

**ANASAC Report from face-to-face Meeting,  
Charlottesville, 13-14 Sept 2010.**

**Preamble:**

The NAASC appears to be making reasonable progress to assist ALMA users in NA at the start of Early Science (ES), with some concerns that we highlight in the individual charges below.

We are concerned that inter-ARC interactions are limited beyond astronomer-on-duty tours in Chile. While we would not want to add non-specific time burdens on the ARC staff, we suggest that the NAASC managers consider whether there are more opportunities for video-conferencing might allow more familiarity with the other ARCs' practices and staff.

**Charge 1: Review the key recommendations of the 2012-2016 NSF proposal review panel, and provide guidance on behalf of the community on the importance and priority of these recommendations. Specifically:**

**a. What balance should NAASC seek between “managing the expectations of the user community” for Early Science (ES) and raising interest in ALMA amongst non-expert users?**

**b. How should NAASC define the scope of re-processing capabilities, which the panel has put at a high priority? What services can NAASC cut to accommodate increased data processing services and advanced algorithm development?**

The preliminary report from the NSF panel was reviewed, and the specific questions charged are addressed below.

ANASAC would like to be more involved in the NSF proposal preparation in the future, and would encourage the availability of a draft proposal further ahead of the deadline. We also feel that the NAASC may need to integrate better its schedule with the project, concerning deadlines for proposals to support ALMA operations in the different executives. There was a strong need for a concrete operations plan from the project before the deadline for this NAASC proposal, but the schedule of the whole project meant that this was not available. The lack of this information may yet have a negative impact on the approved support for the NAASC.

**Charge 1a: balance in Early Science between `managing expectations' and `raising interest'**

The involvement of the wider community, beyond those with experience in mm-wave interferometry is crucial to the success of ALMA. However, in ES there is inevitably a limited capability, both in terms of array performance and tools available for exploitation of the data.

We would like to see the term 'managing expectations' excised from NAASC materials, and any discussion of the distinction between 'experts' and 'novices' to be minimized. When 'managing expectations' comes to mind, we suggest that they be considered in terms of a 'transparent engagement with the community'.

We feel that the need for these distinctions amongst categories of users can be avoided by making clear, transparent statements of the capability of the array through ES, the skills that will be demanded of successful proposers in order to fully utilize their ES data, and the details of the way in which the NAASC will be able to support the exploitation of their data. If these statements are incorporated in all calls, we believe that applicants can decide whether they are realistically in a position to apply, regardless of their experience.

In particular, we emphasize that the scientific and technical criteria for project selection, including for example, the degree to which users must use the imaging simulator, to satisfy technical assessment must be stated very clearly.

We strongly support the panel's principle of 'underpromise and overdeliver', with the note that the promises made must be very clear and transparent. While there is a risk that non-expert users will be deterred from applying, we are more concerned that users would be disappointed and unable to reach their science goals.

We feel that the provision of 'proposal workshops' would be a burden on the NAASC staff, and that the maximum use be made of web-pages/webinar/cookbook video and screen capture tools.

We suggest that NAASC first work to ensure that all suitable clarity is present in the project-wide call for ES proposals; however, we would favor any necessary clarification about the NAASC's support for NA users during ES to be added to the call documents.

Strong opinions were expressed concerning the EPO component of the NAASC's effort. Some considered that the costs of a significant EPO effort were unfortunate in the light of a financial pressure on the scientific functions of NAASC. Others expressed that vigorous public outreach was essential for the security of ongoing public funding for large astronomy projects.

**Charge 1b: Re-processing of data by users during ES, and priorities for support.**

NAASC should assess carefully the needs users will have for custom reprocessing of data, based on the number, type and size of successful NA-based proposals as well as the suitability of the pipeline tools available to deal with ES data. To help match the available capacity of the NAASC staff to offer this support, it may be necessary to add full-time data aide support to the current plan.

We suggest that something in the style of the existing 'CASA workshop' format where five to ten users might visit NAASC to work together with staff at the same time could be a good one for face-to-face user support for ES data. The implementation of VNC-based access to systems at NAASC for ES users also appears to be an attractive option.

Given the limitations in staff time, we recommend that NAASC emphasizes online tools (such as web videos) to support the pre-proposal phase, and shifts to face-to-face workshops and assistance to support the data reduction and exploitation phase in approved ES observing programs.

**Charge 2: Continue to monitor the readiness of ALMA software systems, and NAASC user support services. ANASAC should examine the capabilities of the latest release of CASA and the Observing Tool, and the NAASC web-based outreach/education services, and comment on their readiness for the start of Early Science.**

The status of current software for ALMA users appears to be generally acceptable, but we have not been able to try hands-on tests and cannot verify this. The key question is whether the forthcoming comprehensive project reviews agree. The release of the observing tool (OT) at the call for ES proposals is a key forthcoming step. User testing of the OT is key requirement.

The model for support for ES users' data reduction and exploitation at NAASC appears to be reasonable, subject to some concerns noted in charge 1b above.

The experience of some of the committee, and questions in presentations suggested that the functionality and readiness of the archive for ES might not yet have been demonstrated, with issues concerning being able to search for and retrieve data. The committee has no specific recommendations, but encourage the forthcoming reviews to probe this question carefully.

NAASC's plans for increasing their computing resources to handle data from the

full array appear to be in place.

For advanced data products, the committee felt that there are existing resources available in other areas that might be useful. The data sets produced by ALMA will often take the form of "spectral line cubes," which are inherently three-dimensional. Therefore, it makes sense for CASA, or software that easily connects to CASA (e.g. see [AstroPython and SAMP discussions](#)), to offer interactive 3D display in addition to "movie" modes where users scroll through "channels" of 2D planes. It is critical that the 3D capability connect seamlessly into the existing 2D CASA capabilities, so that statistical/quantitative data exploration and analysis remains possible in the "3D mode." This kind of functionality is most easily available in packages currently outside of CASA, although none of these is perfect on its own. For example, the [3D GAIA](#) package that is part of Starlink, has some 3D functionality, and the [AstroMed](#) project, which uses medical imaging software on spectral line cubes, also goes part of the way to these goals. ALMA cubes will be so large that new hardware/software (e.g. GPU-based) approaches, even beyond what it used in the medical imaging community, will be needed. It is recommended that the NAASC software team investigate modern options for the 3D interactive display of cubes.

An example of an interactive figure within a *Nature* paper that shows how 3D spectral-line-cube visualization software will be used in research is at <http://adsabs.harvard.edu/abs/2009Natur.457...63G>.

Note: ANASAC member Alyssa Goodman has already communicated some software leads directly to Mark Lacy.

**Charge 3: Please comment on the impact on the NA community of shortcomings in ES capabilities and data processing capabilities. How can NAASC best plan for and minimize the impact of such shortcomings on observers, given the limited NAASC resources?**

ANASAC strongly supports the application of the existing criteria for the properties of the array at the start ES. Unless the ES array is more capable than any existing facilities, and it achieves routine operation with its entire current complement of antennas over a significant fraction of the available ES time, we believe that ES will be frustrating for users, and risks having a negative impact on the ALMA user base. We note that metrics for the fractional availability of the array are currently unclear, and should be developed.

Such frustrations might continue if a useful pipeline is not available by the time ES ends. Furthermore, we feel that a rush to proceed to ES must not jeopardize progress towards the inauguration milestone.

We feel that the best way to reduce the impact of shortcomings in the ES array is to avoid having them, by not commencing ES unless the previously-stated conditions for the readiness of the array are satisfied.

We addressed issues of NAASC support during ES in the reply to charge 1a above.

**Charge 4: Comment on the process and status on the definition of the ALMA Development activities within the NA community (US, Canada and Taiwan) and on how to promote a strong NA development program within the international context.**

Extensive discussions concerning development have been held in the past, involving the US Project Scientist Al Wooten. In the context of budget pressure, the suggestion was made that some development funds could be used to aid the greater project (as pointed out by the NSF review), perhaps including power supply. This is reasonable, providing that the NA funds do not cross-subsidize the international project at the expense of support for ALMA developments in the NA region, and are carried out in a coordinated and equitable manner across all the executives. A call for development study proposals, to match that already announced by the EU executive would be sensible. In order for ALMA Development to proceed smoothly, the three Executives need to coordinate on a longer term Development process in the very near future.

**Self-initiated charge 5: "ALMA Users Grant Program": As the NSF will likely only support ALMA research under its PI grants program, what further recommendations can be made to suggest to improve the efficiency and effectiveness (e.g. minimizing double jeopardy hazards of independent reviews of ALMA observing time and NSF funding proposals) of the NSF PI grants program to support ALMA preparatory research currently (see recent NSF announcement on pre-ALMA research proposals) and research activities during ALMA full science operations?**

The ANASAC believes that realizing our return on the large capital investment in ALMA will be jeopardized by inadequate support for research by North American scientists. The NSF Review Committee commented along these lines (Sec. 2.1, Comment 11), noting that "inadequate support for ALMA data processing and image delivery in early years (both in terms of too little grant support and/or user support from NAASC) is a major risk for early user acceptance and scientific success." Nonetheless, the Review Committee did not recommend funding a user grant program specific to ALMA (Sec 2.1, Recommendation 5): "An ALMA

specific user grants program is not supported by this committee, particularly in light of other programmatic risk areas that may require funding."

We believe that these statements by the Review Committee do not rule out a possible program in the future and we encourage NRAO to continue to seek means to support community use of ALMA. In the meantime, it is essential to continue programs to support page charges, relevant travel, and, if possible, support for graduate students. The NSF now allows proposers to note that their proposal involves ALMA, and this can be a mechanism for tracking whether ALMA exploitation by NA scientists is being compromised by lack of funding. We encourage NRAO to work with NSF to track this issue.

In addition to this report, the incoming ANASAC chair, Alberto Bolatto, will write a letter from ANASAC to NSF emphasizing these points.

**Self-initiated charge 6: ASAC will continue to look for ways in which ALMA construction and operations might be more environmentally friendly, especially in terms of energy use (without compromising science).**

Concerning power supply for ALMA, ANASAC has generated some new ideas and concerns that will be taken up at the forthcoming ASAC by our representatives. We believe that much money could be saved and much goodwill generated over the lifetime of the project by including renewable energy supplies at the ALMA site. In particular, we believe that both wind and solar thermal power supplies offer long-term advantages when combined with the planned combined-cycle plant.

## North American ALMA Science Center

### Response to ANASAC report from the 2010 September Meeting

**Charge I:** Review the key recommendations of the 2012-2015 NSF proposal review panel, and provide guidance on behalf of the community on the importance and priority of these recommendations. Specifically:

- a. What balance should NAASC seek between “managing the expectations of the user community” for Early Science (ES) and raising interest in ALMA amongst non-expert users?
- b. How should NAASC define the scope of re-processing capabilities, which the panel has put at a high priority?! What services can NAASC cut to accommodate increased data processing services and advanced algorithm development?

**General ANASAC comment:** ANASAC would like to be more involved in the NSF proposal preparation in the future, and would encourage the availability of a draft proposal further ahead of the deadline. We also feel that the project needs to integrate better its schedule with the deadlines for proposals to support ALMA operations in the different executives. There was a strong need for a concrete operations plan from the project before the deadline for this NAASC proposal, but the schedule of the whole project meant that this was not available. The lack of this information may yet have a negative impact on the approved support for the NAASC.

**NAASC Response:** We agree with both of these points. NAASC would value earlier involvement of ANASAC in the proposal preparation process and will apply the lessons learned from the experience in preparing the FY2012-2015 proposal to improve the planning of the next proposal. The NAASC supported the JAO-led revision of the AOP to the extent possible given the schedule; we hope that the ALMA project will work to align its schedules better with those of national budgetary cycles.

**ANASAC remarks on Charge Ia:** The involvement of the wider community, beyond those with experience in mm-wave interferometry is crucial to the success of ALMA. However, in ES there is inevitably a limited capability, both in terms of array performance and tools available for exploitation of the data.

We would like to see the term ‘managing expectations’ excised from NAASC materials, and any discussion of the distinction between ‘experts’ and ‘novices’ to be minimized. When ‘managing expectations’ comes to mind, we suggest that they be considered in terms of a ‘transparent engagement with the community’. We feel that the need for these distinctions amongst categories of users can be avoided by making clear, transparent statements of the capability of the array through ES, the skills that will be

demanded of successful proposers in order to fully utilize their ES data, and the details of the way in which the NAASC will be able to support the exploitation of their data. If these statements are incorporated in all calls, we believe that applicants can decide whether they are realistically in a position to apply, regardless of their experience.

In particular, we emphasize that the scientific and technical criteria for project selection, including for example, the degree to which users must use the imaging simulator, to satisfy technical assessment must be stated very clearly.

We strongly support the panel's principle of 'underpromise and overdeliver', with the note that the promises made must be very clear and transparent. While there is a risk that non-expert users will be deterred from applying, we are more concerned that users would be disappointed and unable to reach their science goals.

We feel that the provision of face-to-face 'proposal workshop(s)' could be a relatively inefficient use of the NAASC staff, especially in light of the uncertain schedule for a call for ES proposals. We recommend that the maximum use be made of web-pages/webinar/cookbook video and screen capture tools, to reach out to the community ahead of the ES proposal deadline. We are sure that existing presentations by NAASC staff planned for workshops would make excellent web-based video presentations, and hopefully reach a broader audience than a single workshop at NAASC.

We suggest that NAASC first work to ensure that all suitable clarity is present in the project-wide call for ES proposals; however, we would favor any necessary clarification about the NAASC's support for NA users during ES to be added to the call documents.

Strong opinions were expressed concerning the EPO component of the NAASC's effort. Some considered that the costs of a significant EPO effort were unfortunate in the light of a financial pressure on the scientific functions of NAASC. Others expressed that vigorous public outreach was essential for the security of ongoing public funding for large astronomy projects. We would appreciate future presentations on EPO at f2f meetings.

**NAASC response:** We find these comments very helpful, and we will follow this advice. We (and the other ARCs) are focusing effort on the development of the materials that can be the basis of on-line training resources as well as face-to-face tutorials. The ALMA project as a whole recognizes that Early Science will be very challenging for novices and that clarity about the capability of the array and the requirements on observers is paramount in the Call and other outreach materials.

"Managing expectations" is a phrase emphasized by the NSF proposal review panel in their advice on how ALMA should approach outreach to the community; we agree that it is not a useful term in the context of outreach materials themselves. Moreover it is important to continue to send the message to the community that ALMA is a transformative instrument that can outperform any existing observatory by a large



margin, even at the start of ES with 16 antennas, as long as that message is tempered with transparency to the reality of the ES experience.

We apologize for the lack of an EPO presentation. EPO has recently generated a strategic plan, which we will circulate to ANASAC.

**ANASAC remarks on Charge 1b:** We strongly endorse the importance of user-initiated reprocessing of ES data. NAASC should assess carefully the needs users will have for custom reprocessing of data, based on the number, type and size of successful NA-based proposals as well as the suitability of the pipeline tools available to deal with ES data. To help match the available capacity of the NAASC staff to offer this support, it may be necessary to add full-time data aide support to the current plan.

We suggest that something in the style of the existing 'CASA workshop' format where five to ten users might visit NAASC to work together with staff at the same time could be a good one for face-to-face user support for ES data. The implementation of VNC-based access to systems at NAASC for ES users also appears to be an attractive option. We note that our Taiwanese representatives cautioned that VNC systems are sometimes unreliable across the Pacific, and would need a specific test for this capability.

Given the limitations in staff time, we recommend that NAASC emphasizes online tools (such as web videos) to support the pre-proposal phase, and shifts to face-to-face workshops and assistance to support the data reduction and exploitation phase in approved ES observing programs.

**NAASC response:** NAASC will develop plans to re-focus some funding to data processing/re-processing needs, including: benchmarking desktops for ALMA data processing, providing an interface for remote user-requested reprocessing, developing pipeline heuristics as data become available, and developing enhanced algorithms. Implementation of some of these efforts will be dependent on the available funding profile.

The small workshop format is a good plan, and NAASC is going ahead with planning several small workshops (up to about 30 attendees) during the ES period. We will also support several "ALMA Days" at community venues.

**Charge 2:** Continue to monitor the readiness of ALMA software systems, and NAASC user support services. ANASAC should examine the capabilities of the latest release of CASA and the Observing Tool, and the NAASC web-based outreach/education services, and comment on their readiness for the start of Early Science.

**ANASAC remarks on charge 2:** The status of current software for ALMA users appears to be generally acceptable, but we look forward to being able try hands-on tests to verify this at the earliest opportunity. The key question is whether the forthcoming

comprehensive project reviews agree. The release of the observing tool (OT) at the call for ES proposals is a key forthcoming step. User testing of the OT is key requirement. The model for support for ES users' data reduction and exploitation at NAASC appears to be reasonable, subject to some concerns noted in charge 1b above. The experience of some of the committee, and questions in presentations suggested that the functionality and readiness of the archive for ES might not yet have been demonstrated, with issues concerning being able to search for and retrieve data. The committee has no specific recommendations, but encourage the forthcoming reviews to probe this question carefully.

NAASC's plans for increasing their computing resources to handle data from the full array appear to be in place. For advanced data products, the committee felt that there are existing resources available in other areas that might be useful. The data sets produced by ALMA will often take the form of "spectral line cubes," which are inherently three-dimensional. Therefore, it makes sense for CASA, or software that easily connects to CASA (e.g. see AstroPython and SAMP discussions), to offer interactive 3D display in addition to "movie" modes where users scroll through "channels" of 2D planes. It is critical that the 3D capability connect seamlessly into the existing 2D CASA capabilities, so that statistical/quantitative data exploration and analysis remains possible in the "3D mode." This kind of functionality is most easily available in packages currently outside of CASA, although none of these is perfect on its own. For example, the 3D GAIA package that is part of Starlink, has some 3D functionality, and the AstroMed project, which uses medical imaging software on spectral line cubes, also goes part of the way to these goals. ALMA cubes will be so large that new hardware/software (e.g. GPU-based) approaches, even beyond what it used in the medical imaging community, will be needed. It is recommended that the NAASC software team investigate modern options for the 3D interactive display of cubes. An example of an interactive figure within a *Nature* paper that shows how 3D spectral-line-cube visualization software will be used in research is at <http://adsabs.harvard.edu/abs/2009Natur.457...63G>. Note: ANASAC member Alyssa Goodman has already communicated some software leads directly to Mark Lacy.

**NAASC Response:** The recently concluded Operations Readiness Reviews have resulted in requirements on software testing before the systems can be declared ready for Early Science. A timeline for access to CSV data and for the ES-ready OT is expected in early January.

The Data Services Group is undertaking a gap analysis of the 3D data visualization and handling packages that are currently available, including those noted above, against the requirements for large ALMA data cubes. The DSG is including other high level data analysis requirements such as source extraction and velocity maps in the analysis.

**Charge 3:** Please comment on the impact on the NA community of shortcomings in ES capabilities and data processing capabilities. How can NAASC best plan for and minimize the impact of such shortcomings on observers, given the limited NAASC

resources?

**ANASAC remarks on charge 3:** ANASAC strongly supports the application of the existing criteria for the properties of the array at the start ES. Unless the array is both more capable than any existing facilities at that point, and it achieves routine operation with its entire current complement of antennas over a significant fraction of the available time for ES, we believe that ES will be frustrating for users, and risks having a negative impact on the ALMA user base. We note that metrics for the fractional availability and reliability of the array are currently unclear, and commend the recent initiative by the project scientist to quantify reliability. Such frustrations might continue if a useful pipeline is not available by the time ES ends. Furthermore, we feel that a rush to proceed to ES must not jeopardize progress towards the inauguration milestone. We feel that the best way to reduce the impact of shortcomings in the ES array is to avoid having them, by not commencing ES unless the previously-stated conditions for the readiness of the array are satisfied. We addressed issues of NAASC support during ES in the reply to charge 1a above.

**NAASC response:** The ORRs and the Annual ALMA External Review have resulted in similar recommendations, which the ALMA Board has agreed with and which the JAO is expected to follow.

**Charge 4:** Comment on the process and status on the definition of the ALMA Development activities within the NA community (US, Canada and Taiwan) and on how to promote a strong NA development program within the international context.

**ANASAC remarks on charge 4:**

Extensive discussions concerning development have been held in the past, involving the US Project Scientist Al Wootten. In the context of budget pressure, the suggestion has been made that some development funds could be used to aid infrastructure development in Chile. This is reasonable, providing that the NA funds do not cross-subsidize the international project at the expense of support for ALMA developments in the NA region, and are carried out in a coordinated and equitable manner across all the executives. A call for development study proposals, to match that already announced by the EU executive would be sensible. In order for ALMA Development to proceed smoothly, the three Executives need to coordinate on a longer term Development process in the very near future. We note, and have expressed to our ASAC representatives, that there is a risk that Chile-based developments (such as data rate increases) could fall between the cracks in a development plan that is built up from regionally-driven priorities.

**NAASC response:** NAASC has drafted a call for development study proposals, which the ANASAC has now seen and commented on. It is under review by other entities and will be announced as soon as possible.

**Self-initiated charge 5:** “ALMA Users Grant Program”: As the NSF will likely only

support ALMA research under its PI grants program, what further recommendations can be made to suggest to improve the efficiency and effectiveness (e.g. minimizing double jeopardy hazards of independent reviews of ALMA observing time and NSF funding proposals) of the NSF PI grants program to support ALMA preparatory research currently (see recent NSF announcement on pre-ALMA research proposals) and research activities during ALMA full science operations?

**ANASAC comments on charge 5:** The ANASAC believes that realizing our return on the large capital investment in ALMA will be jeopardized by inadequate support for research by North American scientists. The NSF Review Committee commented along these lines (Sec. 2.1, Comment 11), noting that "inadequate support for ALMA data processing and image delivery in early years (both in terms of too little grant support and/or user support from NAASC) is a major risk for early user acceptance and scientific success." Nonetheless, the Review Committee did not recommend funding a user grant program specific to ALMA (Sec 2.1, Recommendation 5): "An ALMA specific user grants program is not supported by this committee, particularly in light of other programmatic risk areas that may require funding." We believe that these statements by the Review Committee do not rule out a possible program in the future and we encourage NRAO to continue to seek means to support community use of ALMA. In the meantime, it is essential to continue programs to support page charges, relevant travel, and, if possible, support for graduate students. The NSF now allows proposers to note that their proposal involves ALMA, and this can be a mechanism for tracking whether ALMA exploitation by NA scientists is being compromised by lack of funding. We encourage NRAO to work with NSF to track this issue. In addition to this report, the incoming ANASAC chair, Alberto Bolatto, will coordinate a committee letter to the NSF leadership, expressing ANASAC's views on these points.

**NAASC response:** We welcome this support for a grants-with-time program. We are hopeful that there is a possibility of moving beyond the existing stalemate situation with NSF's funding resources. Specifically we believe a breakthrough on this issue may be possible if the AST can argue for a larger share of the science budget. The opportunity presented by ALMA coming on line could be strongly exploited for this.

NAASC will continue to plan some travel and student support for ALMA users.

**Self-initiated charge 6:** ASAC will continue to look for ways in which ALMA construction and operations might be more environmentally friendly, especially in terms of energy use (without compromising science).

**ANASAC comments on charge 6:** Concerning power supply for ALMA, ANASAC has generated some new ideas and concerns that will be taken up at the forthcoming ASAC by our representatives. We believe that much money could be saved and much goodwill generated over the lifetime of the project by including renewable energy supplies at the ALMA site. In particular, we believe that both wind and solar thermal power supplies offer long-term advantages when combined with the planned

combined-cycle plant. We encourage the project to investigate these matters.

**NAASC response:** We believe that the way forward on this is for the case to be brought directly to the Board rather than the JAO, which is not likely to be able to find the resources to initiate such an effort in the near future.

**ANASAC Final note**

We are concerned that inter-ARC interactions are limited beyond astronomer-on-duty tours in Chile. While we would not want to add non-specific time burdens on the ARC staff, we suggest that the NAASC managers consider whether there are more opportunities for video-conferencing might allow more familiarity with the other ARCs' practices and staff.

**NAASC response:** NAASC brought this issue to the attention of the other ARC managers, who agreed that more communications are desirable. A 3-way videocon of all ARC staff is planned, to be followed by more contacts between groups to focus on specific areas of effort / discussion. NAASC also plans to initiate the inter-ARC visit exchange plan for science staff members, as time and resources permit.