Spring 2008 Report of the Users Committee of the National Solar Observatory
23 July 2008

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

The NSO Users Committee met by teleconference on 11 April 2008 for over two hours. Committee present: Leka, Barnes, Basu, Choudhary, Jennings, Rabin, Radick, Reinard, Seykora,Tomczyk. Representing NSO: Keil, Giampapa, Eliason, Hill, Norton, Penn, Piano, Streander, Wagner. The meeting was structured as an open discussion framed by documents provided in advance to the Committee (including the FY 2008 Program Plan, slides from the February 2008 Cooperative Agreement Review, and the FY 2007 Annual Report) as well as information gathered by the Committee. Because of scheduling difficulties, there was no physical meeting this year; there were email exchanges before and after the teleconference and at other times throughout the year.

No single issue dominated the discussion. NSO has defined a future—the era of the Advanced Technology Solar Telescope (ATST) and Long-Term Investigations — that is worthy of a national observatory and has the support of the US solar physics community, the NSF, and the Committee. However, the implementation of the NSO vision is in many respects "on hold" pending the start of the ATST construction phase. This persistent uncertainty of schedule greatly complicates NSO's tasks of setting near-term priorities, efficiently allocating resources, and serving and building its user community.

ATST. The committee did not identify areas of technical or management concern with respect to ATST. The obstacle to progress is funding, pure and simple. The $4.3M requested for ATST in FY 2008 is urgently needed to prepare for construction funding in FY 2009. The conundrum facing the Users Committee, which is charged with representing the interests of current and future NSO users, is that the substantial support from the NSO base program that is necessary to maintain momentum toward ATST makes it increasingly difficult for NSO to sustain healthy current operations and a user base that will be ready to exploit ATST fully at first light.

The Committee supports NSO's strategy of total commitment to ATST. The only "right" answer for the NSO user community and US solar physics is the commencement of ATST construction at the earliest opportunity. However, if the construction phase is delayed beyond FY 2009, it may then be appropriate for NSO to review its approach to operations and instrumentation to ensure that its existing facilities remain relevant to a solar physics community that enjoys immediate access to a large and growing body of data from powerful space instruments.

GONG. In accordance with the NSF Senior Review Report, GONG personnel have been working to secure further non-NSF sources of funding. Currently, NASA funding supports a large fraction of in-house GONG science. GONG is currently in active discussions with the US Air Force Weather Agency (AFWA) and the USAF Space Command. The Air Force is preparing to incorporate GONG magnetograms into their forecasting system. They would also like to see an H-alpha instrument added to the GONG shelters and are interested in the potential of helioseismology to predict flares. A partnership with USAF has the potential to support 25-30% of the GONG operational budget, but nothing has been finalized. In addition to its scientific publications, GONG was recognized in 2007 by an AURA Team Award for the magnetogram data pipeline and an AURA Science Award to Irene González Hernández for her contribution to the calibration of farside acoustic holography. The Committee applauds not only these necessary

efforts to attract non-NSF funding, but equally the recognition of the continuing scientific and data-processing activities that have kept GONG at the forefront of helioseismology and ground-based synoptic facilities.

SOLIS. The Committee notes with pleasure the progress that has been made in the last year by the Vector Spectromagnetograph (VSM) Vector Working Group in cooperation with the Community Spectro-Polarimetric Analysis Center in preparing a data pipeline for fully processed (not just quick-look) 630.2 nm vector magnetograms. We recognize that removing polarization fringes from the VSM data has been very challenging. In addition, the incorporation of new VSM cameras, a redesigned data acquisition system, redesigning the guider, possible replacement of the polarization modulators, and the commissioning of the Full Disk Patrol have made strong demands on the SOLIS team.

The Committee recommends that NSO concentrate its SOLIS efforts on ensuring that the VSM is ready to provide spatially and spectrally stable vector field data products in time for the beginning of Solar Dynamics Observatory (SDO) operations in mid-2009. For the long-term future of SOLIS, including the possibility of additional sites, it is important that users of the filter-based SDO Helioseismic and Magnetic Imager look to the VSM for "ground truth" validation from the outset of the SDO mission. The availability of quantitative full-disk vector magnetograms with good spatial integrity will also solidify the value of SOLIS for users of the *Hinode* Spectropolarimeter, which has a partial-disk field of view. As it is unlikely that all the desired VSM hardware and software improvements will be ready for SDO early operations, it will be important to define a VSM operational "plateau" that will be both useful and stable enough to attract and keep a user base. The Committee requests periodic brief email updates on SOLIS and particularly VSM progress over this next critical year.

Sacramento Peak Instrumentation. The Sac Peak instrumentation program includes the Spectro-Polarimeter for Infrared and Optical Regions (SPINOR), the Diffraction-Limited Spectro-Polarimeter (DLSP), the Interferometric Bidimensional Spectrometer (IBIS), the Rapid Oscillations in the Solar Atmosphere (ROSA) instrument, the Facility Infrared Spectro-Polarimeter (FIRS), and the Prominence Magnetometer (ProMag). All these instruments involve collaborations between NSO and other institutions. High-order adaptive optics (AO) is a key element of the user environment at the Dunn Solar Telescope (DST). The two operational AO systems at the DST constitute a major success for NSO on the way to ATST; the current development of multi-conjugate AO is the logical next step. NSO is to be congratulated for formulating a Sac Peak instrumentation program that effectively serves both current users and ATST development.

Kitt Peak Instrumentation. The defining mission of the McMath-Pierce Facility in the lead-up to ATST is to carry out unique infrared observations and develop new instrumentation for the thermal infrared. The NSO Array Camera (NAC) has produced high-quality Stokes polarization images in Fe I 1564.8 nm and has obtained solar observations of the fundamental vibration-rotation bands of the CO molecule near 4.67 μm and planetary observations (Mercury). The visiting CELESTE cryogenic spectrometer has been used for solar magnetometry in the 12.3 μm Mg I line and for thermal infrared observations of Saturn. The highly successful image stabilization and infrared adaptive optics systems have increased the scientific value and visibility of, and thus the demand for, both resident and visiting instruments. The committee commends NSO staff for developing external funding to further improve the AO system.

However, the Committee believes that progress in the mission of this facility needs to proceed more rapidly. Flexible narrow-band filtering and polarization optics are not yet available for the 2500–5000 nm wavelength band, even though exploiting known diagnostics and discovering new ones in this wavelength region are key elements of the scientific justification for

the open, all-reflecting ATST. Another major impediment to scientific productivity at the McMath-Pierce is the ineffective and unmaintainable telescope control system. The Committee recognizes that facility upgrades at both the DST and the McMath-Pierce are severely constrained because of their limited lifetimes. However, it is vital to quickly solidify the case for the full spectral range of ATST. Thus, the Committee urges NSO to define as soon as possible a relatively low-cost pointing/guiding system at the McMath-Pierce, and to procure optics and filters necessary to allow the NAC to operate effectively over its full available wavelength range within the next 1-3 years. The Committee requests an in-depth discussion of NSO's plans for McMath-Pierce pointing and guiding at its next meeting.

Fourier Transform Spectrometer. We consider the FTS separately because it is used and financially supported by an active community that is somewhat distinct from the rest of the NSO user base. In late March, the FTS was tested with a visitor-supplied methane sample cell. The test was not successful: the spectra were corrupted by spurious signals of unknown origin. The FTS users recognize that much progress has been made in upgrading the FTS and that the staff has worked hard toward bringing it back online. However, the user community is growing impatient and believes that the immediate goal of the staff should be to demonstrate successful FTS operation. Further necessary upgrades can be made following return of the FTS to service. In its present state, the FTS is in danger of losing its user base, both laboratory and solar.

Virtual Solar Observatory. The Committee identified no specific issues but would welcome at its next meeting a somewhat extended report on VSO status and future plans.

Respectfully submitted,

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