CONICYT
Ministerio de Educación
Gobierno de Chile

Comisión Nacional de Investigación Científica y Tecnológica – CONICYT

Resultados Concurso Apex 2015-A

Propuesta: 2015A/005

Investigador Principal: Monica Rubio, Universidad de Chile.

Título: Dark CO in the SMC: the NE region

Resumen: The Small Magellanic Cloud is a unique laboratory to study the gas, dust, and star formation in a low metallicity environment that resembles the early phases of galaxy formation. A key yet poorly explored aspect of the metal poor interstellar medium is its gas and dust properties. Characterizing them is crucial to understand the gas heating, the interstellar medium thermodynamics, the dust-to-gas ratio, and to use dust continuum observations and CO as a tracer of gas mass.
We have been undertaking a complete study of the ISM in the SMC, combining CO, 870μmcontinuum, HERSCHEL, SPITZER and HI observations to determine the gas and dust properties, the relationship between CO, total gas and dust including gas to dust ratio, the CO conversion factor to derive masses, the sub-millimeter excess of dust emission and recently the transition of CO -bright to CO dark gas in order to understand the effects of metallicity in the star formation process in low metallicty molecular clouds. The scarcity of CO observations at 10 pc resolution is limiting this study. Thus, we propose to perform sensitive CO2-1 observations towards the several cold dust emission regions in the SMC.

Tiempo asignado: 49 horas

Propuesta: 2015A/010

Investigador Principal: Roberto Assef, Universidad Diego Portales

Título: ArTeMis Observations of Lower Redshift Hot Dust-Obscured Galaxies

Resumen: The WISE mission has discovered a rare population of high-redshift, hyper-luminous infrared galaxies, all with LBol > 1013 L_, and many with LBol > 1014 L_, that live in signi_cantly overdense environments. Selected by their extremely red mid-IR colors and shown to have very hot dust temperatures, these hot, dust-obscured galaxies (Hot DOGs) may probe a key stage in galaxy evolution and supermassive black hole growth. A most
important aspect for understanding the role of this population is to understand their redshift evolution, yet this is hampered by the selection function of these objects being biased against z . 2, near the peak AGN epoch. In this proposal we target a new near/mid-IR sample, selected to be the lower-z counterparts of the Hot DOGs. To establish the Hot DOG nature of these candidates we need to con_rm the characteristically high dust temperatures of the population, and to test if they are in crowded environments. Here we request 27.3 hrs of PWV_0.5mm time with ArT_eMis at APEX to study the dust temperatures and the environments of 5 of these candidates, as well as to study the environments of 2 well established Hot DOGs that, using JCMT/SCUBA-2, show an overdensity of neighboring sub-mm galaxies.

Tiempo asignado: 28 horas

Propuesta: 2015A/001

Investigador Principal: Leonardo Bronfman, Universidad de Chile

Título: Structure, Excitation, and Dynamics of the Inner Galactic Interstellar Medium (SEDIGISM)

Resumen: Over the last decade, many surveys performed systematic mapping of the inner Galactic Disk in the continuum at various wavelengths, e.g.: GLIMPSE (3.6-8 μm), MIPSGAL (24 and 70 μm), ATLASGAL (870 μm) and Hi-GAL (70-500 μm). Here we propose a systematic survey of the southern Galactic plane in the J=2–1 molecular transition of 13CO, similar to the Galactic Ring Survey (GRS) covering the northern Galactic plane in 13CO(1-0), but providing transformational new synergies with existing 13CO(1–0) data from the Three-mm Ultimate Mopra Milky Way Survey (ThrUMMS). We plan to map 78 deg2: -60◦≤ l ≤ +18◦, |b|≤0.5◦, at 28□□ resolution, to significantly enhance ThrUMMS and fully complement GRS. We aim to: 1) constrain the large scale Galactic structure: spiral arms, and central bar; 2) produce a fully 3D realization of the molecular excitation and optical depth in the ISM; 3) achieve a complete census of filamentary structures, and probe their formation mechanism; 4) study the dynamics of the ISM at all scales (clumps, filaments, and molecular complexes); and 5) measure the star formation process efficiency as a function of environment.

Tiempo asignado: 20 horas

Propuesta: 2015A/008

Investigador Principal: Gerrit van der Plas, Universidad de Chile

Título: Are disks around very low mass stars in the Chameleon I Star-Forming Region really that different?

Resumen: Young Brown Dwarfs and low mass stars are the most numerous objects in the sky. Like their heavier counterparts, they are known to possess protoplanetary disks and even planets. The manner in which these disks and planets form and evolve is far from clear. For example, there exists a controversy about how the disk shape changes as function of stellar mass. Models predict these disks are more red (larger scale heights), whereas observations by Sz}ucs et al. (2010) shows the opposite (disks around lower mass objects are flatter).
Their study only used data up to 24□m, which has limited use in constraining the disk structures. With the now available Herschel data we have the possibility to constrain the disk structure far more accurately and thus check if the discrepancy in disk shape between models and observations is real. To do so, we need an as complete as possible SED coverage of our targets, out to the optically thin regime at 870 μm.
With these observations we will be able to further constrain the structure of protoplanetary disks around brown dwarfs and young low mass stars and take an essential step towards reconciling the theory and observations of these objects.

Tiempo asignado: 21 horas

Propuesta: 2015A/004

Investigador Principal: Nadia Lo, Universidad de Chile.

Título: Confirmation of warm-up phase chemistry in the G11.94-0.62B and G16.871-2.154 molecular cores

Resumen: We propose the continuation of a wideband pointed spectral-line survey towards two "mm-only" cores G11.94-0.62B and G16.871-2.154, as part of pilot study to accurately derive the temperatures and masses of these objects, and hence determine whether the molecular cores are massive enough to form high-mass stars. While originally deemed to be "cold" and without direct association with methanol masers and H II regions from a survey of southern massive star-forming regions (Hill et al. 2005), the detection of complex, saturated gasphase species using the Mopra radio telescope at _ 3 and 7 mm (Balnozan et al. 2014, in prep.), predicted to be present in the very early and di_cult-to-observe initial warm-up stages of a massive star forming core, suggests that these sources are in exactly this phase. In this proposal, we request high-frequency APEX observations of higher-energy transitions of key tracers and complex molecules detected with Mopra and the ATCA, crucial for deriving the physical and chemical parameters leading to the comprehensive characterization of these two science targets. We will use radiative transfer modelling and LTE/non-LTE analysis methods to accomplish these goals.

Tiempo asignado: 4 horas

Propuesta: 2015A/007

Investigador Principal: Monica Rubio, Universidad de Chile.

Título: SuperCam survey of the LMC and SMC.

Resumen: We propose the _rst observations for the SuperCam Magellanic Cloud survey|the _rst full-galaxy map of CO in the LMC and SMC with sub-arcmin resolution. Using the unique mapping capabilities of SuperCam, we will eventually cover 39 deg2 in the LMC and 5 deg2 in the SMC with 1800 resolution observations of CO(3-2). These maps will enable a wide range of science, both on its own and in conjunction with existing observations of CO and dust emission from Spitzer and Herschel. We will study the evolution of GMCs, the star formation law, di_use molecular gas, and more. In addition, the survey will provide the _nding chart and zero-spacing component for a wide variety of ALMA Band 7 observations across this key target. We propose to almost complete the SMC SuperCam CO3-2 map by adding 2 deg2 to the time already granted for 2014B.

Tiempo asignado: 68 horas

Propuesta: 2015A/011

Investigador Principal: Ricardo Demarco, Universidad de Concepción

Título: Witnessing Mass Growth in a High-Density Region at z = 1.6

Resumen: We propose APEX-LABOCA imaging of an 70 circular _eld around the recently discovered cluster SpARCS J0224727□032354 at redshift z = 1:63. Selected by the new developed algorithm, the "stellar bump sequence (SBS) method", we have securely identi_ed 23 cluster members. Our Spitzer-MIPS 24 _m indicates that merging activity in this large-scale structure is enhanced, and our photometric data show a young red sequence (RS) and a large proportion of optically red star-forming galaxies. With our 870 _m imaging, we aim to reveal obscured star formation activity within and around this evolved galaxy cluster as expected around a rapidly assembling high-redshift halo.

Observations at 870 _m are perfectly suited to _nd the massive galaxies in formation, progenitors of the RS galaxies. Our proposed sub-mm observations will complement the already existing exquisite multi-wavelength coverage of this unique structure.

Tiempo asignado: 25 horas

Propuesta: 2015A/006

Investigador Principal: George Privon, Universidad de Concepción.

Título: A Census of the Warm Molecular Gas in Local U/LIRGs

Resumen: Luminous Infrared Galaxies (LIRGs; LIR > 1011 L_) are widely understood to be powered by a mix of star formation and AGN activity. We propose observations of the CO(3{2) emission in a sample of nearby LIRGs to study the properties of the molecular gas fueling this activity. This line is an ideal diagnostic for star formation as it traces the warm molecular gas component associated with high mass star-forming regions in galaxies. We will combine these new CO(3{2) measurements with our Kitt Peak 12m CO(1{0), Herschel CO spectral line energy distribution and Spitzer mid-to-far IR data in order to: (1) determine whether the CO(3{2) luminosity is a good independent estimator of the star formation rate by measuring the constancy of the CO(3{2)-to-FIR luminosity ratios of the sample, (2) search for and characterize starburst-driven molecular outows, (3) compile a library of global CO(3{2) measurements for use in determining the amount of ux resolved out by follow-up interferometric observations, and (4) assess the physical conditions of their molecular gas by
modeling the CO spectral line energy distribution. Beyond our immediate objectives, this APEX dataset will provide great legacy value as a comprehensive catalog of CO(3{2) measurements for LIRGs.

Tiempo asignado: 50 horas

Propuesta: 2015A/003

Investigador Principal: Alexander Roman-Lopes, Universidad de La Serena.

Título: Intensive Study of the Galactic Bubble N4: Gas Distribution and Kinematics.

Resumen: We propose to use the APEX telescope to obtain OTF maps of 13CO J=2-1 and J=3-2 lines toward the Galactic bubbles N4 and N4W, in an area of 16'□11'. The main purpose of this work is to derive the gas distribution and radial velocities with a sub-arcmin spatial resolution, which enable us to further study their kinematics. In combination with our previous data (12CO, 13CO and C 18O, J=1-0), it is also possible to obtain other physical properties such as excitation temperature and column densities to a higher accuracy.
With these data in hand, 3-D model can be made to study the gas distribution and kinematics in space. We will also use the excellent APEX data to search for star formation activities such as outflow and infall structures inside the bubble region, thus contributing to understand the (if any) triggered star formation there. A detailed study of the chemistry in the bubbles will be proposed later. Through these studies we will obtain comprehensive knowledge on the origin, propagation and star formation in this region.

Tiempo asignado: 17 horas

Propuesta: 2015A/002

Investigador Principal: Leonardo Bronfman, Universidad de Chile.

Título: Molecular characterization of N 5 (Sh2-39): a prototypical IR dust bubble

Resumen: Massive stars strongly modify the molecular environment where they are born through their stellar winds and UV photons, creating interstellar bubbles and HII regions. We propose to map the southern infrared dust bubble N5 (= Sh2-39) of about 7 arcmin in size and its environs in the 12CO(2-1), 13CO(2-1), 18CO(2-1), SiO(6-5), and H13CO+(3-2) using APEX. The nebula is associated with photodissociation regions, has blown a cavity in the surrounding molecular material, and includes star forming regions in its environs, as revealed by the presence of young stellar objects and maser emission. We would like to use the molecular data to 1) determine kinematic distances, 2) measure the mass of molecular material, 3) search for the kinematic signatures of expansion and shocks, and 4) measure excitation temperatures and column densities as a function of radius, and 5) compare the molecular conditions of surrounding regions where young stars are forming to more quiescent clouds that have not been subjected to the perturbing influences of evolving massive stellar populations.

Tiempo asignado: 12 horas