Poster Abstracts

From Gas to Stars in Energetic Environments: Dense Gas Clumps in the 30 Doradus Region

C.N. Anderson, D.S. Meier (NMT), J. Ott (NRAO), A. Hughes (MPI), T. Wong (Univ. of Illinois)

We present parsec-scale interferometric maps of HCN(1-0) and HCO^{+}(1-0) emission from dense gas in the star-forming region 30Dor10, obtained using the Australia Telescope Compact Array. This extreme star-forming region, located in the Large Magellanic Cloud, is characterized by a very intense ionizing radiation field and sub-solar metallicity, both of which are expected to affect molecular cloud structure. We detect 13 clumps of dense molecular gas, some of which are aligned in a filamentary structure. Our analysis of the clump properties shows that they have similar mass but slightly wider line widths than clumps detected in other LMC star-forming regions."

Software and Computing at LWA 1

Jayce Dowell (UNM)

In order to take advantage of the flexibility of the voltage data, and to handle the complexities of large-N and large data volumes from the first station of the Long Wavelength Array, LWA1, we have developed the Long Wavelength Array Software Library (LSL). LSL is distributed as a Python module and includes a variety of routines to allow observers to convert the data into the frequency domain and to perform a variety of signal processing techniques, including post-acquisition beam forming from the all-dipoles data and removal of broadband RFI in the time domain data. In addition to the core functionality provided with LSL, there are also four extensions to the module that provide more specific functions. For example, the GPU extension aims to increase the speed at which data can be analyzed by running part of the signal processing on GPUs.

LSL will also serve as the analysis software base available on the LWA1 User Computing Facility. The User Computing Facility is a cluster of six machines designed for signal processing applications. Each node sports a hexacore processor and two GPUs, and will be connected to the LWA1 via a 10 Gb/s link. Once connected, this will enable a variety of real-time and off-line processing options for the LWA1 data streams as well as serve as a test bed for correlating data from other LWA stations with LWA1.

The HALOGAS Project: HI Observations of NGC 4062

Mark Gorski, Rich Rand (UNM)

We present deep neutral hydrogen observations of the nearby spiral galaxy NGC 4062 as part of the Westerbork Hydrogen Accretion in Local Galaxies (HALOGAS) survey currently being performed with the Westerbork Synthesis Radio Telescope (WSRT). NGC 4062 is a moderately inclined HI deficient spiral galaxy, and a member of the Coma I cloud. We present the preliminary models of the main HI disk that exhibits some properties of ram pressure stripping in addition to a slight warp. We see evidence of a beard, however this component has yet to be modeled.

Cold Accretion Flows and Galactic Winds and their Effects on Galaxy Evolution

Nigel Mathes, Christopher Churchill (NMSU), Glenn Kacprzak (Swinburne University of Technology)

We present a study of the strength of HI absorption as a function of galaxy orientation for 52 intermediate redshift galaxies. In an effort to constrain gas physics and chemical enrichment in galactic halos, we show early results of the spatial distribution of HI gas with respect to the rotation axis of the galaxies.

Physical and Chemical Conditions in Centaurus A

Mark McCoy, David Meier (NMT), Juergen Ott (NRAO)

Centaurus A (Cen A), at a distance of 3.6 Mpc, is the nearest active radio galaxy. We present the high resolution maps of six rotational transitions: 12CO(2-1), 13CO(2-1), 13CO(1-0), C18O(2-1), HCN(1-0), and HCO+(1-0) toward the nucleus of Cen A. The HCN and HCO+ trace a high density nuclear region, while the CO isotopologues trace a moderate density arm-like region. The absence of CO isotopologue emission in the nuclear region could possibly be attributed to irradiation by UV/X-rays from the AGN preferentially photodissociating the CO isotopologues.

Closing the loop on the MROI

Tyler McCracken, Alisa Shtromber, Michelle Creech-Eakman (NMT/MRO),Andres Olivares, Chris Salcido, Colby Jurgenson, Fernando Santoro (MRO), David Buscher,John Young, Chris Haniff (Cambridge)

To produce a high quality science product, stellar interferometers must battle the environment while correcting for a constantly changing atmosphere. The Magdalena Ridge Observatory Interferometer (MROI) will have baselines up to 347 meters requiring beam transport of the same scale. Alignment of the beam transport system is crucial and can pose a significant reduction in observation time due to beginning of night alignment and overnight misalignments. For high contrast fringes to be continuously observed, the turbulent atmosphere must also be tracked and its effects minimized. This poster overviews some subsystems responsible for minimizing the alignment effort and correcting atmospheric effects.

Variable Red Supergiant's: Solar-like Oscillations at Ultra-low Frequencies?

Jean McKeever, Jason Jackievixz, Patrick Gaulme (NMSU)

We study two Kepler data sets of stars along the red giant branch (RGB), classical RGB stars with solar-like oscillations and red supergiants that are bright (on average ~1000 solar luminosities) and cool (~3000-3500 K). Initial analysis of one year of Kepler lightcurves for the supergiants has revealed low-frequency oscillations of large amplitude, possibly of solar-like origin. We attempt to ascertain global parameters for these stars and compare them with known scaling relations to see if the valid ranges of these relations can be extended down to such low frequencies.

CHILES: Cosmos HI Large EVLA Survey

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D.J. Pisano (U. West Virginia), T. Oosterloo (ASTRON), Marc Verheijen (U. Groningen), A. Popping (ICRAR), K. Kreckel (MPIA), L. Chomiuk (Michican State), Trish Henning(UNM), and the CHILES collaboration

We present results from the pilot of the COSMOS HI Large Extragalactic Survey (CHILES) carried out with the Karl G. Jansky Very Large Array (VLA). The pilot VLA observations targeted a single pointing of the COSMOS field using the B-configuration, and covered the frequency range 1190 – 1426 MHz, allowing us to probe the 21cm line of neutral hydrogen up to a redshift of z~0.2. The total on-target time was 50 hours. The observed field has 413 galaxies with known spectroscopic redshifts, and it includes galaxies of different morphological types and sizes that reside in different environments. This pilot serves as a test for future deep HI surveys planned with the VLA and SKA pathfinders. Here we present our observing strategy, the impact of RFI, and the various results we have obtained to date.

The Circumgalactic Environment of Cen A: Deep Radio, Ultraviolet, and H_alpha Observations.

S. G. Neff (NASA/GSFC), J. A. Eilek (NMT/NRAO), F.N. Owen (NRAO)

We present deep radio images, taken with the VLA at 327MHz, of the inner ~50kpc of Centaurus A. We show that the "outer jet" is part of a narrow ridge of emission in a broader emission feature, and speculate that the interesting "weather" now seen around Cen A is caused by a massive wind encountering gas left behind by a recent merger event.

Low Frequency Radio Transients and Limits on GRB Prompt Radio Emission

Kenneth Obenberger, Greg Taylor (UNM), Jake Hartman (JPL)

As a backend to the Long Wavelength Array (LWA), the Prototype All Sky Imager (PASI) has collected over 5000 hours of all sky images since September 2011. Using this data we were able to put constraining limits on prompt low frequency emission from gamma ray bursts out to a dispersion measure DM ~ 10^4 pc cmâˆ’3, at both 74 and 52 MHz. While our limits depend greatly on the elevation of the observed GRB, we estimate a 1 Ïƒ RMS sensitivity of 75 Jy for 5 seconds in both frequency bands at zenith. We also report on several interesting transients, which are, as of yet, of unknown origin and not coincident with any known GRBs.

An ALMA and ATCA Molecular Line Survey toward Centaurus A

Juergen Ott, Alison Peck, Violette Impellizzeri (NRAO), David Meier, Mark McCoy (NMT), Sebastien Muller, Susanne Aalto (Onsala), Fabian Walter (MPIA), Christian Henkel (MPIfR), Sergio Martin (ESO), Paul van der Werf (Leiden), Iiana Feain (CSIRO)

We present Atacama Large Millimeter/submillimeter Array and Australia Telescope Compact Array data of molecular absorption lines toward the bright central core of Centaurus A. The line of sight crosses the prominent dust lane and continues through the disk and eventually through gas that may be very close to the central supermassive black hole. The goal of our the survey is to determine the physical conditions of the gas via analyses of molecular line tracers including molecular abundances and excitation conditions that are sensitive to changes in temperature, density, ionization, and shocks. This study allows us to derive the physical conditions of each absorption line complex and allows us to define the main process shaping its environment. We present a first analysis of our data in the 13, 7, 3, and 1mm wavebands.

From Gas to Stars and from Stars to Gas: Dwarf Galaxy Evolution with VLA-ANGST"

Juergen Ott (NRAO), Steven Warren (UMD), Adrienne Stilp (UW), Evan Skillman (UMN), Julianne Dalcanton (UW), Fabian Walter (MPIA), W. J. G. de Blok (ASTRON), Baerbel Koribalski (CSIRO), Andrew West (BU)

The VLA-ANGST survey is a VLA project to map the HI content of a volume filled sample of nearby galaxies at high spatial and spectral resolution. The sample is based on the HST "ACS Nearby Galaxy Survey Treasury" (ANGST) survey that aims to study the resolved, stellar population of a volume limited sample of nearby galaxies with the resolving power and sensitivity of the HST. Major data products include spatially resolved maps of star formation as a function of look-back time (typically up to 500 Myr). We find that the energy output of the underlying stellar population is large enough to create the typical morphologies of large scale rings, shells and cavities. The majority of the structures, however, is not created by single star forming events but rather by the combined feedback from many generations of stars. HI with narrow line widths may indicate the presence of cold gas that potentially be fueling star formation. We find that the narrow components are close to the peaks of the HI column density but typically do not coincide. This, as well as the fraction of cold to warm gas, is similar to molecular clouds in more massive galaxies. We may thus be able to study the basic ingredient for star formation, the cold, dense gas, that is otherwise inaccessible in dwarfs, due to the low metallicities and hence extremely weak molecular line strengths.

Shocks in the Galactic Central Molecular Zone

Juergen Ott (NRAO), Michael Burton (UNSW), Paul Jones (UNSW), David Meier (NMT)

The Central Molecular Zone (CMZ) covers the inner ~500pc of the Milky Way and contains a substantial amount of molecular gas (several 10^7 Mo). Models show that the gas may be funneled along the central Galactic bar into the CMZ and eventually accretes on x_2 orbits that cover the inner ~200pc. Eventually the gas will be destroyed by environmental influences, during the process of star formation, or, in rare cases, the dense gas will be transported all the way further toward Sgr A*, the central supermassive black hole of the Milky Way. We present maps of a large number of dense molecular gas tracers across the entire CMZ. The data were taken with the CSIRO/CASS Mopra telescope in a Large Project in the 1.3cm, 7mm, and 3mm wavelength regime, where many many molecules exhibit their ground state rotational transitions. Here, we focus on the brightness of the shock tracers SiO and HNCO, molecules that are liberated from dust grains under strong (SiO) and soft (HNCO) shocks. We find that their distribution down to the 3rd order is similar but that some regions exhibit remarkable differences. The largest differences are found for the gas that is currently moving along the bar and has not accreted on the x_2 orbit yet. The shocks may have occurred when the gas enters the bar regions and the shock differences are likely a function of the cloud mass. Based on tracers of ionizing photons, it is unlikely that the morphological differences are due to selective photo-dissociation of the molecules.

Metallicity Distribution Functions for Three Local Group Dwarf Galaxies

Teresa Ross (NMSU)

We present metallicity distribution function's (MDF's) for Leo I, Phoenix and IC 1613, derived from photometry with the Wide Field Camera 3 aboard the Hubble Space Telescope.

We obtained relatively high S/N photometry in V (F555W), I (F814W) and Ca H & K (F390M) for giants, then derived the stellar metallicities. The MDF for Leo I contains ~8000 stars, 10 times more stellar metallicities than previously reported. For Phoenix and IC 1613 we measured ~3000 stars. A larger sample of stellar metallicities, albeit of lower accuracy than spectroscopic measurements, provides some advantages in looking for rarer components of the population.

VLA Discovery of a Flat-Spectrum Radio Nucleus in NGC 3115

Joan Wrobel (NRAO) and Kristina Nyland (NM Tech)

The early-type galaxy NGC 3115, at a distance of 10.2 Mpc, hosts the nearest billion-solar-mass black hole. Wong et al. recently inferred a substantial Bondi accretion rate near the black hole. Bondi-like accretion is thought to fuel outflows, which can be traced through their radio emission. We report the discovery of a radio nucleus in NGC 3115, with a diameter less than 0.17 arcsec (8.4 pc), a luminosity at 8.5 GHz of 3.1 x 10^35 erg/s, and a flat spectrum (alpha = -0.23 +/- 0.20, S ~ frequency^+alpha). The radio source coincides with the galaxy's photocenter and candidate X-ray nucleus. The emission is radio loud, suggesting the presence of an outflow on scales less than 10 pc. On such scales, the Bondi accretion could be impeded by heating due to disruption of the outflow. These VLA results are guiding several independent teams that are modelling gas flows near NGC 3115's billion-solar-mass black hole.