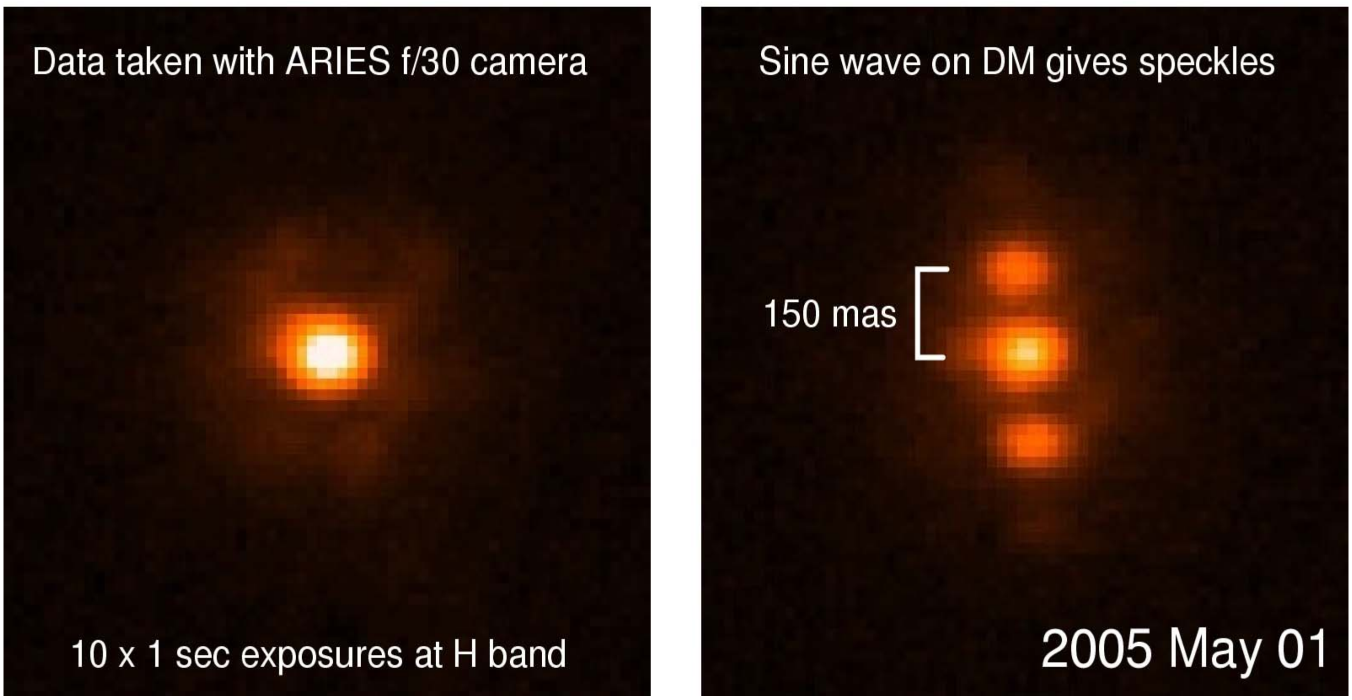
MMT Observatory
Smithsonian Institution &
The University of Arizona®

BIMONTHLY SUMMARY

March - April 2005



Suppressing scattered light: The pair of images shows adaptively corrected, diffraction-limited images at H band (0.065 arcsec FWHM at 1.6 μm) of a star using the MMT f/15 deformable secondary. Shape control of the secondary allows precise control of scattered light. The pair of images shows how the mirror can be deformed to create a "speckle" in the focal plane. Using this technique, the MMTAO group is developing a way of suppressing scattered light remaining in AO images. Static speckles in the focal plane can be effectively eliminated by creating a speckle with the opposite phase using the deformable secondary. This will be especially useful in extrasolar planet searches with the MMT. Image credits: Matthew Kenworthy, Phil Hinz, Douglas Miller, Guido Brusa, Vidhya Vaitheeswaran.

Personnel

On March 2 Ryan Odegard was hired as a student mechanical engineer.

On March 25, Dan Blanco (Assistant Director for Operations) announced his resignation from the MMTO; his last day will be May 6. Dan has accepted a position at NOAO with the thirty meter telescope (TMT) project.

On April 25 UA and SAO announced that Dr. Faith Vilas had been appointed the new MMT Director. She will take over as full-time director in December 2005. Dr. Vilas, a planetary scientist, comes to the MMTO from NASA's Johnson Space Center where she is a major participant in the space mission Hayabusa, which will return samples of the asteroid Itokawa to Earth.

Primary Mirror Systems

Aluminizing

During the reporting period we worked on designing and building interfaces for each of the welder supply units. This allows us to control each unit's output voltage with a common setpoint, and collect data on the welder's output voltage, current, and load voltage. We plan to log all three signals, plus the master setpoint, during the mirror coating. The interface circuitry uses feedback from the load terminals on the 7-m belljar to close an analog servo loop to force each welder's output to track the setpoint command. This allows us to keep all filament circuits heated evenly, and allows for the I/R drop across the #2 AWG welder leads.

Brian Comisso and Cory Knop will be laying out printed circuits for the aluminizing system interface, and plan to assemble and fully test the system before delivery to the summit.

The cryopumps and gate valves were moved into the basecamp shop bay, assembled, and tested. The helium supply in two of the compressor units was depleted, necessitating return to the manufacturer (Austin Scientific) for helium adsorber replacement and retrofit of stainless steel flex hoses to replace the copper hoses that have proven to be unreliable. The other units may need similar service at some point in their lifetimes. Replacement adsorbers were acquired.

The #2 cryopump and its new gate valve (courtesy of the Steward LOTIS project) passed operational checks, the pump attaining a pressure of 10^{-7} mmHg with no leaks. An unfortunate handling mishap befell the #1 cryopump. Subsequently a small leak was detected in the liquid nitrogen line. The leak would limit pressure to a few times 10^{-9} mmHg—not significant. Unknown, however, was how the crack would behave when cooled down to liquid nitrogen temperature. Fears proved well founded—when liquid met the leak fracture, the pressure soared. The #1 cryopump was also shipped to Austin Scientific. Bill Kindred will visit Austin to participate in and document the disassembly and repair. Also, modifications will be made to the pump stands to prevent a reoccurrence of the event that (probably) caused the damage.

Bill Kindred and J.T. Williams participated in cleaning and aluminizing the #1 LBT 8.4-m primary mirror. The first full-up test of the on-telescope system was successful.

Thermal Control System

Work continued on the T-series thermocouples located inside the primary mirror and cell. There is still another man-day required to finish up miscellaneous problems, but it is now working much better and will soon be available as a telemetry tool.

A Neslab HX-540 chiller was sent to the factory for repairs, and a spare unit was installed in the pit. This unit is used to supplement the primary mirror temperature control in the coldest winter conditions. It may have taken a lightning strike, which could explain some of its problems. Phil Ritz, Johnathan Labbe, and Brian Love assisted with installation of the spare unit and plumbing in the supply valves.

Miscellaneous

A mirror cell bridge is being designed to aid in the mirror stripping and washing process. Previously, staff have had to walk on the mirror during the final cleaning process, and the risk of slipping and falling on the slick surface has been a concern. Potential scratching of the glass is also inherent with this method. A bridge in close proximity to the mirror surface would nearly eliminate the need for workers directly on the glass surface. The preliminary design will be evaluated in May for possible implementation in the scheduled July-August re-coating project.

The current mirror cover has been showing its age the last year, with deterioration of parts causing trouble with its operation. Remarkably, this "temporary" cover design has never impeded observations, but failure of some degree awaits. Plans are being made to install a new cover this summer.

Secondary Mirror Systems

Hexapod Positioner Control

During the January *f*/15 AO run, MMT staff collaborated with CAAO engineers to install a tape limit switch inside the secondary hub to prevent hard collisions between the AO electronics module and the hub structure during collimation. Prior to the April run the switch was made more robust, tested off-telescope, and appeared to work properly. An override switch was mounted at the hub to allow moving out of a collision should one occur. A shorting plug was installed in the hub for normal operation of the *f*/5 and *f*/9 secondaries, and a key switch was mounted on the front panel of the hexapod controller to bypass the tape switch when the *f*/15 secondary is not resident. A spare control card is being prepared.

Telescope Tracking and Pointing

Mount Servos

Our efforts to improve telescope mount servo performance continue. Matlab/Simulink are being used to design new servo algorithms, and these are being tested using the xPC Target rapid prototyping environment. In parallel, Tom Trebisky has an experimental version of the mount control software running on a fast Pentium based computer. Our experiments thus far indicate that xPC Target is not suitable to run our production code. It is also clear that the existing VME based computer is inadequate to run the new models that we are developing. Our current goal is to incorporate code generated by Simulink/Real-Time Workshop into the VxWorks based software that now controls the mount, and to run this on a fast Pentium based machine.

Dusty Clark, Ed Bell, and Keith Powell continue to work on servo system development. Ed's latest version remains untested on the telescope due to time constraints. Keith has updated the controller design to incorporate lessons learned at the LBT, and we now have a controller that utilizes a "dual loop" architecture that closes a cascaded position and velocity loop on the drive arc tape encoder (we use the on-axis absolute encoder to acquire an absolute position at startup). With our latest 50X Heidenhain interpolator, this gives us 140 encoder counts per arcsecond, so we expect good low-speed performance. Our confidence in the MMT model has also increased. Off-line servo design in Simulink predicts the telescope behavior with excellent fidelity. We expect to test and verify optimized servo gains this spring.

Our next evolutionary step is to connect the xPC Target machine to the mount VME to test the controller under actual operating conditions using the existing astronomy code and operator GUIs. We want to use this to evaluate the servo under varying conditions that are very like those during observing to ensure the controller works properly before committing it to a production version.

We are laying the ground work to build a production version of the controller. We plan to implement the control system in a fast PC, which allows us to run optimized code in full double-precision math at the high rates required for the new controller algorithms. Currently, the elevation axis controller consumes an average of 67 microseconds to run all the servo code, including signal logging and kernel overhead. Of this time, fully half is the access time to the 8 MHz IP modules for hardware I/O. We have a full set of PCI boards in hand to replace all the IP modules, and we expect to populate the controller with these as the project progresses. With the PCI hardware, plus running all three axes of the telescope, the servo calculation time should remain well within our 1 mS update rate.

Our next challenge is to marry the automatically-generated C-code for the controller from Simulink to the hand-written legacy astronomy code, and link the two into a single VxWorks system program. We may need to acquire new licenses from Wind River to fully support the latest generation of PC hardware, and we will have to learn how to create and link Simulink code to the VxWorks target. Fortunately, some of this work has been done by The Mathworks, which has a pre-packaged VxWorks target in Real Time Workshop. We expect to begin this work over the summer.

All-Sky Camera

On March 24 the all-sky camera was installed permanently and brought on-line. Other than a few control interface quirks that have to be worked around, and a malfunctioning enclosure heater that had to be disconnected, the camera system has worked extremely well. The automatic iris control does a good job of allowing the camera to produce useful images even when the bright sun or moon is shining directly into the camera. Other all-sky cameras such as CONCAMs do not operate at all under a bright moon, let alone during the day. Under dark conditions the camera is at least as sensitive as a perfectly dark-adapted human eye, with a magnitude limit of 6.0-6.5 magnitude. The camera is quite red-sensitive, and therefore red stars down to 7th magnitude are easily detected.

Figure 1 shows a representative image from a clear, moonless night. The Milky Way is easily visible rising in the east, Jupiter is the bright object in the southwest, and the Big Dipper is setting in the northwest (Polaris is occulted by the summit shop roof). The camera is sensitive enough to detect zodiacal light all along the ecliptic, though it may not show up well in hardcopy printouts. The gegenschein is just to the right of the head of Scorpius in this image.

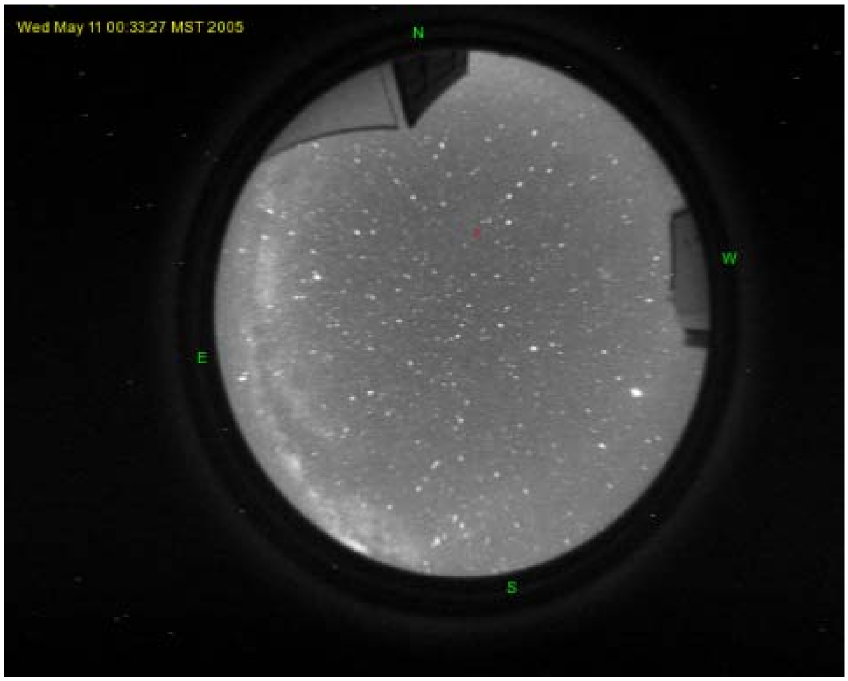


Figure 1: Dark sky image taken with the all-sky camera. A red cross near the Big Dipper marks where the MMT was pointing at that time.

After the camera was mounted, a set of images was run through DAOfind to detect and centroid stars. The resulting lists were then cross-correlated with a catalog of bright stars to build a coordinate transformation that maps altitude and azimuth to image coordinates. This transformation is used to label the cardinal directions in each image and to plot where the MMT is pointing at the time the image is taken. The camera is pointing within a degree of true zenith, but is rotated 10.2 degrees west of true north. The enclosure cuts the image off at 15 degrees elevation, so we're not losing too much compared to a dome enclosure. The image distortions within the visible field are quite mild. A third-order polynomial is used to convert zenith angle to radius in the image, though the deviation from linear is only a few percent even for an elevation of 20 degrees. The coordinate transformation, and thus the mounting of the camera, appears to be quite stable over time.

The telstat display in the control room was upgraded to better support displaying sky camera images. The animated GIF files that are continually created are 15-17 MB in size, and the old telstat computer did not have enough memory to handle displaying them in a browser. The new telstat computer is a Pentium-4 machine running linux (http://telstat.mmto.arizona.edu), and will also control the seeing monitor when it comes on-line. A dual-head video card and a second LCD monitor were obtained and installed so that operators and observers each have their own telstat display. The telstat web pages have been modified to use the SOAP protocol to update the displayed data, which is much more efficient and reliable than doing periodic reloads of the whole page. Sky camera images and movies are now displayed on the telstat page in the lower right and left-hand corners, respectively. The images are updated every 10 seconds, while the movies are updated every 60 seconds since they are fairly large. The latest image, movie, and archived day and night movies are also available at http://skycam.mmto.arizona.edu/.

Computers and Software

Open-loop Temperature and Elevation Corrections

The new automated wavefront sensing tool has been logging hexapod coordinates, elevation, and OSS temperatures after every round of corrections are applied. The resulting database of known good hexapod positions makes it possible to look for correlations with elevation and temperature without requiring engineering time to do special observations. The three hexapod coordinates affected most by gravity and temperature changes are Z (focus), Y, and Tilt_X. There should be no systematic effects on the other three coordinates, and none are found in the data at any significant level. Also, no significant correlation is found between Y or Tilt_X and average OSS temperature. The focus data is modeled by a surface of the form:

$$\text{Focus } (\mu m) = a*\sin(El) + b*T + c$$

where El is the elevation in degrees and T is the average OSS temperature in degrees C. The majority of the wavefront sensor data were obtained with the *f*/5 secondary in the Hecto configuration, and the fit to those data nets the following results:

$a = 1121 +/- 48.6\ \mu m$
$b = -37.8 +/- 1.6\ \mu m/C$
$c = 13977 +/- 43\ \mu m$

The data and best-fit surface are shown in Figures 2, 3, and 4. The sine coefficient and zero-point are fairly consistent with previous determinations, but the temperature coefficient is almost half of the predicted value. This may partly explain why our attempts to correct for temperature effects have not worked well in the past. This discrepancy is not yet well-understood. One thought was that the focus offsets that we use to help correct for spherical aberration may be skewing results. However, combing through the logs and correcting hexapod positions for applied spherical corrections result in much larger scatter around the fit with no apparent correlation with temperature. Work is on-going to better understand the effects of bending defocus into the primary, both from our application of corrective forces and from forcing due to temperature gradients in the primary mirror.

The optical configurations of MegaCam and SWIRC require M1-M2 distances that are different from Hecto, which translate to zero-point offsets in the above fit. Fixing the temperature and elevation coefficients to their best-fit Hecto values and fitting zero-points to the MegaCam and SWIRC data separately gives:

c(MegaCam) = 13547 μm
c(SWIRC) = 9386 μm

These numbers were then used to build a simple hex_predict script that can be used to configure the hexapod to the predicted focus for the current elevation and OSS temperature. This is especially useful for setting up for evening sky flats. Focusing for sky flats previously required educated guesswork by the telescope operator.

The effects of gravity on hexapod Y and Tilt_X are independent of instrument configuration and are modeled by a function of the form:

Position = a*cos(El) + b

For Tilt_X the best-fit parameters to the entire set of March-April wavefront sensor logs are:

a = 219 +/- 6 arcsec
b = 278 +/- 3 arcsec

For Y they are:

a = 2288 +/- 81 μm
b = 1457 +/- 44 μm

For *f*/5, the ratio of Y translation to Tilt_X for zero-coma moves is 9.45, which is very close to the ratio of these cosine coefficients. Thus with *f*/5 installed, gravitational sagging of the front-end maps almost completely into image motion with very little residual coma. This is actually not a coincidence. The front-end was originally designed to self-compensate in this way with *f*/5 installed, as described in the final conceptual design "Orange Books" from Simpson Gumpertz & Heger dated back to 1990. Results of the Y and Tilt_X fits are shown in Figures 5 and 6.

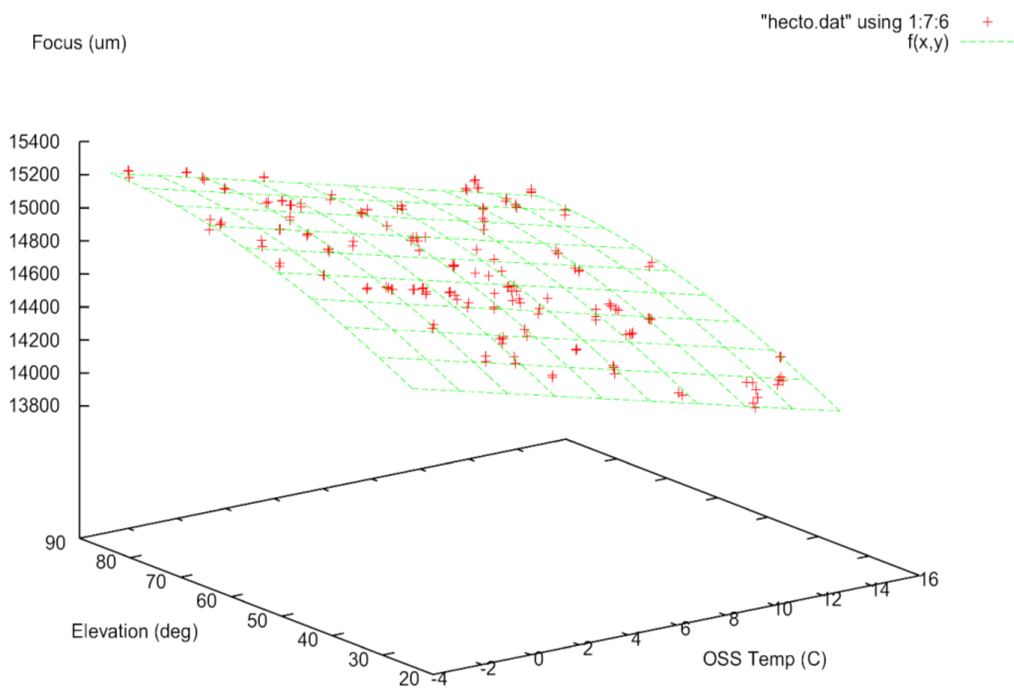


Figure 2: 3D plot of the best-fit surface to focus as a function of elevation and average OSS temperature.

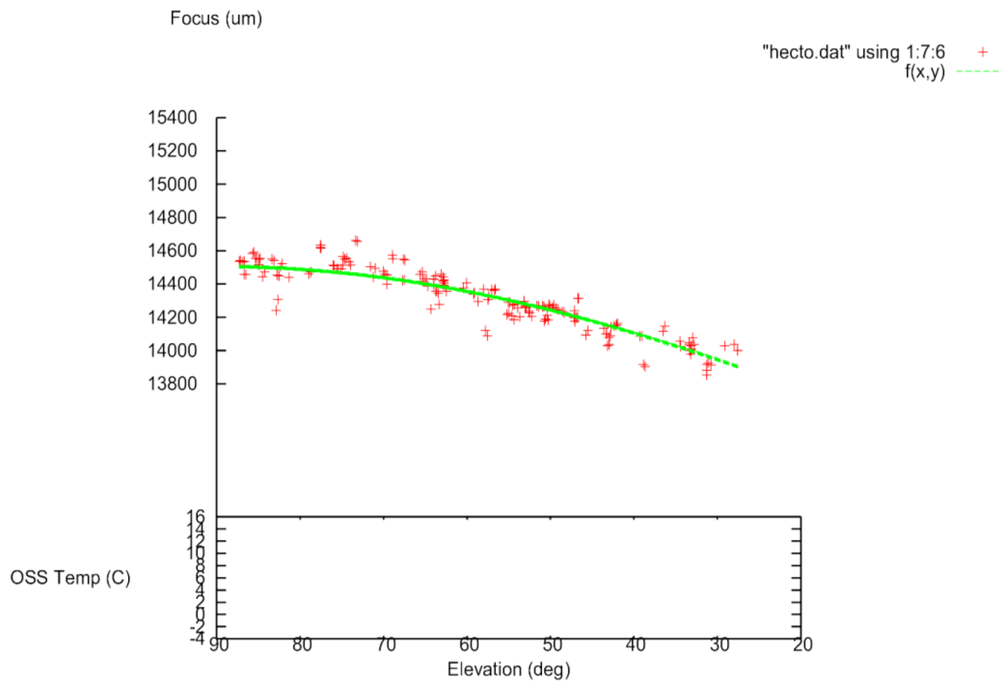


Figure 3: Same as Figure 2, but oriented to show elevation dependence alone.

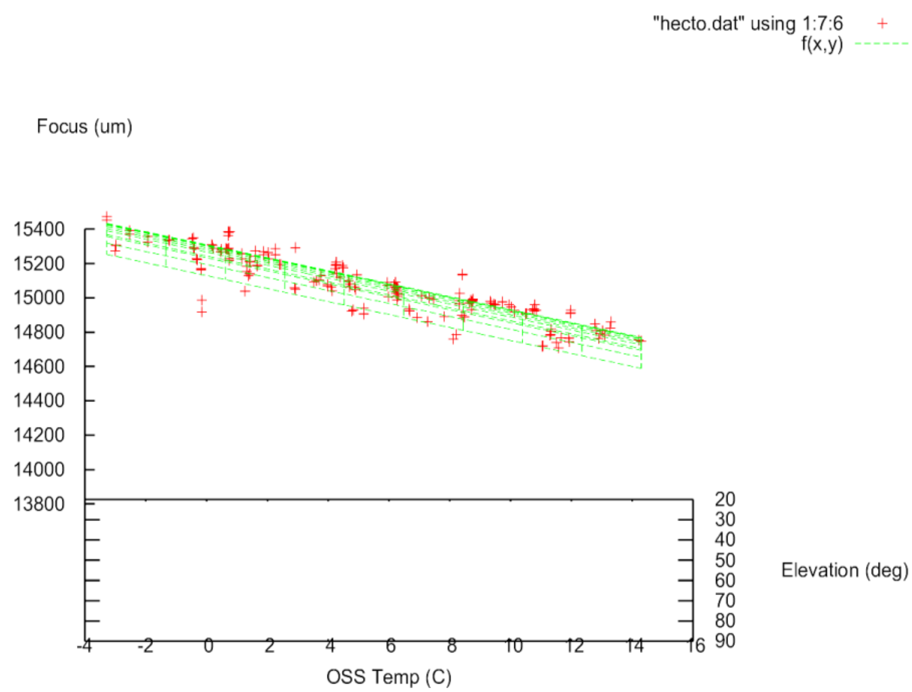


Figure 4: Same as Figure 2, but oriented to accentuate OSS temperature dependence.

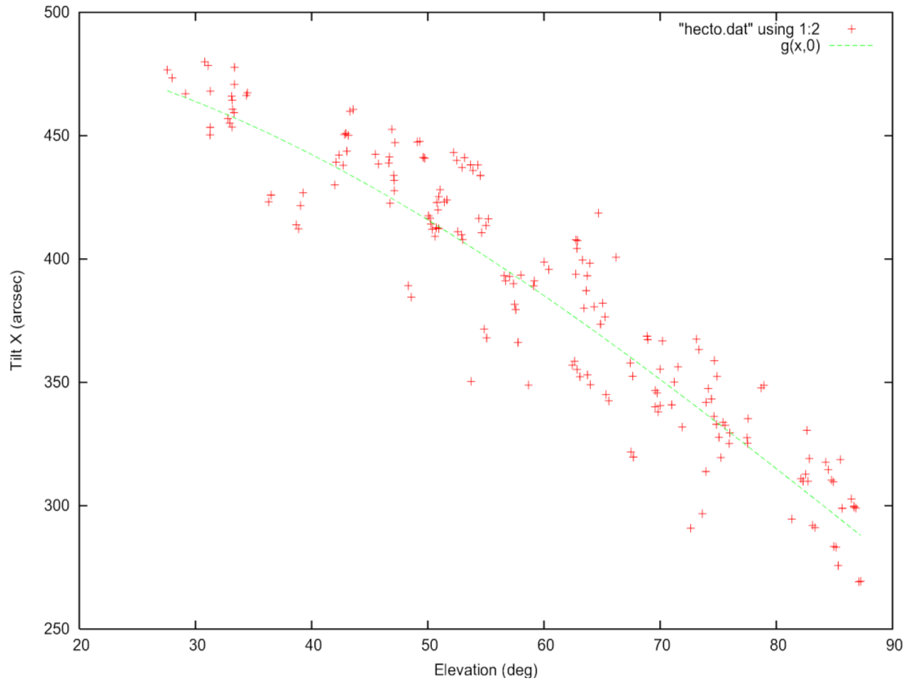


Figure 5: Plot of hexapod Tilt_X versus elevation.

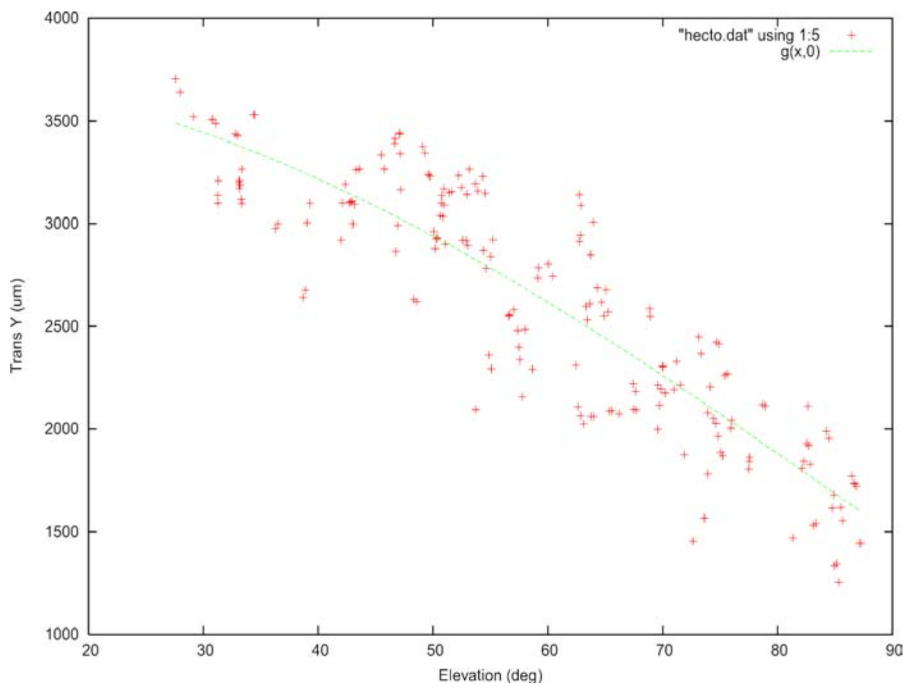


Figure 6: Plot of hexapod Y translation versus elevation.

Environmental and Thermal System Databases

Work continued on integrating the new Vaisala model WXT510 weather station into the MMT. The unit became operational during April. Much of the programming related to the WXT510 weather unit involved setting up round-robin databases (RRD) that are based on RRDtool (http://people.ee.ethz.ch/~oetiker/webtools/rrdtool/index.en.html). RRDtool is a widely used software system to store and display time-series data, such as ambient temperature. It stores the data in a compact manner that will not expand over time. RRDtool will also generate graphs that can be used directly in application or in web pages. RRDs have been set up for several hardware devices at the MMT, including three Vaisala units (models WXT510, HMI36, and HMP240), two TempTrax model E digital thermometers, the DustTrak 8520 unit, pit and shop heat exchangers, and the Carrier model 30GN-040 chiller. Additional RRDs are planned for other devices.

Data are input into the RRDs directly from the Perl-based mini-servers using the RRDtool Perl module. Data are typically averaged internally within the RRDs over three to four different time periods so that graphs can be produced ranging from 30 minutes up to 5 years. The RRDs also include some data filtering of erroneous values.

Web pages based upon these RRDs are currently divided into two major sets: 1) outside weather conditions (http://mmt.mmto.arizona.edu/engineering/weather.php); and 2) chamber conditions (http://mmt.mmto.arizona.edu/engineering/chamber.php. The graphs for these two sets of web pages are presented in both metric and US units.

XML Data Files

Associated with creation of the RRDs was development of a flexible XML format that could be used for new and existing data. This XML format is based upon "entry" nodes where each node includes a timestamp and date attribute as well as other log- and device-specific information. The XML format allows XML tools, such as XML parsers and XSL stylesheets, to be directly applied to the XML files. The format also allows regular expression programming to be performed on the data without requiring XML parsing of the files. Being able to process files as either an XML file or as a regular text file allows programming to be very flexible.

For example, the current data from the new Vaisala WXT510, stored in the XML format, can be directly viewed in a web browser by applying a default XSL stylesheet to the XML file (http://www.mmto.org/engineering/logs/vaisala3/vaisala3_current.xml). The transformation of the XML data log by the XSL stylesheet into XHTML can be performed directly by most web browsers. This particular XML data file is updated every few seconds by the vaisala3 mini-server.

A utility Perl script, bg_logger2xml.pl, was written that converts existing background logs, produced by the "bg_logger" service, into the new XML format. Background log data from November 2003 until the present were converted into the new XML format. These background logs contain values of most MMT telescope subsystem parameters that are sampled every five minutes. The data are now available at http://hacksaw.mmto.arizona.edu/engineering/background.php through a web browser interface. Similar to the Vaisala WXT510 XML/XSL example above, different XSL stylesheets are applied to the XML background log files to generate XHTML that can be viewed in a web browser. This represents a more user-friendly interface to the background logs than was previously available. The background XML files can also be used to supply archived data into the RRDs for the past one and a half years.

Instruments

Hectospec, Hectochelle, and Megacam

Despite tracking problems and continued bad weather, Hectospec was able to collect data for about 60 percent of the time it was scheduled in March and April. A failure of the fiber positioner robot on March 4 occasioned a visit by John Roll and Dan Fabricant. The instrument was back in operation the next night.

New calibration lamps for Hectochelle have been installed inside the *f*/5 mid-baffle, and thus allow ThAr exposures to be taken concurrently with field exposures. New CCD temperature control software is in place that will maintain the chip temperatures to better than 0.1C, thus reducing the small shifts in wavelength that had been attributed to cycling of the detector heater. The fiber configuration software, "xfitfibs," continues to be improved based on needs and user comments. Observers are advised to always use the latest version when preparing their programs.

The Megacam run of April 11-21 got off to a rough start; the first two nights were lost to software problems. These were cleared by the 13th thanks to diligent efforts from John Roll and Maureen Conroy working from SAO.

SWIRC

SWIRC enjoyed a productive engineering and science run on the MMT April 17-21, 2005. The J-band blocker plus filter background was measured and is reduced by a factor of 3.8, and the total J-band throughput is down by a factor of 0.88. The exposure time calculator has been updated accordingly. The new J-band filter, originally scheduled for delivery March 25, 2005, was postponed by the manufacturer until some time in June.

The alt-az coordinate system header information in the 32-channel read-out mode was verified, and several new MICE control features were exercised. The biggest problem, the telescope server repeatedly crashing, was traced to a Megacam guider server that was unrelated to SWIRC. A few minor fixes to the MICE interface will be implemented for the May 2005 run.

More information on SWIRC is available at http://www.cfa.harvard.edu/swirc/.

Natural Guide Star Adaptive Optics (NGS-AO)

The natural guide star adaptive optics (NGS AO) system had a very successful run at the end of April, thanks to the hard work of the AO and ARIES teams, and the strong support provided by the MMTO crew. The system was on the telescope for nine days, with 3.5 nights lost, mostly at the beginning of the run, to bad weather. After being weathered out for three runs, some much needed engineering tasks were finally completed. High quality, stable closed loop science data were obtained for projects ranging from quasar host imaging to exoplanet searches around nearby stars.

During the last five nights of the run the seeing varied from 0.5 to 1.5 arcseconds, and the wind varied from calm to 35+ mph gusts. In all conditions we were able to lock the AO loop consistently and provide corrected images in H of around 30% Strehl. On one exceptional night we even closed the AO loop (at a lower correction rate) on a 14.5 magnitude star.

Thanks to the hard work of many people and a dash of good luck with the weather, this was the most scientifically productive AO run yet. We look forward to the next AO run in June.

f/5 Instruments Documentation

The *f*/5 instrument installation checklists have been updated to reflect minor changes. New checklists for the installation and removal of Megacam have been added to the MMT staff web page. The Megacam user manual has been updated with changes following the April run. The most significant modification to the manual details the current procedure for obtaining sky flats, and includes the filenames for the sky flat catalogs.

Miscellaneous

On Sunday April 24 the AO team found a coatimundi (*Nasua narica*) in the telescope chamber. After a harrowing chase through the yoke room to the loading dock they finally persuaded it to leave the building. When we uncovered the primary mirror we found coati tracks leading from the Cassegrain hole across the face of the primary and around the outer edge of the 6.5-m mirror. The animal apparently climbed in through an opening in the AO top box. This points out the desirability of shielding the instruments: to exclude stray animals as well as stray light.

General Facility

March-April Operations

The weather was patchy at the start of March but gradually improved; April was mostly clear except for a thunderstorm on the 23rd. When the weather cooperated we had some very good seeing and smooth operations, prompting these encouraging words from Ale Milone's March 21 night log: "A smooth, trouble-free night for all telescope systems."

An intermittent problem with telescope tracking continued to plague us, and increased in frequency during the reporting period. The telemetry from the azimuth absolute encoder occasionally faulted, giving a spontaneous error of either 42 arcminutes, or a 180 degree flip, causing the telescope drives to shut down due to commanded over-speed. Usually this cleared on restart with only minor loss of time. All of the electronic group members attempted to solve the problem, checking out all the boards, power supplies, and wiring in the system. The intermittent behavior of the problem was frustrating, and individual events continued to occur. On April 11 a suspect chip was replaced in the encoder electronics, but intermittent problems resumed. Finally on April 30, Dusty Clark's replacement of the azimuth resolver reference cable in the azimuth angle to digital board solved the problem.

This episode points out the need to upgrade the encoder electronics to a more modern design. Ten years ago, when this system was built, MMTO did not have the ability to support surface-mount components or to lay out circuit boards for prototyping. This is no longer the case. In today's printed-circuit market, it is practical to prototype custom encoder circuits directly on printed circuit boards. We will be looking at design improvements that can be achieved over the summer and fall.

We are happy to report that the building drive problems reported in the last period have not recurred. Ken Van Horn traced these disruptions to a faulty cooling fan power supply in the building drive rack. We now have spare fans in stock and an external power supply has been moved into the rack.

Thermal, Facility

The Neslab RTE-4, which is used on the telescope dry air supply, was rebuilt with new bearings and seals, and installed and tested.

Brian Love completed installation of an air scavenge system (essentially a modified in-house vacuum system) with PVC plumbing running to panels at the drive arcs, to the top of the Cassegrain instrument area ("the cone"), and to the PMAC controller at the top end of the telescope. This system will extract air warmed by waste heat from active electronics on the telescope and instruments.

Other Facility Improvements and Repairs

Court Wainwright installed a new mount for the replacement telescope-to-building LVDT. The new LVDT must still be connected, tested, and calibrated.

Three dual and single actuators were rebuilt and tested, and additional spare cards are being tested.

The MMT's weather stations are being upgraded; a second Vaisala WXT510 weather station arrived but has yet to be installed. A newer, more weather resistant R. M. Young wind gauge is on order.

In April the Smithsonian safety inspectors arrived for their annual visit and training. The site inspection went well, but the final report is not due for another month or so. They appreciated the staff cleaning up their work areas.

Visitors

April 18: Ron Lukins and Rose Ahart, engineers from Boeing Electro-Optic Division in California, accompanied by Bill Kindred. Boeing is interested in in-situ coating of mirrors for telescopes they are building for the military.

April 27: Brian Lula (president) and James Deichmann (west region senior sales engineer) of Physik Instrumente, hosted by Doug Miller (CAAO) during the April ARIES run.

Publications

MMTO Internal Technical Memoranda

None

MMTO Technical Memoranda

None

MMTO Technical Reports

None

Scientific Publications

05-9 A Search for Substellar Companions Around 15 Weak-Lined T Tauri Stars with the Planetary Camera 2 of the *Hubble Space Telescope*
Massarotti, A., Latham, D. W., Torres, G., Brown, R. A., Oppenheimer, B. D.
AJ, **129**, 2294

05-10 Spectroscopy of High-Redshift Supernovae from the ESSENCE Project: The First 2 Years
Matheson, T., Blondin, S., Foley, R. J., Chornock, R., Filippenko, A. V., Leibundgut, B., Smith, R. C., Sollerman, J., Spyromilio, J., Kirshner, R. P., Clocchiatti, A., Auilera, C., Barris, B., Becker, A. C., Challis, P., Covarrubias, R., Garnavich, P., Hicken, M., Jha, S., Krisciunas, K., Li, W., Miceli, A., Miknaitis, G., Prieto, J. L., Rest, A., Riess, A. G., Salvo, M. E., Schmidt, B. P., Stubbs, C. W., Suntzeff, N. B., Tonry, J. L.
AJ, **129**, 2352

05-11 Cataclysmic Variables from Sloan Digital Sky Survey. IV. The Fourth Year (2003)
Szkody, P., Henden, A., Fraser, O. J., Silvestri, N. M., Schmidt, G. D., Bochanski, J. J., Wolfe, M. A., Agüeros, M., Anderson, S. F., Mannikko, L., Downes, R. A., Schneider, D. P., Brinkmann, J.
AJ, **129**, 2386

05-12 Discovery of an Unbound Hypervelocity Star in the Milky Way Halo
Brown, W. R., Geller, M. J., Kenyon, S. J., Kurtz, M. J.
ApJ, **622**, L33

05-13 The Distance and Metallicity of the Newly Discovered, Nearby Irregular Galaxy Hizss 3
Silva, D. R., Massey, P., DeGioia-Eastwood, K., Henning, P. A.
ApJ, **623**, 148

05-14 New Low Accretion-Rate Magnetic Binary Systems and their Significance for the Evolution of Cataclysmic Variables
Schmidt, G. D., Szkody, P., Vanlandingham, K., Anderson, S., Barentine, J. C., Brewington, H. J., Hall, P. B., Harvanek, M., Kleinman, S. J., Krzesinksi, J., Long, D., Margon, B., Neilsen, Jr., E. H., Newman, P. R., Nitta, A., Schneider, D. P., Snedden S. A.
Submitted to *ApJ*

05-15 *Hubble Space Telescope* and Ground-Based Observations of SN 1993J and SN 1998S: CNO Processing in the Progenitors
Fransson, C., Challis, P. M., Chevalier, R. A., Filippenko, A. V., Kirshner, R. P., Kozma, C., Leonard, D. C., Matheson, T., Baron, E., Garnavich, P., Jha, S., Leibundgut, B., Lundqvist, P., Pun, C. S. J., Wang, L., Wheeler, J. C.
ApJ, **622**, 991

Observing Reports

D. Miller: April 23-May 1, ARIES

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 University of Arizona and the Smithsonian Institution."

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

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Tucson, AZ 85721-0065

MMTO in the Media

No activity to report.

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:

1. General information about the MMT and Mt. Hopkins.

2. Telescope schedule.

3. User documentation, including instrument manuals, detector specifications, and observer's almanac.

4. A photo gallery of the Conversion Project as well as specifications related to the Conversion.

5. Information for visiting astronomers, including maps to the site.

6. The MMTO staff directory.

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.

Use of MMT Scientific Observing Time

March 2005

Instrument	Nights Scheduled	Hours Scheduled	Lost to Weather	Lost to Instrument	* Lost to Telescope	Lost to Gen'l Facility	Total Lost
MMT SG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PI Instr	29.75	305.30	143.90	13.15	0.75	0.00	157.80
Engr	0.25	2.50	2.50	0.00	0.00	0.00	2.50
Sec Change	1.00	10.70	0.00	0.00	0.00	0.00	0.00
Total	**31.00**	**318.50**	**146.40**	**13.15**	**0.75**	**0.00**	**160.30**

Time Summary Exclusive of Shutdown

Percentage of time scheduled for observing	95.9
Percentage of time scheduled for engineering	0.8
Percentage of time scheduled for secondary change	3.4
Percentage of time lost to weather	46.0
Percentage of time lost to instrument	4.1
Percentage of time lost to telescope	0.2
Percentage of time lost to general facility	0.0
Percentage of time lost	50.3

* Breakdown of hours lost to telescope

mount software 0.75

April 2005

Instrument	Nights Scheduled	Hours Scheduled	Lost to Weather	Lost to Instrument	* Lost to Telescope	Lost to Gen'l Facility	Total Lost
MMT SG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PI Instr	29.00	267.60	57.85	11.25	5.50	0.00	74.60
Engr	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sec Change	1.00	9.00	3.00	6.00	0.00	0.00	9.00
Total	**30.00**	**276.60**	**60.85**	**17.25**	**5.50**	**0.00**	**83.60**

Time Summary Exclusive of Shutdown

Percentage of time scheduled for observing	96.7
Percentage of time scheduled for engineering	0.0
Percentage of time scheduled for secondary change	3.3
Percentage of time lost to weather	22.0
Percentage of time lost to instrument	6.2
Percentage of time lost to telescope	2.0
Percentage of time lost to general facility	0.0
Percentage of time lost	30.2

* Breakdown of hours lost to telescope

primary panic 1
hacksaw 1.5
az drive 3

Year to Date April 2005

Instrument	Nights Scheduled	Hours Scheduled	Lost to Weather	Lost to Instrument	Lost to Telescope	Lost to Gen'l Facility	Total Lost
MMT SG	20.00	227.30	186.20	0.00	4.00	2.50	192.70
PI Instr	88.25	918.10	403.55	32.90	20.00	0.00	456.45
Engr	2.25	24.30	2.50	0.00	0.00	0.00	2.50
Sec Change	3.50	37.40	9.00	6.00	0.00	0.00	15.00
Total	**114.00**	**1207.10**	**601.25**	**38.90**	**24.00**	**2.50**	**666.65**

Time Summary Exclusive of Shutdown

Percentage of time scheduled for observing	94.9
Percentage of time scheduled for engineering	2.0
Percentage of time scheduled for secondary change	3.1
Percentage of time lost to weather	49.8
Percentage of time lost to instrument	3.2
Percentage of time lost to telescope	2.0
Percentage of time lost to general facility	0.2
Percentage of time lost	55.2