CASA and Pipeline Updates

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on behalf of CASA and Pipeline teams

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Outline

Goal

Summarize operational status of Pipeline and what's new in the new CASA + Pipeline releases.

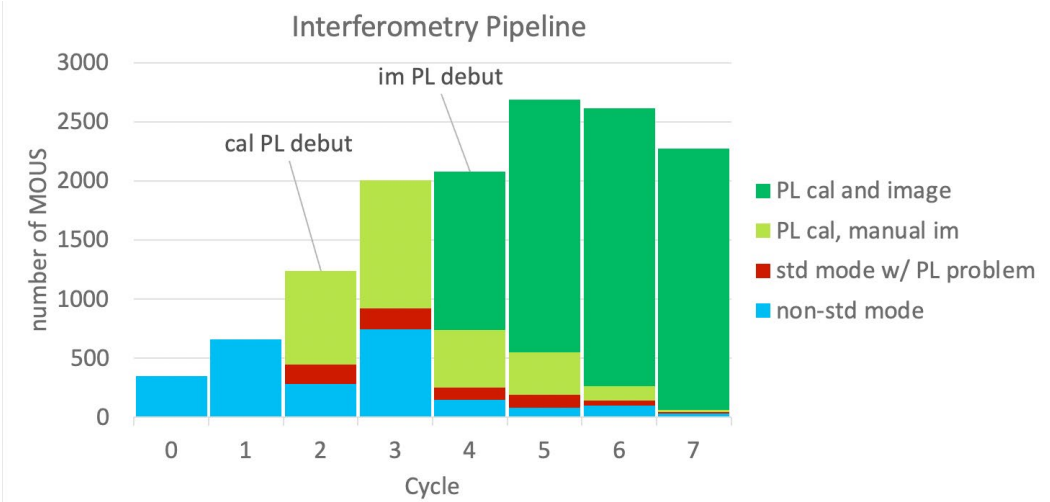
Outline of this talk

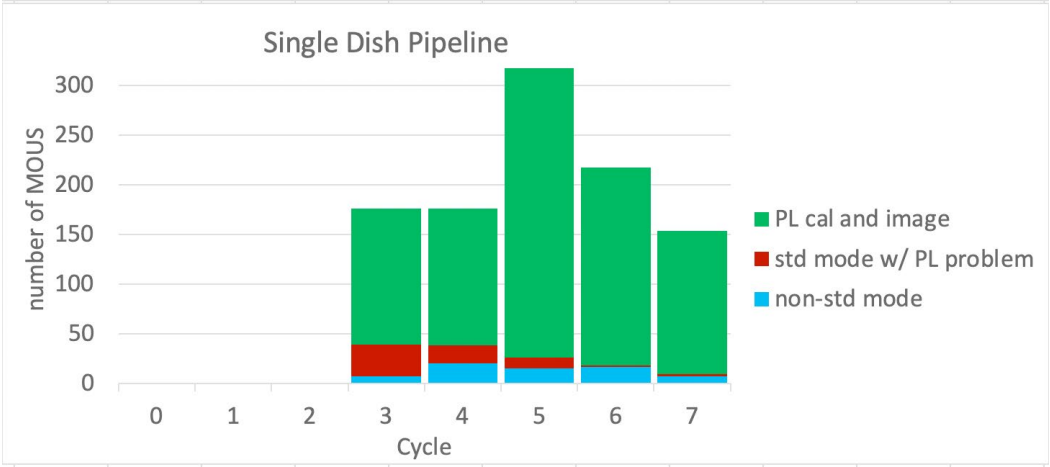
- Operation of ALMA Cycle 7 Pipeline
- Operation of Nobeyama Pipeline
- Highlights of CASA/Pipeline Updates in 2021 Releases
- Plans of 2022 Releases (if time allows)

Operation of Cycle 7 Pipeline

Cycle 7 statistics includes results of both before and after the observatory shutdown (Pipeline 2020 and 2018)

More than 90% of data are successfully processed by Pipeline

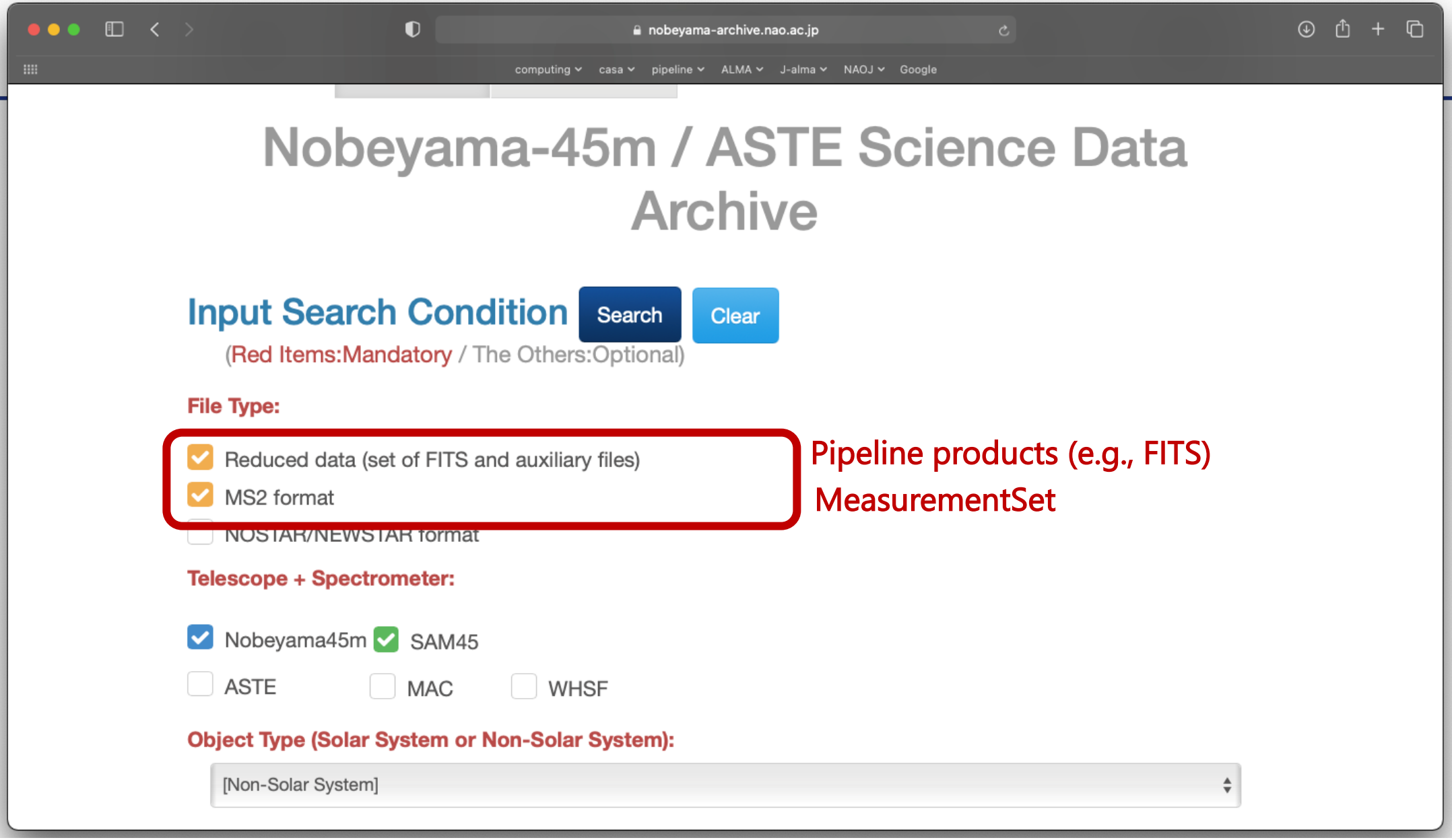




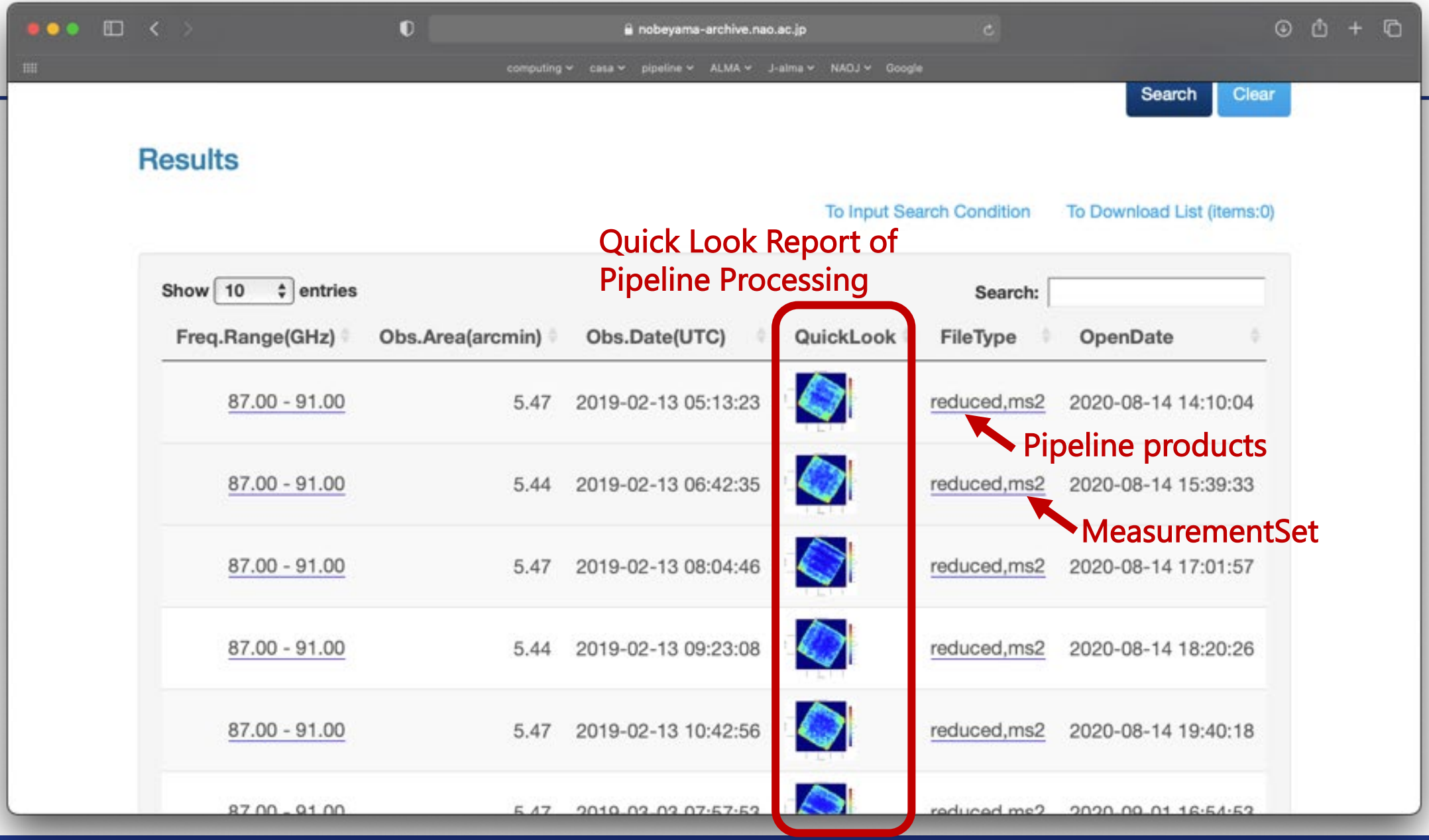
(Created by Pipeline Working Group)

Operation of Nobeyama Pipeline

- Pipeline 2020.1.0 in CASA 6.1.0 and later supports OTF observations by Nobeyama 45-m telescope (mainly FOREST)
  Nobeyama Pipeline Users Guide:
  https://www.nro.nao.ac.jp/~nro45mrt/html/obs/CASA/pipeline/NobeyamaPipelineUsersGuide.html
- **3537 datasets** of 2019-20, 2018-19, and 2017-18 seasons were successfully processed by Nobeyama Pipeline
- **MeasurementSets**, **Pipeline products (incl. FITS images)** and **Quick Look reports** are available at Nobeyama-45m / ASTE Science Archive
  https://nobeyama-archive.nao.ac.jp/user/index.html



Pipeline products (e.g., FITS)
MeasurementSet


nobeyama-archive.nao.ac.jp
computing
casa
pipeline
ALMA
J-alma
NAOJ
Google
Search
Clear
Results
To Input Search Condition
To Download List (items:0)
Quick Look Report of
Pipeline Processing
Show 10 entries
Search:
Freq.Range(GHz)
Obs.Area(arcmin)
Obs.Date(UTC)
QuickLook
FileType
OpenDate
87.00 - 91.00 5.47 2019-02-13 05:13:23 reduced,ms2 2020-08-14 14:10:04
87.00 - 91.00 5.44 2019-02-13 06:42:35 reduced,ms2 2020-08-14 15:39:33
87.00 - 91.00 5.47 2019-02-13 08:04:46 reduced,ms2 2020-08-14 17:01:57
87.00 - 91.00 5.44 2019-02-13 09:23:08 reduced,ms2 2020-08-14 18:20:26
87.00 - 91.00 5.47 2019-02-13 10:42:56 reduced,ms2 2020-08-14 19:40:18
Pipeline products
MeasurementSet

CASA and Pipeline Releases

CASA

- Release schedule change:
  Two feature releases/year
  → **Incremental release** (every 1-2 months) from CASA 6.4 series
- CASA 6.1.1 (Mar. 2021), **6.2.0/5.8.0** (Jun. 2021), **6.3.0** (Aug. 2021), 6.1.2 (Sep. 2021), **6.4.0** (Oct. 2021)

Pipeline

- One release/year/project
- Packaged with CASA as a tarball
- **ALMA**/**Nobeyama**/VLA: **Pipeline 2021.2.0** in CASA6.2.1 (Sep. 2021), **2020.1.0** in CASA6.1.1 (Mar. 2021)

Highlights of CASA Updates (1/2)

See release notes for the full list of updates

https://casadocs.readthedocs.io/en/v6.3.0/notebooks/introduction.html (6.3.0)
https://casadocs.readthedocs.io/en/stable/notebooks/introduction.html (6.4.x)

Common

- Configuration script, **config.py**, implements more functionality
- (next slide) **CARTA is recommended** as an alternative to casaviewer if the same functionality is available

Interferometer

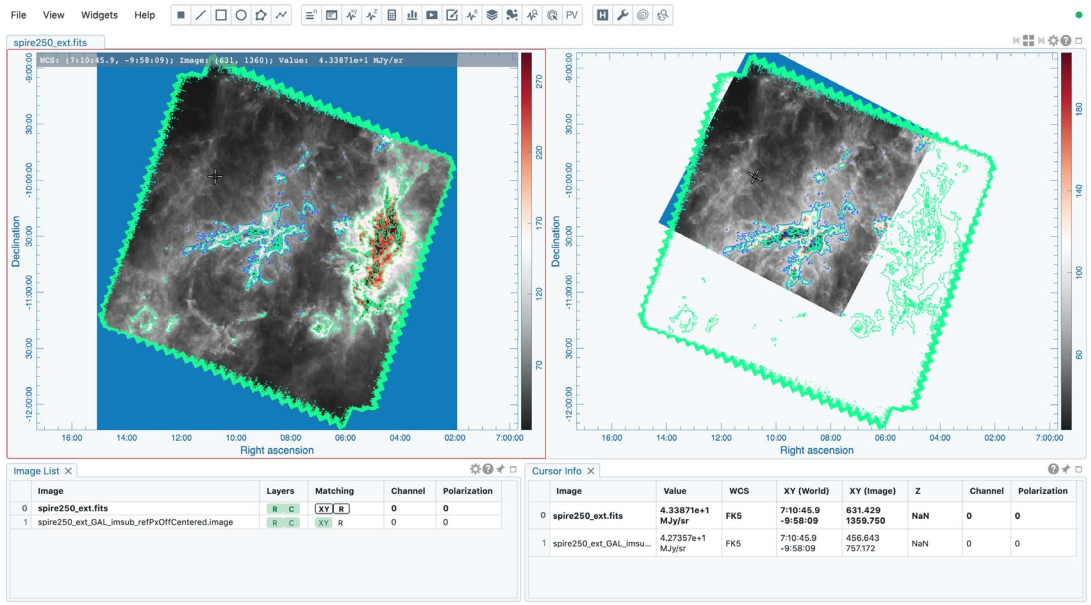
- Cube imaging refactor of *tclean* for better performance and reliability
- New task to shift the phase center, ***phaseshift***, to replace *fixvis* with the improvement for wide-field numerics

Single Dish

- (next slide) Offline atmospheric correction task, ***sdatmcor*** (Sawada et al. 2021)
- **Timerange** selection in *tsdimaging*

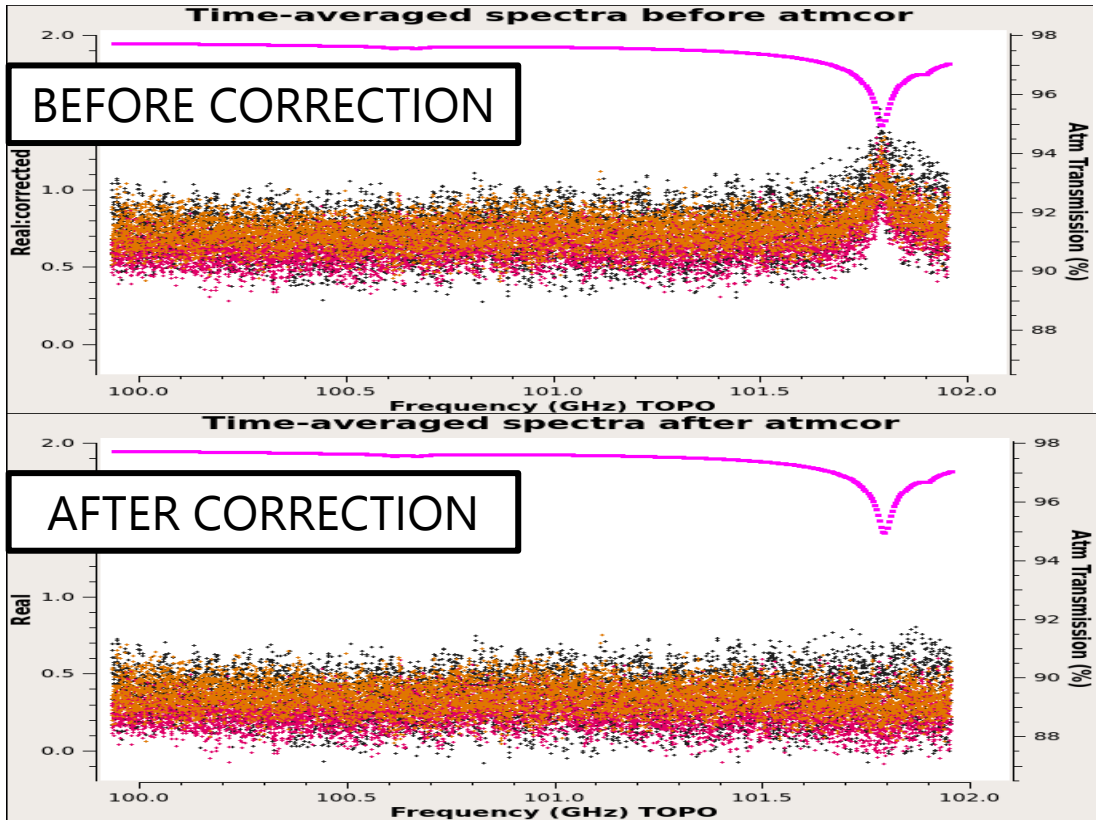
Highlights of CASA Updates (2/2)

CARTA is recommended



No bug fix will be provided for CASAviewer.
Please visit CARTA website (https://cartavis.org/) to check available features.

ATM correction with *sdatmcor*



(Created by T. Nakazato)

Highlights of Pipeline Updates (1/2)

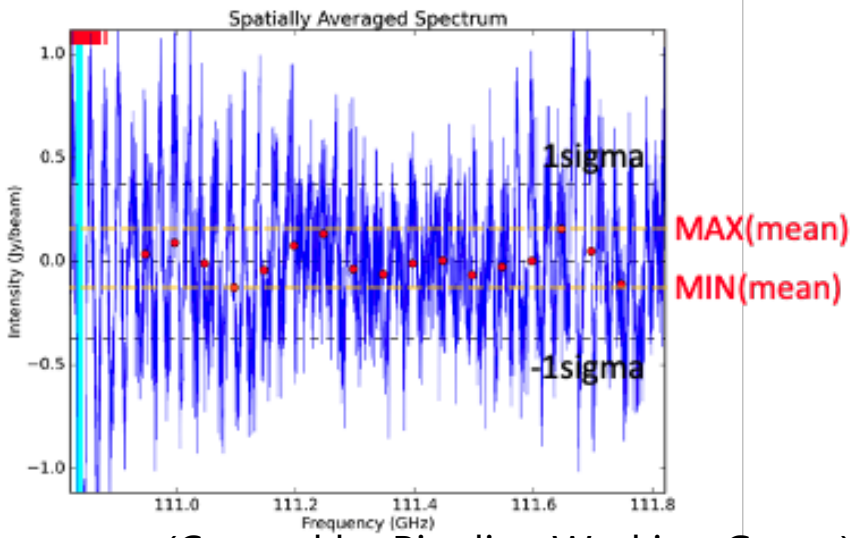
See ALMA Science Pipeline Users Guide for details
https://almascience.nao.ac.jp/documents-and-tools/alma-science-pipeline-users-guide-casa-6-2.1

Interferometer

- (next slide) A new stage, hifa_renorm, in ALMA recipe
- Use of 'briggsbwtaper' weighting in cube imaging

Single Dish

- A new stage, hsd_atmcor, in ALMA recipe
- Pipeline QA score for the quality of baseline subtraction



(Created by Pipeline Working Group)

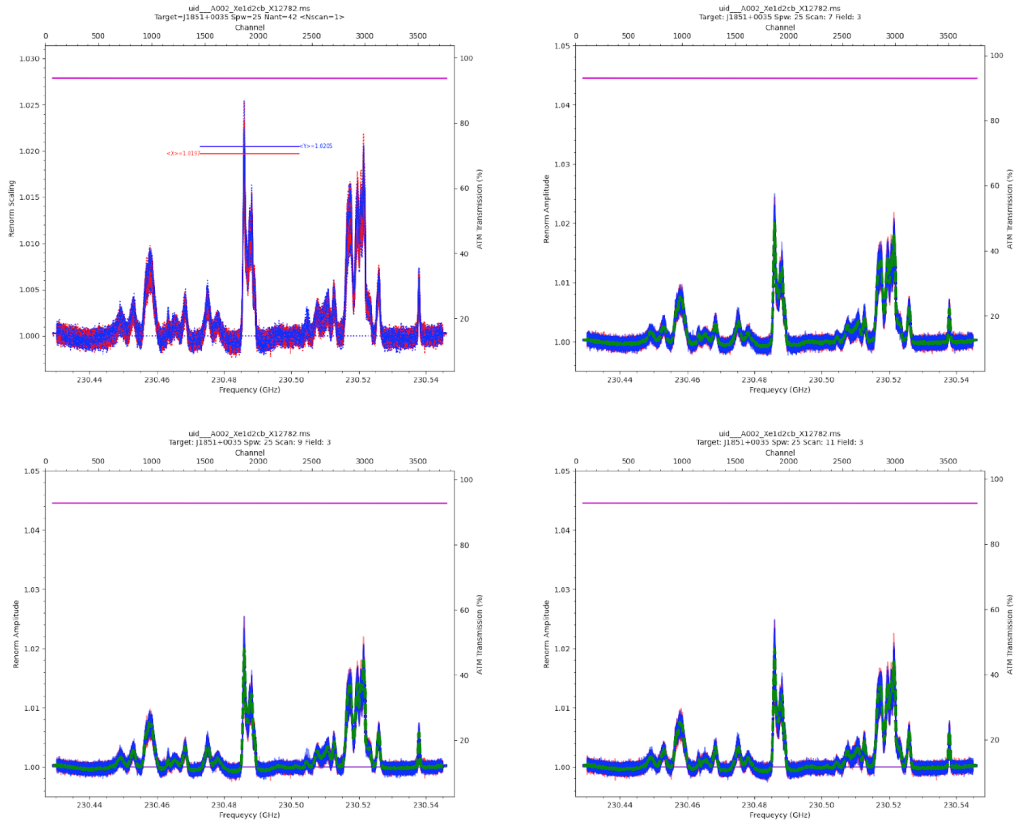
Highlights of Pipeline Updates (2/2)

hifa_renorm corrects renormalization issue of ALMA when error > 2%
https://help.almascience.org/kb/articles/what-are-the-amplitude-calibration-issues-caused-by-alma-s-normalization-strategy

MS/Source/SPW that trigger the need for renormalization above a threshold of 1.02 highlighted in red.

Please refer to the Pipeline User's Guide (linked to this weblog's Home page) for more details on renormalization and interpretation of the plots.

MS Name	Source Name	SPW	Max Renorm Scale Factor (field id)	PDF Link to Diagnostic Plots
uid___A002_Xe1d2cb_X12782.ms	J1851+0035	25	1.0201028 (3)	PDF
		27	1.0132526 (3)	PDF
		29	1.0017472 (3)	PDF
		31	1.0022426 (3)	PDF
uid___A002_Xe850fb_X4efc.ms		25	1.0143336 (4)	PDF
		27	1.0025214 (4)	PDF
		29	1.0016964 (4)	PDF
		31	1.0019715 (4)	PDF



(Created by Pipeline Working Group)

Plans of Pipeline and CASA releases in 2022

Pipeline 2022

- Improve calibration using faint calibrator/low atmospheric transmission/high frequency
- Improve QA score calculation and reporting towards automated review
- A prep. work to support selfcal in a future release
- Automatic ATM model selection in hsd_atmcor
- Improve QA score algorithm/display of hsd_baseline and introduce it to hsd_imaging

CASA 6.4 and 6.5 series

- Fixes to memory leak in tools -> major impact to Single Dish Pipeline
- Imaging tasks upgrades: *deconvolve*, *feather*, *sdintimaging*, GPU gridder, etc
- New interactive-clean prototype
- Full Pol mosaic imaging characterization for VLA and ALMA
- Performance improvement of single dish imaging tasks
- Bug fixes and improvements of *sdbaseline*
- Initial implementation of CNGI framework (uses Dask, xarray)

Thank you!

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Summarize operational status of Pipeline and what's new in the new CASA + Pipeline release.

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- Operation of Nobeyama Pipeline
- Highlights of CASA/Pipeline Updates in 2021 Releases
- Plans of Cycle 9 (if time allows)

Introduction to CASA and Pipeline

Common Astronomy Software Applications (**CASA**) https://casa.nrao.edu/

- General capabilities to calibrate, flag, image, and analyze observation data
- Supports both single dish and interferometry radio telescopes
- Used in manual QA2 of ALMA

Data Processing Pipeline (a.k.a. CASA Pipeline)

- Defines the best data processing strategies/parameters – **heuristics**
- Uses CASA capabilities (tasks and tools) underneath to process data
- Used by **ALMA interferometry and single dish**, Very Large Array (VLA), VLA Sky Survey, Science Ready Data Product, and **Nobeyama 45-m**
- Pipeline supports most of ALMA observations.

Plans of Cycle 9 Pipeline and CASA 6.4 and 6.5

- (CASA)
- Imaging tasks upgrades: *deconvolve*, *feather*, *sdintimaging*, GPU gridder, etc. <- 削除？
- New interactive-clean prototype
- Full Pol mosaic imaging characterization for VLA and ALMA
- （こっちのが大事）Performance improvement of single dish imaging tasks
- Bug fixes and improvements of *sdbaseline*
- Initial implementation of CNGI