IGRINS Newsletter -- 2015 Trimester 2

Dear IGRINS community:

IGRINS has now had 110 nights scheduled at McDonald Observatory since commissioning and celebrated its first year since first light on March 14th, 2014. UT and KASI observers were awarded 63 nights on the 107-inch in 2015 Trimester 2. In this edition of the newsletter we report the current instrument status, remind observers of their obligations when requesting IGRINS time, introduce a new mini-queue proposal method and share some early science results from the IGRINS user community.

The next proposal deadline is June 1st, 2015, at 8am CDT. We would like to take this opportunity to remind IGRINS users of the proposal guidelines. If you plan to submit a proposal, please contact one of the instrument team members. An ongoing complaint from the TAC is that IGRINS proposals fall short in their feasibility review and in clearly stating date requirements on the coversheets. **Proposals should be sent to your IGRINS collaborator by May 27th so they can be reviewed for feasibility ahead of the proposal deadline (June 1st).** Proposals that meet these early deadlines do remarkably better with the TAC.

IGRINS will be available August 1-6 and after September 23rd in 2015T3.

Dr. Chan Park's SPIE proceedings for IGRINS commissioning (http://adsabs.harvard.edu/abs/2014SPIE.9147E..1DP) have been published and should guide your feasibility of observations. Version 3 of the Exposure Time Calculator now provides the best estimates of IGRINS performance on the 2.7m (http://irlab.khu.ac.kr/~igrins/). The average acquisition time is ~10 minutes per target.

The first IGRINS science paper has been accepted to ApJ:
High Resolution Optical and NIR Spectra of HBC 722
Jeong-Eun Lee, Sunkyung Park, Joel D. Green, William D. Cochran, Wonseok Kang, Sang-Gak Lee, and Hyun-Il Sung
http://arxiv.org/abs/1505.03206

Science publications are a major goal for the IGRINS instrument team in 2015. In addition, we would like to advertise IGRINS successes on department websites and through press releases. So, please don't hesitate to share your science!

With best wishes,
Dan Jaffe and the IGRINS Team

1. Current IGRINS Status and Performance

IGRINS is heavily subscribed and performing consistently. There have been no major changes or issues with the instrument in the last trimester. The Pipeline Package is continuing to be developed by Dr. Jae-Joon Lee (https://github.com/igrins/plp/wiki). The IGRINS wiki pages are continually updated and we ask that the IGRINS community consult https://wikis.utexas.edu/display/IGRINS/Manuals for observing guidelines, instrument manuals, links to other software (e.g., IGRINS observability), and troubleshooting. *We anticipate returning IGRINS to UT in August for minor refurbishments and it will not be available between August 7th and September 22nd.*

2. Scientific Data from the Commissioning Runs

Any member of the astronomical community may examine the IGRINS commissioning data to help form their future proposals. Science verification data from the commissioning runs are processed using the current pipeline and available on Dr. Jae-Joon Lee's website (http://leejjoon.kasi.re.kr/igrins/pipeline/). Please be sure to read the "Sample Data Policy" also available on the same website. More information on these data can be found in previous newsletters here:
https://wikis.utexas.edu/display/IGRINS/IGRINS+Newsletters

3. Considerations for IGRINS Users

The faintest guide star used to-date was K=12.4 mag with 30s slit-view images. If your target is fainter than K=10 then you should have off-slit guide stars prepared for your target. Off-slit guide stars can be as faint as K=13, depending on conditions. It is possible to guide-by-hand if no guide star is available, but this can be difficult.

If you plan to use the IGRINS pipeline, we suggest that you take a sky frame with a minimum of 300sec exposure to improve the wavelength solution of your processed data. If you have science frames with exposures of this length, then they will work as sky frames too. Observers will also want to get UNe calibration frames nightly since progress is being made to utilize them for improving the pipeline wavelength solution.

IGRINS needs one qualified 107" observer **and** one qualified IGRINS observer at all times. This is to ensure safe operation and efficient use of the awarded time. We will continue to supply the IGRINS observer at team expense. We need you to supply the 107" observer. You will need to support this observer with your own funds. Please see the McDonald website for requirements.

http://www.as.utexas.edu/mcdonald/policy/vacant_time.html#TRAINING

4. IGRINS Mini-Queue Proposals

After a test run in 2015T2, we have found that observing efficiency is greatly increased by queue sorting based on observing conditions. For 2015T3 there will be a block of nights set aside for queue observing. Proposals can ask for any fraction of a night and should aim to finish ongoing projects and test new projects. IGRINS queue requests can be made at any time. The earlier the request is made, the higher the chance is of making it into the queue. If additional observers are needed to support queue observations, then people will be drafted from the pool of queue requests.

The proposal for mini-queue time should include:
PI name/Institution
Email address
Type of proposal (1=finish existing program; 2=exploratory program; 3=short program)
Object name and coordinates
Instructions for observations (e.g. nods, slit PA, S/N, exposure time)
If type 1 proposal, give trimester designation (e.g. 2015-2) and
proposal number for program you are completing and include the ORIGINAL abstract
For type 2 or 3 proposal, list IGRINS team member collaborator
For all proposals, give a 1/2 page science justification

For any of the three types of observations, please send the proposal via email, as a pdf, to anita@astro.as.utexas.edu. The subject of the email should include "IGRINS mini-queue" and your name.

5. Deadlines for 2015 Trimester 3

Proposals for use of IGRINS on the McDonald 2.7m telescope during 2015 Trimester 3 (August to November) will be due on June 1st. Anyone may apply for IGRINS time, but a member (or members) of the IGRINS team must be on each proposal. **Proposals should be sent to your IGRINS collaborator by May 27th so they can be reviewed for feasibility ahead of the proposal deadline.**

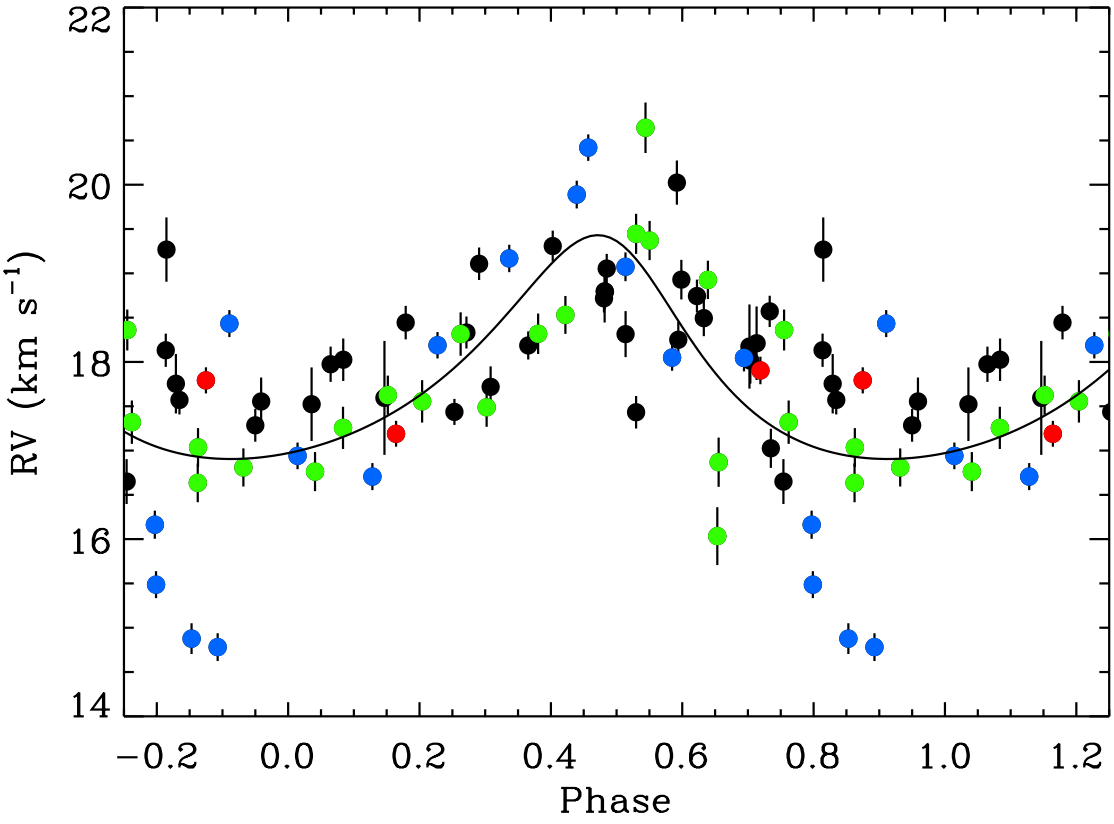
Science Highlights:

A few of the initial science results from IGRINS are discussed below. If you would like to share your progress in the next newsletter, please let us know and we will be sure to contact you when we begin to put it together. If you have plans to publish IGRINS results soon, then be sure to contact the IGRINS PIs to make sure that your work follows team guidelines. Publication guidelines can be found at the end of the newsletter.

T Tauri Exoplanet Detection

Jacob McLane and Lisa Prato (Lowell Observatory), Chris Johns-Krull (Rice) et al.

Phased radial velocity observations of a ~2 Myr old classical T Tauri star in the Taurus region reveal a coherent period for a 13 Jupiter mass object in a 9 day orbit. Observations taken with 4 different spectrographs on 5 different telescopes over a 6 year period give us confidence in the result. A power spectrum periodogram analysis indicates a false alarm probability of 6.9e-5 for this period. Visible light radial velocity observations phase to a distinct period of 7.1 days, identical to the stellar rotation period; both of these signals are likely the result of star spots on a rotating, inclined star. We used the inclination angle of the circumstellar disk and assumed that the planet's orbit is coplanar to determine the stellar inclination and thus the planet's absolute mass. Symbol colors are coded as follows: black CSHELL/IRTF, red NIRSPEC/Keck, green Phoenix/KPNO 2.1 and 4.0 meter, blue IGRINS/McDonald 2.7 meter. We are completing a manuscript on this system and anticipate submission later this month (McLane et al. 2015).



LkHα 234 Outflow

Heeyoung Oh (UST/KASI) and IGRINS Team

LkHα 234 is Herbig Be, an intermediate-mass young star and was observed during the IGRINS commissioning run in July 2014. The scientific goal of this project is to study characteristics of YSOs emitting parsec-scale outflow, i.e., jet kinematics, launching mechanism, and physical parameters (electron density, temperature, shock condition). Figure 1 is a two-panel position-velocity diagram of [Fe II] 1.644 μm and H2 1-0 S(1) 2.122 μm emission lines after the stellar continuum subtraction.

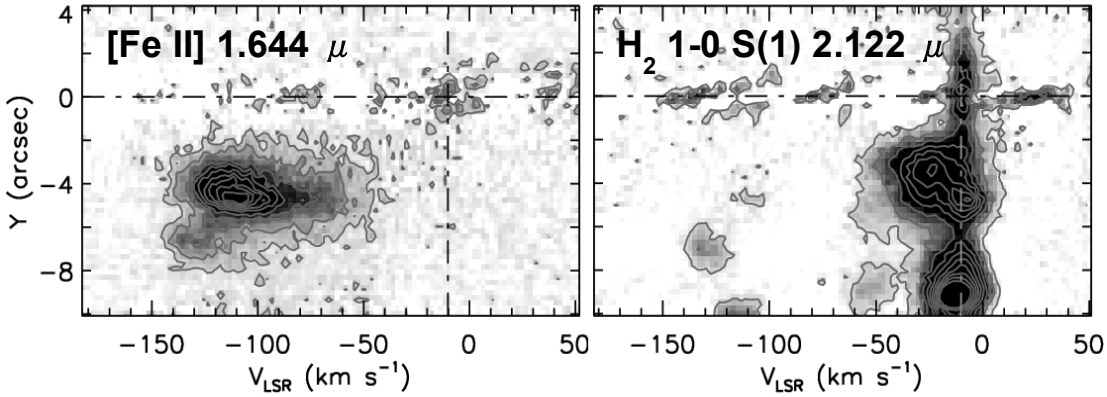


Figure 1: P-V diagram of [Fe II] and H2 1-0 emission lines. Position of subtracted stellar continumm (horizontal dashed line) and systematic velocity (vertical dashed line) are also shown.

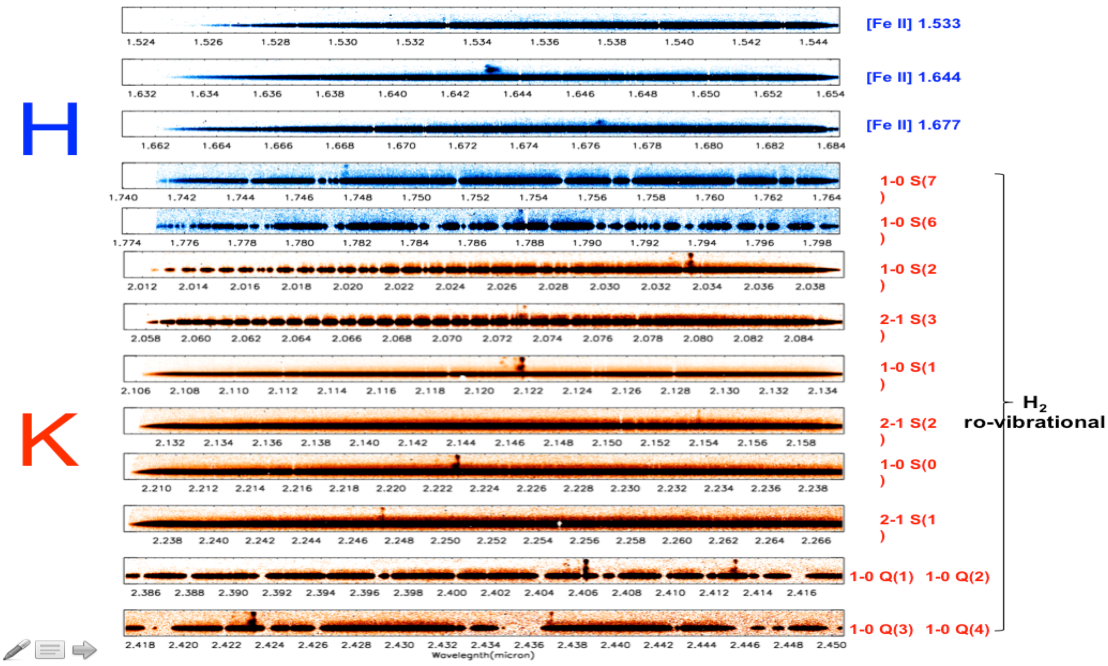
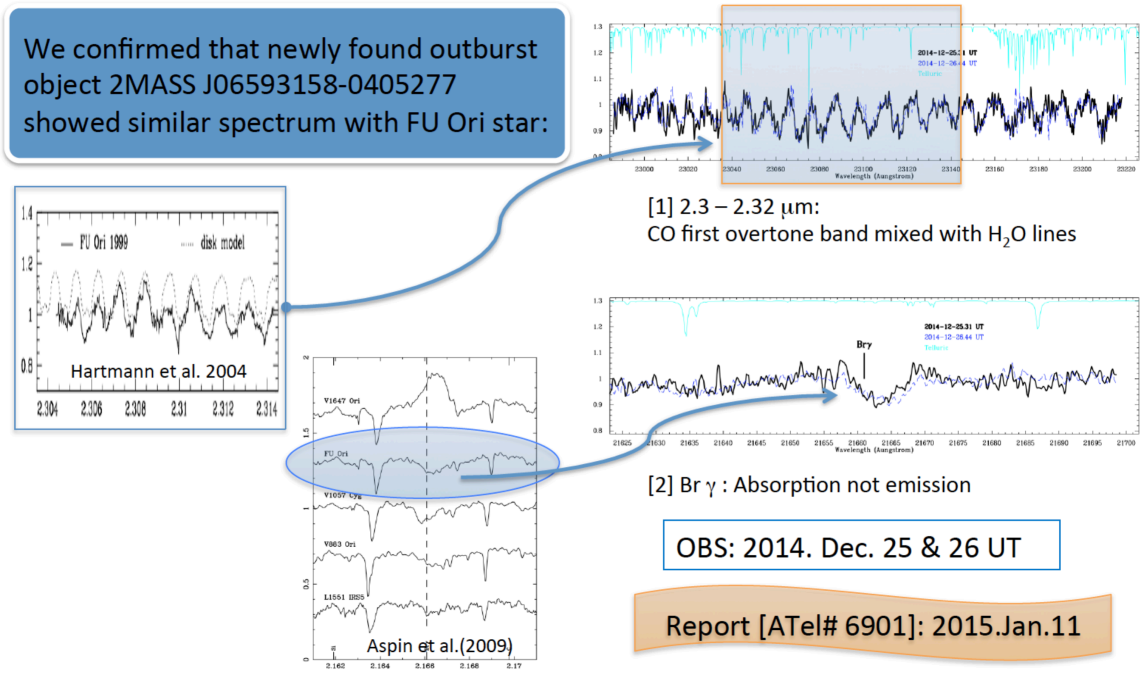


Figure 2: Other identified emission lines in the IGRINS H- and K-band spectra.

IGRINS K-band High-resolution Spectroscopy of the FU Ori type Object 2MASS J06593158-0405277

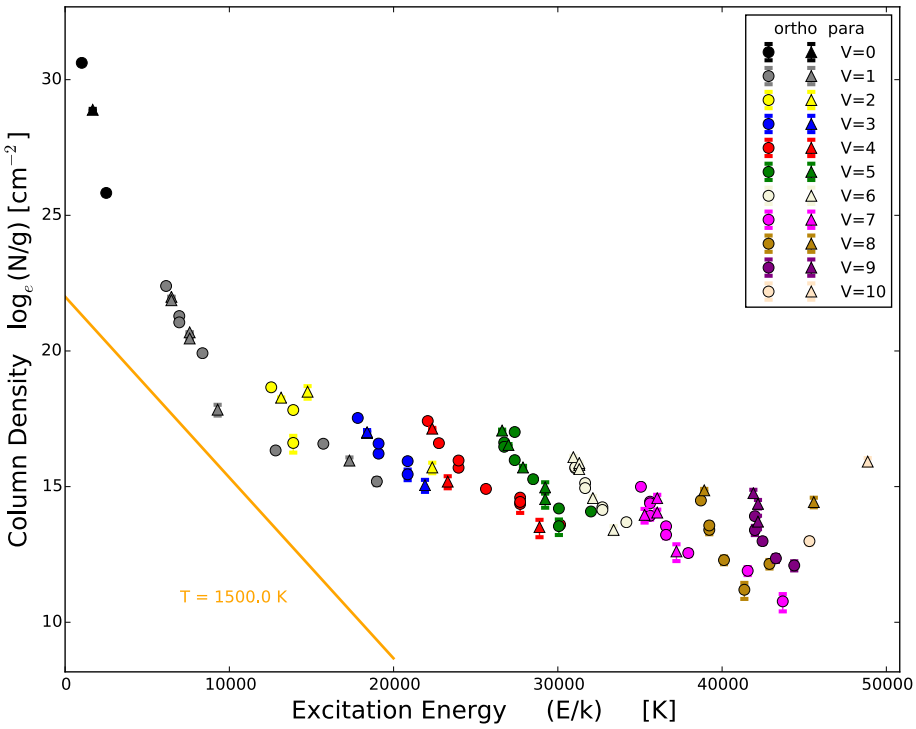
Tae-Soo Pyo (NAOJ), Heeyoung Oh(UST,KASI), In-Soo Yuk (KASI), Hwihyun Kim (KASI,UT), C. J. Davis (Liverpool John Moors Univ., UK)

We reported a part of K-band spectra of 2MASS J06593158-0405277 to Astronomers Telegram (#6901), which was discovered recently by Maehara, Kojima, and Fujii (ATEL #6770). The spectra were obtained on December 25.31 and 26.44, 2014 (UT). The total on- source exposure time was 400 s (100 x 4) for each night. The signal-to-noise ratio was 50 ± 30. Fig. [1] shows the normalized spectrum in the range of 2.3 - 2.32 micron where the CO first overtone band is dominant and mixed with water lines. It shows very similar pattern with FU Ori in 1999 but not with V1515 Cyg (1999) in Hartmann et al. (2004: ApJ, 609, 906). We found that the Br_gamma line shows absorption not emission (Fig. [2]). The FWHM of the absorption is ~ 95 - 100 km/s. The line profile was almost symmetric at 21663.3 A on Dec. 25.31, 2014 UT. It shows a little asymmetric with the deepest point shifted to 21664.73 A on Dec. 26.44, 2014 UT. FU Ori, V1057 Cyg, V883 Ori, and L1551 IRS5 show the similar weak Br_gamma absorption, which can be only detected with high spectral resolution spectroscopy (Aspin et al. 2009, AJ, 137, 2968). We have been monitoring program with IGRINS and preparing for a paper with the whole H- & K-band (1.48-2.45 micron) spectra in detail.



H2 Excitation in the Orion Bar
Kyle Kaplan (UT) and IGRINS Team

The Orion Bar, a slab of molecular gas in the Orion Nebula exposed to the intense UV light from the central Trapezium stars, with edge on geometry, is the perfect nearby laboratory for studying high-density photodissociation regions (PDRs) illuminated by powerful ultraviolet fields. In such a region, the ro-vibrational lines of molecular hydrogen (H2) have significant diagnostic power about the conditions at the H/H2 transition. To exploit this power, we examine a large range in level energies by observing many H2 lines in a deep spectrum taken at a single position. The high spectral resolution and large wavelength coverage of IGRINS allowed us to resolve ~100 H2 lines, some from high excitation (vibration levels up to 10) never observed before in Orion. From the intensity of each line, we can calculate the column density of the upper state of each transition, and determine the detailed ro-vibrational level populations of H2. The figure below shows the H2 ro-vibrational level populations on a Boltzmann Diagram. This gives us the diagnostic power we need to determine the significance of UV fluorescent excitation, modification of level populations by collisions in the dense gas, and see the possible excitation from other processes. In Figure 1, a purely thermalized gas (ie. a shock) would appear on the Boltzmann Diagram as a straight line, depicted by the T=1500 K line. Higher temperatures lead to shallower slopes. A UV fluorescent gas takes on a characteristic jagged appearance as the transition to the electronic ground state after an H2 molecule absorbs a UV photon tends to populate high vibrational (V) levels while the radiative cascade out of these levels favor low rotation (J) leading to a jagged Boltzmann diagram showing high V and low J temperatures. Collisions modify the level populations by populating higher J states and depopulating high V states leading to the lower V and higher J temperatures as shown in Figure 1 for the Orion Bar where the gas is dense enough that we can see collisions modifying the level populations. Future results will include a 6"x15" map of the Orion Bar and deep IGRINS spectra of other bright PDRs.



Publication policy

Observing PIs are expected to analyze and publish their data promptly. It is up to each observing group to determine the number and type of publications to produce from any observing run.

Decisions about authors and author orders of general publications are the responsibility of the proposal PI. The IGRINS team member(s) on the observing proposal(s) should be included as paper authors. Wherever possible, PI's should seek reasons to give first authorships to junior team members, in particular to students and postdocs. All authors should have intellectual ownership of the material and have contributed to the work. The IGRINS team is committed to ethics in publication and does not condone "courtesy" authorships.

When several groups are working on similar science programs, the IGRINS team will try to inform the groups of this fact. While we encourage appropriate collaboration and data-sharing between groups, it is up to the groups themselves to make such arrangements.

The IGRINS team will archive IGRINS spectra. The current proprietary period is 24 months from the date the data are taken. At the discretion of either the UT or KASI PI's, this period can be extended for up to 36 months upon request for graduate students who have not yet completed their dissertation. Observing groups, will be subject to the policy that was in place at the time their observing time was awarded.

Refereeing:

The IGRINS team will have an internal refereeing process for observing and instrumentation papers. We strongly recommend that all papers to be submitted to a refereed journal and using IGRINS data or technical information go through the IGRINS internal refereeing process. Papers for non-refereed conference proceedings may also make use of this service. The PI or a designee will serve as IGRINS editor. First authors should submit papers that are ready for publication to the IGRINS editor in pdf form. Comments and suggestions will be sent to the author within 3 weeks. Revisions in response to these comments can be made at the discretion of the authors but there will be no further review.

Authors should inform the IGRINS editor of the acceptance of *all* papers, refereed and non-refereed, at the time of acceptance, giving the title, journal, volume, and author list.

Acknowledgements:

Any paper using IGRINS science or engineering data must reference the designated IGRINS instrument paper(s):
Park, C. et al., "Design and early performance of IGRINS (Immersion Grating Infrared Spectrometer)," Proc. SPIE 9147 (2014).

Authors should inquire of one of the PIs about the appropriate references and the recommended form of the acknowledgement at the time of submission. Currently, the correct acknowledgement reads:
"This work used the Immersion Grating Infrared Spectrograph (IGRINS) that was developed under a collaboration between the University of Texas at Austin and the Korea Astronomy and Space Science Institute (KASI) with the financial support of the US National Science Foundation under grant AST-1229522, of the University of Texas at Austin, and of the Korean GMT Project of KASI."

Talks and Colloquia:

The IGRINS editor should be informed of any IGRINS conference talks or colloquia given by team members or observing PIs. No approval is needed for talks about one's own results. Review talks or summary talks about IGRINS results or instrument performance, however, should have approval of the PI of the speaker's team.