

Director's Corner

Steve Keil

Planning is underway for the next decadal survey for astronomy and astrophysics, and we must ensure that there is strong support for solar science and the tools required to do it. Thus, it is important that solar astronomers take the time to attend and voice your opinions at the meetings held by the main survey committee as well as meetings of the disciplinary sub-committees. The major solar ground-based tools that came out of the previous survey, including the Advanced Technology Solar Telescope (ATST), Frequency Agile Solar Radiotelescope (FASR), and a Synoptic Optical Long-term Investigations of the Sun (SOLIS) network—as well as a strong theoretical program—still need your continuing support. The nomination deadline for Survey Committee membership will be closed by the time this newsletter is published, but nominations for sub-panel membership will be taken through 15 October 2008 via the web (www7.nationalacademies.org/bpa/Astro2010.html).

For high-resolution solar physics, the ATST has worked its way through all of the processes needed for a new construction start as part of the NSF Major Research Equipment Facilities Construction program, except for the final baseline review which is scheduled for next winter. Given the current status of the project, ATST should not be re-competed in the survey, but would benefit from the endorsement of the decadal review, as was given for Atacama Large Millimeter Array in the previous survey. The ATST enjoys wide support in the solar community and is crucial to a vibrant ground-based solar science program.

In addition to ATST, ground-based solar needs community support for a broad range of activities and facilities. These include theory and modeling, radio observations, helioseismology, and synoptic observations of solar magnetic fields and activity, to mention but a few. We encourage members of the solar community to nominate scientists they feel will strongly support solar physics and the important role that it plays in astrophysics and space physics, and who have the ability to work closely with other communities while clearly advocating for the needs of solar physics.

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This year's University of Arizona/National Solar Observatory Summer School in Solar Physics held at Sacramento Peak was again a great success, enjoyed by both students and faculty. The intensive one-week course is designed for beginning graduate and advanced undergraduate students with an interest in the physics of the Sun who may possibly want to pursue a career in solar physics, space physics, or related field.

We would like to extend our special thanks to all of those who gave lectures, including Joe Giacalone (director of the school), Randy Jokipii and Tami Rogers (University of Arizona), Spiro Antiochos (Naval Research Lab), Sam Krucker (University of California-Berkeley), Gene Parker (University of Chicago), Charles Smith (University of New



Assistant Professor Tami Rogers (right) shows the twisting of solar magnetic fields as part of the solar dynamo process, with the help of Research Experiences for Undergraduates student Marrisa Pitterle.

Hampshire), and NSO staff scientists Irene González Hernández, Aimee Norton, Matt Penn, and Han Uitenbroek. We also thank the students who shared their research results through talks and posters. No wild bears tried to crash the lectures this year, unlike last year, making it easier to concentrate! We look forward to next year, and encourage you to let your students know about the summer 2009 course. Information is available at www.lpl.arizona.edu/SummerSchool08/ or eo.nso.edu/.

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About 220 members of the extended NSO Sunspot family gathered at Sac Peak for a 4th of July reunion. The attendees included employees (past and present) and their family members, including several "Sunspot babies" born to employees who were working there at the time. At least three father-son teams were represented: Frank Hegwer (Sunspot, retired) and Steve Hegwer (NSO/Sunspot), George Streander (Sunspot, retired) and Kim Streander (NSO/Tucson), and Lou and Doug Gilliam (NSO/Sunspot).


Reunion attendees represented the entire 61 years of Sac Peak's history, and many hadn't seen each other since they were small children on the Peak. More than 70 deceased members of the family were memorialized on Sunday, July 6.

The longest association with Sac Peak (in attendance) as a resident/employee was Rebecca (Cope) Coleman, and the longest association

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Director's Corner continued

with Sac Peak (in attendance) were Bill and Jean Davis' daughters Jacquie Day, Jeanell Clements, and Linda Bynum. "The reunion was a phenomenal success," said reunion organizer Jackie Diehl of the NSO Director's office at Sac Peak, "not only for those in attendance sharing their stories of life here in Sunspot, but for the many volunteers who put their hearts into making this an event of a lifetime. It was truly enjoyed by all."

We would like to welcome David Elmore, who has joined NSO as ATST instrument scientist. Dave will be located at Sunspot, but will be spending considerable time on the road working with ATST partners to develop instrument packages. Dave will also be doing research and working on ATST-related instrument projects at Sac Peak. 

First Quarter Deadline for NSO Observing Proposals

The current deadline for submitting observing proposals to the National Solar Observatory is 15 November 2008 for the first quarter of 2009. Information is available from the NSO Telescope Allocation Committee at P.O. Box 62, Sunspot, NM 88349 for Sacramento Peak (SP) facilities (sp@nso.edu) or P.O. Box 26732, Tucson, AZ 85726 for Kitt Peak (KP) facilities (nsokp@nso.edu).

Instructions may be found at www.nso.edu/general/observe/. A web-based observing-request form is at www2.nso.edu/cgi-bin/nsoforms/obsreq/obsreq.cgi. Users' Manuals are available at nsosp.nso.edu/dst/ for the SP facilities and nsokp.nso.edu/ for the KP facilities. An observing-run evaluation form can be obtained at ftp.nso.edu/observing_templates/evaluation.form.txt.

Proposers are reminded that each quarter is typically oversubscribed, and it is to the proposer's advantage to provide all information requested to the greatest possible extent no later than the official deadline. Observing time at National Observatories is provided as support to the astronomical community by the National Science Foundation.

ATST

The ATST Team

The Senate Appropriations Committee approved \$9.5 million for the Advanced Technology Solar Telescope (ATST) in its June 19 markup of the proposed FY 2009 Federal budget: "We will also grow our (under)standing of the sun and its effects on our satellites, telecommunications, and even our electrical power grids," said U.S. Senator Daniel K. Inouye, in announcing several Committee actions. ATST "is a powerful, next generation instrument that will be the world's largest and most capable solar telescopes, and it will offer many scientific breakthroughs." On June 25, the House Appropriations Committee passed the Commerce, Justice, Science, and Related Agencies FY 2009 appropriations bill. The overall Major Research Equipment and Facilities Construction account is funded at \$147.51 million, equal to the President's request. Votes by the House and Senate are pending.

Environmental Impact Statement (EIS)

The ATST project manager and architect participated in National Historic Preservation Act Section 106 meetings held in June on Maui. The meetings were conducted by the NSF and were attended by the ATST environmental engineering team and consulting parties interested in proposals for mitigation of cultural impacts associated

with building ATST on Haleakalā. Individuals from institutions such as the State Historic Preservation Office, Hawaii Historic Foundation, and Maui Community College, as well as members of the general public, also participated. The meetings were productive and focused on specific, realistic proposals for mitigation. The NSF will hold two more meetings on Maui in late August, leading to the completion of the NHPA Section 106 process, which is required for the completion of the Final EIS for the project.

Science Working Group

The ATST Science Working Group (SWG), chaired by Thomas Berger of the Lockheed Martin Solar and Astrophysics Laboratory, met in May at the NSO offices in Tucson. A key action from the meeting was to develop at least one ATST Science "use case" for each of the planned commissioning instruments. A strong recommendation to the SWG was to fully develop at least one solid, tested, working, scientifically relevant use case for each instrument. ATST observers then would be encouraged to choose from a menu of available use cases. These will remain the primary examples for each instrument going forward. Draft science use cases were first laid out in the Science Requirements Document and reflected in the science section of the ATST proposal.

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ATST continued



Members of the ATST Science Working Group gather on the steps of the NSO offices in Tucson, after concluding their three-day review of science and engineering issues facing the project.

The ongoing effort will flesh them out in more detail, while taking into account the most recent progress in solar physics, and helping to fill in details for telescope and instrument operations and data handling.

Working groups within the SWG are using a standard template to capture the hypothetical observing programs. The template is modeled as a typical scientific observing proposal, followed by additional information that would more likely be gathered in a planning phase for the experiment. The goal is to provide a common outline on which to describe a range of use cases while guiding the community through various considerations for future observing programs.

The use cases picked by the SWG are: quiet sun chromospheric dynamics and heating; high-cadence and high-resolution observations of solar flares; velocity spectrum of photospheric structures; sunspot penumbral dynamics; magnetic field of prominence cavities; and multi-instrument observing program issues. Initial instrument and observing needs were set and will be refined over the next year.

The SWG identified several different actors who may be involved in an observing program over its lifetime:

- Investigator** - the scientist responsible for a specific experiment.
- Instrument Scientist** - a scientist with detailed knowledge of one or more instruments, who is responsible for preparing experiment definitions for accepted observing programs and determining scientific tasks of the telescope during the observing day.
- Operator** - the telescope controller responsible for the health and safety of the telescope.
- Engineers** - responsible for facility monitoring and maintenance.

ATST will be operated in one of three main modes:

- Instrument Principle Investigator (PI) mode** - A PI brings a new instrument to the telescope for custom observations. The PI remains on the mountain at all times in this case.
- Science PI mode** - A scientist has dedicated time on the telescope to run planned scripts to achieve an approved science observation. The PI may be on the mountain or may be remote.
- Target-of-Opportunity or "Queue" mode** - Tentatively designed as a series of pre-approved programs from which the ATST Scheduling Committee can choose a daily observing schedule, independent of input from a Science or Instrument PI. Details require further study.

Two findings were announced. After some discussion, it was decided that the Visible Broadband Imager (VBI) must maintain both red and blue channel capabilities as a stand-alone instrument in order to meet its science mission. However, the realities of the beam splitting in the coude room may sometimes preclude use of the VBI red channel in combination with other instruments. The SWG accepts this tradeoff. The SWG also found that the transition from disk to coronal observations must be automated and rapid (approximately 10 minutes) to minimize lost observing time.

The next SWG meeting is tentatively scheduled for May 2009, after the NSF-sponsored final design review, at a location to be determined. ☐

SOLIS

Aimee Norton & The SOLIS Team

Recent science results from the SOLIS instrument include a comparison between observations from the Hinode X-Ray Telescope (XRT) and the STEREO Sun-Earth Connection Coronal and Heliospheric Investigator (SECCHI) instrument to study polar coronal jets and plumes and the corresponding magnetic base of mixed polarities, as identified in SOLIS Vector Spectromagnetograph (VSM) data (Raouafi et al, 2008, ApJ, 682, L137). The study focuses on the temporal evolution of jets and plumes and their relationship.

The data from 7-8 April 2007, show that 26 of 28 jet events (>90 percent) are associated with polar plume material with a one-to-one spatial correspondence of jets to plumes (see figure 1). Extreme ultraviolet (EUV) images from STEREO/SECCHI show plume haze rising from the location of 70 percent of the polar X-ray jets (via Hinode/XRT) and EUV jets with a time delay ranging from minutes to hours. The remaining jets occurred in areas where plume material existed already with an enhancement of the plume after the jet event. Short-lived, jet-like events and small transient bright points are

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SOLIS *continued*

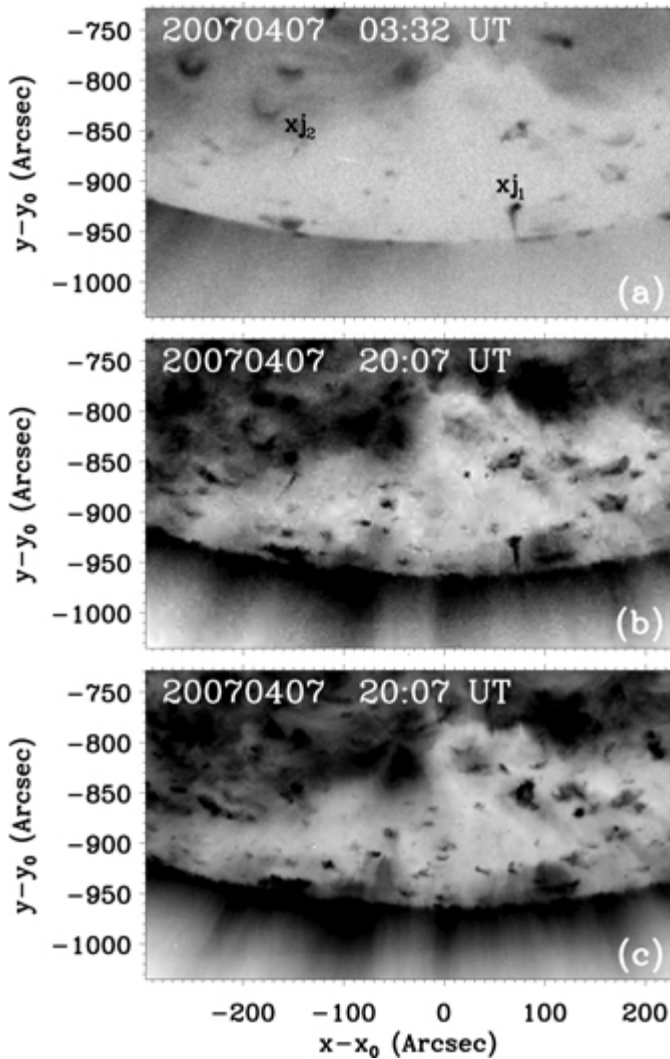


Figure 1: Hinode/XRT snapshots of the southern polar coronal hole recorded on 7 April 2008 showing several X-ray jet events (x_{j1} and x_{j2}). Middle and bottom: 171 Angstrom images from STEREO/SECCHI/EUVI-A of the southern polar hole of the same day. Polar plume haze clearly rise from the same locations as X-ray and EUV jets with a time delay ranging from minutes to hours.

seen at different locations within the base of pre-existing long-lived plumes. X-ray images show rapid evolution of collimated, thin jets to wider plume-like structures associated with time delayed plume haze in the EUV. These observations suggest evidence for X-ray jets being precursors of polar plumes, or of brightenings of plumes.

The SOLIS team has had some positive news regarding funding. The NASA proposal “Data Services Upgrade for SOLIS/VSM Stokes Profile Data” by Henney et al. was recently selected for funding. This proposal to the NASA Solar and Heliospheric Physics Division’s Virtual Observatories for Heliospheric Data program will allow preservation of the VSM full-disk Stokes synoptic data for recent and future advancements in polarimetric data analysis. The proposal was motivated by the opportunity to preserve and make available this unique dataset,

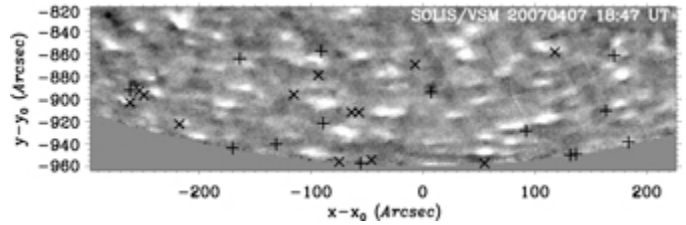


Figure 2: SOLIS VSM line-of-sight chromospheric magnetogram Ca 8542 showing the location of the X-ray jets observed by Hinode/XRT on 7-8 April 2007. Their displacement due to solar differential rotation is taken into account.

and to do the same for future VSM vector observations. The proposed data compression, using the Expansion in Hermite Functions method, and storage is certainly a welcome alternative to the pending deletion of the datasets.

In May, the SOLIS team was invited to submit a full proposal for the National Science Foundation Division of Atmospheric Sciences Mid-Size Infrastructure Opportunity. We proposed to construct two near-duplicates of the Vector Spectromagnetograph instrument of the SOLIS facility, currently operating on Kitt Peak. The replicated VSMs would be operated at established foreign sites by international partners in collaboration with the National Solar Observatory, thereby forming a global network of these forefront instruments for high-precision, synoptic measurements of magnetism on the solar disk.

The primary objective of the VSM network would be to provide nearly continuous vector magnetic field data, in place of the sporadic data presently gathered. We also propose to provide this multi-wavelength vector field data at two levels of the solar atmosphere. The data would support community research on dynamic magnetic phenomena that are relevant to the origins of space weather and geomagnetic disturbances, and may contribute a natural component of long-term global climate change.

Details of the proposed VSM network were presented at the SPIE Astronomical Instrumentation meeting held in Marseille, France in June. The paper, titled “A Global SOLIS Vector-Spectromagnetograph (VSM) Network” by Streadler et al., can be found in the forthcoming SPIE conference proceedings.

The online availability of the calibrated ISS “Sun-as-a-star” spectra was announced in Cool News, a monthly electronic newsletter on the topics of cool stars and the Sun. The ISS data can be downloaded at solis.nso.edu/iss/, or by visiting the NSO home page at www.nso.edu and clicking on “SOLIS,” where information on the ISS instrument also can be found. Time series of derived parameters characterizing the K line are also given.

The initial alignment of the optics in the Full Disk Patrol (FDP) instrument is completed. We expect to be taking engineering images with this instrument in the near future. The SOLIS team continues to improve upon the treatment of the polarization fringe removal and inversion of the VSM data. The team is positioned for camera replacement and is simply looking for an opportunity during the monsoon season to complete the task. ■

First Lock for McMath-Pierce Planetary Adaptive Optics System

Claude Plymate & Andrew Potter

For several years, the McMath-Pierce Solar Telescope has been used to map Mercury's tenuous sodium exosphere by observing sodium D-line emissions from sunlit sodium atoms in the exosphere. The distribution of sodium atoms over the surface of the planet is found to be non-uniform and changes with time and orbital position. Since the exospheric sodium atoms are produced from the surface of Mercury by the action of solar radiation and particles, these non-uniformities and changes are clues as to how the Sun interacts with the surface of Mercury.

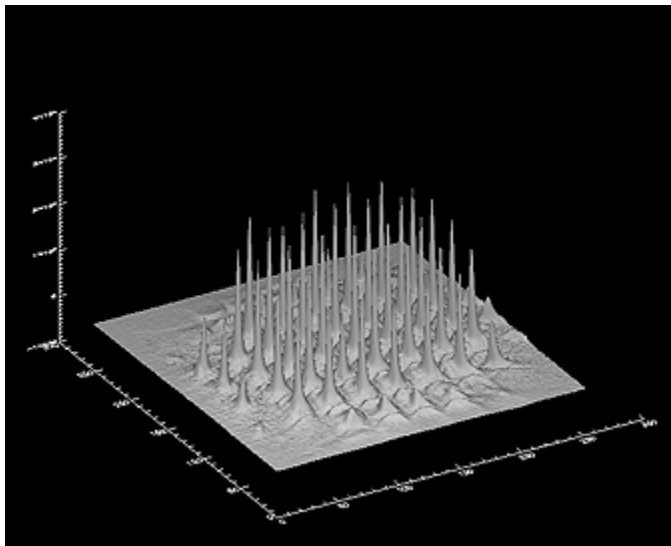


Figure 1. Shack-Hartmann wavefront sensor intensity map showing Mercury in each subaperture.

A ten-slice image slicer is used at the input of the McMath-Pierce stellar spectrograph to divide the planetary disk into an array of spectra. These can be analyzed to produce planetary maps of the sodium D-line emissions, which can then be used to produce maps of sodium atom column density.

Mercury typically subtends at around 6-7 arcsecs, and observations must be conducted during daytime and/or at twilight. Poor seeing during these times can limit the planet's disk to only a few resolution elements across. A planetary adaptive optics (PAO) system, funded through a NASA grant, has been developed at the McMath-Pierce in an effort to improve the spatial resolution of sodium observations across Mercury's disk. To minimize cost, the existing infrared adaptive optics (IRAQ) system at the telescope was used as a model for the PAO system, but optimized for planetary use. The PAO system

was developed around the same commercially available 37-actuator deformable-membrane mirror used on the IRAQ.

First adaptive optics lock on Mercury was demonstrated during an observing run at the McMath-Pierce on 7 May 2008. Figure 1 is a contour map from the wavefront sensor and shows the planet imaged by the Shack-Hartmann lenslet array. The run was hampered by clouds, but we were able to obtain one sodium spectrum through a "sucker hole" under fairly poor seeing conditions.

The resulting sodium map (figure 2) is estimated to have a resolution of 0.7 arcsec, quite close to the 0.5-arcsec resolution of the spectrograph's image slicer, and is roughly a factor of two improvement over previous maps. Further improvement in spatial resolution is expected from refinements in the system software and optics.

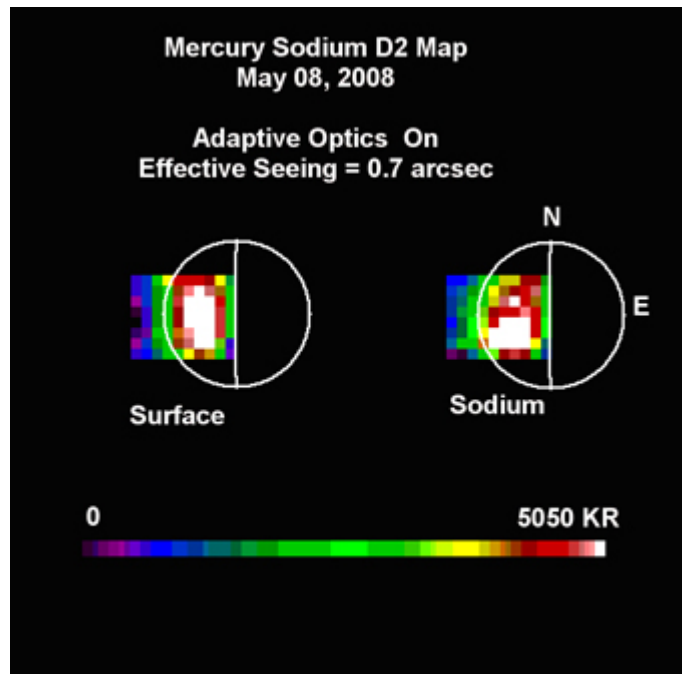


Figure 2. Two views of Mercury measured on 7 May 2008 local time (8 May 2008 UT). The pixels in these images are 0.5-arcsec square. The right view shows the sodium emission intensity in units of kilorayleighs (KR) and the left view shows the surface reflection intensity scaled to match the sodium emission intensity. The sodium emission is clearly offset from the surface reflection, with the preponderance of emission in the southern hemisphere.

GONG++

Frank Hill & the GONG++ Team

There is very promising news in the search for continued support for GONG in response to the NSF Senior Review's challenge for GONG to find a significant complement of its operating expenses outside the NSF astronomy division. The US Air Force Weather Agency (AFWA) has determined that GONG data fulfills the requirements of their space weather forecast system. This means that there is a very good likelihood that they will fund the installation of an H-alpha observing system in the GONG instruments, and provide a substantial portion of the annual GONG operational budget.

We had an initial teleconference with Air Force personnel based in Nebraska, Colorado, California, and Washington DC in early June, where technical details were initially discussed. A second teleconference was held on July 17. While some details remain to be settled and contracts are yet to be negotiated and signed, the additional H-alpha data set and continued stream of high-cadence magnetograms and helioseismic data promise to provide the community with very important new scientific opportunities.

The H-alpha data will consist of 2048 × 2048-pixel, full-disk on-band images obtained once per minute continually around the clock with the same 90 percent duty cycle that GONG routinely attains. As well as providing a flare patrol for AFWA, this will enable studies of flare evolution, filament dynamics, Moreton waves, etc. with simultaneous magnetograms, Dopplergrams, and subsurface helioseismic data from simultaneous observations and compatible instrumentation. We are looking forward to working with AFWA and increasing GONG's role in space weather.

Science Highlights

As seen in the Science Highlights section of this *Newsletter*, Rudi Komm has been evaluating the efficacy of the subsurface vorticity measure as a flare predictor. The preliminary results look quite good, and we will be working with the space weather community to further evaluate the forecasting ability of this quantity and its temporal variation. Rudi is also working with a Research Experiences for Undergraduates summer student, Ryan Ferguson from Michigan State University, who has added to the existing data base increasing it to 1009 active regions and has applied a discriminant analysis method to the data to determine which subsurface parameters are best suited to distinguish between flaring and non-flaring active regions.

Kiran Jain has been studying the correlation between the p-mode frequencies and a variety of activity indices as a function of the phase of the solar cycle. Kiran divided the data into three sets corresponding to the rising, high, and declining phases of Cycle 23. She finds that the rising and declining phases of the cycle produce higher correlations between the activity index and the frequency, with a very substantial difference for activity indices that are most affected by sunspots with strong fields. This is another indication that the effect of the magnetic field on the oscillations depends on whether the field is relatively weak and distributed over a large area, or concentrated in localized areas of high field strength.

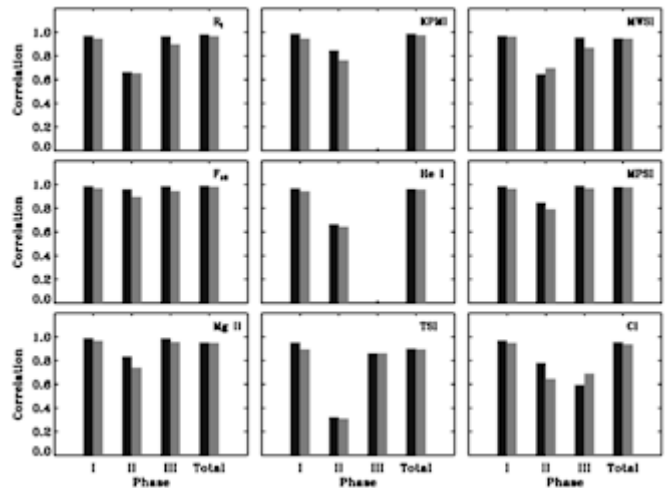


Figure 1. Bar-chart showing phase-wise variation of the Pearson's linear correlation between intermediate degree p-mode frequencies and various activity indices. The complete solar cycle is divided into three phases: the rising (Phase I), high (Phase II) and declining (Phase III) activity. Each activity phase has values for GONG (left) and MDI (right) data. The activity indices used here are; the international sunspot number (RI), the line of sight magnetic field observed at the Kitt Peak Vacuum Telescope magnetic index (KPMI), the Mt. Wilson sunspot index (MWSI), calculated using Mt. Wilson magnetograms, the integrated emission from the solar disk at 2.8 GHz (F10), the equivalent width of the He I 1083 nm solar absorption line (He I), the strength of magnetic plages (MPSI), the ratio of the h and k lines of the solar Mg II feature at 280 nm to the wings at approximately 278 nm and 282 nm (Mg II), the total solar irradiance (TSI), and the total energy emitted by the corona at a wavelength of 530.3 nm (CI). For all indices, except for the F10, the correlation changes significantly from phase to phase. The rising and the declining phases are better correlated than the high-activity phase. The missing values for KPMI and He I for Phase III are due to unavailability of the activity measurements. A substantial decrease in correlation during Phase II is obtained for RI, MWSI and TSI. These indices are most affected by sunspots with strong magnetic fields, while other proxies (e.g. MPSI, Mg II) are sensitive to the weak component of the magnetic field. However, the KPMI and F10 indices are modulated by both components.

Network Operations & Engineering

Preventive Maintenance (PM) visits were made to Chile and Australia this quarter. After the impromptu camera replacement at CTIO in March, a planned PM visit followed in April. The major task was the replacement of the light-feed turret and subsequent optical alignment, which completes the installation around the network of turrets with improved moisture seals between the moving parts. The old turret was returned to Tucson for refurbishing.

A trip to Learmonth took place in June. The improved clean-air system was deployed to each of the sites. The new pumps have field-

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GONG++ *continued*



Figure 2. Left, 2008 NSO/GONG IRES participants at a social gathering with students at the Indian Institute of Astrophysics in Bangalore, India. At right (left to right) Driss Takir, Andrea Kunder, IIA Director Dr. Siraj Hasan, Catherine Wu, Erik Larson, and Dr. Kiran Jain.

serviceable parts and can be overhauled onsite with a screwdriver and inexpensive overhaul kit. This is a vast improvement over the previous pumps, which required return to Tucson to be professionally overhauled in our instrument shop. We are now replacing hard disks used by the data caching system during PM visits. Most of these hard drives have been running for over five years now, and we are beginning to experience some failures. Since there is redundancy designed into our data caching system, these failures have not resulted in any lost data.

Earlier in the year, the Udaipur instrument experienced a problem with the turret's pitch-positioning mechanism. This now appears to be the result of moisture intrusion into the area housing the pitch-position resolver. Once the moisture was removed, the turret operated flawlessly until the end of June, when the instrument was shut down for the annual monsoon. How the moisture entered the turret is still undetermined, but the resolver-cover seal is a prime suspect. New sealing material has been implemented on a turret in Tucson and pressure tests indicate the sealing ability is greatly enhanced. Even though the current Udaipur turret was operational at shutdown, it will be replaced at the end of the monsoon season as a risk-mitigation measure.

The Mauna Loa turret continues to experience problems with pitch positioning. The problem is intermittent: some days it is not seen at all and on other days can persist for several hours, making it difficult to troubleshoot. Indicators point to an improperly tuned servo circuit, but attempts to adjust it remotely have not eliminated the problem. Plans to visit the site during the next two months are under discussion.

Data Operations and Software Development & Analysis

GONG's Data Storage and Distribution System (DSDS) is now running routine archive and distribution functions on a Linux platform and a link to the new data archive has been added to the GONG Web page. To access the new GUI and peruse the available data products from the home page, go to "Data Archives." Send your comments or suggestions to smcmanus@nso.edu.

As we work through the final stages of porting GONG's production software from Sun/Unix to PC/Linux, we get a step closer to retiring the Sun servers. This quarter gongxx, the cornerstone of the original GONG++ processing system, and the L180 tape library were retired. This allowed us to bolster our existing Linux processing capabilities with two dual-CPU, dual-core servers, and 26 terabytes of disk space, which will support a 13-terabyte mirrored FTP archive.

Twenty months worth of GONG magnetogram synoptic maps and field strength models were reprocessed to remove the recently discovered annual periodicity at the poles. The reprocessing effort proved to be a successful implementation of the pipeline manager, Conductor, which allowed the synoptic map pipeline to be distributed across five servers. Conductor was developed by the Planetary Image Research Laboratory at the University of Arizona's Lunar and Planetary Laboratory.

Processing to date includes time series, frequencies, merged velocity and rings for GONG Month 125 (centered at 13 August 2007), with a fill factor of 0.90.

Program

We are investigating the possibility of setting up a data node for the upcoming SDO mission, due to be launched soon. This would provide an alternative location for users to obtain data and reduce the load on Stanford.

The GONG 2008/SOHO XXI meeting was held in Boulder, Colorado from August 11-15. Approximately 100 scientists were scheduled to gather to discuss solar-stellar dynamos as revealed by helio- and astero-seismology. See the Web page at gongsoho08.ucar.edu/ for further details.

The four students for this year's International Research Experience for Students (IRES) program arrived safely in Bangalore, India for a six-week program. Andrea Kunder (Dartmouth University), Erik Larson (University of Colorado), Driss Takir (University of North Dakota), and Catherine Wu (New Mexico State University) will be working

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GONG++ continued

with S. Giridhar, S.P. Bagare, U.S. Kamath, and S.K. Saha of the Indian Institute of Astrophysics (IIA). The students settled in quickly, and hosted a social event to meet the Indian graduate students at the IIA (see figure 2). Information about the summer school program, including project reports from last year's participants, can be found on the Web at eo.nso.edu/ires/.

We are happy to announce that Kiran Jain has officially joined the GONG staff. Kiran has been working with us as an NSO long-term visitor and serving as the IRES program coordinator. We are delighted that we can now provide financial support for her under NASA funding. ●



International Research Experience for (Graduate) Students (IRES)

NSO/GONG announces a summer 2009 research program for US graduate students sponsored by the NSF Office of International Science and Engineering (OISE). The eight-week program, beginning June 10, 2009, will take place in Bangalore, India under the auspices of the Indian Institute of Astrophysics (IIA). The goal of the program is to expose potential researchers to an international setting at an early stage in their careers. See eo.nso.edu/ires/ for additional information and application materials.