2005-2006 Report of the Users' Committee of the National Solar Observatory

July 2006

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

The Users' Committee met 30 November – 01 December 2005 in Tucson, AZ, where a full array of updates on the status of instrumentation, staff, and challenges were presented to the Committee. In attendance at that meeting were Leka, Denker, Jennings, Seykora, Tomczyk, and Dalyrymple (for Mozer), with occasional telephone participation by Pizzo and Basu.

More recently, a slightly different subset of the Committee (Leka, Rabin, DeForest, Denker, Altrock (for Mozer), and a de facto international member, G. Cauzzi) met with Keil and assorted NSO staff (Hill, Penn, Balasubramaniam) over dinner during the June 2006 meeting of the AAS Solar Physics Division in Durham, New Hampshire. The Committee was again briefed on the present status of NSO projects and staff, and questions and concerns were freely discussed.

The report, compiled here as part of the duties of the Users' Committee, encompasses both Committee meetings, and the state of the NSO as viewed and experienced by the broad community of NSO facility users and NSO broadly-disseminated data.

Comments on NSO Status and Facilities

The Advanced Technology Solar Telescope (ATST) is the project arguably headlining at the NSO, with a significant investment in time, attention, and resources being dutifully directed toward it in anticipation of extremely large benefits in the future. The Users' Committee is aware of the continued community support and is pleased with the project's progress and Keil's handling of the myriad challenges. Upcoming potential hurdles include the Environmental Impact Statement to be released in the near future, and the unknown waiting time for construction funding once the project is approved by the MREFC in light of other budgetary pressures. An upcoming ATST science working group meeting to be held on Maui in October 2006 will include discussions on operations of the ATST, and various Users' Committee members will be in attendance. The European commitment for participation in the ATST project has apparently fluctuated, and the Users' Committee was concerned to learn of the possible reduction in European involvement in the ATST. We look forward to learning of the ATST project's smooth transitions to the NSF Science Board and on toward construction, as well as updates on the international support level.

With the schedule delays and ATST's first light slated for 2014 or later, well into the next sunspot cycle, NSO has supported continued maintenance and upgrades for two of the present flagship facilities, the McMath-Pierce Solar Telescope and the Dunn Solar Telescope, as they also dovetail into required ATST technologies. The Users' Committee fully endorses this approach. The Virtual Camera System and the queuing system for observing projects at the Dunn, in addition to the nice instrumentation suite available to users now or in the near future, will ensure that this diffraction-limited telescope is optimally utilized until ATST is available. The NSO Aladdin near-infrared Array Camera (NAC) is now on-line at the McMath-Pierce; with the plans for full polarimetry capability in autumn 2006, the NAC should afford

unprecedented exploration of the solar $1-5~\mu m$ infrared spectrum. In addition, the new adaptive optics system implemented at the McMath-Pierce greatly improves infrared imaging. This AO system works in concert with the NAC to improve the imaging spectroscopy but, as importantly, can be used with visitor instruments. With the additional planned upgrades to the McMath-Pierce telescope control system, this facility may become a phoenix of solar observatories.

The GONG instrument suite is performing well and the resulting scientific output has been quite high. The magnetograms are in use by the wide community. The Users' Committee expressed concern in December 2005 regarding resources allocated for a fully operational "hot spare" unit, and it appears that the present direction without that unit is a more fiscally balanced direction. We support the long-range planning for camera upgrades and image-stabilization systems.

The SOLIS project and specifically the Vector Spectromagnetograph (VSM) vector field data are widely anticipated by the community, especially for context observations in support of the Solar-B mission. It was reported to the Committee that the modulators were successfully replaced and the downstream optics re-aligned, with a significant mitigation of the vignetting, and a nice increase in the polarization sensitivity. The line-of-sight magnetic field data are now routinely available and in use by various scientists; the He 1.083 µm Full-Disk Patrol (FDP) data will be delayed until the vector magnetic field data are finalized, and the Integrated Sunlight Spectrometer (ISS) still requires cross-calibration with archive synoptic data. The chromospheric full-Stokes polarization data are being acquired and an inversion technique is in-place, but the magnetograms are not yet being released due to lingering questions on interpreting the results. Thus, while significant progress has been made since the Committee was last updated in December, there are still delays which appear to be, still, insufficient FTEs for the project, coupled with unforeseen hardware problems. Staff departures have been mitigated by new hires (including students and a postdoc). Henney has expressed the desire to have more input from NSO- and extra-NSO experts in spectropolarimetry; the formation of a VSM Vector Working Group is underway to provide feedback to him and Harvey on algorithms and data products. Members will be drawn from NSO staff with polarimetry expertise for tasks involving significant time commitments, and members from the larger international community will be drawn for feedback on algorithm deployment, the resulting β-level data, and data products. The Users' Committee has historically been very supportive of a SOLIS Global Network, and news from the Director's office that interest in cloning the VSM has been communicated by various international groups is very welcome. The Committee finds that PI Giampapa and the Director's Office are responsive to the community's desire that SOLIS be operational and available as soon as possible, caveat budget shortfalls. The new NASA funding and new staff brought on-board with it are positive developments. The Users' Committee recommends that the Director's Office provide what is needed to ensure that VSM vector data be routinely available before Solar-B is operational.

The coronagraph at the Evans Solar Facility (ESF) at Sac Peak is used routinely by the Air Force for daily coronal emission line measurements. The full-disk imaging capabilities of the Improved Solar Observing Optical Network (ISOON) and SOLIS now provide what was required for the NSO daily spectroheliograms, and ISS (SOLIS) will replace the NSO Ca-II K-line monitoring from the ESF coelostat once calibration is completed. Interest in the Evans facility otherwise comes primarily (but not solely) from NCAR/High Altitude Observatory; the coronagraph provides a unique platform for a present program by HAO and collaborators to develop instrumentation for measuring prominence and coronal magnetic fields. A Memorandum of Understanding is expected between the Air Force, NSO, and NCAR to outline responsibilities and usage priorities, and HAO is expecting to commission the publicly-available

instrumentation in late 2006. The Users' Committee supports continued minimal basic maintenance of the ESF coronagraph by NSO, development and investment by NCAR or similar institutions in modern instrumentation, and continued unsupported access for observing by the wide solar community.

Comments on NSO Directions and Priorities

The Committee finds that NSO's directions as presented to the Committee and outlined in the FY 2006-2010 Long-Range Plan are well-balanced. Budget pressures and the requirements for major projects such as the ATST and SOLIS can be maddening to NSO management and the community at large. The Committee has noted a recent turn of tide, from glum reports to reports of progress, of creative solutions and hard decisions which are accepted if not embraced by the NSO staff and the solar physics community. Indeed, some Committee members have noticed a distinct improvement in the outlook of the NSO staff; more congeniality, conveying a distinct sense of looking forward to exciting developments. Continued attention to the present NSO productive facilities, even as ATST demands more resources, is a key to continued community support, and NSO is to be commended on the success of this enormous effort.

The Users' Committee is in agreement that realizing the full photospheric vector capability of the VSM (SOLIS) is the highest short-term priority in the context of upcoming NASA missions. If temporary reallocations can be made in order to mitigate data-storage pressures or algorithm-development and data-processing code development bottlenecks, whether through hardware loans or the duties of the Vector Working Group mentioned above, we urge the NSO to do so.

The Committee recommends, however, that a lower priority be assigned to assuring that the rest of the SOLIS instrument suite be deployed in early 2007. We see the implementation of a new telescope control system at the McMath-Pierce telescope as an excellent cost/benefit activity. Complementing that, we urge that the broader solar physics audience be made aware of science topics that can be immediately addressed by the unique infrared capabilities of the McMath-Pierce telescope.

It has come to the Committee's attention that the tenure decision process at NSO creates difficulties for tenure-track staff in the context of prioritizing their efforts. The present time-line for feedback concerning a staff member's direction is sufficiently long so as to impact their scientific productivity and ability to modify their course of effort and inquiry. The Committee urges NSO to consider a more formalized midtenure-track review at the 3-year mark to help guide tenure-track staff toward a positive tenure review.

On a related note, the Committee was concerned to learn in December that staff salaries had fallen behind those of comparable university positions, especially as staff continue to report frustrations with being "stretched too thin" and having sometimes quite disparate responsibilities. Still, recent new hires, whether from base funds or outside contracts, are encouraging for a robust and exciting scientific venue at NSO.

In the context of doing much with challenged resources, streamlining GONG and SOLIS data pipelines is an effort supported by the Users' Committee. It has also come to our attention that in some cases the results of algorithm development for the GONG data reduction and analysis have not been published, and the Users' Committee urges that this oversight be rectified for more comprehensive information dissemination.

The Users' Committee has no comment on NSO future headquarters location possibilities, except that the

balance of accessibility for the broad community to NSO expertise and staff, the ability of NSO to attract the best available for positions in science and engineering, and the concerns of the staff for quality-of-life requirements be considered.

The Users' Committee supports the idea of an NSO-sponsored prize in honor of R. B. Dunn that would be administered through the Solar Physics Division of the AAS for innovations in instrumentation for solar observations. The Committee supports a semi-annual award with requirements favoring young researchers.

We, the members of the Users' Committee for the NSO, attempt to represent the solar physics community and the priorities expressed to us through discussion at numerous venues. Even though this Committee will make recommendations which compete fiscally, we commend Keil on his continued ability to balance, enthuse, and evoke national and international community support for the projects at the NSO.

Respectfully submitted,

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