Smithsonian Institution &
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BIMONTHLY SUMMARY

January - February 2006

The image on the left is the existing MMT building. The image on the right represents a proposed extension of the chamber back wall to facilitate the transfer of instruments from the parking lot directly onto the telescope chamber floor. See General Facility section for details. Images by Ricardo Ortiz (MMTO).

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Personnel

John Glaspey attended the 207th meeting of the AAS in Washington, DC, January 8-12, 2006. He posted a draft of the Observing Support Engineer job announcement and discussed the position with a few potential candidates.

On February 24, Cory Knop and Ken Van Horn attended a Vaisala seminar in Tempe, Arizona, to learn about the science of humidity measurement and how to calibrate those instruments. This was a worthwhile meeting; they learned some useful information and made some good contacts.

Primary Mirror Systems

Primary Mirror Support

The primary mirror support hardpoints began exhibiting difficulties during the reporting period. Careful investigation revealed minor leaks in three of the hardpoint breakaway mechanisms, and mechanical interference with the gravity counterweights on unit #6. The behavior of the hardpoint breakaways is sufficiently different that we have decided to characterize it for individual hardpoints. One by one we will remove them from the cell, replace them with a working calibrated spare, and put them on a test stand to characterize (and correct) their operation. LBTO has generously offered the use of their hardpoint test stand. MMTO will build new electronics and hardware to support testing MMT hardpoints using same.

Our ability to log and display data from the primary mirror support computer, in particular the hardpoint lvdt and load cells, has been improved. It is now possible to examine a nightly log (updated every 5 seconds by a new mini-server) using graphical tools and explore events where premature hardpoint breakaway has occurred. Our long-standing *rslew* facility has also been given a graphical display. The *rslew* program obtains high speed (111 Hz) data from the primary support hardpoints along with position information from the mount, and is developing into a facility diagnostic tool. It has yielded useful data about hardpoint performance under dynamic conditions and is being used to explore performance limitations of the hardpoints currently in service.

Actuator 125 began failing bump tests. The actuator behaved normally on the test stand, and even worked when re-installed on the telescope for a short time, but it eventually failed. The problem was traced to a kink in the air supply line. The kink was removed and no problems have been reported since.

Thermal System

After much research into available commercial off-the-shelf technology and industry literature on thermocouple measurement, Dusty Clark settled on an in-house design based in part on the LOTIS system. The new electronics will provide accurate measurement of both differential and absolute temperature from the T-series thermocouple system, and will provide the data directly to the MMTO network. Both a preliminary design review and final design review were conducted, and the PowerPoint slides on the system architecture are available from Dusty Clark. The Hewlett-Packard data acquisition units (DAUs) that have been monitoring the T-series thermocouples have been removed from the telescope.

Aluminization

Long-deferred work was performed on the aluminizing filament feedthroughs, inspecting the copper feedthrough to the belljar metal interface to see if there is evidence of any arcing occurring during last shutdown's coating. It was thought that there could have been arcing due to the spare feedthrough's possible wet corrosion, which would have resulted from exposure to weather and standing water from the unfortunate countersinks on the outside of the belljar plate. The data collected from the welder supplies show a short-lived spiking event from all welders during the start of the coating (of order 50 V at 700 Å). Ricardo Ortiz and Dusty Clark removed the #10 feedthrough, carefully supporting the copper rod inside, and discovered that there was indeed wet corrosion and a perfect arcing pattern of threads from the feedthrough stud on the walls of the hole in the belljar. We will need to remove all the feedthroughs, clean the holes, and seal the feedthrough studs to prevent this from occurring again, before it is used by LOTIS. Current plans are to remove the entire elbow plate turbo-pump manifold and rework all the holes, including painting, during the belljar's sojourn at the FLWO basecamp, before delivery to UA for the LOTIS coating. Addition of a new weather cap for all feedthroughs and instrument fittings will provide additional protection from the elements.

Secondary Mirror Systems

f/9 Secondary Support

During the last week of February, elevation dependent image motion was seen on the *f*/9 top box acquisition cameras. The motion made observing with blue and red channel very inefficient. Creighton Chute, Brian Comisso, J.T. Williams, John McAfee, and Tom Trebisky were all involved at some level in solving this problem, which was a faulty Bellofram air control valve. The transducer was replaced and is now working normally.

Telescope Tracking and Pointing

Servos and Encoders

The new mount encoder electronics remain in the process of assembly and testing. The spare on-axis encoder has been brought out from storage, and support electronics have been packaged into convenient rack-mount boxes for later deployment. We await construction of some minor test support cards; firmware development can then begin.

CAAO requested measurement of the secondary hub resonant modes with an accelerometer, using the elevation drive motors as the torque input driven by a chirp signal. Dusty Clark and Keith Powell were unsuccessful in the first attempt to gather these data due to an unfortunate bug in the Simulink block that provides the chirp signal when running under xPC Target. This will be fixed and those data gathered both before and after the secondary vane stiffening wires are installed, in order to provide feedback on the improvement (if any) from the stiffening wires.

Telescope Collimation and Optical Performance

M2 (Secondary Mirror/Hexapod) *f*/9 Open Loop Corrections

Since we did not have any dedicated engineering time to refine the *f*/9 open loop parameters, they were refined over the course of the *f*/9 run using wavefront sensor (WFS) data. When the WFS is finished applying corrections, it logs elevation, OSS temperatures, and hexapod platform coordinates. These data from multiple nights are then combined and each platform coordinate modeled with a function of the form:

$$f(el,T) = a*\cos(el) + b*\sin(el) + c*T + d$$

where el is the elevation and T is the average OSS temperature. We have been doing similar analyses to build the open loop tools for *f*/5, but this is the first opportunity since our extended shutdown to do likewise for *f*/9.

The results of analyzing the *f*/9 WFS data from January 31 through February 28 are shown in Figure 1. There is significant scatter in the data (130 microns in Z and 200-215 microns in X and Y) that is likely due at least in part to the problems with the primary and secondary mirror support systems during this time period. Some WFS data were obviously compromised by the primary mirror being out of position and were not included in this analysis.

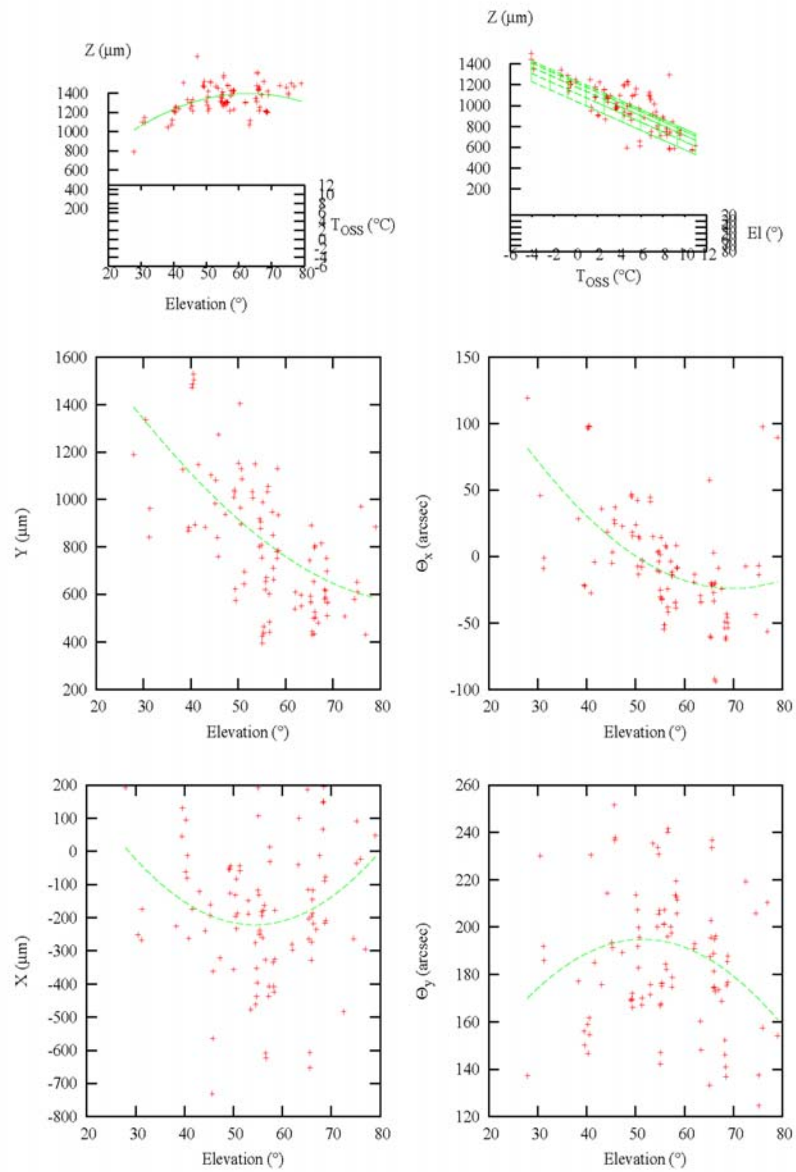

Figure 1: Results of analyzing f/9 WFS data to determine parameters for open loop corrections.

Modeling the Effects of Primary Mirror Thermal Non-Uniformities

With the help of Brian Cuerden (SO), we have begun work on using finite element analysis to model the effects that thermal non-uniformities within the primary mirror have on its surface figure. Our first attempt was to follow the analysis E. Pearson and L. Stepp (NOAO) performed for a 1.8-meter borosilicate blank ("Response of Large Optical Mirrors to Thermal Distributions," 1987). They modeled the temperature structure in the front and back plates using 9-term Zernike polynomials.

Then they used finite element analysis to apply temperature distributions corresponding to each term individually to each plate, and model the resulting figure of the front surface of the mirror. These models of the mirror figure can then be scaled and added linearly to correspond to measured temperature distributions. The goal is to take the cell E-series temperatures for each plate, fit Zernike polynomial surfaces to the data, use the coefficients from the fits to scale the surface models, and then generate open loop corrections to take out the predicted surface errors.

Performing this analysis on the MMT primary reveals that the most significant terms are focus generated by front-to-back gradients, and astigmatism caused by the corresponding astigmatism terms in the temperature distributions. This is qualitatively consistent with what we know from experience. Quantitatively comparing these models with what we observed in November 2005 shows, however, that they are not yet quite sufficient. Figure 2 shows the focus errors predicted by the measured temperature structure along with the focus errors that we measured. They don't quite match, differing by 50 microns or so most of the time. Other aberration modes, such as astigmatism and spherical aberration, disagree with the predicted values by roughly a factor of 10. In the case of the 1.8-meter blank, Pearson and Stepp did not find that including the mid plate in their modeling affected their results much. Our empirical data from November, however, show that the mid plate temperature structure is often significantly different from that of the front and back plates. Work is ongoing to include all three plates in the modeling.

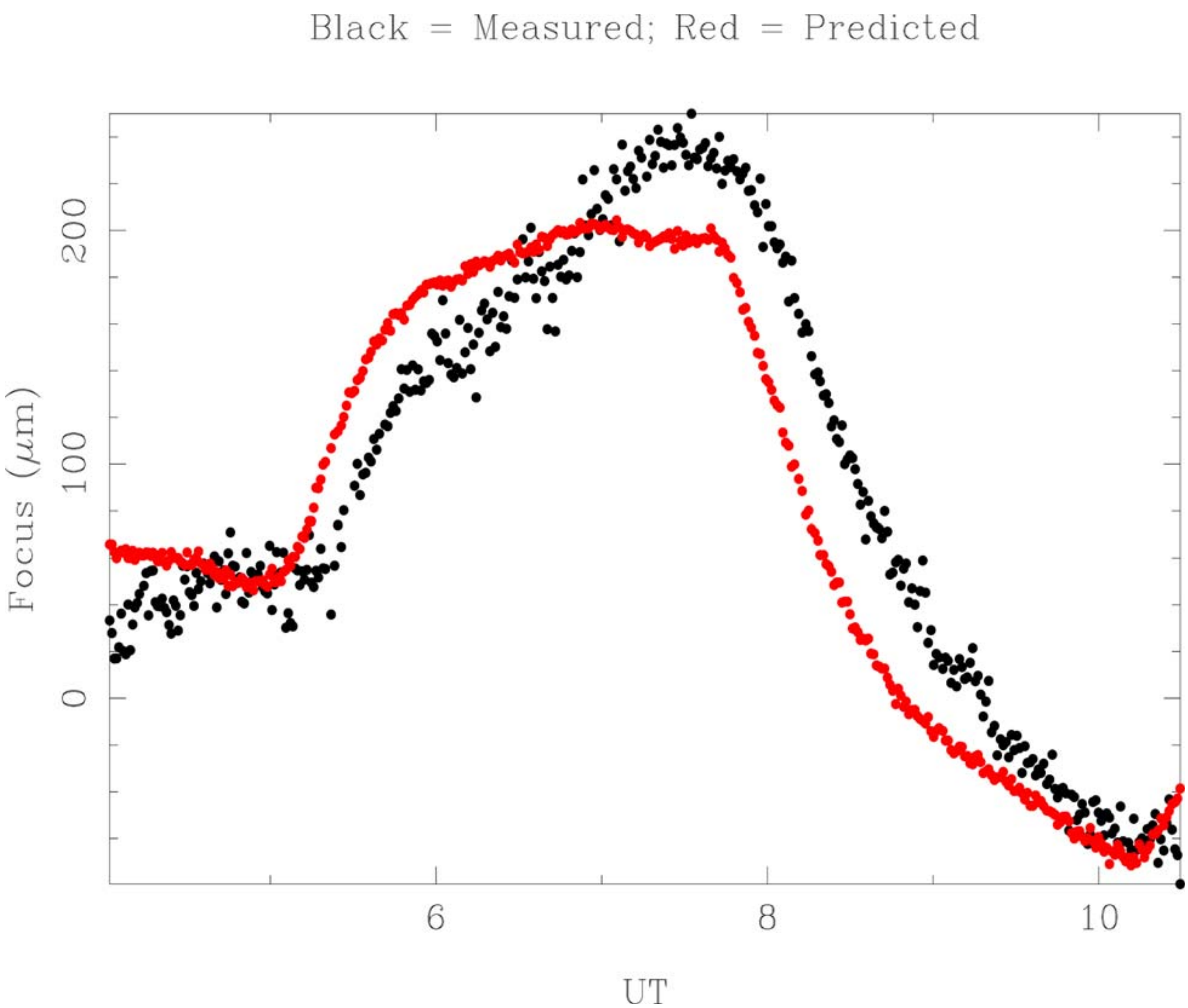

Figure 2: On November 22, 2005, we measured the wavefront errors that resulted from intentionally forcing the primary mirror to warm and then cool quickly. Plotted in black are the focus errors as measured by the WFS. Plotted in red are the predicted focus errors that take into account the thermal structure of the primary mirror, as well as the slight changes in elevation and OSS temperature.

Computers and Software

"Service" Tracking System*

The "service" (trouble reports) tracking system matured since its initial inauguration in December 2005. Additional categories were added, including a "symptoms" category with various subjects for use when the specific subsystem causing the problems is not evident. An example of this would be poor image quality, which could result from mount, secondary, instrument, or other problems.

* Not to be confused with telescope tracking.

In addition, a new priority ("near-critical") has been added to the system. This priority level indicates that the telescope is partially operational, but observing is *significantly* impacted by the problem. Observers may be willing to donate some telescope time to addressing the problem. Action by MMT staff is required within 24 hours, including during the weekends.

Non-Sidereal Telescope Tracking

Various catalogs of non-sidereal objects are being updated daily on *hacksaw*. The following four sets of catalogs are maintained in EDB (Xephem) format. The following text is taken, in part, from the web page at *http://www.mmto.org/obscats/edb.html*:

a) The Lowell Observatory catalogs provide elements for the roughly 30,000 asteroids in ASTORB, and also include some 237215 orbits from the Harvard/CfA Minor Planet Center. These catalogs are fetched and converted daily.

- AstLowell.edb (3919 bright minor planets)
- AstLowell_dim.edb (316509 asteroids, never brighter than 13)

b) The MPC catalogs are obtained from the Harvard/CfA Minor Planet circulars (MPCORB). These catalogs are fetched and converted daily.

- AstMPC.edb (3684 bright asteroids)
- AstMPC_dim.edb (278171 minor planets, never brighter than 13)

c) The following catalogs are derived from the JPL DASTCOM database, which is provided by the JPL HORIZONS System. These catalogs are fetched and converted daily.

- JPLComet.edb (2292 Comets)
- JPLNumAst.edb (120437 named or numbered asteroids)
- JPLUnNumAst.edb (194272 unnumbered asteroids)

d) We obtain 5 catalogs from the Center for Astrophysics at Harvard University, which provide these catalogs in EDB format.

- Soft03Cmt.edb (190 or so observable comets)
- Soft03CritList.edb (68 or so observable critical list minor planets)
- Soft03Distant.edb (680 observable distant minor planets)
- Soft03Unusual.edb (642 observable unusual minor planets)
- Soft03Bright.edb (55 bright minor planets)

In addition, we obtain the following catalogs for earth-orbiting satellites in two-line element (TLE) on a daily basis from *www.space-track.org*:

- FullSat.tle (Full Satellite Catalog)
- GeoSat.tle (Geosynchronous Satellites)

- NavSat.tle (Navigation Satellites)
- WeaSat.tle (Weather Satellites)
- IridSat.tle (Iridium Satellites)
- OrbcSat.tle (Orbcomm Satellites)
- GlobalSat.tle (Globalstar Satellites)
- IntelSat.tle (Intelsat Satellites)
- InmarSat.tle (Inmarsat Satellites)
- AmatSat.tle (Amateur Satellites)
- VisSat.tle (Visible Satellites)
- SpecSat.tle (Special Interest Satellites)

Faith Vilas is very grateful to the staff for making these catalogs available.

Settings Server

We have entirely overhauled our methodology for providing non-volatile storage of infrequently changed parameters for our diskless control computers. A previous scheme involved the crate, our logger service, and the user interface software in a way that was not solidly reliable. The new scheme implements a "settings server" that is accessed (via the network) solely by the crate, and saves settings in an XML file.

The mount crate now uses this method with complete success. Mount values in the settings server include the current DUT, and the positive and negative rotator limits. The current DUT is the difference between coordinated universal time (UTC) and universal time (UT). A new Perl script was written to retrieve this daily from the US Naval Observatory. Previously, the telescope operators had to enter this value manually.

Hexapod values in the settings server include positive and negative limits for all six axes of motion, "elcoll" and "tempfoc" coefficients, the current secondary, the current instrument, and open loop coefficients for elevation and temperature dependent focus and collimation adjustments. The hexapod control computer has been partially switched over to use the settings server, the exception being the open loop elevation and temperature correction code which will be switched over when testing of a new model for this algorithm is complete. The new model incorporates the functionality of the current "hexpredict" script within the hexapod computer. When work on the settings server is complete, we will simplify and improve the event logging service.

Environmental Systems

A new Yankee Environmental Systems thermohygrometer (model MET-2010) was configured and a new miniserver was written to obtain and log data from the unit. The unit was used to calibrate the Vaisala model HMI36 and the spare Vaisala model WXT510. The temperature and dewpoint offsets obtained from these calibrations are being used in the old_vaisala and the vaisala3 miniservers. The Yankee unit has been installed in the telescope chamber. Current values can be seen on the Thermal Transect web page at *http://www.mmto.org/engineering/thermal_transect.php*. These data are also being logged in the background logging for the MMT.

Website Redesign

The mmto.org website got a much needed, long overdue redesign to improve its appearance, usability, and maintainability. The basic layout of the pages is now done using cascading style sheets (CSS) rather than tables and lots of small placeholder images. This makes the pages much easier for clients to load and easier for us to maintain. The pages have also been updated to conform to the XHTML 1.0 standard, which allows pages and page styles to be constructed and maintained in a more object-oriented manner. Work remains to be done to update and flesh out the information contained in many of the pages and to incorporate the new style into our PHP-based systems like the operator log, the service request system, and our dokuwiki documentation system. Plans are afoot to further refine the design.

Miscellaneous Software

Programming was done in support of the Adaptive Optics (AO) group. An additional miniserver and web pages were set up for their new AKCP SensorProbe unit. This probe measures humidity and temperature for the AO room at the Common Building. The web pages can be accessed from *http://www.mmto.org/engineering/#aoroom*. These data are also being logged in the background logging for the MMT.

A Perl script, horizons.pl, was written to send right ascension (RA) and declination (Dec) values to the mount crate, based upon ephemeris tables. These tables can be produced from the HORIZONS web page: *http://ssd.jpl.nasa.gov/horizons.cgi*. In its present form, the script reads the ephemeris from a text file and sends the new RA/Dec whenever they differ from the most recent values sent to the mount crate. One improvement on the script would be to have the script interact directly with the telnet interface to HORIZONS to obtain the current RA and Dec for the object of interest.

Work continues on improving the way we use the UMAC controller to position the hexapods. An effort initially directed at improving logging revealed a bug in motion initiation, which was fixed. The hexapod GUI was modified to give a clear visual indication to the operators if an unexpected move from commanded position occurs, as does occur from time to time.

Instruments

Hectochelle

Work continues with the Hectochelle calibration lamp assembly. Gabor Furesz (SAO), Court Wainwright, and Creighton Chute tested the assembly on February 21. All parts fit well and have been sent back to the University Research Instrumentation Center for final machining and coating. The assembly is expected to be operational for the March Hectochelle observing run.

Adaptive Optics

More tests of the new *f*/15 secondary handling fixture, the DM (deformable mirror) jockey, were performed in February. It was instrumented with accelerometers and loaded with a dummy weight. It was then moved from the Common Building clean room to the telescope chamber and back while monitoring the shock loading. Later, it was also loaded into the air ride truck and driven to Steward and back. The peak shock was about 2.5g, which occurred at the Santa Cruz River bridge on I-19. Shocks of 1-1.5g were seen at various cattle guards and railroad crossings.

The Common Building AO clean room preparation is nearly complete. The room was used during work after the February run to remove a foreign body from between the mirror shell and the reference body. This was the first instance of gap contamination in over two years. Thanks to the nice clean room facility, it was cleaned by the AO group and the mirror returned to service in about eight hours.

In preparation for the nine-night *f*/15 run in February, the AO secondary and topbox were mounted by Creighton Chute and Thomas Stalcup with help from Richard Sosa and Manny Montoya (CAAO). The mounting went smoothly and the mirror was ready for operation by about 8:00 that evening. Dismounting was also performed by the same staff members after the run.

ARIES

In Figure 3, we present an ARIES Simultaneous Differential Imager (SDI) AO image of what is likely the tightest binary yet resolved at the MMT. Here we split a ~0.077 arcsec binary GL 569Bab (see inset). This M8/M9 binary is a well known binary brown dwarf companion to the young nearby M2 star GL 569A. The brighter component is thought to be 68±11 Jupiters and the fainter component is thought to be 57±11 Jupiters (Zapatero Osorio et al. 2004, ApJ 615, 958). Interestingly, recent observations do not detect Lithium in Bb in contrast to theoretical predictions given Bb's median mass and age. Our additional epoch of observation will help continue to lower the error bars in the dynamical masses.

These images were obtained with ARIES's unique Simultaneous Differential Imager, which allows the detection of any methane rich objects (like extra-solar planets) by making multiple simultaneous images of the same star inside and outside the 1.6 micron methane absorption feature. No methane rich objects were found around either GL 569B or its brighter primary GL 569A (shown at bottom left). Hence no additional companions more massive than ~20 Jupiters >5 AU from GL 569A are obvious in this relatively short (5 min) SDI exposure. Note how similar the speckles in these two SDI images of GL 569A are — such images are only possible with ARIES SDI optics in the northern hemisphere.

These SDI images were reduced by Laird Close. Data were taken during the night of February 12, 2006, UT by additional observers Beth Biller, Eric Nielsen, Craig Kulesa, and Don McCarthy (ARIES PI). The MMTAO system was operated by Doug Miller and Matt Kenworthy (who suggested this target for SDI observation). North is up; east is right; the images have been slightly "unsharp mask" filtered to highlight the speckles.

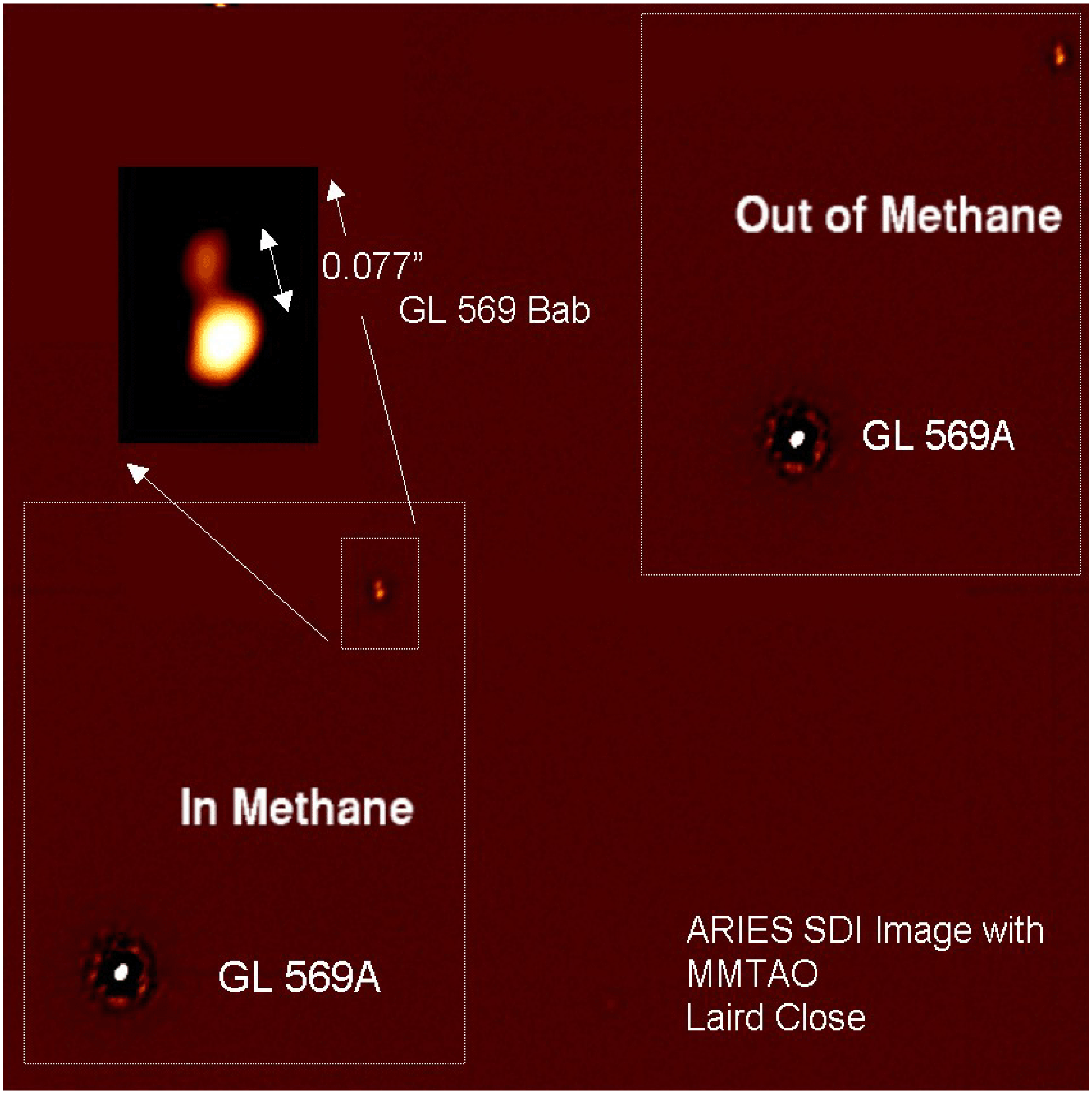

Figure 3: ARIES SDI Images of Tight Brown Dwarf Binary

General Facility

MMT Enclosure Enlargement Modifications

Following the 6.5-m conversion, the MMT has been faced with limited storage space, an inadequate loading door aperture, and sensitive lifting procedures of instruments into the observing chamber using the facility overhead crane.

In an effort to alleviate some or all of the current constraints, we are proposing the following changes:

- Telescope building back wall extension: removal of a section from the back wall adjacent to the elevator shaft and extend the first and second floors out (north) by roughly 11 feet north and 23 feet west, achieving an additional area of 253 square feet. We can utilize this area in a variety of ways. By installing a docking platform and a rolling door and then rotating the building +85.5 degrees, we can arrange the geometry to match the loading dock lift at the existing yard location.

- Purchase a double stage lift with a minimum rise of 185 inches to allow transfer of instruments from the parking lot directly onto the chamber floor, eliminating crane rigging, maneuvering around telescope counterweights, and hatch size constraints.

Efficient transitions between the chamber floor and the loading dock lift open the possibility of safely maximizing a possible overhaul of the summit shop site for instrument storage.

Another advantage would be the opportunity to create a double-height instrument clean room service station in the northwest corner of the proposed addition to accommodate instrument PI service requirements and testing.

Other Facility Improvements and Repairs

Larger than normal currents were observed as the telescope moved in elevation with the Megacam instrument mounted. The combination of the weight of the instrument in a certain orientation coupled with a heavier mirror cover produced a larger moment on the telescope. The transverse counterweights were adjusted to reduce the elevation motor currents.

Bill Stangret modified the west drive arc cable holder for Megacam to allow supporting the weight of the cable plate while bolts are being attached.

Ken Van Horn has been redesigning the transverse counterweight drive chassis and has ordered string pots for sensing the position of those counterweights. The design and documentation is almost complete, and the re-fabrication of the chassis and its internal wire wrap cards should begin soon.

Johnathan Labbe installed new fluorescent light fixtures in the northwest corner of the chamber to light the area where SAO works on their fiber positioner. Staff time has been spent assisting SAO with refurbishing the positioner, including replacing a Copley Controls amplifier in one of their racks.

The MGE UPS system lost communication with its internal web server and, under direction of the factory, required a cold boot of the internal interface card. This seemed to solve the problem, but we have established a trouble report number with the factory that we may reference for a card replacement if necessary in the future.

Ricardo Ortiz and Bill Stangret designed and built a new cart for the rotator alignment tool (RAT), eliminating the need to share the hexapod cart. They also modified the hexapod cart to a fixed height to simplify installation of the hexapod onto the *f*/9 cell.

Ricardo Ortiz and Bill Stangret also added a 15-degree angle piece to the 18-inch blower pipe to remove stress from the pipe.

Bill Stangret added key holes to the low elevation safety bumper stop, thus facilitating removal of the stop unit during secondary changes.

Bill Stangret built and installed safety railing outside the third floor yoke platform, and mounted the elevation encoder box on the platform into a protective bracket.

At the FLWO basecamp, J.T. Williams and Bill Stangret modified the steel handling structure for rotating the bell jar, making it a more robust setup for the upcoming LOTIS project.

Dennis Smith performed preventive maintenance on the Mattei 20 HP compressor and the building exhaust and supply units. This included lubrication and replacing or cleaning the filters.

We have contracted with Air Liquide to repair our trailer-mounted 400 gallon LN_2 tank. This unit was leaking and not building pressure during last shutdown's aluminization.

Dennis Smith revised the MMTO Forest Fire Procedure to include installing welding blankets on louvers and filling the moat. A tub in the mechanical room contains welding blankets, screws, and the tools to install them.

Issues continue with the Vaisala HMI36 unit, the "old Vaisala." Various internal errors have occurred over the past few weeks. Efforts are continuing in order to fix these errors.

Issues also remain with the DustTrak aerosol monitor, model 8520. The unit was serviced by Ken Van Horn according to the manufacturer's supplied directions. However, a persistent error regarding the internal pump remains.

The MMT summit air ride truck was serviced, including replacing the windshield, at the FLWO Basecamp motor pool.

One of the video monitors in the control room failed and has been replaced by a new unit.

Visitors

January 23: John Glaspey hosted visiting astronomers Jose Franco and Jesus Gonzalez (Universidad Nacional Autonoma de Mexico) and Byeong-Gon Park, Moo-Young Chun, San-Hyeon Ahn, and Cheongho Han (Chungbuk University, South Korea), accompanied by Peter Wehinger (Steward).

February 14: Faith Vilas, J.T. Williams, Grant Williams, John Glaspey, Emilio Falco, Trevor Weekes, and Dan Brocious, with support from Ken Van Horn and the MMTO mountain staff, hosted Lawrence Small (Secretary of the Smithsonian Institution), Charles Alcock (CfA Director), Amanda Preston (Chief Advancement Officer, CfA Director's Office), Virginia Clark (Director of External Affairs, Smithsonian Office of External Affairs), and Adrienne Mars (Smithsonian and National Air and Space Museum supporter).

Pictured (left to right) are Charles Alcock, Faith Vilas, Virginia Clark, Lawrence Small, J.T. Williams, and Adrienne Mars.

MMTO Internal Technical Memoranda

None

MMTO Technical Memoranda

None

MMTO Technical Reports

None

Scientific Publications

06-1 SDSS J102111.02+491330.4: A Newly Discovered Gravitationally Lensed Quasar
B. Pindor, D. J. Eisenstein, M. D. Gregg, R. H. Becker, N. Inada, M. Oguri, P. B. Hall, D. E. Johnston, G. T. Richards, D. P. Schneider, E. L. Turner, G. Brasi, P. M. Hinz, M. A. Kenworthy, D. Miller, J. C. Barentine, H. J. Brewington, J. Brinkmann, M. Harvanek, S. J. Kleinman, J. Krzesinski, D. Long, E. H. Neilsen, Jr., P. R. Newman, A. Nitta, S. A. Snedden, D. G. York
AJ, **131**, 41

06-2 *XMM-NEWTON* and Optical Follow-Up Observations of SDSS J093249.57+472523.0 and SDSS J102347.67+003841.2
L. Homer, P. Szkody, B. Chen, A. Henden, G. Schmidt, S. F. Anderson, N. M. Silvestri, J. Brinkmann
AJ, **131**, 562

06-3 Cool White Dwarfs in the Sloan Digital Sky Survey
M. Kilic, J. A. Munn, H. C. Harris, J. Liebert, T. von Hippel, K. A. Williams, T. S. Metcalfe, D. E. Winget, S. E. Levine
AJ, **131**, 582

06-4 A Survey of $z > 5.7$ Quasars in the Sloan Digital Sky Survey. IV. Discovery of Seven Additional Quasars
X. Fan, M. A. Strauss, G. T Richards, J. F. Hennawi, R. H. Becker, R. L. White, A. M. Diamond-Stanic, J. L. Donley, L. Jiang, J. S. Kim, M. Vestergaard, J. E. Young, J. E. Gunn, R. H. Lupton, G. R. Knapp, D. P. Schneider, W. N. Brandt, N. A. Bahcall, J. C. Barentine, J. Brinkmann, H. J. Brewington, M. Fukugita, M. Harvanek, S. J. Kleinman, J. Krzesinski, D. Long, E. H. Nielsen, Jr., A. Nitta, S. A. Snedden, W. Voges
AJ, **131**, 1203

06-5 Using Line Profiles to Test the Fraternity of Type Ia Supernovae at High and Low Redshifts
S. Blondin, L. Dessart, B. Leibundgut, D. Branch, P. Höflich, J. L. Tonry, T. Matheson, R. J. Foley, R. Chornock, A. V. Filippenko, J. Sollerman, J. Spyromilio, R. P. Kirshner, W. M. Wood-Vasey, A. Clocchiatti, C. Aguilera, B. Barris, A. C. Becker, P. Challis, R. Covarrubias, T. M. Davis, P. Garnavich, M. Hicken, S. Jha, K. Krisciunas, W. Li, A. Micelli, G. Miknaitis, G. Pignata, J. L. Prieto, A. Rest, A. G. Riess, M. E. Salvo, B. P. Schmidt, R. C. Smith, C. W. Stubbs, N. B. Suntzeff
AJ, **131**, 1648

06-6 The Multiple System HD 27638
G. Torres
AJ, **131**, 1702

06-7 The $1 < z < 5$ Infrared Luminosity Function of Type I Quasars
M. J. I. Brown, K. Brand, A. Dey, B. T. Jannuzi, R. Cool, E. Le Floc'h, C. S. Kochanek, L. Armus, C. Bian, J. Higdon, S. Higdon, C. Papovich, G. Rieke, M. Rieke, J. D. Smith, B. T. Soifer, D. Weedman
ApJ, **638**, 88

06-8 Early Infrared Spectral Development of V1187 Scorpii (Nova Scorpii 2004 No. 2)
D. K. Lynch, C. E. Woodward, T. R. Geballe, R. W. Russell, R. J. Rudy, C. C. Venturini, G. J. Schwarz, R. D. Gehrz, N. Smith, J. E. Lyke, S. J. Bus, M. L. Sitko, T. E. Harrison, S. Fisher, S. P. Eyres, A. Evans, S. N. Shore, S. Starrfield, M. F. Bode, M. A. Greenhouse, P. H. Hauschildt, J. W. Truran, R. E. Williams, R. B. Perry, R. Zamonov, T. J. O'Brien
ApJ, **638**, 987

06-9 Deep Near-Infrared Observations of L1014: Revealing the Nature of the Core and its Embedded Source
T. L. Huard, P. C. Myers, D. C. Murphy, L. J. Crews, C. J. Lada, T. L. Bourke, A. Crapsi, N. J. Evans, II, D. W. McCarthy, Jr., C. Kulesa
ApJ, **640**, 391

06-10 A Successful Targeted Search for Hypervelocity Stars
W. R. Brown, M. J. Geller, S. J. Kenyon, M. J. Kurtz
ApJ, **640**, L35

06-11 The *ROSAT* North Ecliptic Pole Survey: The X-Ray Catalog
J. P. Henry, C. R. Mullis, W. Voges, H. Böhringer, U. G. Briel, I. M. Gioia, J. P. Huchra
ApJ Supp, **162**, 304

06-12 NGC 7679: An Anomalous, Composite Seyfert 1 Galaxy Whose X-Ray Luminous AGN Vanishes at Optical Wavelengths
L. M. Buson, M. Cappellari, E. M. Corsini, E. V. Held, J. Lim, A. Pizzella
A&A, **447**, 441

06-13 Bispectrum Speckle Interferometry of the Massive Protostellar Outflow Source IRAS 23151+5912
G. Weigelt, H. Beuther, K.-H. Hofmann, M. R. Meyer, T. Preibisch, D. Schertl, M. D. Smith, E. T. Young
A&A, **447**, 655

Observing Reports

Copies of these publications are available from the MMTO office. We remind MMT observers to submit observers' reports, as well as preprints of publications based on MMT research, to the MMTO office. Such publications should have the standard MMTO credit line: "Observations reported here were obtained at the MMT Observatory, a facility operated jointly by the Smithsonian Institution and the University of Arizona."

Submit publication preprints to *bruss@mmto.org* or to the following address:

MMT Observatory
P.O. Box 210065
University of Arizona
Tucson, AZ 85721-0065

MMTO in the Media

Warren Brown and other astronomers from SAO, using the SAO Wide-Field InfraRed Camera (SWIRC) with the 6.5-m MMT, discover two stars exiled from the Milky Way galaxy. Those stars are racing out of the Galaxy at speeds of more than 1 million miles per hour — so fast that they will never return.

Press Releases:
Sci/Tech News Service (*http://www.scitechinfo.com/node/300*)
Center for Astrophysics (*http://cfa-www.harvard.edu/press/pr0610.html*)

MMTO Home Page

The MMTO maintains a web site (*http://www.mmto.org*) that includes a diverse set of information about the MMT and its use. Documents that are linked to include:

- General information about the MMT and Mt. Hopkins.
- Telescope schedule.
- User documentation, including instrument manuals, detector specifications, and observer's almanac.
- A photo gallery of the Conversion Project as well as specifications related to the Conversion.
- Information for visiting astronomers, including maps to the site.
- The MMTO staff directory.
- What's New at MMTO.

Observing Database

The MMTO maintains a database containing relevant information pertaining to the operation of the telescope, facility instruments, and the weather. Details are given in the June 1985 monthly summary. The data attached to the back of this report are taken from that database.

NOTE: Beginning January 2005, the formula for accounting lost time on the telescope has been changed. Previously, time lost to weather was deducted from the total observing time before calculating time lost to instrument, telescope, and facility from the remaining balance. From now on, the time lost to each source is computed as a fraction of the total scheduled time.

And beginning June 2005, a new category, environment, was added to account for time lost to natural, uncontrollable, non-weather events such as flying insects melting in laser beams and forest fires.

Use of MMT Scientific Observing Time

January 2006

Instrument	Nights Scheduled	Hours Scheduled	Lost to Weather	Lost to Instrument	* Lost to Telescope	** Lost to Gen'l Facility	Lost to Environment	Total Lost
MMT SG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PI Instr	29.00	341.30	108.15	11.50	5.30	5.00	0.00	129.95
Engr	2.00	23.70	0.00	0.00	0.00	0.00	0.00	0.00
Sec Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**31.00**	**365.00**	**108.15**	**11.50**	**5.30**	**5.00**	**0.00**	**129.95**

Time Summary

Percentage of time scheduled for observing	93.5
Percentage of time scheduled for engineering	6.5
Percentage of time scheduled for sec/instr change	0.0
Percentage of time lost to weather	29.6
Percentage of time lost to instrument	3.2
Percentage of time lost to telescope	1.5
Percentage of time lost to general facility	1.4
Percentage of time lost to environment (non-weather)	0.0
Percentage of time lost	35.6

* Breakdown of hours lost to telescope
hardpoint 0.5
hexapod 1.5
hexapod, guider 3
primary panic 0.3

** Breakdown of hours lost to facility
building drive wheel 5

February 2006

Instrument	Nights Scheduled	Hours Scheduled	Lost to Weather	Lost to Instrument	* Lost to Telescope	** Lost to Gen'l Facility	Lost to Environment	Total Lost
MMT SG	17.00	188.90	55.70	7.00	4.30	1.50	0.00	68.50
PI Instr	11.00	123.30	68.70	4.00	0.00	0.00	0.00	72.70
Engr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sec Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**28.00**	**312.20**	**124.40**	**11.00**	**4.30**	**1.50**	**0.00**	**141.20**

Time Summary

Percentage of time scheduled for observing	100.0
Percentage of time scheduled for engineering	0.0
Percentage of time scheduled for sec/instr change	0.0
Percentage of time lost to weather	39.8
Percentage of time lost to instrument	3.5
Percentage of time lost to telescope	1.4
Percentage of time lost to general facility	0.5
Percentage of time lost to environment (non-weather)	0.0
Percentage of time lost	45.2

* Breakdown of hours lost to telescope
cell crate 0.5
f/9 secondary 2
oscillation 0.8
telserver 0.5
wavefront sensor, guider 0.5

** Breakdown of hours lost to facility
water in air system 1.5

Year to Date February 2006

Instrument	Nights Scheduled	Hours Scheduled	Lost to Weather	Lost to Instrument	Lost to Telescope	Lost to Gen'l Facility	Lost to Environment	Total Lost
MMT SG	17.00	188.90	55.70	7.00	4.30	1.50	0.00	68.50
PI Instr	40.00	464.60	176.85	15.50	5.30	5.00	0.00	202.65
Engr	2.00	23.70	0.00	0.00	0.00	0.00	0.00	0.00
Sec Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**59.00**	**677.20**	**232.55**	**22.50**	**9.60**	**6.50**	**0.00**	**271.15**

Time Summary

Percentage of time scheduled for observing	96.5
Percentage of time scheduled for engineering	3.5
Percentage of time scheduled for sec/instr change	0.0
Percentage of time lost to weather	34.3
Percentage of time lost to instrument	3.3
Percentage of time lost to telescope	1.4
Percentage of time lost to general facility	1.0
Percentage of time lost to environment (non-weather)	0.0
Percentage of time lost	40.0