National Solar Observatory

Quarterly Report (1) FY 2009

01 October - 31 December 2008

Submitted to the National Science Foundation
Under Cooperative Agreement No. AST-0132798
Scientific Program Order No. 2

Also published on the NSO Web site: *http://www.nso.edu*

AURA

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01 October– 31 December 2008

Submitted to the National Science Foundation under
Cooperative Agreement No. 0132798
Scientific Program Order No. 2

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This report consists of summary statistics and other data on NSO observing programs and telescope usage, and a safety report for the fiscal quarter ended 31 December 2008. Quarterly highlights of public and educational outreach activities are also described. The appendix contains a comprehensive list of principal investigators and collaborators, program titles, telescopes used, and observing hours associated with observing programs at NSO facilities this quarter.

Scientific highlights and current updates on NSO initiatives, new capabilities, instrumentation, and operational activities are published separately in the quarterly *NOAO-NSO Newsletter*.

Table of Contents

I. Observing Programs*

25 observing programs, five of which were thesis programs involving six thesis graduate students, were carried out at NSO this quarter. A comprehensive list of PI's, Co-I's, and collaborators, as well as program titles, telescopes used, and observing hours associated with observing programs this quarter is attached as the Appendix.

NSO Observing Programs by Type (US and Foreign)

3 Months Ending December 2008	*Nbr*	*% Total*
Programs (US)	18	72%
Programs (non-US)	2	8%
Thesis (US, involving 2 grad students)	2	8%
Thesis (non-US, involving 4 grad students)	3	12%
Total Number of Unique Science Projects*	**25**	**100%**

**Includes observing programs conducted by NSO/NOAO staff scientists.*

Users of NSO Facilities by Category

	Visitors				NSO/NOAO Staff
	US	*Non-US*	*Total*	*% Total*	
PhDs	14	14	28	78%	12
Graduate Students	1	5	6	17%	0
Undergraduate Students	0	0	0	0%	0
Other	1	1	2	6%	9
Total Users	**16**	**20**	**36**	**100%**	**21**

Institutions Represented by Visiting Users**

	US	*Non-US*	*Total*	*% Total*
Academic	5	5	10	53%
Non-Academic	3	6	9	47%
Total Academic & Non-Academic	**8**	**11**	**19**	**100%**

***Note: Total number of institutions represented by users do not include departments or divisions within an institution as separate entities (e.g., US Air Force and NASA are each counted as one institution even though several different sites/bases/centers are separately listed in the data base).*

Number of Users by Nationality

Czech Republic	1	Japan	3
Germany	2	Mexico	1
India	3	Spain	2
Italy	8	United States	37

INSTITUTIONS REPRESENTED BY USERS

Foreign Institutions (11)

Abdus Salam Intnl. Centre for Theoretical Physics, Italy
Astronomical Institute Ondrejov, Czech Republic
INAF - Arcetri Astrophysical Observatory
INAF - Osservatorio Astronomico di Roma
Indian Institute of Astrophysics
Indian Space Research Organization (ISRO)
Instituto de Astrofisica de Canarias, Spain
Kiepenheuer Institut fuer Sonnenphysik
National Astronomical Observatory of Japan
Universidad de Monterrey, Mexico
Universita "La Sapienza", Rome
University of Rome "Tor Vergata"
University of Tokyo

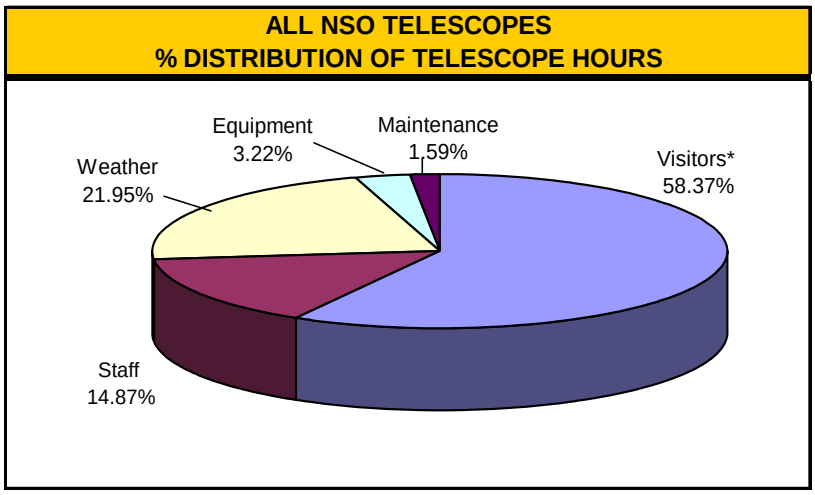
US Institutions (8)

California State University, Northridge
Dickinson College
High Altitude Observatory, NCAR, Boulder
NASA/Ames Research Center
NASA/Goddard Space Flight Center (NASA/GSFC)
University of Florida
University of Hawaii, IFA
University of Maryland
US Air Force/Philips Lab (USAF/PL/GSS)

II. Telescope Usage and Performance Data

In the quarter that ended 31 December 2008, 58.4% of the total available telescope hours at NSO/Sacramento Peak and NSO/Kitt Peak went to the observing programs of visiting principal investigators and synoptic programs; 14.9% were devoted to the programs of NSO and NOAO scientists. Scheduled maintenance, including instrument tests, engineering, and equipment changes accounted for 1.6% of total allotted telescope hours.

Total "downtime" (hours lost to weather and equipment problems) for NSO telescopes was 25.2%. 21.9% of these lost observing hours were due to bad weather, with 3.2% lost to equipment problems.



NSO TELESCOPES
Percent Distribution of Telescope Hours
(Scheduled vs. Downtime)
01 October 2008 - 31 December 2008

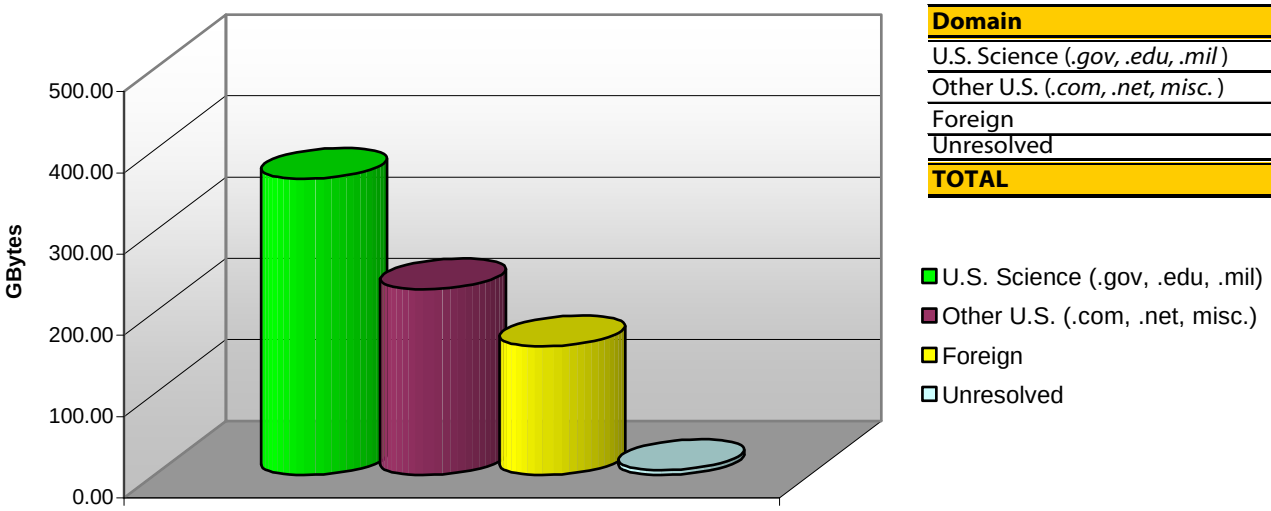
Telescope	Hours Scheduled	% Hours Used By: Visitors[a]	% Hours Used By: Staff	% Hours Lost To: Weather	% Hours Lost To: Equipment	% Hrs. Lost To: Scheduled Maintenance
Dunn Solar Telescope/SP	778.0	47.6%	22.4%	23.9%	1.0%	5.1%
McMath-Pierce*	759.0	64.2%	25.0%	5.0%	5.8%	0.0%
KP SOLIS Tower[a,b]	726.0	65.2%	1.4%	30.0%	3.4%	0.0%
FTS Lab[c]*	0.0	0.0%	0.0%	0.0%	0.0%	0.0%
Evans Facility	252.0	54.8%	0.0%	43.7%	1.6%	0.0%
Hilltop Dome	0.0	0.0%	0.0%	0.0%	0.0%	0.0%
All Telescopes	**2,515.0**	**58.4%**	**14.9%**	**21.9%**	**3.2%**	**1.6%**

[a] *Includes synoptic programs for which all data are made available immediately to the public and the scientific community at large.*
[b] *Formerly the Kitt Peak Vacuum Telescope (KPVT).*
[c] *The FTS Lab was closed for repairs/upgrades this quarter.*
[*] *Totals include both day and night hours. (All others are day only.)*

III. User Statistics – Archives/Data Bases

All statistics *exclude* the use of NSO archives and data bases from within the NSO Local Area Networks in Tucson and at Sac Peak, and from NOAO as a whole.

DATA (Gbytes) DOWNLOADED FROM NSO FTP & WWW SITES
01 October – 31 December 2008



Domain	Gbytes
U.S. Science (*.gov, .edu, .mil*)	364.10
Other U.S. (*.com, .net, misc.*)	228.59
Foreign	157.98
Unresolved	5.69
TOTAL	**756.36**

PRODUCT DISTRIBUTION BY DOWNLOADED GBYTES
01 October - 31 December 2008

Site	Product Type	Gbytes	%
T	GONG Helioseismology	427.46	56.7%
SP	Realtime Images and Movies (*OSPAN, Other)*	145.04	19.3%
SP	SMEI Experiment & Data Pages	41.29	5.5%
T	GONG (Magnetograms, spectra, time series, frequencies)	26.31	3.5%
T	SOLIS/VSM	25.49	3.4%
SP	General Information	21.42	2.8%
SP	Staff Pages	19.61	2.6%
SP & T	Other	17.21	2.3%
SP	Press Releases	14.45	1.9%
SP	Corona Maps & Other Images	4.13	0.5%
SP	Adaptive Optics Pages	2.84	0.4%
T	KPVT (magnetograms, synoptic maps, helium images)	2.25	0.3%
SP	Icon & Background Images	1.55	0.2%
SP	Telescope Home Pages	1.55	0.2%
SP	OSPAN Project Pages	1.29	0.2%
SP	Public Relations	1.03	0.1%
T	FTS (Spectral atlases, general archive)	0.35	0.0%
T	Evans/SP Spectroheliograms (Hα, Calcium K images)	0.00	0.0%
TOTAL		**753.27**	**100.0%**

V. Public and Educational Outreach Activities

NSO public and educational outreach encompasses activities at the Sunspot Astronomy and Visitor Center, including the Visitor Center's retail operations, educational exhibits, and of the NSO/Kitt Peak facilities; Web site outreach, including public information requests; scientific press and media relations; and staff involvement in programs to enhance science education in grades K–12, as well as higher education. Highlights for this quarter follow.

A. Educational Outreach

1. Research Experiences for Undergraduates (REU), Research Experiences for Teachers (RET), and Other NSO Summer Research Assistantship (SRA) Programs

In early October, recruitment and marketing plans were established for the 2009 REU and SRA programs, including the NSO/GONG 2009 International Research Experience for (Graduate) Students (IRES) program. In addition to detailed postings about the respective programs on the NSO Web site, advertisements were placed in the American Indian Science and Engineering Society's *Winds of Change* magazine and the *The Science Teacher* magazine of the National Science Teachers Association. NSO REU program advertisements were placed in the upcoming national conference program for the Joint National Society of Black Physicists and the National Society of Hispanic Physicists Conference scheduled for February 2009.

2. Other Educational Outreach

During this quarter, John Leibacher served on the respective PhD juries in Paris, France of Kevin Balkacem (Observatoire de Paris; October 2008) and Clement Troisseille (Université Paris-Sud; December 2008). Leibacher was also a lecturer at the 4th El Leoncita Solar Physics School on "Recent Progress in Solar Physics," held 28-29 November 2008 at Complejo Astronómico de El Leoncito, (CASLEO), San Juan and Universidad de La Punta, San Luis, Argentina.

Brian Harker-Lundberg (Utah State University) defended his thesis, "On the Applicability of Genetic Algorithms to Fast Solar Spectropolarimetric Inversions for Vector Magnetography," on 02 December 2008. Harker-Lundberg was mentored at the NSO by K. S. Balasubramaniam and had previously spent two summers at the NSO as a graduate summer research assistant. Brian will be an NSO postdoctoral research associate with the SOLIS project in Tucson, Arizona.

Han Uitenbroek gave three lectures to undergraduate and graduate students at a Centre National de la Recherche Scientifique (CNRS) workshop on "The Solar Photosphere, Chromosphere and Corona at High Resolution" in Beaulieu, France, 21-25 October. Approximately 20 students and scientists from various institutes in France participated in the workshop. During this quarter, Dave Dooling taught two sections of Astronomy 110 at New Mexico State University, and in December, Mark Giampapa gave talks to two 5th-grade classes at Fruchthendler Elementary School in Tucson about the essential elements of a science fair project; approximately 50 students and teachers were in attendance.

B. Public Outreach

1. Other Public Outreach, Including External Coordination, Media and Public Information

During this quarter, as part of the AURA/NSO/NOAO renewal of the current Cooperative Agreement with NSF, NSO put a significant amount of effort into developing a multi-pronged approach to increase the diversity within its staff and more generally within solar physics. The goal of this plan is to

Sunspot Astronomy & Visitor Center
Summary of Visitors and Tours
(3 Months Ending 12/31/08)

Group/Program	*No. of Visitors*
General Public Tours (Visits to Center and Self-Guided Tours)	2,770
Guided Public Tours:	
- School Groups K-12	25
- Special Tours	8
Total Visitors	**2,803**

provide a better focus and to establish connections with other underrepresented minority programs combined with an advisory structure that will help NSO meet its and NSF's goals for increased diversity. Important elements of this plan include: establishing a Diversity Advocate on the NSO staff (along with a diversity advisory panel), establishing stronger relationships with universities conducting programs for underrepresented minorities through both the NSF Partnerships in Astronomy & Astrophysics Research and Education (PAARE) program and through joint programs with selected schools and universities, recruiting at professional meetings of minority organizations, and establishing an assessment mechanism to determine what does and does not work. As part of this effort, on 17-18 October, Jackie Diehl represented NSO at the regional meetings of the National Society of Black Physicists (NSBP), the National Society of Hispanic Physicists (NSHP), and Zones 13 and 16 of the Society of Physics Students (SPS) at the University of Texas in El Paso. In November, Mark Giampapa met with Native American groups and their representatives on the University of Arizona campus to discuss opportunities at NSO for Native American students. The NSO also will have an exhibit at the joint conference of the NSBP and NSHP in Nashville, Tennessee in February. That trip will include visits to Fisk University in Nashville and Alabama A&M University in Huntsville.

In early November, Mark Giampapa did an email interview for an article about US and European space- and ground-based solar facilities in *Coelum*, an Italian popular astronomy magazine. And in December, a film crew from Authentic Entertainment, Inc. and Discovery Communications spent two days at NSO/Tucson, filming interviews with Mark Giampapa, Jack Harvey, Frank Hill, and Matt Penn for a one-hour Discovery Channel special on the Sun.

In October, NSO hosted exhibits at the New Mexico Science Teachers Association annual meeting in Albuquerque (17-19 Oct.), the Space Explorers' Education Days event at the New Mexico Museum of Space History in Alamogordo (21-25 Oct.), and the Albuquerque Teachers Open House event (29 Oct.).

Dave Dooling spoke to the Tularosa, New Mexico Rotary Club about the NSO. He also hosted a tour of Sac Peak by the executive director and education director of the New Mexico Spaceport Authority and discussed possible joint educational and public outreach projects since the Spaceport will become a major tourist destination, and gave tours to representatives from the National Atomic Museum in Albuquerque and representatives from the Dark Ridge Observatory, an education oriented facility in Weed, New Mexico.

In September, Cliff Toner hosted a star-gazing session for a group of senior Girl Scouts in Tucson by providing two telescopes through which the girls learned how to find north by looking at the stars and how to recognize several constellations. Tim Purdy hosted "Astronomy Night" at a local Tucson restaurant, Cata Vinos, on 13 December, during which approximately 30 people viewed the night sky through two telescopes.

As part of the NASA Science Mission Directorate exhibit and activities at the 2008 Fall AGU meeting in San Francisco, Alexei Pevtsov gave a public presentation on recent results from the Hinode mission.

V. Risk Management and Safety Report

Risk Management services at NSO/Kitt Peak and Tucson are shared with NOAO. Therefore, see the "Tucson and Kitt Peak Site Safety Report" section of the NOAO October - December 2008 Quarterly Report for details on risk management activities at NSO/Kitt Peak and Tucson. There are no risk management and safety activities to report for NSO/Sac Peak this quarter.

APPENDIX

National Solar Observatory

01 October - 31 December 2008

October - December 2008: During this period, 25 observing programs, 5 of which were thesis programs involving 6 thesis graduate students, were carried out at NSO. Graduate and undergraduate students are indicated by (T) for thesis students, (G) for non-thesis graduate students, (UT) for undergraduate thesis students, and (U) for undergraduate students. (RBSE) identifies middle and high school teachers who are Research-Based Science Education program participants, (REU) identifies Research Experiences for Undergraduates program participants, and (RET) identifies Research Experience for Teachers participants.

		Nights	Days	Hours
1858		**0.0**	**10.0**	**35.0**
William Livingston	National Solar Observatory			
Cycle Variability of the Solar Spectrum				
McMath-Pierce Solar Telescope	Main Spectrograph			
2058		**0.0**	**5.0**	**46.0**
Andrew Potter	National Solar Observatory			
Killen	University of Maryland			
Mangano	Istituto di Fisica dello Spazio Interplanetario, INAF			
Studies of Exospheric Emission Lines in the Inner Solar System				
McMath-Pierce Solar Telescope	Stellar spectrograph			
2127		**0.0**	**14.8**	**70.0**
Richard Altrock	USAF Research Laboratory			
Three-Line Coronal Photometer				
Evans Solar Facility (ESF)	Sac Peak			
2128		**0.0**	**14.8**	**68.0**
Simon Worden	NASA Ames Research Center			
Keil	National Solar Observatory			
Ca K Solar Rotation				
Evans Solar Facility (ESF)	Sac Peak			
2375e		**0.0**	**3.0**	**8.0**
Constance Walker	National Optical Astronomy Observatory			
Plymate	National Solar Observatory			
Understanding Active Regions: Using Zeeman-Split & Doppler Shift Measurements of IR Lines to Determine Magnetic Field Strengths & Evershed Flows of Sunspots				
McMath-Pierce Solar Telescope	Main spectrograph			

		Nights	Days	Hours
2489g		**0.0**	**5.0**	**40.0**
Douglas Gilliam	National Solar Observatory			
Smaga	National Solar Observatory			
Elrod	National Solar Observatory			
Bradford	National Solar Observatory			
Schimming	National Solar Observatory			
Dunn Solar Telescope Maintenance				
Dunn Solar Telescope (DST)	Sac Peak			
2523		**0.0**	**10.0**	**69.0**
Matthew Penn	National Solar Observatory			
NSO Array Camera Development				
McMath-Pierce Solar Telescope	Main Spectrograph/NSO Array Camera (NAC)			
2525		**0.0**	**5.0**	**22.0**
Matthew Penn	National Solar Observatory			
NSO Array Camera High-Resolution Imaging				
McMath-Pierce Solar Telescope	Main Spectrograph/NSO Array Camera (NAC)			
2527n		**10.0**	**0.0**	**103.0**
Donald Jennings	NASA/Goddard Space Flight Center			
Sada	Universidad de Monterrey			
Boyle	Dickinson College			
Lunsford	NASA Goddard Space Flight Center			
Shrader	NASA Goddard Space Flight Center			
Near Infrared Photometry of Planets with the NSO Array Camera				
McMath-Pierce Solar Telescope	Main Spectrograph/NSO Array Camera (NAC)			
2527		**0.0**	**10.0**	**104.0**
Donald Jennings	NASA/Goddard Space Flight Center			
Sada	Universidad de Monterrey			
Boyle	Dickinson College			
Lunsford	NASA Goddard Space Flight Center			
Shrader	NASA Goddard Space Flight Center			
Near Infrared Photometry of Planets with the NSO Array Camera				
McMath-Pierce Solar Telescope	Main Spectrograph/NSO Array Camera (NAC)			
2531		**0.0**	**9.0**	**72.0**
Haosheng Lin	University of Hawaii, IFA			
Jaeggli (T)	University of Hawaii, Institute for Astronomy			
Facility Infrared Spectro-Polarimeter (FIRS) Engineering and Science				
Dunn Solar Telescope (DST)	Sac Peak			

		Nights	Days	Hours
2547		**0.0**	**10.0**	**39.0**
Ilaria Ermolli	INAF Osservatorio Astronomico di Roma			
Del Moro	University of Rome "Tor Vergata"			
Criscuoli (T)	University of Rome "Tor Vergata"			
Centrone	INAF- Osservatorio Astronomico di Roma			
Giorgi	Abdus Salam International Centre for Theoretical Physics			
Radiative Properties of Magnetic Elements at the Spectral Range of the Ni I 676.8 nm Line				
Dunn Solar Telescope (DST)	Sac Peak			
2575		**0.0**	**3.0**	**30.0**
Deqing Ren	California State University, Northridge			
Integrated Field Unit (IFU) 3-D Imaging Spectroscopy On-Site Testing and Installation				
McMath-Pierce Solar Telescope				
2576n		**5.0**	**0.0**	**43.0**
Andrew Potter	National Solar Observatory			
Killen	University of Maryland			
Detection of a Lunar Dust Cloud				
McMath-Pierce Solar Telescope	Main Spectrograph			
2576		**0.0**	**5.0**	**40.0**
Andrew Potter	National Solar Observatory			
Killen	University of Maryland			
Detection of a Lunar Dust Cloud				
McMath-Pierce Solar Telescope	Main Spectrograph			
2580		**0.0**	**1.0**	**10.0**
Eric Galayda	National Solar Observatory			
Kitt Peak Solar Telescope Engineering				
Kitt Peak SOLIS Tower (KPST)				
2584a		**0.0**	**11.0**	**76.0**
Thomas Rimmele	National Solar Observatory			
Marino	University of Florida			
Berkefeld	Kiepenheuer Institut fuer Sonnenphysik			
Richards	National Solar Observatory			
Schmidt (T)	Kipenheuer Institut fuer Sonnenphysik			
Multi-Conjugate Adaptive Optics (MCAO) Development				
Dunn Solar Telescope (DST)	Sac Peak			

		Nights	Days	Hours
2585		**0.0**	**7.5**	**8.0**
Phillip Judge	High Altitude Observatory, NCAR			
Reardon	INAF - Arcetri Astrophysical Observatory			
Uitenbroek	National Solar Observatory			
Stokes Polarimetry of Photosphere and Chromosphere Part II				
Dunn Solar Telescope (DST)	Sac Peak			
2589		**0.0**	**10.0**	**220.0**
Brent Holben	NASA Goddard Space Flight Center			
Sorokin	NASA Goddard Space Flight Center			
McMath-Pierce Solar Telescope	Main Spectrograph/NSO Array Camera (NAC)			
2590a		**0.0**	**6.0**	**48.0**
Kevin Reardon	INAF - Arcetri Astrophysical Observatory			
Komsa	National Solar Observatory			
NSO Staff				
Interferometric BIdimensional Spectrometer (IBIS) Engineering				
Dunn Solar Telescope (DST)	Sac Peak			
2598		**0.0**	**2.0**	**20.0**
Friedrich Woeger	National Solar Observatory			
Beck	Instituto de Astrofisica de Canarias			
Tritschler	National Solar Observatory			
The Temporal Evolution of Penumbral Grains				
Dunn Solar Telescope (DST)	Sac Peak			
2604		**0.0**	**8.0**	**56.0**
Francesco Berrilli	University of Rome "Tor Vergata"			
Sobotka	Astronomical Institute Ondrejov			
Del Moro	University of Rome "Tor Vergata"			
Vantaggiato (T)	University of Rome "La Sapienza"			
Magneto-Convection in the Sunspot Umbra and Pores				
Dunn Solar Telescope (DST)	Sac Peak			
2610		**0.0**	**11.0**	**68.0**
Ryoko Ishikawa (T)	University of Tokyo, Dept. of Astronomy, NAOJ			
Fujimura (T)	University of Tokyo, Dept. of Astronomy, NAOJ			
Tsuneta	National Astronomical Observatory of Japan			
Reardon	INAF - Arcetri Astrophysical Observatory			
Search of Transient Horizontal Magnetic Fields in the Chromosphere: Joint Observing Campaign with Hinode				
Dunn Solar Telescope (DST)	Sac Peak			

		Nights	Days	Hours
2611		**0.0**	**4.5**	**25.5**
Krishnappa Nagaraju	Indian Institute of Astrophysics			
Sankarasubramanian	Indian Space Research Organisation (ISRO), India			
Komandur	Indian Institute of Astrophysics			
Choudhary	California State University, Northridge			
Elmore	National Solar Observatory			
Simultaneous Spectropolarimetry of Active Regions in H-alpha and Fe I line Pair at 6302 Angstroms				
Dunn Solar Telescope (DST)	Sac Peak			
2611		**0.0**	**4.5**	**25.5**
Krishnappa Nagaraju	Indian Institute of Astrophysics			
Berst	National Solar Observatory			
Fletcher	National Solar Observatory			
Komsa	National Solar Observatory			
Simultaneous Spectropolarimetry of Active Regions in H-alpha and Fe I line Pair at 6302 Angstroms				
Dunn Solar Telescope (DST)	Sac Peak			
2612		**0.0**	**11.0**	**106.0**
Alexandra Tritschler	National Solar Observatory			
Elmore	National Solar Observatory			
Socas-Navarro	Instituto de Astrofisica de Canarias			
Diffraction-Limited Spectro-Polarimeter/Spectro-Polarimeter for Infrared and Optical Regions (DLSP/SPINOR) Telescope Polarization Matrix				
Dunn Solar Telescope (DST)	Sac Peak			