Cycle 8, 9 science operations and Cycle 10 prospects

in addition to Alvaro's report

Misato Fukagawa
East Asia ALMA Regional Center

21st December 2022

Before we start… about discussion session

Discussion today from 14:45-

1. Any questions regarding the talks, feedback in general from users on the ALMA operations

2. Data processing current and future: Outcome of the previous surveys, additional comments from users
   - Are you fine with no weblogs or QA2 reports?

   “We have started to work on the implementation of WSU.”

Role of the ALMA Regional Centers (ARCs)

Joint ALMA Observatory

Effective array operations: Execution of programs under suitable conditions
High availability of the array for science : Repairs, Preventive maintenance

Science operations in regional centers with **functions agreed in EA, EU, and NA, in close coordination with JAO**

EA ARC	EU ARC	NA ARC
EA ALMA users	EU ALMA users	NA ALMA users

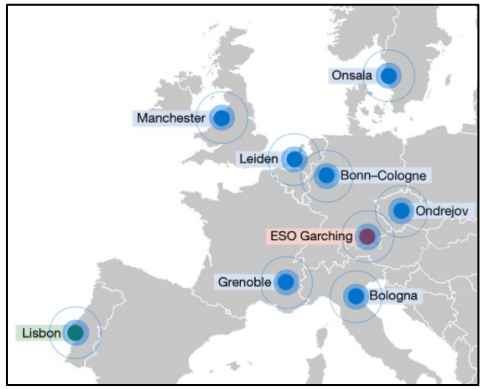
ARC provide support for users in the respective regions so that they can concentrate on observing proposals and data analysis.

East Asia ARC

Central office is at NAOJ Mitaka:

- Core functions: Agreed on internationally
- Enhanced functions: Flexibly planned and executed in each ARC
  - ✓ Native language suppose
  - ✓ Realization of users' demands

Two nodes in Taiwan and Korea:
User support optimized to the individual regions in addition to the core functions of the ARC



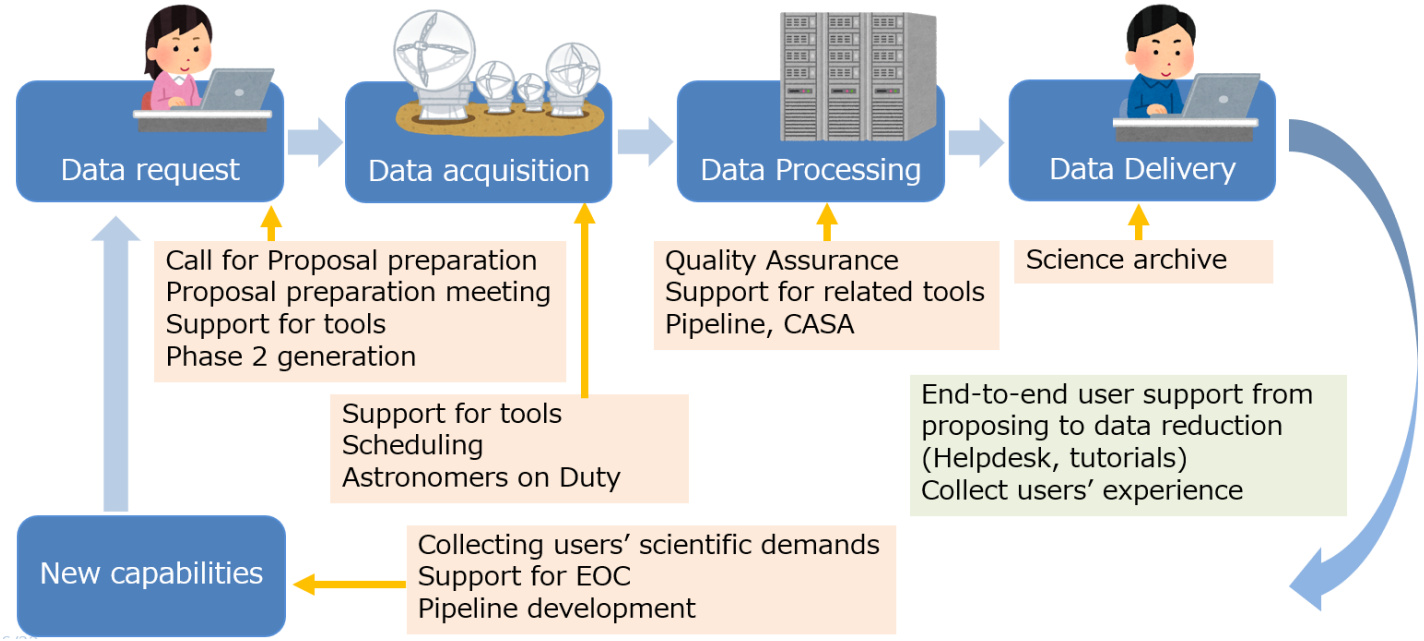
EU has several nodes in addition to the central office at ESO, Garching.
https://www.eso.org/sci/facilities/alma/arc.html

- "Executive": Region at the proposal submission, related to the observing time allocation
- "Preferred ARC": Region to support the user (can change depending on the change of user's affiliation)

Working as “one ALMA” on daily basis

- Development of the single-dish part of the Pipeline, single-dish part of CASA
- QA2, QA3, and data processing tools
- Archive, Helpdesk, Improvements for Phase 2 generation, Observing Tool, Scheduling, Science Portal etc.

- **Contribution to commissioning of new observing capabilities**, to preparations of offering the new modes (polarization, long-baseline high-freq, Solar, TP-related, ACA spectrometer, Band 1)
- Contribution in the WG to investigate the algorithm for data combination (TP, 7 m, 12 m)
- **Working on regional user-support items**



Each management team, Subsystem and working group basically consists of representatives from all the regions of ALMA.

East Asia ALMA Regional Center (EA ARC) at NAOJ

- Misato Fukagawa
- Hiroshi Nagai
- Koichiro Nakanishi
- Shun Ishii
- Patricio Sanhueza
- Jorge Zavala
- Toshiki Saito
- Yu-Ting Wu
- Sarolta Zahorecz
- Gianni Cataldi
- Masumi Shimojo
- Satoko Takahashi
- Xiaoyang Chen
- Andrea Silva
- Yu Cheng
- Toshinobu Takagi
- Atsushi Miyazaki
- Yoshihiko Yamada
- Mika Konuma
- Takuma Izumi

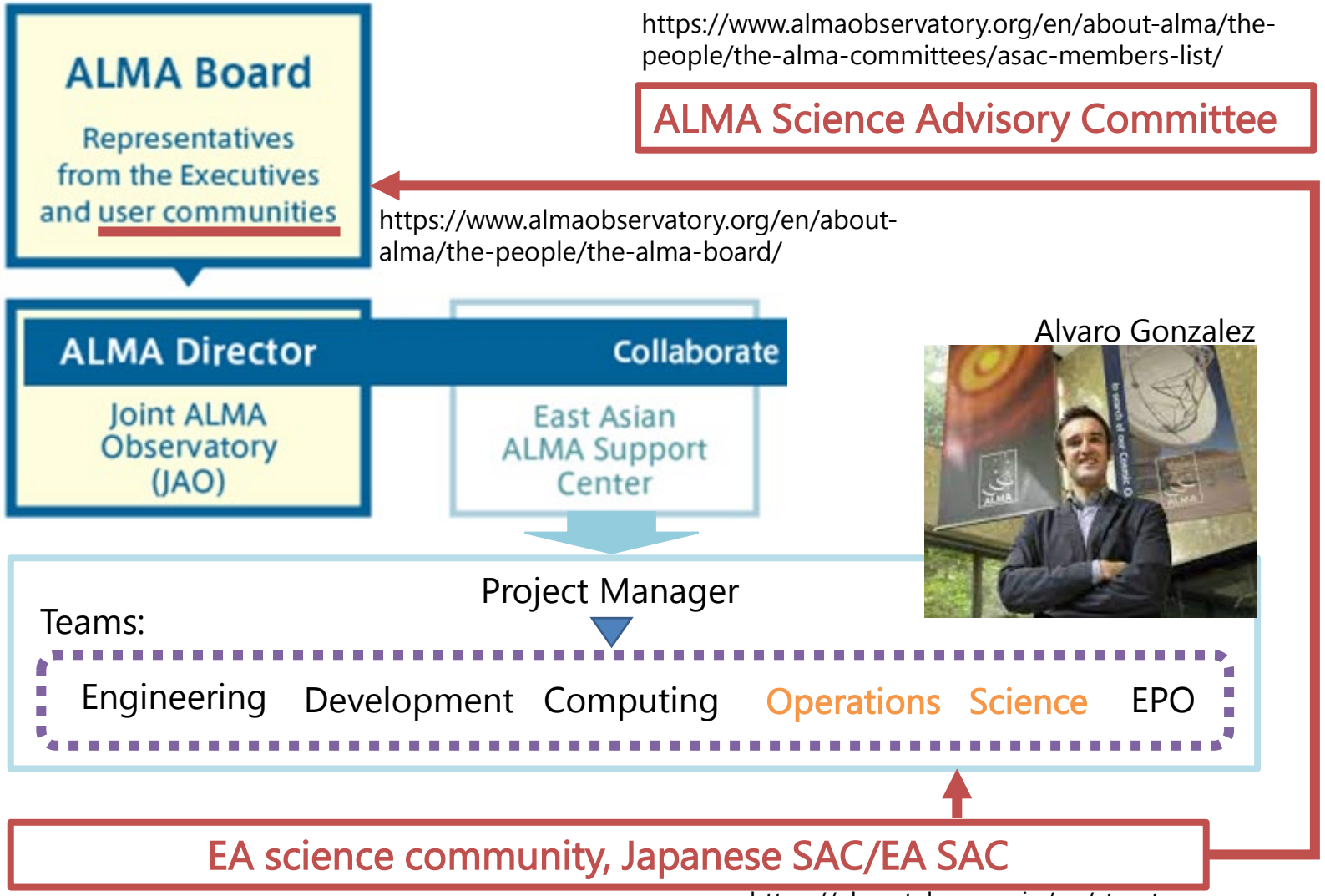
CASA Users Committee:
Yoshimasa Watanabe-san
from Japan

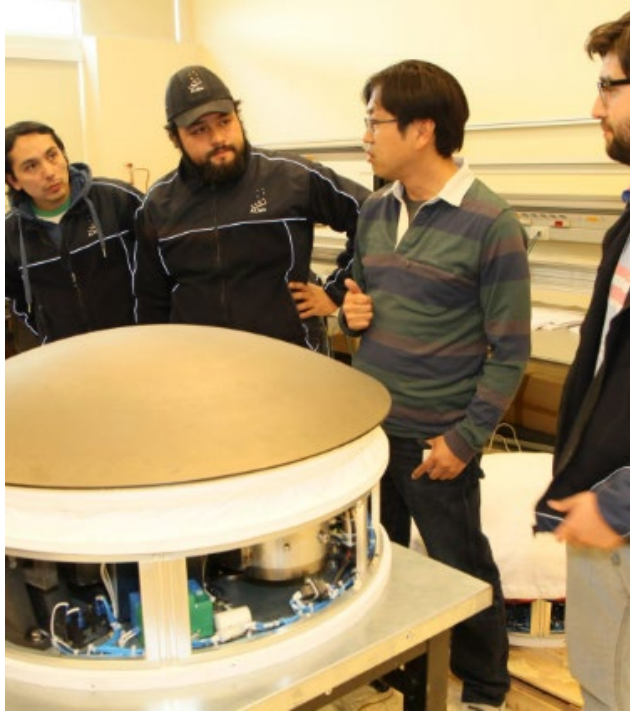
Receiving inputs/feedback from users

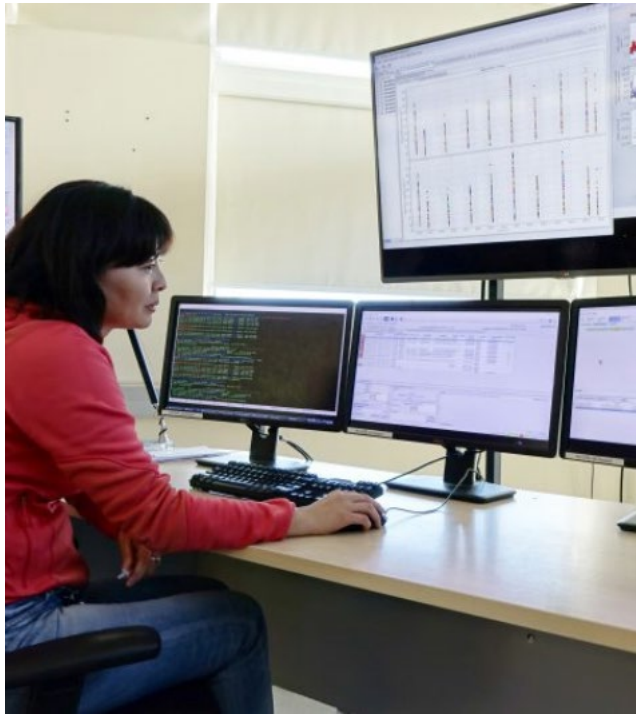
Two paths

- Regional/ALMA Science Advisory Committees
  - ✓ Working on the charges by the Board. Recommendations and advice to the Board on various issues including future science capabilities, improvements in operations
- Various tools/opportunities

Note: ALMA also deeply involves the community in the developments.







Working as “one ALMA” on daily basis

Many people support the various necessary activities including software development, repair and maintenance of telescopes and instruments, and a wide variety of other tasks to produce the exciting science results.

Cycle 8 and 9 operations

Alvaro's talk covered

- Cycle 8 data acquisition on the 12m Array was the 2nd highest in ALMA history
- Cycle 8 data processing had excellent pipelined data KPIs (50% of datasets were delivered within 10 days)
- Cycle 9 data acquisition was ahead of target at the time of the cyberattack at the end of October

Cycle 9

Recovery to science observations

- Cycle 9: ALMA has resumed performing PI science observations following the cyberattack. The end-to-end data acquisition and processing workflow and software were successfully re-tested prior to the restart. ALMA is currently taking observations in configuration C-3. User services are also now back online, including access to ALMA user profiles, SnooPI, and the Cycle 9 DDT submission server.

- Most compact configurations (C-1 and C-2) will not be visited again in Cycle 9. Some Scheduling Blocks (SBs) requiring configuration C-2 were already observed in the days prior to the cyberattack. Projects with SBs in nominal configurations C-1 and C-2 that can still be observed in configuration C-3 will remain in the observing queue. As per usual ALMA policy, incomplete Cycle 9 Grade A projects will carry over into Cycle 10.

- Regarding Cycle 10, due to the disruption caused by the cyberattack, the Cycle 10 pre-announcement will now be issued in the week of January 16.

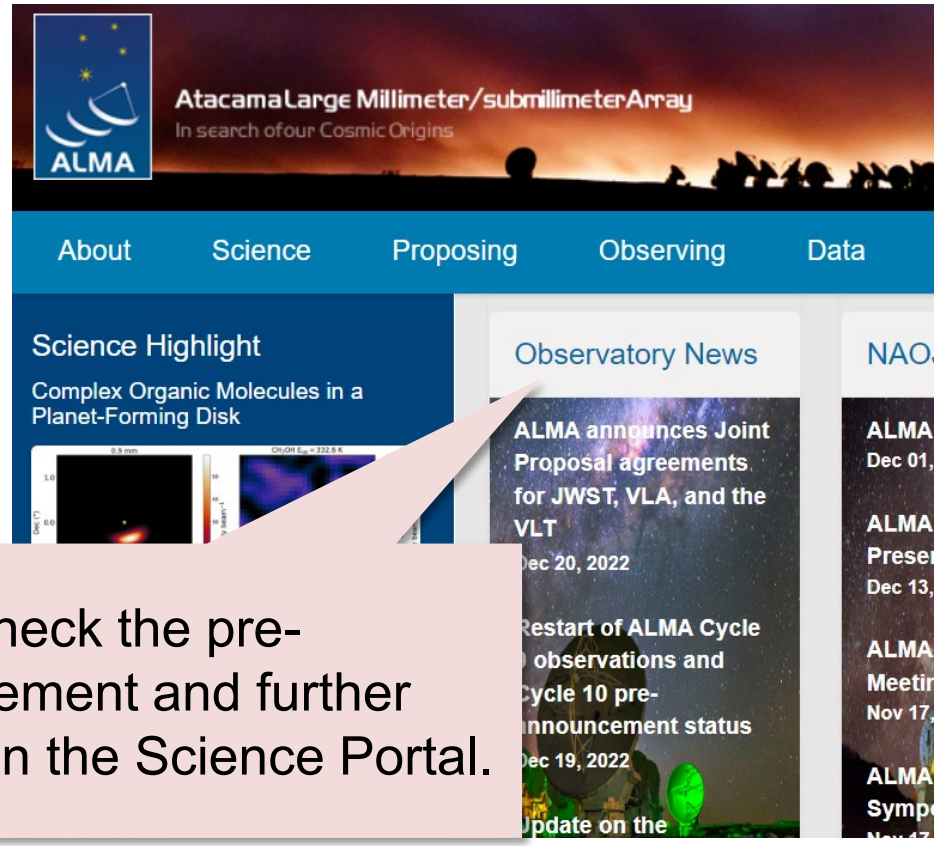
Cycle 10

Joint Proposal agreements for JWST, VLA, and the VLT

- Joint Proposals are dedicated to scientific projects that require observations with two or more observatories to achieve their scientific goals. A Joint Proposal is submitted to a single observatory for scientific peer review, which allows one observatory to award observing time on multiple telescopes.
- For each ALMA cycle, starting in Cycle 10, ALMA will be able to allocate up to 115 hours of JWST time, up to 50 hours on the VLT, and up to 5% of the available time on the VLA.
- JWST will be able to allocate up to 115 hours of ALMA time (on each of the 12-m, 7-m, and Total Power Arrays) per cycle starting with JWST Cycle 2 (with the call for proposals released in November 2022), VLA and VLT will each be able to allocate up to 50 h of ALMA time per year starting with Semester 2023B for the VLA (with the call for proposals released in January 2023) and Period 112 for the VLT (with the call for proposals released in February 2023).

Pre-announcement for Cycle 10

- The pre-announcement in January provides you a plan to assist the early proposal planning.
- Please wait for the pre-announcement on the plan for Cycle 10, e.g., which observing modes will be newly available.



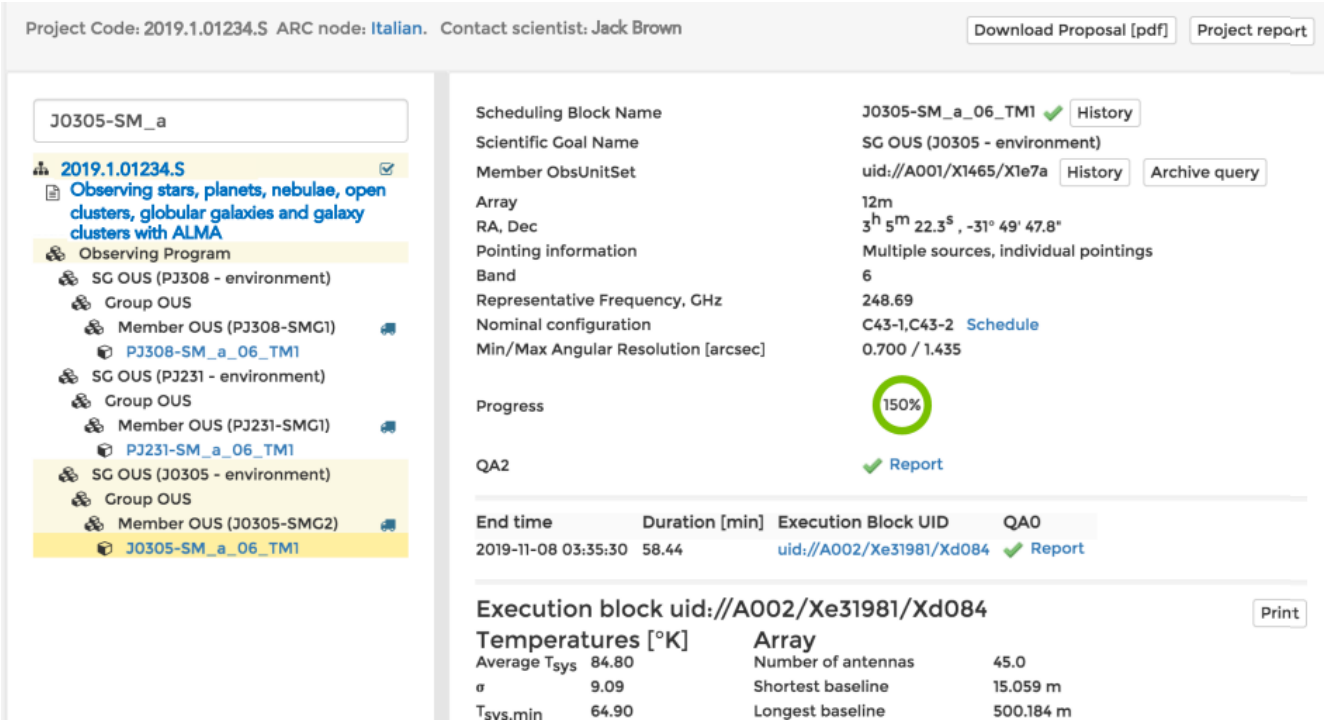
Please check the pre-announcement and further updates in the Science Portal.

Note on the scheduling

- Note on the scheduling
  - Users do not have to care about the antenna configurations in OT. The scheduling is done based on the requested angular resolution.
  - What is the min/max angular resolution for the scheduling block?

→Please see the Proposer's Guide (at the proposal planning stage) about the "range"

→You can check in SnooPI. You can also check in the Phase 2 part in the OT.



Regional support
User Support

Taiwan node → Yu-Nung's talk
Korea node → Jihyun's talk

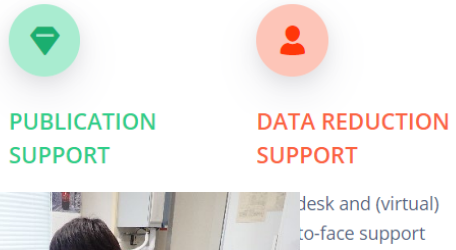
Our goal: **To improve the scientific productivity with ALMA in the EA community**

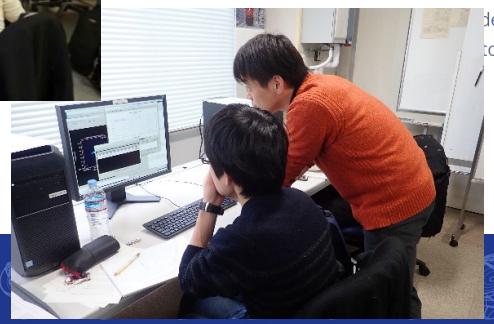
Collect users' voices and statistics

- User surveys (archive, user end-to-end experience)
- Conversations in meetings
- Interviews

Provide support/improve usability of ALMA

- Improvements of Archive, OT…
- Workshops, tutorials
- Enhanced services
- Budgetary support for publication
- …





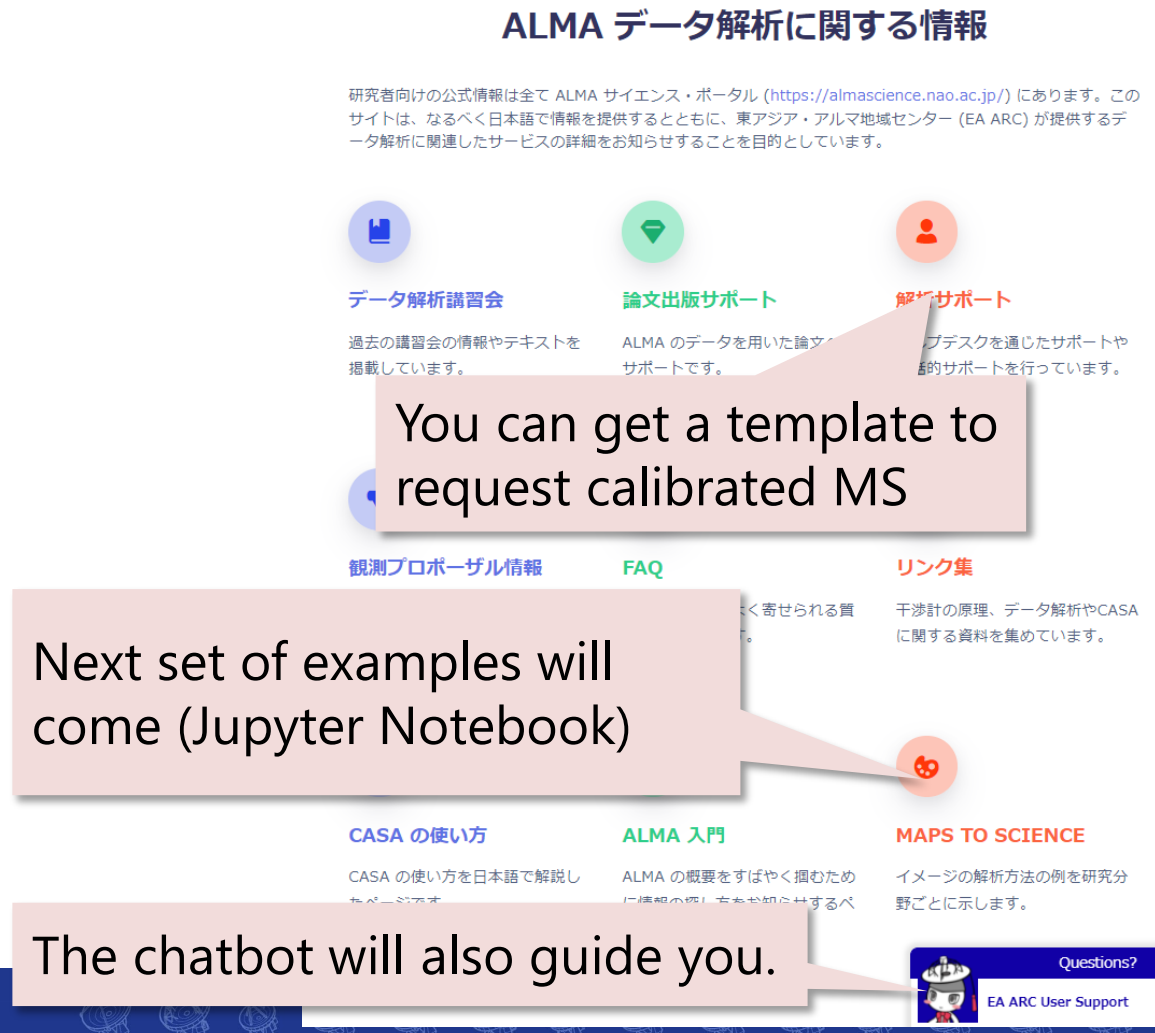
Regional support

User Support

- Calibrated MS delivery
  - We offer this service for data in all the cycles (but Cycle 0 where you can get the calibrated MS from the Archive)
- Japanese material
  - Website, textbook for data reduction
- ALMA-J users email list
  - Any ALMA users can join
- Items from surveys, comments received in Users Meeting and conversations

Supplemental website

https://www2.nao.ac.jp/~eaarc/DATARED/index.html



You can get a template to request calibrated MS

Next set of examples will come (Jupyter Notebook)

The chatbot will also guide you.

User Support

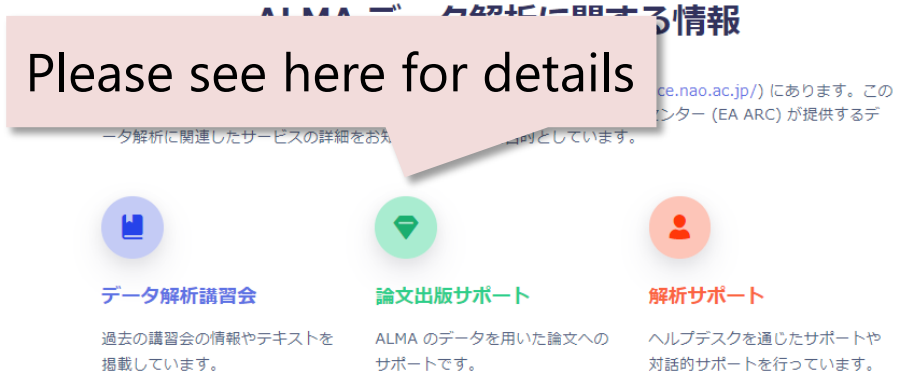
- Data reduction tutorials for users in Japan
  - Recent ones
    - November 2, 5 in 2021: Intermediate-level course (imaging), fully virtual using Zoon
    - July 5 and 7 in 2022: Basic-level course, fully virtual
    - February 27, 28 in 2023: Intermediate-level course, face-to-face is planned

Supplemental website
https://www2.nao.ac.jp/~eaarc/DATARED/index.html

NAOJ news

Publication support

- Publication Support program
  - Motivation
    1. Improving the scientific productivity, including papers with archival data
    2. Advertising science results in the international community
  - Publication fee, English editing fee, conference registration fee, Images in PR led by universities
    - Based on inputs in the UM, JSAC, and discussion in the project
  - 1st authors who include the affiliation in Japan, and who submitted (will surely submit for English editing) papers with ALMA data
  - Post-COVID-19 (from FY2023?): conference/colloquium abroad with oral presentations (not for posters)

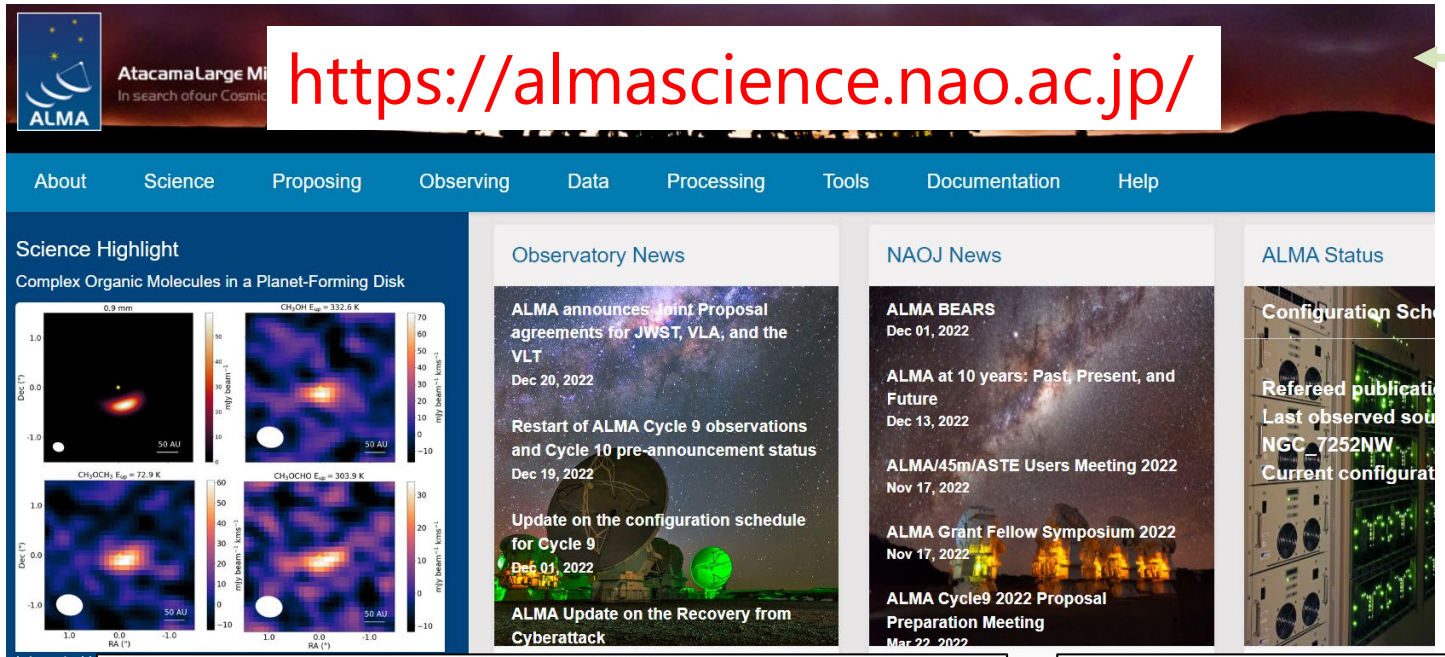


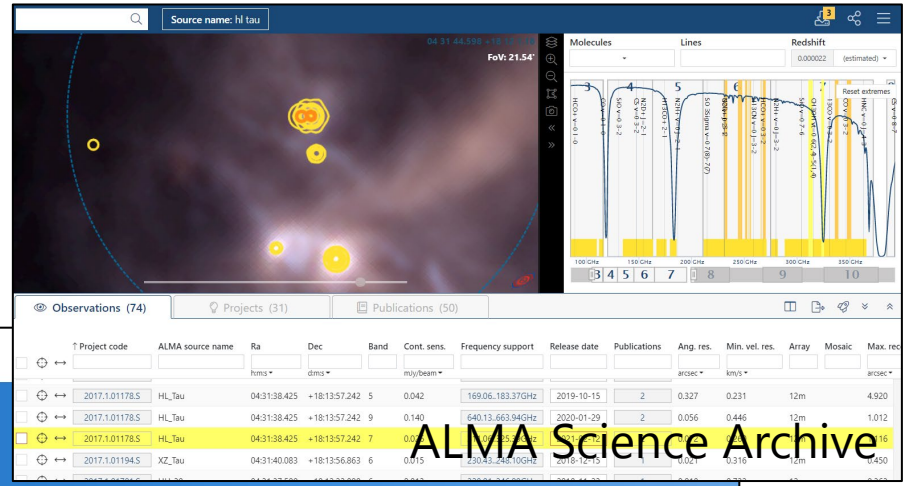
Quality of science is good. Internationalization will be important in particular for the young generation.

Science Portal – almost everything is here

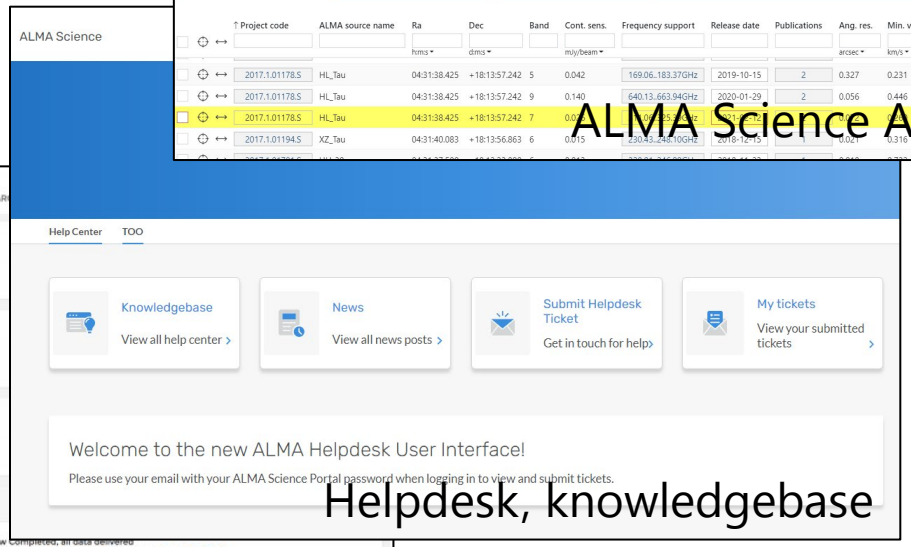
https://almascience.nao.ac.jp/

Registration is necessary to propose observations, getting data under the proprietary period

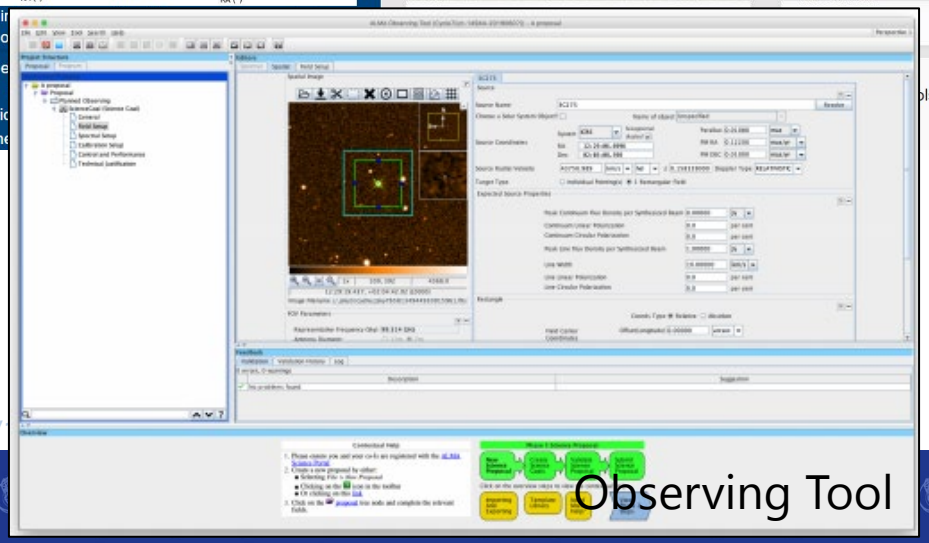




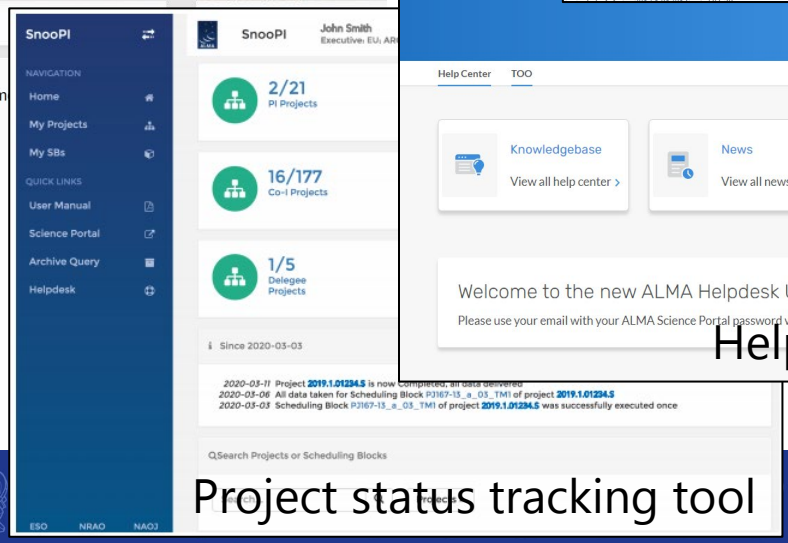
ALMA Science Archive



Helpdesk, knowledgebase



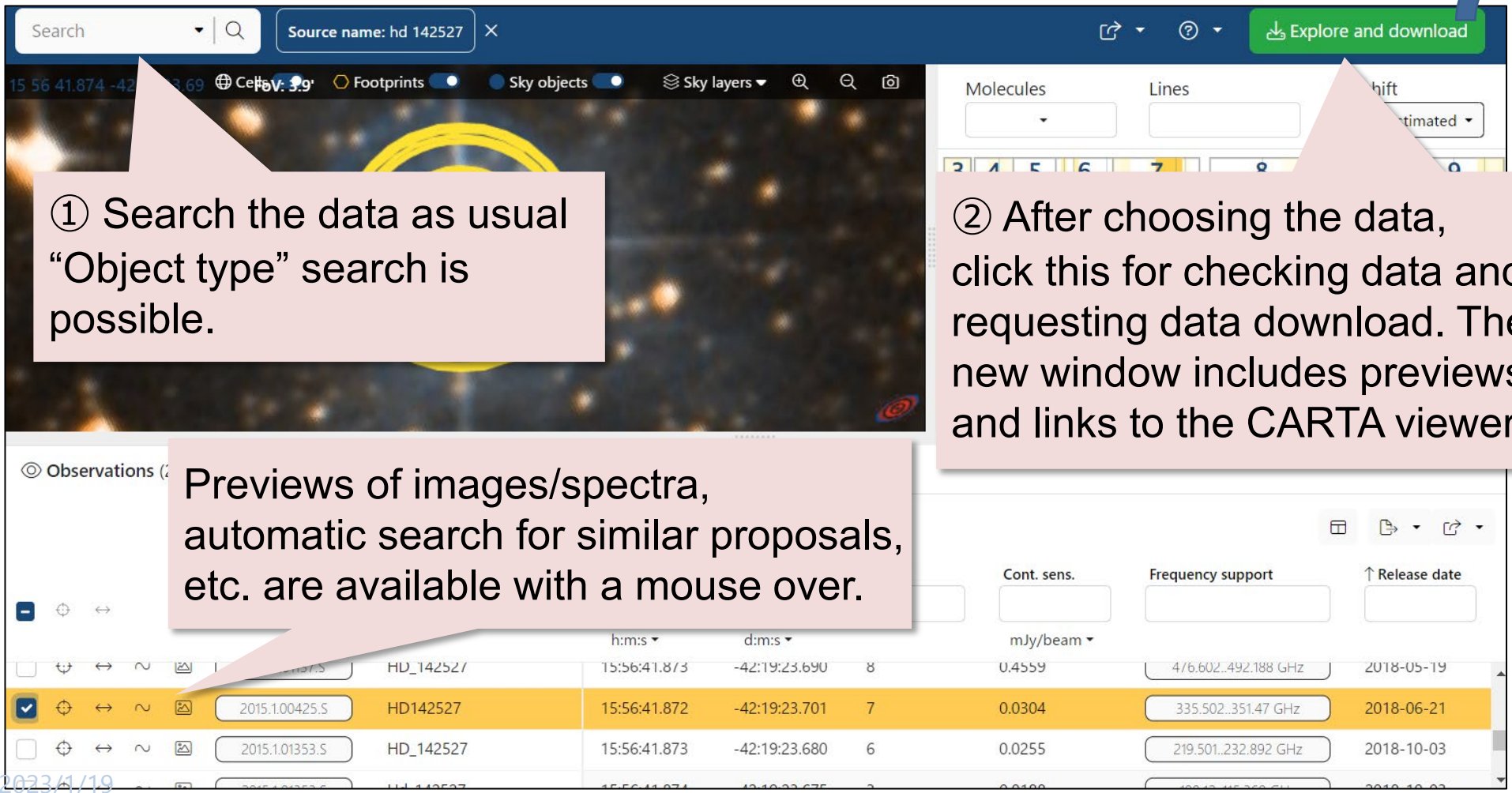
Observing Tool



Project status tracking tool

Archive updates/features

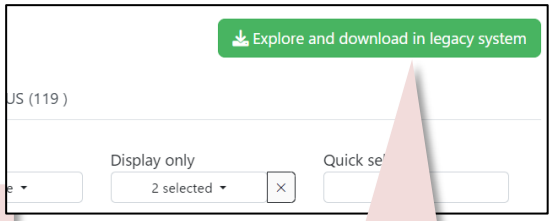
ALMA Science Archive in the Request Handler page



① Search the data as usual "Object type" search is possible.

② After choosing the data, click this for checking data and requesting data download. The new window includes previews and links to the CARTA viewer.

Previews of images/spectra, automatic search for similar proposals, etc. are available with a mouse over.



If you want to use the previous type of request page, click "Explore and download in legacy system" at the upper-right corner.

Archive updates/features

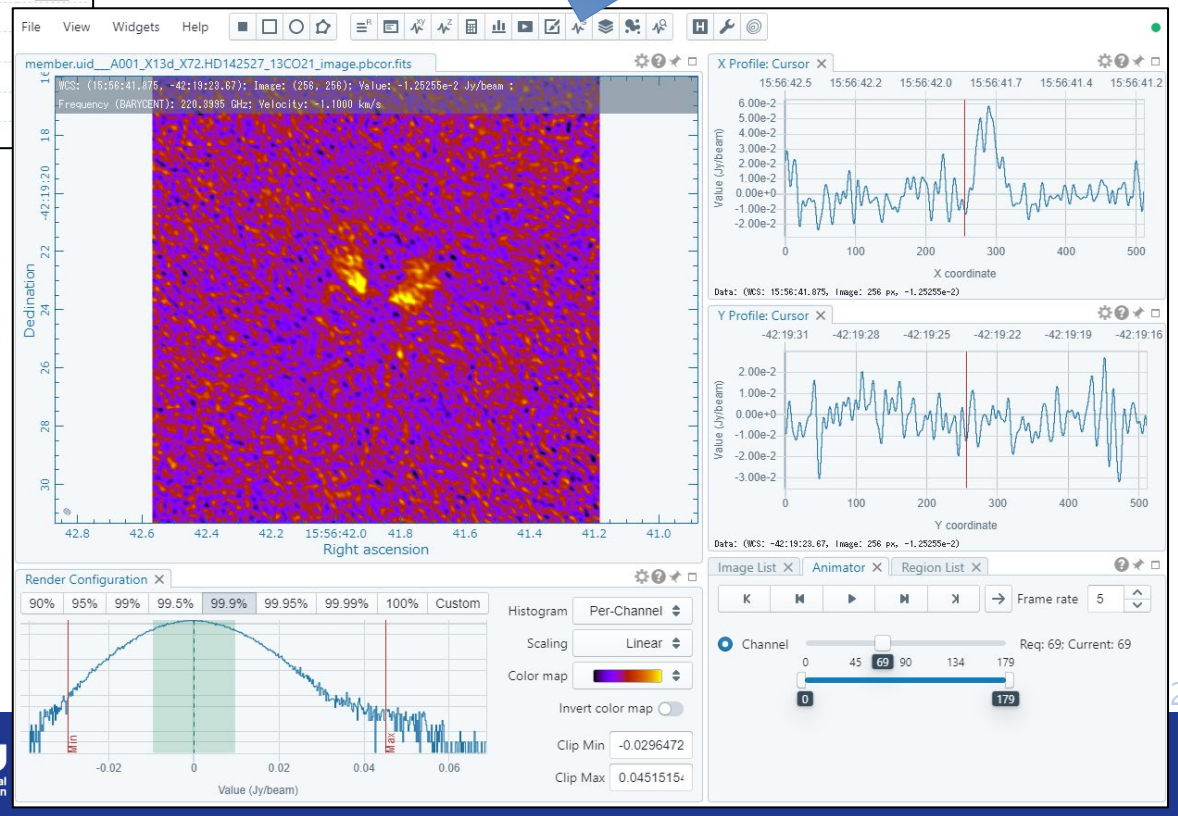
ALMA Science Archive in the Request Handler page

In the legacy system:

Click the link icon to CARTA as a viewer

Open the file tree by clicking ▶

A new webpage automatically opens in your browser! (You do not have to install CARTA desktop version).



You can check and analyze the images/cubes without downloading the data to your local disk. (e.g., you can generate and immediately check moment maps in CARTA)

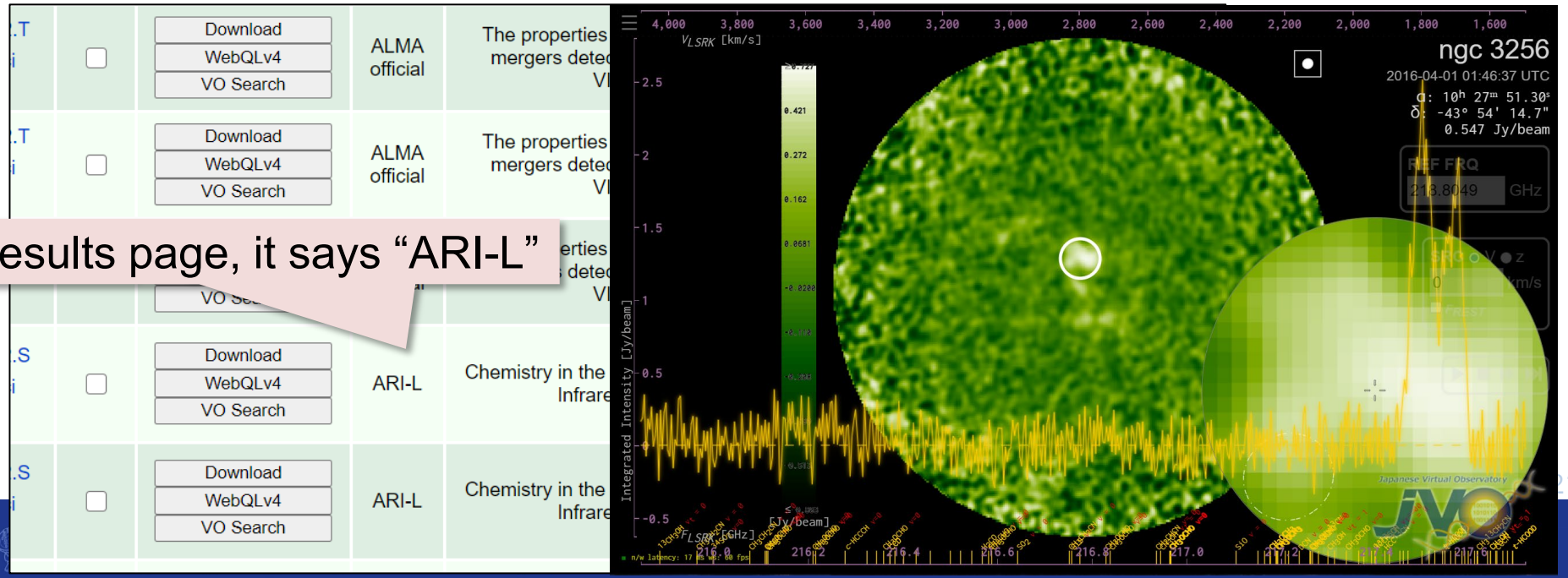
Archive features: ARI-L

Additional Representative Images for Legacy (ARI-L):
A uniform set of full data cubes and continuum images of the data from Cycles 2-4.

In the Request Handler page, you will see “external” with the package name “ari_l”.

ARI-L images are also in the JVO archive in NAOJ

In the search results page, it says “ARI-L”



What type of support would work for you?

- Getting ALMA time
- Using archive data
  - Data accessibility
  - Data reduction
  - Scientific Analysis
- Strengthen the research group

Discussion, Q&A

- ✓ Wideband Sensitivity Upgrade
- ✓ Development efforts
- ✓ Proposal review system
- ✓ User support

Recalling past surveys/interviews

User End-to-End Experience Survey results

✓Purpose

- To identify the main issues that prevent the best ALMA user experience

✓Survey period

- Conferences/events with ALMA users in 2019 and early 2020

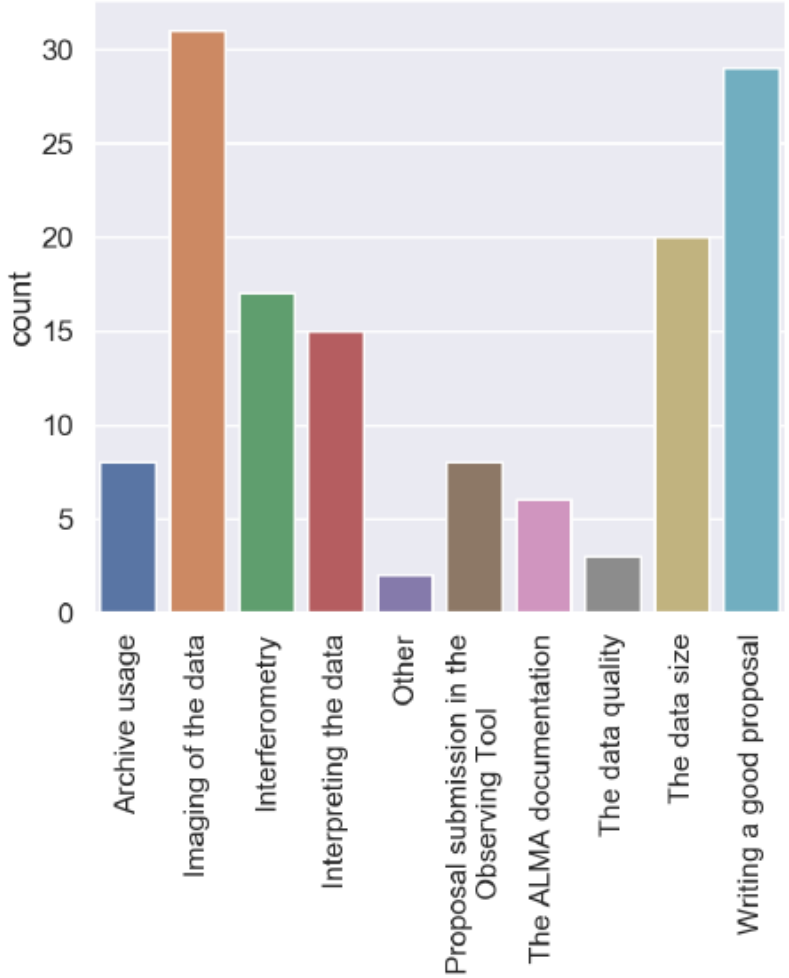
Thank you for your contribution!

✓Results

- Total 106 responses. Almost all have used ALMA.
- "Imaging of the data" and "Writing a good proposal" are the most challenging aspects, followed by "Data size", "Interferometry", "Interpreting the data".

Some of the top priority items have already been implemented. e.g., archive previews, improved documentation.

What are the two most challenging aspects of using ALMA according to your experience?



Recalling past surveys/interviews

Interview results

Some items have been implemented already, and some are waiting for discussion or implementation.

Redesign the User eXperience (RedUX)

Evanthia Hatziminagoglou (EU,ESO)
George Privon (NA, NRAO)
Yoshito SHIMAJIRI (EA, NAOJ)

[Purpose] Learn from the users about the quality of the services, collect the feedback, and then improve our service.

- Interviewed between Nov. 2020 and May 2021
- 69 interviewees (26 in EA) carried out

  Span all levels of interferometry expertise and career stage as well as scientific profile and interests.

- The outcome will be public
  as Messenger Article on the middle of March .
  https://www.eso.org/sci/publications/messenger/
- Here, I focus on the topics concerning to EA ARC service.

Demographic Breakdown of RedUX Interview Participants

Category	N	% of Total
Participants	69	100
Region		
East Asia	26	38
Europe	27	39
North America	16	23
Interferometry Expertise		
Beginner	11	16
Intermediate	30	43
Expert	28	41
Career Stage		
Student	11	16
Postdoc	29	42
Junior faculty/staff	17	25
Senior faculty/staff	12	17
Scientific Profile†		
Theory	13	19
Observation	65	94
– Radio	51	74
– Optical	15	22
– UV	1	1
– Infrared	21	30
– X-rays	1	1
Primary ALMA Data Usage		
Archival data	15	22
Data as PI or Co-I	48	70
Archival and PI/Co-I data	1	1
Have not used ALMA yet	5	7
ALMA Data Reduction Experience†		
None	7	10
Have reduced ALMA data	55	80
Reduced other interferometric data	35	51
Reduced other (single-dish, IR, optical) data	40	58

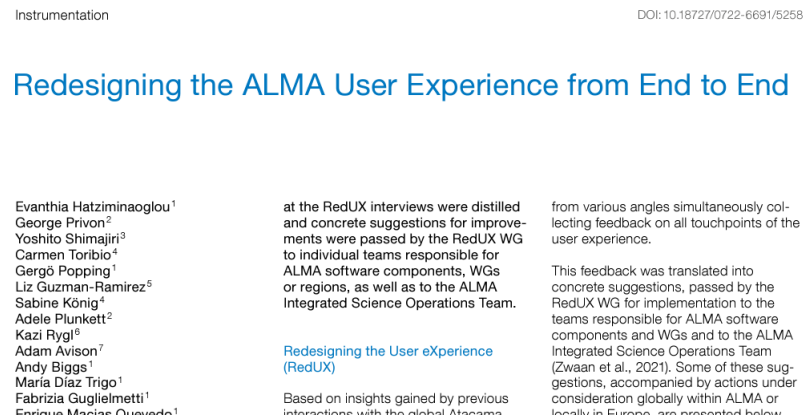
† Multiple responses were permitted, numbers may sum to larger than the total.

Recalling past surveys/interviews

Interview results

Some items have been implemented already, and some are waiting for discussion/ implementation.

- Users reported difficulties following the development of the various CASA versions, updates and bug fixes, and also difficulties with maintaining various CASA versions on their computers.
- Remote, centralized, user-initiated data processing would circumvent the need for users to keep up with CASA versioning, to allow users accessing powerful computers, and to further promote archival science.
- …



Instrumentation

DOI: 10.18727/0722-6691/5258

Redesigning the ALMA User Experience from End to End

Evanthia Hatziminaoglou[1]
George Privon[2]
Yoshito Shimajiri[3]
Carmen Toribio[4]
Gergö Popping[1]
Liz Guzman-Ramirez[5]
Sabine König[4]
Adele Plunkett[2]
Kazi Rygl[6]
Adam Avison[7]
Andy Biggs[1]
María Díaz Trigo[1]
Fabrizia Guglielmetti[1]

at the RedUX interviews were distilled and concrete suggestions for improvements were passed by the RedUX WG to individual teams responsible for ALMA software components, WGs or regions, as well as to the ALMA Integrated Science Operations Team.

Redesigning the User eXperience (RedUX)

Based on insights gained by previous

from various angles simultaneously collecting feedback on all touchpoints of the user experience.

This feedback was translated into concrete suggestions, passed by the RedUX WG for implementation to the teams responsible for ALMA software components and WGs and to the ALMA Integrated Science Operations Team (Zwaan et al., 2021). Some of these suggestions, accompanied by actions under consideration globally within ALMA or

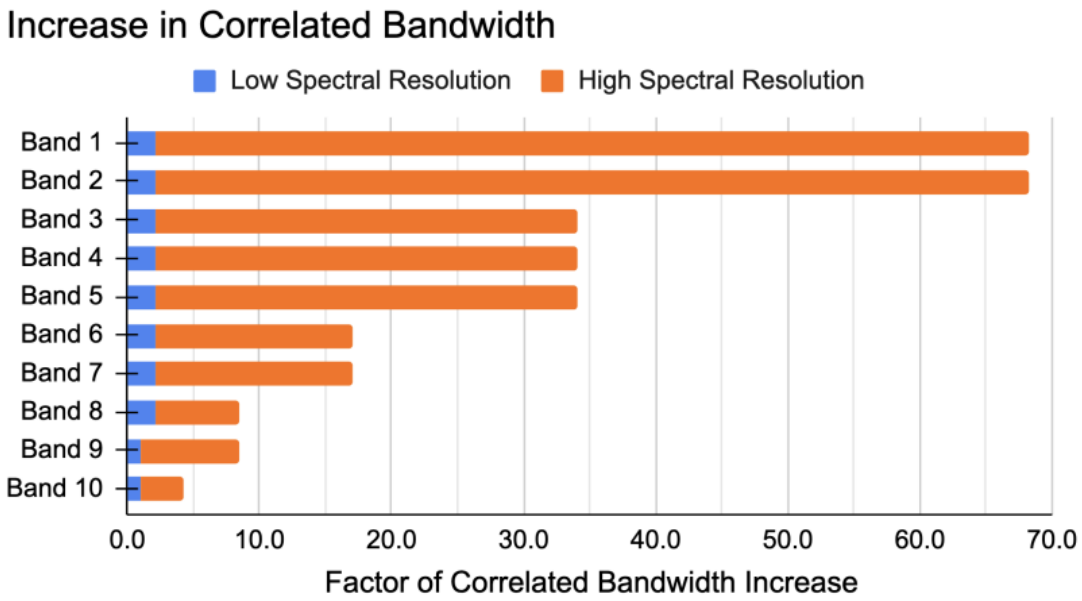
Summary has been published in the ESO messenger article.
https://www.eso.org/sci/publications/messenger/archive/no.186-mar22/messenger-no186-20-24.pdf

EA ALMA Development WS in the Archive

Future of Science Archive, held in March 2022

Some points from the WS draft report:

- Astronomer will not be able to investigate data in 2030. Observatory's responsibility will increase.
- Survey result: Imaging of the data is more challenging than writing a successful proposal.
- Quick access to calibrated MS will expedite science analysis.
- Catalogue for molecular inventories, catalogues for continuum sources. Product images with different weight options, quick line identification, etc.



Carpenter et al. (2022)

- Survey project creates a lot of data. Efficient data discovery is the key to synergy between opt/IR and ALMA. VO: Capability to search related data observed by the other telescope
- HSC+PFS science platform: No need to download data. Processing is done on remote science platform. Provides pipeline processed data. No raw data are available (~100 TB for raw+PL intermediate products)

Data processing current and future

- What data products do you need?
  - Have you checked the weblogs or QA2 reports?