# Summer 2010 Report of the Users' Committee of the National Solar Observatory (NSO) 08 October 2010

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

The NSO Users' Committee met 17-18 August 2010, at NSO in Tucson, Arizona. Most of us enjoyed the air conditioning in the face of blistering outside temperatures, but we all appreciated the time and effort taken by NSO staff to inform us on various issues, and the lively conversations which ensued. We commenced by noting the recent passing of Dr. Raymond (Ray) N. Smartt. His substantial commitment to solar physics and training so many generations of researchers was best summarized by recognizing that roughly three quarters of the people in the room had been mentored by Dr. Smartt over the past many decades.

*Committee members present*: Leka (*Chair*), Basu, Choudhary, DeForest, Jennings, Rabin, Radick, Reinard, Seykora, Tomczyk.

*Representing NSO:* Keil (Director), Giampapa, González Hernández, Hill, Penn, Pevtsov, Piano, Streander, Wagner, with scientific talks presented by Harvey, Penn, Schad, Tripathy.

### Sacramento Peak Instrumentation

# Dunn Solar Telescope (DST)

There is an impressive set of user and prototype instruments at the Dunn Solar Telescope presently, and the Committee positively notes the emphasis being placed on instrumental development in preparation for the ATST. This includes resources and personnel being focused on using the DST as a test bed for the logistics of how ATST will be operated with multiple instruments simultaneously for scientifically efficient operation.

We note recent new additions to commissioned instruments such as the Facility Infrared Spectropolarimeter ("FIRS"), and the ability to now simultaneously run multiple instruments makes the DST a powerful tool for studies of, e.g., the solar chromosphere. The Committee notes, however, that no announcement was made to the solar physics community regarding FIRS, and that it takes some serious digging at the NSO website to find a list of available instrumentation for the DST. While web-based documentation and outreach efforts for available instrumentation may seem to be of secondary importance when personnel time is limited, it is imperative that researchers—especially potential new users—be able to explore the facility's capabilities without searching out individual staff members.

The Committee was pleased with the new table control and data handling system at the DST: it appears to be well scoped and stable. Further, it serves as a good first step for the more complex ATST control system and data handling.

### **Other SPO Facilities:**

No additional presentations were made concerning the other facilities at Sacramento Peak, which is appropriate given the necessary ramp-down that has occurred over the last five years. In addition, no requests were made by the Director for input from the Committee on the other Sacramento Peak facilities, and the Committee has no further comment.

# Advanced Technology Solar Telescope (ATST)

The Users' Committee congratulates and commends the NSO and National Science Foundation for their intensive and sustained efforts as they enter the construction phase of the ATST.

The UC recommends that NSO identify one or more current DST instruments to serve as "pathfinders" for developing the standards and infrastructure for instrument package requirements regarding data reduction pipelines and user access modes in the ATST era. A pathfinder would serve, first, as a test bed for the ATST data pipeline and its integration with the NSO archive and Virtual Solar Observatory ("VSO"), and second, as a means of cultivating core groups of users *outside* of the immediate instrument team for each corresponding instrument. The architecture of such a pathfinder data plan should be developed in collaboration with the ATST Science Working Group ("SWG") and existing or potential users, and should include a formal document that presents the scientific and algorithmic basis for the processing that produces each defined level of data and derived products. Initiating a "pathfinder" or "test bed" program for data handling, reduction, and distribution, with one of the present DST instruments will have the additional benefit of making present DST data widely available. As it stands, little of the data acquired at the DST are made public, even after the 12 month proprietary time. NSO should use a DST pathfinder instrument to define data architecture standards that will be uniformly applied, to the extent possible, to all NSO instruments in the ATST and Synoptic Program era.

The Committee strongly urges NSO and the ATST project to define, before Preliminary Design Review for the instruments, required metadata and standard data reduction levels, comparable to those used by other facility-class programs.

We recognize that there is presently no funding within the ATST budget for data handling, and that the data handling requirements for this new facility will be huge. The required resources will simply not be available from present levels of the NSO base budget. The Committee recommends that the NSO propose to the National Science Foundation, separately from the ATST construction phase funding, for resources to adequately handle the expected data load, including resources for processing the data to the SWG-specified calibration levels in a manner established by the pathfinder program.

The Committee expects that one of the biggest challenges for NSO will be creating and sustaining a US user community for the ATST. A "public face" of ATST science, based in the US, needs to start being developed through ATST science meetings within the US and ATST-

instrument US-centered science teams which extend beyond the actual instrument teams. These efforts are time critical, and are best addressed prior to commissioning. There should be a conscious effort to train/involve/encourage wider US participation in the user community for these instruments. ATST science meetings, in concert with a DST-instrument pathfinder program that includes promoting and distributing data from a DST instrument, will help avoid the perception that the ATST will be a facility primarily for the Principal Investigator teams. The Committee recommends that the ATST data release and archive policy be clarified. Any proprietary policy must encourage the timely release of data in a usable form while protecting the rights of the PI. We view the creation of a policy consistent with NSO general policy as primarily the responsibility of the ATST project, with input from the broad user community.

The Users' Committee took note of the significant NSO scientific presence proposed for Maui, whether on permanent assignment or on a rotating basis. While plans for the structure of NSO in the ATST and Synoptic Era are in their infancy, the Committee urges a careful examination of this plan in light of budgetary and personnel constraints.

The NSO Users' Committee would appreciate the opportunity to communicate with the ATST SWG directly. As the ATST transitions into construction phase, we believe that the SWG may benefit from understanding the concerns being raised by the broad solar physics user community. We suggest that a representative of the ATST SWG make a presentation at future Users' Committee meetings.

# Synoptic Optical Long-term Investigations of the Sun (SOLIS)

The Committee noted with pleasure that some of the specific recommendations made a year ago were noted and adopted by the SOLIS project management and that durable, tangible action had been taken. We also noted the recent increase in SOLIS-targeted personnel; the addition of scientists who have a vested interest in the program and data will help bring SOLIS up to its full potential, with regard to data quality, standardization, documentation and dissemination. Still, there is concern about a continued single point of failure for SOLIS instrumentation, and there is significant work yet to do to provide the user community with well-documented, science-ready data from the VSM. It was also noted that ISS data are underutilized.

The Committee learned of the new instrument, "S5T", developed by C. Keller's group for synoptic observations of the scattering polarization on the solar limb, and the plan to install it on the SOLIS spar. We understand that the pending MOU will limit NSO's involvement and commitment to just a few minutes each day, and that there is agreement that the installation of this instrument will not occur until the Full Disk Patrol is also ready, in order to assure minimal and coordinated downtime of the SOLIS package. The Committee urges the SOLIS management to adhere to the limited commitment of resources in the proposed MOU, and maintain the highest priority for NSO facilities.

Throughout the provided documents and the summaries presented in Tucson, there was significant emphasis on SOLIS's future ability to obtain chromospheric vector magnetograms. There are two aspects about this that concern the Committee to some degree. First, there is a

significant research gap between acquiring full spectropolarimetric data in a chromosphereformed line, and producing chromospheric vector magnetic field maps and understanding their
limitations. The programmatic emphasis has been placed on the former. The Committee
recommends a conservative approach that includes algorithm development and validation, lest
the user community develop unrealistic expectations. Second, in concert with this, the
Committee emphasizes that the highest priority needs to be providing the solar physics
community with photospheric vector magnetograms in an exquisitely useful and available
manner. While the UC recognizes that NSO has increased the resources devoted to bringing the
SOLIS VSM and FDP instruments to full operational status, SOLIS photosphere vector
magnetograms need to be established as a default "go-to" data source—especially in light of the
alternatives being space-based, and therefore inherently less reliable for long-term data
availability.

It is therefore the Committee's suggestion, that NSO maintain its focus on the photospheric aspect of the VSM project and the SOLIS Full Disk Patrol, and accord lower priority to other capabilities for the time being.

# Global Oscillations Network Group (GONG)

We applaud the GONG group for its continued fruitful efforts on streamlining, standardizing, and documenting the GONG data products, and on securing outside-NSO funding to address the requirements of the NSF Senior Review. The success of the negotiations with the Air Force Weather Agency has been exemplary; the Users' Committee extends our appreciation to AFWA on behalf of the solar physics community, and we urge the establishment of a long-term commitment for the cooperation by both parties to ensure continuity. The Committee looks forward to contributions to solar physics research from the new GONG  $H\alpha$  images.

There have been personnel changes in the GONG program of note: the UC learned of the imminent departure of R. Howe and the assumption of some management responsibilities by I. González Hernández from F. Hill. It is a tribute to Dr. Howe's scientific contributions to helioseismology and the GONG program in particular, that the UC urges her position be filled with a researcher who can devote nearly full time to GONG science.

# NSO Synoptic Program

The NSO Users' Committee fully endorses the establishment of the NSO Synoptic Program to complement the high-resolution program in the ATST era, and even before. The efficiency brought about by combining programs such as SOLIS and GONG will be complemented by the establishment of standard architecture for both management and data products, and this consistency will benefit both NSO and the broad user community.

Above, we suggest the possibility of a present instrument from the DST becoming a pathfinder for developing the user base, data storage and reduction, documentation, and dissemination in preparation for ATST. With respect to the Synoptic Program, we propose that, as the GONG program is fairly well developed along these lines, the SOLIS data may also provide a similar

test bed by which to develop Synoptic Program-era infrastructure. As such, and given the wide expertise available in the community, it has been suggested by community members that the "instrument corrected" Level-1 Stokes spectra be made available, even if by request to the VSO (*i.e.*, not necessarily stored "live").

The UC reaffirms the importance of building and maintaining a user base for its synoptic instruments that, in the post-SDO era, will likely be the premier source of high-quality synoptic data worldwide. The broad user community has confidence in Dr. Hill as a leader for major programs that rely on strict attention to detail and depend upon worldwide negotiations.

# Virtual Solar Observatory (VSO)

The Committee recognizes that the NSO has made significant contributions to the Virtual Solar Observatory, with relatively minor commitments of resources. However, given the NSO's present and future reliance on the NASA-supported VSO, the NSF should consider monetary support for continued NSO involvement in VSO development, especially during the lead-up to ATST commissioning and operations.

### **Kitt Peak Instrumentation**

### McMath-Pierce Main

The UC was pleased to see new and interesting scientific results from the McMath-Pierce infrared program and appreciates that the support for this unique facility has been sustained as we recommended. In particular, we applaud the inclusion of students in work with the NSO array camera and recognize the need for the continued routine observations of sunspot magnetic field strengths in the 1.56 µm line through at least first light with ATST.

We judge that this program is scientifically underutilized as a test bed for longwave IR observations with ATST. The UC strongly recommends that NSO hire a postdoctoral fellow to do infrared solar science, focused on (although not limited to) using the McMath-Pierce facility.

# The McMath-Pierce Fourier Transform Spectrometer

The Users' Committee recognizes the unique capabilities of the McMath-Pierce FTS for high-resolution spectroscopy of the Sun. The FTS remains the only facility in the world where a spectrometer covering the UV, visible and IR is coupled to a large-aperture solar telescope, and there remains interest in applying these capabilities to solar studies. The continuing effort to bring the FTS back to operation appears to be at a crossroads, where a completely different approach may be warranted. Before the instrument is declared a lost cause, we recommend that an independent assessment be made as to whether there is any possibility of reviving it. We recognize that this cannot be regarded as high-priority for NSO, but we encourage that some effort be made to find a way forward within personnel and budget constraints.

# **Other Topics**

# Fostering a Healthy, and Diverse, US User Base for the NSO

The Users' Committee noted with concern an overall decline of the US presence in solar physics research which is not commensurate with the extraordinary facilities available now and in the near future at NSO. We have suggested a few mitigating steps, but encourage overall attention to fostering the next generation of a US user base for NSO facilities.

The Users' Committee recognizes the success of NSO in establishing strong and on-going outreach programs which emphasize training for under-represented sections of the US population. The burden for these efforts, and for including broad representation within NSO staff, should fall on all NSO projects and personnel. Future NSO workshops should take steps to enable a strong participation by US graduate students and young researchers, especially on topics relevant for the ATST era.

For all NSO instruments and facilities, improved and transparent data distributions will provide greater utilization of NSO products and also allow an easier transition when bringing new researchers and graduate students into Solar Physics. The Users' Committee encourages the dissemination of analysis tools relevant to the different data sets through, e.g., the SolarSoft distribution and the website of the facility in question.

### Committees and Communication

The Director mentioned forming a new ATST-specific users' committee; we suggest that, should an advisory committee be formed distinct from the Science Working Group, a similar entity should be formed in parallel to advise the Director's Office specifically regarding the NSO Synoptic Program.

The Committee proposes that the Director institute occasional joint committee meetings between the Solar Observatory Council and the NSO Users' Committee. The two groups may emphasize different priorities, and on occasion, it could be beneficial to both groups to understand the respective perspectives being brought to the Director's Office.

# NSO's Transition to a New Headquarters Location

The Users' Committee was briefed on the progress toward selecting a site for the future Headquarters facility for NSO, and noted the breadth of the groups that have submitted Letters of Intent to Propose. The new NSO Headquarters move offers an excellent opportunity to build a closer relationship between NSO and an academic host institution. In particular, the training of the next generation of solar physicists is reliant on a strong academic program which includes training in observational and theoretical solar physics as well as physics and mathematics. We are pleased to see that an increased University presence in solar physics is a priority of the Headquarters decision.

# Possible NSF Reorganization

The Committee recognizes that a potential large reorganization within the National Science Foundation regarding the "home" for the US solar physics community within the organization may occur. As a fundamentally cross-disciplinary science, members of our scientific community are concerned that they will be under-represented, regardless of which NSF division is responsible for funding solar physics research. In an ideal world, particularly in the age of the ATST, the United States user community deserves a unique division within the NSF, one that significantly revitalizes our field.

# Respectfully submitted,

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