IGRINS Newsletter -- 2015 Trimester 1

Dear IGRINS community:

This Newsletter is the second since IGRINS was commissioned, and the first time that we report on a full trimester of regular science operations. UT and KASI observers were awarded 47 nights on the 107-inch in 2014 Trimester 3, and another 55 are scheduled for 2015 Trimester 1. In this edition we report the current instrument status, remind observers of their obligations when requesting IGRINS time, explain an update to the IGRINS Exposure Time Calculator, and share some early science results from the IGRINS user community.

The next proposal deadline is January 31st, 2015, and 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 January 23rd so they can be reviewed for feasibility ahead of the proposal deadline (January 31st).** Proposals that meet these early deadlines do remarkably better with the TAC.

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 for a bright target and ~20 minutes for fainter targets. It takes ~10 minutes to rotate IGRINS to a new position angle.

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 returned to McDonald in September 2014 and will continue to be used regularly through 2015 Trimester 2. The Pipeline Package is continuing to be developed by Dr. Jae-Joon (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. Detector persistence in the H band has been reduced and the echellograms have remained stable to within 0.1 pixels. *We anticipate returning IGRINS to UT in August for minor refurbishments and it will not be available early 2015 Trimester 3.*

2. Scientific Data from the Commissioning Runs

In the May and July, 2014 commissioning runs we observed targets submitted by members of the community that could aid potential observers in assessing the scientific capabilities of IGRINS and evaluating possible observing protocols. During these runs we observed young stellar objects, late-type stars, planetary nebulae, supernova remnants, and the circum-nuclear disk in the Galactic Center. We have distributed the logs and links to the data files for those who are interested in reducing and analyzing IGRINS spectra. Any member of the IGRINS community may examine the 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.

3. Lessons from 2014 Trimester 3

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.

The faintest guide star used to-date was K=12.4 mag with 30s slit-view images. If your target is fainter than K=9.5 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.

4. 2015 Trimester 1 Proposals for IGRINS

    a. Proposals

The McDonald Observatory time allocation committee received 27 proposals for IGRINS time for Trimester 1 (2015 December-March) for a total of 73 nights. For Dec-Mar, there are 55 nights of scheduled IGRINS time. Proposals covered a broad range of scientific topics. Most proposals came from within the UT and Korean communities with many having co-I's in both communities, which is strongly encouraged.

b. Schedule

In 2015 Trimester 1 IGRINS observations are scheduled for ~50% of the available time. The McDonald observing schedule is available on the link here (http://www.as.utexas.edu/mcdonald/schedules/). In summary IGRINS observations are scheduled for Dec 1-9, Dec 23-Jan 7, Jan 20-Feb 1, and Feb 20-Mar 8 in the current trimester.

5. 2015 Trimester 1 Observers

It is important that you familiarize yourself with the instrument before you come to the telescope. We recommend that observers review the IGRINS wiki, which you can find at https://wikis.utexas.edu/display/IGRINS/Manuals. There are specific methods for acquiring your targets and establishing guiding.
Please contact Hwihyun Kim (hwihyun@astro.as.utexas.edu), Greg Mace (gmace@astro.as.utexas.edu), or Kyle Kaplan (kfkaplan@astro.as.utexas.edu) to meet and plan your observing run well in advance.

We suggest observers bring the following:

1. Finder charts generated from Kyle's observability tool (marked with possible off-slit guide stars)
2. A TCS worklist with your targets and nearby A0 telluric standards.
3. Blank logsheets (printed or digital).

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

6. Exposure Time Calculator – Version 3

Huynh Anh N. Le and Soojong Pak (Kyung Hee University) have examined the IGRINS Exposure Time Calculator (ETC). They found a small bug in the calculation routine. In addition, the total throughput values are revised based on more realistic slit transmission and obscuration values. The updated ETC program (version 3.0) can be downloaded from http://irlab.khu.ac.kr/~igrins

Comparing with ETC version 2.11 with version 3.0 reveals that the limiting magnitudes are ~0.3 magnitudes brighter. We understand that the revised ETC results are more realistic to the observation results. The details of the ETC can be see in in the IGRINS ETC paper which was just submitted to Advances in Space Research.

7. IGRINS and Future Plans

IGRINS will be fully available to UT and Korean astronomers in 2015 Trimester 2 (April 2015 – July 2015). After the July run, IGRINS will be brought back to the UT lab for the IGRINS instrument team to perform annual maintenance. There is considerable interest in developing a future arrangement with another facility to provide our communities with a larger telescope. We will keep the community informed as these discussions unfold.

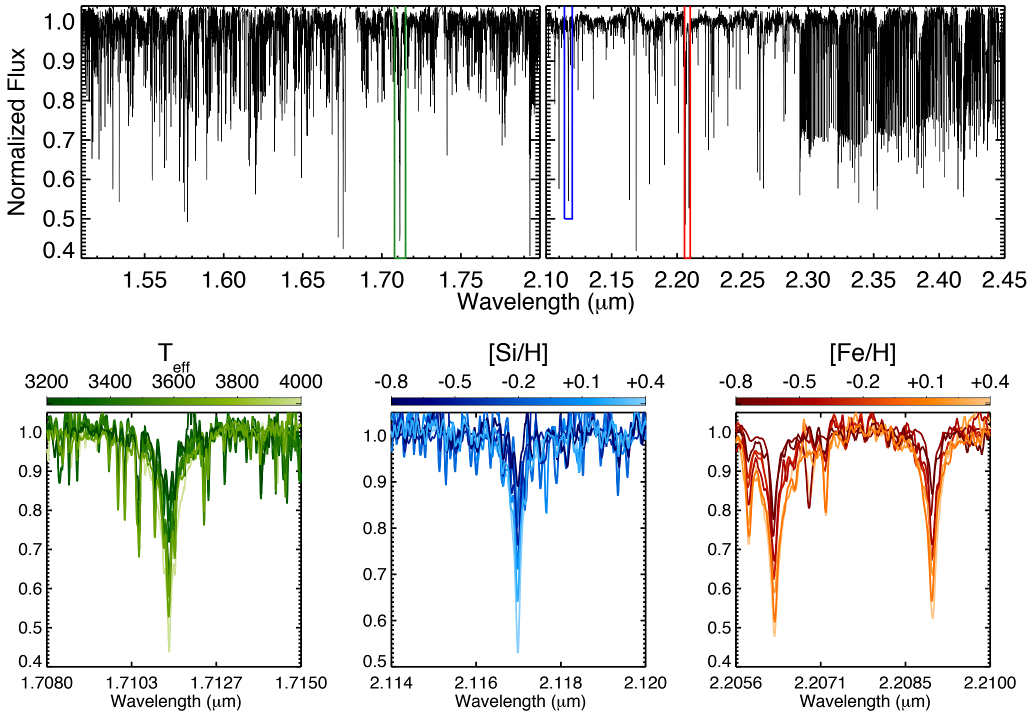
8. Deadlines for 2015 Trimester 2

Proposals for use of IGRINS on the McDonald 2.7m telescope during 2015 Trimester 2 will be due at the end of January 2014. 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 January 23rd 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.

Dr. Andrew Mann, UT, Harlan J. Smith Postdoctoral Fellow

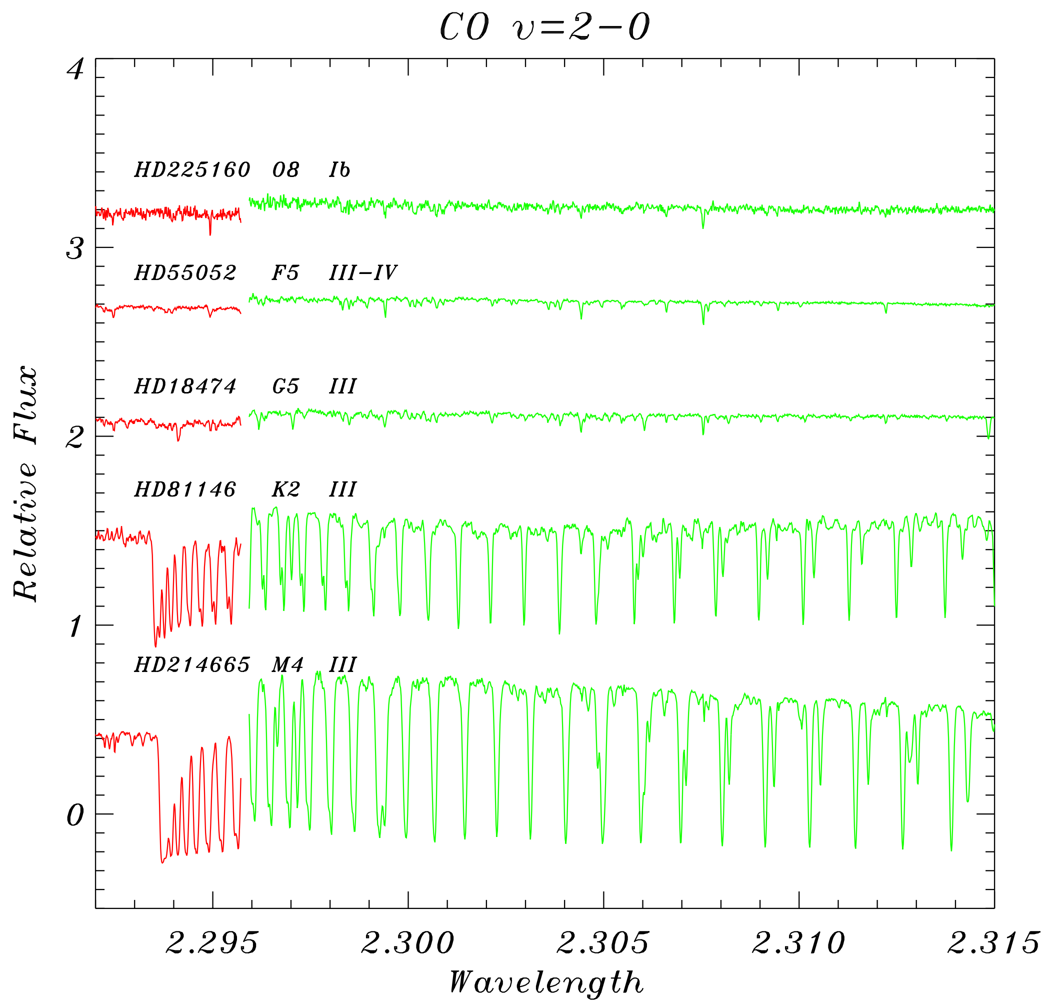


Top: Full IGRINS spectrum, with a small region around 1.9 microns removed due to significant telluric contamination. The bottom panels show three different zoomed in regions of the IGRINS spectrum, each with 7 IGRINS spectra (not the same 7). The spectra are colored by effective temperature (left, green), Si abundance (a proxy for alpha abundance, blue, middle), and [Fe/H] (red, right). The specific features are (from left to right) Mg, Si, and an Na doublet (Si and Sc lines can also be seen). The spectra in the right two panels are from wide binaries containing a Sun-like primary, from which their abundances are derived. The spectra in the leftmost panel have their effective temperatures determined from stars with interfeometric angular diameters. The effect on these features is extremely strong, suggesting that a single IGRINS spectrum can be used to precisely determine all the important parameters of M dwarfs needed for upcoming exoplanet surveys (e.g., TESS). Using a larger fraction of the spectrum will only improve the precision.

IGRINS Spectral Library Project (Jeong-Eun Lee, Sunkyung Park, Wonseok Kang, Sang-Gak Lee, Moo-Young Chun, Kang-Min Kim, Ueejeong Jeong, In-soo Yuk)

The high-resolution NIR spectra is very important not only for better understanding of stellar photospheric features but also for providing of high quality template spectra to the studies of circumstellar objects such as planets and disks. Therefore, we aim to construct an inventory of high-resolution NIR spectra covering all spectral types and luminosity classes. Last November, a subsample from our targets of standard stars were observed. Figure 1 shows the CO v=2-0 overtone transitions toward 5 different spectral types for the luminosity class III sources.

Figure 1. -



IGRINS Survey of Protoplanetary Disks
(Jeong-Eun Lee, Sunkyung Park, Seokho Lee)

The physical and chemical structures of the inner gaseous disks provide clues to the planet formation and accretion processes within young stellar systems. We aim to study disks in wide ranges of age, luminosity, and mass (from Class I to wTTSs, and from low-mass TTSs to Herbig Ae/Be stars and massive YSOs). The power of IGRINS is the high spectral resolution to resolve different gas components in velocity. Figure 2 shows the CO v=2-0 overtone transitions, which are composed of three different velocity components, toward a wTTS, Anon1; the blue, green, and purple lines indicate our model fitting of three individual components while the red line shows the sum of the three components. In addition, to study the effect of heating by outburst on the physical and chemical structure in disks, we observe FU Orionis objects. Figure 3 shows the CO v=2-0 bandhead toward 5 FU Orionis objects; the rotation of disks can be studied by the bandhead profile.

Figure 2.-

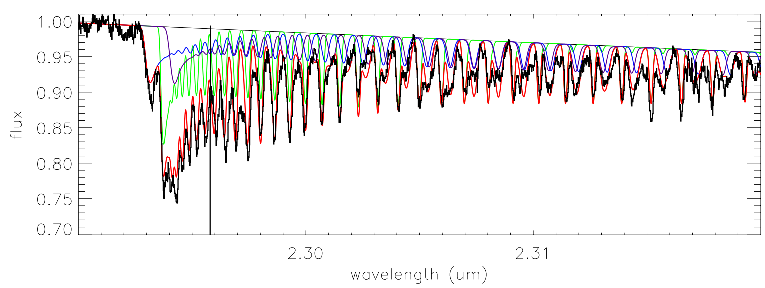
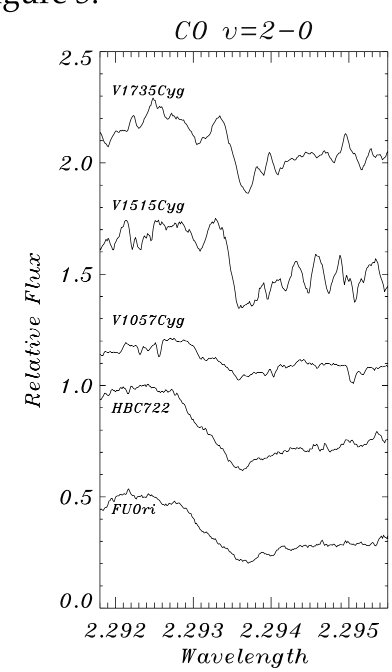
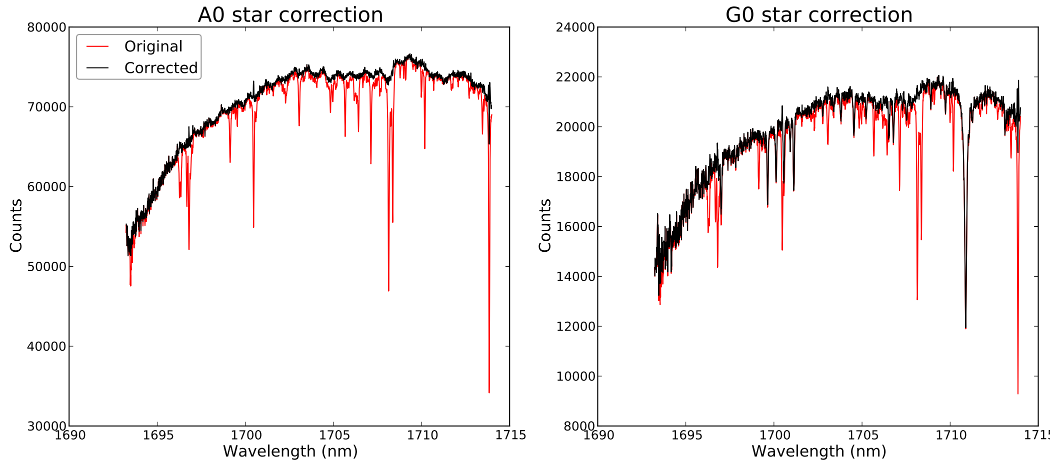


Figure 3. -



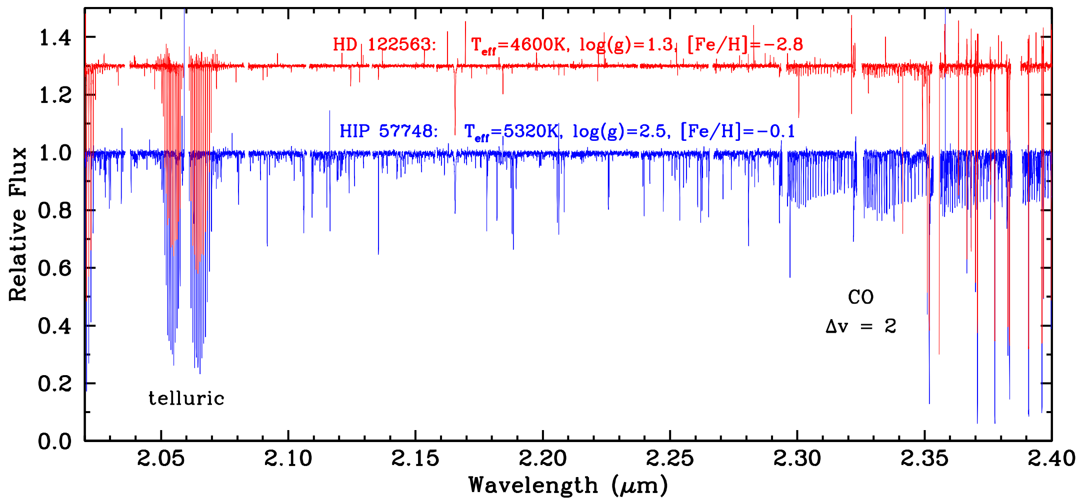
Kevin Gulikson, UT, Graduate Student



This figure demonstrates fitting a telluric model spectrum to correct both early and late-type stars, using the TelFit code (Gullikson et al. 2014). The code adjusts the H2O, CO2, CO, N2O, and CH4 mixing ratios in Earth's atmosphere to find the best fit to an observation, and uses the temperature, pressure, and telescope zenith angle as non-varied inputs. On the left panel is the spectrum of an A0V star before correction (red) and after correction (black). The narrow telluric lines are removed with small residuals (on the order of a few percent of the the continuum). Most of the remaining features in the spectrum are instrumental in origin.

The right panel shows the correction for a G0 star. Since the star itself has narrow lines, a direct telluric fit can become unstable and produce erroneous results. To produce a telluric model for a late-type star, I used a B9 star observed just before, *but not at the same airmass*. In this case, the science target airmass was z=1.10, while the standard star airmass was 1.32. I found the best-fit model parameters to the B9 star, adjusted the zenith pointing angle to match that of the G0 observation, and generated a telluric model with the best-fit parameters. This procedure still requires an early-type star, but significantly loosens the constraints on both the spectral type and the airmass difference between the science and standard star.

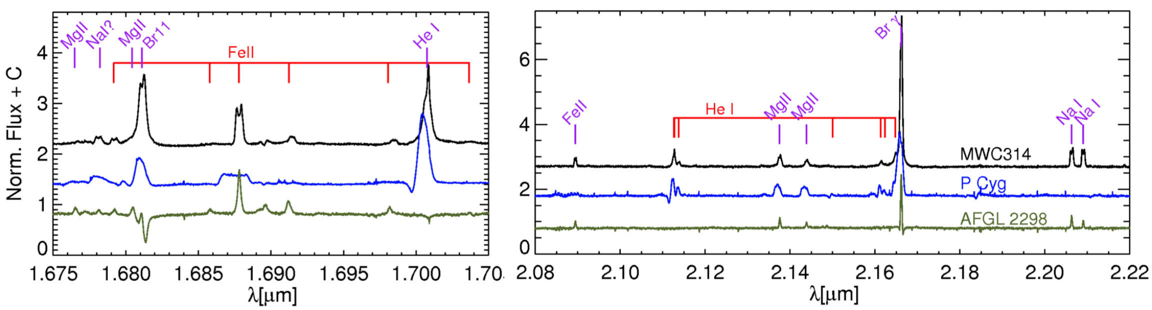
Drs. Chris Sneden and Melike Afsar, UT



During commissioning, the IGRINS team observed the bright very metal-poor stars HD 122563 and HD 140283. We have detected transitions of Fe, Mg, Si and Ca in both stars, and from them we have derived metallicities and abundance ratios that are consistent with previous investigations. The significant advance is in the large increase in number of transitions available in the H & K bands, with concomitant increase in abundance accuracy over past visual-wavelength investigations. In HD 122563 we also have detected IR transitions of OH and CO, which will greatly improve the accuracy of C and O abundances in these evolved stars. We will be presenting a poster at the Seattle AAS meeting on HD 122563, and writing up a journal paper on these two stars within the month.

Hyun-Jeong Kim, SNU

During the IGRINS commissioning run, we observed two luminous blue variables(LBVs) --P Cygni and AFGL 2298-- and one LBV candidate in a binary system MWC314. We have detected Brackett series of hydrogen, He I lines (with or without P-Cygni profiles), and metallic lines such as Mg II or Fe II, which are generally observed in LBVs. Whereas most lines in LBV spectra are broad due to their strong stellar winds, the IGRINS spectra have revealed new features hidden in a broad line. Double-peak profiles from a circumbinary disk in MWC 314 are usually observed in metallic lines in optical, but we have clearly detected them in hydrogen lines as well. In P Cygni spectrum, we have found complicated discrete components at negative velocity of the higher Br-series lines (from Br 10 upto ~Br 15) and a double-peak feature in the Br-gamma line. On the other hand, the higher Br-lines in AFGL 2298 have been observed as absorption, but another weak emission component inside absorption profiles has been also discovered.



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.