Spring 2007 Report of the Users' Committee of the National Solar Observatory

25 June 2007

To: Dr. Stephen L. Keil, Director National Solar Observatory (NSO)

With the release of the Report of the NSF AST Division Senior Review Committee in late Autumn 2006, and at additional requests from the NSO Director, the Users' Committee has responded to various issues in the first half of 2007. The committee has met several times either in full or at least a majority, in person or by telephone, as detailed on the accompanying page.

Discussion in February on the state of the FTS at the McMath/Pierce facility resulted as concern was raised by both the solar and non-solar FTS user community (Attachment A). The recommendations formulated by this committee included continuing minimal technical support from NSO as the upgrades are completed, and broadening the FTS user outreach to include non-laboratory participation in maintenance of the facility. We also recommended that the FTS user community apply for instrument upgrade funds from NASA and NSF to cover the major portion of hardware costs and to supplement the required engineering and support.

The recommendation of the NSF Senior Review regarding the GONG facility was troublesome to a wide community base. The committee synthesized the concerns, with a broad focus to complement the reactions NSF has received already from the helioseismology community, and sent a short letter to Dr. Wayne van Citters at NSF (Attachment B). In it, we urged the NSF to "make every effort to continue funding for the operation of GONG while NSO investigates non-NSF funding, and to provide at least 50% funding for the duration of the SDO mission." In addition, the committee reiterated these wide-reaching concerns and the plea for partial funding through the SDO mission at the NSF town hall meeting on 5 April 2007.

The status of the ATST project greatly troubles the committee. From presentations delivered to us on 6 April by Jeremy Wagner and Steve Keil, we are convinced that there is no engineering or scientific reason to delay the progress through the NSF MREFC process. The continuing delays are taking a severe toll on the morale both at NSO and amongst the broad solar community. The committee sent a letter in April 2007 to Dr. Arden Bement, NSF Director, with copies to select members of the National Science Board, urging the NSF to "rapidly move this project forward to construction" (Attachment C). We recognize that the Environmental Impact Study is to some degree outside the control of NSF or NSO. However, the committee reiterates that the ATST site survey clearly and quantitatively demonstrated that Haleakalā is the best of the tested sites for achieving the full program of ATST scientific objectives. The other sites are not "neutral" alternatives, and switching target sites would compromise both the scientific value and timely availability of the facility. The NSO Users' Committee commends the NSO Director, the Project Manager, and the Project Team for the outstanding work and preparation that enabled ATST to pass its Preliminary Design Review October 2006 with glowing praise from the reviewers. We reiterate the support of the NSO users and the broader solar physics community for ATST and the importance of retaining the best site. We respectfully urge NSF to renew and strengthen its proactive efforts to bring ATST to fruition on Haleakala.

SOLIS continues to make progress toward full operational status, with new availability of ISS spectra and VSM quick-look vector magnetogram images. The committee is pleased to hear that Kim Streander will be joining NSO as NSO/Kitt Peak Projects Manager, with the state of SOLIS being a high priority. The committee notes with some disappointment that there are still no vector field data available to the community for quantitative analysis, only images, and there is still no pipeline in place to analyze the incoming data for distribution. With the Hinode satellite now in full operation, there is increased urgency to provide the full range of context data that SOLIS/VSM offers. The committee recommends that NSO appoint a VSM Lead Scientist to work with the Project Manager on a daily basis to prioritize, schedule, and implement a full VSM data pipeline. We recognize that there are instrumental problems (which are being addressed) that will require some data to be accompanied, for a time, by explanatory material. However, we feel that the value of these data to the user community outweighs the understandable desire to issue only "best and final" data products.

We understand that the NSO Director is considering the use of carry-over funds to ensure the completion of the SOLIS facility. Although we do not comment in detail on NSO operational decisions, some SOLIS project augmentation, particularly in programming support, is clearly necessary to achieve the objectives above. However, any diversion of resources from other NSO/Kitt Peak projects should be fully discussed and coordinated with the McMath-Pierce Telescope Scientist, because, as an important part of the scientific justification for ATST, the McMath-Pierce must remain available and viable for forefront infrared observations in the pre-ATST era.

The NSO Users' Committee will keep current with developments regarding ATST, GONG, and the NSF support for both. In addition, we will continue to monitor the progress of SOLIS. The committee congratulates the NSO scientists recently granted tenure and looks forward to their continuing scientific and programmatic contributions. Our next meeting is tentatively scheduled for Autumn 2007 in light of relevant timelines at NSF, the National Science Board, Mr. Streander's arrival and anticipated impact, and updated NSO/NSF budgetary information.

Respectfully submitted,

- Dr. K. D. Leka, Chair, NSO Users' Committee (NorthWest Research Associates, Inc.)
- Dr. Sarbani Basu (Yale University)
- Dr. Craig DeForest (Southwest Research Institute)
- Dr. Carsten Denker (New Jersey Institute of Technology)
- Dr. Donald E. Jennings (NASA, Goddard Space Flight Center)
- Dr. Douglas M. Rabin (NASA, Goddard Space Flight Center)
- Dr. Richard R. Radick (Air Force Research Laboratory)
- Dr. Alysha Reinard (NOAA, Space Environment Center)
- Dr. Edward J. Seykora (East Carolina University)
- Dr. Steven Tomczyk (High Altitude Observatory, NCAR)

Meetings of the NSO Users' Committee in the first half of 2007

January 2007: Scheduled meeting at Sacramento Peak canceled due to weather.

06 Feb 2007: Teleconference to discuss FTS facility and GONG. Present: Leka, Barnes (ex officio), Basu, DeForest, Denker, Jennings, Rabin, Reinard, Seykora, Tomczyk. Also present: Keil, Giampapa, Hill, Dulick, Piano.

06 April 2007: Committee meeting in conjunction with NSF "Town Hall" meeting, Tucson. Present: Leka, Barnes (ex officio), Basu, Denker, Jennings, Rabin, Radick, Reinard, Seykora, Tomczyk. Also present: Keil, Giampapa, Hill, Piano, numerous additional NSO staff including Rimmele, Eliason, Henney, Norton, Penn, Wagner.

30 May 2007: Meeting with the Director during SPD meeting. Present: Leka, Basu, Denker, Rabin, Reinard.

NSO Users' Committee Telecon 6 February 2007

Recommendations for the Repair and Upgrade of the McMath-Pierce FTS

The NSO Users' Committee met by teleconference on 6 February. On the agenda was the status of the McMath-Pierce Fourier Transform Spectrometer. The committee heard a presentation on the FTS by Mark Giampapa and Mike Dulick. There was general agreement that the FTS is a unique instrument that still produces valuable science and has some capabilities that are not offered by any other instrument. The discussion then centered on the present dismal situation with the FTS and what needs to be done to return it to user availability. The recent feedback from FTS users demonstrates the strong interest in bringing the FTS back on line. NSO will hold a telecon with the FTS users in the near future to discuss the status of the FTS.

The repair of the FTS has been slow for a variety of reasons, but it is expected to be working again within the next few weeks and may become available soon for limited use. However, the present repair is a stop-gap measure, not a permanent fix. Other components of the FTS need to be replaced or upgraded to bring it back to a reliable state of operation. The total one-lump cost for refurbishing the FTS was estimated by Mike and Mark to be approximately \$50K, on top of the present funding that covers Mike's time, standard maintenance and user operations. It is recognized that a full refurbishment will call for months of additional down-time. This is justified if the FTS can be made reliable for the remaining life of the McMath-Pierce Facility.

The FTS laboratory program has been considered non-programmatic since 1995. Because lab work has accounted for most of its use, the FTS has not been supported in the NSO base budget since that time. The cost of the FTS has been solely borne by laboratory grants from NASA and NSF. If the FTS is to undergo a major refurbishment, it would be reasonable to ask for instrument upgrade money from these agencies.

There is, however, significant interest in future FTS applications among solar users, as well in astronomy applications in general. Therefore, we believe that the NSO should bear some of the cost of a refurbishment. For the short-term repair that is presently underway, the NSO is the only source of technical assistance. After an upgrade is complete, the NSO should provide the (presumably) small amount of technical maintenance needed to support a visitor's program.

In view of these considerations, the Users' Committee makes the following recommendations to both the NSO director and the FTS user community:

- 1) The NSO should provide some portion of the funding for an upgrade of the FTS. This amount should be determined based on the expected fraction of solar and other astronomy usage. Technical support should be provided by the NSO for the repair of the FTS that is now taking place (we realize that this is already being done). After an upgrade is completed, routine maintenance should be provided by the observatory.
- 2) The laboratory users should apply for instrument upgrade funds within the NASA Upper Atmospheric Research Program and the NSF Chemistry Program to cover the major portion of the refurbishment of the FTS. A realistic cost and schedule estimate for this upgrade should be worked out between the lab users and the FTS staff.
- 3) In view of the very limited budget of the FTS, individual users are encouraged to supply monetary support or contributed equipment to the FTS from their own research programs. The level and type of individual support should be based on FTS usage and available funds.

March 30, 2007

Dr. Wayne van Citters National Science Foundation 4201 Wilson Boulevard, Room 1045 Arlington, VA 22230

Regarding: NSF Senior Review Recommendations for the National Solar Observatory's Global Oscillations Network Group (GONG) Facility

Dear Dr. Van Citters:

The Users' Committee of the National Solar Observatories (NSO) has received positive feedback regarding the Senior Review Report, in particular the recognition that NSO has developed an exciting scientific program for the Advanced Technology Solar Telescope (ATST) and directed significant effort toward that component of its future.

However, we wish to communicate strong concerns regarding the Senior Review recommendations for the Global Oscillations Network Group (GONG) facility. The scientific impact of imminent GONG closure would be far-reaching, more so than even many of our committee members had initially appreciated.

The consensus of the helioseismologists from whom we have heard is that the Senior Review report underestimates the scientific importance of operating GONG during the Solar Dynamics Observatory (SDO) era. While it is possible that HMI will operate beyond its planned 5-year lifetime, the recent failure of the ACS instrument on Hubble, shortly *before* its fifth anniversary, reminds us to take very seriously the limited lifetime of space experiments (indeed, SOHO and its MDI instrument were nearly lost three years after launch). Assuring the continuity of helioseismic measurements *through* the upcoming solar activity cycle is particularly crucial because *we do not yet know* what constitutes a "normal" helioseismic cycle. Only one activity cycle has been observed, and already there appear to be differences between the cycle we are leaving and the one we are entering.

Results from helioseismology are now of central importance for solar physics, yet the measurements are complex and subject to many subtle systematic errors, particularly with respect to secular variations. As an independent (as well as physically accessible and upgradeable) helioseismology system, GONG is an equal partner with spacecraft instruments in definitively establishing important new results, especially those that imply solar-activity related changes.

GONG serves a community that extends far beyond helioseismology. While the magnetograph capability of the upgraded GONG facility is relatively new, researchers are already beginning to incorporate these data as boundary conditions for heliospheric modeling. With continuous coverage, high cadence and sensitivity, and the critically important institutional support of a national facility charged with ensuring its quality and consistency, GONG magnetograms have the potential of becoming a standard source of data for heliospheric modeling and prediction. By its nature, heliospheric modeling and application development relies critically on long-term, stable measurements.

For the space-weather forecasting community — historically a heavy user of NSO data — GONG is a source for both magnetograms and helioseismic far-side imaging. Real-time operational facilities such as NOAA's Space Environment Center are particularly vulnerable to outages of single-point space assets. At a time of increased human presence in space, and increased reliance on technology that is itself subject to

heliosphere-generated disruption, GONG plays an important backup role in maintaining a national predictive capability.

GONG has well served the NSF's long-standing role in training and nurturing scientists. The young field of helioseismology is just beginning to produce "the next generation," who are questioning, testing, refining, and discovering. Yet, current graduate students and post-doctoral researchers are questioning whether helioseismology is a viable career choice if data are limited to those from a single spacecraft.

Indeed, GONG is the NSF's primary, if not the only, funded tool with which to study the solar interior, its dynamics and evolution in the context of the broader stellar physics. This aspect establishes the GONG facility squarely within NSF's broad astronomical interests, and its support must be considered in this context.

Finally, GONG is an outstanding example of affordable international collaboration at a time when such partnerships are deemed vital to NSF efforts such as ATST. The impact of closing GONG would be felt most keenly at those sites located in developing nations.

The NSO Users Committee brings representation to the wide community of users of NSO data and facilities. We are aware that some of the concerns expressed above have been separately communicated to the NSF by individual members of the community. We also realize that all facilities exist in a competitive environment and that all will eventually close. However, with this letter we hope to highlight the breadth and importance of GONG's impact on the heliophysics and space weather communities. We urge the NSF to make every effort to continue funding for the operation of GONG while NSO investigates non-NSF funding, and to provide at least 50% funding for the duration of the SDO mission.

Yours sincerely,

NSO Users' Committee

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Steven Tomczyk High Altitude Observatory, NCAR April 11, 2007

Dr. Arden L. Bement, Jr., Director National Science Foundation 4201 Wilson Boulevard, Suite 1205N Arlington, VA 22230

Dear Dr. Bement,

The National Solar Observatory (NSO) Users' Committee strongly supports the solar community's plan to construct and operate the Advanced Technology Solar Telescope (ATST). The ATST is critical for understanding the solar magnetic fields that underpin a broad range of solar physics, from variation in the solar irradiance, to heating and acceleration of the solar wind, to explosive solar eruptions. This importance was highlighted in the most recent astronomy decadal survey ("Astronomy and Astrophysics in the New Millennium"), the solar and space physics decadal survey ("The Sun to the Earth — and Beyond"), the Senior Review of the NSF Division of Astronomical Sciences, and preceding these, in the NAS/NRC study of ground-based solar astronomy ("Ground-based Solar Research: An Assessment and Strategy for the Future"). The NSO Users' Committee regards the ATST as fundamental to the scientific vitality of our community and the development of the next generation of solar physicists. We understand the project passed its Preliminary Design Review and was deemed ready to proceed into the approval phase. We urge NSF to rapidly move the project forward to construction.

Sincerely yours,

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cc: Dr. Kathie L. Olsen, Deputy Director and Chief Operating Officer, NSF

Dr. G. Wayne van Citters, Director, Division of Astronomical Sciences (AST), NSF

Dr. Craig B. Foltz, Manager, Facilities & MREFC Project Development, AST, NSF

Dr. Elizabeth Hoffman, National Science Board

Dr. Louis J. Lanzerotti, National Science Board