10th Annual

GRAM 2011
GEORGIA REGIONAL ASTRONOMY MEETING

Talks & Posters Abstracts

Morning Talks

Richard Schmude, Jr. - Gordon College:
Jupiter's Changing North Equatorial Belt

Monthly latitude measurements of Jupiter's North Equatorial Belt are reported between 1995 and 2011. Measurements were made using images submitted to the speaker. All latitudes are zeoncentric. The width oscillated with a period of about 4 ½ years over the study period. This is similar to what it did between 1896 and 1953. The latitude of the northern boundary of the NEB changed a lot more than that of the southern boundary. There is little correlation between belt width and the number of NEB barges. There is also little correlation between belt width and the average drift rate of NEB barges.

David Dundee - Tellus Science:
Fire Ball Meteor Camera at Tellus

This is a NASA funded project that places meteor cameras at various sites around the country. These cameras are equipped with fish eye lenses that are fixed inside of a PVC pipe (on the roof of our museum). They record every night and are triggered by light and motion. So bright meteors, lightning and aircraft usually get recorded. Our camera is one of 4 sites in the southeast to eventually become a network of 15 cameras. Every morning images are downloaded through the internet and the data is combined with other sites. This network of cameras determines the speed, height and direction of bright meteors. We are able to access images from our site and other sites. This is an ongoing project that detects about 4 to 6 bright object every clear night.

Rob Parks – Georgia State University:
A Long Term Study of the Near-Infrared Variability in the Molecular Cloud rho Ophiuchus

Presented are the results of a near-IR photometric survey on ~1700 stars in the direction of the Ophiuchus star forming region using data from the 2MASS Calibration Database. For each target in this sample, up to 1584 individual J, H and Ks band photometric measurements are obtained over 3 observing seasons spanning ~2.5 years; it is the most intensive survey of stars in this region to date. This survey identifies 101 stars as variable using criteria sensitive to long and short timescale variations.

The Ks band peak-to-trough amplitudes from 0.044 to 2.31 mag and (J-Ks) color amplitude between 0.053 to 1.47 mag. A subset of these variables, 22 stars, are suggested as new candidate members of the Oph star forming region based on variability, on-cloud location and position on a color-magnitude diagram. From the 101 variable stars, a novel period-searching algorithm identifies 32 stars as periodically variable with periods from 0.49 to 92 days. Increases or decreases in stellar flux over long timescale (> 60 days) is identified in 31 stars with timescales ranging from 64 to 790 days. The timescales are measured from the brightest point in the photometry to the lowest. The majority of variable stars (41) exhibit sporadic, non-periodic variability over the ~2.5 years. Variability is, also, identified in 79% of previously classified young stellar objects. In addition, this work discusses specific stars of special interest to young star evolution and stellar variability analysis.

Agnes Kim – Georgia College and State University:
Asteroseismology of the Kepler Field DBV
We present an asteroseismic analysis of the helium atmosphere white dwarf (a DBV) recently found in the field of view of the \emph{Kepler} satellite. We analyze the 5-mode pulsation spectrum that was produced based on one month of high cadence Kepler data. The pulsational characteristics of the star and the asteroseismic analysis strongly suggest that the star is hotter (29200~K) than the 24900~K suggested by model fits to the low S/N survey spectrum of the object. This result has profound and exciting implications for tests of the Standard Model of particle physics.

Misty Bentz - Georgia State University:
STARE: Calibrating Black Hole Masses in Active Galaxies
The Southern Telescope AGN Reverberation Experiment (STARE) is a world-wide collaboration of small and medium aperture telescopes monitoring active galaxies with the intent of measuring the masses of their central supermassive black holes. I will give a summary and update on STARE's first monitoring season.

Cherilynn Morrow - Georgia State University:
AstroJazz - Integrating Astronomy, Music and Art in Education

Kyujin Kwak – University of Georgia:
Simulations of High Velocity Clouds
High velocity clouds (HVCs) are neutral hydrogen clouds whose motion significantly deviates from the Milky Way's rotation. Recent studies found that some HVCs are in the Milky Way's halo and that some HVCs are highly ionized containing C IV, N V, O VI, and Si IV. By using hydrodynamic simulations, we studied a scenario for highly ionized HVCs in which an H I HVC interacts with hot ambient gas in the Milky Way's halo. The simulations self-consistently traced the non-equilibrium ionization evolution of carbon, nitrogen, oxygen, and silicon. Our simulations showed

that the cool gas ablates from the cloud via shear instabilities and undergoes turbulent mixing with the hot ambient gas. The high ions are abundant in the mixed gas. We predicted column densities and emission intensities of high ions and compared our results with observations and predictions from other models.

Robin Shelton – University of Georgia:
Simulations of High Velocity Clouds - Their X-ray Signatures
Surrounding and sometimes impinging upon our Galaxy are a number of massive, high velocity clouds of gas. Their affect on the Milky Way is to mix with, supplement, and sometimes shock-heat the gas in our Galaxy. Observers have recently noted X-rays,apparently from a couple of the clouds. X-rays generally originate in extremely hot gas, creating another indicator of the energetic nature of the interactions between the clouds and the Milky Way. In this presentation, I will discuss hydrodynamic simulations of cloud-Galaxy interactions that were performed in order to probe the X-ray productivity. We examined two basic phenomena, shock-heating, and mixing, finding that shock-heating can result in the observed X-ray signal, but only if radiative cooling is mysteriously disallowed.

Noel Richardson - Georgia State University:
New Telescopes, New Instruments, New SCIENCE! Recent Updates to GSU's Hard Labor Creek Observatory
Georgia State University has recently begun a large renovation of its Hard Labor Creek Observatory, located in Rutledge, GA. I will present information on the history and development of the site. I will show the development (so far) of new telescopes and a second building. We have obtained a new spectrograph for the new telescopes and it has been commissioned and has seen first science results. I will present some of these spectra and talk about the new science prospects at the observatory using this instrument and also with another new telescope and camera.

Tom Crowley (Sara Past President) – Atlanta Astronomy Club:
Society of Amateur Radio Astronomy (SARA) Outreach Programs
SARA is concerned that students are not excelling in the sciences. To help assist schools and individual students worldwide we are providing financial assistance in the form of grants to students and schools for radio astronomy projects. SARA, in conjunction with Stanford University and NASA, are providing radio astronomy projects for schools and students worldwide. SARA builds, ships, and provides mentoring and support for the Stanford SUPERSID VLF radio which is used to detect Sudden Ionospheric Disturbances (SID) from the Sun. SARA also provides financial aid and mentoring for the NASA RadioJove project. RadioJove detects Jovian and Solar radio emissions.

Sarah Higdon – Georgia Southern University:
Going Live - Georgians Experience Astronomy Research in Schools

The Georgians Experience Astronomy Research in Schools (GEARS) project aims to provide a rigorous and inquiry-based astronomy curriculum to GA's public schools. Exposure to data mining and research activities using the astronomy archives can be the trigger for the next generation of scientists, and it improves a student's ability to solve problems. Students then consolidate their findings and improve their communication skills by writing scientific reports and creating video presentations. The GEARS curriculum has units on the solar system, life in the Universe, stars, galaxies and cosmology. Here I present some of the activities in the Galaxy and Cosmology Units. The GEARS material is freely available.

Posters

Emily Aldoretta - Georgia State University:
Spectroscopy of delta Sco's Recent Periastron

Be stars are a subclass of B stars that experience rapid rotation and have thin, gaseous equatorial disks. The bright star δ Scorpii (also called Dschubba) is a long period (~11 year), highly eccentric (e~0.95) binary with a Be primary star. During the previous periastron in 2000, the primary developed a Be type disk that had not been previously observed. During the recent periastron passage (UT 2011 07 06), the secondary star came within 1.1 stellar radii of the circumstellar disk, causing major changes in the Hα profile that we show here. All spectroscopic data shown were taken at Georgia State University's Hard Labor Creek Observatory (HLCO) located in Rutledge, GA using the 20-inch RC Optics Telescope, an LHIRES III Spectrograph, and an SBIG ST-8XME CCD camera.

Saida Caballero - Georgia State University:
High Angular Resolution Observation of Massive Stars

It is a widely accepted fact that massive stars love company and have a significant affect on the evolution of the universe, from galactic dynamics and structure to star formation. However, our knowledge of O-type multiple systems with periods in the range from years to thousands of years is incomplete. The Fine Guidance Sensors (FGS) on the Hubble Space Telescope and Adaptive Optics at the Gemini Observatory North are ideal for finding widely separated binaries at high angular resolution within a differential magnitude of 3 mag or greater and separations of at least 0.1 arcseconds. At a distance of 1.7 kpc, Cyg OB2 provides a nearby, young stellar environment, rich in high-mass stars. We observed 75 O- and early B-type stars and determined that 42% of the sample have at least one statistical companion.We present these initial results as part of an ongoing survey of O-stars with FGS.

Jay Dunn - Georgia Perimeter College:
Determining the Source of Reddening in Low Ionization BAL Quasars
We present here the results of a search for objects that exhibit both strong narrow line emission for Balmer Hbeta 4861 Ang, Hgamma 4340 Ang, as well as broad absorption lines (BALs) due to MgII 2800 Ang and FeII 2600 Ang. associated with outflows (FeLoBALs). We found 2 objects in a search of all spectra taken by the SDSS through Data Release 7. Furthermore, we also include one object that was known prior to our investigation that does not show the FeII absorption in the SDSS spectrum. The strong Balmer lines associated with the narrow line region (NLR), allow us to determine if the source of reddening seen in these objects, common in FeLoBALs, lies interior to the NLR for these three objects, which has implications on the estimations of energetics for the outflows in general.

Amanpreet Kaur - Clemson University:
The First Ultra-Luminous X-ray Transient in M31
We report on Chandra/Swift/XMM-Newton observations of an ultraluminous
X-ray (ULX) source in M31 discovered by Chandra-HRC-I on December 17,
2009. The light curve was established using follow up observations with Swift-XRT and XMM-Newton. The X-ray spectrum is best fit by a combination of a thermal component with kT ~ 1 keV and a non-thermal component with photon index ~ 2.6. The maximum unabsorbed X-ray luminosity (Lx) derived from this data is 3.8 x 10^{39} erg/s, and subsequently decreased to 0.6 x 10^{39} erg/s on a time scale of one month. The luminosity exhibits an exponential decay with a time constant of 34 days. The estimated mass of the underlying black hole is ~ 14 solar masses.

Amy J. Lovell – Agnes Scott College & Ellen S. Howell – Arecibo Observatory:
Radio OH Observations of Comets
We have observed 18-cm OH lines in over twenty long- and short-period comets in the past decade. 1665 and 1667 MHz spectra were observed with the Arecibo Observatory 305m and with the National Radio Astronomy Observatory (NRAO) Green Bank Telescope (GBT), at spatial resolutions of 4 and 8 arcminutes. Such spectral line observations provide useful constraints on the gas production and velocity in the coma, and the distribution of outgassing from the nucleus. In addition, spatially-resolved spectroscopic mapping observations on these large arcminute scales provide constraints on the excitation conditions in the coma, including collisional quenching. Results will be presented to enable comparison amongst the categories of comets and at differing heliocentric distances.

David Moffett – Furman University & Ale Ham – University of Florida
Mapping Hydrogen in the Galactic Plane with a Small Radio Telescope
We present observations of the 21-cm (1420 MHz) hyperfine line of hydrogen taken with a 4.6-m radio telescope at the Pisgah Astronomical Research Institute. We recorded hydrogen spectra from the Galactic plane from l = 347 degrees, through the Galactic Center, to l = 231 degrees. These spectra were used to create a map of Galactic longitude vs. LSR velocity along the plane. These data were also used to find a radial velocity curve of the Milky Way, which yields an estimate of the galaxy's mass and experimental evidence for dark matter in the Milky Way. We describe the process for deriving these data products, which can be used on these data again for a introductory astronomy activity, or can be used on spectra recorded from a small radio telescope.

Rob Parks - Georgia State University:
Can CHARA Image Cool Starspots?
We present H band interferometric images of cool starspots on the chromospherically active giant Lambda Andromedae. Images span roughly 75% of the rotational period with a cadence of ~1 week. The data were obtained using all six telescopes in the CHARA array with the MIRC beam combiner. Model solutions provide direct measurements of cool starspot properties. Images are constructed with MACIM implementing a new gradient suppressing regularizer. We obtained consistent results between model solutions and MACIM reconstructions. The results of simulations testing model fidelity based on uv sampling are presented. In addition, we present evidence interferometrically measured diameters are insensitive to cool starspot presence at an ~2.5% confidence level.

Stephen Ramsden - www.solarastronomy.org:
Live Narrowband Solar Astronomy
Stephen Ramsden (Director www.solarastronomy.org) presents live narrowband viewing of the Sun's Chromosphere and Photosphere through observatory quality solar scopes from Sun up to Sun down on Saturday. Mr. Ramsden runs the largest Solar Astronomy Outreach program in the world from right here in Atlanta.

Chris Shull & Samuel Thomas – North Georgia College and State University:
STARE at North Georgia
The undergraduate Astronomy and Astrophysics Research Group (AARG) at North Georgia was given the opportunity to participate in the STARE Consortium, headed by Dr. Bentz at Georgia State University. Two of four STARE Consortium AGN targets may be monitored from our observatory. Images of AGN NGC 6814 & 7469 were taken in four different filters (B, V, R, & I) with the 0.4 m NGAO telescope. The North Georgia STARE team consisted of

fifteen different observers who were responsible for monitoring the targets 5 nights a week since the beginning of the autumn semester. The CCD images are being reduced to obtain high precision differential photometry for the monitoring period. This poster presents preliminary light curves in the four filters for the two AGN targets. These data will aid the larger STARE project in achieving its goals, as well as provide R & I images that were not taken at any other facility.

Samuel Thomas, Nic Collins & Chris Shull – North Georgia College and State University
NERT Reloaded
Previous experimentation with the old NERT receiver system resulted in radio detection of the Sun using transit scan techniques. An updated version of the receiver system was acquired from Radio Astronomy Supplies and used with the same dish to continue the project. Since we only detected the Sun with the old system, solar transit scans were obtained with the new receiver to compare the new and old systems. The updated system performance indicated that Cas A would be easily detected with the new receiver and the new system detected Cas A during several transit scans. Temperature data taken along with these scans revealed significant effects on the output signal due to the receiver temperature. Even with the temperature effects, we were able to estimate the calibration of the receiver output signal using the Cas A transit scans: 5.925E5 Jy/V normalized to a gain of 10 dB. Using this calibration we have estimated the detection limits for the small NERT and the expected limits when we are able to use the larger 5 m dish.

Rosa Williams - Columbus State University:
A Database of Magellanic Cloud Supernova Remnants

Jen Winters - RECONS/Georgia State University:
A SMARTS Distance Runner: the 0.9m at CTIO
We present a photometric census of the southern sky, with particular emphasis on the large number of newly discovered red dwarfs within 25 pc. In total, we have now collected VRI photometry for ~1400 objects, over a thousand of which are M dwarfs with V-K > 3.0. When we combine our VRI photometry with 2MASS JHK magnitudes, we are able to estimate photometric distances accurate to 15%. The nearest candidates are then added to the target list of our astrometry program CTIOPI (Cerro Tololo Inter-American Parallax Investigation), which now has in excess of 500 red dwarf neighbors of the Sun.

Lunch Break

Grab a sandwich and walk up the hill to the Observatory to see:

Stephen Ramsden - www.solarastronomy.org:
Live Narrowband Solar Astronomy

Afternoon Talks

Philip Groce – Helping Planetariums Succeed:
Observing 2012 Transit of Venus

Larry Krumenaker – The Classroom Astronomer Magazine:
The Legacy of Queen Seondock - Astronomy in Korea
Cheomsangdae is the oldest and most complete astronomy relic in Korea and East Asia but that doesn't mean astronomy is dead today in the land of the Morning Calm. A look at observatories, ancient and modern, and where astronomy fits into 21st century Korean education. Time permitting, a look at Korean astronomy misconceptions and statistics about astronomy knowledge there versus North America.

Nicole Makely – Agnes Scott College:
Observing Exoplanetary Transits with the SARA Telescopes
An overview of observing exoplanetary transits with the SARA Consortium ground based, remotely controlled telescopes, in conjunction with MIRA and extended scripts, as the primary data reduction software.

Adric Riedel - Georgia State University:
AP Col and Other Stellar Babies
Not too long ago, the idea of young stars in the solar neighborhood was unheard of. I will discuss what we currently know about nearby young associations, including the new closest stellar baby, AP Col.

Joe Jones – North Georgia College and State University:
AARG: Our 'Motley Crew' at North Georgia
Our undergraduate research group at North Georgia, the Astronomy & Astrophysics Research Group (AARG) is a diverse group of students, including Physics, English, and Criminal Justice majors and advanced amateur astronomers. This year we have had the wonderful opportunity to participate in the Southern Telescopes AGN Reverberation Experiment (STARE) organized by Dr. Misty Bentz (GSU). We are one of many teams and individuals who are monitoring two of STARE's target AGNs visible from northern latitudes. We also have continued developing our North-Georgia Educational Radio Telescope (NERT) project, by acquiring an updated receiver system and detecting the next brightest radio source in the sky after the Sun, the supernova remnant Cas A.

Monique Aller – University of South Carolina:
Interstellar Silicate Dust in a z=0.9 Quasar Absorption System: Crystalline Silicates at High-z?

Interstellar dust plays a crucial role in studies of the evolution of galaxies, impacting both physical processes driving the evolution, such as star-formation, and the heating, cooling, and ionization of interstellar material, as well as affecting our interpretation of the radiation observed from distant objects. However, while the properties of dust in the local interstellar medium have been studied extensively, relatively little is known about the properties of the dust in higher redshift objects. Using radiation from distant quasars which has passed through foreground absorption systems, it is possible to directly probe the global properties of dust in intermediate-redshift galaxies. We present evidence from Spitzer Space Telescope infrared spectra for silicate dust, possibly of a crystalline structure, in one such z=0.9 quasar absorption system, and briefly discuss the broader implications of this finding on studies of extragalactic dust. This research is supported by NSF-grant AST-0908890 and Spitzer-award PID-50783 through JPL/Caltech/NASA.

Manjeet Singh – Clemson University:
Evaluation of the ^{26}Al method as a Star Formation Rate Indicator
The aim of this work is to evaluate the "^{26}Al method" used to determine the Galactic Star Formation Rate (SFR) and compare it to other alternative methods. 26Al is a radioactive isotope produced mainly in massive star winds and in the ensuing core collapse supernova explosion. The radioactive 26Al decays with a life time of 106 years by emitting γ- ray photons in 1.808 MeV band. The 26Al method involves using the Galactic 26Al radioactive flux as a tracer. This approach based on the γ- ray line measurements does not suffer from extinction and small number statistics. To evaluate the 26Al method, we model the spatial distribution of massive stars by Monte-Carlo methods and simulate the kinematics of radioactive 26Al produced in massive star winds and supernovae explosions. The uncertainties associated with the 26Al method are largely due to uncertainty in the possible sources of 26Al and the yields associated with each source.

Dan Llewellyn – Atlanta Astronomy Club:
Jupiter, Mars, Saturn Imaging for the Amateur Astronomer
I will be demonstrating how amateur astronomers have contributed to planetary research and science by imaging from their backyards. A brief overview of what is involved with Planetary Imaging and photos of Mars, Jupiter and Saturn will be shown, with recent storms and impacts caught by devoted planetary imagers.

Varsha Kulkarni – University of South Carolina:
Interstellar Matter across Cosmic Time
Understanding of interstellar matter in galaxies is important for the study of galaxy evolution. Absorption lines in quasar spectra

allow us to obtain detailed chemical and kinematic information about interstellar matter in galaxies along the line of sight. We discuss our ongoing studies of quasar spectroscopy and imaging to attempt to address various aspects of the evolution of interstellar gas and dust: e.g. how interstellar metallicity built up with time, and how it relates to the dust content, galaxy luminosity, star formation rate, etc. This work is supported in part by NSF grants AST-0908890 and AST-1108830.

James Higdon – Georgia Southern University:
The "Over-Cooked" ISM in Starburst Ring Galaxies