ALMA Science Operations Report - Cycle 10 and 11 -

Takuma Izumi

East Asia ALMA Regional Center (EA-ARC)

Users Meeting on December 19, 2024

国立天文台 NAOJ National Astronomical Observatory of Japan

Introduction of ARC

Role of the ALMA Regional Centers (ARCs)

Joint ALMA Observatory

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

We are doing science operations with **functions agreed in EA, EU, and NA, in close coordination with JAO**

EA ARC

EA ALMA users

EU ARC

EU ALMA users

NA ARC

NA ALMA users

ARC provides support for users in the respective regions so that you can concentrate on making proposals and analyzing data.

East Asian ARC (EA-ARC) collaboration

Central office is at NAOJ Mitaka:

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

Two nodes in Taiwan and Korea:

User support optimized to the individual regions in addition to the core functions of the ARC

Talks today:

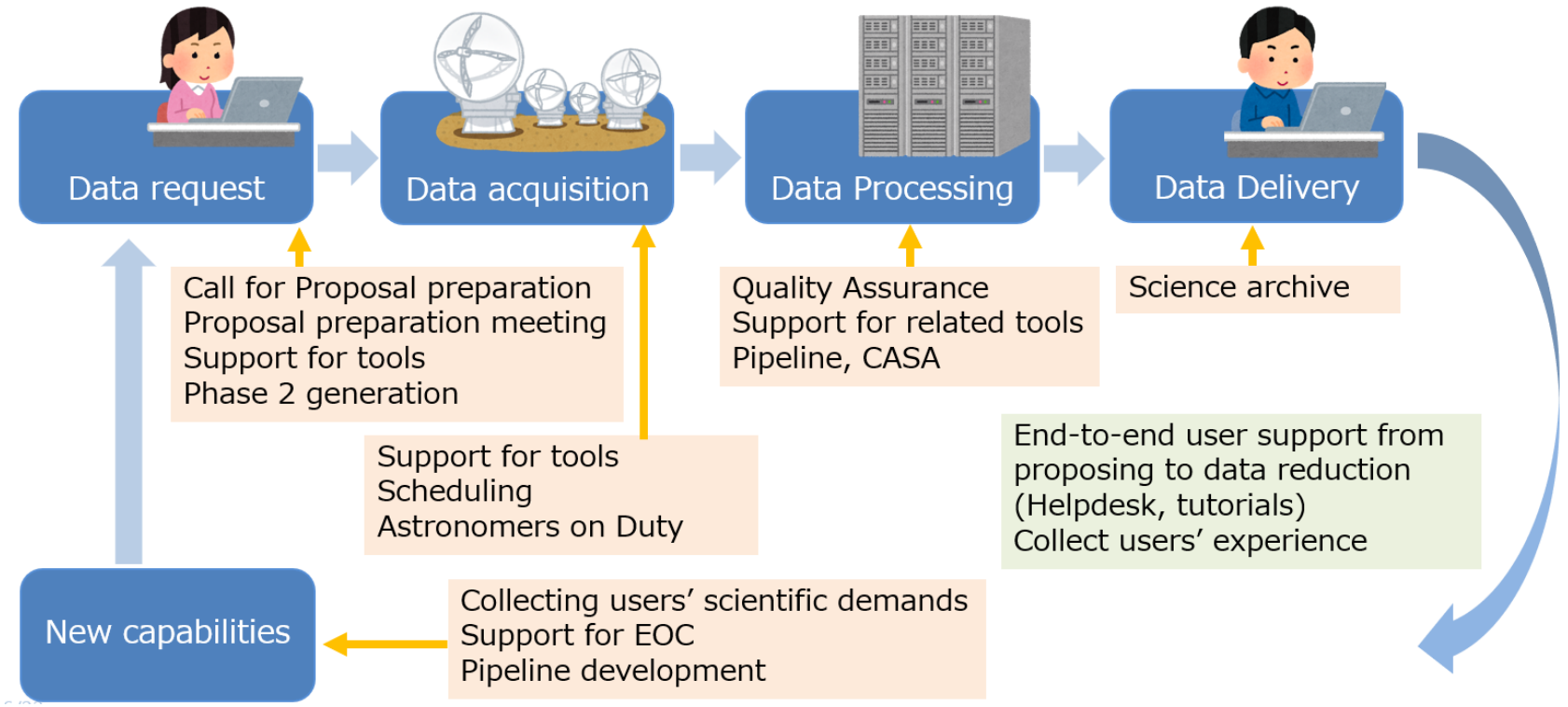
Yu-Nung Su will update for Taiwan node

Aran Lyo will update for Korean node

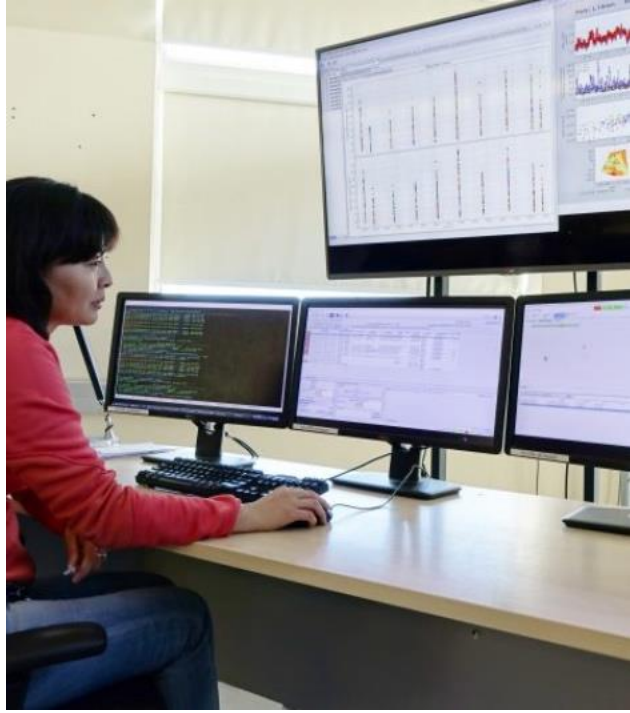
Working as “one ALMA” on daily basis

- Support your observations and archive users in various aspects.

- We are also doing:
  - ✓ System design for Wideband Sensitivity Upgrade (WSU)
    → Ishii-san’s talk
  - ✓ Commissioning of new observing capabilities
    (Band 1, 7-m sub-array, etc.)
  - ✓ Regional optimized user-support items



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



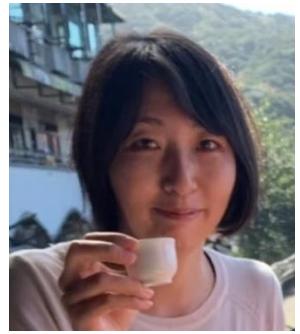
Working as “one ALMA” on daily basis

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

East Asia ALMA Regional Center (EA ARC) at NAOJ

- Gianni Cataldi
- Xiaoyang Chen
- **Zhengyi Chen**
- Pei-Ying Hsieh
- **Natsuko Izumi**
- Takuma Izumi
- Akiko Kawamura
- **Kshitiz Mallick**
- Yuichi Matsuda
- Hiroshi Nagai
- Koichiro Nakanishi
- Masumi Shimojo
- Andrea Silva
- Satoko Takahashi
- **Kotomi Taniguchi**
- Sarolta Zahorecz
- Jorge Zavala
- Atsushi Miyazaki
- Toshinobu Takagi
- Yoshihiko Yamada
- Mika Konuma


Zhengyi Chen


Natsuko Izumi


Kshitiz Mallick


Kotomi Taniguchi

DMS Panel of the Users Committee (DPUC):
Y. Watanabe-san → T. Saito-san from Japan

Astronomer on Duty (now)

Receiving inputs/feedback from users

Two paths

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

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

Toshikazu Onishi (chair)

https://www.almaobservatory.org/en/about-alma/the-people/the-alma-committees/asac-members-list/

ALMA Science Advisory Committee

EA SAC, Japanese SAC

ALMA Board

Representatives from the Executives and user communities

https://www.almaobservatory.org/en/about-alma/the-people/the-alma-board/

ALMA Director

Joint ALMA Observatory (JAO)

Collaborate

East Asian ALMA Support Center

Project Manager

Teams:

Engineering Development Computing Operations Science EPO

①

②

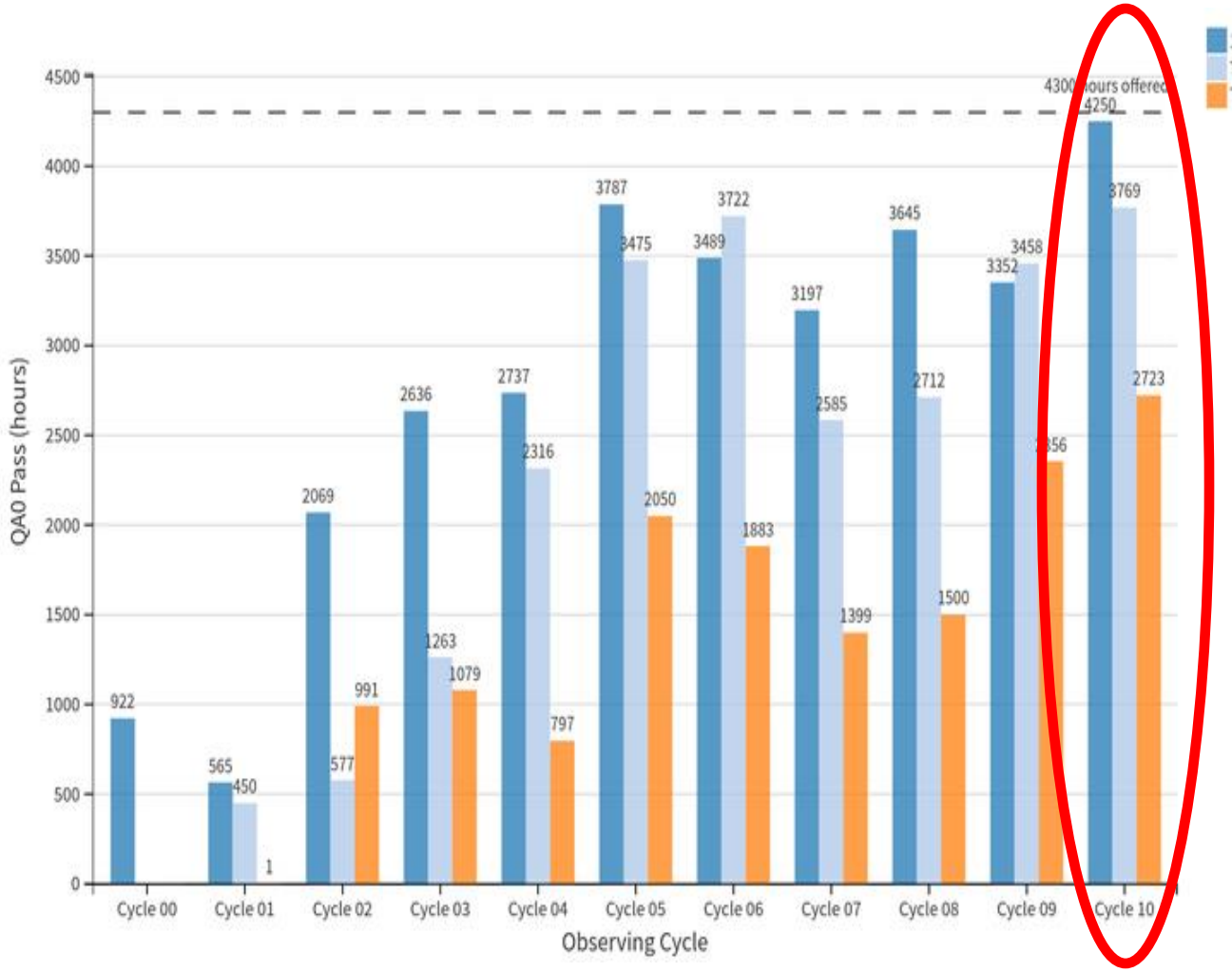
EA science community (users)

https://alma-telescope.jp/en/structure

Cycle 10 Highlight
(operation perspective)

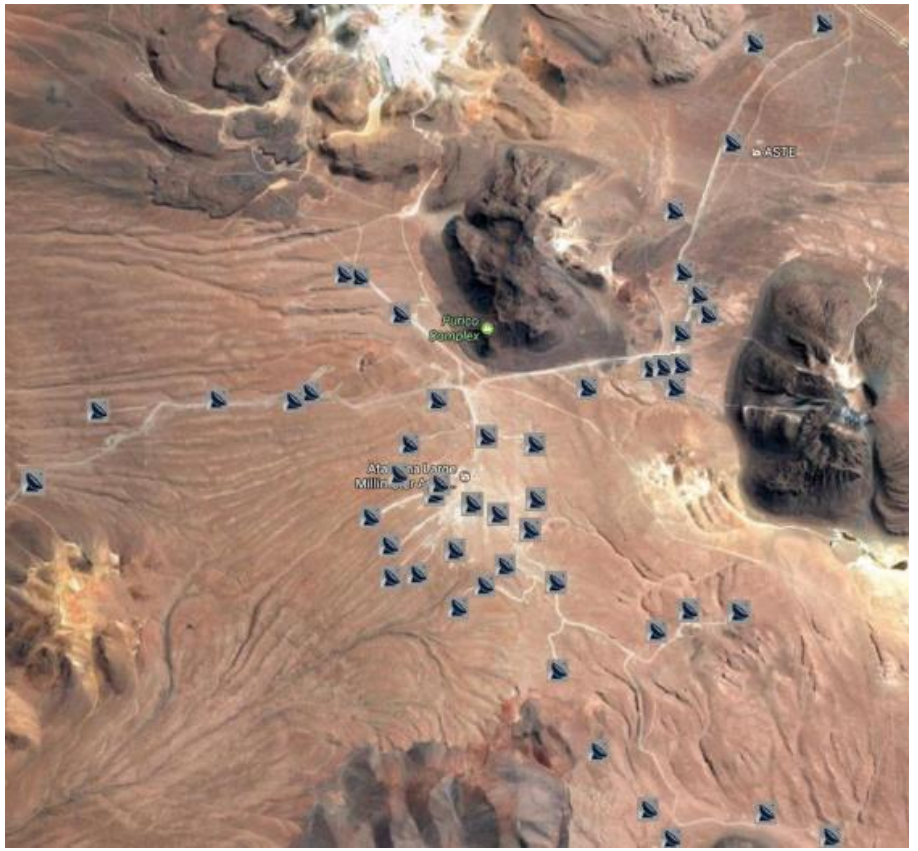
Cycle 10 Highlight: Record number of obs time

- Despite the observatory's hard time to prepare for WSU, the ALMA observatory acquire an impressive in total 4250 hrs of science-quality data (QA0 pass) on the 12-m array!
- This significantly exceeds the previous record of 3787 hrs in Cycle 5…!
- Record numbers were also achieved for 7-m (3769 hrs) and TP (2723 hrs).
- I would like to thank to all ALMA staff for this milestone achievement.



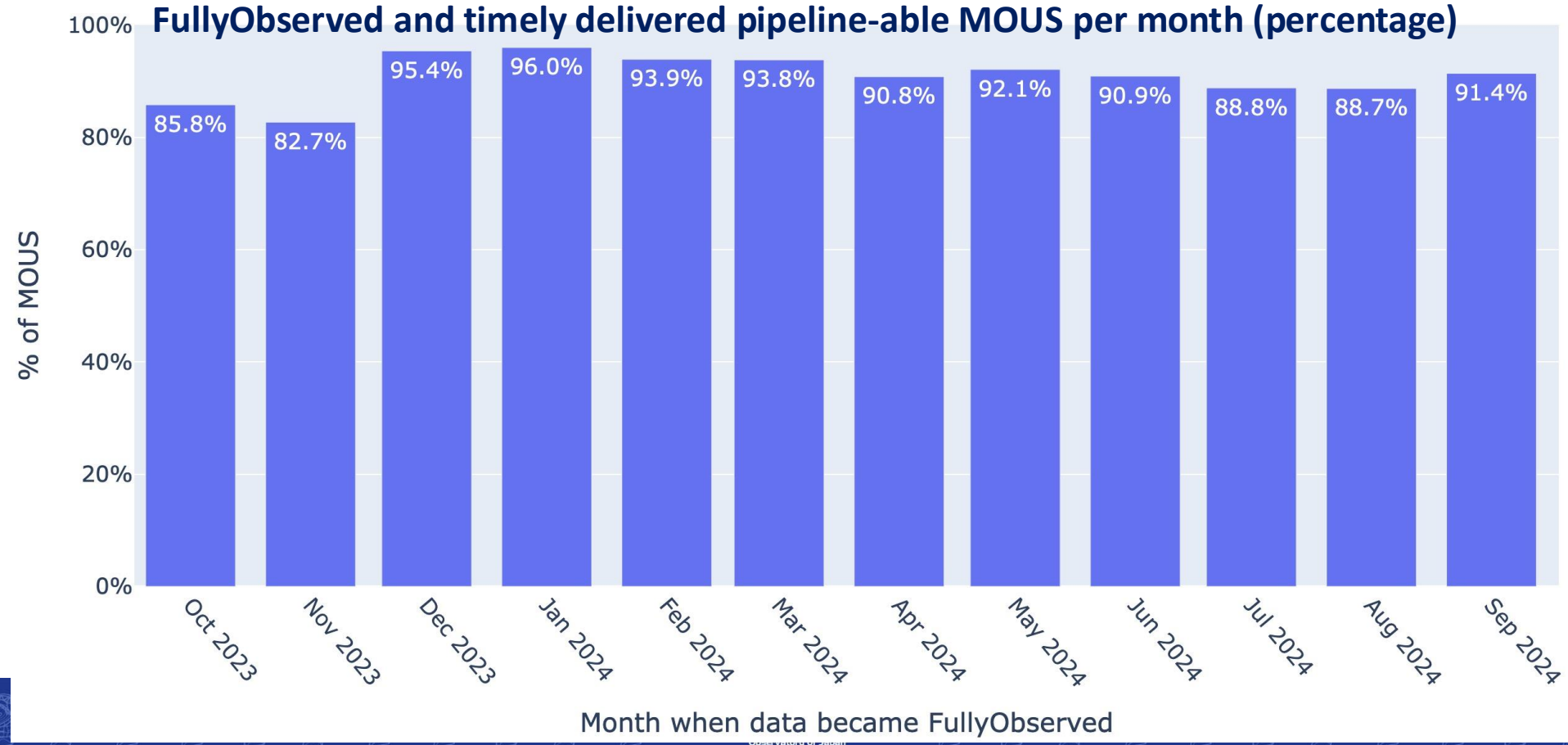
Cycle 10 Highlight: Array configurations

- There was an issue in both of the two antenna transporters, which required urgent maintenance at the beginning of Cycle 10.
- This has delayed the relocations of some antennas (C-8 and C-7), which changed the configuration schedule.
- We recovered as much as possible. Apologies for any inconvenience.



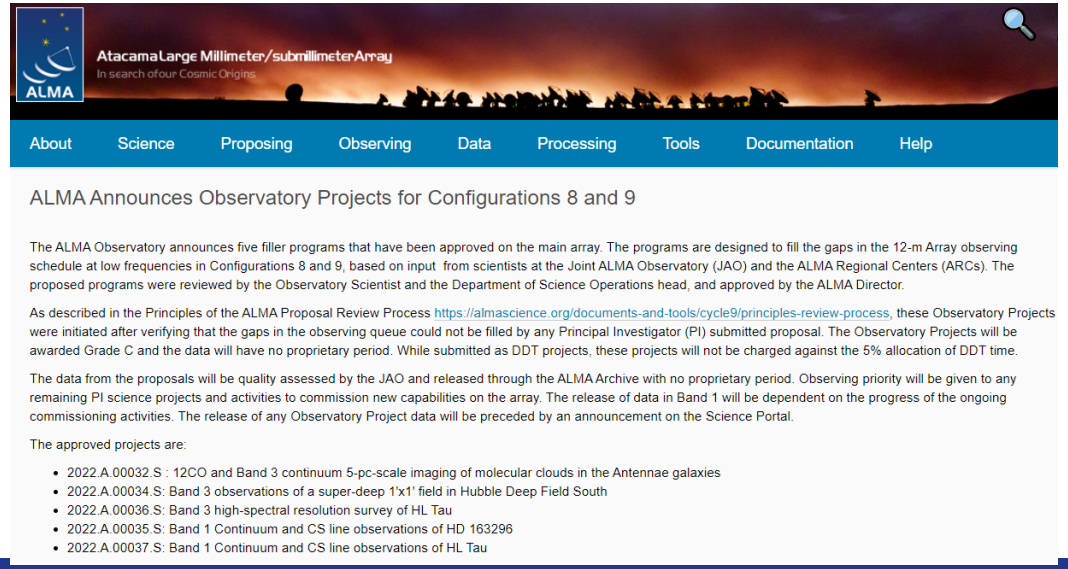
Cycle 10 Highlight: Efficient data processing

- Data processing maintained a high level of performance, with nearly 90% of pipelined data delivered within 30 days.
- Manual processing is still challenging (e.g., Band-to-Band calibration).

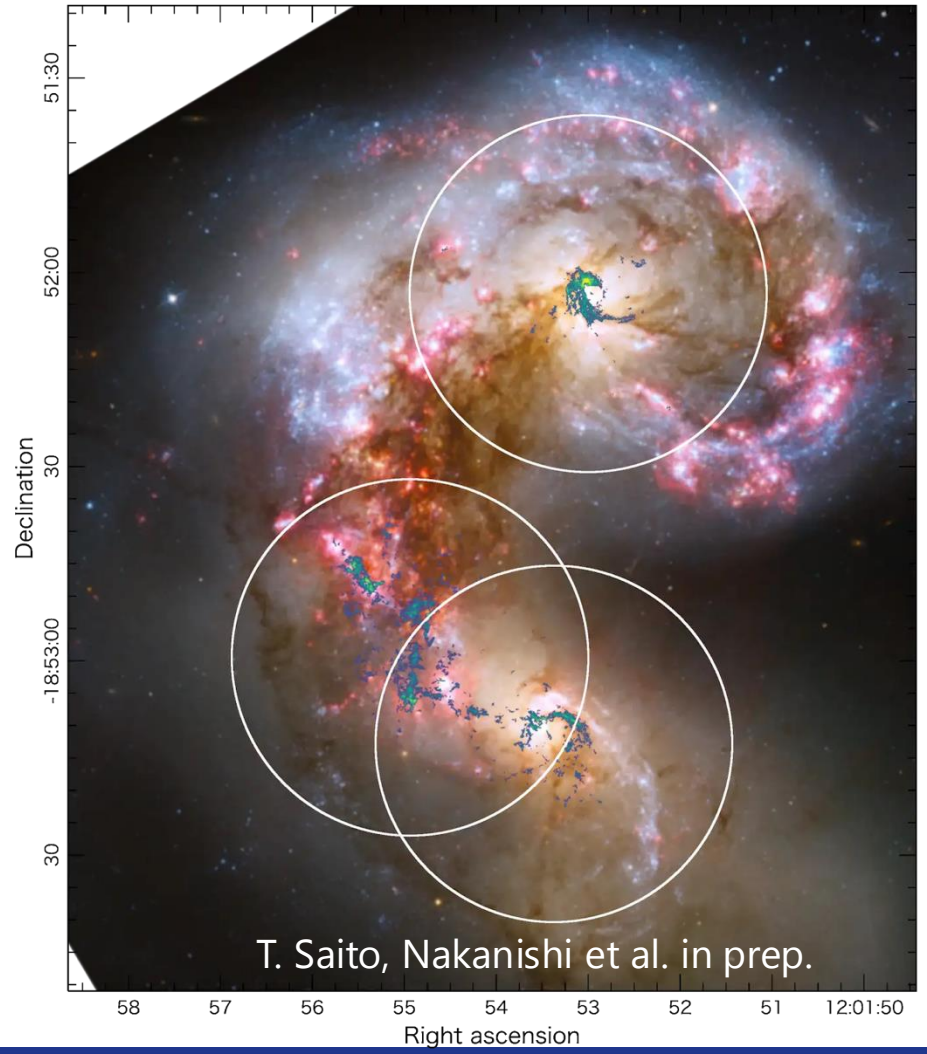


Cycle 10 Highlight: Observatory filler projects

- Five programs were designed to fill the gaps in the 12-m Array C-8 & -9 schedules at low frequencies, during Cycle 10. (Lack of sufficient number of low frequency PI projects)
- Observing priority was of course given to any PI science projects + activities to commission new capabilities on the array.

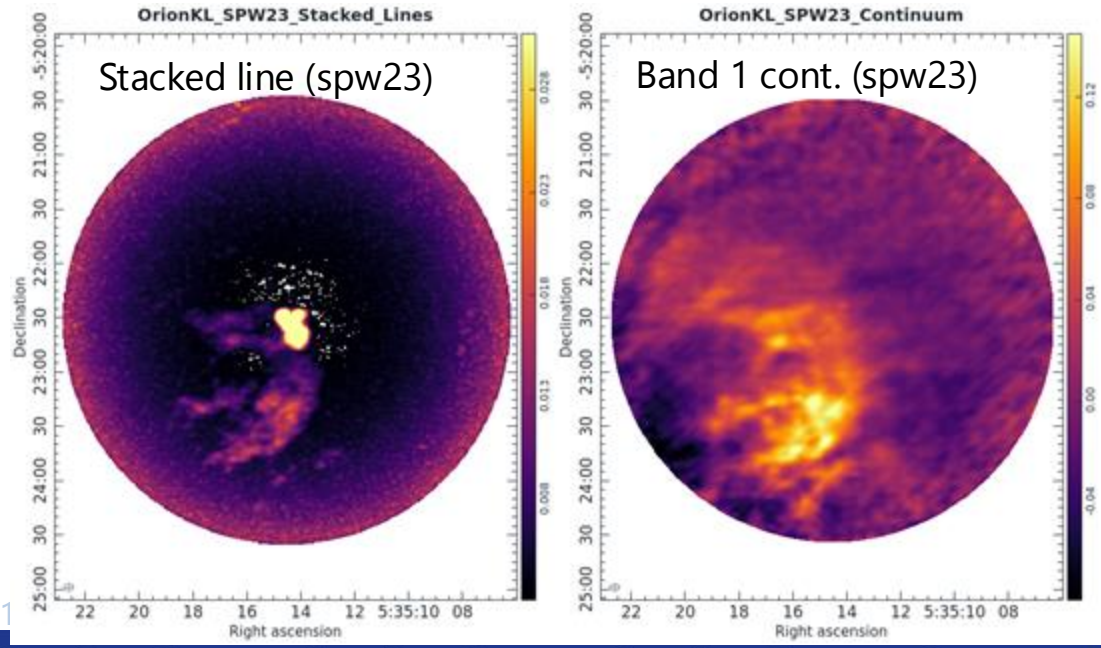


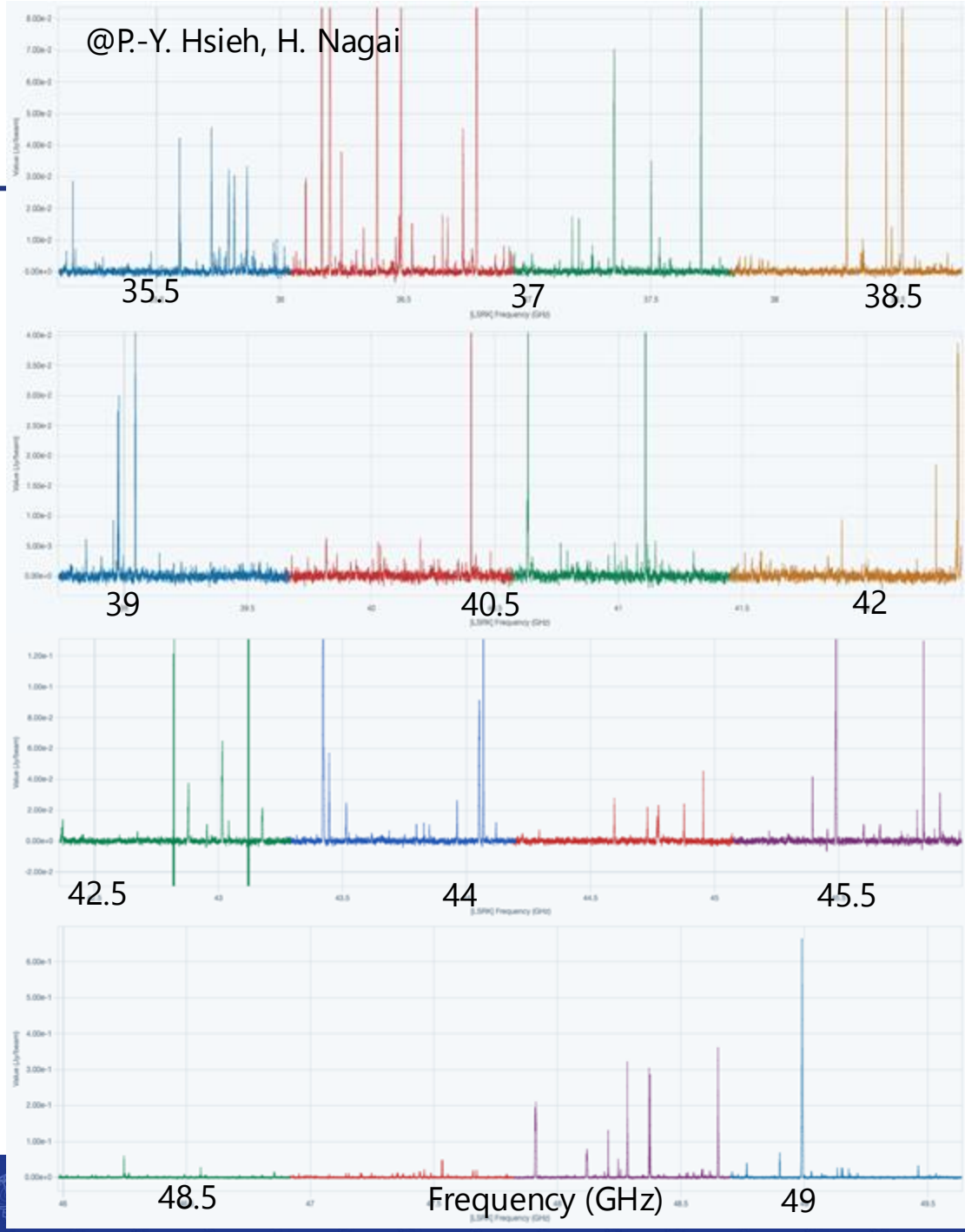
5-pc Band 3 (^{12}CO10 + 3mm cont) map of the Antenna



Cycle 10 Highlight: Band 1

- Band 1 on the 12-m array was officially offered from Cycle 10.
  → e.g., SV data of Ori-KL
  (https://almascience.nao.ac.jp/news/release-of-science-verification-data-for-orion-kl-in-band-1)
- Many Band 1 proposals are accepted from EA (19 for grade-A+B+C).





Cycle 11 Initial Results (operation perspective)

Cycle 11 – at the proposal submission

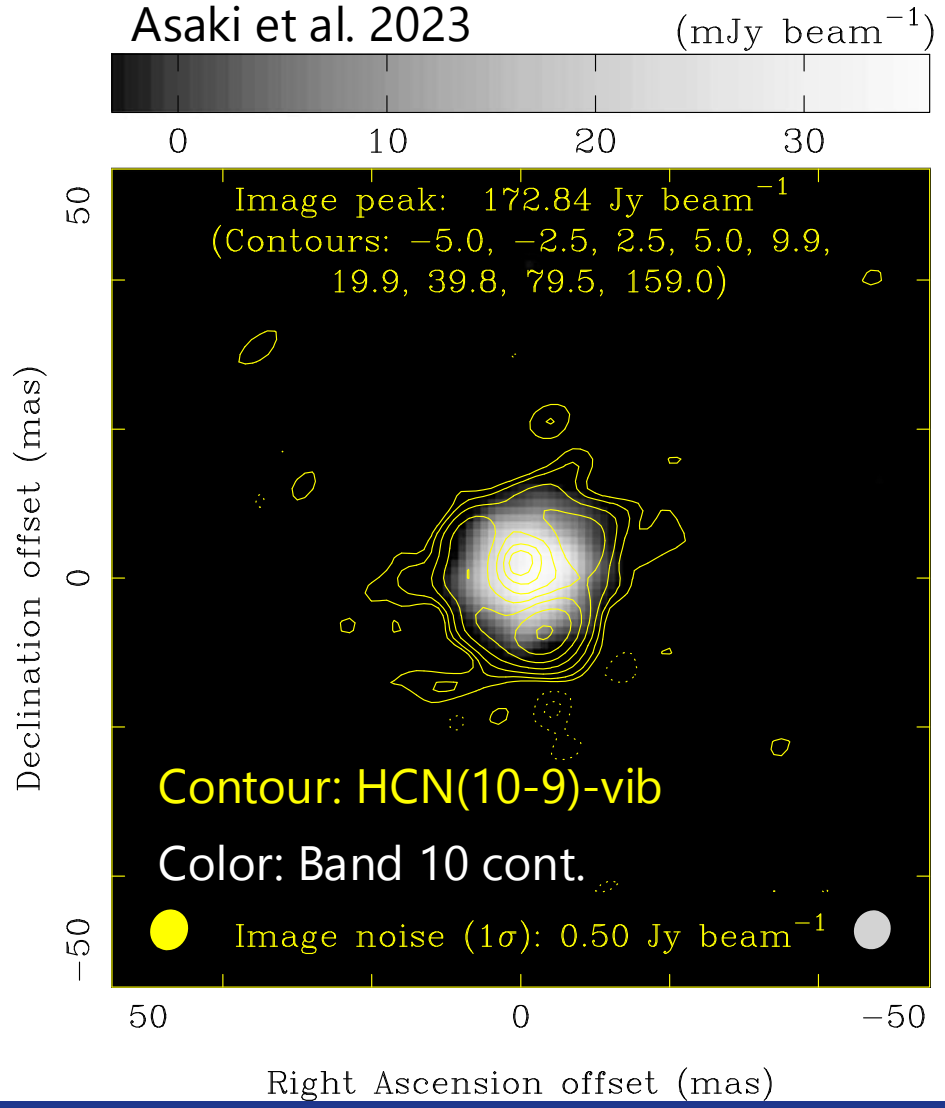
- One day before the deadline, proposals requiring Band 7 and higher started to experience inconsistent observing time estimates.
- This was due to a temporary and intermittent connectivity issue between the online calibrator catalogue and OT. When the catalog is not available, B2B calibration was triggered, which increased the estimated time a lot.
- This issue recurred during the hours before the DL, causing many validation/submission troubles.
- Another issue related to user authentication also occurred around the DL.
- We sincerely apologies for those who are involved to these issues.
- The root-causes were already identified and fixed.

Cycle 11 – Initial Results

- ALMA successfully started the Cycle 11 operation for all the 3 arrays on Sep 30th as planned.
- Some new capabilities have been offered: Full polarization in Band 1 (12-m array), Band 1 on the 7-m array (Stokes-I only), High-frequency long-baseline (Bands 9 and 10 in C-10 config), 4x4-bit spectral mode on the 7-m array (dual pol).
- We found some major data acquisition and processing issues at the beginning of the Cycle (triggered QA-3). But the root-causes were identified, and we are now getting back to the stable operation.

Cycle 11 – High-frequency, long-baseline

- ~5 mas resolution is now available (Band 6, 16-km baseline)!
- For example, Asaki et al. 2023 mapped HCN(10-9)-vib emission around the evolved star R Lep at Band 10.
  - ✓ Dense gas escaping from the star
- Band-to-Band (B2B) phase referencing technique allowed this achievement.
  - ✓ Originally developed in Nobeyama!
- We will see other super-high resolution cases in this Cycle.



User Support

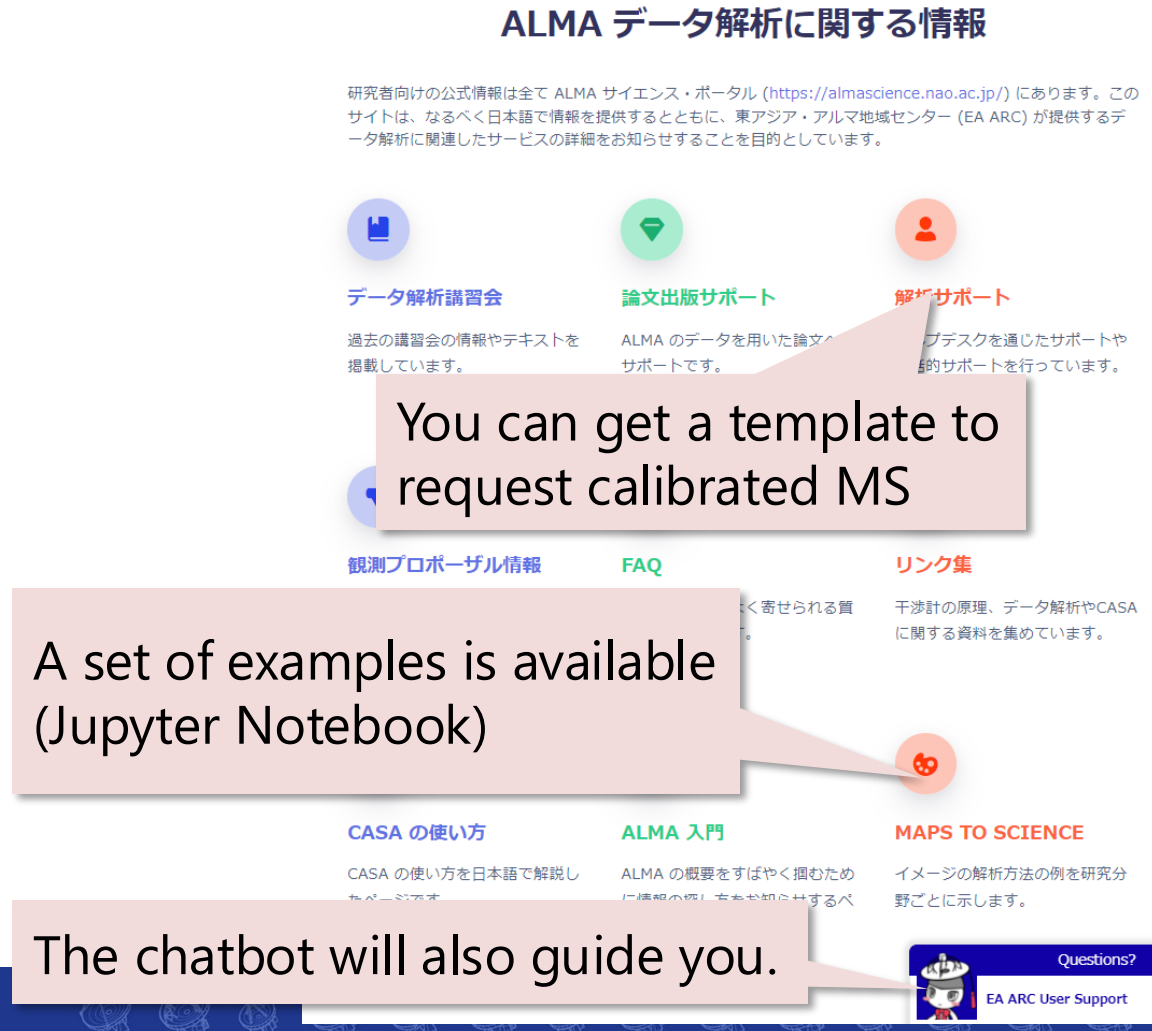
Regional support

User Support

- Calibrated MS delivery
  - We offer this service for data in all the cycles (except for Cycle 0: you can get the calibrated MS from the Archive)
- Face-to-face support at NAOJ
- 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 will be considered to realize

Supplemental website

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



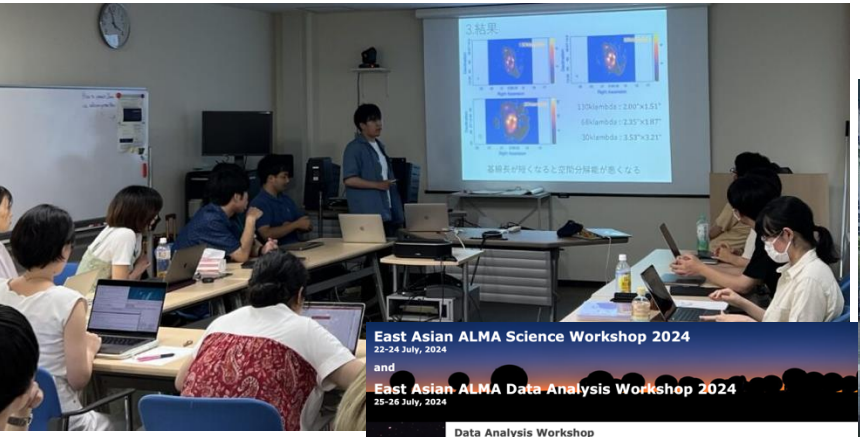
You can get a template to request calibrated MS

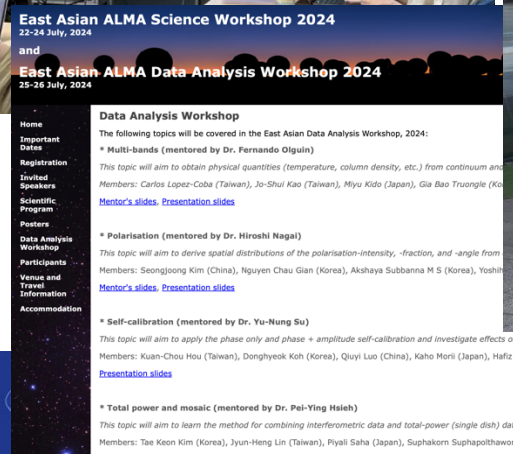
A set of examples is available (Jupyter Notebook)

The chatbot will also guide you.

Regional support
User Support

- We provide data reduction tutorials/workshops
- Beginner, Intermediate, and Advanced (new) courses for users in Japan
- From 2024, we organize EA-ALMA Data Analysis WS
  - ✓ The 1st one was held in Korea in 2024
  - ✓ Next one will be held in Japan in 2025





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

Questions?
EA ARC User Support

User Support: Proposal Preparation Meeting

- Explain the major changes from the previous Cycle, as well as the basics of ALMA proposals.
- Introduce notable “good points” of approved proposals.
- Offer English proofreading service.
- Hands-on session for individual consultation from users about their proposals (e.g., feedback on their approach/draft).
- Held annually, ~1 month before the proposal DL.

Dedicated website
https://www2.nao.ac.jp/~eaarc/Meetings/ALMA_PPM2024/

ALMA Cycle 11 Proposal Preparation Meeting

Date: JST9:30-17:00, March 22 (Fri) in 2024
Language: mostly English
Venue:hybrid (NAOJ Mitaka + online) for talks, NAOJ Mitaka for hands-on session

Program

Morning session Online/Onsite

9:30-9:55	ALMA Cycle 11 Proposer's Guide	Akiko Kawamura
9:55-10:20	Cycle 11 Observing Capabilities	Hiroshi Nagai
10:20-10:40	Observing Tool Guide	Jorge Zavala
10:40-10:50	From Scheduling and Phase 2 Generation Viewpoints	Yu-Ting Wu
10:50-11:05	break	
11:05-11:35	Cycle 10 Proposal Review Process - jointly held with Taiwan and Korea -	Pei-Ying Hsieh
11:35-11:55	Current Metrics of EA Proposals	Bunyo Hatsukade
111:55-12:15	Show Cases of Successful Proposals (general points)	Takuma Izumi

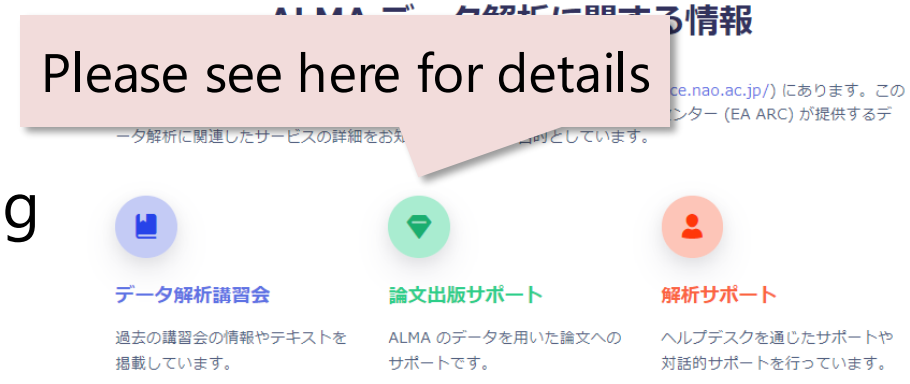
* The recording for some sessions will be available on request until April 15. Please contact us (see below for the contact information) if you attended and would like to watch the recording.

Hands-on session in the afternoon Onsite only

Regional support

User Support: Publication

- Publication Support program (JP)
  - Motivation
    1. Improving the scientific productivity, including papers with archival data
    2. Advertise science results in the international community
  - Publication fee, English editing fee, conference registration + travel fee, colloquium presentation in an overseas institutions, PR images
    - Based on inputs in the UM, JSAC, and discussion in the project
  - 1st authors who include the affiliation in Japan, and who submitted papers (or who will surely submit, for the case of English editing) with ALMA data



The fraction of publications has remained lower than the proportion of regional contributions until now.

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

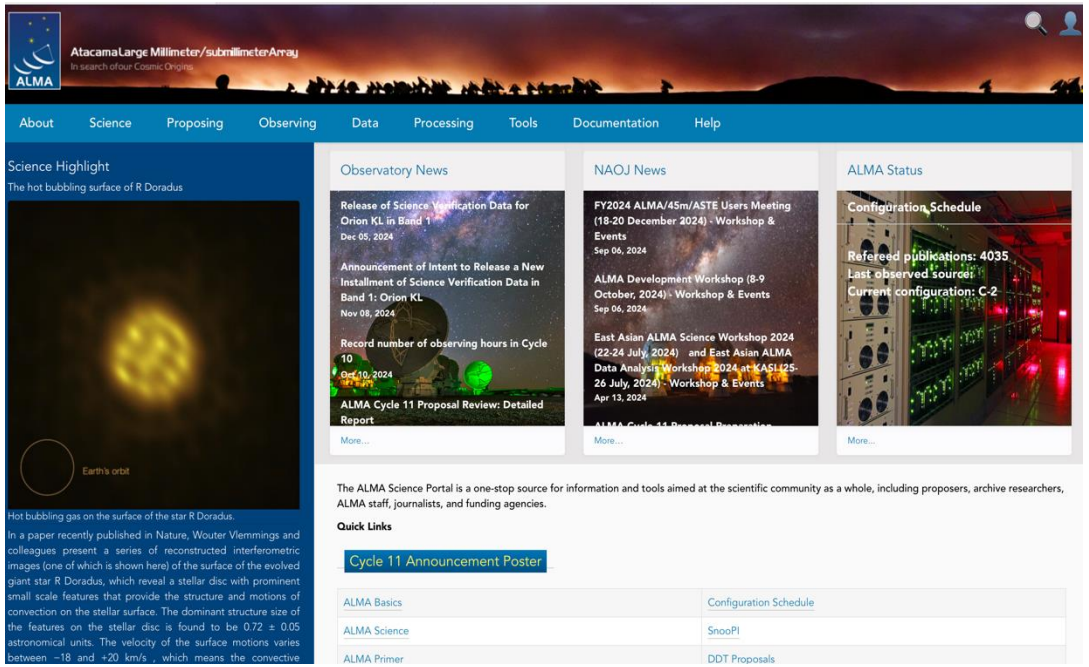
Cycle 12?

Cycle 12 – Information for early proposal planning

- We are rushing to release a plan.
- This release will include:
  - ✓Key dates (e.g., proposal deadline)
  - ✓New observing capabilities
  - ✓Available observing modes for Large Programs
  - ✓Possible configuration schedule
- We will soon make an announcement through the Science Portal.
- Some note for Cycle 12 proposal writing:
  - ✓ update your profile
  - ✓ follow the anonymity policy
  - ✓ be careful about plagiarism (also with AI)
  - ✓ avoid mass-proposals with copy/paste

NOT YET AVAILABLE!!

Check this → https://almascience.nao.ac.jp




Thank you!