Atacama Large Millimeter/submillimeter Array (ALMA)



- The world's largest sub/mm interferometry.
- Located at the 5000m Atacama Desert in Chile (~40 hrs from Tokyo).
- Operated by North America, Europe, East Asia, and Chile.
- Max baseline = 16 km → 10× higher resolution than the HST.



- ALMA consists of three different "arrays":
  - Main Array (50 × 12m antenna)
  - Atacama Compact Array (a.k.a. Morita Array; 12 × 7m antenna)
  - Total Power Array (4 × 12m antenna) → single dish
- Operating over a wide range of frequency of 35 - 950 GHz.
  - 10 receiver bands
- Started early operation from 2011. Since then, ALMA has continued to produce ground-breaking results.

East-Asia ALMA Regional Center (EA-ARC)



Work together with the Joint ALMA Observatory (JAO; Chile) and the other regional ARCs (NA, EU)

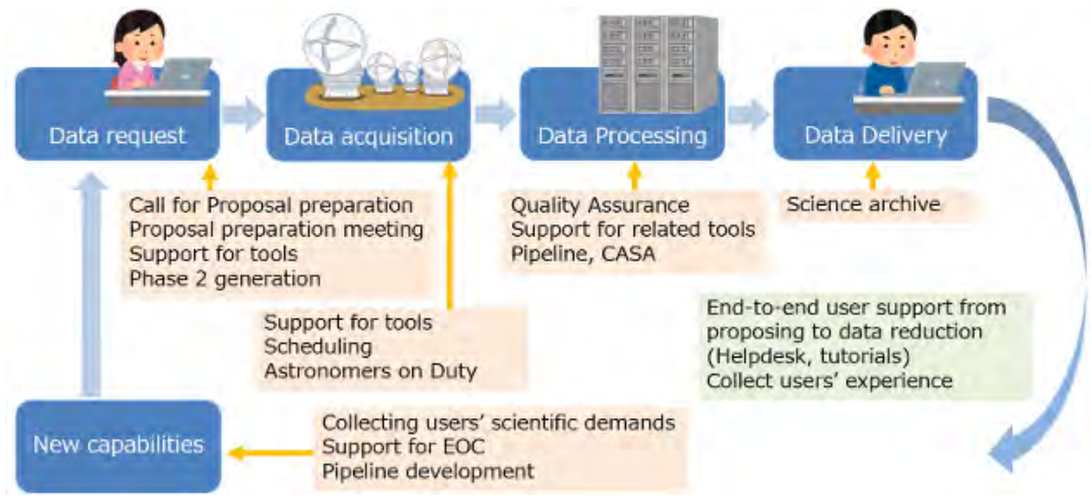
Central office in NAOJ Mitaka

- Core functions: agreed on internationally.
- Enhanced functions: flexibly planned and executed in each ARC.
  - Native language support
  - Realization of user's demands, etc.

Two nodes in Taiwan and Korea

- User support optimized to the individual region in addition to the core functions of the ARC.

Working as "one ALMA" on daily basis to support your observations



We are also doing - system design, Wideband Sensitivity Upgrade (**WSU**), commissioning, etc.

PR-17P

Overview of the ALMA Project and the EA-ARC

Takuma Izumi, Satoru Iguchi, Misato Fukagawa, Bunyo Hatsukade, Shun Ishii, Kenichi Kikuchi, George Kosugi, Kanako Sugimoto, and the ALMA Project Team (NAOJ ALMA Project)

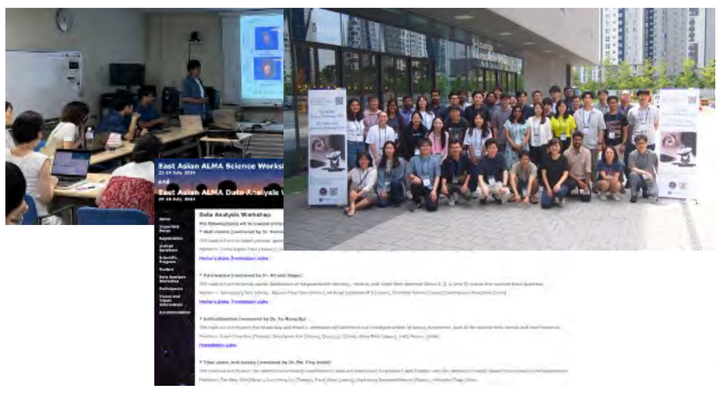
The Atacama Large Millimeter/submillimeter Array (ALMA), which consists of 66 high-precision antennas, is the world-largest sub/mm interferometer located at an altitude of 5000 meters on the Chajnantor Plateau in northern Chile. ALMA is a powerful tool for studying cold Universe across redshift, including the formation of planetary systems, stars, galaxies, and supermassive black holes. Over the last >10 yrs of science operation, ALMA has made various ground-breaking discoveries such as the detection of complex organic molecules in star-forming regions, imaging rings/gaps in protoplanetary disks, finding most distant galaxies, etc. The ALMA observatory is operated by the global partnership between North America, Europe, and East Asia in cooperation with Chile. Here we describe an overview of the ALMA project, and the role of the East Asia ALMA Regional Center (EA-ARC). We provide various user support activities (e.g., workshop, data analysis support, proposal preparation support, data delivery) in the EA-ARC. We hope this to be a good opportunity to expand the ALMA community, and enhance our science activity in EA.

Example of our regional user support

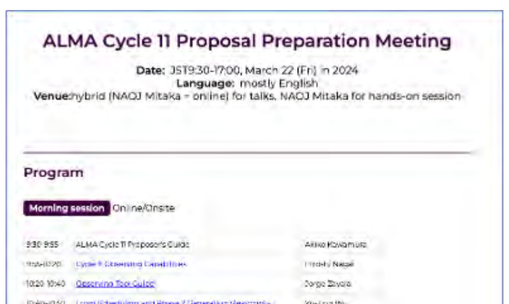
- Calibrated Measurement Set (Cal MS; ALMA's visibility data) delivery
- Face-to-face support at NAOJ
- Japanese material (now preparing English version)
- Items from user surveys, comments received in Users Meeting, and conversations will be considered.



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

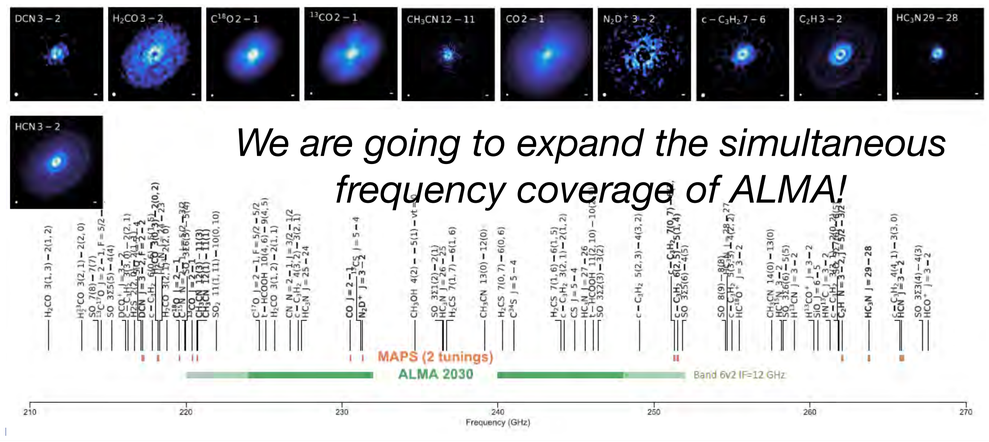


- We provide data reduction tutorials/workshops.
  - Beginner, intermediate, and advanced courses.
  - From 2024, we organize EA-wide Data Analysis workshop as well.
- In spring, we have "proposal preparation meeting"

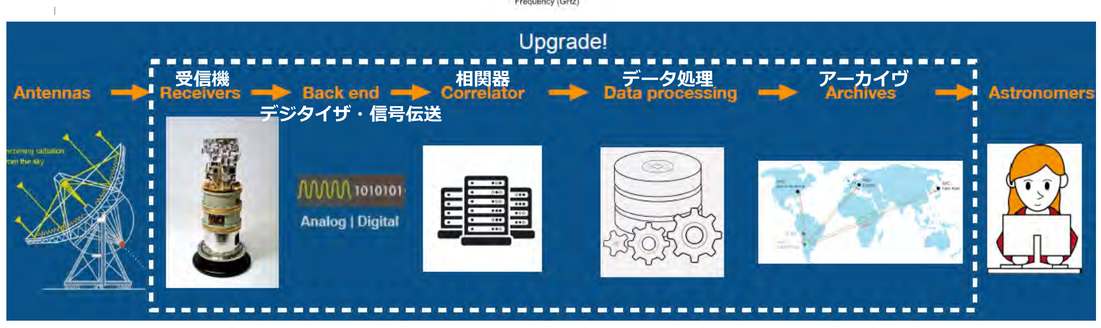


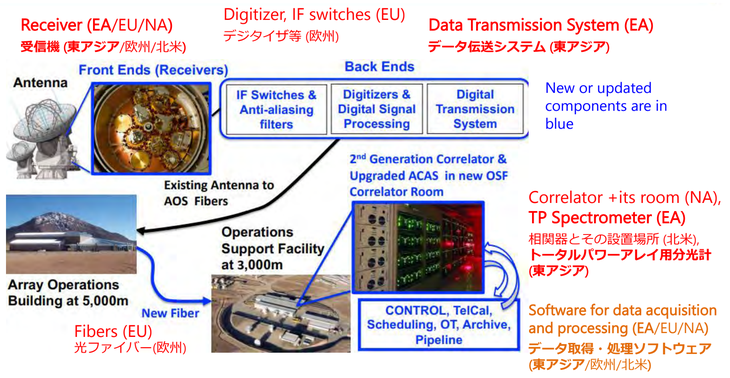
- Publication support program in Japan
  - Publication fee, English edit fee, conference registration + travel support, colloquium in an overseas institution, PR images…

Wideband Sensitivity Upgrade (WSU)



We are going to expand the simultaneous frequency coverage of ALMA!





- We will upgrade "most part" of the ALMA system.
  - Receivers with increased bandwidth and sensitivity
  - More powerful correlator
  - Increased data reduction capacity
- We will operate the WSU mode from the early 2030s.