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GHz) survey of the Milky Way disk with the Green Bank Telescope. Our data are essentially extinction-free, with higher spatial and spectral resolution compared to previous large-scale RRL surveys. This allows us to determine the distribution and kinematics of the ionized gas. Using the WISE Catalog of Galactic HII Regions, we are able to distinguish between HII region RRL emission and emission tracing diffuse ionized gas known as the Warm Ionized Medium (WIM). We produce WIM-only datacubes and constrain the ionization state of the diffuse gas. We estimate the fraction of photons escaping from individual HII regions within the surveyed area by comparing our data to an empirical model of RRL emission near HII regions. Since these photons are believed to be responsible for maintaining the ionization of the WIM, GDIGS enables us to better understand the connection between HII regions and the WIM within this dynamically complex region.

232.06 — Ultraviolet HST Spectroscopy of CO and C I in Planck Cold Clumps

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We report results of the first study utilizing the ultraviolet capabilities of the Hubble Space Telescope to investigate a sample of Planck Galactic Cold Clump (PGCC) sources. We have selected high-resolution spectra toward 25 stars that contain a multitude of interstellar absorption lines associated with the interstellar medium (ISM) gas within these PGCC sources, include carbon monoxide (CO) and neutral carbon (C I). By building cloud-component models of the individual absorption components present in these spectra, we can identify and isolate components associated with the PGCC sources, allowing for a more accurate investigation of the ISM behavior within these sources. Despite probing a broad range of overall sightline properties, we detect CO along each sightline. Analysis of these sightlines reveals distinctly different behavior between sightlines with high carbon monoxide (CO) column density (N(CO)>10̂15 cm̂-2) and those below this threshold. We speculate that this may be related to the C I thermal pressure of the gas, though more work is necessary to confirm the nature of this behavior.

233 — AGN Jets and Outflows II

233.01 — Imaging the AGN Torus in Cygnus A

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We present the first direct imaging of the thick torus of the active nucleus of the powerful radio galaxy Cygnus A. The observations are made with the Jansky VLA at 34.5 and 44 GHz, with 45 mas resolution. An elongated structure, perpendicular to the radio jets, and centered on the nuclear core, is well resolved with a full length of 400 by 250 pc. The radio emission is reasonably charcterized by optically thin free-free emission, with a brightness temperature at radius 100 pc of about 240K. The implied EM is 1.2e8 pc/cm6. The spectrum of the radio core shows a sharp cutoff below 10 GHz, consistent with free-free absorption by gas in the torus. We discuss a simple model of a flaring dusty torus, with the ionization cone oriented alog the jet axis roughly in the sky plane. The implied opening angle for the ionization cones is about 60 degrees, and the mean density of the torus is about 540 cm̂-3. The torus gas mass is 3e8 solar masses. The gas mass in comparable to a rough estimate of the stellar mass within this volume, and the sum of mass in gas and stars within 215 pc radius is a factor 3.5 below the mass of the supermassive black hole. The thermal pressure of the torus is well below the minimum energy pressures in the radio jet, implying the jets are not confined by the thermal pressure of the ambient medium.

233.02D — X-ray Variability in the Nucleus of Cygnus A and the Radio Transient Cygnus A2

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In 2015, a radio transient was discovered in Cygnus A with the VLA. This transient, named Cygnus A-2, is 0.42 arcsec removed from the AGN and can therefore not be resolved by most X-ray telescopes. We have looked for an X-ray counterpart to Cygnus A-2, using Chandra ACIS observations from 2015 to 2017.

We simulated the source with Marx and compared it with the data, and find no evidence of an extension of the PSF in the direction of the transient. Based on this, we put an upper limit to the 2-10 keV X-ray luminosity of Cygnus A-2 of $2
times 10{43}$ erg/s.

Additionally, we present a spectral analysis of the AGN of Cygnus A using old and new Chandra observations. We compare the 2-10 keV X-ray luminosities with archival XMM-Newton, NuSTAR and Swift XRT data. The resulting light curve shows that the luminosity of Cygnus A was constant between 2000 and 2005, doubled in 2013 while observed by NuSTAR and Swift, and dropped back down in 2015. Previous analysis of the NuSTAR spectra has also indicated the presence of a fast, ionized wind, something not seen by Chandra and XMM-Newton.

We discuss the possible connection between Cygnus A-2 and the X-ray light curve. The lack of X-rays from Cygnus A-2 in 2015 disfavors the interpretation of Cygnus A-2 as a steadily accreting black hole. Instead, we suggest that Cygnus A-2 is the radio afterglow of a tidal disruption event (TDE). This would explain the increase and subsequent fading of the X-ray luminosity between 2005 and 2015. A TDE could also have launched the short-lived, fast, ionized outflow seen by NuSTAR. If correct, it would provide further evidence that TDE rates in merging galaxies are much higher than previously thought.

233.03 — AGN feedback in galaxy clusters driven by intermittent accretion of cold gas

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Recent observations of cool core clusters provide evidence that the presence of cold, atomic and molecular gas in their centers is more common than previously expected. This finding has important implications for the fueling of and feedback from the supermassive black holes (SMBHs) located in central cluster galaxies. Motivated by it, we run a suite of 2D and 3D hydrodynamic simulations to study the efficiency of radio-mode feedback driven by intermittent accretion of cold gas on the central SMBH. This type of fueling drives strong and recurrent AGN feedback episodes, whose duty cycle is determined by the presence of cold gas in the vicinity of the central SMBH. We find that intermittent AGN jets, with duty cycles shorter than the gas cooling time scale at the central region, are considerably more effective in suppressing the cooling flow than steady jets, the power of which does not significantly vary over time. Based on this, we suggest that the increased efficiency of AGN feedback is a natural consequence of intermittency driven by accretion of cold gas, and thus this effect plays an important role in preventing runaway cooling in galaxy clusters.

233.04D — Cosmic Rays or Turbulence can Suppress Cooling Flows (Where Thermal Heating or Momentum Injection Fail)

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The quenching "maintenance" and "cooling flow" problems are important from Milky Way through massive cluster elliptical galaxies. Previous work has shown that some source of energy beyond that from stars and pure magnetohydrodynamic processes is required, perhaps from AGN, but even the qualitative form of this energetic input remains uncertain. Different scenarios include thermal "heating," direct wind or momentum injection, cosmic ray heating or pressure support, or turbulent "stirring" of the intra-cluster medium (ICM). We investigate these in 10^{12}-$10^{14}M_{\odot}$halos using high-resolution non-cosmological simulations with the FIRE-2 (Feedback In Realistic Environments) stellar feedback model, including simplified toy energy-injection models, where we arbitrarily vary the strength, injection scale, and physical form of the energy. We explore which scenarios can quench without violating observational constraints on energetics or ICM gas. We show that turbulent stirring in the central ~100kpc,or cosmic-ray injection, can both maintain a stable low-SFR halo for > Gyr timescales with modest energy input, by providing a non-thermal pressure which stably lowers the core density and cooling rates. In both cases, associated thermal-heating processes are negligible. Turbulent stirring preserves cool-core features while mixing condensed core gas into the hotter halo. Pure thermal heating or nuclear isotropic momentum injection require vastly larger energy, are less efficient in lower-mass halos, easily over-heat cores, and require fine-tuning to avoid driving unphysical temperature gradients or gas expulsion from the halo center.

233.05 — On the role of magnetic fields around active galaxies

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