Comisión Nacional de Investigación Científica y Tecnológica – CONICYT

Resultados Concurso Apex 2012-B

Propuesta: 2012B-20

Investigador Principal: Guido Garay, Universidad de Chile.

Título: Mapping The Structure of an Extreme Massive Star Forming Core.

Resumen: The infrared dark cloud (IRDC) SDC335 is among the most massive and extreme objects in the recently constructed Spitzer catalogue of IRDCs. Within it are two of the most luminous candidate high mass protostars known. However compared to other candidate massive star forming clouds, SDC335 is in a very quiscent region making it a prime candidate for studying the initial conditions of massive star formation. The remarkable kinetics of SDC335 indicating infall along its _laments have recently been imaged in an ALMA Cycle 0 project. Here we request time to map SDC335 with LABOCA and SABOCA to image the dust continuum emission. In combination with the shorter wavelength data from HiGAL, these APEX observations will allow us to construct temperature and density maps of the region as well as better constrain the nature of the two young massive protostars within it.

Tiempo asignado: 10 Horas

Propuesta: 2012B-12

Investigador Principal: David R. Rodriguez, Universidad de Chile.

Título: Characterizing Phoenix Giant Disks.

Resumen: We are studying a new class of _rst-ascent giant stars that are surrounded by substantial dusty disks that are sometimes being accreted by the host giant star| Phoenix Giants. We propose APEX-LABOCA observations of a subset of the most infrared-bright systems to constrain their disk dust mass. Such observations will enable probes into the origin of the Phoenix Giant phenomenon.

Tiempo asignado: 8 horas

Propuesta: 2012B-17

Investigador Principal: Leopoldo Infante, Universidad de Chile.

Título: Measurement of the Kinetic Sunyaev-Zel'dovich E_ect in MACS J0717:5+3745 with Z-Spec.

Resumen: We propose to measure the kinetic Sunyaev-Zel'dovich e_ect spectrum in the intermediate redshift (z = 0:545) galaxy cluster MACS J0717:5+3745 with Z-Spec. The Sunyaev-Zel'dovich (SZ) e_ect is a change in the spectrum of the cosmic microwave background (CMB) as seen through galaxy clusters. To correctly describe the SZ distortion when the scattering medium is moving with respect to the CMB requires the addition of the kinetic SZ (kSZ) e_ect which modi_es the canonical SZ spectral distortion; the kSZ e_ect has not yet been measured de_nitively in a single object. Z-Spec is ideally suited to measure this e_ect in a cluster where the kSZ signal is large. The MACS J0717:5+3745 surface brightnesses measured at 140 and 270 GHz are discrepant with a purely thermal SZ spectrum at a signi_cance of 1:9_ and require that one of the cluster's subclumps have a line of sight peculiar velocity of 3600+3500□2200 km/s, consistent with the spectroscopically determined optical velocity estimates for the galaxies associated with the subclump. A peculiar velocity this large will lead to a 6_ measurement in a reasonable Z-Spec integration time, which would be the _rst ever de_nitive measurement of kSZ in a single object.

Tiempo asignado: 20 horas

Propuesta: 2012B-06

Investigador Principal: Gustavo Orellana, Universidad de Concepción.

Título: ZSPARC: the Z-Spec/APEX Redshift Campaign for H-ATLAS: The Chilean Sub-Sample.

Resumen: The largest area (_ 580 deg2) extragalactic Herschel survey, H-ATLAS, has provided by far the brightest sample of moderate- to highly-lensed FIR galaxies (_1 per deg2). With Z-Spec we can observe the brightest H-ATLAS sources, obtaining redshifts, determining gas properties via the CO ladder and exploring the inuence of AGN, whilst relatively immune to uncertainties in the lensing models. The Z-Spec H-ATLAS sample thus allows us to study the galaxies that dominate the FIR background and the star-formation-rate density at the peak epoch of starburst/AGN activity. With Z-Spec redshifts in hand, we will have the ultimate sample to exploit ALMA, mapping sub-kpc internal structures, in powerful diagnostic transitions such as [C ii], CO, 13CO and C18O, on the scale of individual GMCs. We have commenced this process with the Einstein Ring G15v2.19: with a Z-Spec derived redshift (2011A; P.I. Orellana) of 1.027, we obtained Cycle 0 ALMA time (7hr; P.I. Orellana) for a detailed study of its molecular gas and dust properties. This proposal to observe three H-ATLAS sources in 24 hours with Z-Spec is a resubmission of our successful 2011B proposal, which was not observed due to technical failures.

Tiempo asignado: 24 horas

Propuesta: 2012B-02

Investigador Principal: Franz Bauer, Pontificia Universidad Católica de Chile.

Título: Tracing the cold dust in the most massive galaxies at $1 < z < 3$.

Resumen: We propose LABOCA observations of 18 southern high redshift radio galaxies (HzRGs; L3GHz > 1026WHz−1, $1 < z < 3$) from our HeRGE survey. Stellar masses and mid-IR AGN luminosities from Spitzer confirm that these sources are amongst the most massive galaxies and powerful AGN known above $z = 1$. We have an ongoing Herschel program which will constrain the peak of the cool dust emission associated with star formation. Recent inspection to this Herschel data shows that the SPIRE-500 μm photometry is too shallow to constrain the coldest dust components for our high-z sources. We propose to use LABOCA 870 μm to alleviate the confusion noise in the 500 μm maps (36” fwhm) and to ideally match the Herschel 250 and 350 μm depths. These new data will provide us with accurate far-IR luminosities, dust masses and obscured star formation rates, allowing us to tackle the evolutionary state of these massive high-z galaxies to great detail. The total requested time for this APEX program is 65 hours from which 22 hours are being requested by Chilean collaborators, with the rest coming from ESO and Swedish time.

Tiempo asignado: 22 horas

Propuesta: 2012B-23

Investigador Principal: Matthias Schreiber, Universidad de Valparaíso

Título: Measuring the mass of planet forming protoplanetary disks.

Resumen: Although large numbers of extrasolar planets have been identi_ed within the last two decades we still struggle to understand the details of the formation process of giant planets. Giant planet formation is thought to show observational signatures in the so called transition disk objects, i.e. pre-main-sequence stars surrounded by circumstellar disks with inner opacity holes. The direct detection of forming planets still embedded in their primordial disks represents the most promising path to learn about the planet formation process. Such systems provide ideal laboratories to study the properties of both young planets and the disks in which they form. Sad but true, currently there are only two transition disk systems with a claimed direct detection of forming planets (LkCa 15 and T Cha). In March 2012 we observed the transition disk Cha T35 with VLT/NaCo using the Sparse Aperture Masking (SAM) technique and detected a new forming planet well inside the gap expected in the disk of Cha T35. Here we propose to estimate the mass of the disk in Cha T35 and four additional transition disks showing signs of planet formation, by using APEX/LABOCA to measure their optically thin submillimeter emission.

Tiempo asignado: 5 horas

Propuesta: 2012B-04

Investigador Principal: Guido Garay, Universidad de Chile.

Título: Searching for hidden hot gas in G0.25+0.016 a molecular cloud progenitor of an Arches-like cluster.

Resumen: Clusters are the building blocks of galaxies and the nurseries of most stellar systems. However, little is known about the formation of the most massive clusters. In recent surveys, one object, G0.25+0.02, stands out as extreme. Identi_ed as a cold, dense, massive molecular clump devoid of current star-formation, it has exactly the properties expected for a clump that may form an Arches-like massive cluster. Our wealth of ancillary data reveals tantalising evidence that it is highly structured and, thus, may be undergoing hierarchical fragmentation. Surprisingly, while its dust temperature is very low (15 K), the detection of complex molecules that arise from hot gas suggests that the gas temperature within G0.25+0.02 may be > 100K. The proposed observations will reveal the distribution and kinematics of the hot gas. These data combined with our upcoming ATCA and ALMA early science observations, will allow us to better understand the initial conditions within this massive protocluster.

Tiempo asignado: 32 horas

Propuesta: 2012B-21

Investigador Principal: J. González, Pontificia Universidad Católica de Chile.

Título: Deep Sub-millimeter imaging of CLASH galaxy clusters.

Resumen: The Cluster Lensing and Supernova survey with Hubble (CLASH) is a 524-orbit multi-wavelength HST program to use gravitational lensing by 25 galaxy clusters to constrain models of galaxy and structure formation with unprecedented accuracy. Despite the unique panchromatic nature of this survey, CLASH lacks a key measurement at submillimeter wavelengths to locate lensed background submillimeter galaxies (SMGs). We propose to perform deep 870_m imaging of 3 of the 25 CLASH clusters using LABOCA on the APEX telescope. These observations will be crucial to identify the strongly magni_ed, high-redshift SMGs in the background of these clusters. Taking advantage of the superb multi-band high-resolution optical/near-IR imaging with HST we will be able to fully characterize the properties of these intrinsically faint SMGs (SFR, stellar mass, redshift) and to study their morphologies by reconstructing the source plane with unprecedented detail in turn.

Tiempo asignado: 18 horas

Propuesta: 2012B-13

Investigador Principal: S. Torres-Flores, Universidad de La Serena.

Título: Studying the Schmidt-Kennicutt law for merging/interacting galaxies

Resumen: The Schmidt-Kennicutt law relates the star formation rate and gas density in spiral galaxies, _SFR and _H2, respectively. Recently, some authors have found that starburst and spiral galaxies follow different laws in the _SFR versus _H2 plane, suggesting the existence of two different star formation regimes. In this sense, it results crucial the study of the Schmidt-Kennicutt law for local and well resolved merging/interacting galaxies, where we can identify strong star-forming regions as in the main body of the merging object as in their tidal tails. In this proposal we ask for APEX observing time to study, for the first time, the _SFR versus _H2 law for a merging galaxy in sub-kpc scales. We propose to use the APEX-1 (SHeFI) instrument to map the CO(2–1) emission in the system NGC 1487 and determine its H2 mass content and _H2. By using GALEX and Spitzer archival data of NGC 1487, we will estimate the _SFR for different small-scale regions in this system. The analysis of the _SFR versus _H2 plane for NGC 1487 will allow us, for the first time, a detailed study of the different star formation regimes in a merging galaxy.

Tiempo asignado: 7.2 horas

Propuesta: 2012B-25

Investigador Principal: Rodolfo Angeloni, Pontificia Universidad Católica de Chile.

Título: Unveiling the millimeter emission of the giant jet in Sanduleak's star: paving ALMA observations

Resumen: We recently discovered an exceptionally large jet around Sanduleak's star, an enigmatic symbiotic system in the Large Magellanic Cloud. Extending 14 pc across the LMC, it is the largest bipolar stellar jet known so far, and the _rst extra-galactic stellar jet to be clearly resolved. This makes it an extremely valuable target for the study of the large-scale formation and evolution of astrophysical jets. Here we request APEX observations with the aim of unveiling for the _rst time the millimeter-wave properties of Sanduleak's star. Using both LABOCA and SABOCA, we will measure the continuum emission at 345 and 850 GHz to establish the presence and properties of the cold dust that is expected to be created by the central symbiotic source. In addition, we wish to use the APEX-1 and APEX-2 heterodyne receivers to search for an accompanying molecular outow by tracing the 12CO (2-1) and (3-2) line emission at di_erent points along the optical jet axis. Extraordinary sources like Sanduleak's star provide unique opportunities to test the foundation and limits of current theory. Our proposed APEX observations will lend insight into the nature of the central source and help to establish Sanduleak's jet as a promising source for future detailed studies with ALMA.

Tiempo asignado: 11.5 horas

Propuesta: 2012B-18

Investigador Principal: Guido Garay, Universidad de Chile.

Título: How do stars form in _lamentary IRDCs?

Resumen: Much of the dense gas in molecular clouds has a _lamentary structure. Various models predict the structure and evolution of these _laments. However, to date little is known observationally about the relationship between the _laments and the clumps, cores and stellar clusters which form within them. We have mapped 13 _lamentary infrared dark clouds (IRDCs) with the ATNF Mopra 22m telescope in N2H+ (1-0) and other species. The _laments show bright emission with broad line-widths. Here we propose to observe the peaks of the cores within the clouds in N2H+ (3-2) to determine the kinematics of the densest parts, where stars will form.

Tiempo asignado: 31 horas

Propuesta: 2012B-08

Investigador Principal: A. Plunkett, Universidad de Chile.

Título: The impact of molecular outflows on intermediate-mass star forming regions: M8 and Circinus.

Resumen: Outflows are vital feedback components to the star formation process, injecting momentum and energy into the cloud, and likely feeding turbulent motion. Although the role of outflows is relatively well understood for isolated, low-mass stars, the impact of outflows on surrounding clustered environments, where most intermediate- to high-mass stars form, remains unknown. We propose APEX observations as an important part of a multi-wavelength study of the interaction of outflows and their surrounding clouds for a range of masses and evolutionary stages. We will map CO (3-2) to trace warm outflow emission in 6x10 arcmin regions in the two intermediate-mass star forming clusters M8 and Circinus. We will determine outflow properties (i.e. mass, momentum and energy), and compare with overall cloud properties in these regions. With complementary observations of these and another young, very active region Serpens South, we will study how the impact of outflows changes with relative evolutionary stage of star formation in clusters.

Tiempo asignado: 25 horas

Propuesta: 2012B-19

Investigador Principal: P. Hily-Blant, Universidad de Chile /LFCA-UMI.

Título: Turbulence in non-star-forming clouds: the Chameleon case.

Resumen: Dissipating part of the turbulent support of molecular clouds is a prerequisite to star formation. How and where does this dissipation take place are still outstanding questions. We propose to tackle these questions by combining observations of a non{star-forming molecular cloud, with dedicated 3D numerical simulations. The comparison between the two will be performed based on the statistical properties of the velocity _eld. Previous APEX observations towards the Chameleon Cloud IV suggest that the velocity _eld is intermittent, a fundamental property of turbulence, and that the turbulence in this cloud bears similarities with incompressible turbulence. The intermittent regions have elongated shapes, like what is observed in the Polaris Flare. These properties make the Chameleon Cloud IV a strong case to study turbulence in molecular clouds. The aim of the present proposal is twofold: increase the signi_cance of the preliminary results (both in terms of signal-to-noise and statistics), and to extend the map of the intermittent regions which we may expect to be parsec-scale _lamentary structures.

Tiempo asignado: 20.5 horas

Propuesta: 2012B-16B

Investigador Principal: Leonardo Bronfman, Universidad de Chile.

Título: A new warm dust _lament in the Orion-A GMC: Continuum and line observations at 350 GHz and 850 GHz.

Resumen: We propose continuum imaging and line observations to study the star formation history in a new warm dust_lament northeast of OMC-3 in the Orion-A GMC. This _lamentary structure is found by dust-continuum observations at 1.1 mm. It is located between OMC-3 and a second-generation star cluster, Orion 1c, which is 1.2 pc northeast from the _lament. The new dust _lament would be the youngest structure in Orion-A because it contains an infrared source, which is identi_ed as a Class 0 object with high-mass envelope. We observed Orion-A in the CO(J=4-3) line at 9' resolution using a 30-cm sub-mm telescope and found, through comparison with our existing CO(1-0) dataset, that this region has the highest intensity ratio of CO(4-3) to CO(1-0) (>1.2) in Orion- A. This indicates that warm and diffuse molecular gas is associated with the new dust _lament. It is plausible that the diffuse gas heated by Orion 1c has inuenced third-generation star formation in the new dust _lament through compressing and heating the molecular gas and the dust. The proposed observations will allow determining the relation between global environment and triggering of star formation in the new dust _lament.

Tiempo asignado: 11.8 horas

Propuesta: 2012B-05

Investigador Principal: Jordanka Borissova, Universidad de Valparaíso.

Título: Apex View on Newly Discovered Protoclusters and their YSOs.

Resumen: The principal aim of this project is to initiate a campaign to establish fundamental parameters for newly discovered protoclusters by securing radio/(sub)-millimeter observations. The crucial APEX data shall com-plement our near-infrared V V V (Y ZJHKs) photometry, mid-infrared WISE (3.4, 4.6, 12, 22μm) photometry,and SofI,NTT spectra. The synthesis of that data will provide a complete census of star formation within the target complexes, an estimate of the efficiency of this process, and, via a comparison of the mass functions of the differing populations, constraints on the physics governing giant molecular cloud fragmentation and subsequent cluster formation. Moreover, the data will permit the evolutionary states and masses of the constituent YSOs to be determined, and enable the characterization of clumps and dense cores throughout these regions (sizes, virial masses, densities, optical depth, energy). The proposed observations will highlight potential outflows, which are pertinent for identifying collapsing sources and actively forming stars. In sum, we aim to map two recently discovered bright protocluster complexes (G312.71+0.064 & G321.91-0.01) via
the APEX-2 345 GHz band.

Tiempo asignado: 26.6 horas

Propuesta: 2012B-24

Investigador Principal: Simon Casassus, Universidad de Chile

Título: Submm lines and spectroscopic redshifts of two extremely bright sub-mm galaxies discovered by Planck.

Resumen: The Planck mission, by surveying the whole sky, has the unique capability of systematically finding the rarest, brightest high-redshift sub-millimeter (sub-mm) sources, including potentially some of the most highly magnified gravitationally lensed sub-mm galaxies on the sky. We propose to observe two exceptionally bright sub-mm lens candidates at z_2 and 4. Both were intitially discovered in our *Planck* all-sky maps, have the typical "cold" FIR colors of high-redshift galaxies, and are bright, isolated point sources in very recently obtained Herschel images. Both have multiple sources associated with them in the WISE survey, which may be the amplifying structure (an intervening galaxy cluster or group). With the proposed observations we will confirm the nature of our sources, measure spectroscopic redshifts, and potentially obtain a first interpretation of the gas conditions in the ISM of the intensely star-forming regions in these two rapidly growing galaxies in the early Universe. With a flux boosting of factors of 10−50 and size scales of _100 pc in the source plane that can be resolved with ALMA, exceptionally strongly lensed high-z galaxies provide a unique window onto the most vigorous star formation in the early Universe, which is still essentially *terra incognita*.

Tiempo asignado: 29 horas

Propuesta: 2012B-28

Investigador Principal: Mónica Rubio, Universidad de Chile.

Título: 13CO(*J* = 3 *!* 2) Observations in the Small Magellanic Cloud: Tracing Dense and Warm Molecular Gas.

Resumen: The Small Magellanic Cloud is a perfect place to study the gas, dust and star formation in a low metallicity environment that resembles a primeval galaxy. The molecular gas in this galaxy has been studied in detail using lower transitions of CO, showing that most of the molecular gas is likely to be in moderate extinction regions where CO is faint and mostly photo-dissociated. We propose to conduct observations of the optically thin 13CO(*J* = 3 *!* 2) at 330 GHz toward five molecular regions in the SMC. We will combine these observations with existing CO(*J* = 3 *!* 2) as well as lower-J CO and 13CO data in order to constrain the temperature, column density and volume density of molecular gas. These observation will provide us detailed information about the distribution of SMC giant molecular clouds, their evolutionary state and their relation to star formation activity.

Tiempo asignado: 4,8 horas

Propuesta: 2012B-11

Investigador Principal: David R. Rodriguez, Universidad de Chile.

Título: Characterizing the Molecular Disk on the Closest, Lowest Mass T Tauri System.

Resumen: Recent work has discovered hundreds of young stars (ages _10{100 Myr) in moving groups less than 100 pc from the Earth. Our own research with the GALEX satellite has revealed many previously unknown candidate young, low-mass stars. To date there are only four \old" (_10-Myr) classical T Tauri systems within 100 pc that possess molecular disks. Our recent work with the APEX telescope has revealed a _fth disk-bearing system. Such molecular disks orbiting pre-main sequence stars represent the raw materials necessary for (or leftover from) the formation of giant planets, Kuiper Belt objects, and comets. These evolved disks are at evolutionary stages close to end of the giant planet formation stage. TWA 32 exhibited CO(3{2) emission at the systemic velocity of the system. At a distance of only _60 pc and spectral type M5, this is the closest, lowest mass system known to possess a molecular disk. This proposal aims to solidify our 12CO(3{2) detection in order to study its kinematics and infer properties of the disk.

Tiempo asignado: 12 horas

Propuesta: 2012B-15

Investigador Principal: Leonardo Bronfman, Universidad de Chile.

Título: The Gas Kinetic Temperature in the Circumnuclear Disk of the Galaxy.

Resumen: The circumnuclear disk (CND) of our galaxy has been widely studied. However, studies of the kinetic temperature (Tkin) of the bulk of molecular gas are extremely rare. We propose observations in the three 218 GHz and five 364GHz transitions of formaldehyde (H2CO) (both sets of transitions are quite close in frequency and can be observed simultaneously) towards four selected locations associated with the CND and Sgr A∗. The relative populations of its Ka ladders are determined by collisional processes and are therefore an excellent tool to determine Tkin. Knowing the temperature improves our knowledge of the H2 densities, the abundances of density tracer molecules, and it is therefore crucial for studies of the physical and chemical state of the CND. We request 26 hours in total to complete this project.

Tiempo asignado: 26 horas

Propuesta: 2012B-26

Investigador Principal: Mónica Rubio, Universidad de Chile.

Título: Dust, Molecules, and Star Formation at Low Metallicity.

Resumen: Dust affects the cooling cycle in the ISM and this affects the ability of a galaxy to form cold, dense clouds that can form stars. Thus, the low dust content of dwarf irregular galaxies should have consequences to the star formation process, but just what is the connection? We obtained LABOCA 870 μm maps of the low metallicity dwarfs WLM and IC 1613 and propose here to use LABOCA to map three more dwarf galaxies with low oxygen abundances. These data will trace the cold FIR dust continuum emission of low metallicity systems, and reveal probable sites of molecular material. These data, in combination with our exquisite HI maps and star formation history maps, will allow us to examine the relationship between the dust content, gas, and star formation in metal-poor dwarf galaxies. This will be important for understanding the evolution of dwarfs and star formation in the early universe.

Tiempo asignado: 25.8 horas

Propuesta: 2012B-03

Investigador Principal: David R. Rodriguez, Universidad de Chile.

Título: Molecular Gas in the Circumstellar Disk of MP Mus.

Resumen: Radio molecular line studies of residual gas in the disks orbiting nearby classical T Tauri stars o_er unique. opportunities to investigate timescales and processes involved in circumstellar gas depletion and Jovian planet formation. To date only four of these objects (TW Hya, V4046 Sgr, T Cha, and MP Mus) have been observed in molecular lines with a radio telescope; all four there were detected. We request observing time on the APEX 12-m to perform a line survey of the molecular circumstellar disk orbiting MP Mus, within which we recently detected CO with APEX. These observations will signi_cantly increase the sample of molecular lines observed from circumstellar disks orbiting young solar analogs and better constrain models of the late evolution of planet-forming circumstellar disks.

Tiempo asignado: 24 horas

Propuesta: 2012B-14

Investigador Principal: G. van der Plas, Universidad de Chile.

Título: Molecular gas in disks around nearby young Brown Dwarves.

Resumen: Young Brown Dwarves (BDs) with infrared excess are an exciting new environment to test the limits of planetary formation in protoplanetary disks. The molecular gas content of disks around BDs is still an unknown. Gas plays a large part in disk evolution, and the dispersion of the gas from the disk sets firm upper limits on giant planet formation. We propose to search for 12CO J=3-2 emission at 345.86 GHz in the disks around two nearby BDs (Spectral types M6 and M8.5) in the TW Hydrae Association. This will allow us to set limits on the molecular gas content of the disks.These observations will establish prime targets for gas rich disks around sub-stellar mass objects that can be observed with large radio telescopes such as ALMA.

Tiempo asignado: 16 horas

Propuesta: 2012B-09

Investigador Principal: N. Lo, Universidad de Chile.

Título: Chemical differentiation of star-forming cores at different evolutionary stages.

Resumen: In order to investigate the chemical signatures/properties of star-forming cores, in particular of the high mass ones, we request observation time with SABOCA to obtain the continuum emission at 350 _m for a 6 arcmin_ 5 arcmin region in the G333 giant molecular cloud, one of the best studied examples of massive star forming region. The targeted region is selected from the 870 _m continuum emission images (ATLASGAL), the proposed 350 _m observations together with data from MIPSGAL and GLIMPSE (3.6 to 24 _m) will give well constrained SED models of these cores, and thus categorise the evolutionary stages accurately. Combining this with our multi-molecular line maps, we can deduce the chemical signatures of star-forming cores at different evolutionary stages.

Tiempo asignado: 4.5 horas

Propuesta: 2012B-27

Investigador Principal: Mónica Rubio, Universidad de Chile.

Título: Molecular Clouds at Low Metallicity.

Resumen: Assessing the molecular gas and how it is distributed into clouds is essential to understanding the processes that drive star formation, but CO is notoriously hard to detect at low metallicities. With our previous SHFI observations we matched the beam size to cloud size and successfully observed CO in the low metallicity dwarf galaxy WLM. This observation breaks the low metallicity barrier for CO observations. Our CO detection in WLM is at the LABOCA FIR continuum peak in that galaxy. In this proposal we are requesting time to obtain CO observations of the LABOCA FIR continuum peak of another metal-poor dwarf irregular: IC 1613. A correlation between CO and dust that radiates at 870 μm in the LABOCA passband has been observed in the Magellanic Clouds. Here we are exploring cold dust as a potential tracer of molecular gas in metalpoor systems other than the Magellanic Clouds. If successful, these observations would open up the use of LABOCA-type images as tracers of molecular clouds in metal-poor dwarf galaxies.

Tiempo asignado: 30 horas

Propuesta: 2012B-07

Investigador Principal: Diego Mardones, Universidad de Chile.

Título: The Temperatures and Excitation Conditions of Molecular Outflows.

Resumen: A detailed understanding of the temperature, excitation conditions, and driving mechanisms of molecular outflows is currently lacking. Some recent progress has been made in deriving the temperatures of outflowing gas, but only for a limited, biased sample of objects that concentrates on rather isolated intermediate and high luminosity protostars. We propose to map two outflows - one driven by a very low luminosity protostar and one driven by a protostar in a highly clustered region - with APEX in the J = 6−5 and 7−6 transitions of CO. Combined with existing lower-J maps we will derive the temperatures of the outflowing gas by comparing the line ratios in different transitions to model predictions. With these results we will accurately determine the kinematic and dynamic properties of these outflows and study the underlying accretion histories onto the protostars and feedback in clusters. More generally, our results will characterize the temperature and excitation conditions for outflows driven by two types of protostars (low luminosity and location in clustered region) not considered by previous studies and allow us to investigate the outflow driving mechanisms and their impact on the cloud.

Tiempo asignado: 18.3 horas

Propuesta: 2012B-10

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

Título: SHFI APEX observations of the RCW106 massive star forming complex.

Resumen: In this work we aim to perform CO(2-1) OTF maps in the direction of several star forming sites of the massive galactic star formation complex RCW106. The primary goal is to derive physical properties of the molecular gas like (in a _rst moment from the CO(2-1) alone), the spatial distribution and mass of molecular gas for each detected condensation, the MFWHM of the lines, the kinematic properties in the inermost regions, the velocity _elds, etc. With these data in hands, we will study their relationship with the associated stellar population detected from new deep near-infrared (NIR) imaging data obtained from the VISTA Variables in the Via-Lactea (VVV) survey. Later, a follow up study will target some very speci_c regions with observations of the CO(3-2) transition and CO isotopomers and other molecular species, to reveal further information about the state of the gas. The excellent spatial resolution and sensitivity of the SHFI APEX instrumental con_guration, make it well suitable to provide us the tools needed to achieve the goals of this project.

Tiempo asignado: 33.7 horas

Propuesta: 2012B-16A

Investigador Principal: Leonardo Bronfman, Universidad de Chile.

Título: A new warm dust _lament in the Orion-A GMC: Continuum and line observations at 350 GHz and 850 GHz.

Resumen: We propose continuum imaging and line observations to study the star formation history in a new warm dust_lament northeast of OMC-3 in the Orion-A GMC. This _lamentary structure is found by dust-continuum observations at 1.1 mm. It is located between OMC-3 and a second-generation star cluster, Orion 1c, which is 1.2 pc northeast from the _lament. The new dust _lament would be the youngest structure in Orion-A because it contains an infrared source, which is identi_ed as a Class 0 object with high-mass envelope. We observed Orion-A in the CO(J=4-3) line at 9' resolution using a 30-cm sub-mm telescope and found, through comparison with our existing CO(1-0) dataset, that this region has the highest intensity ratio of CO(4-3) to CO(1-0) (>1.2) in Orion- A. This indicates that warm and diffuse molecular gas is associated with the new dust _lament. It is plausible that the diffuse gas heated by Orion 1c has inuenced third-generation star formation in the new dust _lament through compressing and heating the molecular gas and the dust. The proposed observations will allow determining the relation between global environment and triggering of star formation in the new dust _lament.

Tiempo asignado: 8.1 horas
