Comisión Nacional de Investigación Científica y Tecnológica – CONICYT

Resultados Concurso Apex 2014-A

Propuesta: 2014A/04

Investigador Principal: Guido Garay, Universidad de Chila

Título: SuperMALT: determining the physical and chemical evolution of high-mass star-forming clumps

Resumen: MALT90 was a recent, large survey that observed over 2600 high-mass star-forming clumps within the Galaxy. Using the Mopra telescope, it obtained small maps in 16 molecular lines near 90 GHz around each of the ATLASGAL-selected clumps. The low-J transitions of the molecules included in the MALT90 survey traced a combination of cold, dense and hot/shocked gas. While these data reveal a wealth of information about the gas morphology, chemistry, and kinematics, alone, they are unable to constrain the physical properties of the clumps. In order to characterise the various stages in the evolution of a high-mass star-forming clump, we now propose a large APEX program, SuperMALT, to observe the higher J transitions of these molecular species toward a carefully selected sub-sample of the MALT90 clumps. The combination of the Mopra and APEX data will constrain the molecular excitation and allow us to deduce accurate temperatures and column/volume densities within each clump. Reliably determining these parameters is critical to establish their evolutionary stage. With an accurate measurement of their global properties, we will then select the best candidates for detailed followup with ALMA with the goal of testing star and cluster formation scenarios.

Tiempo asignado: 47 horas

Propuesta: 2014A/05

Investigador Principal: David Rodriguez, Universidad de Chile

Título: Toward identifying the unusual solid-state emission features toward HD131488 and HD121191

Resumen: We have recently identi_ed HD131488 and HD121191 to host signi_cant quantities of inner and outer planetary system dust and also unusual, as of yet unidenti_ed, solid-state emission features in their mid-infrared spectra. We seek to pursue one interpretation that these features could be due to outgassing cometary bodies that swarm the host stars. CO-line measurements will allow us to begin to characterize cometary activity towards these objects and its relation, if any, to the strange observed mid-infrared emission feature. As a test case, we also request observations of HD166191, a star that is similarly dusty as HD131488 and HD121191, but hosts a more typical silicate solid-state emission feature. These observations will also serve as a primer for future ALMA proposals to map dust continuum and molecular line emission toward these objects and measure other molecules expected if the material is cometary in origin.

Tiempo asignado: 4.5 horas

Propuesta: 2014A/03

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 _m), MIPSGAL (24 and 70 _m), ATLASGAL (870 _m) and Hi-GAL (70-500 _m). 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_,jbj_0.5_, at 2800 resolution, to signi_cantly 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 _lamentary structures, and probe their formation mechanism; 4) study the dynamics of the ISM at all scales (clumps, _laments, and molecular complexes); and 5) measure the star formation process e_ciency as a function of environment.

Tiempo asignado: 20 horas

Propuesta: 2014A/08

Investigador Principal: Diego Mardones, Universidad de Chile

Título: Unraveling the Evolutionary Sequence for Planck cold cores.

Resumen: Stars form in dense regions within molecular clouds, called pre-stellar cores (PSCs), which provide the initial conditions in the process of star formation. However, the physical and chemical properties of prestellar cores especially massive prestellar cores are still unclear and need to be investigated systematically with an appropriate large sample. The low dust temperature (<14 K) of Planck cold clumps/cores makes them likely to be pre-stellar objects or at the very initial stages of protostellar collapse. Here we propose to conduct a study of the physical and chemical properties of 30 Planck cold clumps/cores having high column density (N_ 1022 cm□2) in 13CO/C18O (2{1), N2H+ (3{2) and HCO+ (3{2) transitions. In concert with other ground-based (Mopra, PMO 14m and NANTEN2) and space-based observations (Herschel), we will determine the evolutionary sequence for these clumps/cores and answer whether and when the clumps/cores may collapse. This study will greatly improve our understanding of the initial conditions for star formation and core evolution.

Tiempo asignado: 35 horas

Propuesta: 2014A/07

Investigador Principal: Ricardo Finger, Universidad de Chile

Título: The molecular environs of Bochum 7 and IRAS08426-4601. Stellar formation triggered by an Hi supershell?

Resumen: The compression of interstellar gas (either molecular or atomic) by expanding Hi supershells seems to be a good mechanism for the formation of new generation of stars in our galaxy. GS263-02+45 is a giant galactic Hi supersell that may have triggered the formation of the OB association Bochum 7, close to the IRAS source 08426-4601. We have mapped the close environs of IRAS08426-4601 with the MOPRA 22m telescope and we found a molecular cloud that is likely to be associated with Bochum 7; very likely, these objects are the result of a process triggered by the expansion of GS263-02+45 into the Galactic neutral/molecular medium. Since the low sensitivity of MOPRA telescope did not allow us to perform a detailed analysis of the molecular cloud, we are proposing here to perform a high sensitivity molecular observation of the environs of Bochum 7 and IRAS08426-4601 with SHFI APEX-1 instrument. The aim of this project is to characterize in detail the molecular gas of the cloud previously detected with MOPRA and study its physical properties. This study will help to better understand the stellar formation process triggered by the expansion of giant Hi supershells in the Milky Way.

Tiempo asignado: 19 horas

Propuesta: 2014A/010

Investigador Principal: Lara Rodrigues

Título: Structure of gas _laments and cores in L1641.

Resumen: We propose to map the L1641-C to L1641-S regions simultaneously in the 13CO and C18O 2{1 lines using the APEX1 receiver. With these data combined with the L1641-N region being mapped in ESO time we will resolve the _lamentary structure observed in dust emission and absorption into separate kinematic components as demonstrated by Hacar et al (2013) in the B213 star forming region. Thus, we will match the surface mass and ux density from YSOs derived from nir observations to the column density and dynamical state of the gaseous environment.

Tiempo asignado: 36 horas

Propuesta: 2014A/02

Investigador Principal: Leonardo Bronfman, Universidad de Chile

Título: Molecular gas in RCW 122, an extreme massive-star forming complex in action.

Resumen: RCW 122 is a giant star forming region associated with large amounts of molecular gas and dust, where strong evidence of localized massive star formation has been reported (outflows, maser emission, high density gas, etc.). The goal of this project is to fully characterize the molecular gas where star formation is taking place.
The crucial APEX data shall complement our near-IR photometry (obtained with Du Pont telescope), which will allow us to detect and to study Young Stellar Object candidates. The excellent spatial resolution of SHFI APEX-1 instrument will allow us to investigate the physical conditions where YSO candidates are embedded (like density, temperature, abundance, etc.) and will also highlight shocked molecular gas, where potential outflows, expanding ionization fronts, or wind-blown molecular gas might be acting and possibly triggering the formation of a new generation of stars. This information is very important to better comprehend the mechanism involved in the formation of massive stars, and to fully understand the feedback processes between them and their parental molecular clouds.

Tiempo asignado: 14 horas

Propuesta: 2014A/09

Investigador Principal: Mónica Rubio, Universidad de Chile

Título: Molecular gas and outflows towards IRAS sources

Resumen: We would like to observe the star forming regions IRAS 08140-3559, IRAS 08589-4714, IRAS 09014-4736, and IRAS 09026-4842 from the list of Beltr´an et al. (2006), with the aim of investigating the star formation activity in the regions. Specific aims are: (1) to detect the molecular gas counterpart of the associated cold dust clumps and analyze the kinematics of the molecular gas, (2) to detect molecular outflows, (3) to investigate the evolutionary phase of the young stellar objects in each region, and (4) to confirm that massive stars are forming in the regions. To perform this study we propose to map a region of 2×2 arcmin centered at the IRAS positions, in the molecular lines in 12CO(3-2), 13CO(3-2), HCO+, SiO(5-4), H2CO, and DCO+, which will provide information about the excitation conditions of the molecular gas, the physical parameters of the dense gas in the clumps, and the characteristics of the molecular outflows from young stellar objects in the regions.

Tiempo asignado: 25 horas

Propuesta: 2014A/11

Investigador Principal: Mónica Rubio, Universidad de Chile

Título: Dark CO in the SMC

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, 870_m continumm, HERSCHEL, SPITZER and HI observations to determine the gas and dust properties, the relatonship between CO, total gas and dust including gas to dust ratio, the CO conversion factor to derive masses, the submillimeter excess of dust emission and recentyy the transition of CO -bright to CO dark gas in order to understand the e_ects 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: 45 horas

Propuesta: 2014A/06

Investigador Principal: Pia Amigo, Universidad de Valparaíso

Título: The G347.6+0.2 star forming region: Revealing starburst episodes beyond the Galactic Center.

Resumen: We propose to map at 870μm and 350μm with LABOCA and SABOCA the star forming region G347.6+0.2. This region is particularly interesting since it is located at a distance of 8–9 kpc and may be located in the very center of the Galaxy or beyond the Galactic center. This represents an excellent opportunity to observe star formation at the Galactic center. The star formation in the region may be triggered by the nearby young massive stellar cluster DBS2003 179, recently studied by our group with VVV images. The main goal of our project is to characterize star formation within this complex, and the proposed APEX observations will help to trace the distribution of cold dust and the progenitors of high mass stars, leading to a better understanding of star formation in this Galactic region. This is a resubmission of the last semester proposal C-091.F-0010. Due to bad weather, SABOCA observations could not be completed. We asked for a continuation of our program to fulfill our science goals.

Tiempo asignado: 5.7 horas
