

ALMA Science Operations Report - Cycle 10 and 11 -

Takuma Izumi

East Asia ALMA Regional Center (EA-ARC)

Users Meeting on December 19, 2024



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

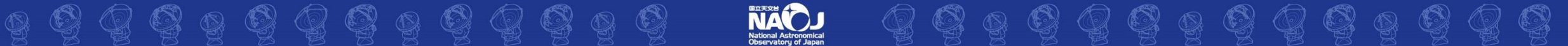


NA ARC

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

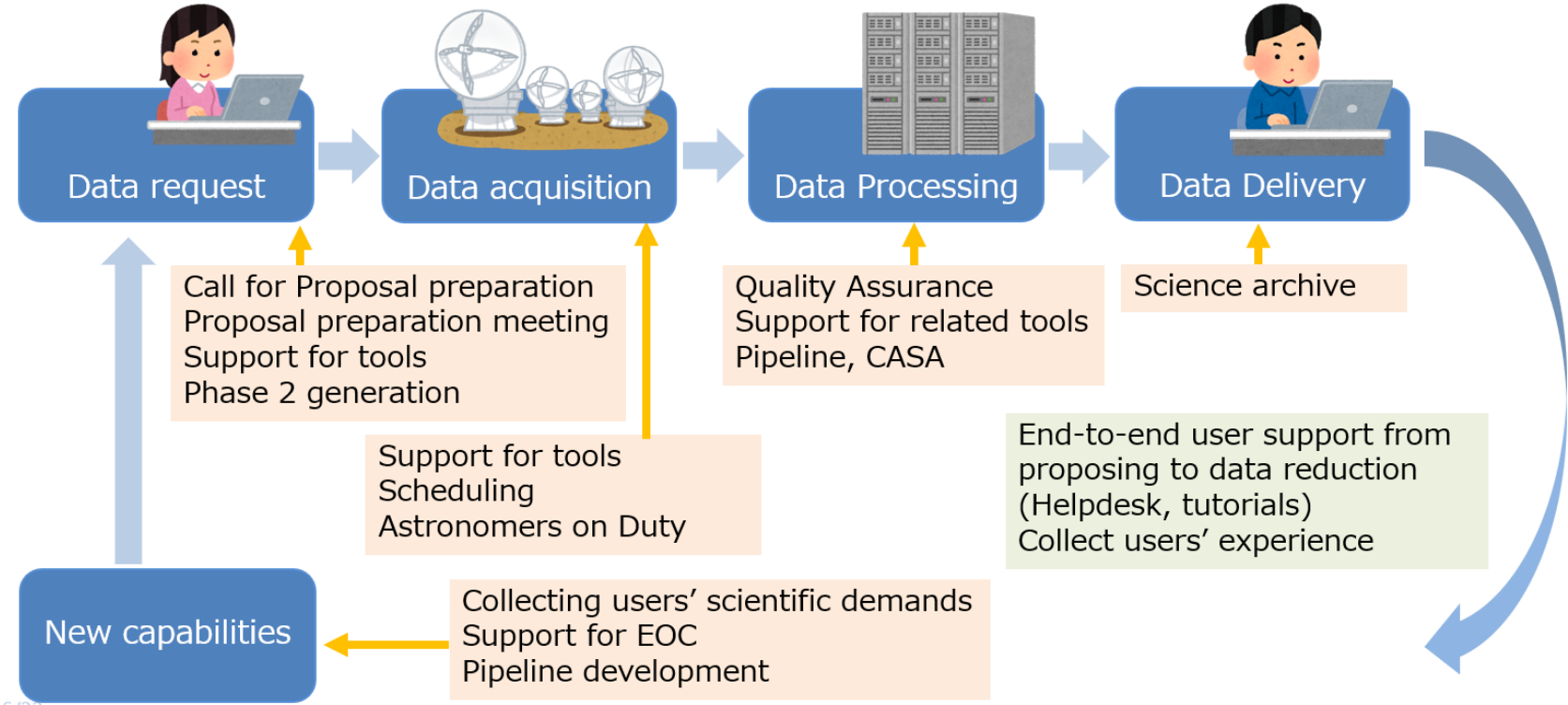
Aran Lyo will update for Korean node





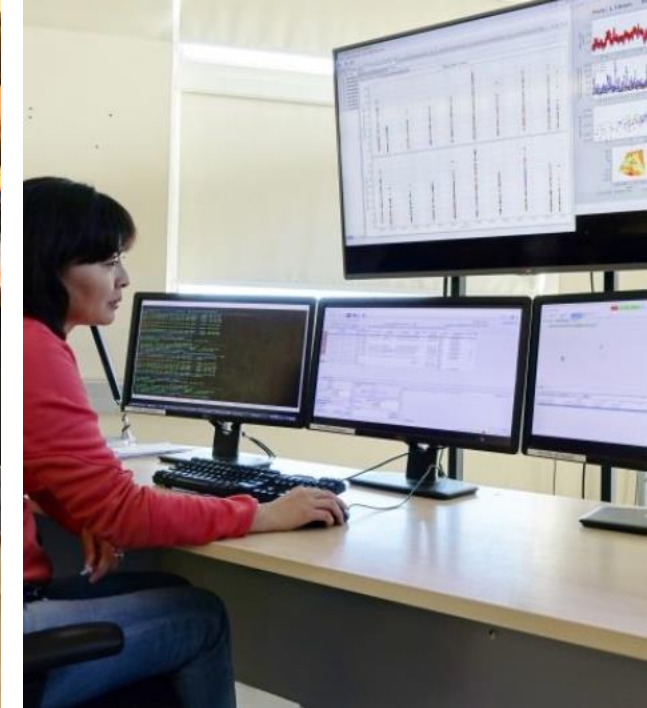
Working as "one ALMA" on daily basis

- 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.

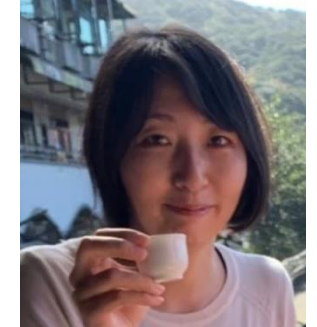


East Asia ALMA Regional Center (EA ARC) at NAOJ

- 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)**



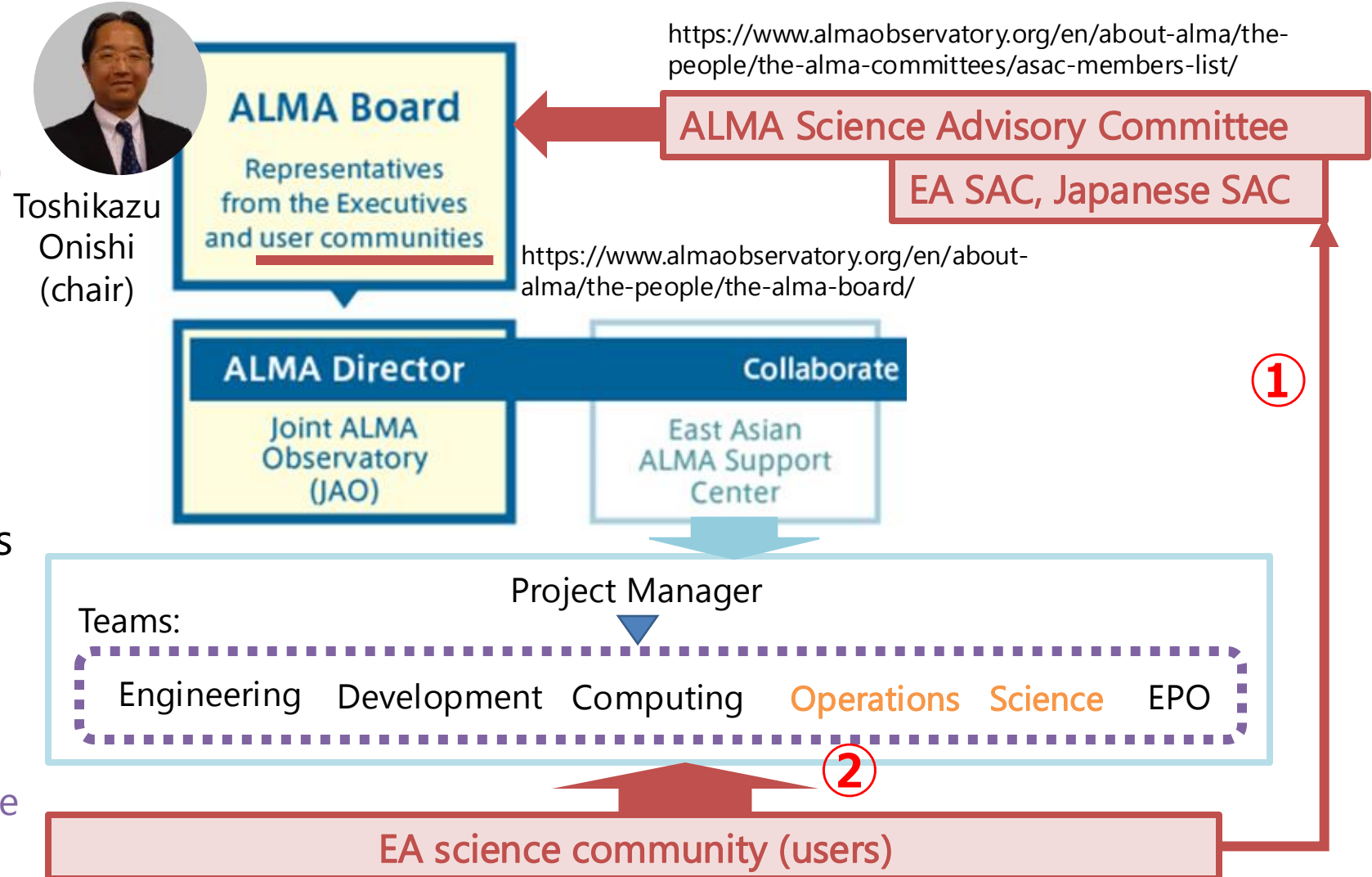


Receiving inputs/feedback from users

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.





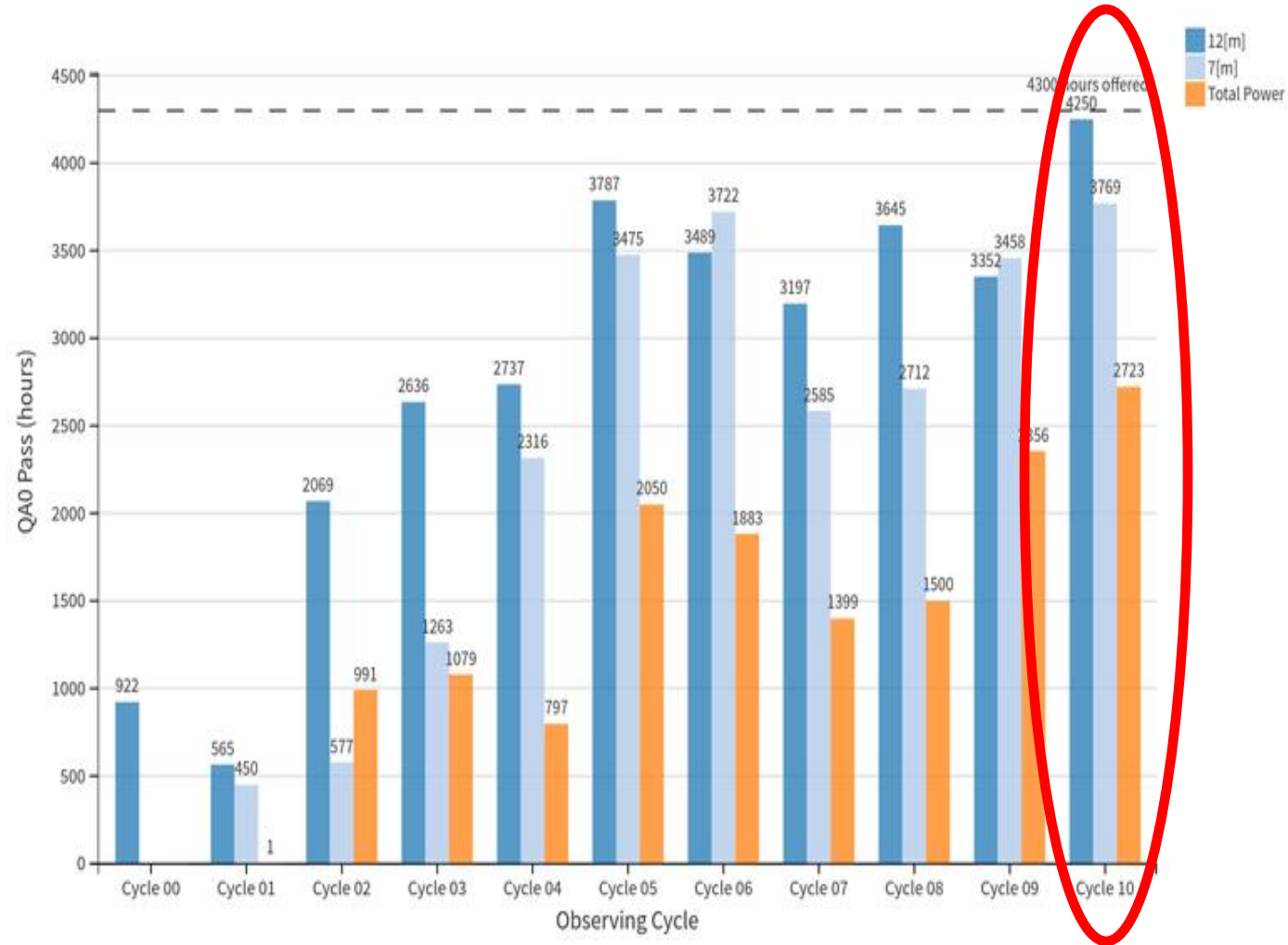
Cycle 10 Highlight (operation perspective)





Cycle 10 Highlight: Record number of obs time

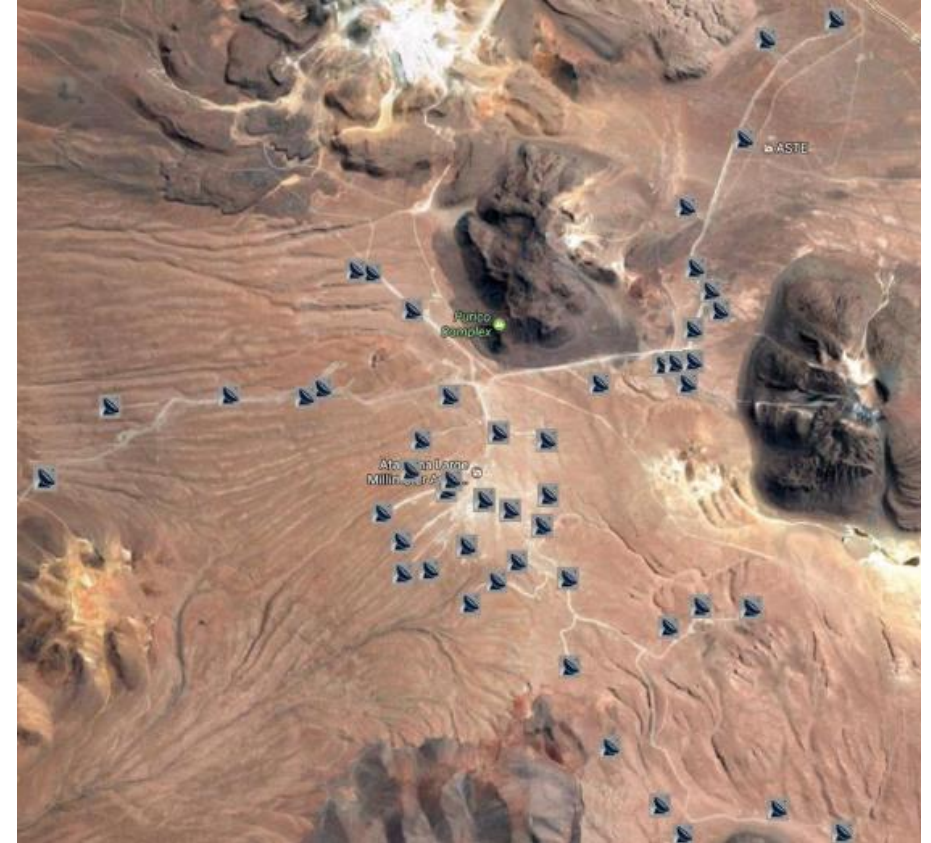
- Despite the observatory's hard time to prepare for WSU, the ALMA observatory acquire an impressive in total 4250 hrs of science-quality data (QA0 pass) on the 12-m array!
- This significantly exceeds the previous record of 3787 hrs in Cycle 5...!
- Record numbers were also achieved for 7-m (3769 hrs)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





Cycle 10 Highlight: Array configurations

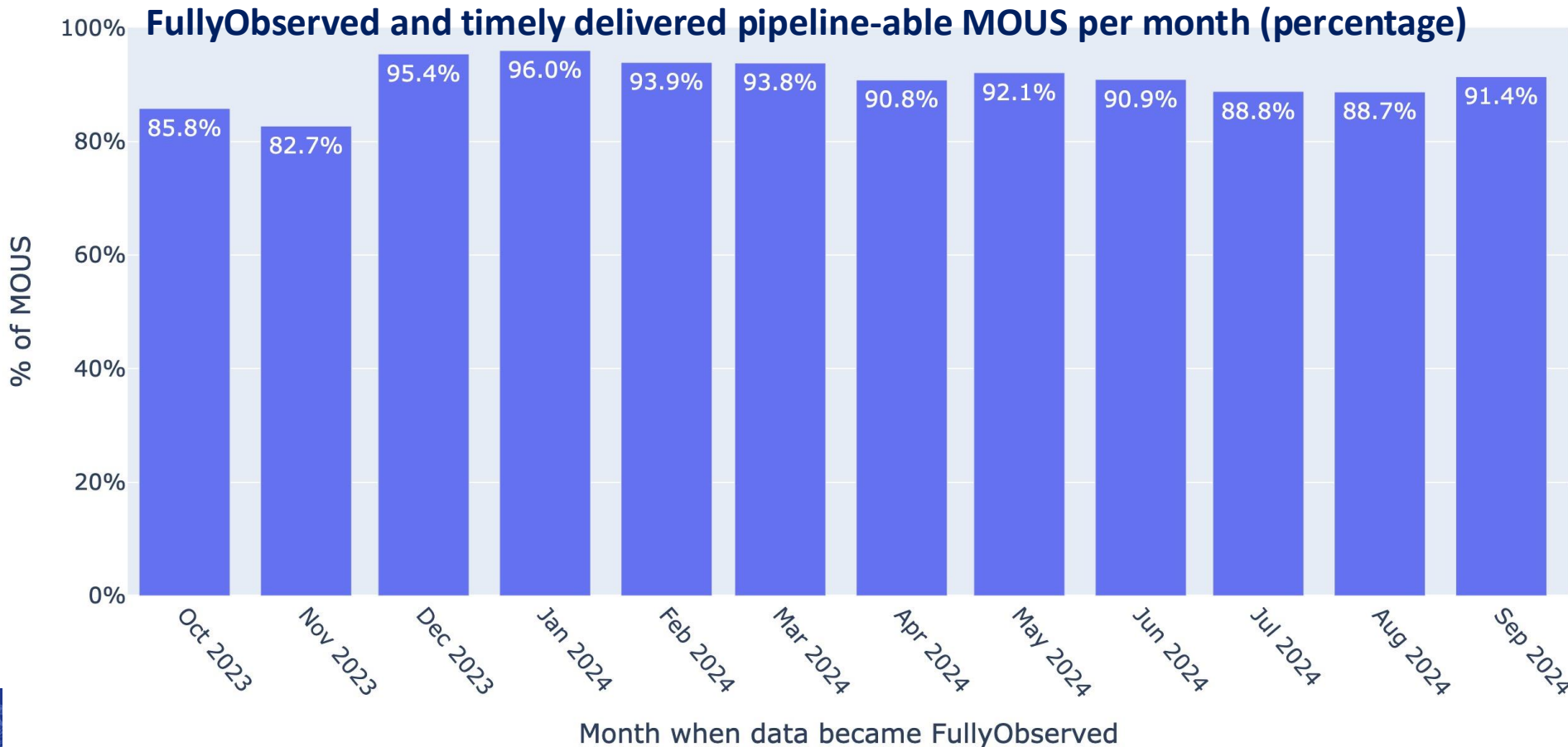
- There was an issue in both of the two antenna transporters, which required urgent maintenance at the beginning of Cycle 10.
- This has delayed the relocations of some antennas (C-8 and C-7), which changed the configuration schedule.
- We recovered as much as possible. Apologies for any inconvenience.





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).

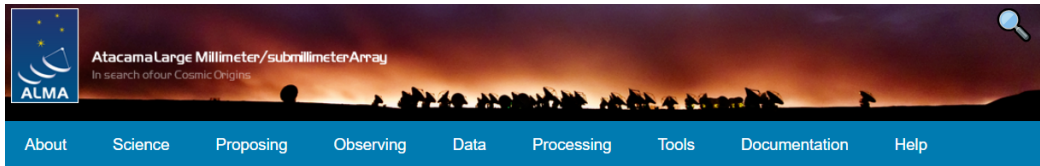
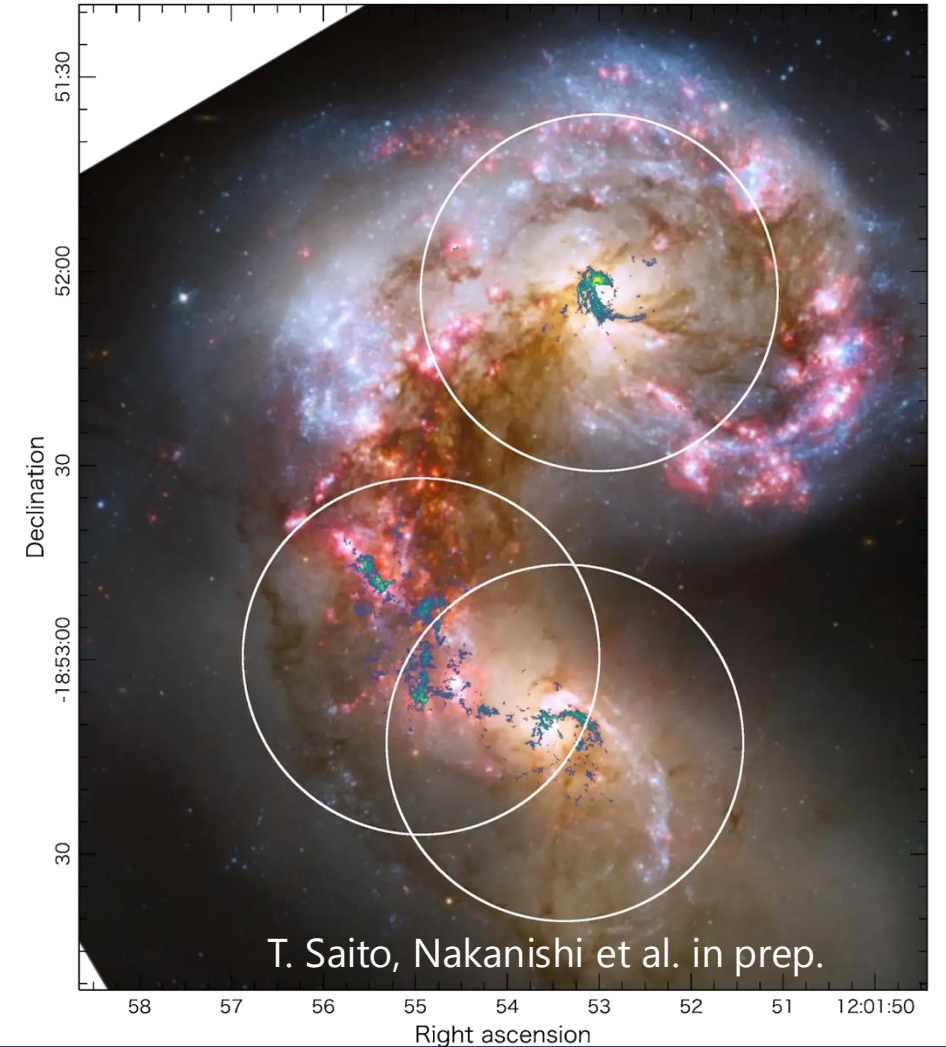




Cycle 10 Highlight: Observatory filler projects

- 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 ($^{12}\text{CO}10$ + 3mm cont) map of the Antenna



ALMA Announces Observatory Projects for Configurations 8 and 9

The ALMA Observatory announces five filler programs that have been approved on the main array. The programs are designed to fill the gaps in the 12-m Array observing schedule at low frequencies in Configurations 8 and 9, based on input from scientists at the Joint ALMA Observatory (JAO) and the ALMA Regional Centers (ARCs). The proposed programs were reviewed by the Observatory Scientist and the Department of Science Operations head, and approved by the ALMA Director.

As described in the Principles of the ALMA Proposal Review Process <https://almascience.org/documents-and-tools/cycle9/principles-review-process>, these Observatory Projects were initiated after verifying that the gaps in the observing queue could not be filled by any Principal Investigator (PI) submitted proposal. The Observatory Projects will be awarded Grade C and the data will have no proprietary period. While submitted as DDT projects, these projects will not be charged against the 5% allocation of DDT time.

The data from the proposals will be quality assessed by the JAO and released through the ALMA Archive with no proprietary period. Observing priority will be given to any remaining PI science projects and activities to commission new capabilities on the array. The release of data in Band 1 will be dependent on the progress of the ongoing commissioning activities. The release of any Observatory Project data will be preceded by an announcement on the Science Portal.

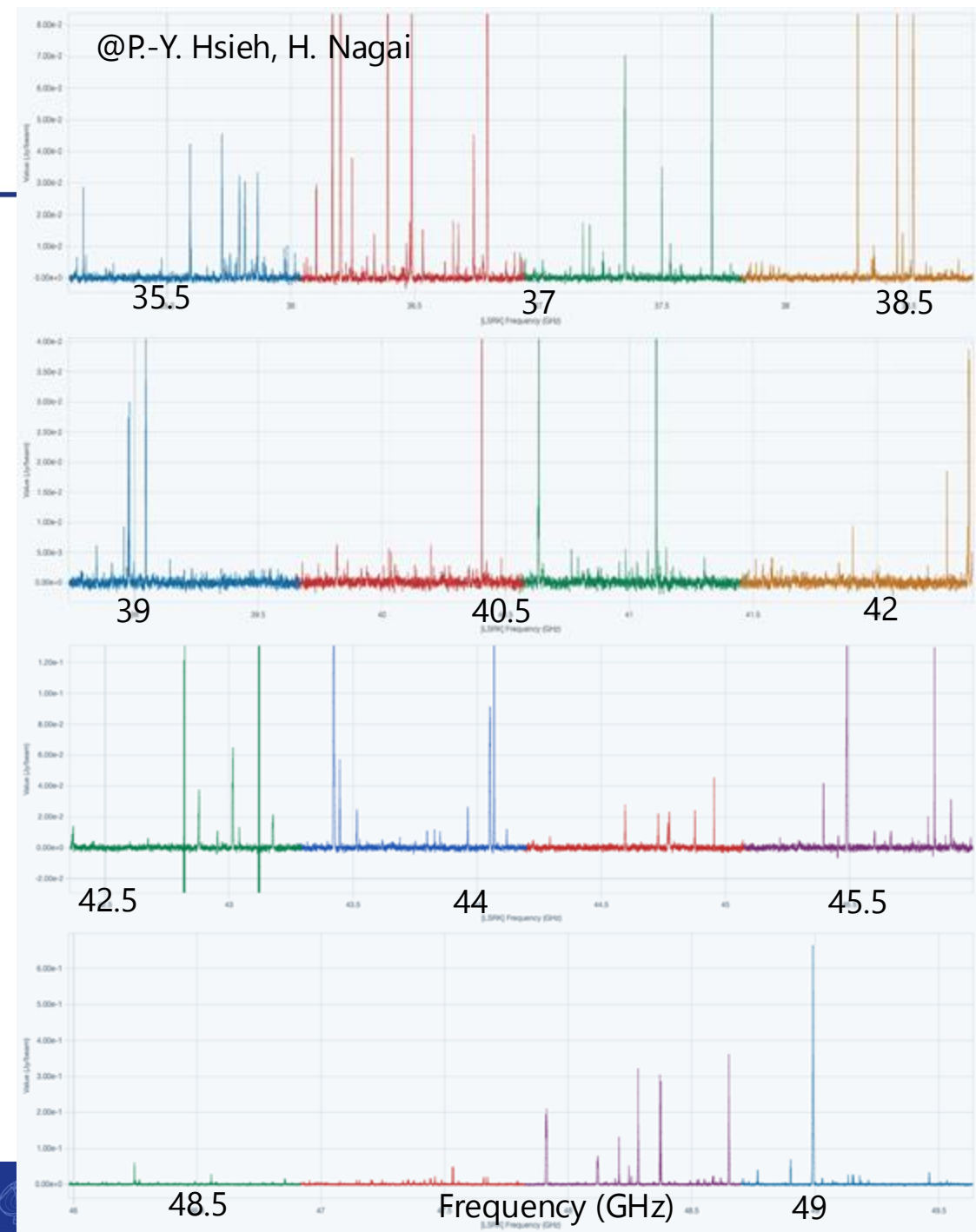
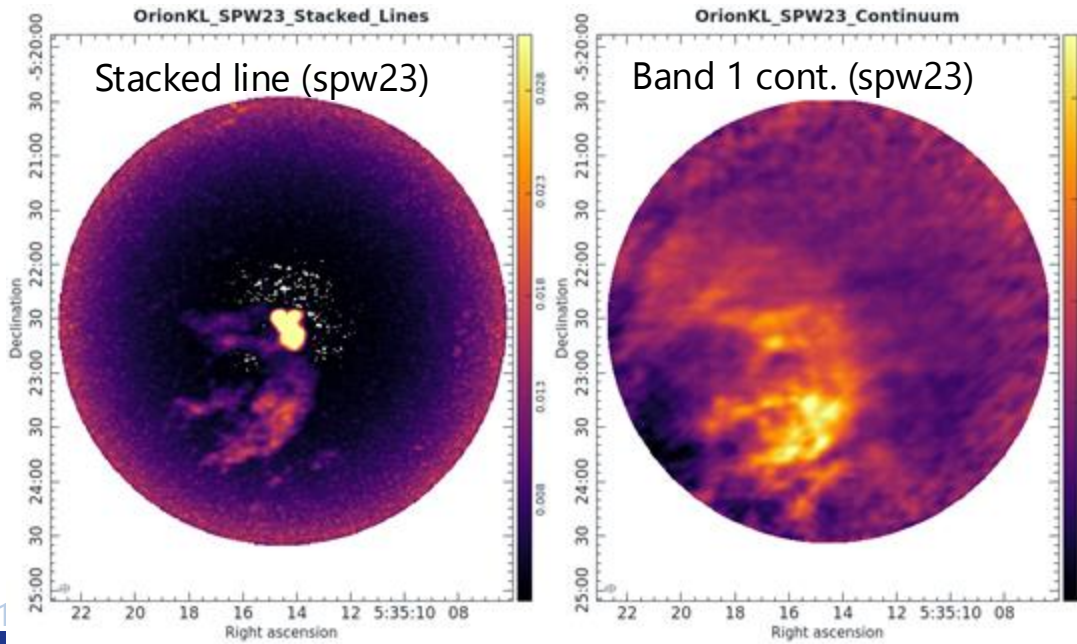
The approved projects are:

- 2022.A.00032.S: ^{12}CO and Band 3 continuum 5-pc-scale imaging of molecular clouds in the Antennae galaxies
- 2022.A.00034.S: Band 3 observations of a super-deep $1' \times 1'$ field in Hubble Deep Field South
- 2022.A.00036.S: Band 3 high-spectral resolution survey of HL Tau
- 2022.A.00035.S: Band 1 Continuum and CS line observations of HD 163296
- 2022.A.00037.S: Band 1 Continuum and CS line observations of HL Tau



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

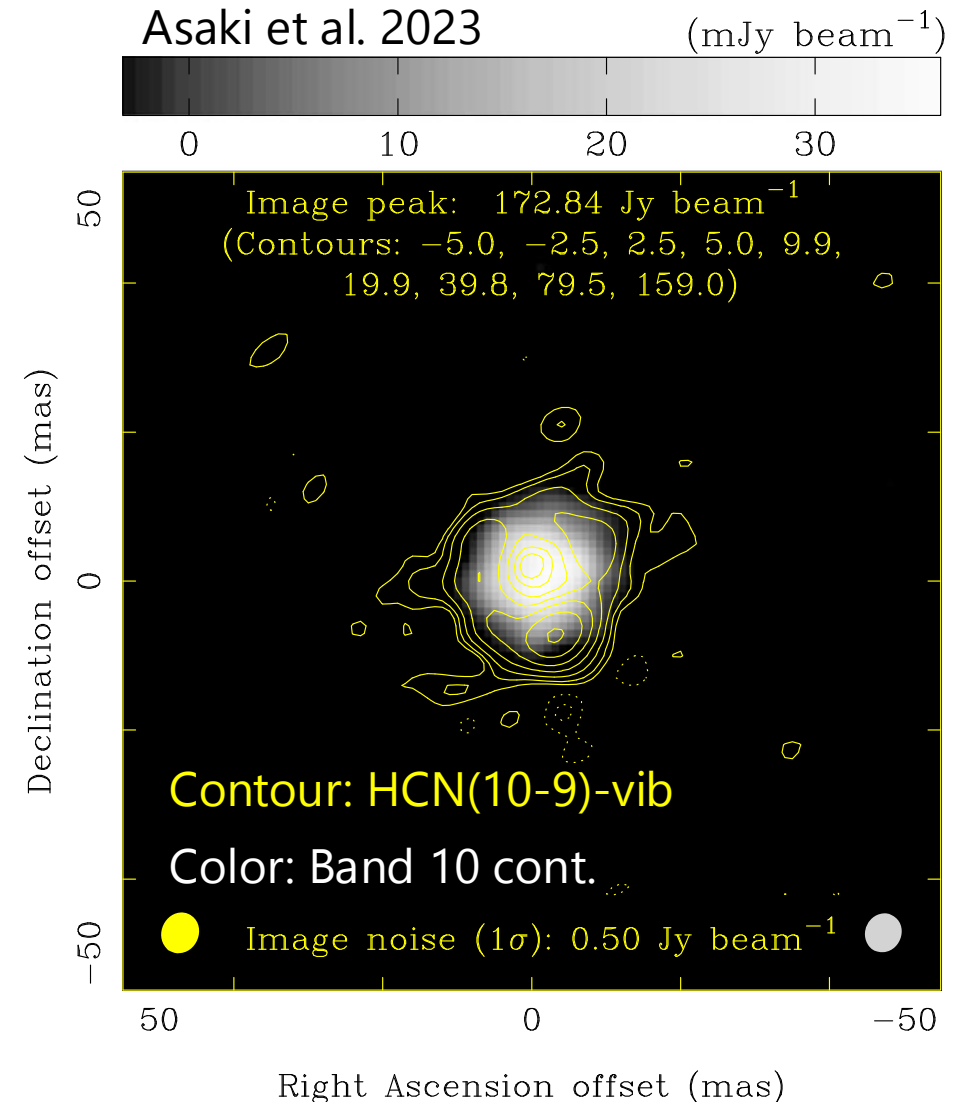
- ALMA successfully started the Cycle 11 operation for all the 3 arrays on Sep 30th as planned.
- Some new capabilities have been offered: Full polarization in Band 1 (12-m array), Band 1 on the 7-m array (Stokes-I only), High-frequency long-baseline (Bands 9 and 10 in C-10 config), 4x4-bit spectral 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>

ALMA データ解析に関する情報

研究者向けの公式情報は全て ALMA サイエンス・ポータル (<https://almascience.nao.ac.jp/>) にあります。このサイトは、なるべく日本語で情報を提供するとともに、東アジア・アルマ地域センター (EA ARC) が提供するデータ解析に関連したサービスの詳細をお知らせすることを目的としています。

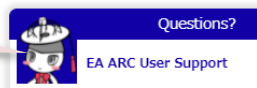
The screenshot shows a grid of service icons and text boxes:

- データ解析講習会** (Data Analysis Workshop): 過去の講習会の情報やテキストを掲載しています。
- 論文出版サポート** (Paper Publication Support): ALMA のデータを用いた論文の出版サポートです。
- 解析サポート** (Analysis Support): プロデュークを通じたサポートや個別のサポートを行っています。
- 観測プロポーザル情報** (Observation Proposal Information)
- FAQ** (Frequently Asked Questions)
- リンク集** (Link Collection): 干渉計の原理、データ解析やCASAに関する資料を集めています。
- CASA の使い方** (How to use CASA): CASA の使い方を日本語で解説したページです。
- ALMA 入門** (ALMA Introduction): ALMA の概要をすばやく掴むための情報の窓口をお知らせするページです。
- MAPS TO SCIENCE** (Maps to Science): イメージの解析方法の例を研究分野ごとに示します。

You can get a template to request calibrated MS

A set of examples is available (Jupyter Notebook)

The chatbot will also guide you.



Questions?

EA ARC User Support





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>

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研究者向けの公式情報は全サイトは、なるべく日本語で提供しています。

...or, you can google with "ALMAデータ解析講習会"



データ解析講習会

過去の講習会の情報やテキストを掲載しています。



論文出版サポート

ALMA のデータを用いた論文へのサポートです。



解析サポート

ヘルプデスクを通じたサポートや対話的サポートを行っています。



FAQ

ヘルプデスクによく寄せられる質問を集めています。



リンク集

干渉計の原理、データ解析や CASA に関する資料を集めています。



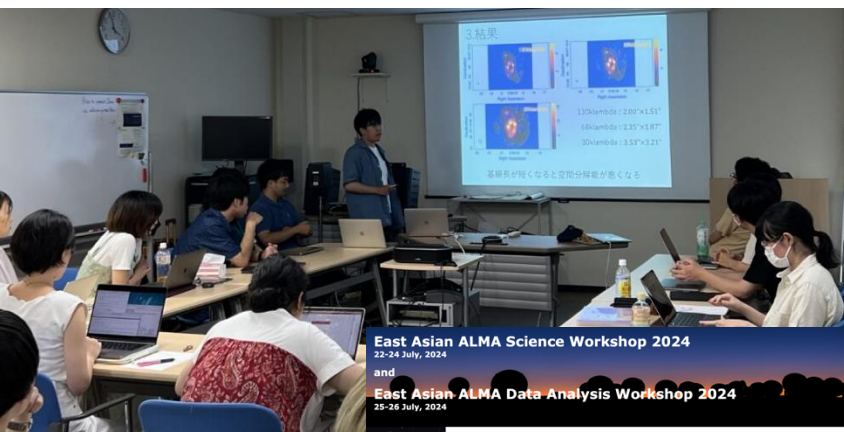
ALMA 入門

ALMA の概要をすばやく掴むために情報の探し方をお知らせするページです。



MAPS TO SCIENCE

イメージの解析方法の例を研究分野ごとに示します。



East Asian ALMA Science Workshop 2024
22-24 July, 2024

and
East Asian ALMA Data Analysis Workshop 2024
25-26 July, 2024

Home
Important Dates
Registration
Invited Speakers
Scientific Program
Posters
Data Analysis Workshop
Participants
Venue and Travel Information
Accommodation

Data Analysis Workshop

The following topics will be covered in the East Asian Data Analysis Workshop, 2024:

* Multi-bands (mentored by Dr. Fernando Olguin)

This topic will aim to obtain physical quantities (temperature, column density, etc.) from continuum and

Members: Carlos Lopez-Coba (Taiwan), Jo-Shui Kao (Taiwan), Miyu Kido (Japan), Gia Bao Truongle (Korea)

Mentor's slides, Presentation slides

* Polarisation (mentored by Dr. Hiroshi Nagai)

This topic will aim to derive spatial distributions of the polarisation-intensity, -fraction, and -angle from

Members: Seongjoong Kim (China), Nguyen Chau Gian (Korea), Akshaya Subbanna M S (Korea), Yoshitaka

Mentor's slides, Presentation slides

* Self-calibration (mentored by Dr. Yu-Nung Su)

This topic will aim to apply the phase only and phase + amplitude self-calibration and investigate effects of various parameters, such as the solution time interval and clean threshold.

Members: Kuan-Chou Hou (Taiwan), Donghyeok Koh (Korea), Qiuyi Luo (China), KaHo Mori (Japan), Hafiz Nazeer (India)

Presentation slides

* Total power and mosaic (mentored by Dr. Pei-Ying Hsieh)

This topic will aim to learn the method for combining interferometric data and total-power (single dish) data together with the method for making images from mosaic ALMA observations.

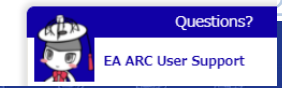
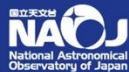
Members: Tae Keon Kim (Korea), Jyun-Heng Lin (Taiwan), Piyali Saha (Japan), Suphakorn Supaphothaworn (Japan), Himanshu Tyagi (India)



EA ALMA Science Workshop 2024
EA ALMA Data Analysis Workshop 2024

EA ALMA Science Workshop 2024
EA ALMA Data Analysis Workshop 2024

2024/12/19





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
11:55-12:15	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








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

ALMA データ解析に関する情報

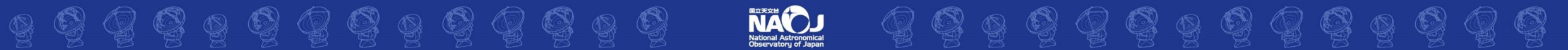
Please see here for details

ce.nao.ac.jp/) あります。この
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データ解析講習会	論文出版サポート	解析サポート
過去の講習会の情報やテキストを掲載しています。	ALMA のデータを用いた論文へのサポートです。	ヘルプデスクを通じたサポートや対話的サポートを行っています。

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>

The screenshot shows the ALMA Science Portal website. At the top, there is a navigation bar with tabs for About, Science, Proposing, Observing, Data, Processing, Tools, Documentation, and Help. Below the navigation bar, the page is divided into several sections:

- Science Highlight:** Features an image of the hot bubbling surface of the star R Doradus. Below the image, there is a caption and a short paragraph of text.
- Observatory News:** Contains several news items with dates, such as "Release of Science Verification Data for Orion KL in Band 1" (Dec 05, 2024) and "Announcement of Intent to Release a New Installment of Science Verification Data in Band 1: Orion KL" (Nov 08, 2024).
- NAOJ News:** Contains news items like "FY2024 ALMA/45m/ASTE Users Meeting (18-20 December 2024) - Workshop & Events" (Sep 06, 2024) and "ALMA Development Workshop (8-9 October, 2024) - Workshop & Events" (Sep 06, 2024).
- ALMA Status:** Displays key statistics such as "Referenced publications: 4035", "Last observed source: C-2", and "Current configuration: C-2".
- Quick Links:** A table of links for various resources.

Quick Links	
Cycle 11 Announcement Poster	
ALMA Basics	Configuration Schedule
ALMA Science	SnooPI
ALMA Primer	DDT Proposals





Thank you!