Astro Con DC 2017 (ACDC2017)

Thursday, July 27th

Galactic Session 1: 9:00-10:15
9:00-9:30 : Oleg Kargaltsev (GWU)
9:30-9:50 : Nicholas Gorgone (GWU)
9:50-11:10: Laura D. Vega (NASA GSFC/ Vanderbilt University)

Coffee Break + Posters: 10:15-10:45

Galactic Session 2: 10:45-12:05
10:45-11:05: Justin Linford (GWU)
11:05-11:25: Amir Jafari (JHU)
11:25-11:45: Jeremy Hare (GWU)
11:45-12.05: Noel Klingler (GWU)

Lunch Break: 12:05-1:15

Special Talk: Career Presentation
1:15-1:45: Padi Boyd (NASA GSFC)

Extragalactic Session 1: 1:45-3:00
1:45-2:15: Brad Cenko (NASA GSFC)
2:15-2:35: Mary Keenan (UMBC)
2:35-2:55: Stephen Walker (NASA GSFC)

Coffee Break + Posters: 3:00-3:30

Extragalactic Session 2: 3:30-4:55
3:30-3:50: Eric Burns (NASA GSFC)
3:50-4:10: Hsiang-Chih Hwang (JHU)
4:10-4:30: Nathaniel Roth (UMCP)
4:30-4:50: Tiffany Lewis (George Mason University)

Happy Hour at The Hive: starting ~5:15

Friday, July 28th

Galaxy, Cosmology and Instrumental Session: 9:00-10:20
9:00-9:20 : Elizabeth Tarantino (UM)
9:20-9:40 : Michael Busch (JHU)
9:40-10:00 : Matthew Berkeley (CUA)
10:00:10:20: Pradip Gatkine (UMCP)

Coffee Break + Posters: 10:20-10:45

Solar System Session 1: 10:45-12:00
10:45-11:15: Vladimir Airapetian
11:15-11:35: Andrew Leisner (UM)
11:35-11:55: Joseph DeMartini (UMCP)

Lunch Break: 12:00-1:00

Solar System Session 2: 1:00-1:45
1:00-1:20: Chigomezyo Ngwira (CUA)
1:20-1:40: Zeeve Rogoszinski (UM)

Exoplanet Session 1: 1:45-2:15
1:45-2:05: Erika Nesvold

Coffee Break + Posters: 2:30-3:00

Exoplanet Session 2: 3:00-4:00
3:00-3:20: Aparna Bhattacharya (NASA GSFC/ UMCP)
3:20-3:40: Sean Terry (NASA GSFC/ CUA)
3:40-4:00: Clement Ranc (NASA GSFC/ USRA)

Posters:

Galactic:
Adina Feinstein (NASA GSFC)

Extragalactic:
Maxwell Atkins (UMBC)
Noah Kasmanoff (UM)
Kiera Lyons (CUA)
Sydney Paugh (NASA Summer Intern/ University of St. Thomas)
Peter Breiding (UMBC)

Galaxies:
Tianxing Jiang (Arizona State University)

Cosmology:
Rachel Losacco (NASA GSFC)

Solar System:
Meriem Alaoui (CUA)
Jillian Kunze (NASA GSFC)
Adam Jacobs (George Mason University)

Exoplanets:
Mahmuda Afrin Badhan (UMCP)

Oral Presentation Abstracts:

Oleg Kargaltsev (GWU)
Title: Highlights of High-Energy Astrophysics of Galactic Compact Objects
Abstract: I will present an overview of recent observational results and developments in high-energy astrophysics of galactic compact objects. Results from recent Chandra X-ray Observatory, Hubble Space Telescope, Fermi Gamma-Ray Observatory studies of pulsars, magnetars, high-mass X-ray binaries, TeV sources and other exotic objects will be shown.

Nicholas Gorgone (GWU)
Title: The Swift/XRT Deep Galactic Plane Survey
Abstract: The Swift Deep Galactic Plane Survey utilizes XRT (0.3-10 keV) in the first deep, homogeneous and systematic search for magnetars, HMXBs, and transients. Over two years we will survey 40 sq. deg., in the two regions where the Galactic bar meets the Scutum and Perseus Arms (10 deg < |l|< 30deg and |b| < 0.5 deg) in 366 overlapping 5ks tiles. The survey will be complete to luminosities of L=1.0x10^34 erg/s and relies on multi-wavelength archival and follow up data to determine the nature of new sources as well as spectral and temporal variability. The goal of this survey is to better establish the source populations of compact stellar systems by increasing their numbers for statistical studies. We will also constrain the galactic star formation rate and the nature of massive star evolution.

Laura D. Vega (NASA GSFC/ Vanderbilt University)
Title: Evidence for Disk Obscuration in Kepler Observations of the RV Tau Variable DF Cyg
Abstract: RV Tau variables, named after their prototype, RV Tauri, are identified by the signature pulsation pattern of alternating deep and shallow minima in their light curves. There are two photometric types: RVa stars maintain a relatively constant mean magnitude, while RVb stars show an additional long-period variation (600 - 1500 days) in mean magnitude with amplitudes that can reach up to 2 mag in V. Many RV Tau stars show infrared excess in their spectral energy distribution which is indicative of dust. There is evidence that the dust in both RVa and RVb objects may be trapped in a long-lived circumbinary disk surrounding the pulsator and a companion star. This suggests that the difference between the RVa and RVb classification may be due to a geometrical effect, where RVa stars are seen face-on while RVb stars are seen almost edge-on. However, the precise nature of the rare RV Tau stars is still a mystery. During its primary mission, Kepler observed the archetype RVb star, DF Cygni, producing a 4-year light curve of unparalleled precision and cadence for any RV Tau star to date. We present published results of our analysis of DF Cyg's light curve as well as its spectral energy distribution.

Justin Linford (GWU)
Title: Radio Transient Searches with VLITE
Abstract: The VLA Low Band Ionosphere and Transient Experiment (VLITE) is a commensal low frequency system on the Karl G. Jansky Very Large Array (VLA). Because the VLA repeatedly observes certain areas for either calibration purposes (e.g., 3C286 & 3C48) or as part of deep imaging campaigns (e.g., CHILES), there are many opportunities to search for transient sources. Thanks to the tagging along with VLA observations, VLITE has access to a large swath of parameter space previously unavailable to transient searches, from minute to year timescales.

We are utilizing the LOFAR Transient Pipeline to search for transient sources on multiple timescales with VLITE. We present early results from VLITE image plane transient searches.

Amir Jafari (JHU)
Title: Magnetic Field Transport in Accretion Disks
Abstract: The most plausible theories for launching astrophysical jets rely on strong magnetic fields at the inner parts of some accretion disks. An internal dynamo can in principle generate small scale magnetic fields in situ but generating a large scale field in a disk seems a difficult task in the dynamo theories. In fact, as far as numerous numerical experiments indicate, a dynamo-generated field in general would not be coherent enough over the large length scales of order the disk's radius. Instead, a large scale poloidal field dragged in from the environment, and compressed by the accretion, provides a more promising possibility. The difficulty in the latter picture, however, arises from the reconnection of the radial field component across the mid-plane which annihilates the field faster than it is dragged inward by the accretion. We suggest that a combination of different effects, including magnetic buoyancy and turbulent pumping, is responsible for the vertical transport of the field lines toward the surface of the disk. The radial component of the poloidal field vanishes at the mid-plane, which efficiently impedes reconnection, and grows exponentially toward the surface where it can become much larger than the vertical field component. This allows the poloidal field to be efficiently advected to small radii until the allowed bending angle drops to of order unity, and the field can drive a strong outflow.

Jeremy Hare (GWU)
Title: Puzzling ejections from the high-mass gamma-ray binary PSR B1259-63
Abstract: I will present the analysis of new Chandra X-ray Observatory observations of the high-mass gamma-ray binary PSR B1259-63. During the 2011-2014 binary cycle we discovered an extended feature moving away from the binary with a large projected velocity of $v \approx 0.07c$ and showing a hint of acceleration. The new observations were taken between 2015-2017 and show a new extended feature being launched from the binary system. I will discuss the new results and our current understanding of how these clumps are formed and launched from the binary.

Noel Klingler (GWU)
Title: Deep Chandra Observations of Nebulae Produced by Three Supersonic Pulsars
Abstract: When pulsars move with supersonic speeds, the ram pressure exerted by the oncoming ambient interstellar medium exceeds the pulsar wind pressure, thus confining the pulsar wind to the direction opposite the pulsar motion resulting in a bow shock nebula with an extended tail behind the pulsar. Deep Chandra observations of PSRs J1509–5850, J1747–2958 (the Mouse), and B0355+54 have revealed both the small and large-scale structures of the pulsar wind nebulae (PWNe) produced by these pulsars. We have observed contrasting morphologies of the compact PWN heads, resolved jets and extended tails, and measured the spatially-resolved spectra of these PWNe. We also attempt to make a connection between the pulsar geometries, the appearances of their PWNe, and their light curves in radio and Gamma-rays. For PSRs J1509 and B0355 we have discovered asymmetric misaligned structures similar to those seen in the Guitar and Lighthouse PWNe. These observations probe the physics of magnetized relativistic outflows including particle diffusion, collisionless shock structure, magnetized flow collimation, magnetized plasma turbulence, and reconnection.

Padi Boyd (NASA GSFC)
Title: TBA
Abstract: TBA

Brad Cenko (NASA GSFC)
Title: The Time-Domain Revolution
Abstract: TBA

Mary Keenan (UMBC)
Title: AGN Unification through Radio Spectral Decomposition
Abstract: Active Galactic Nuclei (AGN), powered by a supermassive black hole (SMBH), are among the most energetic phenomena in the universe. They can emit radiation throughout the entire electromagnetic spectrum. Radio- loud AGN have large-scale jets on either side of the SMBH. These jets cause material to propagate away from the SMBH and into radio-emitting lobes. The two major components of the low-frequency spectral energy distribution (SED) for these AGN are the lobe emission and the jet emission. The jet emission is relativistically beamed along the jet axis, which cause it to be highly affected by the orientation of the jets. The extended emission, however, emits isotopically, and so is independent of the jet orientation. This extended emission can be separated from the rest of the spectrum for a time-integrated measurement of the power of the source. Current AGN unification models characterize sources based on their morphology, which can lead to an unclear distinction in some cases. Meyer et al. (2011) introduces the "Blazar Envelope" which characterizes the sources based on having either strong or weak jets, which clarifies the distinction between AGN classes. An interactive python program is being made to decompose these spectra faster and more efficiently, so that thousands of AGN spectra can be processed, and can be used to revisit the "Blazar Sequence" and to look further into population statistics for these sources.

Stephen Walker (NASA GSFC)
Title: Is there a giant Kelvin-Helmholtz wave rolling through the Perseus cluster?
Abstract: Deep observations of nearby galaxy clusters with Chandra have revealed mysterious concave 'bay' structures in a number of systems (Perseus, Centaurus and Abell 1795), which have similar X-ray and radio properties. By comparing to simulations of merger induced gas sloshing, we find that the bay in the Perseus cluster bears a striking resemblance in its size, location and thermal structure, to a giant (50 kpc) wave resulting from Kelvin–Helmholtz instabilities. If true, the morphology of this structure can be compared to simulations to put constraints on the initial average ratio of the thermal and magnetic pressure. Simulations with a stronger magnetic field are disfavoured, as in these the large Kelvin-Helmholtz rolls do not form, while in simulations with a lower magnetic field, the level of instabilities is much larger than is observed. We find that the bay structures in Centaurus and Abell 1795 may also be explained by such features of gas sloshing.

Eric Burns (NASA GSFC)
Title: Gravitational Waves and the Search for Electromagnetic Counterparts
Abstract: With the recent direct detections of gravitational waves by LIGO the gravitational wave era has begun. The current ground based interferometer network, the International Pulsar

Timing Array, and the future space-based LISA will search the gravitational wave sky for sources from the merging of supermassive black holes to core-collapse supernova. Here we give a brief background on the first detection of gravitational waves, these three instruments, and their known and expected sources. Further, we discuss expected electromagnetic counterparts to these sources and the science that can be done only with joint observations with a focus on the (expected) canonical joint events, short gamma-ray bursts.

Hsiang-Chih Hwang (JHU)
Title: The origin of radio emission from radio-quiet quasars
Abstract: Since the discovery of the first radio quasar 3C 273, it has been debated whether there is a real bimodality between radio-loud and radio-quiet populations. It might be natural to have a bimodal distribution if two or more different mechanisms are responsible for the radio emission. While the bright radio sky is mostly contributed by jets, the origin of radio emission from the radio-quiet population is still not well understood. Possible contributors are compact or low-power jets launched by central supermassive black holes, secondary emission from radiatively driven winds, or coronal emission, or star formation. Extremely red quasars (ERQs) provide a new opportunity to attack the puzzle of the radio emission in radio-quiet population. They are luminous in the infrared and appear to be near Eddington accretors, and therefore they are the best place to investigate the connection between radio emission and central radiation source. The radio properties of ERQs, including the luminosity and the spectral shape, suggest that radiatively driven winds may play an important role as the origin of radio emission from radio-quiet population.

Nathaniel Roth (UMCP)
Title: What sets the line profiles in tidal disruption events?
Abstract: The origin of the optical and UV emission from tidal disruption events (TDEs) remains poorly understood. Discriminating between the various theoretical models for this emission requires careful analysis of the spectra from these events, which display a large amount of diversity. Due to the high gas densities in the line emitting regions of TDEs, photoionization calculations along the lines used to analyze the broad line region of AGN may break down. I will present results from radiative transfer calculations designed to model the spectral features from this high-density gas, showing how the combined effects of electron scattering and gas kinematics can shape the line profiles. In particular, I will demonstrate how the line profiles from several TDE spectra can be interpreted as evidence for massive outflows, as predicted by some models of the optical emission.

Tiffany Lewis (George Mason University)
Title: Modeling Multiwavelength Blazar Spectra using a Self-Consistent Solution to the Electron Transport Equation
Abstract: Blazars are luminous extragalactic sources across the entire electromagnetic spectrum, but the spectral formation mechanisms in these sources are not well understood. We have developed a new theoretical model for simulating blazar spectra in which we numerically integrate the electron transport equation to generate the electron number distribution with respect to energy. Our transport model considers shock acceleration, adiabatic expansion, stochastic acceleration due to MHD waves, Bohm diffusive particle escape, synchrotron radiation, and Compton radiation. We implement the full Compton cross-section for electron interactions with

photons from dust and 26 lines from the broad line region, each considered individually. We use the solution for the electron distribution to calculate multi-wavelength SED spectra for 3C 279. This new, self-consistent model provides an unprecedented view into the jet physics at play in this source, especially the relative strength of the shock and stochastic acceleration components and the size and location of the emitting region. We show that our new Compton + synchrotron blazar model is the first to successfully fit the Fermi-LAT gamma-ray data for this source based on a first-principles physical calculation.

Elizabeth Tarantino (UM)
Title: Constraints on the CO Luminosity of the Extremely Metal-Poor Galaxy Leo P
Abstract: We present preliminary results from ALMA on sensitive CO (J = 1-0) emission line observations of the extremely metal-poor, star-forming dwarf irregular galaxy Leo P. Sitting at 1.62 Mpc, Leo P is closer than any other comparable low-metallicity galaxy. Its isolated nature and metallicity of 3% solar provide a pristine environment to understand star formation in the low-mass and low-metallicity regime, mimicking the conditions of galaxies in the early universe while being nearby enough to study. Although no CO was detected, we find a CO luminosity upper limit of 43.57 K km/s pc^2, the lowest limit to date and two orders of magnitude more sensitive than the previous observations. This limit helps understand the role of molecular gas in star formation at these extreme environments.

Michael Busch (JHU)
Title: Probing the Structure of Dark Molecular Gas in the Perseus Arm with the GBT One-Square-Degree Survey
Abstract: A critical issue in the science of the interstellar medium (ISM) is measuring the mass content of the molecular gas in the volume of the Galaxy. Most of the molecular gas is in the form of molecular hydrogen, which is largely invisible to us. This fact forces astronomers to use other molecules as tracers of the total molecular gas content of the Galaxy. We explore the use of the hydroxyl molecule (OH) as a tracer of molecular gas in the Galaxy. In low density environments, the nearly universally accepted molecular gas tracer of CO(1-0) is not collisionally excited, rendering this gas effectively invisible in CO surveys. OH is especially useful in regions of the ISM where the density of molecular gas is low: it may potentially trace the diffuse, low density molecular gas that the CO emission cannot. We present a recently completed OH survey using the 100m Green Bank Telescope (GBT) in the direction of the Outer Galaxy towards the Perseus Arm traversing a 60 x 60 parsec section with OH 1665 and 1667 MHz emission profiles every 6 pc. With the distance to the Perseus Arm is known via triangulation from VLBI observations, accurate physical sizes of the OH emission can be compared to CO surveys in the same area. This allows for the first time a direct comparison of OH and CO emission velocity profiles on similar angular resolution scales, allowing us to probe the structure of the dark molecular gas, relative to the CO-bright molecular gas.

Matthew Berkeley (CUA)
Title: Creating a full-sky map of Polycyclic Aromatic Hydrocarbon (PAH) emission
Abstract: The theory of cosmic inflation is a variant of the Big Bang theory, and is currently the primary focus of the Cosmology community. The expected signal from inflation is very faint, underscoring the need for accurate characterization and removal of bright foreground sources. In 1996, a new galactic foreground emission component was discovered. Dubbed ‘anomalous

microwave emission' (AME), this new foreground has yet to be identified. The leading hypothesis proposes that the emission comes from small dust grains, called Polycyclic Aromatic Hydrocarbons (PAHs), or 'spinning dust'. My work involves creating a full-sky map of PAH emission, in order to test the spatial correlation with the AME, thereby either proving or disproving this hypothesis. The work uses data from the Wide-field Infrared Survey Explorer (WISE) satellite. This data, in the form of 2.7 million individual images measured at four different mid-infrared wavelengths, is stitched together to form full sky projections at the different wavelengths. Using the characteristic emission spectra of the foreground components, we can combine the four full-sky maps to create a map of the PAH emission. This full-sky PAH map can then be correlated with the AME maps to determine whether or not PAH is the source of AME.

Pradip Gatkine (UMCP)
Title: A tale of an astrophotonic spectrometer
Abstract: Astrophotonics is the next-generation approach to miniaturize near-infrared (NIR) spectrometers for upcoming large telescopes (ground- and space-based) and make them robust and cost-effective. In this talk, I will give a brief introduction to astrophotonic technologies with a special focus on arrayed waveguide gratings. I will present new results from our efforts to fabricate arrayed waveguide grating (AWG) spectrometers for astronomical applications entirely in-house. Our latest devices have a peak overall throughput of 23%, a spectral resolving power of 1300, and cover the entire H band (1450-1650 nm). Various practical aspects of implementing AWG as astronomical spectrographs will also be discussed. These milestones will guide the development of the next generation of astrophotonic spectrographs for extremely large telescopes.

Vladimir Airapetian
Title: TBA
Abstract: TBA

Andrew Leisner (UM)
Title: Asteroid Spin-up Analysis
Abstract: Asteroids are subject to the YORP effect, a slow change in spin caused by reflection and reemission of solar radiation. There is an upper limit to how fast an asteroid can spin before some form of disruption takes place, depending on the strength of the asteroid. For our purposes, disruption is defined to occur when one of the axis ratios changes by more than one percent. The maximum spin rate for a particle to remain at the equator of a rigid body should only depend on the overall shape of the asteroid and its bulk density, not on its size. However, observations show that smaller asteroids are spinning faster than the theoretical limit for cohesionless bodies, while larger asteroids are not. Using the PKDGRAV simulation package, we are conducting simulations modeling the spin-up of asteroids. First the effect of cohesion was tested we and found that the stronger the cohesive force, the faster an asteroid can spin before disrupting, as expected. This was true for a spherical, oblong, and flattened initial shapes. Next the effect of overall size of the asteroid was tested, at low and high resolution (fewer and more particles, respectively). Results show that while cohesion has an effect on asteroids of all sizes, it is less important for larger bodies, for which gravity dominates. Next steps include devising a more

accurate measurement of the bulk density of the simulated asteroids for comparison with theory, and deriving the theoretical spin limit for flattened cases.

Joseph DeMartini (UMCP)
Title: Tidal Disruptions in the 2029 Close Encounter with 99942 Apophis
Abstract: Asteroid 99942 Apophis will make a close approach to Earth in 2029 and offer a unique opportunity to study the surface and subsurface properties of asteroids with diameters greater than 150 meters and to see how asteroids are affected by tidal forces during encounters. I am carrying out an investigation using high-resolution simulations over a broad range of plausible physical parameters for Apophis. The goal of my simulations is to provide a prediction for the effects that the Earth's tidal forces will have on the asteroid and to determine whether seismic events will be detectable during the encounter. The simulations in this project consist of a multi-particle physical model of Apophis, matched to the current best-known observational data, sent on the predicted trajectory past the Earth using the N-body gravity code, PKDGRAV. Results will include measurements, based on a constrained range of plausible initial conditions and physical properties, of changes in the asteroid's spin orientation, phase, and trajectory, and potentially the degree of surface and subsurface regolith perturbation measured via interparticle contact networks and pressure forces. The product of the research will be an assessment of whether any detectable seismic events can be expected for the Apophis close encounter in 2029. Preliminary results from the work in progress will be presented.

Chigomezyo Ngwira (CUA)
Title: Space Weather in a Technology-Dependent Society
Abstract: Space weather causes geomagnetic storms that can affect critical infrastructure such as navigation systems, high-voltage electric power transmission grids, and oil/gas pipelines. Understanding the dynamic response of the coupled solar wind-magnetosphere-ionosphere system to severe space weather is an on-going challenge. In this presentation, I will talk about applied space weather research at NASA Goddard Space Flight Center and discuss how and why this work is important for addressing societal needs.

Zeeve Rogoszinski (UM)
Title: Tilting Uranus with a secular spin-orbit resonance
Abstract: The most accepted hypothesis for the origin of Uranus' 98° degree obliquity is one or more giant collisions during the late stages of planetary formation. While this model is plausible, it does require impactors of at least 0.1-1 Earth masses, depending on the quantity, to strike close to Uranus' pole. Even larger mass impactors would be required for more equatorial collisions. Here I explore an alternative non-collision model to titling Uranus by using a secular spin-orbit resonance between Uranus and Neptune during the earlier stages of planetary formation. The inspiration for this model comes from a similar explanation of Saturn's non-negligible tilt, where a secular resonance between Saturn's spin axis and Neptune's orbital pole is responsible (Ward and Hamilton (2004) & Hamilton and Ward (2004)). Thommes et al (1999, 2002, 2003) argue that at least the cores of Uranus and Neptune were formed in between Jupiter and Saturn, as the density of the protoplanetary disk was greater there, and then later migrated outward. If Neptune migrated out before Uranus, then a resonance between the two planets is possible; however, the magnitude of this effect may not be sufficient enough to drive Uranus all the way to its current obliquity.

Erika Nesvold
Title: TBA
Abstract: TBA

Aparna Bhattacharya (NASA GSFC/ UMCP)
Title: Detecting Low mass wide orbit planets with Microlensing in WFIRST era
Abstract: Microlensing is the only method that can detect low mass wide orbit exoplanets. Though Kepler has detected more than 3000 exoplanets, these planets are warm close orbit planets. On the other hand, microlensing has detected around 60 exoplanets which are giant, sub giant or neptune analog planets. Because of this uniqueness, microlensing is selected as one of the main missions of NASA's top priority project WFIRST. With WFIRST we will be able to detect thousands of wide orbit low mass planets and complete the exoplanet census - a mission started by Kepler. I will discuss the basics of microlensing method, the current research with ground based observations and the preparations for WFIRST. I will also touch base with WFIRST Exoplanet mass Measurement Method. A very interesting problem in microlensing is that the ground based light curve analysis provides the planet-host star mass ratio, but it fails to provide the physical masses of these planets. We solved this problem by developing a unique mass measurement method using HST Follow Up observations. This research yielded the first confirmation of the microlensing planetary signature. This method will be the primary method for mass measurement of WFIRST Microlensing exoplanets.

Sean Terry (NASA GSFC/ CUA)
Title: A Study of Stanek's Window as Precursor Science for the WFIRST Microlensing Field of View
Abstract: I present preliminary results of a stellar population study using HST images in several passbands of a moderately extinct field that lies inside the currently planned Wide-Field Infrared Survey Telescope (WFIRST) microlensing field of view. Images were taken by WFC3/UVIS F555W/F814W and WFC3/IR F110W/F160W in 2010; additionally, F814W images were taken approximately two years later in 2012 to allow for proper motion cleaning of the CMD. A calibration to the OGLE-III system was then applied, as well as corrections for extinction and reddening. Further, deep bulge luminosity functions were created with corrections for photometric completeness as well as completeness due to crowding. The contamination from disk sources, both foreground and background is of order 1%, leading to very clean bulge luminosity functions. The F160W luminosity function represents one of the deepest created in a bulge field that will yield better estimates of the microlensing event rates and bound Earth-mass detection rates within this area of the WFIRST microlensing footprint.

Clement Ranc (NASA GSFC/ USRA)
Title: The Challenge of the Kepler 2’s Microlensing Observations Analysis
Abstract: The recent explosion in our understanding of exoplanetary systems has been driven largely by the Kepler mission, which has replaced radial velocities as our main planet discovery method. While Kepler has provided a large sample of planets that will allow a robust statistical determination of the properties of exoplanets in close orbits about their host stars, the Kepler mission was cut short shortly after the start of its 5th year. This led to the Kepler 2 (K2) mission, that could observe up to 18 different fields in the ecliptic plane. The K2 mission has focused on

lower mass host stars and spending one observing campaign on field in the Galactic bulge in order to make use of Kepler's orbit to determine the masses and distances to microlensing systems via the microlensing parallax effect. These K2 Campaign 9 observations help to develop the microlensing planet detection method, which will be employed by the WFIRST mission that will extend the statistical census of exoplanet to include planets in wide orbits. While the photometric light curve of a microlensing event observed from the ground provides important constraints on the lens physical parameters, in many cases the lens mass and distance from Earth remain degenerated. I will present how joint space- and ground-based observations can break this mass-distance degeneracy. The main challenge now is to deal with the K2 photometry that suffers from numerous systematic effects. I will present a new promising method to correct the K2 light curves from these effects.

Posters Presentation Abstracts:

Adina Feinstein (NASA GFSC)

Title: Characterization of Young Red Dwarfs in the Solar Neighborhood
Abstract: Members of young moving groups (ages 10-200 Myr) are the closest youngest stars and grant us insight into the formation and evolution of stars and their planets. The number of low-mass stars in these groups is growing, but remains incomplete. In an effort to complete this sample, 119 probable young candidates were identified using a proper motion selection algorithm and follow-up spectroscopy was obtained with SpeX on the NASA Infrared Telescope Facility (IRTF). The data was reduced using SpexTool and the stars were visually classified by matching the spectra to standards in the JHK bands. The visual classifications were confirmed using index based measurements. Young stars in the sample were then identified using a combination of molecular indices and equivalent width measurements of spectral features sensitive to surface gravity. Candidates with weak absorption features were re-evaluated by eye to confirm the numerical results. So far we have identified nearly one dozen stars that are likely new members of young moving groups in our ongoing analysis. Young low-mass stars identified in this research will be prime targets for exoplanet studies with the near future TESS and JWST missions.

Maxwell Atkins (UMBC)
Title: Anomalous X-Rays and Morphology in Active Galactic Nuclei Jets
Abstract: Nearly every galaxy has a supermassive black hole at its center, and when it is actively accreting matter we call it an Active Galactic Nuclei (AGN). Some AGN have massive jets whose energy flow may have a significant effect on their environment, so understanding these objects unlocks a better understanding of galactic evolution. When anomalously high x-rays were detected in 1999, new theory was developed which explained the high flux through inverse Compton scattering off of the cosmic microwave background (IC/CMB). This theory can be tested by gamma ray measurements, but in several sources, the upper limits on observed gamma rays are lower than what the theory predicts. The failure to consistently predict gamma rays shows that something is missing from our understanding. My project aims to find additional clues from the morphology of the jets. In some jets, there is an apparent displacement between the peaks of radio and x-ray intensity that has hitherto be ignored. Our goal is to first catalogue jets in which this displacement takes place in search of a common thread. Do these displacements happen all the time? If that is the case why don't we always see them? Are they connected to jet power? By estimating the approximate size of displacements and organizing other jets by angle and redshift, we can see how likely it is that geometry and relativistic beaming are hiding other examples. Armed with this knowledge, we plan to develop theory that is consistent with both observed fluxes and morphologies.

Noah Kasmanoff (UM)
Title: Optimizing Gamma-ray Burst Localizations for Future NASA Mission Concepts
Abstract: Future NASA science missions will aim to explore the high-energy domain of the universe by way of Gamma-ray bursts. These GRBs will provide context for gravitational waves, as well as more information about time domain astronomy. The objective of this study is to optimize the instruments designed to capture and localize Gamma-ray bursts. In this study,

simulations are done sampling the sky with ranging GRB detector instruments, numbers, and orientations that are assessed to demonstrate the optimal designs of such instruments.

Kiera Lyons (CUA)
Title: Analyzing AGN Outflows with HST/STIS in Nearby Seyfert Galaxies
Abstract: We evaluate Active Galactic Nuclei (AGN) outflows of nearby Seyfert galaxies as a function of distance from the nuclei in order to describe their kinematic structure. Using data collected from the Hubble Space Telescope Space Telescope Imaging Spectrograph (HST/STIS) long slit observations of the [OIII] emission line, we verified the validity of a previously written gaussian fitting program (Fischer et.al 2013) by comparing the mathematical model created by the program to the observational STIS data. The model was then used to determine the velocity, Full Width Half-Maximum (FWHM), and flux along the long-slit observation as a function of distance in arc seconds from nuclei of the galaxy. From the velocity, FWHM, and flux data, the AGN outflows were identified and measured. The extent of outflows in nearby, Seyfert AGN suggests that AGN winds in low luminosity may not extend far enough into their host galaxy to have a significant impact in the formation of the M-sigma relationship. Moving forward, we will compare the maximum outflow radius measurements to maximum [OIII] radii in imaging and also compare the outflow radius to luminosity to see if any correlation exists.

Sydney Paugh (NASA Summer Intern/ University of St. Thomas)
Title: Exploring Extremely Bright Gamma-Ray Flashes from Blazar BL Lac
Abstract: Extremely bright flashes in the gamma-ray range with minutes to hours timescales in blazars have attracted the attention of the astronomical community as this suggests that particles can be promptly accelerated with impressive efficiency in tiny magnetized regions within extended sources. Using Fermi-LAT (large area telescope) data, we investigated gamma-ray flux variations in a nearby blazar, BL Lac. The fastest variability timescale will be used to pinpoint the location and size of the gamma-ray emission region.

Peter Breiding (UMBC)
Title: Fermi non-detections of four Anomalous X-ray Jet Sources and Implications for the IC/CMB Mechanism
Abstract: The Chandra X-ray observatory has discovered kpc-scale X-ray jets in many powerful quasars over the past 2 decades (Harris & Krawczynski, 2006). In many cases these X-rays cannot be explained by the extension of the radio-optical spectrum produced by synchrotron-emitting electrons in the jet, since the observed X-ray flux is too high and/or the X-ray spectral index is too hard. A widely accepted model for the X-ray emission, first proposed by Celotti et al. (2001) and Tavecchio et al. (2000), posits that the X-rays are produced when relativistic electrons in the jet up-scatter ambient cosmic microwave background (CMB) photons via inverse Compton scattering from microwave to X-ray energies (the IC/CMB model). However, explaining the X-ray emission for these jets with the IC/CMB model requires high levels of IC/CMB γ-ray emission (Georganopoulos et al., 2006), which we are looking for using the Fermi/LAT γ-ray space telescope. Another viable model for the large scale jet X-ray emission, favored by the results of Meyer et al. (2015) and Meyer & Georganopoulos (2014), is a second population of synchrotron-emitting electrons with up to multi-TeV energies. In contrast with the second synchrotron interpretation; the IC/CMB model requires jets with high kinetic powers which can exceed the Eddington luminosity which remain highly relativistic ($\Gamma\approx10$) up to kpc

scales. I will present recently obtained deep γ-ray upper-limits from the Fermi/LAT which rule out the IC/CMB model in four sources previously modeled with IC/CMB, and discuss the properties of the growing sample of non-IC/CMB anomalous jets and the implications for jet energetics and environmental impact.

Tianxing Jiang (Arizona State University)
Title: Mass-metallicity relation of green pea galaxies
Abstract: Green peas are the best nearby analogs of high-redshift Lyα emitting galaxies. We assemble the largest green pea spectroscopic sample from SDSS DR13 spectroscopic database. The sample consists of 600 star-forming green peas with EW([OIII]λ5007Å) > 200Å, detected [OIII]λ4363Å and compact sizes. We measure the stellar masses with SDSS spectra and the metallicities with direct Te method. The metallicities are 12+log(O/H) = 7.5 - 8.5. We find that for the same stellar masses, green peas have much lower metallicities than typical star-forming galaxies in SDSS, with an offset of ~0.35 dex. The next step is to improve the measurement of stellar masses based on the combination of optical and near-IR data and constrain the mass fraction of the old stellar populations in green peas.

Rachel Losacco (NASA GSFC)
Title: Galaxy Formation From Cosmological Simulations And Observations
Abstract: One of the big unknowns in galaxy evolution is the timescale on which galaxies grow by forming stars and die by quenching the star formation. When interpreting observations and deriving a galaxy's physical properties, we must assume a possible formation history, therefore guessing such timescale. For this project, we study a model of galaxy formation to find the most realistic and physically motivated functional form to describe a galaxy's star formation history. To do this, I fit several functional forms with varying degrees of freedom onto stochastic star formation histories derived from a semi-analytical model of galaxy formation. The parameters of the best fit are examined for correlation with observable physical properties of the galaxies, such as their stellar mass and star formation rate. Identifying this functional form and correlations of its parameters to observable features will allow us to gain insight into the star formation histories of real observed galaxies.

Meriem Alaoui (CUA)
Title: Return currents in solar flares: Exploring the validity of Ohm's law
Abstract: Solar flares are associated with the biggest explosions in the solar system. They accelerate particles both toward the interplanetary medium and back toward the surface of the Sun; and they radiate emission from the entire electromagnetic spectrum. In the x-ray range between a few deka-keV and 300 keV, the emission mechanism is bremsstrahlung from accelerated electrons interacting with the heavy ions; and x-ray spectra can be fitted with a single or broken power-law distribution. These spectra are obtained with the solar spectroscopic imager RHESSI (Ramaty High Energy Solar Spectroscopic Imager) which has been operating since 2002 and provides flare observations in the 3 keV to 17 MeV range. We choose spectra with "strong" spectral breaks and fit them with a 1D return-current collisional thick target model (RCCTTM). Strong breaks are defined as those that can not be explained by non-uniform ionization or albedo alone. Our model assumes the beam electrons lose some of their energy in the corona due to the return-current potential drop before they are stopped in the chromosphere, where the density is high enough for Coulomb collisions to dominate. I will show that the

resistivity in the corona is "enhanced" by a few orders of magnitude as compared to Spitzer (classical collisional) resistivity even though the return current is apparently stable to the generation of standard current-driven instabilities. I will show the conditions for the validity of Ohm's law and what population of electrons carries the return current.

Jillian Kunze (NASA GSFC)
Title: Multiple Detections of Radio Bursts from Earth's Magnetic Field
Abstract: Terrestrial myriametric radio bursts (TMRBs) are isolated temporal bursts of magnetospheric radio emission about which little is known. This study sought to identify new potential cases of TMRBs and establish strong linkages between the bursts and changes in the interplanetary magnetic field (IMF), as well as examine the ranges of the locations of the emission beams. The purpose of this investigation was to determine whether TMRBs are caused by reconnection between the interplanetary and terrestrial magnetic fields. To accomplish this, potential TMRB events were found via a thorough inspection of spectrograms gathered by the Geotail and IMAGE satellites from 2000 to 2005. The few most promising TMRB candidate events were then analyzed for their relationships with changes in the X, Y, and Z components of the IMF. The locations of satellites that did and did not detect the emission were also investigated to establish the limits of the beaming paths. This study found that there is a linkage between variations in all three directional components of the IMF and important components of the TMRB emission such as the period of maximum intensity and breaks in the signal. The beaming paths may be affected by the behavior of the y-component of the IMF and could originate from the expected locations of magnetic reconnection. These findings indicate a strong relationship between all components of the interplanetary magnetic field and TMRBs, which along with the potential beaming paths provides evidence that TMRBs originate from magnetic reconnection.

Adam Jacobs (George Mason University)
Title: Simulating Pluto's Haze Layers with a Single Scattering Model
Abstract: A solar scattering model was used to simulate New Horizon's LORRI and MVIC instrument images taken during flyby July 14, 2015. More than 20 distinct haze layers were identified by LORRI, embedded in a background haze extending above 200 km. I/F values are calculated for geometries above and around Pluto's limb at high solar-spacecraft phase angles. Reproduction of observed haze layers is explored with one possible layering mechanism. Several gravity (buoyancy) wave model data sets are used to explore layering and visual line of site effects. Haze particle characteristics are also explored through derived scattering cross section and phase functions for assumed particle sizes, shapes, and compositions. Constraints are explored for certain particle characteristics with altitude, as well as how effective layering by gravity (buoyancy) waves can be in reproducing observed LORRI image characteristics with current understanding of gravity wave generation and propagation in Pluto's atmosphere.

Mahmuda Afrin Badhan (UMCP)
Title: Atmos: A 1-D Coupled Climate-Photochemical Model to Simulate Exoplanet Atmospheres
Abstract: Upcoming observatories, such as JWST, will provide transit spectroscopy data needed to constrain abundances of species in exoplanet atmospheres with unprecedented accuracy. It will also increase the number of smaller, cooler planets for which we have such information.

Interpreting the observed signals will require reliable atmospheric modeling tools that simulate both physical and chemical processes, especially for those cooler planets, where equilibrium chemistry does not necessarily dominate. The Virtual Planetary Laboratory's "Atmos", a coupled 1-D climate-photochemical modeling tool, has been validated for modeling of early Mars, Archean (~4-2.5 billion years ago) and modern Earth atmospheres. These codes have also been used to simulate rocky exoplanets, including simulations that have helped define the habitable zone. In recent years, we have extended our modeling capabilities to other environments such as Titan, sub-Neptune worlds, and hot-Jupiter exoplanets. Mixing ratio profiles of gases and photochemical hazes are derived from Atmos. For rocky planets in the habitable zone, we also obtain temperature structures. These can be fed into radiative transfer models to generate spectra for different types of exoplanets. The spectra can then be used with future mission simulators to self-consistently determine the potential for retrieval of spectroscopic signatures with upcoming space-borne instruments. Here I will highlight the present modeling capabilities of Atmos, show results from our recent work simulating solar system and exoplanet atmospheres, and discuss how these simulations can help interpret results from JWST. Atmos is now publicly available on Github, and this release presently contains our most stable and well-validated templates.