NRAO Users Committee/ANASAC Report
May 26-28, 2020

Users Committee/ANASAC Membership

Edo Berger, Harvard University (2021)
Ilse Cleeves, University of Virginia (2021)
Alessandra Corsi, Texas Tech University (2023)
Christopher DePree (Chair), Agnes Scott College (2021) CASA UC
Jin Koda (Vice-Chair), Stony Brook University (2021) ANASAC
Shih-Ping Lai, National Tsing-Hua University (2020) ANASAC
Casey Law, California Institute of Technology (2022)
Laurent Loinard, UNAM (2021)
Thomas Maccarone, Texas Tech University (2023)
Dan Marrone, University of Arizona (2020) ANASAC/ASAC
Susan Neff, NASA/GSFC (2022)
Giles Novak (ANASAC Chair), Northwestern University (2020) ANASAC
Rachel Osten, Space Telescope Science Institute (2020) ANASAC
Kate Su, University of Arizona, (2021) ANASAC
Stephen White, AFRL (2020) ANASAC/ASAC
Christine Wilson, McMaster University (2020) ANASAC/ASAC

Table of Contents

2020 NRAO Users Committee Report

Standing Charge (from NRAO)

The Users Committee plays an important role in the functioning of the Observatory, advising on matters of concern to those whose research is dependent on NRAO research facilities. The specific charge to the Users Committee from the Observatory follows.

- Provide advice to NRAO on scientific, technical, operational, and development issues relating to the astronomical community's current and future use of NRAO research facilities, including the Atacama Large Millimeter/submillimeter Array, the Very Large Array, and the Very Long Baseline Array.
- Make recommendations to NRAO that maximize the Observatory's scientific productivity and improve its effectiveness for the user community.
- Consult widely with current and potential NRAO users and communicate their requirements, recommendations, issues, and concerns to the Observatory.
- Deliver an annual report to the NRAO Director that summarizes the Committee's recommendations and concerns.

Overview and Main Recommendations

The NRAO User's Committee (UC) met via Zoom from May 26-27, 2020. A mid-year telecon was held in December 2019, and the agenda for the June meeting was developed in coordination with the Director (Beasley), Chair (De Pree), and Vice Chair (Koda). As in much of the world since March 2020, day to day business at NRAO this spring has been dominated with its response to the COVID-19 pandemic. NRAO reported to the UC on the progress it has made in a variety of areas since our last meeting in June 2019 and detailed its response to COVID-19. The UC commends NRAO's quick response and leadership in guaranteeing the safety of its employees, and (as much as possible) the continuation of business at NRAO[1]. We all missed the collegiality of this annual face-to-face meeting, and look forward to when the committee can return to its normal work.

At the conclusion of our meeting, Ilse Cleeves was elected Vice Chair for 2020-21. All current members of the UC are slated to remain on the Committee through 2021.

This report is structured in the same order that material was presented to the UC. We give our main recommendations below, and then provide key feedback and recommendations for each of the reports that were delivered.

[1] The continuation of NRAO's long standing REU program and the Synthesis Imaging Workshop (online) this summer are particularly noteworthy.

Main Recommendations of the UC:

1. Given the continued delays with the VLASS Single Epoch Continuum, NRAO should consider an early release of at least a few square degrees (possibly larger; e.g., 10 - 100 square degrees) in a simple yet interesting part of the sky in order to pique community interest and enable early science.
2. The UC was pleased that an X-Proposal is likely to be executed and that preliminary observations have already started. Given the community interest in X-Proposals, we encourage serious consideration for at least one more X-Proposal call as VLASS winds down and as time permits (in context of the progress of ngVLA).
3. As much as possible, the UC supports the idea of finding a way to maintain the operation of the Jansky VLA in some form during the transition period from VLA to ngVLA.
4. The UC asks that NRAO look for ways to fund archival research, perhaps through the existing Student Observing Support program and at a similar magnitude.

ALMA Operations & Development

The UC was pleased to see the continued high impact work out of ALMA, where the publication rate remains on par with other ground and space based facilities. The better support of time-critical observations like those of exocomet Borisov were impressive. The UC encourages ALMA to continue exploring the possibility of coordinated proposals with other facilities to further increase the impact of ALMA science and bring in an even larger community, including those new to radio astronomy.

The UC was impressed with the fast return to operations after the civil unrest in Chile in October. Furthermore, the successful contract renegotiation with the two unions was a positive step forward to ALMA operations' stability. The relocation of the NRAO/AUI Office for Chilean Affairs closer to the JAO seems very practical. The establishment of the PROVOCA program to further engage the Chilean community and diversify science is exciting and the UC recommends this program continue and expand if possible.

ALMA's operations response to the COVID-19 pandemic are laudable. The fast response to closing the array in March in a way that optimized the safety of the staff was impressive. The rapid adaptation to work from home status at the JAO and the NAASC is a testament to the resilience of the ALMA staff. The UC was impressed with the quick transition of the NAASC's offerings to a digital format, especially with regards to the face-to-face support. We encourage the NAASC to continue to support this mechanism in tandem with in-person support even after the pandemic, to help support those who may not be able to easily travel.

Furthermore, the UC commends the NAASC for their efforts to keep the morale of the staff high by supporting socializing events (daily coffee hours). Such efforts have undoubtedly helped motivation and productivity during otherwise very difficult times.

The decision of the ALMA Board to postpone the ALMA Cycle 8 deadline by one year appears to be the most practical way forward given the uncertainties surrounding reopening, and the varying progression of COVID-19 in the different partner countries. The UC encourages careful thought regarding how any available time is filled, and that if Observatory Programs are initiated to fill this time, that these are carefully vetted to ensure that they do not duplicate accepted programs by PIs.

Key Findings and Recommendations:

- The UC is encouraged by efforts to continue to grow the ALMA community and engage with the local Chilean community (e.g. PROVOCA Program).
- The UC encourages the continued consideration of a joint proposal process between ALMA and other facilities (e.g., NASA/NOAO) to expand the user base and enable new science.

- The continued improvement of supporting time-critical observations with ALMA like those of exocomet Borisov is impressive.
- The UC was impressed at the responsiveness of ALMA management to the civil unrest in Chile in October in 2019, very quick recovery. Therefore when COVID hit, the observatory had been on track, and when ALMA comes back online it will be easier to finish the goals of Cycle 7.
- The UC is encouraged with the continued community engagement during the transition to work from home status supported by the NAASC, i.e., maintaining “face to face” online.

VLA/VLBA Operations & Development

The UC is very impressed with the high impact scientific results achieved with both the VLA and VLBA (e.g., wandering black holes and size/mass constraints on SgrA*). The UC is also pleased with the careful, continuous infrastructure updates at the VLA site, and with the status and performance of community support activities. These include the full implementation of REALFAST, the meetings hosted at the NM site (especially the plan for moving the synthesis imaging workshop online), and the opening of an Albuquerque office. For the Albuquerque expansion, it would be useful to see a more formal statement of scope, detailing its impact on recruitment and on other activities it may facilitate.

For the VLBA specifically, the UC was happy to hear about the progress with the Mark6 recorders and the fiber project. It was not completely clear, though, to what extent the fiber (or other) upgrades are meant to get the community closer to conducting “real-time” science with VLBA (which would be extremely valuable). A clarification of scope for the VLBA upgrades would thus be helpful. The UC also suggests using only the subset of antennas with upgraded fiber connections for Shared Risk target of opportunity observations.

The UC recommends that efforts continue to be made to expand the user base of both the VLA and VLBA beyond the current one. To this end, the UC encourages continued and more broad advertising of the VLBA NRAO staff help, beyond the newsletter if possible (e.g. using social media). We also suggest using NAASC to promote the VLA in their ALMA events, and to consider a specific ***proposal*** Helpdesk/Friend program (or else advertise broadly and periodically the current helpdesk infrastructure as a way for the community to get help on proposal writing).

Key findings and recommendations:

- The UC is very impressed with recent high impact scientific results.
- The UC feels the VLA and VLBA should expand their user base beyond the current one. We encourage advertising the VLBA “NRAO staff help” more broadly and periodically,

and beyond newsletter if possible (e.g. social media). We also suggest using NAASC to promote VLA in their ALMA events.
- We encourage the VLA to consider a specific ***proposal*** Helpdesk/Friend program.
- The UC is impressed with the plans for the virtual synthesis imaging workshop.

VLA Sky Survey Status

The UC is very interested in ensuring that VLASS, which has taken years of investment from NRAO and will occupy a full year of observing time, deliver on the science that motivated it. Epoch 1 data collection was completed in July 2019 and the nominal delivery time of Epoch 1 imaging is 12 months later. We heard that the computing required to deliver a final Epoch 1 image is significantly greater than expected, and that a timeline for Epoch 1 will be available by September, as Epoch 2 observations begin.

Considering the significant computational costs of delivering the Epoch 1 image, we urge NRAO to carefully validate test images, using existing mosaics or new pointed mosaics if needed. We suggest that NRAO release images of sample region(s) of the sky to allow for early science and to drum up community interest.

The UC suggests that it may be worth relaxing some survey specifications (e.g., dynamic range) to deliver data sooner, and the VLASS SSG be consulted about such a tradeoff. The UC also notes that polarization was an important and well-reviewed part of the case for VLASS, and urges NRAO to begin work on this aspect of the survey as soon as possible.

Key Findings & Recommendations:

- We strongly recommend a preliminary release of a small subset of VLASS Single Epoch Continuum data, to allow for early science and drum up community interest (e.g., 10 - 100 square degrees in the North Ecliptic Pole, a large enough field to validate handling of sky curvature.)
- It was not clear to the UC that the Epoch 1 imaging challenge necessarily required large new investments in staff time and computing costs. It seems that modest compromises in the pipeline design will allow the VLASS meet most or all of its formal specifications for Epoch 1.
- Along with transient science, polarization was identified as high impact science in the VLASS review. It is important to move this science along, again even for a subset of the data.
- Ensure that the Epoch 1 image is scientifically correct before pushing through the full processing, given the expense. This likely will require tests that compare against pointed observing mode.

Data Management & Software/CASA

The UC is encouraged by several developments and ongoing planning related to software and data management. In particular, the procedures and tools for management of CASA have improved, which will undoubtedly improve confidence and utility of this software that is critical to the global radio astronomy community. Planning for next-generation CASA is timely and a valuable investment.

That said, it is important to maintain a balance in the allocation of software developments among NRAO facilities. For example, the VLBI community is not benefitting from these new tools and remains saddled with legacy software with a design that is unfriendly to new radio astronomers. VLBI/VLBA support in CASA needs to be prioritized in order to improve the health of the VLBA user community and support novel VLBA science cases.

The plans for Science Ready Data Products are well developed and in line with expectations of the broader astronomy community. And while ALMA pipeline improvements have been impressive, we recommend continued efforts to identify any inefficiencies in the pipeline and to achieve further improvements. The description of new archive tools and CARTA are positive developments that we hope will support new classes of NRAO users and use cases. The presentations made clear that the ngVLA will put tremendous pressure on plans and systems being made by the SRDP and computing groups.

There is a reasonable argument to be made that quality pipeline products from ALMA have helped build a community that includes people outside of traditional radio astronomy. Another factor is likely to be the quality of documentation and support systems used by ALMA. There is general acknowledgement that NRAO software is documented, but difficult to find, which is consistent with the UC experience. For example, the “knowledge base” system used by ALMA is well populated with question/answer style documentation, while the NRAO equivalent is not. Effective use of a knowledge base can reduce demand on the helpdesk and reduce user frustration. Email feedback is generally underutilized, so it would be worth finding tools for feedback on individual documents (e.g., +1/-1 feature on a casaguide or other documents) to help NRAO identify confusing or substandard documentation.

Finally, the UC was happy to hear NRAO interest in supporting archival research with a funding program. The UC views archival funding as an effective way to magnify the SRDP investments. Furthermore, funding of archival research introduces radio astronomy to underrepresented institutions and groups (Peek et al; https://arxiv.org/pdf/1907.06234.pdf).

Key Findings & Recommendations:

- VLBI support in CASA needs a higher priority to improve the health of the VLBA user community.

- It is encouraging to see procedures improved for CASA development and testing. Planning and work on next-generation CASA seem to be going well.
- Preparation for ngVLA is continuing, but it is clear that some of the work is pushed to SRDP.
- ALMA pipeline improvements are impressive and SRDP development is encouraging.
- A new archival research funding program would improve the use of SRDP and archives. A new program could also be targeted to support new institutions and underrepresented groups, or could be implemented as an expansion of the SOS program.

COVID-19 Impacts & Plans

The UC strongly endorses NRAO's approach to working in the COVID-19 environment. The Observatory moved quickly to address the pandemic, and developed processes/structures to address most threat situations, and has continued to work through a few remaining situations. NRAO management has thought/is thinking hard about these issues. The UC was very impressed by how quickly NRAO adapted VLA/VLBA functions, by the safety protocols implemented at the VLA / VLBA / CDL, at the swift transfer of new activities on-line (conferences, EPO) and the efficacy of working from home for the majority of the employees.

The current plans for working-from-home and for a paced return-to-work seem reasonable and appropriate, given our current understanding of the COVID situation. Because of the many current unknowns, this flexible and circumstance-shaped response seems likely to be a functional and effective approach.

The UC concurs with NRAO management assessment that restarting and operation of ALMA will be much more challenging. Stand-down and delay of operations are appropriate. UC endorses the plan to continue community engagement supported by the NAASC, e.g., moving the "face to face" training online.

The UC was very pleased to hear about NRAO's recent successes in recruiting and hiring during the pandemic, and hope that this continues. Going forward, we suggest that NRAO be proactive in addressing equity issues likely to be exacerbated by the virus. For example, NRAO could offer supportive actions such as long-term part time status with the option to return to full-time when schools reopen, optional temporary furloughs that maintain benefits, extended leave options, or logistic/financial help providing good internet access where it is not readily available (e.g., parts of Charlottesville and Socorro – perhaps in coordination with the local universities.)

We also suggest that NRAO offer or facilitate regular, frequent COVID-19 testing for all NRAO employees who want to be tested.

Key Findings & Recommendations:

- The UC applauds NRAO's approach to working in the COVID-19 environment : quick response, safe work protocols, fast return to VLA/VLBA operations, safe hands-on work at CDL, moving new activities on-line (conferences, EPO).
- Plan for paced Return-to-Work seems reasonable (as far as we know now).
- Committee concurs with NRAO management that restarting and operation of ALMA will be much more challenging. Stand-down and delay of operations are appropriate. UC endorses the plan to continue community engagement supported by the NAASC - "face to face online".
- The UC suggests that NRAO investigate providing regular, frequent, COVID testing of all NRAO employees who would like it.
- The UC recommends that NRAO address potential equity issues likely to be exacerbated by the COVID pandemic by offering supportive actions such as: long-term part time status, optional furloughs for those providing home schooling/child care/eldercare, or financial help providing internet access (satellite options) where it is not readily available (parts of Charlottesville and Socorro)

Science Support & Research

This section was presented in two parts, with Dale Frail reporting on scientific activities and the time allocation process, and Jeff Kern reporting on the Science Ready Data Products and Telescope Time Allocation Tool.

Dale has been serving as the acting director for the Science Support and Research Division for about nine months, and will step down as Trish Henning takes over in about 3 months. The committee thanks Dale for stepping up in this time of need.

It was possible to recruit five Jansky fellows in the past year, up from a typical number of 3.

Most of the time allocation process was fairly routine. The committee had asked in the past for a breakdown not just of oversubscription by proposal number, but also by time requested. It appeared that the data had not been collected in a consistent manner for these two ways of looking at the oversubscription. In particular, the committee was curious about why the GBT oversubscription oscillated strongly in hours, but not in proposal number. Regardless of the

metric, oversubscription rates appear to be somewhat higher to much higher than on NOAO facilities.

The X-class proposal process was discussed. These are proposals of order 1000 hours and/or more than 4 semesters in duration. The program was strongly suggested by the UC in the past on the grounds that the time allocation committees had been too reluctant to award such large proposals. A process was developed by which scientific input on the quality of submitted proposals would be given by the normal science panels, but a carefully selected committee free of conflicts of interest, but with a broad range of relevant expertise, would make the final recommendations about whether to execute these programs. Nine were submitted, but one was sent back as a regular Large program, and it was approved by the panel. Of the remaining 8 proposals, one has been tentatively approved, pending some final feasibility analysis, and pilot observations for it have already commenced in the extended duration C configuration.

The committee would like to see consideration given to an additional X-proposal call, especially as VLASS ramps down. Obviously, such a decision will need to be made in the context of what happens with the ngVLA project. If ngVLA is going forward, and hence X-class JVLA proposals could be executed relatively quickly with VLA, consideration should be given to time domain proposals that might still make good use of the time.

Dr. Frail expressed admiration for and pride in the way that the staff have been able to handle maintaining operations during the current pandemic. NRAO has suspended travel to and from its centers, and some forms of user training, but it is still going to conduct a synthesis imaging school and has conducted some ALMA community days.

NRAO is looking for ideas about how to maintain scientific vibrancy, especially for the junior scientists who most need interaction as part of their development. They are looking into making their colloquia an international radio astronomy talk series. The Compact Objects ngVLA virtual meeting has overflowed the NRAO Zoom account, so there is clearly interest in these kinds of things, and NRAO expertise with a viable technical solution for allowing many hundreds of people to join at once will be developed for that meeting.

The progress on Science Ready Data Products was also discussed. In addition to ALMA, these are now being implemented for VLA data for single band continuum observations from X band up, and the expectation is that the lower frequencies will gradually be added over the next few years. The team would like to see a slow, but manageable, ramp up in the level of requests for SRDP. The committee has requested that the team present some estimator of when jobs will be finished, that continued development be done (e.g. to combine data from multiple configurations), and to allow access to pre-QA data with appropriate warnings, especially if lag times increase.

The overhaul of the Telescope Time Allocation Tool (TTAT) is a major project. It has been through a recent design review, and overall the plan was well received, with the final details of

the response being put together now. It is expected that it will be suitable for calls by 2023, and finalized in 2024. It will take about 16 FTE years, including 4 FTE-years of scientific staff time for testing. Goals include making it easy to anonymize the review process, which should help with maintaining panel expertise when there are marginal conflict of interest cases, since conflicts of interest are not possible when the reviewer is unaware of the names of the proposers. The tool will be developed in a manner that makes it easier to go from the proposal to the scheduling blocks, but this will require custom design for each observatory. Testing will be done from remote sites to ensure smooth performance over the internet. One concern was raised, in that the tool might be deployed before it was made user friendly. Some committee members are already concerned that there is a perception that radio astronomy is technically more difficult than it is, and deploying the tool too soon may potentially put off some proposers for considerable amounts of time.

The committee believes that there continue to be barriers to entry for the VLA in terms of setting up scheduling blocks and preparing proposals. Additionally, the fact that expertise with organizing scheduling blocks can strongly affect likelihood of execution for filler targets remains a problem. Ideally, NRAO would do Phase II as a default practice, but in the absence of resources for that, at least providing more documentation, advice about best practices and sample scheduling blocks that can be pulled directly into OPT, or a Proposal Friend Program would be helpful. The committee also believes that better use would be made of the archival SRDPs if there is some access to funding for this purpose.

Key Findings and Recommendations:

- The committee encourages NRAO to consider a new X-class proposal call as VLASS data collection winds down, with an understanding that a time domain survey may be the most sensible approach if ngVLA is approved by that point.
- The committee is encouraged by the TTAT project having a timetable for release, but encourages them to ensure that the new tools are not implemented until they are at least as user-friendly as the current system.
- The committee encourages NRAO to improve the process for submitting scheduling blocks, preferably by having NRAO DAs do them, and having the users just check off on them. If this cannot be accomplished, at least some more effort should be devoted to ensuring that manipulation of how the scheduling blocks are set up does not strongly affect which Priority C targets are observed.
- The committee encourages NRAO to provide funding for both new data analysis and archival data analysis.

ngVLA

The Users Committee commends NRAO and the ngVLA office for great progress made during the last year. Many important milestones have been reached on schedule, particularly in relation to the Astro2020 Decadal Review exercise. We were impressed by the substantial interest shown by the community both within the US and abroad, and especially by the response of the younger portion of the community to the science meetings organized by the ngVLA project.

The Committee understands that the transition between Jansky VLA and the ngVLA is a complex issue with many moving parts. We strongly support the idea of finding a way, if at all possible, to maintain the operation of the Jansky VLA in some form during the transition period from VLA to ngVLA.

The naming system for the ngVLA bands (with, e.g. Band 6 for the ~100 GHz band) is in conflict with the names used for the ALMA bands. Since there is going to be a large overlap between the ngVLA and ALMA user communities, we recommend that a different naming convention be considered.

Key Findings and Recommendations:

- The Users Committee commends NRAO and the ngVLA office for great progress made during the last year. Many important milestones have been reached on schedule.
- We were impressed by the substantial interest shown by the community both within the US and abroad, and especially by the younger portion of the community.
- The Committee supports the idea of finding a way, if at all possible, to maintain the operation of the Jansky VLA in some form during the transition period from VLA to ngVLA.
- NRAO should think of a better band name system for the ngVLA to avoid confusion with ALMA band system (e.g. Band 6), especially important since there is frequency overlap with ALMA.

Central Development Laboratory

UC is excited to see the variety of activities in CDL and are pleased that CDL is leading their own developments for the current and future NRAO facilities as well as working with external partners. The laboratory appears to be in a healthy state in terms of projects.

UC recognizes that managing the transition of staff has been a difficult task for some time and congratulates on the successful recruitment of young talented engineers. UC endorses maintaining institutional expertise as new personnel are integrated into the team as the number one priority.

The cancellation of the ALMA CUP project is a disappointment, but UC understands that it was a responsible and rational decision. We recognize that CDL is maintaining strong expertise in digital and RF teams with recent hires that would be important for a correlator project in the future and that it is currently advertising for "correlator guru".

Key Findings and Recommendations:

- UC recognizes that managing the transition of staff has been a difficult task and congratulates on the successful recruitment of young engineers.
- UC endorses maintaining institutional expertise as new personnel are integrated into the team as the number one priority.
- The cancellation of the ALMA CUP project is a disappointment, but UC understands that CDL is maintaining strong expertise in digital and RF teams with recent hires, and is advertising for "correlator guru". UC recommends to push for that direction, so that CDL can play a major role in correlator developments for ALMA and ngVLA.

EPO/Scientific Communications

The UC received two separate reports, one on Education and Public Outreach (Gurton), and another on Science Communications (Adams). As with many areas, the year was heavily impacted this spring by COVID-19. EPO has made admirable strides in pushing for recognition of NRAO discoveries through the creation of original online content.

The new video content, in particular, was impressive, and the UC hopes that NRAO will continue to push this content out to services with a large number of subscribers, like NASA's ViewSpace platform that is featured in science museums nationwide. The ALMA Top 10 series narrated by Phil Plait and the ALMA and VLA VR demonstrations are examples of creative and original work by this group.

NRAO's presence at AAS meetings has been significantly expanded in recent years, and the collaboration with NSF has been productive in increasing visibility. The "drawing wall" at the Hawaii AAS meeting in January 2020 was another example of creative and playful work by this team that seemed an effective way to draw in visitors. We were informed about plans for the AAS virtual exhibit for the June 2020 AAS meeting, and perhaps mid-year we could get an update on the effectiveness of this approach. There was a request that the stock images of people be changed out for real NRAO employees!

Both eNews and CASA News seem to be relatively effective ways to communicate with the community. We would have liked to have seen some evidence of readership of these newsletters via the various sorts of tracking that are available. We liked the idea of "The Baseline" reports, and there was support for hot-off-the-press reports that could be called "The Dish". The Facebook/Astronomers page can also be an effective way to reach a broader audience outside the Radio Astronomy community.

Key Findings and Recommendations:

- The UC was impressed with the EPO and Science Communications efforts over the past year.
- Especially with the impact of COVID-19, it seems that this Division has managed the transition well. The plans for the upcoming virtual Summer and possibly Winter AAS Meetings seem well considered, and could be revised after the Summer meeting.
- The efforts to create new video content, and the short videos for the web site are commendable.

2020 ANASAC Report

Overview and Main Recommendations

The ALMA North American Science Advisory Committee (ANASAC) met via Zoom on May 28, 2020. All ANASAC members participated, as did several non-ANASAC UC members. Three ANASAC telecons were held during the preceding year, one before each ASAC meeting and one for the purpose of finalizing the ANASAC report to the IVC.

ANASAC would like to thank NRAO for hosting this remote meeting, and we take this opportunity to recognize the enormous contributions of Al Wootten as the NA program scientist and thank him for his efforts on behalf of the North American ALMA community. We welcome Crystal Brogan as the new NA ALMA program scientist. Finally, we applaud the impressive and prompt actions by ALMA and NAASAC in response to the COVID-19 pandemic.

Main Recommendations of the ANASAC:

1. Additional metrics should be used to assess science outcomes, beyond simply counting the number of publications. At a minimum, the total number of citations should be tracked just as carefully.
2. ANASAC recommends moving to half-day (or longer) ANASAC virtual meetings to be held in sync with ASAC meetings.
3. The recent emphasis on CASA verification is to be applauded. However, we recommend that a formal policy for communicating bugs and other known or suspected data-quality problems be developed and implemented soon, in order to avoid loss of time by researchers on issues like the autocorrelation-scaling problem for strong lines.

ALMA Overview and Status

Observatory management:

The completion of 3-year contracts via collective bargaining is a positive sign for maintaining stability for ALMA in the coming years. The ANASAC is also very happy to see how quickly ALMA observing got back on track after the civil unrest in October. Finally, we commend the quick response to COVID-19, including closing the ALMA site to protect the health and safety of the staff, protecting essential functions like the hydrogen maser, and planning for the potential power needs as we head toward Austral winter (extra batteries).

Science operations and communication:

The ANASAC continues to be impressed with the quantity and quality of ALMA scientific results. The strong record of impactful publications from the NA community in particular is reassuring. To promote continued high-impact science, ANASAC recommends continued consideration of a joint proposal process between ALMA and other facilities, e.g., NASA and NOAO. This will help expand the user base to include optical astronomers.

ANASAC appreciates the quick planning for flexible operations during and just after recovery from the COVID-19 shutdown. We agree with the idea of pursuing observatory projects to fill schedule gaps in Cycle 7, but it will be important to pay attention to possible overlap with approved PI programs and targets. Such overlap should be avoided.

ANASAC commends the very successful efforts to continue to grow the ALMA community and engage with the local Chilean community (e.g., the PROVOCA Program).

Software and Data Reduction:

ANASAC congratulates ALMA for achieving the milestone of data delivery within 1 month for 87% of pipeline-processed data sets. We recommend continued efforts to identify any inefficiency in the pipeline and to achieve further improvements, especially for processing the Total Power data in interferometric imaging. Finally, we hope that this high level of performance can be maintained once the data processing reverts to the JAO.

While the emphasis on CASA verification is to be applauded, we note that there does not seem to have been progress on a formal policy that would avoid PIs losing valuable analysis time when they are not promptly informed of issues such as CASA bugs or the autocorrelation-scaling issue for strong lines. A policy for alerting ALMA users regarding suspected or known bugs and other data-quality issues should be developed and implemented soon. On a related note, ANASAC is concerned about allocation of resources for analysis

software (primarily CASA) between ALMA and other NRAO telescopes. In particular, problems with VLASS imaging have led to staff being withdrawn from the development of CASA features with broad relevance in order to deal with issues specific to VLASS. We emphasize the need for a balanced allocation of software development resources.

Key Findings and Recommendations:

- We congratulate the ALMA partnership for achieving the milestone of data delivery within 1 month for the vast majority of projects.
- We recommend that a formal policy for communicating bugs and other known or suspected data-quality problems be developed and implemented, in order to avoid loss of time by researchers on issues like CASA bugs and the autocorrelation-scaling issue for strong lines.
- When pursuing observatory projects to fill schedule gaps in Cycle 7, overlap with existing PI projects should be avoided.

NAASC Operations & Community Outreach

ANASAC was pleased to hear that the option of raw data delivery (with start of proprietary clock) is now available to all observers and that DDT proposals will now be kept in the queue for a full year.

Community acceptance of distributed peer-review seems uneven. More DPR reviewers are against doing it than in favor, with a significant number in a third group that has no opinion. DPR is a marked change from the current method, so the observatory should expect some resistance as well as some bumps in implementation. Clear, early, and frequent communication with the community regarding the DPR review process for Cycle 8 will be very important.

For building interest in ALMA, the results of the AAS Survey suggest reaching out to three demographic categories and communities of astronomers: graduate students, optical astronomers, and radio astronomers who do not use ALMA. The committee suggests concentrating on outreach to optical astronomers. Support of meetings and workshops appears very successful and should be continued as another way to build interest in ALMA.

ANASAC applauds changes made at NAASC facilities to ensure the health and safety of workers during the COVID-19 pandemic. Moving the Ambassador program, site visits, and the summer program to virtual maintained momentum and this practice should be continued where appropriate. Another accommodation made for COVID-19 was extension of the proprietary period. ANASAC applauds this change and suggests that additional extensions may need to be considered based on possible continuation of increased teaching workloads due to the transition

to remote teaching. Finally, the ALMA town hall seems to have been a very successful way to keep the community updated during these difficult times. We recommend that another such meeting be held around the time when ALMA starts up again following the COVID-19 shutdown.

Key Findings and Recommendations:

- Close attention should be paid to the implementation of the DPR review process for Cycle 8. Clear, early, and frequent communication with the community will be very important.
- In light of COVID-19, serious consideration should be given to the idea of additional extensions to the proprietary period for ALMA data sets.

ALMA Development & Roadmap

North America's participation in the recent efforts to provide a robust structure for the implementation of the ALMA 2030 Roadmap was described. The large number of technical decisions required to implement the Roadmap and the need for a coordinated approach are clearly appreciated. The creation of working groups to define requirements, informed by workshops representing community expertise, is a welcome step. The next-generation correlator workshop in Charlottesville was a resounding success, and several capable designs were presented, in addition to important lessons-learned from experience on other projects in recent years. The project understands that a priority for further development is a system-wide plan for handling wider bandwidths throughout the signal path, since this impacts many different aspects of the array upgrade.

We also applaud the recognition that testing of any new hardware should be done in such a way as to minimize the impact on science observations. To the extent that logistics allow old and new equipment to be available in parallel, e.g., the digital system, this will ease the transition to new hardware without requiring extensive loss of science observing. We recognize the value of the Hardware-in-the-Loop system as a tool for testing features off the telescope.

The committee is pleased to see the number of NA development studies underway, with the potential to provide enhancements for the ALMA facility. We note that the next anticipated call for projects is being delayed due to the impact of the COVID-19 pandemic, with several major items expected to be proposed. We welcome the preparations for handling a situation where different groups propose for the same project item and need to be assessed in competition.

We note that there have been instances where EOC teams have observed objects with ALMA in modes that are similar to approved science observations, and have moved to release such data, which would harm the PI observations, without first checking the observation database for conflicts. We recommend that the need for such checks needs to be re-emphasized to EOC participants, potentially with input from Science Operations.

ANASAC was pleased to see a draft of the requirements for the next correlator, and that the concepts can be matched to the bandwidths being considered for the new wider-bandwidth bands (e.g., 2, 6v2).

Key Findings and Recommendations:

- The committee strongly commends the NAASC for their role in the preparations made over the past year for a coordinated, structured approach to implementing the ALMA 2030 Roadmap.
- We note that the correlator workshop was very successful and provided several promising directions for a new ALMA correlator.
- NA development activities are robust with several exciting new projects expected in the next round.
- We emphasize the need for EOC teams and science operations to work together to ensure that releases of commissioning data do not infringe on PI science.

ASAC Permanent Charges

ANASAC appreciated the opportunity to hear a summary of current activity regarding the permanent charges to the ASAC. Regarding Charge #1 (Scientific Capabilities), one concern is that most EOC testing is usually done in the winter (northern summer) season, which in 2020 will be lost to the COVID-19 shutdown. Some EOC activities could take place in the fall once the array is restarted, but anything to do with long baselines will need to wait until summer 2021. The next window for VLBI Band 7 testing is October 2020, the previous testing windows having been plagued with poor weather. In response to a question about a calibration problem on very bright lines mentioned at the October 2019 ASAC meeting, the observatory is still working on the best data reduction path to mitigate the problem. A knowledge-base article has been drafted but not yet released to the community.

For Charge #3 (Assessment of Scientific Outcomes), a variety of metrics were presented, including total publication counts, journal use, total citations, and impact factor. Data on the size of the communities in the different regions were also presented, as were the number of projects per region that have produced a publication and the number of papers based on archival data. ANASAC recommends that total citations and impact factor should be tracked in addition to total publications. It would also be useful to provide statistics using all authors, not just the first author, as the majority of ALMA papers involve international collaborations. Related to the differences in archival data papers between Europe and North America, the ANASAC suggests that expanding the SOS program to cover archival research with ALMA might help to expand both the user community and the North American publication rate.

For Charge #4 (Maximizing Scientific Impact), ANASAC commends NAASC/NRAO/ALMA for implementing double-blind peer review starting with Cycle 8. The current plans for adjusting the ALMA proposal call and review process to include DPR, medium proposals, and a floor on the amount of time awarded to large programs were presented. Our recommendations on DPR roll-out were noted above. ANASAC urges the implementation of two-step review for DPR, to allow a reviewer to see the comments from other reviewers for a proposal before finalizing their own grade. ANASAC will comment further on these plans at a later date once the plans are more concrete.

For Charge #5 (Issues Raised by the Community), the ASAC has recommended that PIs with programs involving multiple components (e..g 12m+7m array data) be allowed to choose whether to wait until data collection is complete before receiving their data, or receive it as it arrives in the normal way. The ANASAC concurs with the ASAC recommendation.

Key Findings and Recommendations:

- ANASAC recommends additional metrics be used to assess science outcomes, beyond just the number of publications: at a minimum, total citations should be tracked just as carefully as the number of publications.
- ANASAC commends NAASC/NRAO/ALMA for implementing double-blind peer review starting with Cycle 8.
- Expanding the SOS program to cover archival research with ALMA might expand the user community and publication rate.
- ANASAC concurs that it would be helpful to allow PIs to choose to receive multi-configuration data only once all observations are complete.
- ANASAC encourages the project to implement a two-step review process in DPR, whereby a reviewer is allowed to see other reviewers' comments before finalizing their grade for a proposal.

Meeting Format / Strategic Role

One of ANASAC's key roles is to provide input on issues discussed by ASAC. In the recent past, one-hour ANASAC teleconferences held before each Face-to-Face ASAC meeting have served this purpose. These short teleconferences should be replaced with longer virtual meetings, of at least half-day duration, as one hour is simply not enough time to fully discuss the large number of issues that typically come up. By shifting many ANASAC discussion topics to these twice-yearly meetings we will remove the need for a dedicated ANASAC day during Spring UC meetings. ALMA will of course still be discussed during UC meetings as part of the overall UC agenda.

ANASAC and UC agree that the synergy between UC and ASAC should continue. As in the recent past, ANASAC members should be appointed to the UC, and UC members should be invited to attend all ANASAC meetings. This promotes the flow of ideas and advice back and forth between UC, ANASAC, and ASAC. Similarly, to promote this connectedness, NRAO should work to ensure that at least one of the three North American representatives currently serving on ASAC will have their term extended to at least the end of Calendar year 2021.

In order to ensure that the ANASAC will be fully informed on ASAC issues when they meet to provide input prior to each ASAC meeting, it is critical that the JAO make it very clear which of the documents made available to ASAC may be shared with ANASAC/UC, and which may not. In the past, some committee members have had the impression that at least some of the many ASAC documents that are made available to ASAC members in advance of teleconferences and meetings are confidential in the sense that permission to share with ANASAC and UC is not obvious. Because a large number of documents and presentations are released just before each ASAC meeting, often at the “last minute”, it is critical that the JAO make it very clear which documents may be shared. Indeed, the timing is often so tight that the only practical solution is to ensure that all documents viewable by all three committees are made available to the three committees essentially simultaneously.

Key Findings and Recommendations:

- ANASAC recommends moving to half-day (or longer) ANASAC virtual meetings to be held in sync with ASAC meetings.
- NAASC should work with ASAC to ensure that JAO clearly communicates regarding confidentiality of any documents shared with ASAC that should not be shown to ANASAC/UC.
- At least one of the three North American representatives currently serving on ASAC should have their term extended to at least the end of Calendar year 2021.