NRAO/GBO Users Committee 2025 Report

`report submitted June 6, 2025`

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Executive Summary

The Users Committee convened virtually on May 20–22, 2025 to review the state of the operations, user-facing policies, and development efforts of the Observatories. This is a time of great uncertainty in the scientific enterprise. However, the staff and leadership of the Observatories continue to do extraordinary work that facilitates transformational research with a broad suite of state-of-the-art telescopes and instruments, develops cutting-edge technologies, supports the research community, trains new scientists, and educates the public to disseminate the knowledge it helps generate. These are remarkable achievements. The committee views those accomplishments as a collective

[1] excused absence

testament to the commitment, quality, and purpose of the NRAO and GBO staff, and wanted to expressly acknowledge their deep value to the scientific community and public at large.

The committee conducted a thorough review of performances, maintenance requirements, and development for the established telescopes: ALMA, GBO, VLA, and VLBA. These facilities are all operating well, with consistently excellent scientific returns thanks to heroic staff efforts, even with ongoing challenges in mitigating obsolescence and modernizing critical equipment and software. The near-term development efforts are especially exciting and bearing fruit, particularly the ngRADAR and cyclic spectroscopy capabilities and the new ultra-wideband receiver (UWBR) at GBO, the VNDA architecture on the VLBA, and the tangible pivot to the WSU era at ALMA. While this report covers the details of our findings and some suggestions for optimally engaging with the user community, we want to emphasize that the true strength of the US investment in radio astronomy is the *synergy and complementarity of all the NRAO and GBO facilities*. The breadth of unique astrophysical information from these telescopes and supporting infrastructure is the key to maintaining the outsized scientific returns from this community.

Beyond the current facilities, the committee was especially excited to consider the progress toward, and prospects for, future facilities. Especially given the challenging funding environment, the success of the ngVLA in securing a new partnership to develop the strategy and capabilities for long baselines was a particularly welcome development. Coupled with the start of commissioning for the ngVLA prototype antenna in New Mexico, there is significant momentum for the project to look forward to over the coming year. The committee additionally felt strongly that the US community should not cede a seat at the table in the ongoing strategic planning for an expanded "ALMA–2040" concept, and that now is the time to meaningfully engage. Recognizing that the NRAO staff are saturated with other pressing tasks, we recommend that this obligation be shared with the community. NRAO should promptly establish a committee focused on these efforts, akin to how the SAC successfully helped develop the scientific motivations for the ngVLA.

The committee wants to explicitly recognize that NRAO and GBO are experiencing significant funding pressures, and understandably, these pressures have required scaling back some of the established support opportunities that help produce strong scientific research and training outcomes in the community (e.g., student support, internship programs, page charge support, workshops, in-person users committee meetings, etc.). Those supports traditionally offer strong returns on the investments, and certainly the impact of these restrictions are felt acutely across the community. We also recognize that the NRAO and GBO leadership hopes to reinstate these as soon as possible. Going forward, it is essential that prompt and forthright communications about these challenges are issued, so users can prepare strategies to compensate for the loss of critical resources.

Finally, the committee had some general logistical recommendations. First, the committee suggests that some reorganization could facilitate a more coherent link with the ANASAC to efficiently propagate more technical suggestions through the ALMA review committees (more detailed suggestions are beyond the scope here; they will be made under separate cover). Second, the committee reminds NRAO and GBO that the turnover rate for UC membership has slowed enough that there is a less-than-optimal backlog of long-serving members (more than the nominal term length) that should be remedied. An extensive list of suggestions for new members will be sent under separate cover. The committee has decided that next year's Vice Chair will be Elisabeth (Betsy) Mills, and the Chair will be Daniel Perley. Lastly, the committee would like to strongly emphasize their desire to return these meetings to a hybrid format as soon as possible, where deeper understanding can come from casual interactions and engagement with each other and Observatory staff.

1. NRAO Overview

The NRAO and GBO facilities are vital to radio astronomy and the larger astrophysics ecosystem around the world. During these challenging times, NRAO is doing a remarkable job balancing maintenance and advancement of these crucial facilities, while also planning for potentially existential pressures on the observatory, its instruments, and the services it provides to the community. However, we are concerned that NRAO is not sufficiently communicating these plans and pressures. The lack of information flow is confusing the user community, inhibiting their planning and making it a challenge for them to advocate strongly on NRAO's behalf.

Recommendations

1 – We recommend more frequent and more targeted communication with the community regarding user-facing programs impacted by funding pressures (Student Programs, Visitor Support, Page Charges, etc.). These updates should be as transparent as possible and acknowledge when more information or reassessments are likely to become available. We suggest specifically engaging users of these support programs in the last ∼5 years.

2 – NRAO should make it clear to the user community that their support and advocacy is, and will be increasingly, critical in the currently challenging funding landscape.

3 – NRAO should continue to support vital development efforts for ALMA, ngVLA, and GBO.

4 – Even despite current challenges, NRAO should not lose sight of long-term goals (e.g., ngVLA, ALMA–2040) and should leverage what internal and external resources are available to maintain momentum in these areas.

2. ALMA Operations

ALMA continues to be a productive flagship observatory, experiencing very high demand and generating influential, cutting-edge scientific output. We commend the ALMA team for their efforts to increase observing efficiency, as demonstrated by the current status that is well ahead of the targeted science hours during this cycle. The NAASC continues to provide valuable community support (e.g., data reduction visits) and outreach (e.g., the ALMA Ambassadors program, community workshops). However, funding pressures have discontinued some community support programs (Student Observing Support, page charge support) that are increasingly critical as the grant funding landscape contracts, placing training opportunities early in career trajectories into jeopardy.

Recommendations

1 – Any further changes to the community support activities offered through the NAASC should be promptly communicated to all users, so that they can plan and respond accordingly.

2 – We continue to recommend that the ALMA user base is surveyed regarding their use of pipeline products, on-demand computing services (like AUDI), and other NRAO-specific software. Specifically, understanding how many ALMA users are performing their own imaging (and why) could help Data Management planning for the WSU (and `RADPS`) transition.

3. ALMA Development

The Wideband Sensitivity Upgrade (WSU) is the focus of ALMA development. Within that effort, many of the key development projects are underway, with either full or Phase 1 funding. The deliverables from the North American executive include the Advanced Technology ALMA Correlator (ATAC), the (recently completed) correlator room upgrade (OCRO), the Band 6v2 receivers, and significant contributions to other aspects of the digital backends, transmission systems, and software efforts. So far, all of these programs are seeing positive progress. Recently, the first wideband Band 2 receivers arrived on-site, with the remainder in production, and are showing excellent performance. Planning for the transition to the WSU system is in an advanced stage, and the final elements will crystallize following the System PDR and Cost Review scheduled later in 2025.

The user community should be informed of the significant changes that occur during the WSU transition through ∼2030. The current plan has normal Cycle 13 operations (likely with new Band 2 capabilities); some minor reductions in antenna access in Cycle 14; then Cycle 15 will span 2 years and cover the full configuration cycle with more significant science time reductions, to enable the substantial commissioning effort; and Cycle 16 will represent the start of WSU operations, with expanding capabilities in the subsequent few years. The exact milestones and timelines are expected to solidify after the System PDR this summer and as the commissioning efforts begin. ALMA plans to release Science Verification data in advance of the first WSU call for proposals, and is planning to mitigate the challenges to observers during the transition as much as possible.

Recommendations

1 – ALMA should advertise the expected Cycle 14–16 capabilities early, and support multi-configuration and multi-array projects during WSU commissioning to the extent possible.

2 – Ensure flexibility to be responsive to new scientific developments during WSU commissioning, particularly the extended (2-year) cycle (e.g., by modifying DDT requirements).

3 – Continue to refine guidance on WSU capabilities as these come into focus, and engage users in defining standard observing modes that will maximize the return on archival data.

4 – Re-engage the community on upgrade priorities for ALMA beyond the WSU (see §12).

4. GBO Operations

GBO maintains its status as an innovative and productive radio observatory, with particularly exciting development advances expected in the coming year (see §5). Maintenance and safety are paramount issues: this summer will see the start of a long-term painting project, which will continue along with ongoing improvements to the drive system to preserve and enhance the capabilities of the GBT. We commend GBO staff for their efforts in expanding the Data Center archives, and we acknowledge the outstanding GBO public outreach efforts, noting that the Science Center is moving to 7 days per week operations and expects 50,000 visitors this year.

The GBO is in the midst of a leadership transition, with Tony Remijan having seamlessly stepped in as Interim Director following Jim Jackson's retirement. A new Director will inherit an exciting development portfolio at GBO, but a challenging funding environment. There is some concern about the decline in purchased time on the GBT (as NANOGrav and Breakthrough Listen reduce

their contributions), and about the challenges in hiring and gaps at mid-career levels that could raise important issues in terms of knowledge transfer and redundancy.

Recommendations

1 – Consider whether there is any way to mitigate the impact of summer painting on the available LST ranges for GBT observations (e.g., the Galactic center is a particularly popular target that is severely affected).

2 – Continue to expand the legacy data sets available within the Data Center archives.

3 – Continue the innovative efforts to engage with partners and seek new sources of support (especially from non-federal streams as opportunities arise).

5. GBO Development

The past year has seen substantial progress in a wide range of development projects at GBO. Significant milestones include breakthroughs in the cyclic spectroscopy and ultra-wide band receiver (UWBR) projects, continued progress on the ngRADAR system and associated software, and the culmination of the `Dysh` offline software for data reduction. This coming year should see much of that progress reflected in expanded capabilities accessible to user proposals. Moreover, there are ongoing efforts to expand the instantaneous bandwidths for spectral line observations and incorporate a 310 MHz all-sky survey project in a collaboration with the University of Richmond. However, several of the instrument development projects we have discussed in previous meetings are stymied by a lack of funding (ALPACA, MUSTANG2, WIKID, CHORD).

Recommendations

1 – We endorse the development efforts for ngRADAR and enhancements to spectral line observing, and look forward to commissioning UWBR and cyclic spectroscopy this year.

2 – Should new funding streams become available, consider whether any of the under-funded instrumentation projects can be revived and seen through to commissioning.

3 – Initiate planning activities for the next generation of significant GBO development projects. For example, this could be kicked off by leveraging the highly successful GBO community Zoom series to host an online forum seeking ideas from the community.

6. VLA and VLBA Operations

The VLA and VLBA continue to drive impressive, high-impact research in radio astronomy. We support and commend the Observatory staff in their critical efforts to operate and maintain the current infrastructure through the ngVLA transition, including preventive maintenance and upgrades despite the current funding pressures. We also acknowledge the innovative pursuit of new customers and funding opportunities, with the support for the Innovative Machines lunar lander as one particularly compelling example. The VLBA recently accomplished a successful PDR for

the new digital architecture (VNDA), which will provide increased capability and reliability upon commissioning. There was also good progress in facilitating `CASA` support for the VLBA, including addressing the user concerns about the `FRINGEFIT` task.

Recent funding pressures are forcing some concerning restrictions. There is a forthcoming reduction in VLA guaranteed science hours for 26A, including a relaxation of the "3 antenna rule" (to 5 antennas). Since the VLA does not guarantee that data will reach a proposed target sensitivity, this could impact observations in a way that PIs are not expecting and cannot easily predict in advance. Moreover, the planned reductions in guaranteed time presumably imply an increase in the C-ranked pool. This could then exacerbate the impacts of the proposed changes to the time allocation policy (see §11). We remain concerned that some maintenance activities are being descoped by funding pressures, which could result in longer repair times and more science downtime.

Recommendations

1 – VLA and VLBA maintenance activities should continue to be carefully prioritized. The continued availability of these facilities through the ngVLA transition – with their current (or improved) capabilities – are viewed as essential to the user community.

2 – The VLBA team should continue investing in RFI detection and management.

3 – Any changes related to funding pressures should be communicated to the user community promptly, particularly if they will affect proposals or observational capabilities.

7. VLASS

The VLA Sky Survey continues to make progress and deliver scientific results. There is a growing volume of VLASS publications and citations, demonstrating the utility of the survey to the community. VLASS is now approaching the end of nominal observing in 2026 (the end of Epoch 4.1). Concrete progress has been made in finding ways to accelerate data processing, and a realistic proposal now exists to provide the primary products to the community by the end of the decade, helping to ensure their scientific relevance. After an external committee review of the case for a fourth epoch, concerns were raised over the speed of completing single epoch data products and that the time-domain science case was not considered to have strong enough motivation for a full fourth epoch. In response, NRAO will proceed with only the first half of a fourth epoch, which will replace the problematic first half of the first epoch. Those observations will begin in Fall 2025.

In response to previous recommendations that the timescale for future major releases should be accelerated, the VLASS-II project was created to complete the single epoch and cumulative processing of the data within 3 years and to deliver archive services. That timeline is subject to extension depending on funding pressures, and will require substantial effort to speed up the processing. We have some concerns that compromises of rigor for efficiency are not yet clear to the user community (e.g., the potential loss in image fidelity and depth for combined-epoch images using image plane combination instead of a joint deconvolution of all the visibilities).

Recommendations

1 – Publish a technical memo detailing the data processing plans for VLASS-II, and the potential trade-offs of decisions that are being made to speed up the production of images (e.g., larger pixel scales, image plane stacking, etc.).

2 – Continue engaging with the user community to reconsider any changing demand for a new survey or future VLASS epoch, including potential large-scale observing strategies.

8. ngVLA

The ngVLA continues to progress toward the goal of being construction-ready by the end of the decade. The project hit several important milestones in the past year: in September 2024, the ngVLA passed the NSF conceptual design review, and in April 2025, the prototype antenna was delivered to the VLA site for testing. The project weathered a temporary funding freeze and has identified sources of partial funding to continue to make progress toward the upcoming PDR in 2026. We commend the staff for their efforts to maintain a high level of community engagement through active working groups and international scientific conferences, as well as continuing to accept new science cases. We also commend the project for continuing to strengthen ties with international partners like Mexico and securing MOUs for additional ngVLA-long stations that increase the US footprint of the project in ways that could help secure future funding support.

Given the current resource landscape, we share some natural concern about future funding through the PDR, the consequences of funding pressures on the overall project timeline, and the associated downstream implications for future national funding prioritization exercises.

Recommendations

1 – Continue seeking partnerships that can strengthen the funding environment.

2 – Continue soliciting science cases from the community, particularly those that could take advantage of the current plan to prioritize development of long-baseline capabilities.

9. Data Management & Software

We commend the DMS department for supporting a remarkably diverse range of projects and activities, especially under current personnel and budgetary constraints. Support for observatory operations and the pipelines for ALMA and VLA are critical, highly successful work. The DMS team contributes extensively to the software infrastructure (including `CASA`, `Dysh`, and the pipelines, archives, and SRDP) that leads to the high productivity of the NRAO and GBO telescopes, and innovates in radio astronomy algorithm development (with the ngRADAR project and the GPU-based CHILES re-imaging two notably impressive recent demonstrations of those contributions).

We endorse efforts to modernize software (such as `RADPS`, `Dysh`, GPU gridding, and VLBA pipeline work) and software development practices (such as shifting to a continuous integration framework), and acknowledge the challenging tasks involved in doing so while navigating a competitive, changing software landscape and dealing with observatories subject to other pressures.

The DMS team is focusing on the early stages of the coming transition from the facility software `CASA` to `RADPS`. The need for a more modern radio data-processing infrastructure is clear and DMS is taking concrete steps to address this with the projects surrounding `RADPS`. The philosophy of `RADPS` to focus on core competencies and needs of the observatory and leverage external, modern tools as much as possible both seem excellent. `RADPS` and MSv4 recently had successful early-stage

external reviews. The WSU commissioning will rely on legacy `CASA`, with a transition to `RADPS` late in the process, mitigating a possible source of "user-facing" risk.

The timeline and logistics of the `CASA`→`RADPS` transition remain murky. Though the plans related to the WSU are encouraging, there are some lingering concerns to consider:

- The `RADPS` conceptual design review has been delayed by personnel constraints. `RADPS` development draws on the same pool of people that address emerging issues and add new capabilities to `CASA`, creating tension between the future and current scientific work by users.
- The use of external libraries and platforms (`airflow`, `dask`, `xarray`) in `RADPS` development will in principle alleviate the burden of software development and avoid the problem of having to "reinvent the wheel." They also imply some commitment to keep developing the software in response to a changing external environment (as the favored platforms evolve). This exposes users to risk if science-facing features always take a back seat to infrastructure. The current pause on `CASA` development, while understood to be necessary, suggests that an increase in personnel will be necessary to make sure that `RADPS` can keep up with external environments.
- We anticipate that the use of legacy `CASA` in the earliest science stages of the ALMA WSU will raise issues that need to be addressed for users to make good use of WSU through the early 2030s. Given the need to have `CASA` personnel working on `RADPS` development, we are concerned about the processing experience for early WSU data (a phase that might turn out to be longer than expected if aspects of each project are delayed).

Recommendations

(Note that the recent DPUC report contains more detailed recommendations to consider.)

1 – DMS handles a sprawling portfolio of programs and activities, and `RADPS` development during the next few years will add greater pressure. We encourage DMS to devise and share a clear set of priorities and timelines to help major projects stay on track under current constraints.

2 – Acknowledging resource constraints that make current additional development on pipelines and `CASA` a challenge, we recommend that DMS considers the following high priority items if those pressures recede: (1) integration of multi-configuration imaging into the pipelines, SRDP, and archive; (2) improving imaging capabilities for large spectral cubes; (3) a working pipeline for the VLBA; and (4) user access to the GPU gridder capabilities without requiring time and effort from specific NRAO experts. These could be excellent early "wins" to demonstrate the benefits of the `RADPS` project.

3 – In the shorter term, we recommend that DMS enables archive hosting of user-made products, analogous to the High Level Science Products from MAST-supported missions, to facilitate community access to data products that are currently beyond pipeline or SRDP capabilities. If resources prohibit this, an observatory-endorsed path to distribute such products, including directly pointing users to such third-party repositories, would serve some of the same purpose.

4 – We commend DMS for recently holding a successful external review for `RADPS`. Similar reviews should be held regularly throughout the development process. As much as possible, we suggest that these reviews involve all key stakeholders, including potential community developers.

5 – We recommend exposing `RADPS` capabilities and development to the community as much as possible, without relying on them for any core development. One way of doing so could be to encourage users to submit pull requests and issues on GitHub, which has been a successful model for development of major packages (e.g., `astropy`). This may ultimately lessen the burden on NRAO as community tools and algorithm development emerge, and is a good use of the more modern infrastructure. It may also help build connections to users in other telescope communities (e.g., particularly MeerKAT and SKA users).

6 – While DMS has indicated that feedback is welcome (e.g., through the `casa-feedback@nrao.edu` e-mail), it is not yet clear to what extent the user community is aware of plans to sunset `CASA`. We recommend that DMS gathers information about common `CASA` usage patterns more proactively, to ensure that no important capabilities are lost in the transition to `RADPS`. A good place to start might be inquiring about the workflows of recent Large Programs.

7 – The Science Ready Data Products continue to be valuable to the community: we recommend that they be prioritized in the face of resource constraints.

10. Spectrum Management

We commend the spectrum management team for the significant positive work this year in monitoring and mitigation, both from the technical and policy sides. We are encouraged to see that the Observatory leadership has elevated this work by formally creating a new department at NRAO. The spectrum management team has recently reorganized and modernized coordination between restricted radio quiet zones (particulary with the Quiet Zone Application Portal); introduced the new RFI monitoring tool `DRIFT`; is finishing up commissioning the ASM–2 monitoring facility; and deeply engaged with both national and international spectrum policy work through the International Telecommunications Union, World Radio Conference, the National Academies of Sciences' Committee on Radio Frequencies, and through submissions of comments to the FCC. We were especially encouraged to learn about the innovative collaborations on Operational Data Sharing (ODS) between the spectrum management team and satellite communications companies to mitigate RFI impacts on observations (particularly the results of the boresight avoidance measures).

The committee shares the Observatory concerns that the national and international situation for human generated radio emissions continues to worsen, both in terms of the amount of RFI in the environment, and with regulatory challenges and well-funded lobbyists with competing interests in spectrum access. We applaud the work of the Observatory and spectrum management group to address these challenges, and support their continued efforts. We also share the concerns about local public opposition to the National Radio Quiet Zone in Pendleton County, WV, since good community relations are essential to the thriving of the GBO.

Recommendations

1 – RFI continues to have major impacts on the radio astronomy user community. The observatory should continue efforts to educate both radio astronomers and the general public about the impacts and realities of use of the passive spectrum.

2 – We are excited to see the launch of the new RFI GUI `DRIFT` and monitoring from ASM-2, and encourage widespread communication of these facilities to users once they are ready.

3 – We were largely unaware (though very interested) of the RFI journal club: more could be done to advertise this opportunity for user engagement.

4 – We encourage continuing the strong local engagement in Pocahontas and Pendleton counties, to help with education about the scientific, educational, and economic benefits of the NRQZ.

11. NRAO and GBO Time Allocation Policy Changes

NRAO has operated under generous "open skies" and "open data" (with modest proprietary periods) policies for decades, with virtually all time on the VLA and VLBA, and most time on the GBT, distributed purely on the basis of scientific merit. This philosophy has been core to the values of the institution as it managed the preeminent radio astronomy observatories in the world. However, changes in the international research environment, including the upcoming commissioning of the (mostly closed) SKA, and the emergence of large and well-resourced groups from countries that have not historically had large radio astronomy communities, have recently motivated the Observatory to reconsider these policies. Beginning in 2026 (semester 26A), NRAO will implement a series of changes to the time allocation policy that limit the amount of time available to observing proposals with PIs that are not based at US institutions. These include:

- lengthening the default proprietary period from one to two years, to offer PIs more time to finish publications based on their program data;
- limiting time awards with PIs that are not based at US institutions to only A- or B-ranked proposals (i.e., excluding their access to C-ranked programs);
- limiting the fraction of total time awarded to non-US PIs: $\leq$10% of the time will be allocated to PIs from any single country, and $\leq$30% of the total time will be allocated to non-US PIs;
- limiting access for additional/mid-cycle proposal calls to only US-based PIs; and
- formally assessing and managing the reciprocity of observing time.

These plans will run for a period of 1–2 years while NRAO evaluates their impacts.

We recognize the reality of these pressures, and acknowledge the need for the Observatory to trial different methods for time allocation. The proposed changes will still enable high-quality proposals from around the world to be awarded time on NRAO and GBO facilities. The proposed rules are also less strict than those at other premier astronomical facilities. Nevertheless, even if the short-term practical effects are modest, the committee raised some important concerns with introducing new restrictions on time allocation or scheduling priorities like those proposed:

- Other observatories will notice that this is a major change in the "open skies" philosophy at NRAO, and might further limit their own policies as a result. This would complicate the concept of "reciprocity" in telescope access for US-based PIs.
- Lack of access to the VLA or VLBA may limit the development of international expertise on these facilities, which may have downstream implications for the ability of NRAO and US-based institutions to hire excellent NRAO users or staff.

- While the proposed international caps will have moderate impact on users in most countries, any introduction of external considerations to the awarding process means that there will be cases where scientifically valuable proposals will not be awarded time in favor of potentially weaker proposals. This could diminish the overall scientific yield of the telescopes.
- The proposed international caps assume that proposals with US-based PIs will fill the remaining space; however, for facilities like the VLBA it is not clear that the current US-based user community is large and active enough to be able to meet this expectation.

Recommendations

1 – Support for US-based users is essential, and small amounts of funding (e.g., student observing support, page charges) can have an outsized impact in a community that is used to getting observing time without accompanying funding. NRAO should view continuing this support as an important priority coupled to the proposed time allocation policy changes.

2 – Changes to the "open skies" policy could have benefits for the US-based user community if they lead to enhanced collaboration between US based astronomers and a pipeline of early career researchers internationally. Such collaboration should be encouraged.

3 – NRAO should collect data on the impact of these changes on both proposal numbers, allocated time, and publications, and present it regularly to this committee. We expressed a strong (though not unanimous) preference for continuing some proprietary access to data for PIs, though the preferred duration (one or two years) was ambiguous. It will be important to understand how an extended proprietary period impacts output.

4 – The statistics presented on the low fraction of proposals which result in publications were concerning (acknowledging that there was some concern about the accuracy of the statistics). NRAO should consider initiatives to keep better track of publications per project, and consider ways to encourage timely publication of results, particularly by US-based PIs.

5 – We would like to hear TAC/SRP feedback on how these policy changes are implemented.

6 – Clear procedures should be put in place to detail how specific countries or regions can obtain or regain full "open skies" access to NRAO facilities if reciprocal observing time on their facilities becomes available, or is judged to already be available.

12. Observatory Futures

The NRAO facilities are a critical part of the world scientific landscape. Maintaining and improving these capabilities has the broad support of the community. At the same time, NRAO's support to students, postdocs, training and schools, conferences, and scientific publications plays a key role in maintaining the health of the US radio and millimeter community. NRAO is doing an admirable job of navigating a difficult set of financial constraints to maintain their core capabilities, at the (hopefully short-term) cost of some of these traditional resources to support users.

Despite these challenges, progress continues on next-generation facilities. The ngVLA long baseline capabilities are emerging as an early focus with good support. However, this raises some

concerns about the need to develop a healthy base of VLBA-focused users in the US. Meanwhile, ALMA's next phase after the WSU (referred to as "ALMA–2040") is coming into focus in the rest of the world. After important early contributions, the involvement of NRAO in this effort has receded over the last year. A renewed engagement on this topic seems worthwhile, and the broader community could help carry the load on such efforts.

Recommendations

1 – We support NRAO's efforts to avoid reductions in force and maintain the core capabilities that make the Observatory an indispensable part of the world scientific landscape. As those efforts impact user-facing programs, we recommend communicating them to users promptly and clearly. We expect such communications to be met with understanding and support.

2 – Given the current emphasis of early ngVLA development on long baselines and other VLBA developments, we recommend that NRAO invests in broadening support for the US-based VLBA community. Key points to consider include developing modern VLBA reduction pipelines, emphasizing early-career technical training, and highlighting the unique scientific opportunities and progress accessible with long baselines.

3 – We recommend resuming NRAO efforts to shape the future of ALMA after the WSU upgrade (ALMA–2040). If possible, hiring dedicated staff (similar to ngVLA) and supporting community workshops on the topic will yield the best results and help mobilize the community if Decadal Survey or similar advocacy is needed. In lieu of this, some internal effort to flesh out a North American plan and maintain a seat at the table seem important, given ongoing efforts by Europe to define their vision of an ALMA–2040 concept.

4 – To activate community efforts on ALMA–2040 and remove some of the pressure on NRAO and NAASC, we recommend that NRAO promptly establishes an ALMA–2040 focus committee of community members, analogous to the ngVLA SAC. This committee could help define the scientific vision for ALMA–2040.

5 – We recommend that AUI develops plans to notify, engage, and facilitate the broader user community and the many supporting communities in the event that the funding situation becomes severe enough to threaten one or more NRAO facilities.

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13. User-Facing Science Communication

Though the tight schedule for a virtual meeting precluded a discussion on the topic in the meeting, we were grateful to receive some update on user-facing science communications in a slide deck. It is now more important than ever to keep working to communicate with the user community and the general public about the excellent science done by the NRAO and GBO facilities. Many committee members remarked on the showcase from CDL at the National Harbor AAS Meeting in January 2025. Acknowledging that the Communications team is working hard to engage with the user community, there is nevertheless a theme in this report that there remains some lack of awareness about various NRAO activities.

Recommendations

1 – We encourage ongoing involvement and showcasing of CDL at meetings (especially AAS).

2 – Continue working on multiple avenues for communication of important news (good and bad).

3 – If analytics of how many of the 10,000 newsletter subscribers click on the links and read the full newsletter are not already being studied, we recommend doing so, and presenting the results at the next meeting.

14. NRAO Cosmic AI Initiative

Again, despite the lack of time to go into detail during the virtual meeting, the committee was excited to learn about this new program and NRAO's leadership role within it, especially as it provides stable funding for both staff efforts and postdoctoral fellowship positions. If successful, the proposed work would have substantial positive impacts on mitigating challenges posed by the data volume and complexity that will be produced by the WSU and ngVLA. We were also happy to see NRAO leading student engagement initiatives, an area in which the observatory excels.

Recommendations

1 – We recommend NRAO makes the effort to increase the visibility of this program to users. An effective strategy may be reaching out to well-placed members of the user community to encourage them to invite the CosmicAI Fellows to give talks at workshops, colloquia, and online seminar series (likely in 2026, after they have had time to get started).

2 – As AI is poised to be an area of growth in the current funding environment, we encourage NRAO to seek opportunities to parlay this initial work into attracting additional funding.

3 – We remind NRAO that the appropriate role of AI in science is still a topic of intense debate among its user community, and to simply be cognizant of this fact when deciding how best to present the exciting results of this effort.