ALMA Newsletter

March 2011

Dear readers of our ALMA Newsletter,

This eighth Science Newsletter comes at the time of the first ever Call for Proposals to observe with ALMA. The start of the first observing period, known as ALMA Early Science Cycle 0, is an exciting event. It marks a major milestone in the evolution of the observatory to a fully operational astronomy facility. It will also be the first opportunity for astronomers outside the ALMA project to discover for themselves what those inside the project already know, namely that "ALMA works".

The leadup to the release of the Call for Proposals has been an incredibly busy time for the science teams at the Joint ALMA Observatory and at the ALMA Regional Centers. There have been frustrations due to the weather, challenges due to the breadth and diversity of the partnership, and positives as the number of antennas available has continued to rise and the capability of the array increases.

By far the biggest challenge has been that inflicted on our Japanese colleagues and friends by the Sendai earthquake. As far as we know, all of our colleagues and their families are safe, but they have of course been deeply affected by the terrible tragedy. With remarkable strength and stoicism our colleagues have rallied, and continue to push towards the start of the scientific observing of ALMA. We continue to offer our Japanese friends our best wishes and any support we can provide, both now and for the future as it will surely take a great deal of time and effort to recover for the earthquake.

We trust that the many astronomers who want to use ALMA will be heartened by the move into Early Science operations. We will do our best to provide a working (but far from complete) ALMA observatory, a clear explanation of Cycle 0, a set of tools and processes that will enable the preparation, assessment and collection of ground-breaking astronomy data, and the resources to get the most science possible in as short a time as feasible. However, our top priority will remain the completion of ALMA without undue delay. We also acknowledge that not everything will work the way we expect, or the way it should, and we may at times fall a little short of your expectations. We hope that you, as users of ALMA, will understand when that happens as we work to deliver the most complex astronomical facility yet built. We'll respond by continually improving and endeavoring to offer an even better observatory in the future.

If the capabilities of ALMA in Cycle 0 don't match the needs of your science, just wait for Cycle 1 or Cycle 2. With 16 antennas ALMA will already have more collecting area than any existing millimeter/sub-millimeter array. It will have far more when we have 66 antennas working. We'll also continue to add scientific capabilities to the array over the coming years.

The response to the request for suggestions for targets for the Science Verification program to be conducted by ALMA scientists generated 80 responses, many times more than expected. The Call for Proposals may generate a level of interest far higher than can be accommodated in Cycle 0. If your proposal isn't successful we wish you more success in future cycles.

As Al Wootten, the North American ALMA Project Scientist who has been involved in the project since its genesis at a meeting more than 28 years ago, always says at the end of his emails: "Clear skies".

Lewis Ball, ALMA Deputy Director

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Organization for Astronomical Research in the Southern Hemisphere (ESO), in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC) and in East Asia by the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Academia Sinica (AS) in Taiwan. ALMA construction and operations are led on behalf of Europe by ESO, on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI) and on behalf of East Asia by the National Astronomical Observatory of Japan (NAOJ). The Joint ALMA Observatory (JAO) provides the unified leadership and management of the construction, commissioning and operation of ALMA.

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Picture composition simulating the 16 antennas of the ALMA array available for the launch of Early Science

Focus on...

Announcement of the ALMA Cycle 0 Call for Proposals

Reproduction of the official Announcement, available on the ALMA Science Portal

1. INTRODUCTION

The ALMA Director, on behalf of the partner organizations and all the personnel in Chile, East Asia, Europe and North America involved in bringing ALMA to Early Science readiness, is pleased to issue the first ever Call for Proposals with ALMA. We invite members of the astronomy community to propose for scientific observations to be scheduled within the ALMA Early Science Cycle 0 period which we expect to start on 30 September 2011 or shortly thereafter. This provides an important opportunity for first science from this cutting edge facility.

ALMA Early Science Cycle 0 will span 9 months. It is anticipated that 500-700 hours of array time will be available for Cycle 0 projects. Any astronomer may submit a proposal for ALMA Early Science Cycle 0.

2. PURPOSE

The purpose of ALMA Early Science Cycle 0 is to deliver scientifically useful results to the astronomy community and to facilitate the ongoing characterization of ALMA systems and instrumentation as the capability of the array continues to grow. Early Science will continue through Cycle 1 and until construction and commissioning of ALMA is complete.

3. CAPABILITIES

The ALMA Early Science Cycle 0 capabilities will comprise sixteen 12-m antennas, receiver bands 3, 6, 7 & 9 (wavelengths of about 3, 1.3, 0.8 and 0.45 mm), baselines from 18m to 125m (the compact configuration) and from 36m to 400m (the extended configuration), single field imaging and mosaics of up to 50 pointings, and a set of correlator modes that will allow both continuum and spectral line observations. Polarization and total power capabilities will not be available in Cycle 0, but are expected to be available from Cycle 1 onwards.

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Credit: ALMA (ESO/NAOJ/NRAO)

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4. THE ALMA SCIENCE PORTAL

The science portal at **almascience.org** is now open, and is the principal resource for information for scientific users regarding observing with ALMA. Astronomers registered through the ALMA science portal may submit proposals for ALMA observing. We encourage proposers to take close account of the detailed information available on the ALMA Science Portal, and to check the portal regularly for updates.

5. BEST EFFORTS

Proposers should be aware that because scientific observations will be conducted on a best efforts basis in parallel with the ongoing construction, commissioning and verification of the whole ALMA system, a range of constraints will apply during Cycle 0. The completion of the full array of 66 antennas with the full set of scientific capabilities will continue to be the highest priority.

Projects will not be carried over from Cycle 0 to later cycles (even if they have not been completed in Cycle 0). PIs will have the same 12-month proprietary rights applicable to all ALMA data but Cycle 0 projects will not block later observations of the same targets with enhanced capabilities.

ALMA staff will conduct quality assurance on ALMA data, and will provide processed data products through the respective ARCs. However, it cannot be guaranteed that the characterization and quality of the data and data reduction will meet the standards expected when ALMA is in full scientific operations.

Proposers should expect that significant experience in radio (in particular, millimeter) interferometry will be an advantage in working with the data products during ALMA Early Science. PIs and observing teams should anticipate the need to invest their own time and expertise in the reduction and analysis of ALMA Early Science data products, including the possible need to visit the relevant ARC to get help and to assist with quality assurance and data reduction. Requests for help should be directed through the Helpdesk available from the ALMA Science Portal.

Astronomers who are interested in establishing collaborations are welcome to contact scientific staff from any of the ALMA organizations, though of course this is not required. The principal scientific interests of ALMA staff at the Joint ALMA Observatory (JAO) are summarized at **JAO Staff**, others are available at their local websites.

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Credit: ALMA (ESO/NAOJ/NRAO)

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6. SUBMITTING A PROPOSAL FOR ALMA EARLY SCIENCE CYCLE 0

All proposals to use ALMA must be submitted using the ALMA Observing Tool (OT) software. The **ALMA OT** is available for download now from the ALMA science portal and can be used to start preparing proposals. The ALMA archive will open for proposal submission on June 1, and until then proposals can be stored on the user's own disk.

The **Cycle 0 Proposers Guide**, the **Early Science Primer**, and the Cycle 0 Technical Handbook (available May 15, 2011) will be especially relevant sources of information for proposers. For specific information not provided on the Science Portal, proposers may submit a Helpdesk (see *User Services* at ARCs in left sidebar of the Science Portal) enquiry to the ALMA Regional Centers.

7. NOTICE OF INTENT

To help ensure that the Cycle 0 review process is set up in a way that allows proper handling of the set of proposals to be assessed, and to assist the JAO to schedule the two configurations offered, prospective Principle Investigators are strongly encouraged to submit a notice of intent by April 29 using a simple web form on the science portal (**NoI**). One form should be completed and submitted for each planned Cycle 0 proposal. This should not require more than a few minutes since the information to be provided is minimal: PI's name and affiliation, science category of the proposal, observing bands and whether the compact or extended configuration will be required.

8. OPPORTUNITIES FOR PUBLIC PROMOTION OF ALMA

Opportunities for public and media interest in ALMA science will be very important during Early Science Cycle 0. Proposers are requested to consider the potential media "appeal" of proposed observations, with regard to scientific content and/or the quality of the visuals that could be produced and to include a brief statement on the likely potential for publicity arising from the proposed scientific observations. This information will not be used in the assessment of the proposal which will be based solely on scientific merit and technical feasibility.

Successful PIs will be required to commit to working with the ALMA Education and Public Outreach (EPO) team on products such as press releases and related material if their project is selected for publicity purposes. The observatory will provide outreach-related expertise and advice, including support in the preparation of visuals if relevant.

9. ACCESS TO THE FIRST ALMA DATA

The first release of ALMA test data to the astronomy community will be through the Science Verification program. Science Verification will involve observations by JAO staff of objects designed to test ALMA systems and confirm their performance. More information on the observations planned for the ALMA Science Verification program is available at: **ALMA Data – Science Verification**.

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Credit: ALMA (ESO/NAOJ/NRAO)

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The first ALMA Science Verification data are not available yet, primarily because of the effects of an unusually severe Altiplanic winter. We expect to release the first Science Verification data in June 2011.

IO. PROPOSAL REVIEW PROCESS

All proposals for the scientific use of ALMA, including Cycle 0 proposals, will be subject to peer review by a single committee. Panels of international experts, independent of the Joint ALMA Observatory and the ALMA Regional Centers, will carry out the review. The assessments from those panels will be synthesized by ALMA's Proposal Review Committee, responsible for the overall ranking of all ALMA proposals, chaired by Professor Neal Evans of the University of Texas.

Proposals will be ranked strictly on the basis of scientific quality and feasibility with respect to the scientific capabilities offered. Proposals that best demonstrate and exploit the advertised ALMA Early Science Cycle 0 capabilities, producing scientifically worthwhile results from relatively short observations (averaging a few hours), will be given preference. The aim will be to ensure that each region receives its share of ALMA time.

Chile has yet to decide its level of participation in this single ALMA Review Process.

II. KEY DATES

The key dates in the current plans for Cycle 0 are given below. Changes in circumstances may make it necessary to alter them.

Date	Topic
31 March 2011	Release of this Call for Proposals for ALMA Early Science Cycle 0 and release of offline Observing Tool
29 April 2011	Deadline for submission of Notice of Intent
15 May 2011	Release of Cycle 0 Technical Handbook and intended schedule of compact and extended configuration availability
1 June 2011	Opening of archive for proposal submission and release of the online version of the Observing Tool
30 June 2011	Proposal submission deadline
September 2011	Feedback to proposers on the results from the proposal review process
30 September 2011	Start of ALMA Cycle 0 observing
February 2012	One month engineering shutdown during the 2012 Altiplanic winter
March/April 2012	Expected deadline for proposal submission for Cycle 1
30 June 2012	End of ALMA Cycle 0

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Acknowledgement: General Dynamics C4 Systems

ALMA In-depth

The Life-Cycle of an ALMA Project

L.-Å. Nyman (Head of the ALMA Department of Science Operations)
M. G. Rawlings (Department of Science Operations)

There are a number of stages involved in the creation and execution of an ALMA project. These are briefly summarized below.

a. PROPOSAL PREPARATION AND SUBMISSION: PHASE 1

The Principal Investigator (PI) of an ALMA proposal first downloads the Observing Tool (OT) from **http://almascience.org/call-for-proposals/observing-tool** and creates an account on the ALMA Science Portal (**http://almascience.org**). The PI uses the OT to prepare a proposal (Phase 1), including the so called Science Goals (i.e. a meaningful sequence of objects to be observed, frequencies to be used, required sensitivity, etc.). A Science Case (i.e. a scientific justification), Technical Justification of the proposed observing modes and requested time, and other supporting materials shall be included as a PDF file. The final project must pass a local validation by the OT.

When the proposal is ready, the PI submits the proposal to the ALMA proposal submission server. The proposal undergoes validation and several other checks at the server side. If the submitted proposal passes these, then the submission server assigns the project a unique project code, which is also written back to the PI's local OT copy of the project. An acknowledgement message is sent to the PI by the server at the Joint ALMA Observatory (JAO) in Santiago de Chile. A copy of the project is written into the ALMA Science Archive. The PI saves a local copy of the now numbered project, and may further edit, resubmit or withdraw this before the proposal submission deadline. After the proposal submission deadline has passed, the ALMA proposal submission server no longer permits (re-)submissions.

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Credit: ALMA (ESO/NAOJ/NRAO), W. Garnier (ALMA)
Acknowledgement: General Dynamics C4 Systems

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b. THE PROPOSAL REVIEW PROCESS

Once the proposal submission deadline has passed, the set of submitted proposals is inspected by the ALMA Proposal Handling Team (PHT) and read into the ALMA Phase 1 Manager (Ph1M) tool. Potential project duplications are identified. The Scientific Assessment is done remotely by members of the first-stage ALMA Review Panels (ARPs) assigned for different scientific fields (e.g. Galactic, extragalactic, cosmology etc.). Technical Assessment is provided by ALMA staff astronomers.

The Science Assessors provide reports and numerical scores (as appropriate) on their assigned proposals via web-based Ph1M forms accessible via their Science Portal accounts. Average scores are automatically generated. If necessitated by large submission numbers, proposals are triaged on the basis of the averaged scores.

Once all of the individual proposal assessments have been completed, the ARPs hold face-to-face meetings to discuss their assigned proposals. Final ARP scores are agreed upon during the meetings. Each ARP generates a ranked list of the proposals in their scientific category based solely on scientific merit and technical feasibility. Recommendations on letter grades are made for each proposal, and ARP consensus reports are written. Additional proposal-specific recommendations may also be made in order to address proposal duplication, specific scheduling requirements, etc.

The output from all of the ARPs is collated by the PHT. The individual ARP ranked lists are merged into a single list, and various reports reflecting for example the distribution of observing time among scientific categories, executives etc. are generated. Next comes the meeting of the ALMA Proposal Review Committee (APRC) comprising the APRC Chair and the Chairs of each of the ARPs (and - in Cycle 0 - the Deputy Chairs of the ARPs and a Chilean member from the ARPs). During this APRC meeting, the merged ranked list of proposals is reviewed and simulations run to predict the observing time usage for the upcoming observing period, subject to proportional sharing of the available time between the ALMA regions (East Asia, Europe, North America and Chile). APRC letter grade recommendations are made, and an APRC-level consensus comment generated for each proposal. Additional proposal-specific recommendations may also be made in order to address proposal duplication, specific scheduling needs, etc. A Long-Term Queue is proposed, consisting of a list of projects to be executed, spanning the whole observing period. Various supplementary summary reports are generated.

The proposed Long-Term Queue is passed to the ALMA Director for inspection, possible minor modifications and ultimately sent to the Executives' Directors for final agreement. When the Long-Term Queue has been approved, final grades are assigned and final consensus reports for each proposal are sent to the PIs. Details of any modifications mandated as a result of the

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Proposal Review Process are noted. The final rankings, letter grades and other appropriate information are written into the projects stored in the ALMA Archive. Any proposals assigned a "D" grade are rejected at this point and do not proceed to Phase 2. All accepted proposals are flagged in the system as ready to proceed to Phase 2 and are designated as ALMA Projects.

c. ACCEPTED PROPOSALS: PHASE 2

The PIs of all approved proposals are instructed by the Observatory to retrieve their projects from the ALMA Science Archive using the OT. If the proposals have not had any changes mandated during the Proposal Review Process, then the PI is simply instructed to use the OT option to automatically generate the necessary Scheduling Blocks (SBs), locally validate the project and then restore into the ALMA Archive. Within a project, SBs are systematically grouped together into Observing Unit Sets ("ObsUnitSets"), for which the resultant data will be identified as related.

The PIs of any projects requiring additional modification (e.g. due to changes mandated as a result of the Proposal Review Process, or additional complications arising as a result of the automatic SB generation) are instructed to contact the supporting ALMA Regional Center (ARC). The assigned ARC staff members modify the Phase 2 project accordingly and the resultant Phase 2 project is stored back in the ALMA Archive. When a given project has reached this point, it (and all of its constituent SBs) is flagged as ready for execution.

d. THE OBSERVING PERIOD: OBSERVATION EXECUTION AND QUALITY ASSURANCE

The observing period starts following the conclusion of Phase 2. During routine operations, the observatory Scheduler software repeatedly searches the ALMA Archive for SBs on the basis of a number of criteria, including current weather conditions, suitability for the current antenna configuration, project letter grade and ranking, and so on, and the results are sorted by ranking algorithms. The highest-ranking SBs are individually retrieved from the ALMA Science Archive in turn by ALMA staff, passed to the array for execution and run as observing sequences. All successfully-executed SBs are marked as having been run. Any SBs that fail to complete (for whatever reason) are flagged as "Suspended" and are subsequently examined. Any SBs with intrinsic problems are identified as such, repaired by ALMA staff and re-admitted to the queue as ready for execution.

SBs that complete execution, immediately undergo some preliminary automatic reduction and are subjected to QA0 (level 0 Quality Assurance). QA0 consists of real-time/semi-real-time monitoring of calibration data during its acquisition, and the calibration summaries at the end of an SB, plus various system monitoring data. This allows the monitoring of the integrity of the whole signal path, from the atmosphere, through antenna and front-end issues, down to the back-ends. The QA0 parameters used monitor possible atmospheric effects, antenna issues, front-end,

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back-end and various connectivity issues. The QA0 parameters are used by the Astronomer on Duty to decide whether a given dataset has been obtained under satisfactory conditions or has to be re-observed. If the collected data for an SB pass QA0, then that execution of the SB is flagged as successful. If the collected data fail QA0, then this is noted, and the cause of the failure investigated and resolved.

Whenever all of the SBs within a single ObsUnitSet are completed, the data undergo a full pipeline reduction to produce calibrated images in form of a data cube. When execution of a whole project has been completed, the entire dataset for that project is re-reduced.

During routine observations, QA1 calibration measurements to monitor system parameters that vary slowly with time (typically on time scales larger than 1 week, such as baselines, pointing etc.) are tracked to ensure optimum operation of ALMA. They are loosely scheduled between science observations as conditions allow.

The final level of Quality Assurance performed on project data in Chile is called QA2. It addresses issues that only surface at the time of full science-grade data reduction. The Science Pipeline combines data for a given project that might have been taken with independent calibrations, various antenna and correlator set-ups, and so on. At this stage, the output is compared with the originally-stated project goals for the target signal-to-noise ratio, etc. All of the required QA2 parameters are inspected by Department of Science Operations (DSO) staff before the data are made available to the PIs. All data that pass QA2 are marked as to be released to the project PIs.

E. DATA DELIVERY

As ObsUnitSets and projects are completed, the approved data are mirrored from the JAO to the ARCs, each of which maintains a full duplicate of the main ALMA Archive in Chile. The PIs are then notified that their data have passed QA2 and are available.

The PI (via the Science Portal) can then request access to some/all of the data taken for his/her project via the ALMA Science Archive. The requested datasets are then packaged and delivered to the PI via appropriate means. If the requested data volumes are not large, they may be delivered directly via computer network. Larger datasets will be delivered via shipped physical media.

Should the PI subsequently believe that he/she has identified a remaining problem with the delivered data, he/she should contact the supporting ARC. The query is investigated by the ARC staff (this is known as QA3). Each of the ARCs maintains a local copy of the Pipeline data reduction computing cluster. If it is deemed that an improvement of the results could be achieved by a re-reduction of the data with modified non-standard scripts, then the option of data re-reduction via the ARC Pipeline system will normally be offered.

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f. PROPOSING FOR ALMA: AVAILABLE TOOLS

Astronomers planning to submit science proposals making use of ALMA have a number of tools at their disposal to help with this task. These include:

- The ALMA Observing Tool (OT)
- The ALMA Sensitivity Calculator
- The Splatalogue
- CASA and the ALMA simulator tools

More information on each of these is given below.

i. The ALMA Observing Tool (OT)

The ALMA Observing Tool (OT) will be accessible from the Science Portals, accessible through the Joint Portal **www.almascience.org**

The ALMA Observing Tool (OT) is the primary tool used by prospective ALMA users. It is used for proposal preparation and submission (Phase 1) and later for detailed planning of observations on the telescope (Phase 2). The OT is a Java-based application (client) which resides and runs on the user's computer and interacts with the ALMA Archive and other databases over the internet while active. Anyone will be able to download and use the OT, but only registered ALMA users will be able to submit proposals.

During proposal preparation, the OT is used to collate the proposal science case and technical justification, and capture other information needed to specify the details of the proposed observations. Within the OT interface, the user attaches the Science Case and Technical Justification as a PDF file that is incorporated into the proposal. The user also expresses intended scientific goals as a series of specialized OT constructs, called Science Goals (SG), and employs various specialized editors to specify target coordinates and mapping field parameters, line frequencies and correlator bandwidths, desired sensitivities and dynamic range, etc. The user's input is interpreted by the OT to establish which resources of ALMA (configurations, antennas, etc.) are required, and to estimate how much observing time (including calibration and observing overheads) is needed.

The Cycle 0 capabilities of the ALMA instrumentation are embedded within the OT as selectable options. Visual editors allow sky viewing of target positions and mapping regions, and spectral editors display the available spectral region against the backdrop of the atmospheric opacity. While a proposal is being prepared, it can be exported to and recalled from a local disk. Once the ALMA Science Archive is available (June 1, 2011 15:00 UT) and the proposal is validated within the OT, it can be submitted to the ALMA Archive. Note that the proposal can be resubmitted by the PI as many times as needed before the proposal submission deadline.

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ii. The ALMA Sensitivity Calculator (ASC)

The ALMA Sensitivity Calculator (ASC) will be accessible from the Science Portals, accessible through the Joint Portal **www.almascience.org**

The ALMA Sensitivity Calculator tool can be used to calculate an estimate of the total integration time necessary for a given sensitivity, or vice versa, for an ALMA observing project. A version of this is included within the ALMA OT, but a standalone web-based version is also available (for which a web browser Java plug-in is required). The current version of the Sensitivity Calculator uses the number of antennas expected to be available during Cycle 0 as a default.

iii. The Splatalogue

http://www.splatalogue.net

The Splatalogue project is an attempt to collate, rationalize and extend existing spectroscopic resources for use by the astronomical community. The Splatalogue itself is a database containing the frequencies of more than 5.8 million lines associated with atomic and molecular transitions which emit in the radio through sub-millimeter wavelength range. The line database is used by the ALMA OT to aid users in planning spectroscopic observations. The OT download actually includes a (several thousand-line) subset of the Splatalogue line list, but the tool is also able to query the full online spectral line database.

iv. CASA and the ALMA simulator tools

CASA: **http://casa.nrao.edu**

CASA Simdata Simulator:

http://casaguides.nrao.edu/index.php?title=Simulating_Observations_in_CASA_3.1

Observing Support Tool (OST): **http://almaost.jb.man.ac.uk**

The Common Astronomy Software Applications (CASA) package is being developed with the primary goal of supporting the data post-processing needs of the next generation of radio astronomical telescopes such as ALMA and EVLA. The package can process both interferometric and single dish data.

CASA is designed to support both the data reduction process and data analysis. For ALMA users, data analysis is likely to be the most valuable part, as ALMA data will be pre-processed before delivery to the user. The CASA package and information on its use (including tutorials and training) are available from the NRAO CASA web site (above).

It is also possible to use CASA to simulate ALMA interferometric observations. The Simdata simulator considers the configuration of the ALMA array, the receiver specifics and atmospheric

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conditions. It allows the user a great deal of control over both the input and output parameters. The CASA Simdata simulator is very powerful, and can be of great help when planning a proposal for ALMA.

A second simulator, known as the ALMA Observation Support Tool (OST), may also be used to quickly simulate ALMA observations. Users can specify input parameters and a source model via a standard web interface. They will then receive a hyperlink to a web page containing a resulting simulated image, an image of the Point Spread Function (PSF), etc. The OST is maintained by the EU ARC node in Manchester (UK) and at ESO.

THE JAO DEPARTMENT OF SCIENCE OPERATIONS

The Department of Science Operations (DSO) has the following major responsibilities:

- Array operations
- Scheduling of observations
- Execution of observations
- Data processing and quality assurance
- Delivery of data to the ALMA Archives
- Support to the Proposal Review Process

Once construction of ALMA is complete science operations will take place 24 hours per day, 365 days per year - apart from periods when the array is offline for maintenance and upgrades. Operations activities occur at both the Operations Support Facility (OSF; the center from which the array is actually controlled) and the Santiago Central Office (SCO) in Vitacura (Santiago de Chile).

The DSO is organized into the following groups:

- The Array Operations Group is responsible for day-to-day array operations, meteorological site monitoring, and AOS activity monitoring.
- The Program Management Group is responsible for day-to-day management of observation execution, data quality control, as well as coordination with ARC science operations activities.
- The Data Management Group is responsible for archive operations, pipeline operations, data processing, calibration, quality assurance and trend analysis.
- The Proposal Handling Team is a small group that oversees and facilitates the ALMA proposal review process.

DSO staff are currently participating in commissioning activities and are planning and preparing for the start of science operations, including activities associated with the Call for Proposals and preparation of the Proposal Review Process.

There is a close interaction between the DSO and the ARCs. The Head of DSO, the ARC Managers and some of their staff have weekly teleconferences, and face-to-face meetings four times per year. Joint activities will include archive operations, part of the data quality assurance, software testing and supporting the Proposal Review Process. There are currently a lot of activities associated with the preparations for the start of science operations. The ARCs provide a number of functional duties directed toward ALMA operations, commissioning, development and outreach. These are described in the section on the ALMA Regional Centers.

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Who's who

Locations of the ARCs and the ALMA site in Chile.

The ALMA Regional Centers (ARC)

The interface between ALMA and the science community worldwide

by **Paola Andreani (European ARC Manager), John Hibbard (North American ARC Manager) and Sachiko K. Okumura (East Asian ARC Manager), with the collaboration of Jim Braatz, NAASC (North American ALMA Science Center) Scientist**.

ALMA is an international facility, a partnership between Europe, East Asia, and North America, in cooperation with the Republic of Chile. As such, ALMA will serve a worldwide community of astronomers. To interface with the geographically distributed user community, the partners have established three ALMA Regional Centers, or ARCs. The ARCs provide the primary gateway to ALMA for the user community. The ARCs are staffed by scientists with expertise in radio astronomy and interferometry, and their purpose is to work with the community of astronomers to maximize the scientific productivity of the telescope.

The East Asian ARC (EA ARC) is based at the National Astronomical Observatory of Japan (NAOJ), headquartered in Tokyo, in collaboration with the Academia Sinica Institute of Astronomy and Astrophysics (ASIAA), in Taiwan. The European ARC (EU ARC) is based at the European Southern Observatory (ESO) headquarters in Garching, Germany, and is supported by a number of affiliated nodes in several ESO member countries. The North American ARC (NA ARC) is based at the North American ALMA Science Center (NAASC), operated by the National Radio Astronomy Observatory (NRAO) in Charlottesville, Virginia, USA. The NAASC works in collaboration with the **National Research Council of Canada**, Herzberg Institute of Astrophysics (NRC-HIA) in Canada and ASIAA in Taiwan.

The ARCs provide user support over the full life cycle of an ALMA observation. Astronomers can get training on ALMA's capabilities and policies and get assistance with proposal preparation, writing and refining observing scripts, and processing and analyzing data. The ARCs also organize **conferences that highlight ALMA science**.

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The key user services provided by the ARCs include:

- Assisting the preparation of the Call for Proposals, and distributing it to astronomers.
- Writing documentation and training materials to help with proposal preparation and submission.
- Providing and supporting the Observing Tool, the software used to prepare, verify, and submit ALMA proposals and to prepare the observing scripts.
- Offering ALMA training workshops and tutorials.
- Staffing the Helpdesk.
- Helping observers prepare "scheduling blocks", the observing scripts used by ALMA.
- Archiving and distributing ALMA data.
- Providing data reduction support, documentation, and cookbooks.
- Developing and maintaining user-oriented observing and analysis tools such as the ALMA sensitivity calculator, the spectral line catalog (Splatalogue), and observing simulators (e.g. SIMdata).
- Hosting visits on-site at the ARCs or nodes for user support.

In addition to these user services, the ARCs provide a number of functional duties directed toward ALMA operations, commissioning, development, and outreach, including:

- Supporting the Commissioning and Science Verification of the telescope.
- Providing technical assessments of proposals and supporting the proposal review process.
- Assisting in the development of CASA, the primary software system used to reduce and analyze ALMA observations.
- Providing scientific evaluation of the ALMA data pipeline.
- Supporting outreach programs to publicize and promote ALMA to the public.

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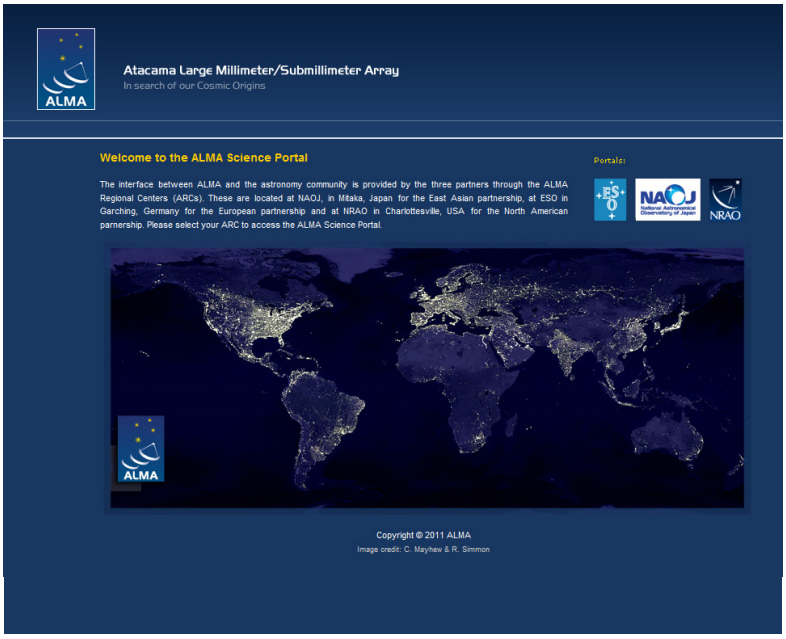

ACCESS TO ALMA: THE SCIENCE PORTAL

Access to ALMA user tools and to services provided by the ARCs is available through the Science Portal (SP): **http://www.almascience.org**

Users must register with the SP and log in to the site to gain full access to the tools and information provided there (some documentation and access to public data is available without logging in) As part of registration, a user identifies the institution with which he or she is affiliated. Based on that affiliation, users from EA, NA or EU institutes will be assigned to the corresponding ARC for user support. Users from Taiwan may choose either the EA ARC or the NA ARC. All other users will be able to select any one of the three ARCs.

At the SP, users can:

- Access user documents (the ALMA Primer, the Call for Proposals, ALMA specifications documents, Observing Tool documentation, etc.).
- Submit tickets to the Helpdesk.
- Search the ALMA data archive and access data.
- Download the Observing Tool, the software used to prepare proposals and observations.
- Access the Project Tracker, which allows users to follow the status of observations in the queue.

When using the SP website, users are directed seamlessly to their appropriate ARC. For example, when a user submits a Helpdesk ticket, the ticket will be assigned to staff at the appropriate ARC, based on the user's affiliation.

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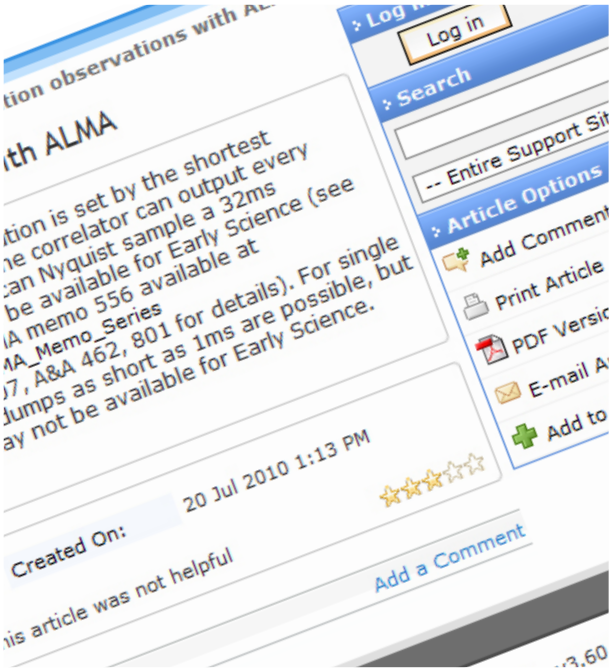
THE HELPDESK

The ALMA Helpdesk is the main resource for users seeking help from their assigned ARC. The Helpdesk is where users can ask general questions, report problems or bugs in any ALMA-related software, request information about their observing programs, and make arrangements to visit one of the ARCs. Users must be registered with the SP to submit a Helpdesk ticket.

The Helpdesk system includes a library of "*knowledgebase*" articles that address many common issues and questions. As a user is composing a question to the Helpdesk, the text of the question is searched as it is being typed and any knowledgebase articles relevant to the question are presented to the user, sorted by relevance. If the question is not addressed by one of the articles, the user can submit the question. Knowledgebase articles can be searched and browsed without having to log in to the SP.



The Helpdesk staff aim to respond to Helpdesk tickets within two working days. During the week prior to a proposal deadline, additional staff will be assigned to the Helpdesk, and every effort will be made to respond to emergency questions in a timely manner.

In the following sections we describe user services specific to the three ARCs.

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THE EAST ASIAN ARC

The EA ARC Headquarters is located at the NAOJ in Mitaka. The key user service of the EA ARC at the NAOJ headquarters includes supporting the complete trajectory of the project, from proposal preparation, preparation of Phase 2 materials, and eventually the delivery of the calibrated science products to the users. In addition to the user services, the EA ARC provides a number of functional duties directed toward ALMA operations, commissioning, development, and outreach. The EA ARC websites are:

http://alma.mtk.nao.ac.jp/e/forresearchers/arc/

The Taiwanese ARC node is located at ASIAA in Taipei. In collaboration with the EA ARC and the NA ARC, it serves all the ALMA user community in Taiwan, and offers support for preparing ALMA proposals and observations, data reduction, and data analysis. For user support, there is also coordination with the University Consortium of ALMA-Taiwan (UCAT). The website for the Taiwanese ARC node is:

http://alma.asiaa.sinica.edu.tw/

Visiting the EA ARC

The EA ARC welcomes visits by successful users to obtain support with reprocessing and analyzing ALMA data. Requests for face-to-face support should be made through the Helpdesk. Users can work with the staff at the EA ARC to decide on dates for the visit. Support staff members are responsible for arranging the details of the visit. Each visitor is assigned a single member of the staff for support purposes and can expect that this support person will be able to respond as quickly as possible to their requests for help, within reason.

At both Mitaka headquarters in Japan and ASIAA in Taiwan, the EA ARC provides a dedicated visitors' room equipped with the network to access all the necessary data and software for ALMA data reduction. Here users can also get help with proposals, and conduct ALMA archive research. Disk space is also provided for raw and processed data. Budget for travel support will be ensured.

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THE EUROPEAN ARC

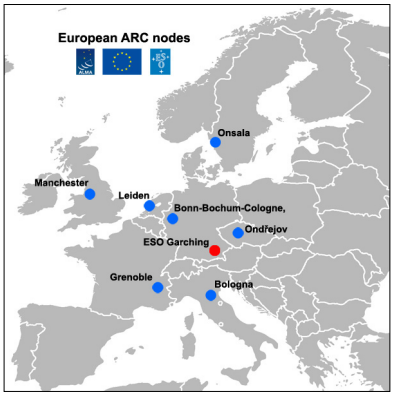
The European ARC is set up as a network of seven nodes throughout Europe, coordinated by a central node located at the ESO headquarters in Garching. In this distributed network, user support and operations experience at ESO can be combined with the millimeter-wavelength astronomy experience that exists in the community to create optimal science support services. More information on the EU ARC can be found at:

http://www.eso.org/sci/facilities/alma/arc/

This site includes links to individual websites for each of the seven nodes throughout Europe. As face-to-face support will happen at the nodes, information for visitors can be found on their websites. A Guide to the European ARC can be downloaded from the ALMA Science Portal.

The European ARC nodes

ARC nodes are set up in Manchester, U.K.; Leiden, The Netherlands; Bonn, Germany; Onsala, Sweden; Grenoble, France; Bologna, Italy; and Ondrejov, Czech Republic. The most important tasks of the ARC nodes are:



- Face-to-face user support with proposal preparation. This support encompasses help with the Observing Tool, assisting users in defining optimal observing strategies and carrying out simulations.
- Face-to-face help with data reduction, including also expert support in data processing for specialized observing techniques.
- Help in archival research, including assistance to users of the ALMA archive in identifying and using the data products suitable for their scientific projects.
- Community development and outreach.

All European ARC nodes are ready to support users for Early Science observations. Requests for face-to-face support should be made through the Helpdesk. Working with the staff at the ESO ARC and the ARC nodes, the user can decide which node to visit and on which dates. User visits are usually made to a local node as national funding bodies normally expect this. If the user and the ARC (node) staff decide that specialist support can be better provided at another node, this can be organized. Support staff at the node are responsible for arranging the details of the visit. Each visitor is assigned a single member of staff for support purposes and can expect that this support person will be able to respond as quickly as possible to their requests for help.

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THE NORTH AMERICAN ARC

The NA ARC is based at the North American ALMA Science Center (NAASC), operated by NRAO on the Grounds of the University of Virginia in Charlottesville, VA. The NAASC website is:

http://science.nrao.edu/alma/

The NAASC works in collaboration with the Canadian node at the NRC-HIA in Victoria, BC and the Taiwanese node based at ASIAA in Taipei. Their websites are available at:

http://almatelescope.ca

http://alma.asiaa.sinica.edu.tw/

The NA ARC provides user support through the entire cycle of an ALMA project, offering training sessions and workshops, assistance with preparation of proposals and observations, and assistance with data reduction and analysis. NRAO also supports publication of ALMA results by providing financial support for page charges for U.S. investigators.

The NAASC will maintain a copy of the ALMA data archive and will host a computing cluster for processing ALMA data. ALMA data will be processed initially by data reduction scripts. However, because of the complexities in the calibration and data processing, users will get the best results by refining the scripts and reprocessing the data themselves, with assistance from NAASC staff.

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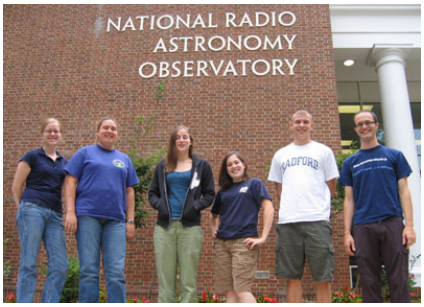
Visiting the NAASC

The NAASC welcomes short-term visits from investigators of successful ALMA early science programs, after their data has been collected. During a visit, users can get expert assistance processing and analyzing their ALMA data. Short-term visits are expected to last about a week. Student visitors must be accompanied by an experienced investigator, usually their academic advisor. Visitors will have access to an office and a computer with ample resources to process their data. Investigators on accepted projects can apply to the NAASC for assistance with travel expenses. To request a visit, send a ticket to the ALMA Helpdesk. In some cases, short-term visits can be arranged prior to an observation, either to help users prepare particularly challenging proposals or to assist in the preparation of the observing scripts (scheduling blocks).



NRAO also offers financial support for approved long-term visits that can range from a few weeks to several months. NRAO particularly encourages long-term visits that could lead to new and innovative instrumentation on ALMA. Full details on the visitor program are available on the NAASC website.

The NAASC supports student involvement in ALMA through the NRAO student programs. NRAO has a Summer Student Program aimed at introducing undergraduate and graduate students to forefront research. A Student Observing Support Program funds graduate students working on accepted NRAO projects, including successful ALMA proposals. Additionally, a graduate Pre-Doctoral Program is available to give students the opportunity to conduct thesis research at NRAO sites under the supervision of an NRAO scientist. Details on the student programs are available at:

http://science.nrao.edu/opportunities/studentprograms.shtml

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ALMA Events

Tutorials and Workshops in Preparation for Early Science

ALMA will soon be ready for science! Even while under construction, ALMA will be a world-leading instrument at millimeter and sub-millimeter wavelengths. To prepare and train the user community for Early Science observations, the three **ALMA Regional Centers (ARCs)** are hosting a series of tutorials and workshops. Those attending these tutorials will learn about ALMA's capabilities during Early Science and will hear about some of the exciting key science expected from the telescope.

The tutorials will introduce users to the Observing Tool (OT). The OT is the software used to design ALMA observations, prepare and submit observing proposals, and create observing scripts. In addition, the tutorials will feature talks on CASA, the primary software package used to reduce and analyze ALMA data. One module in CASA, called SIMdata, allows users to simulate ALMA observations, helping them understand how to interpret their data and guiding them toward optimal observation strategies. Other user tools will be introduced as well. Many of the training events include hands-on sessions, allowing attendees to get some practice with the OT and CASA.

ALMA Events

The following table lists currently planned workshops and tutorials in each of the three ALMA member regions:

Date	Event	Location	Region
April 6-7	ESO ALMA Community Days 2011	ESO, Garching, Germany	EU
April 18	STScI ALMA Early Science Community Day	STScI, Baltimore, MD, USA	NA
April 18-19	Canadian ALMA Early Science Tutorial	U. Toronto, Toronto, Ontario, Canada	NA
April 20	NA ALMA Early Science Community Day	Harvard-Smithsonian CfA, Cambridge, MA, USA	NA
April 20-21	Dutch ALMA Workshop	Leiden Observatory, The Netherlands	EU
April 26-27	ALMA Early Science Tutorials	NAASC, Charlottesville, VA, USA	NA
May 2-3	NA ALMA Early Science Community Day	U. Florida, Gainesville, FL, USA	NA
May 4-5	Canadian ALMA Early Science Tutorial	Herzberg Institute, Victoria, BC, Canada	NA
May 6	EA ARC OT Tutorials	NAOJ, Mitaka, Tokyo, Japan	EA
May 8-10	Midwest (NA) ALMA Workshop	U. Iowa, Iowa Cita, IA, USA	NA
May 9-10	ALMA Early Science Tutorials	NAASC, Charlottesville, VA, USA	NA
May 10	Canadian ALMA Early Science Tutorial	Université Laval, Québec, QC	NA
May 12	NA ALMA Early Science Community Day	U. Arizona & NOAO, Tucson, AZ, USA	NA
May 12-13	Canadian ALMA Early Science Tutorial	U. Calgary, Calgary, AB, Canada	NA
May 23-24	Special ALMA ES training sessions at the 218th AAS Meeting	Boston, MA, USA	NA
May 27	Tri-state (NA) ALMA Community Day	Columbia U., NY, NY, USA	NA
May 31	EA ARC OT Tutorials	NAOJ, Mitaka, Tokyo, Japan	EA
June 3	Canadian ALMA Early Science Tutorial, at the CASCA 2011 Meeting	U. Western Ontario, London, Ontario, Canada	NA
June 13-17	ALMA Training School, “Astrochemistry with ALMA”	Istituto di Radioastronomia, Bologna, Italy	EU

The above list is current as of March 17, 2011. Other events will be added as we approach Early Science, so please visit the following sites for the most up-to-date information and to register for any events:

Visualize all these events on Google maps

- **For the East Asian community:**

http://alma.mtk.nao.ac.jp/e/forresearchers/workshop/ | http://alma.asiaa.sinica.edu.tw/

- **For the European community:**

http://www.eso.org/sci/meetings/2011/alma_es_2011.html

- **For the North American community:**

http://science.nrao.edu/alma/community1.shtml | http://almatelescope.ca/EStutorials.html

ALMA Events

Lately, the following events were held in Regions and attracted lots of enthusiasts.

Recent events in North America

NAASC AT THE AAS

By Mark Adams

The 217th American Astronomical Society (AAS) meeting, January 9-13, 2011, in Seattle, provided an ideal venue for the North American ALMA Science Center (NAASC) staff to present the latest ALMA news and opportunities to the North American community. At Tuesday evening's NRAO Town Hall, Crystal Brogan described the ALMA Early Science opportunities in 2011, including the tools and support available through the NAASC.

The 150 persons attending the **"Observing with ALMA"** Special Session on Wednesday afternoon heard more about the capabilities available for Early Science, as well as NAASC community support and training. Speakers described the ALMA Observing Tool (OT) for proposal preparation and submission, the Common Astronomy Software Applications **(CASA)** package for ALMA science data reduction, the "observing simulator" task, **SIMDATA** , and **Splatalogue**, an on-line Virtual Observatory-queryable spectral line database.

A 90-minute ALMA Early Science proposal preparation tutorial early Wednesday evening provided a filled room of 50 attendees with greater insight into the ALMA OT, CASA, SIMDATA, and Splatalogue.

SPECTROSCOPY 2011: EXTENDING THE LIMITS OF ASTROPHYSICAL SPECTROSCOPY

By Anthony Remijan

More than 125 people attended the spectroscopy workshop in Victoria, British Columbia, in January 2011.

More than 125 participants from countries around the world participated in a scientific and technical meeting on the upcoming spectroscopic capabilities of ALMA held 15-17 January 2011 in Victoria, British Columbia. The meeting emphasized the importance of spectroscopy as a vital tool to obtain a better understanding of the nature of astronomical objects, and included a vast range of contributed presentations (ranging from the investigation of transitions of high redshift CII and CO up to z > 6 to the complex spectra obtained from recent HIFI measurements toward the Orion KL region). In addition, invited speakers gave an overview of the current state-of-the-art observations and what can be expected in the ALMA era in the following scientific areas:

- The Atomic Universe: Atomic Spectra as Probes of Cool Gas
- The Molecular Universe: Dense Star-forming Gas
- Isotopic Variety in the Interstellar Medium
- Our Molecular Origins: Prebiotic Molecules

The invited talks presented the participants with the idea of investigating the complex chemistry on parsec scales towards external galaxies and the hope of identifying an even more exotic and pre-biotic chemistry toward molecular clouds within our own Galaxy given the high sensitivity and high spatial resolution observations that will soon be available with ALMA. To cap the workshop, ALMA Early Science capabilities were introduced with a comparison of what is currently possible with existing facilities.

"It was remarkable to witness the breadth of science that can be done given the new spectroscopic capabilities of these new facilities. The anticipation from the workshop participants to get their hands on these telescopes was truly inspiring", said Gordon Stacey, SOC Chair.

"The meeting venue, location and organization, i.e., the long breaks and poster sessions, truly made for a workshop-type feel. It was great to see the younger generation presenting their work and new ideas through contributed talks and posters for using ALMA, the EVLA and GBT", said Gerald Schieven (CNRC/Hertzberg Instititute of Astrophysics), LOC Chair.

For more information on the meeting and to access the talks and posters visit http://www.almatelescope.ca/Spectroscopy2011

ALMA EARLY SCIENCE TUTORIAL IN VICTORIA, BRITISH COLUMBIA

Following the Spectroscopy 2011 meeting in Victoria, B.C., 80 participants from the astronomical community participated in a day-long tutorial on ALMA tools in preparation for the call for ALMA Early Science proposals. The tutorial consisted of short presentations by NAASC staff on the tools and resources available to the user. These included important user tools such as the science website(s), the **Early Science Primer**,

ALMA Events

NAASC Staff provide hands-on training with ALMA User tools following the January Victoria ALMA workshop.

Mousepad HelpDesk, Observing Tool (OT), **CASA** / **SIMDATA**, and **Splatalogue**. After a brief introduction of these tools, more detailed presentations took place on the ALMA OT and the CASA SIMDATA task. Participants received 4+ hours of hands-on training and instruction where members of the North American ALMA Science Center and Hertzsprung Institute of Astrophysics helped troubleshoot problems and provide insight to the attendees who were learning how to prepare an Early Science proposal based on their specific research interests. *"The goal of the NAASC tutorials is for the participants to be active in using these tools, and to help them prepare for the opportunities that awaits them in ALMA Early Science"*, said Kartik Sheth, NRAO Assistant Scientist and the lead for tutorials, Community Days and training events organized by the NAASC. *"If you are planning to attend a NAASC sponsored training event, come prepared to work"*.

For more information on all the training events sponsored by the NAASC, visit http://science.nrao.edu/alma/community1.shtml

ALMA IN THE COMING DECADE: A DEVELOPMENT WORKSHOP

70 scientists and engineers, and many more connected via internet, gathered in Charlottesville on 21-22 March to discuss the astronomical motivation for developing new capabilities for ALMA.

Being the biggest historical advance in ground-based astronomy, it is even more vital to maintain and expand ALMA's capabilities. Toward this end, the ALMA Operations Plan envisages an ongoing program of development and upgrades of hardware, software or data analysis tools. With a planned modest investment of less than 1% of capital cost per year divided among the three funding regions (North America, Europe, East Asia), ALMA will continue to lead astronomical research through the 2011-2020 decade and beyond. For example, ALMA's wavelength coverage could

About 70 astronomers and engineers attended the workshop in the NRAO auditorium; additional folks attended via video, audio or web links.

be extended to cover from 1 cm to 350 microns with the only gaps those imposed by the atmosphere and thereby encompass additional unique spectral features and important scientific topics. To further explore such ideas, the ALMA partners have begun to explore in detail the programs which could become elements of an ALMA Development Plan. Studies are under way in Europe on several such programs. The North American ALMA Science Center (NAASC) will soon invite proposals from North American entities for studies relevant to the ALMA Development Plan.

Among the topics discussed inj the workshop were the development activities of the other partners, presented by Leonardo Testi (ESO) and Masao Saito (NAOJ), in addition to discussions of the science enabled by specific projects. Johnstone (HIA) led a discussion of the science opportunities at the lowest frequency band, including a repositioning of the nominal 31-45 GHz range to extend nearer the 53 GHz limit imposed by atmospheric oxygen. Frayer and Friesen (NRAO) identified opportunities in the 67-93 GHz band, for which a receiver is under construction for the Green Bank Telescope. Samoska (JPL) and Church (Stanford) discussed detector work in the 2mm window undertaken at JPL and Stanford. Hunter (NRAO) discussed opportunities at the other extreme of ALMA's capabilities, even exploring the possibilities for receivers at higher frequencies than currently planned. Kern (NRAO) and Russell (HIA) discussed opportunities for software upgrades. Other talks covered topics as diverse as VLBI with ALMA, improved photonic LO and alternative energy sources for ALMA. In addition to these specific upgrade opportunities, an important aspect of the workshop was to use community feedback to inform the Call for studies of upgrades to ALMA, to be issued soon.

ALMA Events

Recent events in Europe

ALMA EARLY SCIENCE COMMUNITY DAYS IN BONN, GERMANY

By Wouter Vlemmings

To prepare the community for the preparation of Early Science proposals, the German ALMA regional center node, supported by RadioNet, organized Community Days on 16-17 February 2011. Over 70 participants from mostly the German and Belgian astronomical communities attended the first day of the meeting that consisted of presentations by, among others, several staff members of the EU ARC and ARC nodes.

The presentations included news on the expected ALMA Early Science capabilities as well as ALMA operations, the helpdesk and proposal preparation tools. There were also talks on a number of initiatives funded by the European ASTRONET consortium with German ARC node involvement that aim at providing the prospective ALMA users with data modeling and analysis tools. During the second day of the meeting approximately 40 astronomers participated in two tutorial sessions on the use of the ALMA Observing Tool, ALMA simulators and CASA. This allowed the participants to gain hands-on experience with CASA simdata and the ALMA Observation Support Tool (OST) hosted by the U.K. ARC node (**http://almaost.jb.man.ac.uk**).

Following the Community Days, a further one-day workshop on “Evolved Stars with ALMA Early Science” was attended by over 40 astronomers from all over Europe. The day was organized by Matthias Maercker (ESO/Bonn) and Sofia Ramstedt (Bonn).

Over 70 people attended the ALMA Early Science Community Days in Bonn, Germany in February 2011

ALMA Events

Recent events in East Asia

ALMA USERS MEETING 2011 IN TOKYO, JAPAN

By Kazuya Saigo

On January 13 and 14, the 2nd ALMA Users Meeting in Japan was held in Mitaka Campus of NAOJ, Tokyo, Japan by EA-ARC. At those days, Tokyo was attacked by a cold wave from Siberia. However, over 100 researchers and students participated in the meeting from all over Japan and from Taiwan.

On day 1 of ALMA Users Meeting 2011 (January 13), the participants were given the progress report of ALMA project and information of ALMA Early Science capabilities by ALMA-J staffs. Participants gave us many questions about the ALMA Cycle 0 capabilities. On the afternoon, we explained the user support services of EA-ARC, and demonstrated proposal preparation/submission processes. On day 2 (January 14), tutorials of ALMA Software, OT and CASA, were held by the computing team members and EA-ARC staffs. OT tutorial was done along the OT Walkthrough which EA-ARC prepared for this. This tutorial was held in three classes of beginner, intermediate level and expert level to support wide range of users which ALMA expected. The ratio of participants was about 1:3:1 and the total number of participants is about 70. The meeting closed at just before noon of the second day. After closing the meeting, the optional CASA tutorials were given to those who were interested. About 50 participants, who already have experiences of observations and analysis of data from a radio telescope, attended the tutorials. After the instructions on functional characteristics of CASA, they actually performed data analysis with CASA on data obtained with VLA (Very Large Array).

Other than the ALMA Users Meeting, East-Asia Interferometry Winter School including OT and CASA tutorials was held in Mitaka Campus on 7 – 11 February (**http://alma.mtk.nao.ac.jp/e/forresearchers/symposium/2011/**).

One of the rooms of CASA tutorial. A total of about 50 astronomers participated in the optional CASA tutorial

Over 100 astronomers attended the 2nd ALMA-J Users Meeting in January 13 and 14

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Credit: ALMA (ESO / NAOJ / NRAO), W. Wild (ESO)

Progress at the ALMA site

Here is a short synopsis regarding the recent progress of the site construction work:

Progress in the construction

In the second half of January and first half of February the altiplanic winter brought with it abundant rain both at the OSF and high site affecting ALMA operations. Altiplanic winter is a meteorological phenomenon in which the jet stream reverses and brings moist air from the east to this usually extremely arid site. Generally it occurs sporadically between December and February but was particularly intense this year and affected the whole area. In ALMA, this unusually long period of poor weather resulted in some damage on the OSF-AOS road, which were fixed pretty quickly and barely affect the schedule of transport of ALMA antennas to the high site.

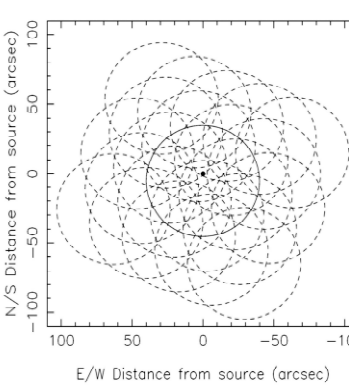
Damage to the OSF-AOS road caused by heavy rain during the altiplanic winter

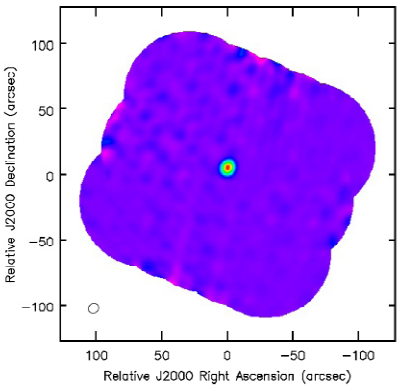
Installation of precision mechanical interfaces has been completed for 116 out of 192 antenna stations. Significant progress was made in the installation of power and signal vaults of the central cluster antenna stations, although the installation of electrical and fiber optic cables has been hampered by the bad weather. A total of 51 antenna stations should be completed by the end of March.

Progress at the ALMA site

Work on both the 23 kV power system and the multi-fuel power generation system continued on schedule. Much of the 23 kV equipment is installed at site and the multifuel turbine generators were shipped by the manufacturer in February.

Commissioning and Science Verification (CSV)

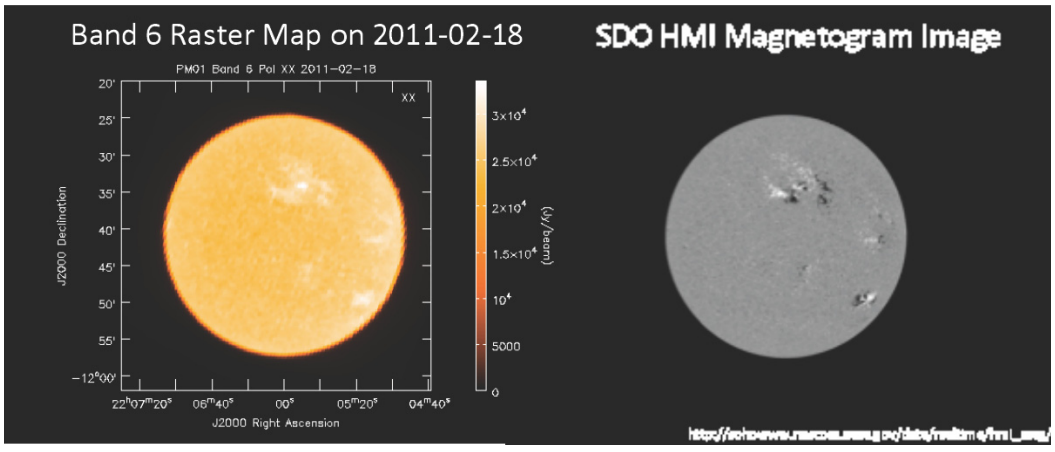




The plot on the left shows the different pointing positions with circles representing the instantaneous field of view. The resulting image is on the right.

Despite this poor weather astronomers did manage important steps forward. The first was an observation using the "mosaic" observing technique, where data is taken at a series of different pointing positions in quick succession and the results are fitted together to make a single image.

As a test of our ability to make single-dish raster maps, the AIV scientists made some maps of the Sun from the OSF. Although the fact that one can see active regions in millimeter-wave images of the Sun is not new, these pictures did generate a good deal of interest in the solar radio astronomy community and served as a very good reminder of ALMA's potential in this field.



On another note, there has been a very strong positive response from the science community to the request for suggestions for science verification targets, with well over 80 suggestions received. CSV has chosen some targets for the first observations, which started at the beginning of March, when we had good conditions.

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Credit: ALMA (ESO / NAOJ / NRAO)

Progress at the ALMA site

Credit: ALMA (ESO / NAOJ / NRAO), J. Holfert (MT Mechatronics)

Antennas

European Antennas

The acceptance of the first European antenna is coming closer. The performance of this antenna is very encouraging and holography tests show that the surface is accurate to just below 11 microns RMS. A second antenna, in acceptance testing since December 2010, has completed holography tests and is currently undergoing pointing tests.

In total there are currently seven assembled antennas at the European antenna assembly site, and assembly of two more will start as soon as there is a pad available.

North American Antennas

In addition to the twelve North American antennas already accepted by ALMA, five more are in various stages of test and assembly at the North American antenna assembly site. Some of those which joined the ALMA array at 5,000 meters altitude on the Chajnantor plateau more than a year ago have been returned to the OSF to undergo their regular maintenance. The recent rough weather conditions in February had no apparent detrimental effect on the performance of the antennas operating at the ALMA high site, which is very encouraging.

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Credit: ALMA (ESO / NAOJ / NRAO)

Progress at the ALMA site

East Asian Antennas

Credit: ALMA (ESO / NAOJ / NRAO)

While one East Asian 12-meter diameter antenna has been used for CSV operations at the Chajnantor plateau, two others have been used for Assembly, Integration and Verification (AIV) operations at the OSF and a fourth one has stayed on a pad at the OSF where further tests have been conducted.

Huge progress has also been made on the five 7-meter diameter antennas that stand at the East Asian antenna assembly site. Despite the bad weather, the surface accuracy of the first antenna has successfully achieved 4.4 microns RMS. A series of electrical integration, tuning and system tests have been conducted in the remaining four antennas in parallel.

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Credit: ALMA (ESO / NAOJ / NRAO)

Tribute

Jorge May, a distinguished Chilean astronomer and a professor at the U. Of Chile Astronomy Dept. for over 50 years passed away on February 19th.

Together with others; the names of Hugo Moreno and Claudio Anguita come to mind just to mention a few, Jorge belonged to the heroic generation of astronomy, well before it became an identifiable university career in this country. These were extremely productive people, self-driven to do astronomy but with training obtained in other areas, most notably engineering. And indeed Jorge was trained as an electrical engineer and his interests rapidly moved in the direction of radio astronomy, a field vastly untapped in Chile. Joining the staff of the National Observatory he devoted himself to the creation in Maipú, near Santiago, of what was going to become by the end of the fifties the first radio observatory in Latin America. Maipú was designed mainly towards studies of the decametric emission from Jupiter, but also became a training facility for astronomers and engineers.

In order to put Jorge's accomplishments in perspective one must recall that when Chile became a known haven for optical astronomy, starting in the sixties, radio astronomy became relegated to a distant second place. Much more so than today, in those days radio and optical astronomy were worlds apart with different skills and professional allegiances and little communication between their communities, a gap being now definitely closed by ALMA. To my mind the survival, continuity and thriving in Chile of radio astronomy was initially almost singlehandedly the work of Jorge. He was good at identifying and stimulating talent and many of those in the younger generation who today occupy positions of leadership in the local community were inspired by him to seek advanced degrees abroad with thesis in radio astronomy. This took foresight and imagination, qualities Jorge had in abundance. And the bet obviously paid off, opening the doors to the necessary scientific Chilean participation in ALMA.

Jorge was a productive scientist. His intense interests in Jupiter lasted for close to two decades and eventually shifted towards an effort of another couple of decades devoted to the understanding of the structure and morphology of our galaxy. The latter clearly motivated his long-lasting interest in millimeter-wave astronomy. It is interesting to look at the long list of his international collaborators, extending for some 60 years, because it shows well the extent to which Jorge succeeded in putting Chile on the world astronomy map by forging alliances across continents.

I met with Jorge sporadically during many years, more often in the last ten or so. I remember him fondly as a good, cheerful, thoughtful person, firm in his opinions but always constructive and helpful. We will all miss his presence, personality and wisdom.

Eduardo Hardy
AUI/NRAO Representative in Chile

ALMA Newsletter

March 2011

Credit: ALMA (ESO / NAOJ / NRAO)

Job Opportunities

There are positions for astronomers to be filled in Chile, both as members of the Commissioning Team and in Operations. Commissioning is part of the ALMA construction project and is of course focussed on getting all of the components fully working as a unique telescope and verifying the quality of the data coming out, so we are looking for people with particular interest in and experience of instrumentation and in-depth data analysis. The Science Operations team is now being built up and there are posts to be filled covering a wide range of activities, including instrumentation and data analysis but also planning and scheduling.

Advertisements for these posts will appear in due course on the ALMA website and those of the ALMA partners, but we are always pleased to hear from qualified people who are keen to join the science team in Chile. If you are interested and well-qualified (i.e. with a doctorate and relevant experience) please do contact either Alison Peck (apeck@alma.cl) or Lars Nyman (lnyman@alma.cl), rather than waiting for announcements to appear. In addition, there is a Visitor's Program in place for people who wish to participate in Chile for periods of about 3 months to a year.

Job Opportunities

In addition to the above mentioned, there is an indefinite staff astronomer position to be filled at the Nordic ALMA Regional Center.

Application deadline 2011-04-30

Onsala Space Observatory (OSO), the Swedish national facility for radio astronomy hosted by Chalmers University of Technology (Gothenburg, Sweden) has an immediate opening for an indefinite term support astronomer position in connection with its European ALMA regional centre (ARC) node.

The successful candidate will primarily support ALMA users in the Nordic region (Sweden, Denmark, Finland, Norway and Iceland) plus the Baltic countries. The nature of this support ranges from help with proposal preparation to calibration and analysis of science data. Additionally, the successful candidate will be engaged in ALMA outreach to the Nordic astronomical community involving visiting universities, organising training workshops etc. Interest in developing new millimetre wave observing techniques/software would also be an advantage. It is strongly encouraged that the successful candidate will conduct up to 50% of her/his time on independent astronomical research, especially using APEX and ALMA.

Onsala Space observatory has had a long involvement in the ALMA project, in particular in the areas of water vapour radiometry design, receiver development, and the design of the antenna pad distribution. Onsala is also a 23% partner in the 12m diameter APEX (Atacama Pathfinder EXperiment) submillimetre wavelength telescope at the ALMA site. Chalmers university has a very active and growing community of astronomers working in diverse areas ranging from studies of the ISM, star-formation, evolved-stars, pulsars, nearby galaxies, AGN and high red-shift galaxies.

The successful candidate should have a PhD in astronomy, with a strong research record and a demonstrated background in radio or millimetre wavelength interferometry. Excellent communication and computer skills, ability to work in a team and good command of English are essential. Salary will be conditional on qualifications and experience.

For further details contact Prof John Conway, Nordic ARC node manager. (John.Conway@chalmers.se). The deadline for applications is 30th April 2011. Please go to http://www.chalmers.se/rss/EN/news-summary/vacancies/positions/alma-regional-center for details of the application procedure and how to apply.

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Credit: ALMA (ESO / NAOJ / NRAO)

Upcoming events

SIXTH NAIC/NRAO SCHOOL ON SINGLE-DISH RADIO ASTRONOMY

Green Bank, West Virginia

2011 - jul - 10/16

The sixth NAIC/NRAO school on single-dish radio astronomy will be held 10-16 July 2011 at the NRAO facilities in Green Bank, West Virginia. The objective of the school is to provide graduate students, post-docs, and experts in other fields of astronomy with knowledge and practical experience in the techniques and applications of single-dish radio astronomy. The school includes an intensive series of lectures and a hands-on radio astronomy project in which participants will acquire observations with the Arecibo 305-m telescope or the Green Bank 100-m (GBT) telescope, analyze the data, and interpret the results. The Single-Dish Radio Astronomy School is sponsored by the National Radio Astronomy Observatory (NRAO), the National Astronomy and Ionosphere Center (NAIC), and the National Science Foundation.

Registration and additional information are available at: **http://www.nrao.edu/meetings/sds6**

STAR FORMATION - NEAR AND FAR | 6TH IRAM 30M SUMMER SCHOOL

Pradollano (Sierra Nevada, Spain)

2011 - sept - 23/30

We will use the IRAM 30m telescope to observe star forming regions in nearby Galactic molecular clouds, in the Galactic Center, in nearby galaxies, and in distant galaxies at the edge of the observable universe. A team of about ten researchers will give lectures on the science topics they have been working on, using recent data from the IRAM observatories and other millimeter and far-infrared facilites. These lectures will be complemented by dedicated lectures on millimeter instrumentation (frontends and backends), observing techniques, and data processing software.

This sixth 30m school is aimed at attracting new astrophysicists to current and future single-dish mm-, submm-, and far-infrared telescopes. Applications will be accepted from young scientists with little previous experience in mm-astronomy. The school is limited to about 40 students, who will be selected on the basis of their interests, CV, and references.

The school runs over one week from Friday to Friday, with six days of 4 to 5 hours of lectures, allowing ample time for small working groups to prepare, conduct, and reduce observations at the 30m telescope. The working groups are led by the lecturers, which will be supported by IRAM staff members. At the last day of the school, the results of the working groups will be presented and discussed. The Fridays are arrival and departure days.

This school is partially funded by the RadioNet FP7 program.

For more details about the IRAM 30m Summer School see **www.iram-institute.org**

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Credit: ALMA (ESO/NAOJ/NRAO), W. Garnier (ALMA)
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If you wish to receive email announcements when new editions become available, please send an email to almanewsletter@alma.cl, with *"subscribe ALMA newsletter"* in the body.

To find out if you are already on the email list, send an email to almanewsletter@alma.cl, with *"which"* in the body.

This newsletter is also available here.

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Comments on the newsletter or suggestions for articles and announcements are welcome.

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Regional Newsletter NRAO

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More information on ALMA and contact details can be found on the ALMA homepage www.almaobservatory.org