'nearest' to 'linear' (CASA 6.6.5)
 - **tsdimaging** now replace to sdimaging as the default imaging task
 - sdimaging will be deprecated in near future
 - tsdimaging's performance is almost comparable to the performance to the sdimaging for most of the observing cases
 - Solar TP image has ~30% time performance improvements with tsdimaging
- SD baseline fitting
 - Improvement for the sinusoidal function fitting
 - **sdbaseline**: per spectrum sinusoidal fitting for baseline subtraction (CASA 6.6.5)



A direct comparison of sdimaging and tsdimaging runtime in CASA 6.6.0. Data points with different color present data obtained with different observing modes or from different telescopes. Grey line indicates the runtime of these tasks are equal.





Highlights of Pipeline Updates (1/3)

- Please see [User's Guide](#) for details of PL (https://almascience.nao.ac.jp/processing/science-pipeline)

CASA versions accepted for ALMA data processing:

CASA version	Pipeline branch and version	Pipeline Documentation	Description	used in operations	tarball for most modern OS available for each	versions that can be used to restore these data with scriptForPI.py
6.6.1.17	2024.1.0.8	User's Guide Reference Manual 2024 Pipeline 2024 known issues	Cycle 11	2024-09-30	casa-6.6.1-17-pipeline-2024.1.0.8-py3.8.el8.tar.xz casa-6.6.1.17-pipeline-2024.1.0.8-12.0-py38.dmg	most recent

User Support:

ALMA Science Pipeline User's Guide
for Release 2024.1.0.8, CASA 6.6.1-17, python3.8
Interferometric and Single-Dish Processing

Pipeline Tasks Reference Manual

Release 2024.1.0.8



pipeline team

PL2024

2024.1.0

CASA

1. 2 GHz dual-pol. ACA spws with 256 channels are identified as TDM instead of FDM on Spectral Setup page (due to CAS-14435 ☞).

Both Pipelines

1. The spw name column is missing from the All Spws tab of the Spectral Setup weblog page (PIPE-1736 ☞).

Interferometric Pipeline

1. hif_uvcontsub will not skip spws that have "NONE" in cont.dat. This situation doesn't arise in operations, but could arise if someone manually edits cont.dat (PIPE-1898 ☞).
2. If the check source is so faint that no gain solutions can be found, then hifa_gfluxscale will crash (PIPE-1468 ☞).
3. In hifa_antpos, in the second table "Antenna Position Offsets Sorted By Total Offset", when there are two antennas with the same offset and the Total Offset column has a common value, the second antenna is not bolded in the same way as the first. (PIPE-1631 ☞).
4. In the polcal recipe, if the selected session reference antenna is fully flagged on any spw by hifa_gfluxscaleflag, then hifa_gfluxscale will crash. The workaround is to set a different reference antenna (or list of reference antennas) in the hif_refant task in the PPR (PIPE-1664 ☞).
5. On the Spectral Setup weblog page, multi-target datasets with multiple tunings not observed in all targets will not show the Transition names for spws associated with tunings beyond the first tuning (PIPE-1909 ☞).
6. For heterogeneous array mosaics with 3 or more PM antennas included, if any field has only 1 baseline of data left unflagged after online flags and any prior stage flagging, then hifa_targetflag will crash (PIPE-1879 ☞).
7. In hifa_spwphaseup, (i) if the refant drops out for the majority of solutions, then the Median Phase RMS assessment cannot be made; (ii) if there is low SNR in the bandpass solutions and the refant jumps in phase, then some antennas can incorrectly be identified as outliers by the Median Phase RMS assessment.
8. FDM spws that have a small number of channels ($\leq 256/N_{\text{corr}}$, e.g. ≤ 128 for dual-pol) will be interpreted incorrectly as TDM by hifa_flagdata resulting in unnecessary edge channel flagging (0.03125% from each edge). This can happen in 4x4 bit mode with online channel averaging factors ≥ 8 (PIPE-2320 ☞).
9. The Tsys field indicator in the mosaic pattern plot on the Spatial Setup page doesn't account for the angular offset of the field (PIPE-2067 ☞).
10. There are a few issues with **Band-to-Band datasets**:
 - a. In some cases, the Tsys spectra shown in h_tsyscal and hifa_tsysflag do not show all the normal labels nor the atmospheric transmission curve. (PIPE-2293 ☞)
 - b. The hifa_tsysflagcontamination stage does not work. (PIPE-2009 ☞)
 - c. If a low-frequency SpW (reference) is fully flagged for the DIFFGAIN, this will not allow the paired High Frequency (Science On Source) SpW(s) to be calibrated and thus the SpW(s) get fully flagged for the Target(s). For Band 7 and 8, there is a 1:1 relation, For Band 9 and 10 with 90-degree Walsh there is a 1:2 relation. Main occurrence = B10 paired with B5 in 183 GHz water line
 - d. If the refant is not ideal, or partially flagged, then some gaincal solves will not complete. Work-around: refant can be manually specified.
 - e. For very narrow spws, especially with 7m ACA, the SNR can be too low even on the DIFFGAIN intent - PL is likely to finish but some HF spws will end up flagged. This requires manual calibration to do spw-combination on DIFFGAIN calibrator.
 - f. For all high frequency data (B25 or not) with narrow spws, there can be significant decorrelation even on the BANDPASS scan, which can affect the phase transfer and flux scale on those spws.

ALMA/45M/AS TE Users Meeting 2024



NAOJ
National Astronomical
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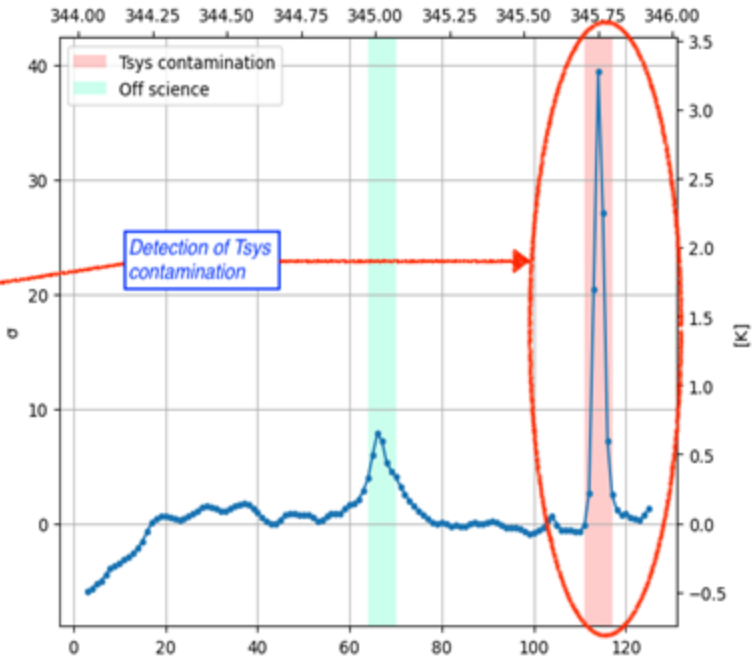
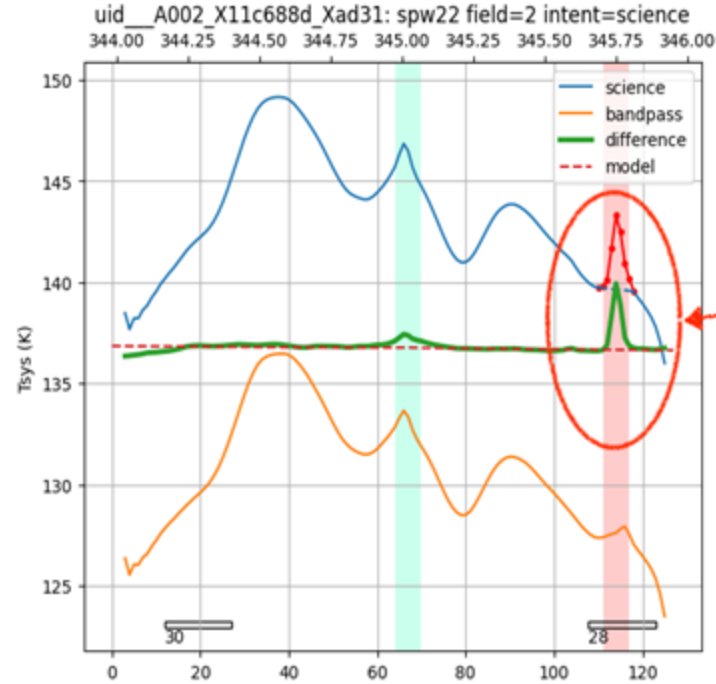




Highlights of Pipeline Updates (2/3)

Interferometry

- Implementation of **Band-to-Band calibration**
- Adding a new stage
“**Tsys contamination flagging**”
- ✓ If astronomical emission line is contaminated in the Tsys spectra, flag them
- Some improvements
 - ✓ calibrated visibility flagging, self-calibration, findContium





Highlights of Pipeline Updates (3/3)

Single-Dish

- Deprecation of `sdimaging`
 - ✓ Imaging operation has been replaced with more versatile imaging task, `tsdimaging`
- Improvement of `baseline subtraction`
- Improvement of visualization
- Implementation of `polynomial fitting function`
- Improvement of the QA scoring
 - ✓ increasing overall (observations & data deliver) efficiencies





Nobeyama Pipeline and Science Data Archive

- <https://nobeyama-archive.nao.ac.jp/> (since 2017/8/21)
- NRO SAM45 data and ASTE MAC/WHSF data
- 61562 raw data (nostar or newstar format, 2013 - 2024)
- For 5857 NRO OTF data (2017-2023), MS2 format data and FITS format data (made by Nobeyama-pipeline)
- 317 users
- Server machine was replaced and all observation data until May 2024 are stored.

The screenshot shows the website's navigation menu with links for Home, Search Data, Download List, History, My Page, Help, and Logout. The main heading is "Nobeyama-45m / ASTE Science Data Archive".

Overview
This site, Nobeyama 45m and ASTE Science Data Archive, provides public science data obtained at the Nobeyama 45m radio telescope at Nagano, Japan and the ASTE telescope at Atacama, Chile.
See more »

News
2023/10/24
This archive service will stop from 2023/11/10 to 2023/11/13 because of our planned electric outage. Sorry for inconvenience.
2023/7/11
This archive service will stop for 9:00-21:00, August 24, 2023 because of maintenance. Sorry for inconvenience.

To use all functions
User ID:
Please enter your ID
Password:
Please enter your password
Login
You can search public data but cannot download them if you do not have user account.
Sign Up if you do not have user account yet.
Reset Password if you forgot your password.

Archived Observation Range at Present
• NRO-45m:
◦ NOSTAR or NEWSTAR: 2013-07-16 to 2021-09-30
◦ MS2: 2017-09-29 to 2021-04-21
◦ FITS: 2017-09-29 to 2021-04-21

(*As of December 12, 2024)





New JVO Service

- A new column linking to JVO (Japan Virtual Observatory; <http://jvo.nao.ac.jp>) for FITS data (pipeline-processed)
- JVO
 - download FITS data
 - operate “WebQL” (online tool to analyze FITS)
 - search other images taken by various telescopes via “VO search”

Link to JVO

Obs.ID	QuickLook	JVO	TargetName	RA:J2000	DEC:J2000	Telescope	Obs. Mode	Freq.Range (GHz)
20171009015940		JVO	Ori-KL	05:35:15	-05:22:30	NRO45m	OTF	84.98 - 86.91
20171009015940		JVO	Ori-KL	05:35:15	-05:22:30	NRO45m	OTF	84.98 - 86.91
20171009035512		JVO	Ori-KL	05:35:15	-05:22:30	NRO45m	OTF	84.98 - 86.91
20171009044331		JVO	Ori-KL	05:35:15	-05:22:30	NRO45m	OTF	84.98 - 86.91

Condition : dataset_id ~ "nro-20171009JST015640-v200811ms_v200908-pipe"

#	Dataset ID ?	Data ID ?	Object ?	Download all the checked data	QL image	QL spect	Maximum intensity map of this dataset	SPW ?	Data Type ?	Coords (Ra Dec) center:
1	nro-20171009JST015640-v200811ms_v200908-pipe	NROA00003657	Ori-KL	Download FITS WebQL VO Search QL by PDF						Center: RA/Dec or object name radius: Radius
2	nro-20171009JST015640-v200811ms_v200908-pipe	NROA00003658	Ori-KL	Download FITS WebQL VO Search QL by PDF						
3	nro-20171009JST015640-v200811ms_v200908-pipe	NROA00003659	Ori-KL	Download FITS WebQL VO Search QL by PDF						
4	nro-20171009JST015640-v200811ms_v200908-pipe	NROA00003660	Ori-KL	Download FITS WebQL VO Search QL by PDF						

Image data collected by other facilities

Facility	Instrument	Number
40cm GPO	40cm GPO	2
AKARI	FIS	4
AKARI	IRC	1
ALMA	-	1535
ASCA	GIS2/GIS3	56
ASCA	SIS0/SIS1	38
ASTRON	-	4
Boydin Observatory; Bloemfontein, South Africa	Astrograph (ten 10-cm Tessar f/6 cameras)	16
Calar Alto Observatory; Spain	Hamburger Schmidt-Spiegel	15
Chandra	ACIS	376
Chandra	ACIS-I	102
Chandra	ACIS-S	256
Chandra	HRC	7
Chandra	HRC-I	6
DSS	photog. plate	3
ESO La Silla	40cm GPO	5
HST	ACS	33
HST	MAST HSTACS	274
HST	MAST HST.FOC	50
HST	MAST HST.NICMOS	1074
HST	MAST HST.STIS	156
HST	MAST HST.WFPC	244
HST	MAST HST.WFPC2	1520
HST	WFPC2	1158
Hamburg-Bergedorf, Germany	1m-Spiegelteleskop	87





Plans of Pipeline and CASA releases in 2025

CASA 6.7

- ***getantposalma*** - to get absolute antenna positions from online database
- ***tclean*** - new interactive clean, improvements to *tclean* reffreq calculation
- ***phaseshift*** - ability to specify multiple fields
- Establish E2E /Stakeholder's test for the single-dish mode
- ***sdbaseline*** - Further functionality improvements regarding the sinusoidal fitting
- Deprecate ***sdimaging***
- Bug fixes and user facing issues

Pipeline 2025

- Improve the QA scoring accuracy for efficient observations and data delivers (automation)

No new development is planned for the legacy CASA and pipeline, rather efforts move to RADPS-ALMA toward the ALMA Wideband Sensitivity Upgrade (WSU) and ngVLA





RADPS

= Radio Astronomy Data Processing System

Primary Objective:

Develop a data processing system that supports production and use of high-level data products for ALMA-WSU and the ngVLA

Secondary Objective:

Support the continued evolution of radio astronomy data processing through a widely accessible package enabling specialization and innovation at facilities and universities

*For more information, please see the following link; <https://safe.nrao.edu/wiki/bin/view/Software/CASA/DUCUsersCommittee2024>





Thank you for your attention