XIII Latin American Regional IAU Meeting

Morelia, Michoacán, México

8–12 November 2010

Contents

Preface

This book contains the abstracts of all scientific presentations that have been accepted for the XIII Latin American Regional IAU Meeting, to take place in Morelia, Michoacán, México, 8–12 November 2010. The oral presentations are divided into three categories: *Invited Reviews* (40 min for presentation + 5 min for discussion), *Invited Talks* (20 min for presentation + 5 min for discussion), and *Parallel Talks* (15 min for presentation + 5 min for discussion). The schedule of *Invited Reviews* and *Invited Talks* is given in the Program on page vii, with the detailed schedule of parallel sessions following on page xi. The poster presentations are divided into two sessions: posters in *Session I* will be displayed on Monday 8 and Tuesday 9 November, while posters in *Session II* will be displayed on Thursday 11 and Friday 12 November.

The *Local Organizing Committee* of the *Centro de Radioastronomía y Astrofísica* (CRyA), UNAM, Morelia is composed of Enrique Vázquez (chair), Jane Arthur, Adriana Gazol, Yolanda Gómez, Ricardo F. González, William Henney, and Luis F. Rodríguez.

The *Scientific Organizing Committee* comprises Luis F. Rodríguez (chair, CRyA-UNAM, Mexico), Zulema Abraham (IAG-USP, Brasil), Vladimir Ávila-Reese (IA-UNAM, Mexico), Rene Méndez (DAS, U. Chile, Chile), Gustavo Romero (IAR, CONICET, Argentina), Gonzalo Tancredi (OALM, FC, Uruguay), and Kathy Vivas (CIDA, Venezuela).

The proceedings of the meeting will be published in the *Revista Mexicana de Astronomía y Astrofísica (Serie de Conferencias)*, edited by Silvia Torres-Peimbert and William Henney. This abstract book was edited by Jane Arthur and William Henney, with design, layout, and LaTeX programming by William Henney.

Program of talks

LUNES 8 DE NOVIEMBRE			
09:00		**Inauguración**	
Moderator: Luis F. Rodríguez			
09:25	Review	Mario Hamuy	El Centro Milenio de Estudios de Supernovas
10:10	Review	Gustavo Bruzual	Modeling stellar populations near and far
10:55		**Refrescos y POSTERS I**	
11:40		**SESIONES PARALELAS**	**1A, 1B, 1C**
13:40		**COMIDA**	
Moderator: Kathy Vivas			
16:00	Review	Vladimir Ávila-Reese	The mass-assembling history of galaxies: observations vs. models
16:45	Invited	Nelson Padilla	Assembly of early type galaxies
17:10	Invited	Octavio Valenzuela	Galactic and sub-Galactic cosmology
17:35		**Refrescos y POSTERS I**	
18:20		**SESIONES PARALELAS**	**2A, 2B, 2C**
19:40		Fin de sesión	
MARTES 9 DE NOVIEMBRE			
Moderator: Zulema Abraham			
09:00	Review	Luiz Nicolaci da Costa	Dark energy and the large-scale distribution of galaxies

09:45	Review	Enrico Ramirez-Ruiz	Gamma-ray bursts
10:30	Invited	Santiago E. Pérez Bergliaffa	Nonsingular cosmological models
10:55		**Refrescos y POSTERS I**	
11:40		**SESIONES PARALELAS**	**3A, 3B, 3C**
13:40		**COMIDA**	
Moderator: Enrico Ramirez-Ruiz			
16:00	Review	Misael Rosales	El Observatorio LAGO (Large Aperture GRB Observatory)
16:45	Invited	William Lee	Accretion modes onto compact objects and the production of GRBs
17:10	Invited	Magdalena González	El observatorio de rayos gamma HAWC
17:35		**Refrescos y POSTERS I**	
18:20		**SESIONES PARALELAS**	**4A, 4B, 4C**
19:40		Fin de sesión	
MIÉRCOLES 10 DE NOVIEMBRE			
08:00		**Tour:**	Las Yácatas y Pátzcuaro
14:00		**COMIDA**	En el Campus UNAM
16:00		Foto de grupo	
16:30		**Regreso al Hotel Fiesta Inn**	
JUEVES 11 DE NOVIEMBRE			
Moderator: Susana Lizano			
09:00	Review	Odylio D. Aguiar	Detección de ondas gravitacionales
09:45	Review	Jorge Cantó	Jets de estrellas jóvenes: teoría
10:30	Invited	Mariana Orellana	Emisión de rayos gamma en microcuasares
10:55		**Refrescos y POSTERS II**	
11:40		**SESIONES PARALELAS**	**5A, 5B, 5C**

13:40		**COMIDA**	
Moderator: Enrique Vázquez-Semadeni			
16:00	Review	Paula Benaglia	Radio emission from massive protostellar objects
16:45	Invited	Martin Makler	Dark matter and strong gravitational lensing
17:10	Invited	Diego Falceta-Gonçalves	Interstellar turbulence
17:35		**Refrescos y POSTERS II**	
18:20		**SESIONES PARALELAS**	**6A, 6B, 6C**
19:20		Fin de sesión	
19:30		**Evento cultural:**	Actuación del Ballet Folklórico "Coyucán"
VIERNES 12 DE NOVIEMBRE			
Moderator: Fernando Roig			
09:00	Review	Laurent Loinard	Mapping star-formation in the Milky Way
09:45	Review	Tatiana A. Michtchenko	New results on celestial mechanics
10:30	Invited	Roberto Saito	Vista Variables in the Vía Láctea (VVV): current status and perspectives
10:55		**Refrescos y POSTERS II**	
11:40		**SESIONES PARALELAS**	**7A, 7B, 7C**
13:40		**COMIDA**	
Moderator: Gonzalo Tancredi			
16:00	Review	Javier Licandro	The transitional asteroid-comet objects
16:45	Invited	Juan José Downes	The formation and early evolution of brown dwarfs viewed through the Orion dispersed populations

17:10	Invited	Fernando Roig	The background population of asteroids in the Main and Trojan Asteroid Belts
17:35		**Refrescos y POSTERS II**	
18:20		**SESIONES PARALELAS**	**8A, 8B, 8C**
19:20		Asamblea y **CLAUSURA**	

Parallel sessions

Monday 8 November, 11:40–13:40

Session 1A	**Session 1B**	**Session 1C**
Galaxies (including AGNs)	*Stars, stellar systems, and star formation*	*Cosmology*
Moderator: Luis Aguilar	***Moderator: Leticia Carigi***	***Moderator: Santiago Pérez-Bergliaffa***
Características de las galaxias espirales enanas **A. M. Hidalgo-Gámez**	Proper motion study of the Magellanic Clouds using SPM material **Katherine Vieira**	Modification of Newtonian dynamics through generalization of Einstein's cosmological term as an alternative to dark matter **Nelson Falcón**
Disruption of dwarf satellite galaxies without dark matter **Rigoberto Casas-Miranda**	A multi-wavelength study of symbiotic stars in the Magellanic Clouds **R. Angeloni**	Constraining the dark energy equation of state using alternative cosmic tracers **Ricardo Chávez**
Study of dwarf AGN candidates **J. P. Torres-Papaqui**	On the chemical connection between the Galactic bulge and the thick disk **Alan Alves-Brito**	The angular power spectrum of dust-obscured galaxies and its impact on Sunyaev-Zel'dovich studies **A. Montaña**
Origin and evolution of the Sagittarius dwarf galaxy using N-body simulations **Carmen Adriana Martínez-Barbosa**	Investigating the outskirts of the Milky Way: the Pisces overdensity **Kathy Vivas**	Sunyaev-Zel'dovich detected massive cluster at $z \sim 1$: a constraint on σ_8 **L. Infante**

The rôle of tidal dwarf galaxies in galaxy evolution **Duilia de Mello**	Measuring the Galactic thick disk with QUEST-I RR Lyrae stars **Cecilia Mateu**	Studying the formation and evolution of galaxy clusters using millimeter-wavelength observations **Milagros Zeballos**
HOLMES and the little monsters **Grażyna Stasińska**	Structural parameters of M81 compact star clusters **M. Santiago-Cortés**	Gravitational lensing and dynamics in the galaxy group SL2S J02140-0535 **T. Verdugo**

Monday 8 November, 18:20–19:40

Session 2A *Galaxies (including AGNs)* ***Moderator: Érika Benítez***	**Session 2B** *Stars, stellar systems, and star formation* ***Moderator: Mauricio Tapia***	**Session 2C** *Cosmology* ***Moderator: Gladis Magris***
Induced nuclear activity in galaxy pairs **Francisco Hernández-Ibarra**	Effects of helium enrichment in globular cluster populations **Aldo A. R. Valcarce**	A variable IMF slope to fit the LCDM picture to observed high-z submm sources **Alejandra Muñoz**
The precessing jet in the core of NGC 1275 (3C84) **Zulema Abraham**	Confirmation of a recent bipolar ejection in the very young hierarchical multiple system IRAS 16293−2422 **Gerardo Pech**	Dissecting the cosmic star-formation history **M. Muñoz-Gutiérrez**
Correlations between properties of parsec-scale jets and optical nuclear emission of compact AGN **J. Torrealba**	El cúmulo globular NGC 6981: parámetros físicos y población de estrellas variables **R. Figuera Jaimes**	Seeding the disk galaxy population at different epochs **Aldo Rodríguez-Puebla**
Curvas de luz de M87 HST-1 como ondas de choque **Yaxk'in Ú Kan Coronado González**	Hα and O III emission-line maps of H II galaxies: characterizing the star formation **Ana Torres-Campos**	The mass power spectrum at galactic and subgalactic scales as a constraint to dark matter properties **Alma X. González-Morales**

Tuesday 9 November, 11:40–13:40

Session 3A *Galaxies (including AGNs)* ***Moderator: Vladimir Ávila***	**Session 3B** *Stars, stellar systems, and star formation* ***Moderator: Will Henney***	**Session 3C** *Cosmology and High energy astrophysics* ***Moderator: William Lee***

Supernova feedback and the bend of the Tully-Fisher relation
María Emilia De Rossi

Dynamics and large-scale star formation in disk galaxies
Rosa Amelia González Lópezlira

Migración del Sol y evolución química de la Galaxia
Leticia Carigi

The nature of assembly bias in a LCDM cosmology
Ivan Lacerna

Análisis de las características morfológicas y químicas de galaxias simuladas
Susana Pedrosa

Determinación de magnitudes físicas con modelos de síntesis inversa de poblaciones estelares
Gladis Magris C.

Gravitational stability of magnetized disks
S. Lizano

The inner regions of high accretion rate disks
P. D'Alessio

Census of protoplanetary disks in young stellar regions: a *Spitzer* view
Jesus Hernández

The CIDA-VISTA survey for young, low-mass stars in Orion OB1
César Briceño

Characteristics of the embedded cluster Tr 14-N4
Mauricio Tapia

VLBA astrometry to the proto–Herbig AeBe star EC 95 in the Serpens core
Sergio Dzib

The Euler Characteristic as a measure of the topology of reionization
Martina M. Friedrich

CCOs in SNR as neutron stars with growing magnetic fields
Giovanny Bernal

Transient gamma-ray emission from accreting black holes
Florencia L. Vieyro

The long-term polarimetric monitoring of blazars at San Pedro Mártir
Erika Benítez

Can T Tauri stars produce high-energy radiation?
María Victoria del Valle

Supernovae interacting with molecular clouds: high-energy aspects
Thierry Montmerle

Tuesday 9 November, 18:20–19:40

Session 4A
Galaxies (including AGNs)
Moderator: Rosa A. González

What multiwavelength monitoring of AGN can tell us about the accretion flow
Patricia Arevalo

Detection of extreme low-luminosity AGN's
Daniel Marcos Neri-Larios

Session 4B
Stars, stellar systems, and star formation
Moderator: Miguel Roth

Two new cataclysmic variables, SDSS1238 and SDSS0804, candidates for bounced-back systems
Andrés Avilés

An extremely long orbital period CV: SDSS0018+3454
Diego Hernando González Buitrago

Session 4C
High energy astrophysics and Interstellar medium
Moderator: Javier Ballesteros-Paredes

Electron acceleration in supernova remnant shocks
Mario A. Riquelme

H II region expansion in a magnetized turbulent medium
William J. Henney

Clustering and halo occupation distribution of active galactic nuclei **Takamitsu Miyaji**	Advances in the understanding of interacting binaries with additional long periods **R. E. Mennickent**	NANTEN ^{12}CO ($J = 1$–0) observations around the star WR 55 **N. U. Duronea**
EVN observations: unveiling the heart of (U)LIRGs. **C. Romero-Cañizales**	Asteroseismology of the Delta Scuti star V650 Tauri **L. Fox Machado**	The oxygen abundance in the Solar neighborhood **Mónica Rodríguez**

Thursday 11 November, 11:40–13:40

Session 5A *Galaxies (including AGNs)* ***Moderator: Gustavo Bruzual***	**Session 5B** *Stars, stellar systems, and star formation* ***Moderator: Paula Benaglia***	**Session 5C** *Interstellar medium* ***Moderator: Silvia Torres-Peimbert***
The AzTEC blank surveys: an overview of the high-z SMG population **Itziar Aretxaga**	On the formation of the most massive stars in the Galaxy **Roberto Galván-Madrid**	NGC 7009 and NGC 6826: a unified study of planetary nebulae and their central stars **Celia Fierro**
Lensed high-redshift galaxies in the *Herschel* ATLAS survey **David Hughes**	Observations of the photodissociated H I region that surrounds G213.880−11.837 **C. A. Rodríguez-Rico**	Evidencias observacionales del "backflow" en nebulosas planetarias altamente evolucionadas **Margarita Pereyra**
Dynamics of binary black holes in a hierarchical Universe **Eva Martínez-Palafox**	Embedded young stellar objects in the Galactic star-forming region IRAS18236-1205 **R. Retes**	PNe as observational constraints in chemical evolution models for NGC 6822 **L. Hernández-Martínez**
Submillimeter galaxies behind the Bullet Cluster **Omar López-Cruz**	New results on the HH80-81 radio jet **Carlos Carrasco-González**	Abundancias químicas de las nebulosas planetarias en NGC 300 **M. Peña**
Multicolour evolution of the galaxy Red Sequence at high redshift **A. D. Romeo**	Thermal radio emission from radiative shocks in colliding wind binaries **Gabriela Montes**	Detection of new planetary nebulae with the IPHAS survey **Laurence Sabin**
The distant Hubble sequence with *HST/ACS*, leading the way to the new Observatory of Panama **Rodney Delgado-Serrano**	How turbulent is molecular cloud turbulence? **Javier Ballesteros-Paredes**	Faint emission lines in Galactic planetary nebulae with [WC] nuclei **Jorge García-Rojas**

Thursday 11 November, 18:20–19:20

Session 6A	**Session 6B**	**Session 6C**
History, Outreach, and other topics	*Stars, stellar systems, and star formation*	*Interstellar medium*
Moderator: Adriana Gazol	***Moderator: Cesar Briceño***	***Moderator: Ricardo González***
Astronomía oficial y astronomía popular: ¿encuentro o desencuentro? **Susana Biro**	Study of filamentary structures across the Galactic plane **Yanett Contreras**	El RSN IC443 observado en 74 y 330 MHz: análisis de su distribución espectral **G. Castelletti**
Astronomy outreach **Julieta Fierro**	Tidal forces as a regulator of star formation in Taurus: a numerical study **Andrés Suárez-Madrigal**	Star-forming regions towards stellar wind bubbles: the ring nebulae RCW 52 and RCW 78 **Cristina Cappa**
La Revista Mexicana de Astronomía y Astrofísica, una opción real de publicación astronómica **Silvia Torres-Peimbert**	Several ways to brightness **Michael Richer**	Emisión de rayos X de burbujas interestelares alrededor de estrellas Wolf-Rayet **Jesús A. Toalá Sánz**

Friday 8 November, 11:40–13:40

Session 7A	**Session 7B**	**Session 7C**
Galaxies (including AGNs)	*Stars, stellar systems, and star formation, and Planetary systems*	*Interstellar medium*
Moderator: Itziar Aretxaga	***Moderator: Yolanda Gómez***	***Moderator: Manuel Peimbert***
Constraining the active galactic nucleus contribution in a sample of Seyfert galaxies: photoionization modeling **Mariela Martínez**	Physical parameters and chemical abundances in bipolar PNe **Daniel Moser Faes**	Mass and metal ejection efficiency in disk galaxies driven by young stellar clusters of nuclear starbursts **Ary Rodríguez-González**
High-redshift objects in dust environments **Eric Martínez**	Expansion angular de la nebulosa planetaria IC418 **L. Guzmán-Ramírez**	The molecular ISM associated with the super star cluster Westerlund 1 **A. Luna**

A local diagnostic for the Milky Way dark matter halo triaxiality
Armando Rojas Niño

Bar detection in isolated and pairs of galaxies
Hugo Méndez-Hernández

NGC 3516: Spectral features and their relation with X-ray variability in time
Eréndira M. Huerta

The universality of the fundamental plane for galaxies and galaxy systems
Hector Javier Ibarra Medel

Atomic line broadening by thermal energy fluctuations in stellar atmospheres and plasmas
O. Cardona

The nature of transition circumstellar disks in the Lupus molecular clouds
G. A. Romero

High-cadence NIR observations of extrasolar planets
Claudio Cáceres

Dynamical method to detect a third object around a cataclysmic variable: the FS Aurigae case
Carlos E. Chávez

Induced star formation in the H II region Sh2–54
J. Vásquez

Formación estelar en los bordes de regiones H II
S. Paron

Iron depletion in ionized nebulae of the Large Magellanic Cloud
Gloria Delgado-Inglada

The density power spectrum in turbulent thermally bi-stable flows
Adriana Gazol

Friday 12 November, 18:20–19:20

Session 8A
Galaxies (including AGNs)
Moderator: Octavio Valenzuela

Modeling the spiral arms of the Milky Way using manifolds
M. Romero-Gómez

GTC long-slit spectroscopy of compact stellar clusters in M81
Y. D. Mayya

3D visualization of evolutionary diagrams for quasars in the parameter space 4DE1
Omar Anguiano Sánchez

Session 8B
Planetary systems
Moderator: Jesús Hernández

Application of granular physics to impact processes on asteroids and comets
Gonzalo Tancredi

The effect of a strong stellar flare on the atmospheric chemistry of an Earth-like planet orbiting an M dwarf
Antígona Segura

Session 8C
Interstellar medium
Moderator: Miriam Peña

On the O/H, Mg/H, Si/H, and Fe/H gas and dust abundance ratios in Galactic and extragalactic H II regions
Manuel Peimbert

Physical conditions and chemical composition of the Small Magellanic Cloud H II region NGC 456
Maria Ángeles Peña-Guerrero

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Oral contributions

Cosmology

Nonsingular cosmological models

Invited Talk

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In this talk I will discuss the basic features of nonsingular cosmological models, and compare them to inflationary models. Particular attention will be devoted to observations that may help in distinguishing between these alternatives.

Galactic and sub-galactic cosmology

Invited Talk

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The Lambda-Cold Dark Matter (LCDM) paradigm is very successful for explaining the large-scale distribution of matter and galaxies properties. In spite of that progress, the model's success at galactic and sub-galactic scales is the subject of a lively discussion in the astronomical community. I will present new results for cosmological predictions and their comparison with observations for: dark matter halo structure (density profile and triaxiality) and the internal kinematics of galaxies, stellar kinematics in the Solar neighborhood and the structure and recent dynamical evolution of the Milky Way, the dark matter particle nature and the substructure abundance at the Solar system scale. Lastly, the state of each one of these theory/observations comparisons as potential conflicts will be briefly reviewed.

Dark matter and gravitational lensing

Invited Talk

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Abstract not available.

A variable IMF slope to fit the LCDM picture to observed high-z submm sources

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A Salpeter IMF seems to describe fairly well a large variety of properties in galaxies. However, some studies have found that it is necessary to change this value to a top-heavy IMF in starbursts to provide an adequate prediction in the abundance of submillimeter galaxies (SMGs) at high redshifts. We show preliminary results of an implementation of a SF intensity dependent IMF slope in a semi-analytic model of galaxy formation, which has been connected with a spectrophotometric code that provides an adequate treatment of reprocessed starlight by dust. We also explore systematic effects on the counts of submillimeter sources coming from the beamsize of the receiver taking into account the spatial correlation of sources and foreground objects. This helps alleviate the discrepancies found between the model and the observations.

Gravitational lensing and dynamics in the galaxy group SL2S J02140-0535

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We combine strong lensing modeling and dynamical constraints in order to probe the mass of SL2S J02140-0535, a galaxy group at $z = 0.44$ from the Strong Lensing Legacy Survey (SL2S) which has uncovered a new population of group-scale strong lenses. The strong lensing analysis is based on multi-band HST/ACS observations which display strong lensing features that we have followed up spectroscopically with VLT/FORS 2. In order to constrain the scale radius of an NFW mass profile not accessible to the lensing constraints, we propose a new method taking advantage of the large scale dynamical information provided by VLT/FORS 2 and KECK/LRIS

spectroscopy of group members. In contrast with other authors, we have shown that the observed lensing features in SL2S J02140-0535 belong to different background sources: one at $z = 1.7 \pm 0.1$ (photometric redshift) yields three images while the other one at $z = 1.0 \pm 0.06$ (spectroscopic and photometric redshift) is singly imaged only. Our unimodal NFW mass model reproduces these images very well. It is characterized by a concentration parameter $c_{200} = 7.5 \pm 0.8$, which is greater than the value expected from ΛCDM simulations for its mass of $M_{200} \approx 1 \times 10^{14} M_{\odot}$. The spectroscopic analysis of group members also reveals a unimodal structure which does not present any evidence of merging. The position angle of the halo is $\theta = 111.4 \pm 0.6$, which is in agreement with the direction defined by the luminosity contours. We compare our dynamic mass estimate with an independent weak-lensing-based mass estimate and we found that both are consistent, arguing for a relaxed galaxy group.

Modification of Newtonian dynamics through generalization of Einstein's cosmological term as an alternative to dark matter

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In recent years, various alternatives to the dark matter paradigm have been proposed: scalar field as quintessence scenarios and modifications of Newtonian dynamics (Brans-Dicke Theoy, Milgrow MOND and Moffat cosmology) which could, separately, explain the rotation curves of galaxies, the acceleration of the Universe and the meaning of the cosmological constant without nonbaryonic dark matter. Present work proposes the existence of one scalar potential with a non-gravitational origen, that would solve these problems. This potential is built up starting from a reflection to speculate on the potential of Yukawa: null in the very near Solar system, slightly attractive in ranges of interstellar distances, very attractive in distance ranges comparable to galaxy clusters, and repulsive at cosmic scales. The consequences of this potential are discussed, through a Friedmann-Robertson-Walker type Cosmological Model with a cosmological term that is a function of the distance (λ as a function of r). In the cosmological model the critical density of matter is consistent with the observed density without including dark matter, MOND theory is deduced for interstellar scales and consequently would explain galaxy rotation curves, the predictions of the Cosmic Microwave Background are not altered, nor is the primordial nucleosynthesis in the early Universe. Also, a gravitational solution to the Pioneer anomaly and the flatness problem without inflation paradigm is discussed.

Dissecting the cosmic star-formation history

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We have developed a versatile semi-analytic model to calculate the cosmic star-formation rate density (SFRD) and stellar mass density (SMD) histories. The backbone of the model is the hierarchical assembly of dark matter halos in the context of the LCDM cosmology. The sequential introduction of different ingredients related to the physics of gas and to the SF process will be presented. We will show that the hierarchical mass assembling leaves its imprint in the SFRD history, but astrophysical processes also affect it significantly. The most relevant of these turned out to be gas ejection by SN feedback in small halos, and the delay of gas infall due to its long cooling time in massive halos as well as AGN feedback. Our model allows us to dissect the SFRD by halo mass and by halo peak height, a quantity related to the environment and SF regime (quiescent or violent). Results on these dissections will be presented and discussed. Our main conclusion is that overall, the LCDM-based SFRD and SMD histories are consistent with observations, but in the dissection by mass, models show that at later times, the contribution to the SFRD from smaller halos strongly diminishes, contrary to what is shown by recent observations (the downsizing problem).

The angular power spectrum of dust-obscured galaxies and its impact on Sunyaev-Zel'dovich studies

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In this work we measure the angular power spectrum of the population of (sub-)-millimetric galaxies (SMGs) using 1.1 mm wavelength observations obtained with the AzTEC camera on the 10 m Atacama Submillimeter Telescope Experiment (ASTE). The sample of observed fields allows us to compare the properties of the angular power spectrum of the (sub-)mm galaxy population towards unbiased and potentially overdense regions of the Universe. Furthermore, our measurements provide a strong constraint to the impact that the SMGs have in the power spectrum of the primary and secondary CMB anisotropies, which is being measured by the new generation of arcminute resolution SZE experiments at millimeter wavelengths (e.g., 3.0, 2.1, 1.4, and 1.1 mm). These results allow a more direct observational estimation of the contamination of the SMGs to SZE studies, which is commonly predicted from theoretical and semi-analytical models constrained by shorter wavelength results (e.g., 850 micron SCUBA and 250, 350, 500 micron BLAST galaxy number counts).

Formación y evolución de barras en galaxias de bajo brillo superficial

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Esta plática presenta los resultados de mi proyecto de tesis de licenciatura. Realizamos simulaciones de N-cuerpos de alta resolución para modelos de galaxias que asemejan a espirales de bajo brillo superficial (LSB). Nuestros sistemas contienen inicialmente un halo de materia oscura y un disco motivado por la cosmología LCDM. Nuestro estudio se enfoca a evaluar la posibilidad de formación de barras en dichos sistemas. Contamos con algunos modelos con parámetros motivados por galaxias en específico, como por ejemplo Malin 1, pero consideramos tanto modelos con discos extendidos como concentrados, así como otros modelos prueba para indagar más sobre los procesos de formación y evolución de estas estructuras. Analizamos y puntualizamos cada caso observado. La conclusión general es que en la mayoría de nuestros experimentos numéricos los modelos desarrollan una barra.

Studying the formation and evolution of galaxy clusters using millimeter-wavelength observations

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Observational studies of the high-redshift Universe at millimetre wavelengths take advantage of a strong negative k-correction, enabling the detection of the formation epoch of the first massive galaxies. The spatial and redshift distributions of high-redshift millimetre galaxies and clusters can measure the luminosity evolution, star-formation history and clustering properties of massive structures over a wide range of physical scales. This study presents preliminary results from an on-going AzTEC mm-wavelength survey of an optically obscured, ultra-luminous, star-forming galaxy population (potentially the progenitors of massive elliptical galaxies) towards strongly biased regions of the Universe (i.e. high-z AGN environments and galaxy clusters) which complement the unbiased blank-field AzTEC surveys (e.g., towards COSMOS, GOODS-N, GOODS-S, SXDF, Lockman Hole).

Sunyaev-Zel'dovich detected massive cluster at $z \sim 1$: a constraint on σ_8

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The clear signature of the Sunyaev-Zel'dovich effect (SZ) is used to produce a unique sample of galaxy clusters defined only by a lower mass limit, essentially independent of distance. In this talk we report on high redshift ($z \sim 1$) massive clusters detected from an Atacama Cosmology Telescope (ACT) 145 GHz survey that covers 455 deg^2. First, we use velocities observed with the ESO/VLT to determine the clusters' dynamical radius and mass. Second, from *Chandra* public data, we estimate X-ray masses of the clusters. And third, we use some of the clusters' strong lens images to put limits on the total mass of enclosed by R_{200}. The fact that these clusters are the only SZ massive clusters detected at $z > 1$ allows us to put, for the first time, a strong constraint on the value of σ_8.

Constraining the dark energy equation of state using alternative cosmic tracers

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We propose to use the H II galaxies redshift-distance relation, measured by means of their $L(\mathrm{H}\beta) - \sigma$ correlation, in order to determine the Hubble function to intermediate and high redshifts, in an attempt to constrain the dark energy equation of state parameters solution space, as an alternative to the cosmological use of type Ia supernovae. So that we can use effectively high redshift H II galaxies as probes for dark energy equation of state parameters, we must reassess the $L(\mathrm{H}\beta) - \sigma$ distance estimator, minimizing the observational uncertainties and taking care of the possible associated systematics, such as stellar age, gas metallicity, reddening, environment and morphology.

Seeding the disk galaxy population at different epochs

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The baryon fraction of galaxies, $f_{\mathrm{bar}} = M_{\mathrm{bar}}/M_{\mathrm{halo}}$, as a function of mass encloses many of the galaxy formation and evolution processes. We infer f_{bar} vs. M_{halo} for

late- and early-type galaxies separately by matching the corresponding cumulative galaxy baryonic mass function (obtained from the observed galaxy stellar mass function and the $M_{\rm gas}$–$M_{\rm s}$ relation) to the cumulative LCDM halo mass function. This analysis is extended up to $z = 1$, where observations are still reliable. Then, the obtained $f_{\rm bar}$–$M_{\rm halo}$ relations for late-type galaxies are used as an input for 'population' models, where disks of mass $M_{\rm bar} = M_{\rm halo} \times f_{\rm bar}(M_{\rm halo})$ are seeded inside LCDM halos at a given z. These models allow us to calculate the sizes of the seeded disks (which depend on the spin parameter of the halo), the contraction of the halo due to the gravitational drag of the disk, the transformation of gas into stars, the rotation curve decomposition, etc. We find that the baryonic and stellar Tully-Fisher relations and their scatters are well reproduced at $z = 0$. We also compare with observations the radius–$M_{\rm s}$, surface density–$M_{\rm s}$, and other structural and dynamical correlations. The models are used for calculating the same mentioned properties and correlations of the disk galaxy population at $z = 0.5$ and $z = 1$. The successes and potential difficulties found from the results at other epochs will be discussed.

The mass power spectrum at galactic and subgalactic scales as a constraint to dark matter properties

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The Lambda-CDM scenario that assumes a Universe dominated by dark matter (DM) and dark energy is currently the most successful cosmological model. However, many questions remain open regarding the dark matter hypothesis. Arguably the most important questions, besides its own detection, are: which particles is DM made of? and how is the DM distributed at galactic and subgalactic scales? The two questions are correlated since the subgalactic mass distribution depends on the primordial mass power spectrum extent and shape, the dynamical evolution of density fluctuations but also on the dark matter candidate properties. We present results of an exploration into using the detailed Solar system dynamics in order to set lower limits to the present day mass power spectrum cut off. We also present preliminary predictions for features in the power spectrum of the high redshift 21 cm background as a constraint to second-order coupling of neutralino dark matter to other particle species. Although these systems lie at different scales and epochs, they both provide potential and complementary constraints to the dark matter properties and small scale distribution.

The Euler Characteristic as a measure of the topology of reionization

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We present here an introduction to the use of the Euler Characteristic in large-scale simulations of cosmic reionization. To characterize the topology of the ionization fraction field, we calculate the evolution of its Euler Characteristic. We find that the evolution of the topology during the first half of reionization is consistent with inside-out reionization of a Gaussian density field.

Galaxies (including AGNs)

The stellar and dark halo mass build-up of galaxies

Invited Review

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An empirical model for galaxy stellar ($M_{\rm s}$) and dark ($M_{\rm h}$) mass build-up is developed. The input of this model are the semi-empirically constructed $M_{\rm s}$–$M_{\rm h}$ relations from $z = 0$ to $z = 4$ and the average LCDM halo mass aggregation histories. Both, in combination, allow us to calculate the average $M_{\rm s}$ growth histories of galaxies, as well as the corresponding specific star-formation rates (SSFR $=$ SFR$/M_{\rm s}$). The latter agree well with direct observational inferences of SSFRs at different redshifts. We find that for low and high masses, the $M_{\rm s}$ build-up deviates significantly from the halo growth. Galaxies on average more massive than $M_{\rm s} \sim 3 \times 10^{10} M_{\odot}$ ($M_{\rm h} \sim 10^{12} M_{\odot}$) at $z = 0$ have stagnated their $M_{\rm s}$ growth; at higher redshift z, the more massive is the galaxy. Less massive galaxies are still in the active regime of $M_{\rm s}$ growth; the lower the mass, the faster the later growth ('downsizing in SSFR'). We also calculate the epoch at which the SSFR of an evolutionary track of a given mass strongly decreases (the galaxy transits from its active, star-forming regime to the passive regime). As expected, the lower the z, the lower the transition stellar mass: $\log(M_{\rm tran}/M_{\odot}) \sim 10.3 + 0.45z$, i.e., with time less and less massive galaxies migrate from the blue to the red population ('population downsizing'). We discuss both the SSFR and population downsizing phenomena in the light of current LCDM models and show that the former is difficult to explain.

Modeling stellar populations near and far

Invited Review

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I will present a summary of recent advances in the fields of stellar evolution, stellar model atmospheres, and stellar spectral libraries, which allow us to build more

realistic stellar population synthesis models than those available up to now. Empirical and theoretical stellar libraries of increasing degree of completeness and accuracy covering from the EUV to the NIR and their usage in current models will be examined. In particular, the treatment of stars in the TP-AGB phase of stellar evolution will be discussed in detail. Understanding these stars is fundamental for the determination of the mass of distant galaxies using population synthesis models. Applications of these models to problems of current interest will be discussed. Problems that need to be understood and data sets that still need to be collected in order to solve issues present in these models will be indicated.

Dark energy and the large-scale distribution of galaxies

Invited Review

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In this presentation, the contribution that studies of the large-scale distribution of galaxies have had to our understanding of the Universe is reviewed. Also discussed are the new surveys underway that are expected to greatly improve the constraints on dark energy currently available.

A local diagnostic for the Milky Way dark matter halo triaxiality

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En este estudio proponemos caracterizar a través de la cinemática estelar local la forma global del halo de materia oscura de la Vía Láctea. El principio utilizado es que la forma del halo implica la existencia de familias de órbitas periódicas que sostienen la forma triaxial. Éstas aparecerían como grupos cinemáticos co-móviles de estrellas en el halo de la Galaxia. Nuestro análisis utiliza simulaciones de la estructura orbital en halos oscuros con diferentes estructuras. Discutiremos como distinguirlos de grupos móviles creados por eventos de acreción en el pasado de la Galaxia.

Migración del Sol y evolución química de la Galaxia

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A partir de un modelo de evolución química construido para reproducir el gradiente de O/H en el disco Galáctico, logramos ajustar: (i) los gradientes de C/H y O/H del disco Galáctico, (ii) las abundancias de H, He, C y O derivadas de líneas de recombinación de la región H II M17, (iii) los valores de H, He, C y O protosolares, (iv) la relación C/O vs. O/H de estrellas enanas de la vecindad solar y (v) las abundancias de C/H y O/H de estrellas jóvenes F y G vecinas del Sol. El reproducir las abundancias protosolares en el tiempo de la formación del Sol implica que el Sol se originó a una distancia galactocéntrica similar a la distancia actual de la vecindad Solar.

Características de las galaxias espirales enanas

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Hasta hace pocos años era negada la existencia de las galaxias espirales enanas. Sin embargo, ahora sabemos que existen galaxias con estructura espiral y de pequeño tamaño. Lo más interesante es que parece que no todas sus propiedades son una continuación de las galaxias espirales de mayor tamaño, sino que en algunos casos las diferencias son importantes. Por ejemplo, el número de galaxias barradas es diferente, así como la distribución espacial de las mismas, estando las galaxias espirales enanas casi ausentes de los cúmulos y de los grupos grandes de galaxias. En este charla se presentarán éstas y otras características, como la abundancia de elementos químicos, la existencia de un gradiente de los mismos o la tasa de formación estelar. Todas estas características son más similares a las encontradas en las galaxias irregulares que a las de las galaxias espirales tardías de mayor tamaño.

Supernova feedback and the bend of the Tully-Fisher relation

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Observational results suggest the existence of a break in the stellar Tully-Fisher relation (TFR) in such a way that smaller galaxies exhibit lower stellar masses than

those expected from the linear regression of fast rotators (e.g., McGaugh et al. 2000, Amorín et al. 2009). Moreover, recently McGaugh et al. (2010) also found evidence for a bend in the baryonic TFR but at a lower rotational velocity. In this work, we study the impact of supernova feedback on the shape of the stellar and baryonic TFRs by performing numerical hydrodynamical simulations in a cosmological framework. Our findings indicate that supernova feedback plays an important rôle in the regulation of the star-formation process and in the triggering of galactic winds in shallower potential wells, generating a steepening of the TFR relation at its low-mass end. In particular, we determine that the bend of the TFR occurs at around 100 km s^{-1}, in agreement with previous observational works and theoretical expectations (see De Rossi et al. 2010 for details).

Constraining the active galactic nucleus contribution in a sample of Seyfert galaxies: photoionization modeling

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Active galactic nuclei (AGN) are thought to harbor massive black holes ($M_{\rm BH} \approx 10^6$–$10^8 M_\odot$) surrounded by an accretion disk responsible for the enormous energy rates observed in their unresolved nuclei. Seyfert-type galaxies represent the most common type of AGN. Historically, Seyfert 1 and Seyfert 2 galaxies have been classified by the presence or absence of broad optical emission lines. In this regard, Seyfert 1 galaxies have broad permitted (FWHM $\approx$ 1–5 $\times$ 10^3 km s^{-1}) and narrow (FWHM $\approx$ 5 $\times$ 10^2 km s^{-1}) permitted and forbidden lines and Seyfert 2 galaxies have only narrow permitted and forbidden line emission. According to the unified model of active galaxies, Seyfert 1 and Seyfert 2 galaxies are intrinsically the same, with their differences attributed to viewing angle. In Seyfert 2 galaxies, our line of sight to the broad line region (BLR) and the central engine is obstructed by an optically thick dusty torus-like structure, while in Seyfert 1 galaxies, our line of sight is not obstructed by the torus, allowing a direct view of the central regions of the active galaxy. Although it has been observationally confirmed, the unified model for Seyfert galaxies does not address the rôle of stellar activity. In this work, we use the ratios between high and low ionization mid-infrared emission lines to separate the relative contributions of the AGN and star formation. The main mechanism responsable for the observed emission lines in the different regions of AGN is photoionization. Photoionization calculations, which study the radiative transport through astrophysical plasmas, are a powerful tool that allow us to numerically resolve the complicated physical processes that produce the observed spectra of

AGNs. We used the photoionization code Cloudy in order to characterize the physical conditions in the emitting regions as derived from the infrared spectra of Seyfert galaxies. We found that the observed mid-infrared spectra can be reproduced by a single-zone model with a range of $-4 \leq \log U \leq -1$ for the ionization parameter and $4 \leq \log n_{\rm H} \leq 6$ (cm^{-3}) for the electron density. Next, we extrapolated this range of conditions to constrain the active galactic nuclei and star-formation contributions for about 100 Seyfert galaxies.

Induced nuclear activity in galaxy pairs

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We analized the nuclear spectra of 893 galaxies in isolated pairs from the Sloan Digital Sky Survey (DR7). These pairs can be divided into three groups: S+S, E+E, and S+E according to the catalogue of isolated galaxy pairs (KIG) by Karachentsev. The distances between pairs are less the 100 Kpc. We also analysed two samples of isolated galaxies: the catalogue of isolated galaxies by Karachentsev (KIG) and Varela's sample of Northern isolated galaxies. We studied the incidence of nuclear activity of different types: Sy1, Sy2, LINERs and starburst galaxies in every group. In order to make a homogeneous and consistent comparison between isolated galaxies and those in pairs, we used the same methods for the subtraction of the host galaxy spectra and the measurement of the emission lines. Our results show that the incidence of AGN activity is significantly higher in most galaxy pairs as compared to isolated galaxies, thus supporting the idea of tidal triggering of activity. Most importantly, we show that this is stronger for earlier morphological types. The presence of a bulb appears to be crucial in explaining the feeding of supermassive black holes in AGN. We also confirm that Seyfert type 1 nuclei are almost absent. This result is not possible to explain with the unified model only.

NGC 3516: Spectral features and their relation with X-ray variability in time

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X-Ray analysis allows us to know the structure and the physical processes of the AGN central engine. The Seyfert 1.5 galaxy, NGC 3516, presents a peculiar time variability in X-rays on timescales of hours to years. In 2006, observations with

XMM-Newton and *Chandra* X-ray telescopes found a strong flux variability between 9 consecutive observations separated by days, from October 6 to 14. We analysed all 2006 *XMM-Newton* and *Chandra* spectra from 0.3 to 10 keV. Using *XMM-Newton* data we found an acceptable model that consists of a continuum emission (power law + blackbody) and Fe complex lines, absorbed by 4 ionized components (warm absorbers WA) modeled with the PHASE code developed by Yair Krongold. The WA phases are commonly at a few light days from the black hole and accretion disk system. We observed an important change in the continuum normalization between observations, which implies a change in the emission source. The 4 absorption phases have different degress of ionization and one of them is responding to continuum emission variability. This model was also tested in cotemporal *Chandra* data and the fit was very satisfactory. We present our most outstanding results.

Study of dwarf AGN candidates

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We report the study of a sample of candidate dwarf AGN based on a sample of 476931 emission-line galaxies from the Sloan Digital Sky Survey using the Data Release 5. The final sample was obtained from a non-classical diagnostic diagram, the so-called N II diagram, which allows us to classify numerous cases of emission-line galaxies for which standard diagnostic diagrams cannot be used because certain important line ratios are missing. We show that this phenomenon affects 22% of the galaxies and is not related to low S/N. The position of these galaxies in the N II diagram suggests that they are mostly dwarf AGNs. For the 2840 galaxies in our sample without [O III] 5007 and Hβ detected emission, we have determined their morphology and environment. The majority (81%) are early-type galaxies ($T < -2$), located (87%) in some sort of dense structure similar to compact groups or clusters of galaxies. Only a small fraction (17%) show evidence of interaction. Consequently, we conclude that the dwarf AGN, as observed in our sample of galaxies, are related to a particular evolutionary phase of galaxy evolution in compact groups or clusters of galaxies. One possible explanation is that these galaxies have lost most of their gas due to astration related with morphology transformation and now show a remnant of activity in their nucleus consistent with an extremely low accretion rate of gas onto a massive black hole. We also report the study of their star-formation history, where this shows that the majority (83%) of galaxies also have important bursts in the past, when the galaxy was formed and when it formed part of the group or cluster of galaxies. And only 17% of the sample shows recent star formation younger than 100 Myrs ($\sim 1 M_{\odot}$ yr^{-1}).

High-redshift objects in dust environments

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In this starting project, we aim to analyze the effect of reddening for high-redshift ($z > 0.2$, up to the reionization limit) star-forming galaxies (e.g., dropouts, $z > 4$) To achieve this goal, we will use the most recent stellar population synthesis models, as well as a reliable model of radiative transfer. The obtained theoretical results will be confronted with observations in various bands and frequencies obtained from deep surveys by various working groups.

The nature of assembly bias in a LCDM cosmology

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I will present a new proxy for the overdensity peak height for which the large-scale clustering of haloes of a given mass does not vary significantly with the assembly history. The peak height can be approximated by the mass inside spheres of different radii, which in some cases can be larger than the virial radius. When this happens, the new peak height definition will consider mass outside the individual host-halo. At large scales, i.e. in the two-halo regime, this model largely recovers the simple prescription where the bias responds to the height of the mass peak alone, in contrast to the usual definition (virial mass) that shows a strong dependence on additional halo properties such as formation time and concentration. In this new approach, some of the objects which were initially considered low-mass peaks (had low virial masses) belong to regions with higher overdensities. The population of galaxies whose "peak height" changes with this new definition consists mainly of old stellar populations and are preferentially located near massive haloes. The latter is in agreement with recent results, which point out that old, low-massive haloes would suffer truncation of matter by nearby larger haloes, thus showing an assembly bias effect.

The precessing jet in the core of NGC 1275 (3C84)

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NGC 1275 is a giant elliptical galaxy at the center of the Perseus cluster of galaxies. It is associated with a strong radio source (3C84) and presents X-ray emission that extends well into the intergalactic medium. The X-ray maps present multiple misaligned pairs of cavities, some of them coincident with maxima in the radio emission, which had been interpreted as bubbles inflated by a precessing radio jet. Falceta-Gonçalves et al. (2010, ApJ 713, L74), using 3D hydrodynamical simulations, found that bubbles can be formed only under some restricted precession conditions, and proposed that the Bardeen-Peterson effect could be responsible for the torques driving this precession. In the present work, we study the radio structure expected from a jet precessing according to this process and obtain the precession parameters that are compatible with both the radio image and the inflation of the X-ray bubbles. Using other properties of the radio galaxy, like bolometric luminosity and mass of the central black hole, we were also able to put limits on the rotation rate of the black hole.

Dynamics and large-scale star formation in disk galaxies

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Azimuthal color (age) gradients across spiral arms are one of the main predictions of density wave theory; gradients are the result of star-formation triggering by the spiral waves. In a sample of 13 spiral galaxies of types A and AB, we find that 10 of them present regions that match the theoretical predictions. By comparing the observed gradients with stellar population synthesis models, the pattern speed and the location of major resonances have been determined. The resonance positions inferred from this analysis indicate that 9 of the objects have spiral arms that extend to the outer Lindblad resonance (OLR); for one of the galaxies, the spiral arms reach the corotation radius. Notably, and further confirming the link between gradients and dynamics, the effects of non-circular stellar velocities are clearly discerned in the data.

Disruption of dwarf satellite galaxies without dark matter

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The evolution of a satellite galaxy of a Milky Way-like galaxy has been studied using a large set of N-Body simulations. The initial satellites, containing 10^6 particles, have been simulated by a Plummer sphere, while the potential of the host galaxy is a three component rigid potential: a Miyamoto-Nagai potential for the disc, a Hernquist potential for the bulge and a Logarithmic potential for the dark matter halo. It has been found that several initial conditions for the orbit of the satellite allow for the existence, for about 1 Gyr or more, of a disrupted, out of equilibrium, body that could be interpreted as a dwarf spheroidal satellite galaxy of the Milky Way as observed from the position of the Earth. For a couple of disrupted objects, several projections have been performed, in order to show how the object would appear to an observer located at Earth's position. In particular, the evolution of the half-light radius, the central surface brightness, the central velocity dispersion and the mass-to-light ratio of the projected satellites are presented.

The universality of the fundamental plane for galaxies and galaxy systems

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We present the first comprehensive study to generate the fundamental plane (FP) for stellar systems, galaxies, groups, and galaxy clusters. The concepts and techniques applied in galaxies can be extended to other gravitational systems in virial equilibrium. For example, a cluster of galaxies can be considered (at least in the innermost regions) as a self-gravitating system made of discrete light tracers (galaxies). Then, it may be possible to extend the study of the FP to other scales; these scales include the study of clusters and groups for larger scales, and globular clusters for lesser scales. With this extension, it could be feasible to search for a possible variation of the FPs at different scales. With this study we have the dark matter distribution as a function of the scale. In this work, we have generated the FP for 6,132 cluster galaxies, 92 galaxy clusters, 44 compact groups and 60 Milky Way globular clusters as part of a comprehensive program to generate the FP for all scale stellar systems. We have also generated a control sample of 4,423 field galaxies searching for environmental effects that could affect the FP for early-type galaxies. In this study, we have used photometric and spectral measurements from the Sloan Digital Sky Survey Data

Release 7 (SDSS-DR7). We found that the cluster fundamental plane and the galactic fundamental plane show some similarity, whose only differences are a zero-point displacement. In addition, we have discovered a new kind of dwarf galaxy that scales in the same fashion as globular clusters. We propose that these galaxies are formed by tidal disruption inside high-density regions. Dark haloes can be truncated resulting in a structure dominated by stars.

Origin and evolution of the Sagittarius dwarf galaxy using N-body simulations

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We study the evolution of the Sagittarius dwarf galaxy by means of N-body numerical simulations. We find the initial conditions of the orbit of the satellite, such that, after a time, this astrophysical object has the position and galactocentric radial velocity currently observed (16 pc and 171 km s^{-1}, respectively). Subsequently, these results are used to simulate the evolution of the progenitor of Sagittarius both with only barionic matter and with different contents of dark matter. These simulations were made by using a modification of the code Gadget 2. The satellite is represented by a Plummer sphere of 10^6 particles; while the Milky Way is a rigid potential of three components. We present the possible content of dark matter that a progenitor could have had in order to reproduce the actual physical properties of this satellite.

Análisis de las características morfológicas y químicas de galaxias simuladas

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En este trabajo, se estudian las propiedades morfológicas y químicas de una muestra de galaxias obtenidas a partir de simulaciones cosmológicas hidrodinámicas que incluyen feedback por supernovas y evolución química. Presentaremos resultados sobre el análisis de las morfologías de estas galaxias y su evolución, y la distribución del contenido de metales en diferentes poblaciones estelares.

Detection of extreme low-luminosity AGN's

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We explore the diagnostic diagram that uses the ratio of emission lines ([N II] 6584/Hα) versus equivalent width of [N II], proposed by Coziol (Coziol et al. 1998) to a sample obtained from Sloan Digital Sky Survey Data Release 7 to separate star-forming and active galaxies from low-luminosity AGNs. This kind of diagnostic diagram does not need the classical emission lines like [O III] 5007, or Hβ to be classified as active type. We show empirically that this combination of emission lines can be used to search for the so-called low-luminosity AGN.

Correlations between properties of parsec-scale jets and optical nuclear emission of compact AGN

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We study the correlations between the VLBA (Very Long Base Array) radio emission at 15 GHz and the optical nuclear emission at 5100 Å for a sample of 233 compact jets. We find that a significant positive correlation for 178 quasars between optical nuclear luminosities and total radio (VLBA) luminosities of the unresolved cores at 15 GHz originates at milliarcsecond scales. For 32 BL Lacs, the optical continuum emission correlates with the radio emission of the jet at 15 GHz. We suggest that the radio and optical emission are beamed and originate in the innermost part of the sub-parsec-scale jet in quasars. Analysis of the relation between apparent speed of the jet and the optical nuclear luminosity at 5100 Å supports the relativistic beaming model for the optical emission generated in the jet, and allows the peak values of the intrinsic optical luminosity ($L_{5100,\mathrm{int}}$) of the jet and its Lorentz factor (LF) to be estimated for the population of quasars ($L_{5100,\mathrm{int}} = 2 \times 10^{20}$ W/Hz, LF $= 50$), BL Lacs ($L_{5100,\mathrm{int}} = 8 \times 10^{21}$ W/Hz, LF $= 21$) and radio galaxies ($L_{5100,\mathrm{int}} = 1.5 \times 10^{21}$ W/Hz, LF $= 9$).

Clustering and halo occupation distribution of active galactic nuclei

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Investigating how active galactic nuclei (AGNs) are distributed in the Universe provides a clue as to the physical conditions in which acretion onto supermassive black

holes (SMBH) takes place. We report on the results of our investigation of broad-line AGNs in the ROSAT All-Sky Survey through the cross-correlation function (CCF) analysis with galaxies in the Sloan Digital Sky Survey. Our results for $z \sim 0.3$ AGNs show that X-ray luminous AGNs ($\log L_X > 44$ erg s^{-1}) are clustered more strongly than lower luminosity AGNs ($43 < \log L_X < 44$ erg s^{-1}, where luminous AGNs cluster like red galaxies and the lower luminosity AGNs cluster like blue galaxies. In order to model our CCF results accurately, we have developed a method to apply the Halo Occupation Distribution (HOD) modeling technique to the CCF between AGNs and galaxies. This has allowed us to constrain, for the first time, the distribution of AGNs among dark matter halos (DMHs) as a function of the DMH mass, beyond quoting a typical halo mass, occupied by AGNs from the large scale bias. Unlike the results of the HOD analysis of galaxies, our analysis of AGN HOD excludes models where the probability of harbouring an AGN grows proportionally with the DMH mass. This is consistent with observations that AGN fraction among galaxies is smaller in rich clusters than in groups.

HOLMES and the little monsters

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The role of hot, low-mass, evolved stars (HOLMES) has long been underestimated in various fields of Astronomy. We show here that the population of galaxies with LINER-like spectra is divided among fake AGN (galaxies where the ionization is due to HOLMES) and weak AGN (i.e. the "little monsters"). We also show that the problem of the ionization of the diffuse interstellar gas in galaxies is solved when considering the rôle of HOLMES. This work is a result of collaborations with UFSC (Florianopolis, Brasil) on the one hand, and with UNAM (DF, México) on the other.

What multiwavelength monitoring of AGN can tell us about the accretion flow

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X-ray and optical monitoring observations of radio-quiet AGN have revealed strong variability over a broad range of timescales. Long term monitoring programmes are showing an increasing number of objects whose optical variations are well correlated with those of the X-rays. The analysis of these variability timescales

and X-ray/optical correlations can be used to understand the physical connection between the optical-emitting accretion disc and the X-ray emitting corona, revealing the structure of the entire accretion flow. In this talk, I will present new data of a sample of AGN to show that, although reprocessing of X-rays into the optical bands can cause the small amplitude, rapid optical variability, we also detect a different source of optical fluctuations, probably accretion rate variations travelling through the thin accretion disc.

Curvas de luz de M87 HST-1 como ondas de choque

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El aparente movimiento superlumínico de los nudos en los jets relativistas de núcleos activos de galaxias generalmente se interpreta como una onda de choque que viaja a través del jet. Una de las maneras más sencillas de observar estos nudos es produciendo una variación de la velocidad del flujo que se mueve a lo largo del jet. El modelo mas sencillo de formación de choques que se propagan en el jet, en el contexto de la formulación clásica, es desarrollado por Canto & Raga (2000), en donde se describe la formación y evolución de una superficie de trabajo en jets estelares con una expresión analítica. La extensión de este trabajo al régimen relativista, considera que el gradiente de presión entre las partículas y el fluido es despreciable y la escala de tiempo para la radiación es mucho más corta que el tiempo para formar una superficie de trabajo particular (Mendoza et al. 2009). Con modelos sencillos en el régimen relativista es posible dar una explicación a la peculiar curva de luz del nudo HST-1 en el jet de la galaxia M87 a través de variaciones de la velocidad del flujo en el jet y de la masa en el flujo, y además extraer los datos físicos más relevantes como masa ejectada y velocidad del nudo.

Bar detection in isolated and pairs of galaxies

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Recent studies have been realized to find out the dependence between bars and different properties of the host galaxy such as luminosity, size, color, concentration, wavelength, etc. (Aguerri 2010, Gadotti 2010, Giordano 2010), as well as the influence of the local environment (groups, clusters, superclusters) (Giordano 2010, Marinova

2010) where the direct influence of environmental perturbers is not controlled. There are different bar detection methods, such as isophotal and Fourier analysis. We calculated the fraction of bars in two samples (where the enviromental effects are well controlled): a subsample of 180 isolated galaxies from the UNAM-KIAS catalogue (Hernández-Toledo et al. 2010) obtained from SDSS DR6 and a subsample of 160 galaxies in pairs from the KPG catalogue (Catalogue of Isolated Pairs of Galaxies, Karachentseva 1972) obtained with the OAN-SPM 1.5 m telescope. We present preliminary results of the efficiency of both bar detection methods, a comparison between these controlled environments and other environments such as groups and clusters.

Determinación de magnitudes físicas con modelos de síntesis inversa de poblaciones estelares

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Presentamos un estudio detallado sobre la recuperabilidad de cantidades físicas como la masa y la edad de galaxias a través del ajuste de modelos de síntesis de poblaciones estelares a espectros integrados de las mismas. Se comparan los resultados obtenidos con diferentes modelos a fin de establecer los límites de aplicabilidad de esta técnica a galaxias de cualquier tipo.

GTC long-slit spectroscopy of compact stellar clusters in M81

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We present the results of an analysis of the long-slit optical spectra, recently obtained using the 10 m Gran Telescopio Canarias (GTC), of compact stellar clusters in the nearby spiral galaxy M81. The spectroscopic sample includes both the old globular clusters as well as relatively younger compact clusters. These spectra are used to determine the ages of the clusters. We also obtain the physical conditions of the ionized gas surrounding the young clusters.

The AzTEC blank surveys: an overview of the high-z SMG population

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Abstract not available.

Dynamics of binary black holes in a hierarchical Universe

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Galaxies are generically observed to host supermassive black holes (SMBHs). According to hierarchical models of galaxy formation, the SMBHs must grow in every, or at least some, merger events. However, it is still unknown how the SMBH binary evolves after its semi-major axis reaches a few parsecs scale. We study the mechanisms by which the SMBH binary can reduce its angular momentum and therefore its merger timescale. These mechanisms, together with predictions of semi-analytical dark matter halo merger rates in a LCDM universe, can be helpful to constrain the signatures and rates of SMBH binary mergers.

Submillimeter galaxies behind the Bullet Cluster

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Clusters of galaxies act as natural gravitational telescopes and allow us to detect and resolve lensed background galaxies that would otherwise be too faint for direct observation. Although such galaxies are responsible for most of the submm-wave and far-infrared backgrounds (e.g., Blain 1997) that are now being resolved by *Herschel Space Observatory* (e.g., Eales et al. 2010, arXiv:1005.2189), the properties of individual sources at redshifts $z > 1$ are still poorly known. Radio observations of galaxies observed at high redshift are mostly biased toward active galactic nuclei (AGN) and the ultraluminous systems ($L_{\rm bol} > 10^{12} L_{\odot}$). Gravitational lensing by galaxy clusters allows the less exceptional high-z galaxies to be identified at submm wavelengths with the current generation of sensitive bolometer arrays. Spectroscopic follow-up observations can then reveal more information about the star-forming

activity and evolutionary state of high-redshift galaxies. In this talk, we present the results of the analysis of deep observations of the submillimeter continuum emission at 870μm of the Bullet Cluster field using the Large APEX BOlometer CAmera (LABOCA) on the Atacama Pathfinder EXperiment (APEX) telescope (Johansson et al. 2010). In total, seventeen point-like sources were found. Thirteen of them lie in the central 10 arcmin of the map, which has a pixel sensitivity of 1.2 mJy per 22″ beam. After correction for flux boosting and gravitational lensing, the number counts are consistent with published submm measurements. Nine of the sources have infrared counterparts in *Spitzer* maps. The strongest submm detection (S1) coincides with a source previously reported at other wavelengths. S1 has a reported spectral redshift $z = 2.79$ (Gonzalez et al. 2010) determined using PAH transitions. We present evidence that S1 submm flux arises from two images of a galaxy magnified by a total factor of about 75. Hence, its intrinsic flux is around 0.6 mJy at 870μm. A simple analysis shows that its intrinsic luminosity is below $10^{12} L_{\odot}$. This means that S1 is probably a rather commmon gas-rich, star-forming galaxy, but not an ultraluminous system (Rex et al. 2010). We will also comment on proposed follow-up observations of CO ($J = 1$–0, $J = 3$–2) aiming at the determination of the physical properties of this galaxy. We propose that systems similar to S1 might be more representative of the overall galaxy population at $z \sim 3$ than the high-mass starbursts (Michalowski et al. 2010) found in pre-*Herschel* submm surveys.

Multicolour evolution of the galaxy Red Sequence at high redshift

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By means of cosmological and hydrodynamical simulations we studied the color-magnitude relation in 10 different bands from UV to NIR, up to redshift $z = 2$, of galaxies belonging to two clusters and 12 groups (4 of which are fossil). In particular, we find that the first derivative of the Red Sequence (RS) slope with respect to redshift does not depend on the environment, whereas it does depend on the color band: the most constant behaviour is given by the $(J - K)/K$ relation, which more closely approaches the quasi-constant evolution of the color-independent "dead sequence" (DS) and that of the metallicity-mass relation. Secondly, we compare our results in terms of the RS luminous-to-faint ratio (LFR) with recent observational data reaching beyond $z = 1$ (Andreon 2009), finding a mild evolution of this quantity, especially if measured in terms of stellar mass. Finally, we find that the Butcher-Oemler effect is also quite wavelength-dependent, with the fraction of blue galaxies increasing much more steeply in optical-optical than in NIR-optical colors. As to differences through environments, we find that groups have flatter LFR at all z and

that non-fossil groups present the highest values of blue fractions. On the other hand, cluster cores exhibit a steeper LFR at high z and the lowest levels of blue fractions; conversely to this trend, there are more blue galaxies in the outer cluster regions, at least out to $z \sim 0.5$.

The distant Hubble sequence with *HST*/*ACS*, leading the way to the new Observatory of Panama

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Two subjects are presented. First, our results concerning the morpho-kinematics of distant galaxies. During my PhD thesis I confronted serious problems of methodology concerning the morphological and kinematic classification of distant galaxies. This has forced us to create a new simple and effective morphological classification methodology, in order to guarantee a morpho-kinematic correlation, make the reproducibility easier and restrict the classification subjectivity. This is not satisfied using other morphological classifications proposed in the past decades. Given the characteristics of our morphological classification, we have thus been able to apply the same methodology, using equivalent observations, to representative samples of local and distant galaxies. It has allowed us to derive, for the first time, the distant Hubble sequence ($\sim$ 6 Gyr ago), and determine a morphological evolution of galaxies over the past 6 Gyr. We found that spiral galaxies were 5/2 times less abundant in the past, which is compensated exactly by the strong decrease by a factor 5 of peculiar galaxies, while the fractional number of elliptical and lenticular galaxies remains constant. It strongly suggests that more than half of the present-day spirals had peculiar morphologies, 6 Gyr ago. Secondly, I will introduce the new Astronomical Observatory of Panama, which has been built inside a regional center of the Technological University of Panama, located at Llano Marin at $\sim$ 5 km from Penonome city (latitude: 08°30′00″N, longitude: 80°19′48″W). Some of the projects that have been scheduled in conjunction with other European laboratories, as well as part of the instruments that will equip the observatory, are also presented. It will be very fruitful for the new Panamanian astronomy if, during the XIII Latin American Regional IAU Meeting, shared projects with the Latin American astronomical community are proposed and discussed.

The rôle of tidal dwarf galaxies in galaxy evolution

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I will present a summary of the recent work that we have been conducting regarding the role of tidal dwarf galaxies (TDGs) in galaxy evolution. TDGs are often seen in galaxies going through collisions. They are young objects formed from and within tidal debris. Our sample contains galaxies with superwinds and H I tidal tails. We use a variety of instruments in different wavelengths (from UV to optical) to detect the TDGs and use stellar population models to date them. We also have determined the metallicity of a few of these objects and concluded that they are metal rich with respect to the population of dwarf galaxies. I will conclude by discussing the importance of these objects at high-redshfits and their significance in galaxy evolution models.

Modeling the spiral arms of the Milky Way using manifolds

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In a series of papers we proposed a theory to explain the formation and properties of rings and spirals in barred galaxies. The building blocks of these structures are orbits trapped by the invariant manifolds of the periodic orbits around the unstable Lagrangian points located near the ends of the bar. Here, we will first present a comparison of the morphology of observed and theoretical spirals and rings. We will describe the mechanism used to obtain these features and then we will compare the morphology and kinematics of the rings and spirals obtained with the ones from observations. Finally, we will introduce the work done to model the spiral arms of the Milky Way using this new approach.

EVN observations: unveiling the heart of (U)LIRGs.

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With the very high sensitivity and resolution provided by instruments such as the European VLBI Network (EVN), it is possible to study the nuclear and circumnuclear

regions in Luminous ($L_{\rm IR} > 10^{11} L_{\odot}$) and Ultraluminous ($L_{\rm IR} > 10^{12} L_{\odot}$) Infrared Galaxies. The high star-formation rates (SFR) of these galaxies ensure both the presence of a high number of massive stars and a dense surrounding medium, so bright radio supernovae are expected to occur. With the aim of detecting core collapse supernova (CCSN) events to estimate the SFR in (U)LIRGs, we started an observing campaign with the EVN on a small sample of the brightest and farthest ULIRGs in the local Universe, and we present here the deepest and highest resolution radio images ever obtained of these objects, using quasi-simultaneous observations with the EVN at 6 and 18 cm. We also present the latest results of our EVN campaign towards Arp 299, which has proved to be an extremely prolific supernova factory.

3D visualization of evolutionary diagrams for quasars in the parameter space 4DE1

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As an attempt at finding a spectroscopic unification for broad-line emitting AGN, Sulentic et al. (2006) defined a parameter space in four dimensions, 4DE1. The Eigenvector 1 (E1), is a principal component analysis (PCA) of the correlation matrix for quasars in the Palomar-Green (PG) sample made by Boroson & Green (1992). The 4DE1 is a four-dimensional parameter space, which combines optical, UV and X-ray measures to discriminate among different classes of AGN. The parameters used by Sulentic et al. (2006) for the 4DE1 are: (1) the dispersion in BLR cloud velocities, (2) the relative strengths of Fe II to Hβ emission, (3) the strength of a soft X-ray excess, and (4) the amplitude of systematic radial gas motions. In this work, we present new results obtained from spectra of *XMM-Newton*, *Chandra* and *Suzaku* archives for the sample of PG QSO. The new results represent a great improvement over the previous work performed with *ROSAT* data. In our analysis, we correlate the four parameters of 4DE1 and also consider other properties of the PG QSO. In order to better visualize the data and correlations among parameters, we present them in a 3D graph using the open source software TOP CAT. The results obtained were framed in the context of an evolutionary scheme for AGN.

Lensed high-redshift galaxies in the *Herschel* ATLAS survey

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The *Herschel* ATLAS (H-ATLAS) is a wide-area ($\sim$ 550 deg^2) FIR-submm survey at 100–500 μm. One component of the H-ATLAS scientific case is to measure the history of star formation in optically-obscured galaxies in the early Universe. The first results from the scientific demonstration phase (SDP), covering 16 deg^2, are already published. Following a brief summary of the extragalactic SDP papers, I will present the evidence, based on FIR-mm continuum imaging, (sub-)mm interferometry and spectroscopic millimeter-wavelength follow-up of the molecular-line emission, that H-ATLAS efficiently identifies a bright sample of highly magnified high-redshift dust-obscured starburst galaxies. The final H-ATLAS survey will contain a sample of a few hundred bright lensed submm galaxies in the early Universe, ideal for measurements of their mass distribution and for future high angular resolution studies of their morphologies and the dynamics of the ISM with ALMA.

High energy astrophysics (including cosmic rays)

Gamma-Ray Bursts

Invited Review

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Although they were discovered more than 40 years ago, gamma-ray bursts are still a mystery. All that we can be confident about is that they involve compact objects and relativistic plasma. Current ideas and prospects are briefly reviewed. There are, fortunately, several new observations that could help clarify the issues.

Emisión de rayos gamma en microcuasares

Invited Talk

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El estudio de la radiación gamma en fuentes galácticas ha experimentado un progreso radical durante los últimos años gracias a los resultados obtenidos por los telescopios Cherenkov y los aportes de *GLAST*. Entre tales fuentes, los 4 sistemas binarios que se han detectado a energías mayores que 100 GeV albergan potentes aceleradores de partículas inmersos en regiones donde pueden operar múltiples procesos no térmicos de emisión y donde la propagación de los fotones energéticos da lugar al desarrollo de cascadas electromagnéticas. A su vez, desde un punto de vista hidrodinámico también muestran un comportamiento fascinante, y cuya descripción aun no hemos alcanzado. Como último resultado de la combinación entre la acreción y la eyección de materia sobre un objeto compacto los microcuasares se manifiestan a lo largo de todo el espectro electromagnético. Esta charla presenta una breve puesta al día sobre nuestro conocimiento de estos sistemas, con énfasis en su emisión a muy altas energías.

El observatorio de rayos gamma HAWC

Invited Talk

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El volcán Sierra Negra en Puebla, México fue seleccionado para albergar a HAWC (High Altitude Water Cherenkov), un observatorio de gran apertura ($\sim$ 2 sr), único en el mundo, capaz de observar continuamente el cielo a energías de 0.1 a 100 TeV. HAWC consiste en un arreglo a una altitud de 4100 m sobre el nivel del mar de 300 contenedores de 7.3 m de diámetro y 5 m de altura llenos de agua pura y sensores de luz que observan partículas sumamente energéticas provenientes de los eventos más violentos del Universo y será 15 veces más sensible que su antecesor Milagro. Las aportaciones científicas de Milagro han demostrado las capacidades únicas de este tipo de observatorios. En esta plática se presentará HAWC, se discutirá brevemente su caso científico y el estatus del proyecto.

Accretion modes onto compact objects and the production of GRBs

Invited Talk

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Gamma Ray Bursts generally release in a prompt emission episode lasting a few seconds an amount of energy comparable to that of a core-collapse supernova. In all likelihood, mass accretion at a high rate onto a compact object (neutron star or black hole) is involved. I will discuss the general qualitative characteristics of such accretion in the context of both long and short GRBs and relate them to their progenitor systems.

CCOs in SNR as neutron stars with growing magnetic fields

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Since core-collapse supernovae (SN II) are the expected progenitors of strongly magnetized pulsars, it is interesting to assume that the magnetic field grows rapidly and saturates at about 10^{12} Gauss. A reasonable argument to propose such a solution is the absence of a syncrotron nebula in these Central Compact Objects (CCOs). This means, perhaps, that the pulsar has not radiated enough energy, because the magnetic field was very weak initially. In this work, we study the effects of

growth models of magnetic fields in CCOs. Such a field evolution is not a new idea (Blandford, Applegate & Hernquist 1983) but the evolutionary implications seem not to have been followed up completely (Michel 1994). We analyzed two new CCOs: PSR J1210–5209 and PSR J1852+0040. The possibility that a rapid, weakly magnetized pulsar might have formed in SN1987A is commented.

Transient gamma-ray emission from accreting black holes

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In this work we study the effects of a time-dependent injection of a non-thermal particle population in a corona around an accreting black hole. In particular, we present a model for high-energy flares in this scenario. We consider particle interactions with magnetic, photon and matter fields in the corona. Transport equations are solved for all species of particles and the electromagnetic output is predicted for the case of Galactic black hole binaries.

Can T Tauri stars produce high-energy radiation?

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T Tauri stars are low-mass, pre-main sequence stars. These objects are surrounded by an accretion disk and present strong magnetic activity. T Tauri stars are copious X-ray emitters. The X-rays are generated by powerful magnetic reconnection events. Strong shocks are likely to be associated with massive reconnection. These shocks can, in principle, accelerate particles up to relativistic energies through the Fermi mechanism. We present a model for the high-energy radiation produced in the magnetospheres of T Tauri stars. We discuss whether this emission is detectable with the existing gamma-ray telescopes.

The long-term polarimetric monitoring of blazars at San Pedro Mártir

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Numerous multiwavelength campaigns have considerably improved our understanding of blazars in the last decade. In particular, a wealth of optical monitoring data have been provided in total flux. However, largely neglected has been the potential of determining the properties of the sources in optical polarized light. This is a powerful tool, e.g. to determine the strength and orientation of magnetic fields in their relativistic jets that give rise to the variable synchrotron radiation and/or as a further test for the various blazar jet models. Most importantly, since multiwavelength campaigns typically concentrate on sources during highly active states, the characteristic polarimetric properties of blazars in the pre-and post outbursts states are poorly known. Thus, we have started a dedicated monitoring program of blazars from the GASP-WEBT sample at San Pedro Mártir with the idea of determining their photopolarimetric variability properties. The monitoring program has been designed in such a way that observations are carried out during seven consecutive nights per month, i.e., about 80 nights per year. For this project, data have been obtained with the 84 cm telescope and the POLIMA instrument since January 2008. In this talk, we want to address the current status of the program, and present a summary of our most relevant results.

Electron acceleration in supernova remnant shocks

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Electron acceleration to non-thermal, relativistic energies is revealed by radio and X-ray observations of young supernova remnant (SNR) shocks. The diffusive shock acceleration (DSA) mechanism is usually invoked to explain this energization, but the way in which electrons are "injected" into this acceleration process starting from thermal energies is an unresolved problem. We present a study of the initial acceleration of electrons in non-relativistic shocks from first principles, using particle-in-cell (PIC) plasma simulations. We systematically explore the space of shock parameters, i.e., the Alfvénic Mach number, M_a, the shock velocity, the angle between the upstream magnetic field and the shock normal, and the ion-to-electron mass ratio. We find that significant non-thermal electron acceleration with a spectral index of 3–4 can happen due to the growth of whistler waves at the foot of quasi-perpendicular

shocks. This acceleration strongly depends on using fairly large numerical mass ratios, which may explain why it had not been observed by previous PIC simulation studies. The maximum energy that we find is, at least, such that the Larmor radius of the electrons is comparable to that of the background ions. This injection mechanism, however, would require SNR shocks to have rather low Alfvénic Mach numbers, $M_{\rm a} <\sim 14$. Thus, if this were to be the process responsible for electron injection in SNR shocks, it would constitute strong new evidence for a significant magnetic amplification in the upstream medium of these shocks.

Interstellar medium

Jets de estrellas jóvenes: teoría

Invited Review

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En los últimos años ha habido un gran esfuerzo en la construcción de modelos teóricos que nos permitan entender y explicar distintos aspectos de los jets producidos por estrellas en su vida temprana. Algunos de estos aspectos son: su mecanismo de producción y colimación, la generación de nudos en su interior y la interacción con el medio circundante. En este trabajo se presentará un breve resumen de estos modelos.

Interstellar Turbulence

Invited Talk

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The Interstellar Medium (ISM) is a complex, multi-phase system, where the history of the stars occurs. The processes of birth and death of stars are strongly coupled to the dynamics of the ISM. The observed chaotic and diffusive motions of the gas characterize its turbulent nature. Understanding turbulence is crucial for understanding the star-formation process and the energy-mass feedback from evolved stars. Magnetic fields, threading the ISM, are also observed, making this effort even more difficult. In this work, I briefly review the main observations and the characterization of turbulence from these observable quantities. Following on, I provide a review of the physics of magnetized turbulence. Finally, I will show the main results from theoretical and numerical simulations, which can be used to reconstruct observable quantities, and compare these predictions to the observations.

Induced star formation in the H II region Sh2–54

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Expanding H II regions surrounded by dense molecular shells are potential sites for the formation of new stars. Two main mechanisms have been proposed for the stellar formation process in the outer dense shells: the radiatively driven implosion model (RDI) and the "collect and collapse" model. In this latter case, the shell becomes unstable and fragments, leading to the formation of massive stars. Sh2–54 is an H II region of about 7 arcmin in size located at $(\alpha_{2000}, \delta_{2000}) = (18\text{h}17\text{m}52.5\text{s}, -11^\circ 40' 58'')$ at a distance of $\sim$ 2.5 kpc. A number of *IRAS*, *Spitzer*, and 2MASS point sources classified as YSO candidates are located in its environs. In this report, we carry out a morphological study of the IR and radio counterparts of the H II region, focussing on the analysis of the stellar formation activity in the region. For this purpose, we take into account the interaction between the UV photons emitted by the excitation sources and the molecular environment. Different stellar formation mechanisms will be confronted to explain the star-formation activity in the region.

Abundancias químicas de las nebulosas planetarias en NGC 300

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Se presenta un estudio espectroscópico de un número importante de nebulosas planetarias en la galaxia espiral NGC 300. Los objetos han sido seleccionados a partir de imágenes en-línea y fuera-de-línea en O III 5007. Los datos fueron obtenidos con el espectrógrafo FORS2 en el VLT (Paranal, Chile). Se ha determinado la composicion química de los objetos (O, N, Ne, Ar, S), por medio de la medición de la temperatura electrónica y la densidad del plasma. Se discute el patrón de abundancias de las nebulosas planetarias en comparación con el de las regiones H II de esta galaxia. Las planetarias son sistematicamente más ricas en nitrógeno, y la mayoría muestra abundancia de oxígeno similar al de las regiones H II, aunque algunas, con oxígeno menor, podrían haber sido afectadas por "hot bottom burning". Los objetos estudiados se encuentran a distintas distancias del centro galáctico por lo que es posible analizar el gradiente de composición química en esta galaxia, dado por las nebulosas planetarias y por las regiones H II.

Detection of new planetary nebulae with the IPHAS survey

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I present some discoveries made with the recent INT Photometric Hα Survey of the Northern Galactic Plane (IPHAS). This deep and fully photometric CCD survey was carried out in Hα, *r* and *i* filters, with the Wide Field Camera (WFC) on the 2.5 meter Isaac Newton Telescope (INT) in la Palma (Canary Islands, Spain). The combination of different search methods (photometry, visual and semi-automated mosaics inspection) allowed us to identify tens of new planetary nebulae (PNe) and hundreds of candidates so far. One of the main characteristics of those new objects is their generally low surface brightness that prevents them being taken into account in global PN studies. Thus, the detection and analysis of these new PNe will help us to improve PN statistics (i.e., size, age, morphology, etc.), as well as give us a better understanding of evolved PNe and interactions of PNe with the ISM. IPHAS will also yield new insights into the chemistry of the interstellar medium. This project has been supported by PAPIIT-UNAM grant IN109509.

Physical conditions and chemical composition of the Small Magellanic Cloud H II region NGC 456

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Uno de los objetivos principales de mi tesis doctoral consiste en una recalibración del método de líneas fuertes de Pagel para la determinación de abundancias en regiones H II extragalácticas, enfocándose en regiones H II de baja metalicidad. Estudiamos la corrección del valor O/H debido a la presencia de inhomogeneidades de temperatura. Para ello, comenzamos con un estudio cuidadoso de una muestra pequeña de objetos, el primero de éstos es NGC 456. Encontramos que hay una incongruencia importante entre la temperatura dada por las líneas de recombinación (LR) del He I y la temperatura de líneas colisionalmente excitadas (LCE) del O, así como entre las LR del multiplete 1 del O II y las LCE de O. Para NGC 456 encontramos una diferencia de abundancias de un factor de 2.11 ó 0.32 dex en la razón O/H (en el campo de las nebulosas planetarias a ésto se le conoce como ADF). One of the main goals of my PhD thesis consists of a recalibration of Pagel's strong-line method of determining the O/H ratio in extragalactic H II regions, focusing on low metallicity H II regions. We are studying the correction of the O/H value due to the presence of temperature inhomogeneities. In order to do this, we need to

perform a careful study of a small set of objects; NGC 456 is the first of these. We find that there is an important discrepancy between the temperature determined through the recombination lines (RL) of He I and the temperature obtained from the collisionally excited lines (CEL) of O. For NGC 456 this discrepancy factor is of 2.11 or 0.32 dex in the O/H ratio (in the field of planetary nebulae, this is known as the ADF).

El RSN IC443 observado en 74 y 330 MHz: análisis de su distribución espectral

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IC443 es un claro ejemplo de interacción bien demostrada de un remanente de supernova (RSN) con el gas molecular circundante. IC443 fue observado en 74 y 330 MHz usando las configuraciones A, B, C y D del Very Large Array (VLA). En base a las nuevas imágenes, obtenidas por primera vez con alta fidelidad y excelente rango dinámico en bajas frecuencias de radio, se investigó la correlación de las estructuras en radio con la emisión en otras bandas del espectro. Además, combinando las observaciones en 74 y 330 MHz se analizó la distribución espacial del índice espectral para identificar el espectro de energía de las partículas aceleradas en el frente de choque.

Star-forming regions towards stellar wind bubbles: the ring nebulae RCW 52 and RCW 78

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In a similar way to the expanding envelopes around H II regions, the dense shells surrounding stellar wind bubbles are potential sites for the formation of new stars. With the aim of investigating stellar formation activity in the molecular layers around the ring nebulae RCW 52 and RCW 78, we carried out observations of the continuum emission at 870μm and ^{13}CO(2–1) line observations. The observational data were obtained with the Atacama Pathfinder Experiment (APEX), located in the north of Chile, in a region of $12 \times 12'$ in size towards RCW 52 and of $8 \times 8'$ in size towards RCW 78, using LABOCA bolometer array and APEX-1 SHFI instrument. The ^{13}CO(2–1) line observations obtained towards these ring nebulae revealed the dense and cold molecular clumps in which the protostar candidates are enshrouded

and allowed us to analyze the kinematics of the clumps as well as to estimate their masses and densities. The optically thin continuum emission at 870μm allowed us to find the cold dust emission regions where the deeply embedded star forming sources are inmersed. Kinematical information confirms the association of the YSOs to the dense molecular layer surrounding the stellar wind bubbles. Finally, we compare the stellar formation activity in these ring nebulae with previous studies of stellar wind bubbles and H II regions.

Formación estelar en los bordes de regiones H II

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Las herramientas observacionales de última generación, sobre todo los observatorios operando en infrarrojo y en el rango milimétrico, han permitido probar el nacimiento estelar en los bordes de regiones H II. La realización de estudios sistemáticos del medio interestelar en los alrededores de dichas regiones es de gran importancia para comprender los procesos químicos y físicos involucrados en el nacimiento estelar inducido. En este trabajo se presentan los resultados de estudios del entorno de varias regiones H II con signos de formación estelar en sus bordes, basados en observaciones de diferentes transiciones moleculares y en longitudes de onda infrarrojas.

NANTEN ^{12}CO ($J = 1$–0) observations around the star WR 55

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Using ^{12}CO ($J = 1$–0) observations obtained with NANTEN radiotelescope (HPBW $= 2.7'$) and Hα line emission data obtained from SuperCOSMOS survey, the interstellar medium towards the star WR 55 was analysed. Three molecular components were detected having remarkable morphological resemblance with the nebula. The bulk of the molecular gas, observed between -58 and -46 km s^{-1}, is expanding around the star and follows the arc-shaped filamentary structure of RCW 78. Adopting a distance of 5 ± 1 kpc, an H_2 mass of about $40000 \pm 16000 M_\odot$ was calculated. The expansion velocity and kinetic energy of this molecular component is about 9.6 km s^{-1} and 3.4×10^{49} erg, respectively. The molecular component in the velocity range of -39 to -35 km s^{-1} seems to be related to the central part of the nebula and shows no evidence of expansion. Up to the present it is not clear if these molecular

components are physically related, which might indicate that RCW 78 is actually composed of two independient structures placed in the line of sight. The third molecular component is detected between -33 and -28 km s^{-1}, and follows an intense lane of optical absorption. This molecular component is very likely placed in front of RCW 78. No traces of stellar molecular gas were found with the present data.

The oxygen abundance in the Solar neighborhood

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We study the distribution of oxygen abundances in a region within a few kiloparsecs from the sun using a sample of H II regions and planetary nebulae with available spectra of high quality. We use similar methods and the same atomic data to derive abundances in both kinds of objects and present results based both on forbidden and recombination lines of oxygen. We compare these abundances with some stellar results and with the oxygen abundances implied by absorption lines in the diffuse interstellar medium.

Emisión de rayos X de burbujas interestelares alrededor de estrellas Wolf-Rayet

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Estudiamos la evolución del medio interestelar y circunestelar de estrellas de alta masa ($\geq 40 M_\odot$) mediante simulaciones radiativo-hidrodinámicas. Los parámetros del viento estelar y la tasa de fotones ionizantes varían en el tiempo según la fase evolutiva de la estrella. Mediante comparaciones con las observaciones en rayos X de algunas burbujas de viento estelar alrededor de estrellas Wolf-Rayet, deducimos que la duración de la fase supergigante roja y el efecto de la conducción térmica son parámetros claves para reproducir la luminosidad y espectro de los rayos X observados. Esto nos permite discriminar entre los diferentes modelos de evolución de estrellas de alta masa disponibles en la actualidad. Comparamos nuestros resultados con observaciones obtenidas con el satélite espacial *XMM Newton* de la burbuja interestelar S308.

The molecular ISM associated with the super star cluster Westerlund 1

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The super star cluster Westerlund 1 (SSC Wd1) is the nearest object of its type that has been studied in detail. From radio to high energies it turns out to be an interesting object: it has the highest concentration of WR stars, massive and hyper-massive stars, a magnetar, and recently was diffuse very high energy γ-ray emission was discovered in that direction. We investigate the molecular environment towards SSC Wd1 on a large scale of hundred parsecs, and we associated SSC Wd1 with two molecular clouds, one receding and the other approaching relative to the central velocity of SSC Wd1 (-55 km s^{-1}), and propose that both are part of a giant molecular outflow.

PNe as observational constraints in chemical evolution models for NGC 6822

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Planetary Nebulae (PNe) are one of the most valuable chemical tracers of the history of the interstellar medium (ISM). Their chemical composition tells us about the chemistry when they were born. PNe result from stars with a range of mass between $\sim 0.8 M_{\odot}$ to about $\sim 8 M_{\odot}$, and have a large spread of ages (from 1 Gyr to 9 Gyr, Allen et al. 1998). Therefore, PNe are used as observational constraints in chemical evolution models, allowing us to improve the inferred chemical history in the galaxies (Hernández-Martínez et al. 2009). We present chemical evolution models for the dwarf irregular galaxy NGC 6822 and a comparison with observational constraints obtained from collisionally excited lines (CEL) and also obtained from recombination lines (RL). We try to use the chemical evolution models as a tool to discriminate between the methods of determination of the chemical abundances.

Mass and metal ejection efficiency in disk galaxies driven by young stellar clusters of nuclear starbursts

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We present results from models of galactic winds driven by energy injected by nuclear starbursts. The total energy of the starburst is provided by young central stellar clusters and parts of the galactic interstellar medium are pushed out as part of the galactic wind (in some cases the galactic wind contains an important part of the metals produced in the new generation of stars). We have performed radiative 3D N-Body/Smooth Particle Hydrodynamics simulations of galactic winds using the Gadget 2 code. We computed the mass and metal ejection efficiencies, and also the efficiencies of gas and metal mass that reaches at least 3 scale heights above the disk but remains gravitationally bound. The numerical models cover a wide range of starburst (from 10^2 to $10^7 M_\odot$) and galactic gas (from 6×10^6 to $10^{11} M_\odot$) masses. The concentrated central starburst regions are an efficient engine for producing the mass and metal loss in galaxies, and also for driving the metal redistribution in the galaxies.

NGC 7009 and NGC 6826: a unified study of planetary nebulae and their central stars

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The aim of this work is to study the planetary nebulae NGC 7009 and NGC 6826 by making simultaneous models of each nebula and its central star; the parameters obtained through models are supported by the semi-analytical study of the nebula. This work yields a self-consistent model of the whole object, imposing more observational constraints on the models than studies that are restricted to the central star or the planetary nebula separately. Both nebulae show evidence of super-ionization in the stellar wind. We find evidence that the diffuse X-ray emission detected in NGC 7009 is associated with the super-ionization in the wind. NGC 6826 has not been observed in X-rays yet, but we hope to find X-ray diffuse emission as in NGC 7009. The abundances obtained from the central star models agrees, within the error bars, with those obtained from photoionization models and from the lines observed in the optical nebulae.

Evidencias observacionales del "backflow" en nebulosas planetarias altamente evolucionadas

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A principios de este año hemos iniciado un estudio estadístico de la evolución cinemática de nebulosas planetarias (NP) con la intención de caracterizar dicha evolución en diferentes poblaciones estelares, edades y entornos. En una primera muestra, hemos seleccionado un grupo de 90 NP con características de objetos altamente evolucionados, obtenidas de *The SPM Kinematic Catalogue of Planetary Nebulae*. Nuestros resultados parecen revelar que las NP que se encuentran justo en la "rodilla" de la trayectoria evolutiva presentan perfiles en Hα con elipsoides de velocidades típicos, mientras que aquellas que se encuentran ya rumbo a la zona de enanas blancas poseen perfiles de línea rellenos. Esto nos lleva a creer en la posible existencia de un proceso de "llenado" durante las últimas etapas de evolución de la estrella central, que podría ser evidencia indirecta del "backflow" sugerido por Kwok en su modelo de dos vientos (ISW). Este modelo predice que en la evolución temprana de una NP, la interacción entre el viento rápido de la estrella central y el viento lento eyectado en la etapa AGB produce un viento chocado que genera a su vez, en el interior del cascarón nebular, una región de alta temperatura y presión denominada la burbuja caliente. Sin embargo, queda poco clara la evolución muy tardía, en particular la importancia cinemática de la burbuja caliente una vez que el viento estelar haya cesado. Se ha sugerido que, al finalizar el viento, esta burbuja desaparece y el material de las regiones internas del cascarón, adyacentes a la burbuja, tendería a regresar hacia la estrella central en un "backflow" pero no hacen predicciones muy claras de si sería una característica común en los objetos más evolucionados. Además, nuestro estudio proporciona la prueba empírica de la aceleración del cascarón nebular en etapas tempranas de la evolución de NP, pues las velocidades de expansión medidas en nuestros objetos son relativamente altas, típicamente entre 30 y 40 km s^{-1}. Corroboramos también que la velocidad de expansión es, en efecto, función del entorno: las velocidades de expansión más altas corresponden a objetos más lejos del plano de nuestra Vía Láctea.

On the O/H, Mg/H, Si/H, and Fe/H gas and dust abundance ratios in Galactic and extragalactic H II regions

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We derive the Mg/H ratio in the Orion Nebula and in 30 Dor. We also derive the

O/H and Fe/H ratios in the extremely metal-poor galaxy SBS0335-052. We estimate the dust depletion of Mg, Si, and Fe in Galactic and extragalactic H II regions. Based on these depletions we estimate the fraction of oxygen atoms embedded in dust as a function of the O/H ratio.

H II region expansion in a magnetized turbulent medium

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We investigate the feedback effects of H II region expansion on the interstellar medium, taking into account the magnetized and highly turbulent nature of the molecular clouds where high mass stars are born. We present the results of numerical radiation-magnetohydrodynamical simulations of the evolution of a magnetized turbulent cloud under the influence of the radiation from an embedded young star cluster, considering the cases of both rich clusters (containing O stars) and poor clusters (containing only B stars). We find that, although the magnetic field can be important locally, acting to suppress fragmentation by radiation-driven implosion at the edges of the H II region, its effect on the global expansion is slight.

Hα and O III emission-line maps of H II galaxies: characterizing the star formation

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In this work we characterize the star formation in four extremely young H II galaxies using broad- and narrow-band optical images obtained mainly with the 4.1 m SOAR telescope. We found several compact stellar clusters and we study the impact of them in the surrounding interstellar media. We use the Hα and [O III] 5007 images to analyze the structure of the ionized gas (superbubbles, tails, voids, etc.) and relate them to the recently formed stellar clusters.

Iron depletion in ionized nebulae of the Large Magellanic Cloud

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In a previous work, we studied the dust present in a sample of 48 Galactic planetary nebulae (PNe) and 8 Galactic H II regions through the analysis of their iron depletion factor, the ratio between the expected abundance of iron and the one measured in the gas phase. The derived depletion factors are consistently high in all the objects, suggesting that more than 80% of the iron atoms are condensed into dust grains (Delgado-Inglada et al. 2009; Delgado-Inglada & Rodríguez, in preparation). We present here preliminary results of an analysis of the iron abundance in three PNe and one H II region of the Large Magellanic Cloud. The results are based on deep spectra obtained with MIKE on the 6.5 m Magellan-Clay telescope. We use these data, together with other available data in the literature, to study the behavior of iron depletion factors at low metallicities.

The density power spectrum in turbulent thermally bi-stable flows

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We present a numerical study of the behavior of the density power spectrum in turbulent, thermally bistable flows. We analyze a set of five three-dimensional simulations where turbulence is randomly driven in Fourier space at a fixed wavenumber and with different Mach numbers M (with respect to the warm medium) ranging from 0.2 to 4.5. The density power spectrum becomes shallower as M increases and the same is true for the column density power spectrum. This trend is interpreted as a consequence of the simultaneous turbulent compressions, thermal instability (TI) generated density fluctuations, and the weakening of the thermal pressure force in the diffuse gas. This behavior is consistent with the fact that observationally determined spectra exhibit different slopes in different regions. The values of the spectral indices resulting from our simulations are consistent with observationally obtained values. We also explore the behavior of the velocity power spectrum, which becomes steeper as M increases. The spectral index goes from a value much shallower than the Kolmogorov one for $M = 0.2$ to a value steeper than the Kolmogorov one for $M = 4.5$. These values suggest that the turbulence statistics is significantly affected by the presence of thermal instability in the subsonic regime.

Faint emission lines in Galactic planetary nebulae with [WC] nuclei

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In García-Rojas et al. (2009) we started a project with the aim of studying the behavior of the heavy metal ionic abundances derived from collisionally excited lines (CELs) and optical recombination lines (ORLs) in planetary nebulae with [WC] nuclei (WRPNe) The aim of this work was to investigate if there is a relation between the observed abundance discrepancy computed from these two types of lines (the so-called abundance discrepancy problem) and the presence of H-deficient metal-rich knots coming from a late thermal pulse event in the latest stages of evolution of the PN central star. In this work, we present preliminary results from the analysis of a sample of 14 WRPNe with detected faint carbon and oxygen recombination lines. The results are based on deep echelle spectra obtained with MIKE on the 6.5 m Magellan-Clay telescope.

Stars, stellar systems, and star formation

Mapping star-formation in the Milky Way

Invited Review

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In the last few years, it has become possible to measure the distance and the velocity vector of young stars located within 500 pc of the Sun with an accuracy of order 1% using Very Long Baseline Interferometry (VLBI) techniques. This represents an improvement by more than 1 order of magnitude over what was previously possible, and opens the door to some extremely high accuracy astrophysics. In particular, theoretical pre-main sequence stellar evolutionary models can now be confronted with very accurate observational constraints. The space distribution, and the internal structure and kinematics of star-forming regions, can also be investigated in unprecedented detail. This has important consequences both for star formation and for Galactic structure studies. In this talk, I will review these recent results, and explore their consequences. I will also present future perspectives and, in particular, describe two very large VLBI projects currently underway that promise to change our understanding of Galactic star formation.

Radio emission from massive protostellar objects

Invited Review

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I will review the main characteristics of massive star-forming regions and protostellar objects. In particular, I will focus on compact molecular clouds in which outflows can be traced by non-thermal radio emission. Specific cases will be presented where radio observations reveal themselves as a powerful tool to probe the physical processes occurring in these sources.

El Centro Milenio de Estudios de Supernovas

Invited Review

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Las supernovas constituyen objetos de gran interés científico, tanto en su rol como fábricas de elementos químicos como en la determinación de distancias y la expansión del Universo. En esta charla resumiré las actividades del Centro Milenio de Estudios de Supernovas que opera en Chile, con el fin de investigar cuales son los progenitores de los distintos tipos de supernovas, sus mecanismos de explosión y su utilización en la medición de distancias cosmológicas.

The formation and early evolution of brown dwarfs viewed through the Orion dispersed populations

Invited Talk

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One of the main goals of contemporary astrophysics is understanding the processes of star and planet formation. Because brown dwarfs are objects with masses intermediate between those of stars and planets, understanding how they form can provide important constraints on the origin of stars and planetary bodies. The latest results of an ongoing large-scale, optical, photometric and spectroscopic survey of very low-mass stars and brown dwarfs down to $M \sim 0.02 M_{\odot}$ in the dispersed, off-cloud populations of the Orion OB1 star-forming region are presented. The survey is based on the combination of multi-epoch optical photometry in V, Hα, R and I bands obtained with the Quest-I camera at the Venezuela National Astronomical Observatory, with near-IR data from the VISTA and 2MASS surveys, spanning a total area of ~ 200 deg^2. The photometric survey is being complemented with follow-up optical spectroscopy on the Hectospec instrument on the 6.5 m MMT, which so far has provided spectroscopic confirmation of young brown dwarfs down to $\sim 0.05 M_{\odot}$ over 6 deg^2. The sample of stellar and substellar objects spectroscopically confirmed as members of Orion and those that still remain as photometric candidates will be discussed, with a focus on the initial mass function, the mass dependence of the spatial distribution, the near-infrared excesses and the fraction of objects with Classical or Weak T Tauri-like characteristics. Finally, we will discuss how these properties behave across the substellar boundary during the age range 5 to 10 Myrs, and how they depend on their surrounding environment.

Vista Variables in the Via Láctea (VVV): current status and perspectives

Invited Talk

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Vista Variables in the Via Láctea (VVV) is an ESO near-IR variability public survey scanning the Milky Way bulge and an adjacent section of the mid-plane. A large team contributes to this project, joining researches from institutions in Europe, South and North America, and Asia. The survey will take 1929 hours of observations with the 4 m VISTA telescope during five years (2010—2014), covering $\sim 10^9$ point sources across an area of 520 deg^2, including 33 known globular clusters and ~ 350 open clusters. VVV will provide data available to the whole community and therefore will enable further studies of the history of the Milky Way, its globular cluster evolution, and the population census of the Galactic bulge and center, as well as the investigations of the star-forming regions in the disk. In this talk, we will present the first results obtained from the VVV Survey, as well as a glimpse into the possibilities for using a deep near-IR atlas in five passbands (Z, Y, J, H and K_s) and a catalogue of more than 10^6 variable point sources. We expect to use the data to find planetary transits of late-type main-sequence stars. We will discuss the planet searches and future follow-ups.

Effects of helium enrichment in globular cluster populations

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The study of the formation and evolution of globular clusters (GCs) is of great importance for understanding the formation of the Galaxy. However, with the development of the latest observatories and techniques, the most recent observations of GCs have revealed to us that our belief that each GC has a unique population is not completely true, at least for some GCs. From spectroscopic observations of individual stars in GCs, the existence of a spread in the chemical composition between stars is widely known, while from photometric observations some GCs have shown multiple main sequences (MSs), sub giant branch (SGB) splits, in addition to extended color distributions of horizontal branch (HB) stars. In this sense, while some SGB splits have been associated with the spectroscopically observed spread others could be associated with variations in the initial helium composition. Similarly, multiple MSs are only associated with different initial helium contents of the populations. Unfortunately, direct measurement of the helium abundance in GCs is

really difficult to do, because only some member stars have the required effective temperature to produce absorption lines in their atmospheres. In this contribution, we discuss a variety of available indicators to test the helium enrichment in GCs, based on new evolutionary tracks computed for a range in helium abundances and metallicities. Additionally, we present our new database of isochrones and zero age horizontal branch models for the study of GCs.

Atomic line broadening by thermal energy fluctuations in stellar atmospheres and plasmas

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The broadening produced by thermal energy fluctuations of the atomic lines in stellar atmospheres and plasmas is presented. The first assumption is to consider that the thermal energy fluctuations perturb the states of the atoms in the given system. The procedure is developed defining the perturbed energy of the atomic states divided by the size of the their orbits to obtain the linear density of the perturbed energy. The energy fluctuations are divided by the size of the box that contains one particle of the system to obtain the linear density of the energy fluctuations. The other assumption of this work is that these two linear densities are equal. A formula is obtained for the linewidths of the atoms, which depends on the temperature and total number density of particles in the system and on the principal atomic quantum numbers of the states that take part in the transitions that produce the lines. Some comparisons are made with published experimental values of the atomic linewidth.

Proper motion study of the Magellanic Clouds using SPM material

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Absolute proper motions are determined for stars and galaxies to $V = 17.5$ over a 450 square-degree area that encloses both Magellanic Clouds. The proper motions are based on photographic and CCD observations of the Yale/San Juan Southern Proper Motion program. Multiple, local relative proper motion measures are combined in an overlap solution using photometrically selected Galactic disk stars to define a global relative system that is then transformed to absolute using external galaxies and *Hipparcos* stars to tie into the ICRS. The resulting catalog of 1.4 million objects is used

to derive the mean absolute proper motions of the Large Magellanic Cloud and the Small Magellanic Cloud; $(\mu_\alpha \cos\delta, \mu_\delta)_{\rm LMC} = (1.89, +0.39) \pm (0.27, 0.27)$ mas yr^{-1} and $(\mu_\alpha \cos\delta, \mu_\delta)_{\rm SMC} = (0.98, -1.01) \pm (0.30, 0.29)$ mas yr^{-1}. These mean motions are based on best-measured samples of 3822 LMC stars and 964 SMC stars. A dominant portion (0.25 mas yr^{-1}) of the formal errors is due to the estimated uncertainty in the inertial system of the *Hipparcos* Catalog stars used to anchor the bright end of our proper motion measures. A more precise determination can be made for the proper motion of the SMC relative to the LMC; $(\mu_{\alpha\cos\delta}, \mu_\delta)_{\rm SMC-LMC} = (-0.91, -1.49) \pm (0.16, 0.15)$ mas yr^{-1}. This differential value is combined with measurements of the proper motion of the LMC taken from the literature to produce new absolute proper motion determinations for the SMC, as well as an estimate of the total velocity difference of the two clouds to within $\pm$ 54 km s^{-1}. The absolute proper motion results are consistent with the Clouds' orbits being marginally bound to the Milky Way, albeit on an elongated orbit. The inferred relative velocity between the Clouds places them near their binding energy limit and, thus, no definitive conclusion can be made as to whether or not the Clouds are bound to one another.

Two new cataclysmic variables, SDSS1238 and SDSS0804, candidates for bounced-back systems

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Recently, the Sloan Digital Sky Survey project has released a list of cataclysmic variables with systems that show spectral features and typical orbital periods of WZ Sge-type objects. From that list we selected two systems, SDSS1238 and SDSS0804. We carried out photometric and spectroscopic studies during 3 years to establish their parameters; however, besides the previous features, the photometry showed that the systems have a permanent double-humped light curve, and the Doppler tomography, constructed from the spectroscopy, revealed a structure on the accretion disc that can be interpreted as a spiral arm pattern. This new phenomenon has not been reported up until now. To try to establish the origin of the new observations, we carried out a spectral energy distribution analysis from IR to optical wavelengths, from which we obtained the mass of the white dwarf, $M_1 = 1 M_\odot$, and a L4 secondary spectral type. Because of the observational evidence and the physical parameters that we have estimated, we proposed that these two systems have all the necessary properties to be classified as true bounced-back systems. We claim that the new photometrical features are the result of the action of the 2:1 resonance, which has been demonstrated to only appear in systems with an extreme mass ratio, $q = M_2/M_1 = 0.05$, as a consequence of the tidal interaction between the secondary

star and a large accretion disc. Besides the observations, our hypothesis is supported by numerical SPH simulations of an accretion disc, for which we used the inferred physical parameters for both systems. A spiral pattern on the accretion disc is clearly visible in the simulations; from this, we made theoretical Doppler tomograms, which agree with the observations, and at the same time we constructed a synthetic light curve, which is very similar to the double-humped one. As a result of our study, we argue that a bounced-back system must be a system with a short orbital period and a small mass ratio, which imply a massive white dwarf and a degenerated secondary. Also it must have a small mass-transfer rate. Finally, we consider that in these systems the 2:1 resonance is always present and its observational signature is the double-humped light curve.

CCD photometry of M15

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We present CCD observations of the Galactic globular cluster M15, in the B and V filters. The cluster was reasonably covered, except in its northern region where our observations present a gap. We obtained a Hertszprung-Russell (HR) diagram for each region observed, and later we produced a combined HR diagram containing more than 3000 stars. We generate a clean colour-magnitude diagram (CMD) and a super-fiducial line (SFL). Application of several methods and isochrone fitting leads us to obtain values for the metallicity $[\mathrm{Fe/H}]_{\mathrm{M15}} \sim -2.16 \pm 0.10$, the reddening $\mathrm{E(B-V)}_{\mathrm{M15}} \sim 0.11 \pm 0.03$, and a distance modulus of $[(\mathrm{m-M})_0]_{\mathrm{M15}} \sim 15.03$.

On the chemical connection between the Galactic bulge and the thick disk

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The formation and evolution of the Galactic bulge and its relationship with the other Galactic populations is not very well understood. To establish the chemical differences and similarities between the bulge and other stellar populations, we performed an elemental abundance analysis of alpha- (O, Mg, Si, Ca, and Ti) and Z-odd (Na and Al) elements of red giant stars in the bulge as well as of local thin disk, thick disk and halo giants using high-resolution spectra. We confirm that thin and thick disks are chemically different at a given metallicity. For all elements

analyzed we find no chemical distinction between the bulge and the local thick disk of our Galaxy. These results clearly suggest that the bulge and local thick disk stars experience similar formation timescales, star-formation rates and initial mass functions.

Census of protoplanetary disks in young stellar regions: a *Spitzer* view

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We are carrying out a study of disk populations in young stellar regions spanning an age range from 1 to 10 Myr. Using the unprecedented sensitivity and spatial resolution provided by the *Spitzer Space Telescope* with its instruments IRAC and MIPS, we have identified and characterized protoplanetary disks around young stellar objects (spanning a wide range of stellar masses) in several young stellar populations. We find that the timescale for primordial disk dissipation around low-mass stars (spectral type K and M) is $\sim$ 5 Myr and less than 3 Myr for intermediate-mass stars (spectral type B, A and F). The infrared excesses observed in low-mass stars decrease with the stellar age, suggesting that as time passes, primordial dust grains in the disk stick together, grow to larger sizes and settle towards the midplane of the disks. On the other hand, we find that for stellar groups of 5 Myr or older, the overall disk frequency in intermediate-mass stars is higher than for low-mass stars. This is in contradiction with the observed trend for primordial disk evolution, in which stars with higher stellar masses dissipate their primordial disks faster. At 3 Myr the disk frequency in intermediate-mass stars is still lower than for low-mass stars, indicating that second generation dusty disks start to dominate the disk population at 5 Myr for intermediate-mass stars. This result agrees with models of evolution of solids in the region of the disk where icy objects form ($>$ 30 AU), which suggests that at 5–10 Myr collisions start to produce a large amount of dust during the transition from runaway to oligarchic growth and then dust production peaks at 10–130 Myr, when objects reach their maximum sizes.

An extremely long orbital period CV: SDSS0018+3454

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We present spectroscopic and photometric observations of a new cataclysmic vari-

able discovered from SDSS. The orbital period of the system appears to be $\sim$ 14 hours. We deduced binary parameters of the object by measuring radial velocities of both components.

Expansion angular de la nebulosa planetaria IC418

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Presentamos observaciones en radio continuo de la nebulosa planetaria (NP) IC418, observaciones que fueron obtenidas en dos épocas separadas por más de 20 años. Estos datos muestran la clara firma de la expansión angular de la NP, obteniendo como resultado una tasa de expansión angular de 5.8 ± 1.5 mas yr^{-1}. Si la velocidad de expansión del frente de ionización es igual a la velocidad medida espectroscópicamente del gas sobre nuestra línea de visión, entonces la distancia de la NP IC418 es 1.1 ± 0.3 kpc. Modelos teóricos predicen que los frentes de ionización en NPs se expanden alrededor de un 20% más rápido que el gas que las rodea. Tomando esto en consideración entonces la distancia a IC418 incrementaría a 1.3 ± 0.4 kpc.

Investigating the outskirts of the Milky Way: the Pisces overdensity

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In the last decade, abundant substructure has been found in the halo of the Milky Way. These clumps are interpreted as debris from destroyed dwarf galaxies, favoring a hierachical formation scenario for our Galaxy. The Pisces overdensity was discovered as an excess of RR Lyrae stars in Stripe 82 of SDSS. Located at a distance of about 80 kpc from the Sun, it is the most distant substructure in the Galactic halo known to date. In this work, we study the properties of the Pisces overdensity using spectroscopic data of several RR Lyrae stars observed with the Gemini-South telescope. We find that the distribution of radial velocities in the overdensity is bimodal, suggesting that two different streams are present in that volume of the halo. The large spatial extension of both groups suggests they are unbound systems, likely debris of a tidally disrupted galaxy or galaxies. Whether both kinematic groups have the same or different progenitors is unclear.

A multi-wavelength study of symbiotic stars in the Magellanic Clouds

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Symbiotic stars are long-period interacting binaries composed of a hot compact star and an evolved giant star, whose mutual interaction via accretion processes is at the origin of the variable emission recorded from radio to X-rays. Nowadays, they represent unique laboratories for studying a variety of important astrophysical problems and their reciprocal influence. The energetics operating these binaries is a basic ingredient for a meaningful understanding of the physical processes at work, but it relies on accurate knowledge of the distance. Unfortunately, the distances to Galactic symbiotics are largely uncertain, preventing reliable calibration of absolute stellar luminosities. Nonetheless, the specific stellar nature of symbiotic systems places them amongst the intrinsically brightest variable stars, easily detectable in nearby galaxies. We present the first results of a multi-wavelength observing program on symbiotic stars in the Magellanic Clouds conducted with some of the state-of-the-art telescopes.

The CIDA-VISTA survey for young, low-mass stars in Orion OB1

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Most stars in our Galaxy were formed in OB associations, vast complexes containing both low-mass and massive stars, and exhibiting all stages of the birth and early evolution of stars. The Orion OB1 association comprises a $\sim$ 75 pc diameter region where star formation has been sustained for 10 million years. Ironically, because it is relatively nearby (d 400 pc), its large extent on the sky has made it difficult to study all but the youngest regions located on the A and B molecular clouds. However, these clouds contain only a fraction of all the young stars in the complex. We present the result of combining the CIDA large scale VRI multi-epoch photometric survey of Ori OB1 with the recent *ZYJHK* data obtained for the VISTA Galactic Science Verification in Orion. The CIDA variability survey has been shown to be a powerful technique to find and map low-mass pre-main-sequence stars in regions devoid of gas and dust, revealing a large a population of young ($\sim$ 2–10 Myr) stars in the extended off-cloud areas. With the addition of the VISTA data, we can now reach well across the substellar boundary; the inclusion of very red bands like Z and Y help

to refine the candidate selection, and allow us to build spectral energy distributions to look for excess IR emission from dusty disks. The advent of these multi-band, optical/near-IR, multi-epoch surveys, provides new means to thoroughly map the large-scale spatial distribution of young stars in nearby associations like Orion, a fundamental tracer of the star-forming history in these regions.

Gravitational stability of magnetized disks

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We consider gravitational perturbations in geometrically thin disks with rotation curves dominated by a central object but with substantial contributions from magnetic pressure and tension, as expected in disks around young stars. We find a dispersion relation for spiral density waves and derive the stability criterion for axisymmetric disturbances in magnetized disks, the analog of the Toomre Q. The magnetic effects work in both directions: magnetic tension lowers the rotation rate making the disk more unstable, and magnetic pressure stabilizes the disk against gravitational collapse and fragmentation.

Several ways to brightness

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The planetary nebula luminosity function is relevant because its maximum luminosity is rather insensitive to the underlying stellar populations in any given galaxy, making it a useful cosmic distance indicator. Studies of the chemical composition of these bright extragalactic planetary nebulae have shown that their progenitor stars have undergone similar chemical enrichment processes, independently of the stellar population from which they arise. Finally, studies of the internal kinematics of bright extragalactic planetary nebulae find that the kinematics of the nebular shell are also largely independent of the age or metallicity of the progenitor stellar population. The similar luminosity, chemical abundance ratios, and internal kinematics all argue that the brightest planetary nebulae arise from similar progenitor stars, but it is not obvious that these findings are necessarily expected theoretically. However, in spite of these similarities, there are important differences in the spectra of bright extragalactic planetary nebulae that do depend upon the host galaxy's stellar populations. These differences imply that we necessarily observe the brightest planetary nebulae

in different galaxies in different evolutionary stages, with the brightest planetary nebulae from elliptical galaxies and the bulges of spirals being observed in an earlier stage. Therefore, there must exist multiple evolutionary pathways to produce the intrinsically brightest planetary nebulae.

Asteroseismology of the Delta Scuti star V650 Tauri

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Stellar oscillations provide a powerful tool for studying the interiors of stars, since the mode frequencies depend on the properties of the star and give strong constraints on stellar models and hence evolution theories. However, the observations of stellar pulsations require extensive data sets in order to achieve accurate frequencies and to avoid the sidelobes in the amplitude spectrum caused by the daily cycle. In this contribution, the results of a multisite photometric campaign on the Pleiades Delta Scuti variable V650 Tauri are reported. The star was observed photometrically for 14 days during 2008 November from three observatories distributed in longitude around the Earth: Observatorio San Pedro Mártir (Mexico), Observatorio del Teide (Spain), Xing Long Station (China). We have found that V650 Tauri is a multiperiodic pulsating star with at least nine oscillation frequencies above a 99% confidence level. A preliminary comparison between the oscillation frequencies and the eigenfrequencies of rotating stellar models that match the corresponding stellar parameters has been carried out.

El cúmulo globular NGC 6981: parámetros físicos y población de estrellas variables

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Se presenta la fotometría CCD del cúmulo globular NGC 6981 a través de los filtros V, R, I de Johnson. Nuestra colección de imágenes incluye 103, 110 y 3 en cada filtro respectivamente. Todas estas imágenes se obtuvieron con el telescopio de 2.0 m del Indian Astronomical Observatory ubicado en la región de Hanle en el norte de la India, en los Himalayas. La reducción y fotometría de las imágenes se realizó usando la paquetería DanDIA, que usa un tratamiento matemático basado en fotometría diferencial y que permite hacer fotometría de alta precisión hasta

estrellas de magnitud 19 ó 20 en zonas muy pobladas como es el caso de las regiones centrales en los cúmulos globulares. Se ha hecho una búsqueda profunda de nuevas estrellas variables y se ha puesto especial atención en las de tipo RR Lyrae, debido a que con ellas es posible determinar parámetros físicos importantes como el radio, masa, temperatura efectiva, magnitud absoluta, metalicidad y distancia de las estrellas RR Lyrae. La técnica que se utilizó para la determinación de estos parámetros físicos es la descomposición de las curvas de luz en sus transformadas de Fourier combinada con calibraciones semiempíricas disponibles en la literatura y determinadas a través de modelos hidrodinámicos de estrellas pulsantes. El objetivo de utilizar estas calibraciones es determinar los parámetros físicos de relevancia astrofísica antes mencionados, de manera precisa y de una manera independiente a otros métodos empleados en el pasado. Esta estrategia ha demostrado ser eficiente en la determinación de la metalicidad del cúmulo. En particular, la determinación de la magnitud absoluta (o luminosidad) permite establecer de una manera independiente la correlación entre la magnitud absoluta media de las RR Lyrae y la metalicidad. Esto significa determinar el nivel de la rama horizontal y su dependencia con la metalicidad, lo que nos proporciona una sutileza de la evolución estelar en esta etapa y su utilización como indicador de distancia. También se reportan 13 nuevas estrellas variables del tipo RR Lyrae y 3 en la zona de las Blue Stragglers.

Measuring the Galactic thick disk with QUEST-I RR Lyrae stars

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The thick disk of the Milky Way is widely recognized as a distinct component, having different kinematics, age and chemistry distinguishable from the thin disk and halo. In external galaxies, recent surveys have found thick disks to be an ubiquitous component, present in $> 90\%$ of disk galaxies. It is therefore crucial for galaxy formation models to reproduce the formation of this component and for observations to provide accurate measurements of Galactic and extra-galactic thick disk structural, chemical and kinematic parameters to be compared with model predictions. In this contribution, we present results for the QUEST RR Lyrae Survey of the thick disk. The survey spans ~ 420 deg^2 at low Galactic latitudes $|b| < 30^\circ$ and galactocentric distances between 7 and 65 kpc, with multi-epoch observations in three optical photometric bands *VRI*, obtained with the QUEST-I camera and the Jürgen Stock Schmidt telescope located at the National Astronomical Observatory of Venezuela. This is the first RR Lyrae survey of the Galactic thick disk conducted at low Galactic latitudes. This allowed for the derivation of the structural parameters of the thick disk, particularly the scale length, with in situ stars having accurate

distances (errors $< 7\%$), individual reddenings (derived from $V - R$ and $V - I$ color curves at minimum light) and a detailed modeling of the survey's completeness. Furthermore, the use of RR Lyrae stars as tracers ensures there is negligible (or none) contamination from the Galactic thin disk and the density contribution of the Galactic halo could be accurately measured by fitting the density profile at large distances (> 25 kpc).

VLBA astrometry to the proto–Herbig AeBe star EC 95 in the Serpens core

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We present astrometry results for a young binary stellar object EC 95 in the Serpens cloud core at eleven epochs from December 2007 to September 2010. A first astrometry, which covers the period from December 2007 to December 2009, allows to us determine the trigonometric parallax of EC 95 to be $\pi = 2.41 \pm 0.02$ mas, corresponding to a distance of 414.9 ± 4.4 pc. This implies a distance to the Serpens core of 415 ± 5 pc, and a mean distance to the Serpens cloud of 415 ± 25 pc. This value is significantly larger than previous estimates ($d \sim 260$ pc) based on measurements of the extinction suffered by stars in the direction of Serpens. Also, we made a rough approximation of the stellar masses of the binary components. The primary (EC 95a) is a 4-–5$M_\odot$ proto-Herbig AeBe object (arguably the youngest such object known), whereas the secondary (EC 95b) is most likely a low-mass T Tauri star. Interestingly, both sources are non-thermal emitters. While T Tauri stars are expected to power a corona because they are convective while they go down the Hayashi track, intermediate-mass stars approach the main sequence on radiative tracks. Thus, they are not expected to have strong superficial magnetic fields, and should not be magnetically active. Here we will discuss both issues.

Thousands of Milky Ways: galaxy satellites and building blocks

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A semi-analytic model of galaxy formation with and without active galactic nuclei feedback is used to study the nature of possible building blocks (BBs) and surviving satellites of $z = 0$ galaxies, including those of Milky Way types. We find that BBs

show a wide range of properties which depend on environmental variables such as the host halo mass; the stellar formation histories are comparatively faster and the chemical enrichment is more efficient in BBs than in surviving satellites, in accordance with recent metallicity measurements for the Milky Way. These results can be used in combination with observational constraints to continue probing the ability of the cold dark-matter scenario to reproduce the history of galaxy demography in the Universe.

Study of filamentary structures across the Galactic plane

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Recent infrared and millimeter observations have shown that filamentary structures are ubiquitous along the Galactic plane. The origin of these structures and their rôle in the process of star formation are, however, still poorly understood. We report here a search, and ensuing study, of filamentary structures within a region of 10 degrees of the Galactic plane in the fourth quadrant ($l = 330^\circ$ to 340°) using ATLASGAL data. The physical parameters of the filaments were then determined from observations of dust continuum emission at 850 and 450 microns and molecular line emission. These observations are providing significant constraints on current models of the formation of filamentary structures and on their importance in the process of massive star formation.

Observations of the photodissociated H I region that surrounds G213.880−11.837

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We present new observations of the H I 21 cm line toward the cometary H II region G213.880−11.837. These observations, carried out with an angular resolution of $\sim 15''$, reveal that the neutral gas in this region is part of an expanding flow. The analysis of the kinematics of the H I gas suggests that it is undergoing a champagne flow: based on the difference between the radial velocities of the neutral gas in the tail (~ 14 km s^{-1}) compared to the velocities of the ambient molecular gas (~ 11.5 km s^{-1}). Besides this photodissociated region, there is only one other reported undergoing an H I champagne flow (G111.61+0.37).

Structural parameters of M81 compact star clusters

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We study the population of compact stellar clusters (CSCs) in M81, using the *HST*/ACS images in the filters F435W, F606W and F814W covering, for the first time, the entire optical extent of the galaxy. This study has allowed us to discover 263 young compact clusters as well as 172 old globular clusters. In this work, we present the structural properties such as the effective radius ($R_{\rm eff}$) and the shape of the profile of these clusters, and relate these properties to the evolutionary stage of the star clusters. Our preliminary analysis shows that the younger clusters tend to have smaller $R_{\rm eff}$ than the older ones. We also explore how the structural parameters are related to their location in the galaxy.

Embedded young stellar objects in the Galactic star-forming region IRAS18236-1205

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In this work, we carry out a multi-wavelength study of a sample of candidates for embedded young stellar objects (YSOs) in the Galactic molecular cloud associated with the *IRAS* 18236-1205 source. This source shows clear signatures of massive star formation, such as *IRAS* flux ratios of ultra-compact H II (UCHII) regions and methanol maser emission. We used the *Spitzer*/MIPS 24μm image to identify candidates for embedded YSOs in the molecular cloud defined by ^{13}CO($J = 1$–0) intensity maps and compiled/carried out photometry of these sources in 2MASS, IRAC and MIPS bands. The resulting 1–24μm SEDs are used to classify the embedded YSOs using the classical criteria of the evolutionary phases scheme and diagnostic diagrams for young objects. There are two active star-forming sites in the molecular cloud: one at the location of the *IRAS* source, and the other to the north-west of the *IRAS* source associated with IRDC G19.36-0.03 and IRDC G19.30+0.07, respectively. We find a tendency for the Class I and II sources (earliest objects) to be associated with the most dense regions of the molecular cloud, whereas the Class III (evolved) objects are uniformly distributed over the cloud.

Characteristics of the embedded cluster Tr 14-N4

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Deep narrow (Brγ at 2.17μm and H_2 at 2.12μm) and broad-band (JHK) near-infrared images of the young regions Tr 14-N4 and the Car I are presented. The observations were made with PANIC, attached to the Baade 6.5 m Magellan Telescope at Las Campanas Observatory. These were supplemented by archive *Spitzer*/IRAC images. Evidence is given of an embedded young compact cluster ($r = 23''$) of medium-to-low mass stars in Tr 14-N4 but that includes at least one high-mass protostar. Its properties are derived from the 1.2 to 11μm photometry. The presence of outflows is evinced by knotty H_2 emission near the edge of a cavity. We also present updates of near-IR light-curves of Car I-136 and 125 in the nearby Car I region.

Search for new open clusters towards star-forming regions

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One of the main goals of the "VVV — Vista Variables in the Via Lactea" ESO Large survey (Minniti el al. 2010) is to search for new star clusters of different ages. In order to trace the early stages of star-cluster formation we are carrying out a survey of infrared star clusters and stellar groups in the directions of known massive star-formation regions associated with methanol maser emission and hot molecular cores. Using up-to-date lists of star-forming regions (Longmore et al. 2009; Churchwell et al. 2006, 2007) we have identified by visual inspection 35 small star cluster candidates. Almost all of them seem to be very young indeed, because most of the mass is still concentrated in the gas.

How turbulent is molecular cloud turbulence?

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Molecular clouds are thought to be turbulent since the detection of supersonic spectral linewidths in the early 70's. However, there is still a lot of debate about the

source(s) of this turbulence. In this talk, I will show both observational and numerical results that support the idea that the large linewidths observed to molecular clouds are mostly the result of clouds undergoing both global and local collapse simultaneously.

The inner regions of high accretion rate disks

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We present models for the inner regions of disks with high mass-accretion rates and compare them with observational results.

On the formation of the most massive stars in the Galaxy

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The "really" massive stars, those with roughly more than 15 times the mass of the Sun, likely start to ionize their surroundings before they get to their final mass. How can these stars accrete in spite of the presence of over-pressurized gas? We present results of Submillimeter Array (SMA) and Very Large Array (VLA) studies of massive-star formation regions in the early stages of ionization: the so-called ultracompact (UC) and hypercompact (HC) H II regions. Molecular-line observations at resolutions from a few arcsec to 0.3 arcsec reveal the presence of rotation, infall, and/or outflow from parsec scales to < 0.05 pc (10,000 AU). The centers of star formation are composed of small groups of massive (proto)stars, usually at different evolutionary stages. The hypercompact H II regions with positive spectral indices from cm to mm wavelengths tend to be the smallest and most embedded, and their spectral energy distributions indicate the presence of density gradients and/or clumpiness within the ionized gas. In the innermost few thousand AU, the ionized gas is sometimes found to have organized motions, probably in the form of outflow and/or rotation. Multiepoch observations of the free-free continuum reveal significant flux variations on timescales of years, attributable to interactions with the surrounding molecular gas. These observations, as well as recent models and numerical simulations of H II region evolution in star-forming accretion flows, favor a picture in which: (i) stars with $M > 15 M_{\odot}$ form by accretion processes similar to those of lower-mass stars, but with significant ionization, (ii) the masses of the cores from which these stars form are not set until relatively late times in the evolution

of the cluster, (iii) accretion can continue past the onset of an H II region, and (iv) the H II region is kept partially confined by its own molecular accretion flow for a period of time.

Thermal radio emission from radiative shocks in colliding wind binaries

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Stellar winds from hot massive stars emit thermal radio emission with spectral indices, $\alpha \sim 0.6$–0.7. For binary systems, a wind-wind colliding region (WCR) is expected to contribute to the emission. We present a semi-analitical model for computing the thermal radio continuum emission from radiative shocks in colliding wind binaries. Assuming a thin-shell approximation, we determine the total emission from close binaries. We analyze the dependence of this influence on binary and stellar wind parameters.

Tidal forces as a regulator of star formation in Taurus: a numerical study

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The Taurus molecular cloud constitutes a typical example of the low-mass star forming regions, i.e., regions that form only low-mass stars at a low rate ($\sim 1\%$). Magnetic and turbulent support have been presented as possible mechanisms for preventing a more vigorous star-formation regime, as they could provide cloud support. In this context, the evaluation of the gravitational energy of clouds has usually been done considering only the mass distribution of the cloud as a source of the gravitational potential. However, as it has been shown using semi-analytical calculations, tidal forces due to the mass external to the cloud may not necessarily be negligible and can play a major rôle in its future disruption or collapse. The present work tests such calculations through SPH simulations of filamentary molecular clouds embedded in the gravitational potential of the Galaxy. We find that the evolution of such molecular clouds is strongly dependent on their alignment with respect to the Galaxy center, showing that tidal forces from the Galaxy affect largely the formation of denser regions, and hence stars, within the cloud. The dynamical results from the simulations are in accordance with previous semi-analytical energy analyses.

Advances in the understanding of interacting binaries with additional long periods

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We report recent advances in our understanding of double periodic variables. These are Algol-like semi-detached interacting binaries showing additional long photometric periods lasting roughly 33 times the orbital period. We discuss the cases of V393 Sco, LP Ara and DQ Vel, based on high-resolution optical spectroscopy spanning the long cycles and orbital light curve modeling. The best system parameters are given for these objects. Our observations fit the scenario of cyclic mass loss producing successive obscuration stages in these binaries.

New results on the HH80-81 radio jet

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The HH80–81 radio jet is associated with the high-luminosity YSO IRAS 18162–2048. With a total extension of 5.3 pc, it is the largest and most collimated protostellar jet known so far. We present new, high sensitivity, centimeter continuum observations obtained with the VLA that show evidence of a non-thermal component in the centimeter continuum emission of the jet. We compare our results with those of other astrophysical objects (microquasar and AGN jets) and we discuss the implications on the rôle of the magnetic field in astrophysical jets.

Physical parameters and chemical abundances in bipolar PNe

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Planetary Nebulae constitute one of the mechanisms by which the interstellar medium is enriched by chemically processed material from stars. We present the results of a project to determine the physical parameters and chemical abundances of a large sample of planetary nebulae in the Galaxy that have bipolar structure. The observational data were obtained in the OPD/MCT–Brazil. The methodology consisted in performing long-slit spectroscopy throughout the longest axis of each

object and later in axes parallel to that. IFU maps from regions of $15 \times 30''$ were also performed. In this way it was possible to derive the required data, physical parameters and chemical abundances, for distinct points of each nebula. We paid particular attention to the variations of the parameters that are associated with the presence of structures in the nebula. Electron density was determined by the ratio [S II] 671.6/673.1 nm emission lines and electron temperature by the ratios [O III] 500.7/436.3 nm and [N II] 658.4/575.4 nm. The results indicate that the density profiles are different for each object, and therefore also the electron temperature profiles. Similarly, we have also determined the abundances of the elements helium, oxygen, nitrogen, sulfur, and argon over the objects. We also show the first results of modeling these objects using the photoionization code Cloudy, using the opt-out pseudo-3D. The non-homogeneity of the objects appears very evident in the results of the sample objects, which also allows us to derive the intrinsic parameters of each object. These results allow us to assess the validity of the assumptions made during the process.

Planetary systems

New results on celestial mechanics

Invited Review

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This talk highlights the most relevant advances in celestial mechanics that have occurred in the last decade. The best example is a topic concerning architectures and the evolution of extra-Solar planetary systems. The discovered worlds challenge our imagination by their unusual orbital configurations and raise new questions in our understanding of their dynamical evolution. For centuries the paradigm, with clockwork revolution of low-eccentricity and low-inclination planets, our own Solar system emerges now as an atypical structure in the current sample of the known multi-planetary extra-Solar systems. In the light of new discoveries, understanding of planetary dynamics is receiving particular attention for several reasons. These include: (i) detection of the extra-Solar planets and determination of their orbits, (ii) modeling the long-term evolution and stability of the extra-Solar systems, (iii) elaboration of theories of formation/migration of the planet systems, and finally, (iv) planetary habitability studies and the search for life.

The transitional asteroid-comet objects

Invited Review

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Comets and asteroids used to be considered as two distinct classes of small bodies of the Solar system, both being remnants from the early stages of its formation. Comets are residual planetesimals formed in a region that extends from the giant planets to the limits of the Solar nebula. Even if they are partially processed, comets (and other related icy minor planets, like trans-neptunian objects and Centaurs), are the most pristine observable Solar System objects. The present population of asteroids

is the product of the collisional and dynamical evolution of remnant planetesimals formed in the region between Mars and Jupiter. As a consequence of the different formation regions, the volatile content of the two populations is different. The most apparent distinction between comets and asteroids is that comet nuclei, when close to the Sun, are surrounded by a coma produced by the outgassing of volatiles, while asteroids do not. So, up to now, a minor body has been considered a comet or an asteroid depending on the detection of a coma. From a dynamical point of view, the orbits of most comets and most asteroids are remarkably dfferent. The criterion commonly used to differentiate between a cometary or an asteroidal orbit is related to the Tisserand parameter with respect to Jupiter (TJ). Most comets have unstable orbits with TJ < 3, while the great majority of asteroids have orbits with TJ > 3. Recent discoveries show that the simple distinction between asteroids and comets needs a revision: (1) the large number of asteroids discovered in comet-like orbits (ACOs), (2) the realization that comets might develop an asteroidal appearance when sublimation stops, either due to the depletion of volatile materials (dead or extinct comets) or by the growth of a surface crust of refractory material up to a thickness that prevents subsurface volatiles from warming up to sublimation temperature (dormant comets, Rickman et al. 1990, A&A, 237, 524); ACOs are candidates to be dead or dormant comets, (3) the discovery of objects in asteroidal orbits that have temporal bursts of activity either in the near- Earth population (e.g., 4015 Wilson-Harrington) and in the main belt (the so-called Main Belt Comets like 7968 Elst-Pizarro, Hsieh & Jewitt 2006, Science 312, 561), (4) the discovery of asteroidal objects that have associated meteor showers that suggest some past cometary activity, e.g., (3200) Phaethon, (5) the discovery of icy objects (TNOs and Centaurs) that, due to their distance from the Sun, rarely develop a coma, (6) the dynamical simulations (Levison et al. 2009, Nature, 460, 364) that suggest that a significant fraction of the asteroids in the outer-belt (objects with a semi-major axis $a > 3.3$ AU: the Cybeles with a between 3.3 to 3.7 AU, the Hildas in the 3:2 resonance with Jupiter at ~ 4.0 AU, and the Jupiter Trojans around the L4 and L5 Lagrangian points of Jupiter at ~ 5.2 AU) are TNOs moved to these resonances in an early epoch of the Solar system called the late heavy bombardment, and (7) the discovery of water-ice on the surface of asteroid (24) Themis (Campins et al. 2010 Nature, 464, 1320; Rivkin & Emery 2010, Nature, 464, 1322), the largest member of the Themis collisional family, which also is a member Elst-Pizarro. Transitional asteroid-comet objects then include three types of objects: (1) the ACOs, (2) the "activated asteroids" (AAs), objects in asteroidal orbits with intermittent or past cometary-like activity, and (3) the primitive asteroids in the outer main-belt. The study of transitional objects is very important as it may provide a number of clues to the origin and evolution of the asteroid and trans-neptunian belt. In particular, it could provide e.g., (1) tests of dynamical models, (2) information about the presence of ice and organics in the asteroid belt and its contribution to Earth, and (3) information about the end state of comets. In this review I will present recent observational studies

of transitional asteroid-comet objects including images, and spectroscopy in the visible, near-infrared and mid-infrared, which provide information on the key issues discussed earlier, in particular on the surface composition and the interrelationships between the different populations.

The background population of asteroids in the Main and Trojan Asteroid Belts

Invited Talk

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In this work, we analyze the distribution of asteroids in the Main Asteroid Belt and in the Jupiter Trojan Belt, specifically looking for correlations among surface colors and orbital parameters. We focus our study on the populations of background asteroids, i.e., those bodies that do not belong to any of the known asteroid families. These background populations are expected to better trace the primordial dynamical and collisional evolution of the Belts, since the families originated from the unusual catastrophic breakup of big asteroids and thus pollute the evolution and distribution of the Belts at later stages. We furthermore focus on those asteroids showing no features in their reflectance spectrum, since it is expected that these featureless asteroids did not suffer any significant thermal process in their interiors, thus being good tracers of the asteroid-formation conditions in the primordial nebula. Moreover, the surface properties of featureless asteroids can be characterized by a single parameter, the spectral slope, or equivalently by a single color, which facilitates the searching for correlations. To assess the asteroid colors, we use the optical 5 band photometry of the Sloan Digital Sky Survey Moving Objects Catalog. Our main result indicates that correlations exist between colors and orbital inclination, in the sense that more reddish bodies concentrate at larger inclinations. In the case of the Trojan Belt, this correlation is quite strong and it is also well correlated to the asteroid sizes (the larger the asteroid, the redder the surface). The reason for this correlation is not clear, but it might be related to a combination of collisional processes and surface alteration processes like the so-called space weathering. In the case of the Main Belt, this correlation is weak and it is more notorious in the outer part of the Belt. We found that the correlation is originated by the contamination of the background due to asteroid fugitives from the major asteroid families, i.e., bodies that were former members of asteroid families but abandoned them due to slow dynamical evolution driven by mean motion resonances and the Yarkovsky effect. This scenario would be in line with the idea that the primordial asteroid population in the Main Belt was significantly depleted at the early stages of the Solar system evolution, and was gradually repopulated by the collisional cascade driven by the formation of large asteroid families at later stages.

The nature of transition circumstellar disks in the Lupus molecular clouds

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Circumstellar disks are an integral part of the star-formation process and the sites where planets are formed. Few circumstellar disk systems are caught in the short transition between strongly accreting Classical T Tauri Stars (CTTSs) and the non-accreting weak-line T Tauri Stars. These transition disk objects have optically thin inner disks and optically thick outer disks (i.e., the disks have inner opacity holes). Basically, four different mechanisms have been proposed to explain the holes of transition disks: grain growth, photoevaporation, tidal truncation in close binaries, and finally, as the most exciting one, planet formation. These mechanisms, all relevant to disk evolution in general, can be distinguished when disk masses, accretion rates, and multiplicity information are available. We run a large coordinated program aiming to collect such information for a large sample ($\sim$ 119) of *Spitzer*-discovered transition disks in order to (i) establish the relative importance of the mechanisms potentially responsible for their inner holes, and (ii) identify systems with strong evidence for ongoing planet formation to be followed-up with *Herschel* and ALMA. Here, we present high-resolution optical spectroscopy (LCO/CLAY/MIKE), VLT/NACO images and submm data (APEX/LABOCA) of 23 transition disk systems located in Lupus region. We derive disk masses and accretion rates and discuss the probabilities for ongoing planet formation in these systems.

High-cadence NIR observations of extrasolar planets

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A second step in the characterrization of extrasolar planets has been achieved with the detection of the atmosphere of those objects by means of the secondary eclipse observations. We use near-infrared high-cadence observations to detect the occultation and the transit of extrasolar planets, which produce a high accuracy characterization. We present the results of this technique applied to the hot planet WASP-4b.

Dynamical method to detect a third object around a cataclysmic variable: the FS Aurigae case

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FS Aurigae is an unusual cataclysmic variable (CV) that has two different periods: the spectroscopically determined orbital period of 85.7 min (Thorstensen et al. 1996) and a photometric modulation of 205.5 min (Tovmassian et al. 2003), attributed to the freely precessing period of a magnetized dwarf. There is, finally, a new very long period, first reported here, of $\sim$ 900 days. It is not easy to find a mechanism that accounts for this very long period, which is so different compared to the first two. In this research, we present a third body (of $\sim 50 M_{\rm J}$) orbiting FS Aurigae as the possible explanation for the observed very long period of $\sim$ 900 days. This third body perturbs the inner binary by secular perturbations exerted in the eccentricity and therefore modulates the accretion rate in the CV. This type of analysis can be applied to other close binary systems with accretion disks. Here we discuss the possible applications of this research to other systems.

Application of granular physics to impact processes on asteroids and comets

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Granular media are formed by a set of macroscopic objects (named grains), which interact through temporal or permanent contacts. Several processes have been identified, which require a full understanding of, for example, grain blocking, formation of arcs, size segregation, response to shakes and impacts, fragmentation, etc. These processes have been studied experimentally in the laboratory, and, in the last decades, numerically. The discrete element method (DEM) simulates the mechanical behavior in a medium formed by a set of particles that interact through their contact points. We have identified two cases where we would like to apply the methods of the physics of granular media: (i) size segregation of rocks due to seismic movements induced by impacts onto asteroids, in particular the the case of asteroid Itokawa, and (ii) production of dust clouds at low relative velocity due to the ejection generated by the passage of a seismic wave produced in a collision. The results would be applied to the case of the so-called "main-belt comets". For the study of these phenomena, we identified 4 areas in which the application of the physics of granular media

would allow us to understand the nature of the collisional processes in asteroids, namely: (1) laboratory experiments for the simulation of impact-induced seismic phenomena, (2) numerical simulations with the DEM techniques in low-gravity conditions (3) orbital evolution of particles ejected from the surface, and (4) observation of asteroids which have experienced recent impacts. Results related to the above work areas will be presented.

The effect of a strong stellar flare on the atmospheric chemistry of an Earth-like planet orbiting an M dwarf

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Main-sequence M stars pose an interesting problem for astrobiology: their abundance in our Galaxy makes them likely targets in the hunt for habitable planets, but their strong chromospheric activity produces high-energy radiation and charged particles that may be detrimental to life. We studied the impact of the 1985 April 12 flare from the M dwarf AD Leonis (AD Leo), simulating the effects from both UV radiation and protons on the atmospheric chemistry of a hypothetical, Earth-like planet located within its habitable zone. Based on observations of Solar proton events and the Neupert effect, we estimated a proton flux associated with the flare of 5.9×10^8 protons cm^{-2} sr^{-1} s^{-1} for particles with energies $>$ 10 MeV. Then, we calculated the abundance of nitrogen oxides produced by the flare by scaling the production of these compounds during a large Solar proton event called the "Carrington event". The simulations were performed using a 1-D photochemical model coupled to a 1-D radiative/convective model. Our results indicate that the ultraviolet radiation emitted during the flare does not produce a significant change in the ozone column depth of the planet. When the action of protons is included, the ozone depletion reached a maximum of 94% two years after the flare for a planet with no magnetic field. At the peak of the flare, the calculated UV fluxes that reach the surface, in the wavelength ranges that are damaging for life, exceed those received on Earth during less than 100 s. Flares may therefore not present a direct hazard for life on the surface of an orbiting habitable planet. Given that AD Leo is one of the most magnetically-active M dwarfs known, this conclusion should apply to planets around other M dwarfs with lower levels of chromospheric activity.

Instrumentation

El Observatorio LAGO (Large Aperture GRB Observatory)

Invited Review

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El estudio de fuentes de radiación cósmica de altísima energía sigue representando un gran reto en la astrofísica. Si bien las observaciones hechas con satélites han permitido desvelar algunas incógnitas en cuanto a su origen y localización a bajas energías, quedan aún preguntas por resolver en rangos de energía más altas ($>$ 1 GeV). No obstante, el flujo de partículas a altas energías es muy bajo, lo que hace necesario grandes superficies sensitivas, por lo que la detección de partículas secundarias desde observatorios en la superficie de la Tierra resulta una solución viable. El observatorio Pierre Auger [1] es hoy día el más importante en el estudio de los rayos cósmicos de las más altas energías ($>$ 1019 eV), instrumentando 3000 km^2 con una red de 1600 detectores de superficie y a 1400 m sobre el nivel del mar. Para medir cascadas iniciadas por un eventual flujo de fotones entre 1 GeV y 1 TeV durante un destello gamma, dada la fuerte absorción de las cascadas en la atmosfera, una idea consiste en no intentar reconstruir la cascada por completo, sino detectar solamente algunas partículas de ésta. Si muchos fotones provienen del destello, uno puede esperar observar durante unos segundos muchos fotones secundarios. Si esta cantidad es mayor a la fluctuación del fondo de fotones, se podría detectar el destello. Este método de la "Partícula Única", tiene como ventaja una disminución importante del umbral de detección, ya que no se hace necesario que toda la cascada llegue al detector. Por otro lado, a pesar de que no se puede efectuar ninguna reconstrucción, si se puede obtener el tiempo de ocurrencia del destello. De manera que, con varios niveles de disparo y una segmentación temporal suficiente, se podría aportar información sobre la estructura temporal y la energía máxima de los destellos, aspectos totalmente desconocidas al día de hoy, y de suma importancia en el estudio de los destellos cortos que serían el resultado de la coalescencia de dos estrellas de neutrones o agujeros negros en un sistema binario, así también de los destellos largos provenientes de explosiones de estrellas tipo supernova cuyas masas serían mayores a las 10 masas solares [3]. Si bien el Observatorio Pierre

Auger tiene tal capacidad dados sus 16000 m^2 de detectores, su baja altura sobre el nivel del mar reduce fuertemente su capacidad de detección. Una alternativa observacional que intenta superar esta limitante es la propuesta [2] por el proyecto LAGO ya iniciado en el 2005, al situar detectores Cherenkov de agua a gran altura. Los sitios de observación [4] han sido seleccionados atendiendo algunos requisitos básicos de altura sobre el nivel del mar, infraestructura académica y técnica y a la existencia de un grupo de investigación que se responsabilice tanto del montaje de los detectores, como del análisis, visualización y preservación de los datos. El primer sitio elegido es Sierra Negra, cerca de Puebla, México, a 4550 m y empezó a tomar datos de manera estable a principios del 2007. El sitio Chacaltaya, cerca de La Paz, Bolivia, a 5250 m, está en funcionamiento desde principios del 2009. Los prototipos en Mérida-Venezuela (1800 m) están listos desde hace 2 años tomando datos y en espera para ser montados en Pico Espejo (4750 m), el prototipo de Bucaramanga-Colombia (1900 m) está en fase de experimentación para ser instalado en el Cerro de los Santos a 4600 m y el sitio Marcapomacocha (4413 m) en el Dpto. Junín en Perú, inició su toma de datos en Agosto del 2010. Chile y Guatemala también han manifestado su interés en formar parte de la comunidad LAGO.

Bibliografía: [1] Pierre Auger Collaboration, 2007, 30th International Cosmic Ray Conference, e-Print arXiv:0801.2321v1
[2] D. Allard, et al, 2005, 29th International Cosmic Ray Conference X. Bertou & D. Allard Nucl. Inst. Meth. A553: 299-303, 2005
[3] P. Mészáros, Rept. Prog. Phys. 69 (2006) 2259-2322, e-Print astro-ph/0605208 LAGO Collaboration, Nucl. Inst. Meth. A595: 70-72,2008
[4] `http://particulas.cnea.gov.ar/experiments/lago/`

Detección de ondas gravitacionales

Invited Review

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La búsqueda de la detección de ondas gravitacionales ha sido uno de los desafíos tecnológicos más difíciles a los que se han enfrentado jamás los físicos experimentales y los ingenieros. A pesar de los resultados nulos obtenidos hasta la fecha después de cuatro años de búsqueda, la comunidad involucrada en ésta área ha ido creciendo. Una de las principales razones de esto es que la primera detección de ondas gravitacionales y la observación regular de ellas son de las metas más importantes para el comienzo de éste milenio. Ellas probarán uno de los fundamentos de la física, la teoría de la relatividad general de Einstein y abrirá una nueva ventana para la observación del Universo, lo cual, seguramente causará una revolución en nuestra

comprensión de la física y la astrofísica. En esta charla daré un reporte actualizado acerca de todos los detectores relevantes (interferómetros, barras, esferas, radio telescopios y satélites CMB) en operación, actualización y los que están construcción o en proyecto. En particular hablaré con más detalle acerca del detector brasilero Schenberg.

Other

Astronomy outreach

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I shall address the different ways I have been doing outreach lately. I shall talk about my experience with radio, television, books, articles for teachers and public lectures. The emphasis will be made on ingredients I have included to make outreach more appealing.

Astronomía oficial y astronomía popular: ¿encuentro o desencuentro?

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Se hace una revisión de la divulgación de la astronomía que hizo el Ingeniero Joaquín Gallo por medio de cartas en la primera mitad del siglo XX. Gracias a que se conservan tanto las preguntas del público como copias de las respuestas de Gallo, es posible estudiar con detalle este ejemplo de la comunicación que se dio entre lo que aquí llamaremos la astronomía oficial —representada por Gallo, director del Observatorio Astronómico Nacional de México— y la astronomía popular. Se hace una lectura cuidadosa de estos intercambios epistolares, poniendo especial atención en lo que cada autor sabe y quiere. El panorama resultante es algo más complejo e interesante que el de un simple intercambio de información. Esta mirada a una parte del quehacer de un astrónomo mexicano en el pasado nos sirve para entender mejor la astronomía en general, y su comunicación con el público en particular.

La Revista Mexicana de Astronomía y Astrofísica, una opción real de publicación astronómica

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Presentamos los datos estadísticos sobre la Revista Mexicana de Astronomía y Astrofísica. Consideramos que esta publicación está bien posicionada en la literatura internacional, por lo que deseamos invitarlos a publicar sus mejores resultados en ella. Igualmente, presentamos información sobre la Serie de Conferencias, que ha tenido muy amplia aceptación, por lo que también les proponemos incluir las memorias de las reuniones astronómicas de calidad de la región en esta serie.

Poster session I

Cosmology

First stars formation with the presence of primordial magnetic field **I-1**

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The problem of the cooling of metal-free Population III stars is considered. The importance of cyclotron cooling in the presence of the primordial magnetic field is discussed. It is shown that the cyclotron cooling must be taken into account, as well as cooling due to H_2 , HD and LiH molecules.

Galaxy-scale strong lens candidates in the RCS2 **I-2**

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We have photometrically pre-selected luminous red galaxies (LRG) in the Red Cluster sequence Survey 2 (RCS2) and visually searched for arcs or multiple images within 6 arcseconds from the candidate LRGs. This has yielded the first catalog of galaxy-scale strong lenses in the RCS2, which is composed of 60 candidates. Besides presenting the catalog along with some preliminary mass and mass-to-light ratio estimates for the lensing galaxies, the unique properties given to these candidates by the nature of the RCS2 survey and the lens search method will be discussed.

Measuring the deuterium-to-hydrogen ratio in the Lyman-alpha forest **I-3**

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I will present results from a systematic search of intergalactic deuterium lines in a complete sample of high-resolution UVES spectra taken from the ESO archive. The

primordial D/H ratio is an important quantity in cosmology as it is determined by the baryon density of the Universe. However, too few detections exist so far because of the lack of suitable absorption-line systems. The large UVES archive offers an excellent opportunity to find new suitable systems.

Spiral-arm substructures in the intracluster gas **I-4**

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Clusters of galaxies, the largest collapsed structures in the Universe, provide a wealth of information on the cosmological assembly of matter. In particular, the mass function of galaxy clusters provides strong constraints for the mass density parameter and the normalization of the density fluctuation power spectrum. However, we do not observe cluster masses directly but either we must perform a detailed analysis (based on galaxy velocities or X-ray observation or gravitational lensing mass reconstruction), or use some proxy for the mass. In this work, we will present detailed analysis of nearby galaxy clusters observed by the *Chandra* X-ray satellite, focusing on the projected density and temperature distributions. Many of these structures have similar morphologies, which exhibit spiral-like substructure. These features are analogous to those found in numerical hydrodynamic simulations of cluster collisions with non-zero orbital angular momentum. Our investigation implies that these spiral-like structures may be caused by off-axis collisions that will lead to minor mergers. Since these features occur in regions of high density, they may confine radio emission from the central galaxy producing, in some cases, unusual radio morphology.

Improving type IIP supernovae calibration using infrared observations **I-5**

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Type IIP supernovae (SNe) have been shown to be very good distance indicators when their brightness is normalized using the Standardizable Candle Method (SCM) first proposed by Hamuy and Pinto (2002) and recently improved by Poznansky et al. (2009) and Olivares et al. (2010). As in the case of supernovae type Ia, reddening estimations remain the mayor source of uncertainties for the intrinsic brightness

determination. Infrared observations are the natural complement to optical observations to reduce the effect of the interstellar absorption. In this poster, we present preliminary results obtained combining in the SCM method both optical (BVRI) and near-IR (JHK) observations of Type IIP SNe.

Galaxies (including AGNs)

Chemical evolution models for spiral disks: the Milky Way, M31, and M33 **I-6**

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The distribution of chemical abundances and their variation with time are important tools for understanding the chemical evolution of galaxies. In particular, the study of chemical evolution models can improve our understanding of the basic assumptions made when modeling our Galaxy and other spirals. We test a standard chemical evolution model for spiral disks in the Local Universe and study the influence of a threshold gas density and different efficiencies in the star-formation rate (SFR) law on the radial gradients of abundances, gas, and SFR. The model is then applied to specific galaxies. We describe the output of a one-infall chemical evolution model where the Galactic disk forms inside-out by means of infall of gas, and test different thresholds and efficiencies in the SFR. The model is scaled to the disk properties of three Local Group galaxies (the Milky Way, M31 and M33) by varying its dependence on the star-formation efficiency and the timescale for the infall of gas onto the disk. The radial oxygen abundance gradients and their time evolution are studied in detail. The present day abundance gradients are more sensitive to the threshold than to other parameters, while their temporal evolutions are more dependent on the chosen SFR efficiency. In conclusion, we see that the most massive disks seem to have evolved faster (i.e., with more efficient star formation) than the less massive ones, thus suggesting a downsizing in star formation for spirals. The threshold and the efficiency of star formation play a very important rôle in the chemical evolution of spiral disks. For instance, an efficiency varying with radius can be used to regulate the star formation. The oxygen abundance gradient can steepen or flatten in time depending on the choice of this parameter.

Heat conduction in the atmospheres of clusters of galaxies **I-7**

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Clusters of galaxies contain an enormous amount of completely ionized, diffuse gas, with densities smaller by a factor of a thousand than the interstellar mean, which act like an X-ray emitting fluid. The usual models for explaining this X-ray emission consider the diffusion approach to thermal propagation and the conductivity dominated by electrons. We have been examining the rôle of heat conduction during the streams and other transitory events in the inner atmospheres of the galaxy clusters assuming the causal propagation of heat in hydrostatic balance, following the methods of Falcon (2004) and Zakamska and Narayan (2003), and using the X-ray data measurements made with the *Suzaku II* satellite. The simulations allow us to consider the soft X-ray emission in the atmospheres of the clusters, particularly in the Abell cluster of galaxies 2052, 2204, 1795. Also, we calculated the mass of these clusters within the virial radius and the Sunyaev-Zeldovich decrement in the cosmic microwave background. We conclude that the estimation of the contribution of the mass of diffuse, X-ray emitting gas is significantly greater when taking into account the causal propagation of heat and the cooling flow.

The Faber-Jackson relation for early-type galaxies: dependence on the magnitude range **I-8**

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Recent papers state that the coefficients and intrinsic dispersions of the Kormendy relation and of the fundamental plane depend on the magnitude range within which the galaxies are contained. In this paper, we study whether this type of behaviour is also present for the other structural relation known as the Faber-Jackson relation. We take one sample of early-type galaxies from the Sloan Digital Sky Survey (SDSS) Release Seven ($\sim$ 90000 galaxies with $\Delta M \sim 7$ mag in g and r filters) and analyse the behaviour of the Faber-Jackson relation coefficients as functions of the magnitude range. We calculate the coefficients in two ways: (i) we consider the faintest galaxies in each sample and we progressively increase the width of the magnitude interval by inclusion of the brighter galaxies (increasing magnitude intervals), and (ii) we consider narrow magnitude intervals of the same width ($\Delta M = 1.0$ mag) over the whole magnitude spectrum available (narrow magnitude intervals). The main results we find are as follows: (i) In both increasing and narrow magnitude intervals

the Faber-Jackson relation coefficients change systematically as we consider brighter galaxies, (ii) non-parametric tests show that the fluctuations in the values of the slope of the Faber-Jackson relation are not products of chance variations, and finally, (iii) analysis indicates that the intrinsic dispersion of faint galaxies is larger than that of bright galaxies. We conclude that the values of the Faber- relation parameters depend on the width of the magnitude range and the brightness of galaxies within the magnitude range. This dependence is due to the fact that the shape of the distribution of galaxies in the $M - \log(\sigma_0)$ plane depends on luminosity.

A stellar population synthesis model that includes binary star interactions **I-9**

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Many stars are observed to belong to multiple systems. Interactions between binary stars may change the evolutionary track of a star, creating atypical stars like Blue Stragglers and explaining the existence of EHB stars. Using evolutionary population synthesis models including binary star evolutionary tracks from Hurley et al., we compute a series of isochrones which include these atypical stars. We derive the integrated spectral energy distributions and the colors corresponding to these populations. By comparison with a pure single star population we derive the trends introduced by the presence of interacting binary stars in the spectral and color evolution. We conclude that it is important to consider binary interactions in evolutionary synthesis models.

Chemical evolution model of M33 **I-10**

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Spiral galaxies present chemical gradients, with these it is possible to follow chemical abundance evolution and its radial distribution. The study of these gradients is done by means of chemical evolution models (CEM). The CEM are capable of reconstructing the history of the chemical composition of the gas contained in the galaxies, by processes of formation of galaxies (galactic accretion and loss of material to the intergalactic medium), and stellar formation by supposing the efficiency of the stars at forming chemical elements by nucleosynthesis processes. The spectral evolution models (SEM) reproduce the photometric history of the galaxy based

principally on the history of stellar formation. Both models complement and promote each other, so the utilization of them in parallel converges to a solid inference of the evolution of a galaxy. To obtain a reliable history of M33 we used the chemical evolution code CHEVO (Carigi, 1994) and a version of the stellar populations code of Bruzual & Charlot (2003), which intrinsically follows the chemical evolution of the stellar populations, and a scenario of the galactic formation of M33 according to cosmological models. In this way we reproduce the majority of the M33 observables.

Global properties of superclusters of galaxies **I-11**

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Galaxies are not randomly distributed in the Universe, forming clusters and superclusters of galaxies. Superclusters are considered the largest, non-relaxed structures observed and their properties represent an important constraint on cosmology, and the formation and evolution of galaxies. In order to evaluate the supercluster properties, we used a volume-limited sample ($M_r < -21 + 5 \log h$), extracted from the SDSS/DR7 and mock catalogues based on a semi-analytical model of galaxy evolution. The density field method was applied to our sample to identify superclusters, taking into account selection and boundary effects. In order to evaluate the influence of the threshold density, we have chosen two thresholds: the first maximizes the number of objects, and the second constrains the maximum supercluster size to 120 Mpc h^{-1}. A morphological analysis, based on the Minkowski Functionals, classified superclusters as filaments or pancakes. We noticed that filamentary structures tend to be richer, larger and more luminous than pancakes in observed and mock catalogues. Comparing superclusters in the velocity and position spaces, we concluded that our morphological classification is not biased by the peculiar velocities. Our analysis also indicates that filaments and pancakes present different luminosity and size distributions.

Planetary nebulae in NGC 300: the PNLF **I-12**

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From [O III]5007 on-band off-band imaging obtained with FORS2 at the VLT, Paranal, Chile, in two zones on NGC 300 (center and outskirts), more than a hundred PNe

candidates have been detected. Instrumental magnitudes for these objects were calibrated using results from follow-up spectroscopy of some objects. The PNLFs were computed. The distance modulus with this method is 26.49 ± 0.20 mag, in close agreement with distances derived from Cepheids and other methods.

High-redshift galaxies and Lyman alpha emitters through gravitational lensing **I-13**

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The technique and some preliminary results on the study of the luminosity function of Lyman alpha emitters (LAEs) through gravitational lensing are presented. Clusters of galaxies with suitably modelled gravitational lenses are observed using the tunable filters (TF) of the instrument OSIRIS at the GTC. The combination of these natural gravitational telescopes, and the higher contrast achievable by the TF, will allow the detection of very faint LAEs, not only reaching a step forward in understanding these primordial objects, but also achieving a better determination of the mass distribution in the inner regions of galaxy clusters.

MIR and hard X-ray luminosities, silicate features and SFR in AGNs **I-14**

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We combined *Spitzer* data with X-ray data from the literature in order to investigate the X-ray–IR connection for AGNs. The sample consists of 160 sources. We studied the correlation between the mid-IR (MIR) and absorption-corrected hard X-ray luminosities. A high correlation is found between the rest-frame 6.7μm ($L_{\rm MIR}$) and 2–10 keV ($L_{\rm X}$) luminosities, following the non-linear relation $\lambda L_{\lambda}(6.7\mu{\rm m}) \propto L_{\rm X}^{0.82}$. We found that type 1 and type 2 AGNs have the same distribution of $L_{\rm X}$ over $L_{\rm MIR}$, which is in agreement with the idea of clumpy torus. However, the dust-covering factor measured by the ratio of dust torus luminosity to X-ray luminosity does not show a correlation with $L_{\rm X}$. We also found the 9.7μm silicate strength correlates with the intrinsic column density $N_{\rm H}$, estimated from X-ray data, which is consistent with the unified scheme. The 7.7μm polycyclic aromatic hydrocarbon (PAH) emission feature, expected from starburst activity, was used to estimate the star-formation rate (SFR). A relationship is seen between SFR and X-ray luminosity: more luminous

AGNs have large SFRs. The dust-covering factor shows a trend to increase with the SFR. Finally, no correlation was found between X-ray absorption and SFRs nor between silicate strength with SFRs.

Effect of young populations in parameter recovery from galaxy spectrum **I-15**

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We present a new inverse population synthesis method called DINBAS3D in order to robustly recover the star-formation history from the spectrum of a galaxy. To do this, we investigate the use of a dynamic base of synthetic spectra, which has the ability to adapt to the particularities of each galaxy, obtaining in this way a simple but robust solution to the problem of extracting the star-formation history from spectra. We applied the algorithm to a sample of synthetic spectra that emulates observed spectra with known characteristics so we can thus validate the method we have developed. From the analysis of the results, we conclude that the presence of young populations in galaxies affects the recoverability of parameters such as the star-formation history.

The luminosity function for radio sources in the HDFS **I-16**

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Using the available UBVRIz optical data of the 0.32 deg^2 Extended *Hubble* Deep Field-South (EHDF-S), which is one of the four fields comprising the MUSYC survey, in addition to optical images of the same field taken with the Wide Field Imager camera on the 2.2 m telescope at La Silla Observatory in 12 medium band filters, we have explored and measured photometric redshifts using a program dubbed EAZY. Once the reliability in redshift measurements is quite accurate, we construct the luminosity function in this survey field for a complete radio-source database up to $z \sim 1$. This is accomplished using a well-known sample of 2.5–8.7 GHz radio sources observed in the *Hubble* Deep Field-South Region (see Huynh et al. 2007).

Modeling the gravitational recoil in the M83 center **I-17**

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Observations indicate that the radio quasar J133658.3–295105, previously supposed to be at $z \geq 1$, is in the nearby Universe and is on a suggestive alignement with the optical nucleus of the M83 spiral galaxy and other radio sources. We propose that it is a by-product of a gravitational recoil produced by the merger of 2 or 3 super-massive black holes (BHs) in the nucleus of the galaxy. We present numerical simulations of collisions of binary and triple BHs in the third-and-half Post-Newtonian order in order to study the gravitational recoil in the central region of M83. We show that the scenario with three BHs is more appropriate than one with two BHs to reproduce the ejection of J133658.3–295105 and simultaneous cause the displacement of the optical nucleus with respect to the kinematic center of the galaxy.

Properties of bars in spiral galaxies from COSMOS **I-18**

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In order to detect the existence and the frequency, as well as the properties of bars at high redshift ($z \sim 0.8$) galaxies, we made an analysis of a sample of spiral galaxies (*I*-band images) obtained from the *HST*-COSMOS survey. COSMOS is an astronomical survey designed to probe the formation and evolution of galaxies as a function of redshift, and of the large-scale structure environment. The images we used were obtained with the ACS (Advanced Camera of Surveys) on the *Hubble Space Telescope*. The scale of the ACS is $0.05''$ pix^{-1}, and the galaxies studied are between 3 and 4 arcsec in diameter, which, combined with the scale, makes it possible to detect spirals and bars. The images we obtained were previously classified as barred from the *HST*-COSMOS (Cosmic Evolution Survey) by visual inspection. The analysis was made with the galaxies projected on the sky and deprojected. We deprojected the images by calculating position and inclination angles from ellipse-fitting analysis. We divided the sample in SB, SAB and SA in order to classify the strong bars. In order to have a second classification for the galaxies, we analyzed the radial profiles of ellipse fitting and detect the bars according to Marinova & Jogee (2007) . So far, we have found the fraction of bars for SB galaxies $\sim$ 48.5% and for the total SB+SAB $f_{\rm bar} \sim$ 77% at $z < 0.8$. This result is in good agreement with Shet et al. (2008) who found $f_{\rm bar} \sim$ 65% and 30% for SB galaxies. Nevertheless, our analysis is more detailed than his, and we are still refining our classification.

High energy astrophysics (including cosmic rays)

Long-term optical variability properties of a sample of gamma-ray-loud blazars **I-19**

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Optical photometric variability in the R-band for a sample of gamma-ray-loud blazars selected from the GASP-WEBT list is reported. The observations were carried out with the 84 cm telescope and the POLIMA instrument at SPM Observatory as part of the Optical Polarimetric Monitoring project on Blazars (see http://www.lsw.uni-heidelberg.de/users/jheidt/spm/spm.html). Data were obtained in periods of 7 consecutive dark-moon nights per month. In this work, general light curves obtained from November 17 2007 up to November 18 2009 (UT) for the sample sources are presented. Relevant variability behavior pre- and post-outburst on some blazars will be discussed in relation to their more general multiwavelength properties.

Analysis of the spectral energy distribution from a runaway-star bowshock **I-20**

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We have detected, for the first time, evidence of non-thermal radio emission from a stellar bowshock related to the O4 I runaway supergiant BD+43 3654. First results have been published in the form of a spectral index map, with thermal and non-thermal emission regions identified. We present here the complementary analysis

in which we take into account the different processes of energy gains and losses, to estimate the spectral luminosity distribution. We discuss whether a bowshock could produce enough high-energy emission to be detected with instruments like *Fermi* or the future Cherenkov Telescope Array (CTA), and which conditions must be fulfilled in order to achieve detection.

Interstellar medium

Searching for heavily obscured post-AGB stars and planetary nebulae: II. near-IR observations of *IRAS* candidates **I-21**

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Asymmetric planetary nebulae (PNe) are believed to be the descendants of intermediate-mass stars with initial masses at the top of the range. As these stars reach the asymptotic giant branch (AGB), they are expected to evolve into heavily obscured post-AGB stars and PNe. We have obtained near-IR *JHK* images for 164 presumably obscured *IRAS* post-AGB and PN candidates and used them, in conjunction with DSS, 2MASS, *Spitzer* GLIMPSE, *MSX*, *AKARI*, and *IRAS* archival data, to search for their optical, near-IR and mid-IR counterparts. The IR spectral properties of the sources in the wavelength range from 1μm to 100μm have been investigated using their IR spectral energy distributions (SEDs) and appropriate color-color diagrams. Sources that were found to be resolved in near-IR *JHK* images have been studied in greater detail, including the acquisition of near-IR narrow-band Brγ, H_2, and *K* continuum images for 7 of these sources.

Mapping and spectroscopy of planetary nebulae in the mid-infrared **I-22**

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We present 3.6, 4.5, 5.8 and 8.0 micron photometric mapping of Galactic planetary nebulae, based on observations taken with the *Spitzer Space Telescope* 3D program. These are shown to have morphologies which are sometimes quite different from those observed in the visible, with much of the emission arising outside the ionized shells. There is also evidence for a change in nebular sizes between the differing photometric bands.

On the dimensions of high velocity clouds (HVCs) at large Galactic latitude **I-23**

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The equilibrium resulting in a recombining plasma with arbitrary metallicity Z, and heated by a mean radiation field E as well as by dissipation of sound waves due to thermal conduction, dynamic and bulk viscosity is analyzed. In particular, for characteristic values at large Galactic latitude and in the halos of other galaxies, i.e. $0.03 \lesssim Z \lesssim 0.3$ ($Z_\odot = 1$) and $0.3 \lesssim E \lesssim 2$ keV, equilibrium states may exist for ϵk smaller than a threshold value $(\epsilon k)_{\rm thr}$ (which depends on the exact values of Z and E assumed) where ϵ is the amplitude of sound waves with wave number k. For $\epsilon k > (\epsilon k)_{\rm thr}$ equilibrium states cannot exist. Therefore, the hydrogen gas in high velocity clouds (HVCs) can be in thermochemical equilibrium as long as the HVCs have dimensions $l > l_{\rm thr}$ where $l_{\rm thr} \approx 0.5$ pc for the above range of values of metallicity and mean photon energy. Additionally, depending on the particular values of Z and E, temperature gaps appear where the equilibrium cannot exist.

Stellar formation activity in the H II region NGC 3503 **I-24**

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The evolution of H II regions strongly affects the structure and dynamics of the surrounding gas, and may induce the formation of new stars. In this work, we analyze the H II region NGC 3503 with the aim of exploring the possible presence of star-formation activity in their environment. To carry out this study, a multiwavelength analysis was made. Nanten data of ^{12}CO(1–0) at 115 GHz was used in order to analyze the molecular clouds linked to the H II region. These observations were combined with mid-infrared *MSX* and SuperCOSMOS Hα emission-line images. Complementary NIR infrared photometric data, obtained from the 2MASS Point Source Catalogue were used to address the star-formation activity of the region.

Physical properties of interstellar atomic dense structures from turbulent simulations **I-25**

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We present a detailed study of the physical properties of dense structures resulting from turbulent numerical simulations. Our simulations are high resolution 2D models of the atomic interstellar gas at 100 pc, including thermal instability and a random turbulent driving at a fixed scale and different Mach numbers. For each simulation we study the evolution of arbitrarily chosen individual condensations focusing on physical mechanisms influencing each phase of their evolution. We also compare the resulting trends for size, density, pressure, dynamical properties, and lifetime, trying to find a relationship between these trends and the intensity of turbulence measured by the Mach number.

Estudio de la dinámica del gas ionizado en regiones H II gigantes en NGC 6822 **I-26**

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Presentamos los resultados preliminares de un estudio de la cinemática del gas en regiones H II gigantes ubicadas en la galaxia NGC 6822. Este investigación fue llevada a cabo en el telescopio William Herschel, en Islas Canarias, empleando la técnica de espectroscopia de rendija larga.

Kinematical study of the planetary nebula NGC 6058 **I-27**

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We present [O III]λ5007 and Hα images and high-resolution, long-slit spectra of the planetary nebula (PN) NGC 6058. Our data, taken at the San Pedro Mártir Observatory (OAN-SPM), show that NGC 6058 is a multipolar PN with a size of approximately 45 arcsec in diameter. This object is composed of four different axisymmetrical and concentric outflows. A system of four expanding ellipsoids, with different spatial orientations, accounts for most of the observed spatiokinematical properties of the nebula. We have used the software SHAPE to obtain equatorial

and polar velocities, and kinematical ages of the four outflow systems observed in NGC 6058. We conclude that NGC 6058 is probably an advanced stage of a "starfish" PN.

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ANNEB: A nebular analysis software **I-28**

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When studying an ionized nebula, a large number of simple calculations are involved in order to derive physical quantities and chemical abundances. This can be a nuisance when a large group of objects are being studied or when the effect of variation of a given set of parameters (extinction law, $c(H\beta)$) on physical quantities (T_e, N_e) and chemical abundances is analyzed. ANNEB is a software intended to derive physical conditions and chemical abundances of a given ionized nebula in an efficient and simple manner. This allows the user to repeatedly calculate a whole set of physical and chemical parameters in a few seconds and with a number of alternative input parameters. The program estimates uncertainties for every derived quantity by proper propagation of emission-line flux errors. To derive physical conditions and ionic abundances, ANNEB invokes the IRAF/NEBULAR packages. Elemental abundances are obtained using the ICFs derived by Kingsburgh & Barlow (1995), but other empirical or theoretical ICFs can be readily implemented. Several line ratios are also calculated in order to obtain diagnostic diagrams. ANNEB was written entirely in AWK language and can be run on any UNIX/LINUX operating system, provided that IRAF/STSDAS is installed. The code and manual are freely distributed by the authors.

LO is in grateful receipt of a CONACYT postdoctoral scholarship. This project was supported in part by grant PAPIIT-UNAM IN109509.

Determinación de velocidades radiales de nebulosas planetarias galácticas con núcleos [WC] y análisis de su comportamiento **I-29**

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A partir de espectros de alta resolución, obtenidos con los espectrógrafos "echelle"

del OAN, San Pedro Mártir, B.C., y MIKE del telescopio Magallanes, Observatorio de Las Campanas, Chile, se determinan velocidades radiales precisas de un conjunto amplio de nebulosas planetarias con estrella central del tipo [WC] (WRPNe). Estos datos se utilizarán para analizar el comportamiento cinemático de estos objetos en la Galaxia, en comparación al comportamiento de nebulosas planetarias con estrella central normal. Se intenta determinar si las WRPNe pertenecen, en particular, a la población más masiva de nebulosas planetarias.

Shape 2010 **I-30**

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Shape has been a publication-proven, 3D, morpho-kinematic modeling software for over a decade. The release version of 2010 incorporates a wealth of new features, most notably a quick 3D radiation-transfer engine that can solve a variety of problems, including scattering by dust in planetary nebulae. This poster shows a summary of the current development status with emphasis on planetary nebula applications.

Stars, stellar systems, and star formation

Study of apsidal motion in massive close binary systems **I-31**

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In O+OB close binary systems, a secular motion of the apsides arises from orbital perturbations due to superior order momenta of the gravitational classical potential and general relativity effects. This phenomenon, and theoretical stellar structure models, can be used to estimate absolute masses of the system components, even for non-eclipsing binaries. This project aims to establish the feasibility of this mass-determination method in all the massive close binary stars for which it could be applied. In this work, we briefly describe the selection criteria of the systems we are studying, the sampling status of their radial velocity curves, the adopted procedures for spectroscopic data reduction, and a few preliminary results.

The IIM stabilised with a cubic spline model for the source function **I-32**

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The Integral Implicit Method (IIM) was developed to solve radiative transfer (RT) problems like those which appear in stellar atmospheres model computations. To take into account all possible opacities, "lines and continua", which must intervene in the determination of physical conditions of the different atmospheric regions, we need a very large interval of optical depths. For example, for Sun-like stars fifteen decades in Rosseland mean optical depth are necessary to cover the range from the region where the most transparent frequencies in the visible are formed to the region where the core of Lyα is formed. This necessity invalidates the other

methods to solve RT problems either by the very great dimension of the necessary matrix to represent the whole system in the integral methods (a matrix whose inversion becomes almost impossible) or because the Forward Elimination and Back Substitution (FEBS) methods, like the Feautrier one, are based on the numerical representation of the second derivative operator at each point as a function of the optical distance to the neighbouring points; these distances are very small in the surface regions and, consequently, the coefficients of the second derivative operator become very great and therefore the whole process is destabilised. The IIM overcomes the aforesaid difficulties but the first (actual) approaches also have some small problems: low precision when a linear piece-wise model for the source function is used, typical instabilities when we use a parabolic piece-wise model and numerical problems, now in the data, because the depth derivative of the thermal sources is necessary when we use a cubic piece-wise model. To avoid these difficulties, we now propose a cubic spline model, which assures the continuity of the source function and that of the first and second derivatives. In some ways this model represents a regularization of the process that allows us to have the values of the source function.

Modelos numéricos de chorros astrofísicos variables **I-33**

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Las estrellas jóvenes eyectan chorros de gas colimado con dimensiones de varios años luz. Estas emanaciones muestran una serie de nudos alineados, debidos a la variabilidad temporal en la velocidad (supersónica) con la que son eyectados. Se han hecho estudios teóricos en los cuales se calcula el flujo que resulta de una eyección que suponen una variabilidad temporal "sinusoidal" o "cuadrada" de la velocidad de eyección. En nuestro trabajo, estudiamos familias paramétricas de funciones de eyección con distintas formas, y las usamos para calcular la evolución temporal de los chorros resultantes, obteniendo modelos que pueden usarse para el cálculo de predicciones de emisión de chorros de estrellas jóvenes.

Análisis de fuerzas de marea en sistemas binarios asíncronos: efectos en rayos X **I-34**

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Encontramos una correlación lineal entre la luminosidad en rayos-X de una muestra

de sistemas binarios, tomados del catálogo de Berghoeffer et al., con la tasa de disipación de energía proveniente de los flujos superficiales inducidos por las fuerzas de marea en sistemas binarios asíncronos. Esta correlación sugiere que en los sistemas binarios con rotación asíncrona se genera un mecanismo de producción de rayos X.

Diffracto-astrometry: the technique and preliminary results **I-35**

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Following the study of internal movements in Trapezium-type systems, we decided to investigate the possibility of performing precision astrometry on saturated *Hubble Space Telescope* (*HST*) images. A region widely observed by the *HST* is that of the Orion Trapezium. The *HST* archive contains public domain observations of this Trapezium obtained with the WFPC/WFPC2 during a 18 year time interval (1991–2009). Applying the new Diffracto-Astrometry Technique we have determined the separation between components A and E of the Orion Trapezium with a precision reaching down to $0.03''$. We find an average separation between these components of $4.54 \pm 0.05''$ and a position angle of 354°. Using historical data and our own measurements we determine a separation tendency of 3.5 mas yr^{-1}, which corresponds to a transversal separation speed of 6.9 ± 1.0 km s^{-1}. We assert that the E component is escaping from the Trapezium, since this velocity is superior to the escape velocity. This technique appears to be very promising for exploiting, not only the important *HST* public image data base but also images obtained at telescopes using Adaptive Optics techniques.

Exploring the internal rotation of GW Vir stars through asteroseismology **I-36**

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Stellar rotation breaks the spherical symmetry of a star, and in the case of a pulsating star, it removes the intrinsic mode degeneracy of a nonradial g-mode characterized by an harmonic degree ℓ and a radial order k. As a result, each pulsation frequency is split into multiplets of $2\ell + 1$ frequencies specified by different values of the azimuthal index m, with $m = 0, \pm 1, \ldots, \pm\ell$. We explore the potential of asteroseismology to place constraints on the internal rotation of GW Vir variable stars. We employ

dedicated seismological models for the pulsating PG1159 stars PG 0122+200, PG 1159–035, and RX J2117+3412 in order to assess the expected frequency splittings induced by rotation, and compare them with the observed ones. To this end, we assume different types of plausible internal rotation profiles.

SPM4: The Yale/San-Juan Southern Proper Motion Survey: 100 million absolute proper motions **I-37**

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The Yale/San Juan Southern Proper Motion SPM4 Catalog is the culmination of a highly successful 47-year collaboration between the National University of San Juan (UNSJ) and the Yale Southern Observatory (YSO). The SPM4 Catalog contains absolute proper motions, celestial coordinates, blue and visual passband photometry for 103,319,647 stars and galaxies between the south celestial pole and -20 degrees declination. The Catalog is roughly complete to $V = 17.5$ and the precision of its positions and absolute proper motions is approximately 30 to 150 mas and 2 to 10 mas yr^{-1}, respectively. It is based on photographic and CCD observations taken with the Yale Southern Observatory's double-astrograph at the Cesco Observatory in El Leoncito, Argentina.

Mixing of young and older stellar clusters in the Canis Major R1 galactic star-forming region **I-38**

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The Canis Major R1 star-forming region (CMa R1) includes the arc-shaped ionized nebula S2-296, suggested to be an old supernova remnant, as well as several very young (< 5 Myr) clusters. We have studied the history of star formation in CMa R1 by using X-ray data, complemented by optical and near-IR data. Based on *ROSAT* observations we have discovered, near to GU CMa, a stellar cluster that is older, by at least a few Myr, than the previously known cluster, around Z CMa, where star formation is very active. Also, the GU CMa cluster is away from any molecular cloud, implying that star formation must have ceased. We suggest that the CMa R1 region has undergone at least two distinct star-formation episodes. Only the current star-formation activity around Z CMa seems related to the S2–296 nebula and possibly

triggered by it. A multi-wavelength study has been developed by us in in the area between Z CMa and GU CMa to confirm the existence of a mixed population from both older and young clusters around S2–296, corresponding respectively to a fossil, and to an ongoing star-formation episode. In the present work, we show the results based on near-IR data. Colour-magnitude diagrams are used in conjunction with pre-main-sequence evolutionary tracks to derive masses and ages of the counterparts of X-ray sources.

Compact radio sources in the vicinity of the ultracompact H II region G78.4+2.6 **I-39**

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We present radio continuum observations at 3.6 cm toward the ultracompact (UC) H II region G78.4+2.6. Four new compact radio sources were identify in the vicinity of the UC H II region. One of them clearly shows evidence of radio variability on a timescale of hours. The four compact radio sources seem to have near-infrared counterparts. In addition, we detected another group of five radio sources which appear located about 3′ to the NW of the cometary H II region G78.4+2.6. Some of them exhibit the presence of extended emission.

Gas and dust in the inner region of protoplanetary disks **I-40**

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A large fraction of T Tauri and Herbig Ae/Be stars shows evidence of being surrounded by circumstellar disks. The external regions of these disks, where the opacity is controlled by dust, have been studied for several decades, by combining observations and models. The more complex inner disk has only been studied during the last 10 years, when the inner rim has been resolved using infrared interferometry and its contribution to the Spectral Energy Distribution has been quantified and, also, different gas tracers of the inner disk atmosphere have been observed and analyzed. In this contribution, we present preliminary results of models of the inner gaseous regions of irradiated accretion disks, from the magnetospheric radius to the dust sublimation radius, using up-to-date LTE molecular and atomic opacities.

Difracto astrometría del Trapecio de Orión **I-41**

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Se pretende determinar la cinemática relativa de las componentes del Trapecio de Orión en base a difracto astrometría de precisión. Esta nueva técnica desarrollada por nosotros hace uso de las características particulares presentes en imágenes saturadas del archivo público del *HST*/WFPC2 obtenidas de 1991 a 2007.

Classification of cluster and Galactic field CP stars **I-42**

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The main characteristics of the so-called classical chemically peculiar (CP) stars of the upper main sequence are: peculiar and often variable spectral lines, quadrature of line variability with radial velocity changes, photometric variability with the same periodicity and sometimes coincidence of extrema. Elemental overabundances of several orders of magnitude compared to the Sun are derived for silicon, iron, chromium, strontium and europium. For several decades, much photometric work was performed to find bona-fide CP stars, for example via Delta-a photometry. But for a further analysis of these objects, at least spectral classifications are needed. We present detailed results of classification resolution spectroscopy for 35 CP star candidates in the Galactic field and open clusters. All but two are true CP stars. We discuss the cluster membership, astrophysical parameters and previously published data for these objects.

Fotometría $uvby-\beta$ de los cúmulos abiertos NGC 1647 y NGC 1778 **I-43**

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Se presenta fotometría $uvby-\beta$ de 35 estrellas en la dirección del cúmulo abierto NGC 1647 y 16 estrellas del cúmulo NGC 1778. Del análisis de los datos obtenidos para NGC 1647 se ha determinado un enrojecimiento $E(b-y) = 0.32 \pm 0.02$ mag y un módulo de distancia de $V_0 - M_V = 8.75 \pm 0.09$ correspondiente a una distancia $d = 564 \pm 106$ pc; asimismo, se han encontrado las estrellas miembros y se ha determinado un valor numérico para la edad del cúmulo de log(edad en años) =

7.98 ± 0.23. A partir del análisis de los datos obtenidos para NGC 1778, se concluyó que no es posible determinar si hay un cúmulo en esa dirección, pues las distancias encontradas para las estrellas observadas son muy diferentes.

Determination of kinematic distances of pre-main-sequence stars in Lupus **I-44**

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The problem of the determination of distances has always played a central rôle in astronomy. How- ever, little recent progress has been made in the distance determination of faint young stellar objects such as pre-main-sequence stars. Many of these stars were neither observed by the *Hipparcos* satellite due to their magnitude nor have any trigonometric parallax measured from the ground due to their distance. A precise determination of distances is required to accurately determine the main physical parameters of stars (luminosity, temperature, mass and age) and to trace the evolutionary tracks of young stars. The procedure that we use here to derive individual parallaxes is based on the convergent point strategy which makes full use of the directly observed data: position, proper motion and radial velocity. The members of a moving group, which share the same space motion, allow us to obtain the convergent point from which, considering that the radial velocity is known, we can determine the kinematic distance. Our sample consists of 205 pre-main-sequence stars spread over the Lupus star-forming region. Individual distances for each moving group member have been calculated and compared with previous published results in the literature.

Observaciones de las líneas H110α y C110α hechas con el VLA hacia GGD14 **I-45**

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Se realizaron observaciones de las líneas de recombinación en radio frecuencias (H110α y C110α) utilizando el Very Large Array (VLA) en la región H II asociada a la región de formación estelar masiva GGD14. Este objeto, con una luminosidad estimada de $10,000 L_{\odot}$, se haya embebido en la nube molecular de Monoceros situada a una distancia de 1 kpc. Los datos obtenidos con el VLA fueron calibrados

y analizados por medio del software AIPS. En este trabajo se presentan resultados preliminares de la dinámica del gas ionizado y fotodisociado asociado a la región GGD14.

Búsqueda de grupos en movimiento utilizando parámetros astrométricos **I-46**

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Se denomina "moving group" a un conjunto de estrellas que se encuentran en la misma región del cielo con características cinemáticas similares. Descubiertos a fines del siglo XIX, fueron estudiados a fin del siglo XX aplicando diversos métodos a los datos del catálogo *Hipparcos* para identificarlos entre las estrellas del campo, combinando la posición, la velocidad radial y la paralaje. El presente trabajo explora un método novedoso para detectar esta clase de objetos considerando sólo la posición y el movimiento propio, despojándose de la limitación de la paralaje. Aplicando un sistema binario, se analizan: (a) regiones de sobredensidad en los movimientos propios y (b) regiones de sobredensidad espacial simultánea con una sobredensidad en los movimientos propios. Se aplica el método a la región del cúmulo abierto IC 2602 y analizan los resultados.

The Vista Variables in the Vía Láctea light-curve templates project **I-47**

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The Vista Variables in the Vía Láctea (VVV) ESO Public Survey, with its awarded 1929 h of observing time on VISTA, will provide an unprecedented look into the Milky Way bulge and part of the disk. In particular, it will provide light curves for $\sim 10^9$ point sources covering a sky area of 520 deg^2, which includes 33 known globular clusters and $\sim$ 350 open clusters (Minniti et al. 2010, NewA, 15, 433). In order to properly classify the $\sim 10^6$ variable stars that will be detected by the VVV survey, an automated classification scheme is currently being developed. This requires high-quality, well-sampled template light curves for the many different types of variable stars that should be present in the surveyed fields. Since the VVV's main variability survey will be conducted in the near-IR (K band), such template light curves are unfortunately largely not available. Here we describe the status of our ongoing effort towards building such a database of high-quality, near-IR

light curves – the VVV templates database. This work is supported by ICM grant P07-021-F and by Fondecyt grant 3100029.

Line-depth indices and atmospheric parameters of Solar-like stars in M67 **I-48**

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We present a progress report on the determination of the leading atmospheric parameters of an extended sample of Solar analogs (about 1200 objects of types G0–G3 V) in the northern hemisphere. We demonstrate the capabilities of diagnostic diagrams of theoretical line-depth indices in the determination of effective temperature and surface gravity. The diagrams were constructed after analyzing all possible index-index combinations of a variety of spectral features in the wavelength region 3800–4700 Angstroms, observed at a moderate spectral resolution (FWHM 2.5Å). Aimed at validating the proposed technique, we applied the diagnostic diagrams to a selected sample of stars of M67 and found that, under the assumption of Solar chemical composition, we obtain a set of atmospheric parameters compatible with those determined from high-resolution studies. The next step is to include a third dimension (chemical composition) in the diagrams, apply the method to the full sample, and determine a fiducial set of planet search targets.

BL Cam – spectroscopic observations of this SX Phe star **I-49**

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BL Cam is an SX Phe star observed in an intense photometric campaign during 2007 and 2008. During February and September 2008, within the framework of the campaign, we made spectroscopic observations of this interesting object. We covered the range 4000 to 5300 Å in February and 3500 to 7000 Å in September 2008. The spectra of the star shows mostly hydrogen lines and the equivalent widths of these lines vary with the same 56 min photometrical period. Part of the photometrical campaign was devoted to observing the star with Stromgren narrow $uvby - \beta$ filters. We report an interesting Hβ behavior of the star.

BL Cam es una estrella tipo SX Phe y fue intensamente observada en una campaña internacional de fotometría en los años 2007 y 2008. Además de participar

en esta campaña, hicimos mediciones espectroscópicas de la estrella en febrero (4000 a 5300 Å) y septiembre del 2008 (3500 a 7000 Å). El espectro de esta estrella muestra sólamente líneas de hidrógeno y nuestros resultados muestran que el ancho equivalente de estas líneas espectrales varía con el mismo período fotométrico de 56 min. También hicimos fotometría con los filtros $uvby - \beta$ del sistema Stromgren, encontrando que la línea Hβ muestra un interesante comportamiento variable. Reportamos este resultado.

Proyecto BOCCE (*Bologna Open Cluster Chemical Evolution*): una gran muestra homogénea de cúmulos abiertos galácticos **I-50**

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El proyecto denominado "Bologna Open Cluster Chemical Evolution" (BOCCE) es un '*survey*' fotométrico y espectroscópico de cúmulos abiertos pertenecientes a nuestra Galaxia, que será utilizado como trazador de las propiedades y de la evolución del disco galáctico. Los parámetros fisicos de los cúmulos abiertos seleccionados, tales como distancia, edad, enrojecimiento, metalicidad y abundancia química detallada, son derivados de manera precisa y homogénea. Estos parámetros serán usados por ejemplo, para determinar la distribución de metalicidad en el disco galáctico y cómo evolucionó con el tiempo. Actualmente contamos con datos fotométricos para una muestra de 40 cúmulos abiertos. Acá presentamos nuestro ultimo avance, relativo a los datos fotométricos obtenidos para NGC 2849.

The "Bologna Open Cluster Chemical Evolution" (BOCCE) project is a photometric and spectroscopic survey of Galactic open clusters, to be used as tracers of the Galactic disk properties and evolution. The clusters parameters, such as age, distance, reddening, metallicity and detailed abundances, are derived in a precise and homogeneous way. These parameters will be used, for instance, to determine the metallicity distribution in the Galactic disk and how it has evolved with time. We have presently data for 40 open clusters. We present here our last effort, concerning the photometric data obtained for NGC 2849.

Espectros integrados EFOS2C/NTT de 9 cúmulos estelares pertenecientes a las Nubes de Magallanes **I-51**

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Presentamos espectros integrados obtenidos con el espectrógrafo EFOSC2 ubicado

en el NTT (ESO, La Silla, Chile) de 9 cúmulos estelares de pequeño diámetro angular de las Nubes de Magallanes, 5 de la Nube Mayor y 4 de la Nube Menor. Usando estos espectros determinamos enrojecimientos y edades de los 9 cúmulos. Estos espectros serán de gran utilidad para actualizar las bases de espectros patrones (o templates) que existen hoy en día.

Primer análisis fotométrico de 6 candidatos a cúmulos abiertos galácticos **I-52**

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Presentamos observaciones CCD *UBVI(KC)* de estrellas ubicadas en regiones de $13.6' \times 13.6'$ en dirección a los agregados Haffner 3, Haffner 5, NGC 2368, Haffner 25, Hogg 3 y Hogg 4, ninguno de los cuales registra estudios fotométricos previos. Estos objetos aparecen clasificados como cúmulos abiertos (CAs) en varios trabajos de catalogación. Nuestro análisis, sin embargo, demuestra que ninguno de ellos es un cúmulo genuino ya que no se distingue en sus respectivos diagramas color-magnitud (CM) y color-color (CC) secuencia principal (SP) alguna u otra característica significativa. Las secuencias visibles en estos diagramas están formadas por la superposición de estrellas del campo de la SP afectadas por distintos enrojecimientos y/o ubicadas a diferentes distancias del Sol. Descartamos la posibilidad de que la presencia de enrojecimiento diferencial pueda estar escondiendo las características de CAs reales, ya que el polvo en las direcciones examinadas está distribuido uniformemente. Examinamos la posible naturaleza física de los objetos seleccionados a partir de recuentos estelares realizados dentro y fuera del campo de los 6 candidatos a CAs. Encontramos que no existe un contraste importante entre las densidades de estrellas en los campos de los candidatos respecto del disco galáctico y que los objetos no parecen tampoco encontrarse en etapas tardías de su evolución dinámica. Los resultados obtenidos permiten sospechar que otros agregados de la Vía Láctea pueden haber sido también incorrectamente catalogados como CAs.

Un nuevo sistema doble de cúmulos abiertos en la Vía Láctea **I-53**

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Presentamos imágenes CCD *UBVI(KC)* obtenidas en Cerro Tololo (Chile) de Hogg 12 y NGC 3590, dos cúmulos abiertos (CAs) ubicados muy próximos en el cielo en la

región de Carina. Basados en criterios fotométricos, morfológicos y de densidad estelar, constatamos que Hogg 12 es un cúmulo abierto (CA) genuino —no una fluctuación estelar del campo en la región como ha sido aceptado hasta ahora— ubicado a $\sim$ 2 kpc del Sol, cuya edad es muy similar a la de NGC 3590 ($\sim$ 30 millones de años). Ambos objetos son sorprendentemente pequeños con radios lineales de $\sim$ 1 pc y están separados por apenas 3.6 pc en el cielo. Estas características, juntamente con sus distancias, enrojecimientos, metalicidades y edades sorprendentemente similares, nos permiten proponer que ambos conforman muy probablemente un nuevo sistema doble de CAs en nuestra Galaxia. De los $\sim$ 180 sistemas dobles de CAs que se estima existen en la Vía Láctea (27 de ellos realmente conocidos), Hogg 12 y NGC 3590 constituyen uno de los dos pares más próximos entre sí.

Planetary systems

Imaging of the dust gap in the transitional disk RXJ1633.9–2242 (Oph Tran 32) I-54

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The infrared spectral energy distributions of circumstellar transitional disks reveal the presence of an optically thin inner region and an optically thick outer disk. As a class they are relatively rare, and only the brightest are suitable for resolving disk structure. Up to now only a few transitional disks have been studied on the scales necessary to resolve the central cavity. We present here Submillimeter Array observations of the continuum emission from the disk around RXJ1633.9–2242, which we previously established as an excellent candidate to harbor forming giant planets as suggested by its low-mass accretion rate, the relatively massive disk ($\sim 11 M_{\rm Jup}$), and the SED morphology. We have also performed radiative transfer modeling of the SED and derived a set of best-fitting properties for the disk. The detected structure, with a cavity of $\sim$ 25 AU in radius, is well described in the context of a close to edge-on disk that contains relatively small dust grains and a sharp decrease in the inner disk emissivity of $\sim 10^{-6}$.

Atmospheric chemistry in a habitable planet with a rich CO_2 atmosphere under the effect of a stellar flare I-55

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The response of planetary atmospheric chemistry to the variation of the ultraviolet (UV) radiation from its star, in cases where the atmosphere contains a high concentration of oxygen, has been studied by Segura et al. (2010, Astrobiology accepted, arXiv:1006.0022v1). However, it is likely that potentially habitable planets around

other stars have an atmosphere with high concentrations of carbon dioxide (CO_2). The objective of this research is to analyze the response of atmospheric chemistry on planets with different concentrations of atmospheric CO_2 and methane (CH_4) and to calculate the ultraviolet (UV) radiation incident on the planetary surface. We used a 1-D photochemical code (Segura et al. 2007 A&A 472, 665), which contains 73 chemical species involved in 359 reactions, and spanned the region from the planetary surface up to 70 km in 1-km steps. We will focus on planets around stars of spectral type M of the main sequence (M dwarfs) because they show intense chromospheric activity that may be detrimental for planetary habitability. We simulated a planetary atmosphere rich in CO_2 subject to changes in UV radiation from its star due to a strong stellar flare. The simulated world is in the habitable zone (HZ) of an M dwarf star. The purpose is determine the chemical changes that occur in the atmosphere due to the variability of UV radiation that can affect the abundance of biosignals such as methane, ammonia, oxygen and other chemical species useful in the detection of life. The results of this work will be particularly useful for planning the *Terrestrial Planet Finder* missions for NASA and *Darwin* of the ESA.

Instrumentation

Measurement of seeing in Bogotá by monitoring the differential movement of images **I-56**

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The search for a suitable site for the location of an observatory in the torrid zone is a task that requires time and many hours of observation. It is of great interest to improve the DIMM technique for the purpose of determining the possibilities of the sky over Bogotá for observation at optical spectral frequencies. We will show how we know the elements involved in the process, using for this purpose the tools found at the National Astronomical Observatory.

A near-infrared spectrometer project design for the *Aster* mission **I-57**

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The *Aster* mission is being planned to use a spacecraft to rendezvous with a near-earth asteroid in 2014. This project uses the expertise of space engineers together with astrophysicists, working on small bodies in the Solar system, who are proposing the near-infrared spectrometer for the *Aster* mission. We present studies and specifications based on scientific needs and previous designs of spacecrafts for asteroid studies, like *Hayabusa* (from JAXA) and *MarcoPolo* (from ESA). It was stipulated that the instrument must cover the spectral bands 0.4–5 micron and 5–20 micron by using two different arrays. These bands are important for determining the asteroid chemical composition (olivine, iron, water, carbon, etc). A cooling system for the sensors is required to achieve a 5 K temperature. The expected spectral resolution can be achieved with 64 channels in a $6' \times 6'$ field of view. The constraints on power, mass and data transfer rate are also discussed.

Construction of an acousto-optical spectrometer for radioastronomy **I-58**

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The acousto-optical spectrometer (AOS) is based on the acousto-optical effect, i.e., the diffraction of light by means of an acoustic wave in some media (acousto-optic cell), where the angle of diffraction is a function of the frequency of the acoustic wave. This AOS consists of five basic modules: laser module, beam expander and collimator, acousto-optical cell, focusing and photo-detector. The material used for the acousto-optic cell is a crystal of tellurium dioxide TeO_2, since its physical properties give the possibility of achieving a theoretical spectral resolution of approximately 16 KHz. In this work, we present the relation between the angle of diffraction and the position of the focused beam in a linear photo-detector and the comparison between the spectrum of an electrical signal, obtained with a spectrum analyzer, and the spectrum obtained with the AOS.

Other

Cálculos de los elementos del movimiento diurno de una estrella utilizando programacion Java **I-59**

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Se utiliza la programación para obtener un software de computadora que automatice labores que antes se hacían manualmente, por esto, se está elaborando una aplicación que optimice la resolución de cálculos para el movimiento diurno de una estrella, haciéndolos mucho más rápidos y de forma más sencilla, debido a que estos se vuelven tediosos al realizarlos de forma manual porque se utilizan algoritmos extensos basados en trigonometría esférica y astronomía de posición. Esos cálculos de los fenómenos astronómicos son herramientas de importancia para muchos astrónomos ya que con estos resultados se puede obtener datos importantes para sus estudios, algunos de esos resultados que se pueden obtener son: la culminación superior e inferior, salida y puesta de cuerpos celestes, paso de un astro por el cenit de un observador y aplicándolos a la navegación astronómica calculando latitud, longitud y azimut astronómicos.

Una propuesta didáctica para el aprendizaje de la Astronomía a través de los cambios paradigmáticos **I-60**

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A lo largo de su recorrido histórico, la Astronomía vivió varios cambios paradigmáticos como por ejemplo salir de la Teoría Geocéntrica para entrar en la Teoría Heliocéntrica. Relatando estos cambios se pueden generar “conexiones didácticas” entre distintas disciplinas de la enseñanza poniendo en evidencia cómo la evolución de los conceptos en una ciencia nace en un determinado contexto social y

cultural con sus descubrimientos e investigación. En este trabajo integraremos la Historia con la Astronomía. La metodología de aprendizaje usada para lograr la inclusión astronómica – histórica será la secuencia didáctica constructivista. Nos parece importante para enseñar Astronomía desde un contexto histórico, enmarcar cuál era la situación política, social, filosófica y religiosa en el momento en que se desarrollan los conocimientos. Aparecerán entonces una serie de problemas en contextos que evocan situaciones de la vida cotidiana. En el marco de utilización de la historia social y de la Astronomía, se trata de interpretar que la evolución del conocimiento científico está relacionada con los cambios de la humanidad. Relacionar los cambios políticos, sociales, culturales, filosóficos y religiosos de un pueblo antiguo, con los primeros pasos de la Astronomía como ciencia. El docente puede pensar en una propuesta didáctica para la enseñanza de la Astronomía apoyándose en los argumentos de la Historia. Desde la Epistemología usaremos el concepto de paradigma de Thomas Kuhn e Imre Lakatos con sus diferencias y críticas a sus modelos, mostrando la secuencia del cambio paradigmático. Como escenas de fusión histórica – Astronómica, elegiremos dos ejemplos de crisis paradigmáticas: el modelo geocéntrico hacia el heliocéntrico y las confrontaciones entre Shapley y Curtis proyectándolo hacia la actualidad: “El Gran debate del siglo XXI: Materia oscura o modificación de la segunda ley de Newton” entre otros.

Poster session II

Cosmology

Baryonic matter at supercluster scales: the case of the Corona Borealis supercluster

II-1

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In a 24 deg^2 survey for baryonic matter at 33 GHz in the Corona Borealis supercluster (CrB-SC) of galaxies ($z = 0.07$), with the Very Small Array (VSA) interferometer (Génova-Santos et al. 2005, Génova-Santos et al. 2008), we found a very strong temperature decrement in the Cosmic Microwave Background (CMB). It has an amplitude of $-230 \pm 23\mu$K and is located near the centre of the supercluster, in a position with no known galaxy clusters,and without a significant X-ray emission in the *ROSAT* All-Sky Survey. Monte-Carlo simulations discard the primordial CMB Gaussian field as a possible explanation for this decrement at a level of 99.6%. We therefore concluded that this could be indicative of a Sunyaev-Zel'dovich (SZ) effect produced either by a warm/hot gas distribution in the intercluster medium or by a farther unknown galaxy cluster.

Here we present an optical and spectroscopic study of the galaxy distribution in this region, aiming at elucidating whether it traces a possible warm/hot gas filamentary distribution or a galaxy cluster. First, we have studied the galaxy population down to $r \leq 20$ magnitudes in the SDSS. This reveals an overdensity by a factor of 2 with respect to nearby control fields, but lower than in the galaxy clusters member of the CrB-SC. This indicates that the associated gas could at least be partially responsible for the observed CMB decrement. Second, we obtained spectroscopic redshifts, using the William Herschel Telescope (WHT) and SDSS-DR7, for a sample of galaxies in the region of the cold spot, and found evidence of a substructure with redshifts extending from 0.07 to 0.10. This suggests the existence of a dense filamentary structure with a length of several tens of Mpc. Finally, we investigated the presence of one farther cluster, at $z \approx 0.11$, in the same line-of-sight and could be responsible of a great part of SZE contrubition.

Cosmological model in metric theories of gravity — astrophysical tests **II-2**

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In this work we present the development of the cosmological model inside a metric theory of gravity. This class of theories is constructed as a generalization of the general theory of relativity (GR), particularly in the form of the action from which the field equations are constructed. In GR the field equations are obtained from an action which is linear in the Ricci scalar and the cosmological constant. In the formalism of the metric theories of gravity, such an action is promoted to an arbitrary function of the Ricci scalar R (this procedure labels these theories as $f(R)$ gravity). The spirit of this formalism is the possibility of studying the dark energy problem as a manifestation of this kind of modification to the sector of curvature in the construction of a fundamental theory of gravity and without requesting the introduction of the cosmological constant or other kind of matter in such scalar fields. We present some astrophysical tests, in the direction of supernovae observations and structure formation, regarding a power law in the function $f(R)$.

Point source contamination in the Sunyaev-Zeldovich observations for the most massive galaxy clusters in the AzTEC Cluster Evolution Survey (ACES) **II-3**

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Galaxy clusters have been proven to be cosmological tracers, since their physical properties (such as mass and temperature) and their evolution (growth rate, cluster surface and volumetric density) are sensitive to the values of cosmological parameters. Traditionally, galaxy clusters are difficult to find at high-redshift ($z > 1$) using optical and X-ray observations; however, Sunyaev-Zeldovich Effect (SZE) observations are mass limited and have the ability to detect these objects at any redshift. Currently, large blind surveys are being conducted by ACT, SPT and *Planck*, which are expected to generate catalogs with hundreds of new galaxy cluster detections. These detections are likely to be contaminated by point sources in the background/foreground, which can bias the mass estimates and hence increase the uncertainty in the cosmological parameter constraints. In this work, we present a collection of massive galaxy clusters observed by AzTEC at the increment of the SZE (270 GHz) with clear evidence of this contamination, and describe how

future AzTEC observations at the Large Millimeter Telescope will be able to split the contribution of the diffuse SZE signal from the contaminating sub-mm galaxy population.

Galaxies (including AGNs)

7 mm emission of SgrA* II-4

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SgrA* is a compact radio source coincident with the position of the supermassive black hole at the center of our Galaxy. It is surrounded by a complex of H II regions, known as SgrA. SgrA* presents variable emission, from radio to X-rays, with timescales that range from hours to months. Interferometric observations at frequencies up to 22 GHz have detected a 106 days quasi-periodicity in the light curves of SgrA*. In our work, we present the result of 43 GHz (7 mm) single dish observations obtained with the Itapetinga radiotelescope, located in Atibaia, Brazil, during several long-lasting campaigns starting in 2006, which aimed to detect variability and verify the existence of periodicity. Using scanning techniques, we were able to separate the contribution of SgrA* from that of SgrA which, together with Sgr B2, were used as instantaneous calibrators. Daily variability was detected, compatible with what was reported at 7 mm using VLBI techniques. The light curve showed the increase of the amplitude of variability with frequency. The expected 106 day periodicity was only obtained after the superposition of 13 cycles, similar to what was found in the 22 GHz VLA observations. It was the first time that the periodicity was detected at 7 mm in single dish observations.

The assembly of early type galaxies from MUSYC: combining luminosity and correlation function measurements II-5

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We present recent results on the evolution of early-type galaxies (ETGs) from $z = 1$ to the present-day using luminosity and correlation function measurements from

MUSYC. The evolution of the number density of bright ETGs, selected so as to have similar passively evolved $z = 0$ luminosities, is seen to increase down to redshifts as low as $z \sim 0.3$, consistent with recent results from models of galaxy formation as well as with previous observational estimates. By taking into account the clustering measurements, which show that ETGs at a given redshift evolve into brighter galaxies at lower redshifts, we make a comparison between the number density of ETGs and their likely descendants at $z = 0$ in the context of a LCDM cosmology. We find that progenitors have higher number densities than their descendants (by a factor of 3 to 10), hinting at a need for mergers. Given that the luminosities of parents are also 3 to 10 times fainter than their descendants, our results show no need for strong star-formation episodes in ETGs since $z = 1$.

Cálculo de las condiciones iniciales para un disco grueso como extensión del algoritmo de Dehnen **II-6**

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El algoritmo de Dehnen es una técnica que se utiliza para producir las condiciones iniciales de un sistema estelar en forma de disco delgado. En este trabajo, se propone un algoritmo para la construcción de un disco grueso, como extensión a la técnica de Dehnen, en el cual se utiliza el método de rechazo. El algoritmo desarrollado puede utilizarse para cualquier función de densidad que describa distribuciones en forma de disco. Nosotros probamos su estabilidad para una tipo Hernquist. Con la técnica desarrollada, es posible generar galaxias espirales como la Vía Láctea, en donde existen 2 componentes de disco, con el fin de desarrollar estudios en fricción dinámica o en formación de sistemas tales como enanas esferoidales y AGNs.

Galaxias sub-mm con altos corrimientos al rojo **II-7**

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Con el objetivo de complementar el escenario de formación y evolución de galaxias, es necesario identificar las galaxias submilimétricas con $z > 1$. Para esto hemos usado los datos de AzTEC (Astronomical Thermal Emission Camera) observados a 1.1 mm en el campo sin sesgo GOODS-S (Great Observatories Origins Deep Survey-South) y los datos de BLAST (Balloon-borne Large Aperture Submillimiter Telescope) observados a 250, 350 y 500μm en el mismo campo. Considerando ciertas técnicas

estadísticas, presentamos las fuentes AzTEC que no fueron detectadas en las bandas de BLAST, las cuales son las principales candidatas a tener altos corrimientos al rojo.

Catalogos sintéticos de estrellas y galaxias en simulaciones cosmológicas: evolución de criterios de selección y aislamiento **II-8**

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La astronomía enfrenta un incremento exponencial en la cantidad, complejidad y calidad de los datos astronómicos, ya sean provenientes de observaciones o de simulaciones numéricas. Este crecimiento de la cantidad de datos astronómicos requiere de nuevos métodos para su análisis y organización. En astronomía se ha hecho cada vez más común analizar grandes bases de datos que permitan detectar con significancia estadística efectos y sistematicidades no encontradas en estudios previos. Presentamos los resultados obtenidos de utilizar un conjunto de herramientas llamadas "PICASSO". Este conjunto de herramientas se ha puesto a prueba con diferentes catálogos – sintéticos y observacionales. La herramienta agrupa un gestor de bases de datos (MySQL), una herramienta de visualización (TOPCAT) y tiene la posibilidad de aceptar scripts en C para incorporar tareas nuevas. Con esta herramienta se pueden construir, almacenar, modificar, manejar, recuperar, indexar, hacer búsquedas, accesos rápidos y comparaciones entre diferentes bases de datos de manera eficiente.

A 2.5–5 micron spectroscopic study of hard X-ray selected AGNs with *AKARI* **II-9**

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We present our preliminary results of the 2.5–5μm spectroscopy of a sample of hard X-ray selected bright AGNs using the InfraRedCamera (IRC) on board the infrared astronomical satellite *AKARI*. The sample is selected from the *Swift* BAT survey in the 14–195 keV range and all of them have measured X-ray spectra at < 10 keV by Winter et al. (2009). In particular, these X-ray spectra provide measurements of the neutral hydrogen column density towards the AGNs. The 2.5–5μm spectroscopy provides a strong diagnostic tool for the circumnuclear environment of AGNs. The 3.3μm polycyclic aromatic hydrocarbon (PAH) feature indicates the star-formation

activities and the broad 3.1μm H_2O ice, 3.4μm bare carbonaceous dust, 4.26μm CO_2, 4.67μm CO features provide information on the physical properties of the absorbing material. Furthermore, the slope of the continuum, combined with the equivalent width of the 3.3μm PAH line as a measure of the starburst contribution, provide us with information on the dust absorption towards the AGN. Our sample contains both Seyfert 1 and Seyfert 2 galaxies because one of our primary scientific aims is to compare the environments of obscured and unobscured AGNs. In this poster, we present a number of representative spectra and the results of the analysis using a model with starburst and (absorbed) AGN components.

Bar Detection in Isolated and Pairs of Galaxies **II-10**

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Recent studies have been realized to find out the dependence of bars and other properties of the host galaxy on luminosity, size, colour, concentration, wavelength, etc. (Aguerri 2010, Gadotti 2010, Giordano 2010), as well as the influence of the local environment (groups, clusters, superclusters: Giordano 2010, Marinova 2010), where the direct influence of environmental perturbers is not controlled. There are different bar detection methods, such as isophotal and Fourier analysis. We calculated the fraction of bars in two samples (where the environmental effects are well controlled): a subsample of 180 isolated galaxies from the UNAM-KIAS catalogue (Hernández-Toledo et al. 2010) and images obtained from SDSS-DR6, and a subsample of 160 galaxies in pairs from the KPG catalogue (Catalogue of Isolated Pairs of Galaxies, Karachentseva 1972) and images obtained with the 1.5 m OAN-SPM telescope. We present preliminary results of the efficiency of both bar detection methods, and a comparison between these controlled environments and other environments such as groups and clusters.

On mid-infrared PAH emission bands in AGN and starburst galaxies **II-11**

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We study the polycyclic aromatic hydrocarbons (PAH) bands, ionic emission lines, and mid-infrared continuum properties, in a sample of 171 emission-line galaxies

taken from the literature, plus 15 new active galactic nuclei (AGN) *Spitzer* spectra. We normalize the spectra at $\lambda = 23\mu$m and group them according to the type of nuclear activity. The continuum shape steeply rises for longer wavelengths and can be fitted with a warm blackbody distribution of $T \sim 150$ to 300 K. The brightest PAH spectral bands (6.2, 7.7, 8.6, 11.3, and 12.7μm) and the forbidden emission lines of [Si II] 34.8μm, [Ar II] 6.9μm, [S III] 18.7 and 33.4μm were detected in all the starbursts and in $\sim 80\%$ of the Seyfert 2. Taking into consideration only the PAH bands at 7.7μm, 11.3μm, and 12.7μm, we find they are present in $\sim 80\%$ of the Seyfert 1, while only half of this type of activity shows the 6.2μm and 8.6μm PAH bands. The observed intensity ratios for neutral and ionized PAHs (6.2μm/7.7μm $\times$ 11.3μm/7.7μm) were compared to theoretical intensity ratios, showing that AGNs have higher ionization fractions and larger PAH molecules ($\geq$ 180 carbon atoms) than SB galaxies. The ratio between the ionized (7.7μm) and the neutral PAH bands (8.6μm and 11.3μm) are distributed over different ranges for AGNs and SB galaxies, suggesting that these ratios could depend on the ionization fraction, as well as on the hardness of the radiation field. The ratio between the 7.7μm and 11.3μm bands is nearly constant with the increase of [Ne III]15.5μm/[Ne II]12.8μm, indicating that the fraction of ionized to neutral PAH bands does not depend on the hardness of the radiation field. The equivalent width of both PAH features show the same dependence (strongly decreasing) with [Ne III]/[Ne II], suggesting that the PAH molecules, emitting either ionized (7.7μm) or neutral (11.3μm) bands, may be destroyed with the increase of the hardness of the radiation field.

Mass of the black hole in the Seyfert 1.5 galaxy H 0507+164 from reverberation mapping **II-12**

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We present the results of our optical monitoring campaign of the X-ray source H 0507+164. We carried out spectroscopic observations for about a month, during November-December 2007. Simultaneous R-band images were also obtained, using the 2.1 m Himalayan Chandra Telescope (HCT). We detect variability in the differential light curve of the continuum as well as in the broad component of the Hβ line. Using cross-correlation analysis, we estimate the time delay in the response of the Hβ line fluxes to the variations in the optical continuum. Using this estimated time delay of 3.59 days (in the restframe of the galaxy) and the width of the broad line, the mass of the black hole is estimated to be about 12.5 million solar masses. This object falls in the low luminosity end of the $L_{\lambda(5100)}$–$M_{\rm BH}$ relation and follows the updated relation obtained by Denney et al. (2009).

Fraction of barred galaxies in the nearby Universe, $0 < z < 0.066$ **II-13**

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An analysis of 913 groups of galaxies and 56 rich clusters of galaxies from the literature in the redshift interval $0 < z < 0.066$ has been made in order to find the mean of the fraction of barred galaxies. The total number of galaxies is 10,318, where 92 groups are from the Nearby Catalog (Huchra and Geller 1982), 176 groups are from the CfA Catalog (Geller and Huchra 1983) and 645 groups are from the Tully Catalog (Tully 1987), and there are 56 Abell clusters (Dressler 1980). Only 87 groups have a number of galaxies, N, higher than 10, in addition to the 56 Abell clusters. 103 groups have N between 5 and 9, and 266 groups have N between 2 and 4. The statistics were carried out separately. In this paper, we report the results for the 87 plus 56 groups with N higher than 10, and for the 103 groups with N between 5 and 9. Our results are: (a) the fraction of barred to total number of galaxies, SB/N, decreases with redshift, (b) the fraction of disk plus barred galaxies, $\mathrm{S}+\mathrm{SB}$, to total number of galaxies, $(\mathrm{S}+\mathrm{SB})/N$, decreases with redshift, (c) the fraction of barred to disk (normal plus barred), $\mathrm{SB}/(\mathrm{S}+\mathrm{SB})$ decreases with redshift, (d) the fraction of disk (normal plus barred) and irregular galaxies to total number of galaxies, $(\mathrm{S}+\mathrm{SB}+\mathrm{I})$ decreases with redshift. Additionally it is found that the relative fraction $\mathrm{S0}/N$ increases with redshift, and finally the relative fraction, E/N also increases with redshift.

Hacia un análisis de las historias de formación estelar e historias químicas de galaxias en diferentes ambientes: sobre la clasificación de una muestra de galaxias del SDSS **II-14**

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Presentamos el proceso de clasificación de una muestra de galaxias del SDSS en diferentes ambientes con el objetivo de analizar sus historias de formación estelar (sfh) y sus historias químicas (CH). La muestra fue seleccionada de la muestra espectroscópica principal de galaxias del SDSS, con los criterios de selección necesarios para obtener una muestra limitada tanto en flujo como en volumen. Los espectros de toda la muestra fueron ajustados utilizando un código de síntesis de poblaciones estelares conocido como STARLIGHT (Cid Fernandes et al. 2005), que nos permite obtener la SFH y CH de cada galaxia, junto con parámetros como la masa y metalicidad estelares, así como la dispersión de velocidades estelares. Del espectro residual

se pueden obtener otros parámetros, i.e. la intensidad de las líneas de emisión - incluso líneas de emisión débiles (que no son detectadas directamente del espectro observado). Las galaxias son clasificadas de acuerdo a tres diferentes grupos de criterios: (1) la actividad en líneas de emisión, utilizando razones de líneas de emisión selectas y diagramas de diagnósito (Baldwin et al. 1981, Coziol et al. 1998), (2) de acuerdo a parámetros fotométricos que correlacionan con su morfología, derivados de Shimasaku et al. 2001 y Fukugita et al. 2007 (una 'clasificación paramétrica'), y (3) de acuerdo a la definición de su ambiente, utilizando catálogos de grupos y cúmulos de galaxias (Abell et al. 1989, Tago et al. 2010). El objetivo principal de este proyecto es analizar la diferencia en la SFH y CH de galaxias en diferentes ambientes separadas en clases de diferentes tipos de actividad en líneas de emisión y diferente "clase paramétrica". Este trabajo está siendo desarrollado como el proyecto de Tesis de Maestría en Ciencias de René A. Ortega-Minakata.

Formación estelar en galaxias LIRG aisladas: indicios de los procesos de formación estelar a mayores corrimientos al rojo

II-15

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Las galaxias luminosas en el infrarrojo (LIRGs, por sus siglas en inglés) son galaxias con luminosidad total en el infrarrojo entre 10^{11} y 10^{12} luminosidades solares. Estas luminosidades son el producto del calentamiento del polvo en regiones de brotes de formación estelar ("starbursts") o en núcleos activos de galaxias. Para que una galaxia con formación estelar emita con estas luminosidades en el infrarrojo, es necesario que tenga una tasa de formación estelar muy elevada, del orden de $\sim$ 17 masas solares al año. En el Universo local, estas tasas de formacion estelar altas son producidas por interacciones violentas entre galaxias o bien, fusiones entre las mismas. Sin embargo, a corrimientos al rojo mayores, la formación estelar masiva en galaxias LIRGs parece ser producida por mecanismos diferentes. El aumento de la densidad numérica de LIRGS con corrimiento al rojo no parece estar relacionada con el cambio de la tasa de fusión de galaxias. Varios autores muestran que alrededor de 50% de las LIRGS con corrimiento al rojo intermedio (entre 0.4 y 1.0) no presentan signos de interacciones violentas. De modo que la formación estelar masiva parece ser producida por otros mecanismos tales como interacciones débiles, canibalismo galáctico o inestabilidades de barra. Con el propósito de explorar estos posibles mecanismos de formación estelar violenta, estudiamos galaxias LIRGs en el Universo local tomadas del catálogo de galaxias aisladas AMIGA. Presentamos observaciones con espectroscopía de rendija larga, imagen directa e interferometría Fabry-Perot de barrido con el fin de estudiar las regiones de formación estelar en este tipo de sistemas.

Ionization of the diffuse gas in galaxies: hot low-mass evolved stars at work **II-16**

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We revisit the question of the ionization of the diffuse medium in late-type galaxies by studying NGC 891. The most important challenge for the models considered so far was the observed increase of [O III]/Hβ, [O II]/Hβ and [N II]/Hα with increasing distance to the galactic plane (z). We propose a scenario based on the expected population of massive OB stars and hot, low-mass evolved stars (HOLMES) in this galaxy to explain this observational fact. The models which fit the observations indicate a systematic decrease of the electron density with increasing z and they become dominated by the HOLMES with increasing z.

Tools for searching resonant moving groups in Galactic disk simulations **II-17**

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One of the most plausible explanations for the origin of the moving groups is the orbital and resonant regions related to the large-scale structure (bar and spiral arms) of the Milky Way (Antoja 2010). Until now, this study has been restricted to the Solar radius. Here we propose to investigate the origin and evolution of these structures through the analysis of the velocity distribution in the full Galactic plane, discussing the link between the kinematic substructures, overdensities (bar and spiral) and resonant regions. To facilitate the analysis of the density function (DF) on the phase space of the simulated Galactic disks, we are implementing statistical tools like EM-WEKA and FoF clustering algorithms, and moments of the distribution function (vertex deviation and third order moments).

High energy astrophysics (including cosmic rays)

GRB980923: un destello con espectro duro a energías de keV-MeV II-18

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Un estudio detallado de datos de los satélites *BATSE-LAD* y *EGRET-TASC* mostró un destello, GRB941017, con una componente anómala a energías de MeV con evolución temporal completamente diferente a la observada en energías de keV y con el doble de energía liberada. El observatorio satelital *Fermi* ha detectado más de estos destellos con componentes duras que se extienden hasta GeVs y que evolucionan temporalmente independiente a la emisión en keVs. Todas las componentes anómalas reportadas son de larga duración, incluso mayor a la duración del destello mismo. En este trabajo se presenta el caso de GRB980923 que presenta una componente dura desde keVs hasta MeVs con duración de unos cuantos segundos.

3D collapse and accretion in slowly rotating polytropes II-19

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Several runs have been made using the code Gadget 2, to model the collapse and accretion of a polytropic envelope onto a black hole (BH) of $\sim 1 M_{\odot}$. Based on previous results, a fixed resolution (number of SPH particles) is chosen and tests are run with different initial angular momentum distributions L. This will provide information about the formation of accretion disks at different distances from the BH. This series of tests will help to develop the necessary modifications to Gadget 2 in the context of the collapsar model for GRBs.

Interstellar medium

Observing faint nebulae and halos with small telescopes **II-20**

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We propose the use of small telescopes ($<$ 1 m) and long observation times for detecting weak emission in planetary nebulae.

Formación estelar alrededor del remanente de supernova G24.7+0.6 **II-21**

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G24.7+06 es un remanente de supernova (RSN) poco estudiado. En la banda de radio, presenta una morfología de doble cáscara con un centro pleriónico. Cercanas al remanente hay varias regiones H II. Estudios de la distribución del gas molecular muestran que posiblemente está interactuando con nubes moleculares. En este trabajo, se analizan datos del infrarrojo cercano y medio con el objetivo de identificar objetos estelares jóvenes (YSOs) en los alrededores de G24.7+0.6. Los resultados preliminares muestran varios candidatos a YSOs sobre las nubes moleculares que rodean al remanente. Se analiza el escenario de formación estelar con el objetivo de discernir si la expansión del RSN pudo haber disparado el nacimiento de nuevas estrellas.

Criss-cross mapping the planetary nebula BD+30 3639 **II-22**

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We present a new method to analyze nebular expansion data. The method that we call "criss-cross mapping" is based on internal proper-motion vectors. "Criss-cross mapping" might find application as future high resolution imaging with large time baselines is expected to produce internal proper motion data for many objects. We apply the method to the young planetary nebula BD+30 3639, for which Li et al. (2007) have determined proper-motion vectors at more than 200 locations. We discuss the systematic deviations from a homologous expansion that we find for the nebula.

Numerical models for the 19th century outbursts of Eta Carinae **II-23**

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We present here new results of 2D hydrodynamical simulations of the eruptive events of the 1840s (the great) and the 1890s (the minor) eruptions suffered by the massive star Eta Car (González et al. 2010). The two bipolar nebulae commonly known as the Homunculus (H) and the little Homunculus (LH) were formed from the interaction of these eruptive events with the underlying stellar wind. We assume a colliding wind scenario to explain the shape and the kinematics of both Homunculi. Adopting a more realistic parametrization of the phases of the wind, we show that the LH is formed at the end of the 1890s eruption when the post-outburst Eta Car wind collides with the eruptive flow, rather than at the beginning (as claimed in previous works; Gonzalez et al. 2004a, 2004b). The regions at the edge of the LH become Rayleigh-Taylor unstable and develop filamentary structuring that shows some resemblance to the observed spatial structures in the polar lobes of the LH (Smith 2005). We also find the formation of some tenuous, equatorial, high-speed features.

Medición del campo magnético en SN 1006 **II-24**

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El remanente de la supernova 1006 constituye un laboratorio ideal para poner a prueba la teoría de aceleración difusiva en choques. A tal efecto, realizamos observaciones polarimétricas en radio con el Very Large Array y con el Australia Telescope Compact Array. Combinando estos datos pudimos obtener un mapa de muy alta resolución y sensibilidad con la distribución del campo magnético en esta fuente. El mapa muestra que el campo es radial en los lóbulos brillantes del remanente, pero es tangencial en el sector sudeste de la cáscara, donde la emisión en el continuo de radio es sumamente débil. Además, mientras que en los lóbulos la polarización es del orden del 15%–20%, en el sudeste es cercana al valor teórico del 71%. Esto indica que el campo está fuertemente ordenado en esta última región y es mucho más turbulento en los lóbulos. Este resultado refuerza la hipótesis de que el campo magnético galáctico en esta dirección es paralelo al disco, que la mayor inyección de partículas y aceleración difusiva se da en choques paralelos, y que los lóbulos brillantes representan capas polares y no una envoltura ecuatorial. Existen indicios de que el campo magnético es tangencial en el frente de choque exterior, probablemente por compresión. El campo magnético radial, en cambio, estaría relacionado con inestabilidades de Rayleigh-Taylor entre el frente de choque exterior y la discontinuidad de contacto.

Orion-KL: the hot core that is not a core? **II-25**

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We present sensitive high angular resolution submillimeter and millimeter observations of torsionally/vibrationally highly excited lines of the CH_3OH, HC_3N, SO_2, and CH_3CN molecules and of the continuum emission at 870 and 1300 microns from the Orion KL region, made with the Submillimeter Array (SMA). These observations plus recent SMA CO $J = 3$–2 and $J = 2$–1 imaging of the explosive flow originating in this region, which is related to the non-hierarchical disintegration of a massive young stellar system, suggest that the molecular Orion "Hot Core" is a pre-existing density enhancement heated from the outside by the explosive event. Unlike in other hot cores we do not find any self-luminous submillimeter, radio or infrared source embedded in the hot molecular gas.

Models of expanding PDR's **II-26**

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Predicted line profiles for the 21 cm emission of an expanding photon-dominated region (PDR) are presented. The model PDR assumes different density laws and an expansion of the gas much smaller than the thermal and turbulent velocity width of the line. The model assumes central symmetry centered around a massive star and an H II region. Input parameters are the far UV luminosity of the central star, the H II region emission measure and size, and the density law profile, temperature and expansion velocity of the neutral gas. The 21 cm line profile of the photodissociated gas is highly sensitive to the above parameters, and strongly determines hitherto uncertain dynamical parameters of these objects. A comparison with published observations of the star-forming region GGD 14 is given as an example.

Emisión de rayos X de la burbuja interestelar NGC 6888: simulación numérica **II-27**

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Abstract not available.

Stars, stellar systems, and star formation

3D simulations of tilted winds of weak-lined T Tauri stars **II-28**

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We perform 3D numerical magnetohydrodynamic simulations of the wind and magnetospheric structures of weak-lined T Tauri stars in the case of a misalignment between the axis of rotation of the star and its magnetic dipole moment vector. We study the effects caused by different model parameters, namely the misalignment angle θ_t, the stellar period of rotation, the plasma-β, and the heating index γ. Our simulations take into account the interplay between the wind and the stellar magnetic field during the time evolution. The system reaches a periodic behavior with the same rotational period as the star. We show that the magnetic field lines present an oscillatory pattern. Furthermore, we obtain that by increasing θ_t, the wind velocity increases, especially in the case of a strong magnetic field and relatively rapid stellar rotation. Our models allow us also to study the interaction of a magnetized wind with a magnetized extra-solar planet. Such interaction gives rise to reconnection, generating electrons that propagate along the planet's magnetic field lines and produce electron cyclotron radiation at radio wavelengths. We find that a close-in Jupiter-like planet orbiting at 0.05 AU presents a radio power that is ~ 5 orders of magnitude larger than the one observed in Jupiter, which suggests that the stellar wind from a young star has the potential to generate strong planetary radio emission that could be detected in the near future with LOFAR. We find a variation of the radio power of a factor 1.3–3.7, depending on θ_t. Moreover, we extend the investigation made in Vidotto et al. (2009) and analyze whether winds from misaligned stellar magnetospheres could cause a significant effect on planetary migration. We show that the time-scale τ_w for an appreciable radial motion of the planet is shorter for larger misalignment angles. Vidotto, A. A., Opher, M., Jatenco-Pereira, V., Gonbosi, T. I. 2009, ApJ, 699, 441

CCD photometry of NGC 6093 **II-29**

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We present CCD observations of the globular cluster NGC 6093 in the Johnson filters B, V, R and I, obtained at the Observatorio Astronómico Nacional at San Pedro Mártir (OAN-SPM). The reduction process was performed in a standard manner using DAOPHOT. The values of the calculated extinction coefficients are 0.221 for B, 0.087 for V, 0.031 for R and 0.136 for I. We also obtain the photometric magnitudes and colours for a number of stars in the cluster. These results allowed us to produce several colour-magnitude diagrams.

Simulaciones de cúmulos abiertos **II-30**

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Mediante simulaciones numéricas, se busca determinar los observables necesarios y/o suficientes para establecer criterios de pertenencia, edad, lugar de nacimiento, y otros parámetros globales de cúmulos abiertos. Asimismo, las simulaciones de la evolución dinámica se realizan a partir de condiciones iniciales parcialmente obtenidas de las observaciones y parcialmente construidas estadísticamente, lo que permite aplicar el método a cúmulos galácticos en particular, pudiendo compararse así los resultados de distintos criterios de pertenencia.

VVV color-magnitude diagrams of selected Galactic young clusters **II-31**

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We will report the first infrared color-magnitude diagrams of the young star clusters Mercer 35, Mercer 83, Mercer 69, Mercer 70 and Mercer 28 obtained within ongoing ESO Large Infrared Survey “VVV - Vista variables in Via Lactea”. The reddening, distance, age and mass of the clusters are obtained and analyzed.

Accretion disks around young brown dwarfs: models for the two viscosity prescriptions **II-32**

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With our detailed vertical structure codes for irradiated α (D'Alessio 1996, D'Alessio et al. 1998) and β (Adame 2010) accretion disks, we construct models for the physical structure of disks around young brown dwarfs ($M_* \lesssim 0.08 M_\odot$) and discuss their differences varying two fundamental parameters: the mass accretion rate ($\dot{M}$) and the turbulent viscosity parameter (α or β). The spectral energy distribution (SED) of the models are constructed to establish expected observational differences between the two turbulent viscosity prescriptions. Finally, we use β-disks to construct the SED for known circumsubstellar disks that we have previously published with the α-prescription. This will allow us to constrain the disk parameters that define the low-mass, low-accretion regime.

Tidal stream detection in the *Gaia* era: a modified great circle method **II-33**

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The observational data expected to come from the *Gaia* astrometric mission represents an unprecedent opportunity to search for tidal streams using all-sky full phase-space information for nearly a billion stars in our Galaxy. In this contribution, we will describe the Modified Great Circle Cell Count (mGC3) method devised for the detection of stellar streams in the Galactic halo. This method is based on the GC3 method originally devised by Johnston, Hernquist & Bolte (1996), modified to include velocity information in order to enhance the contrast of stream signatures with respect to the Galactic halo background. We tested the efficiency of mGC3 by embedding tidal streams from N-body simulations in the mock *Gaia* catalogue of the Galactic background from Brown, Velazquez & Aguilar (2005), which include a realistic realization of the corresponding photometric and kinematic properties, errors and completeness limits. We investigated its success rate as a function of initial satellite luminosity, star formation history and orbital parameters. We find that satellites in the range of 10^8–$10^9 L_\odot$ can be recovered for streams as dynamically old as $\sim$ 10 Gyr and up to Galactocentric distances of $\sim$ 40 kpc, given the observational errors expected for *Gaia*. Even tidal streams from satellites with luminosities down

to 4–5 $\times$ $10^7 L_\odot$ can be recovered for certain combinations of dynamical ages and orbits.

Stellar parameters for stars of the *CoRoT* exo-field **II-34**

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Rotation is one of the most important observable for our understanding of the evolution of stars. The *CoRoT* space mission (Baglin et al. 2006) represents a unique possibility for measurements of the rotation period for a statistically robust sample of stars, offering the necessary tools for the study of rotation and its rôle in stellar evolution. In this context, an essential step is the physical characterization of stars, in particular because the computation of a reliable photometric period from *CoRoT* observations would became hard work without the help of the stellar parameters. In order to support the computation of periods reflecting the rotational modulation of stars in the *CoRoT* fields, we are conducting an important observational survey of stars located in the fields already observed by the satellite. The present work yields the physical and chemical parameters, ($T_{\rm eff}$, $v_{\rm mic}$, $\log g$, [Fe/H], $v \sin i$, A(Li)), for a large sample of *CoRoT* targets, located in different evolutionary stages, ranging from the main sequence to the red giant branch. These stars were observed with the UVES(VLT) and HYDRA(CTIO) spectrographs. The physical parameters were determined on the basis of the spectral synthesis procedure, making use of MARCS stellar atmosphere models and the TurboSpectrum code. The present set of data represents an important piece of work to be used as a standard sample calibration for different programmes in the context of the *CoRoT* Mission, since the list of stars analyzed here are among the brightest ones composing the *CoRoT* exo-field targets.

The physical basis of the spectral classification of A, F and G stars **II-35**

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We present the first results of a precise scheme for spectral classification for the late B, A, F and the early G-type stars. We have used $\sim$ 15000 well-classified stars from Hauck & Mermilliod (1998) and with the Strömgren ($b-y$), [c_1] and [m_1] indices to define the regions in the [m_1]–[c_1] plane. We also generate calibrations for the effective temperature, the surface gravity, and the metallicity depending on the stellar spectral type.

Discontinuidad de Balmer en estrellas tempranas con envoltura **II-36**

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En este trabajo estudiamos el comportamiento de la discontinuidad de Balmer (DB) en estrellas tempranas con envoltura. La DB en estos objetos muestra frecuentemente dos componentes: la estelar, originada en la fotósfera de la estrella, y la circunestelar, originada en el material que rodea la estrella. Aquí analizamos la correlación entre el aspecto que presenta la componente circunestelar de la DB (absorción o emisión) y las condiciones físicas del medio (temperatura, densidad y distribución). El transporte de radiación a través del material es tratado con el método Monte Carlo.

CCD photometry of NGC 5897 **II-37**

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We present CCD observations of the globular cluster NGC 5897 in the Johnson filters B, V, R and I, obtained at the Observatorio Astronómico Nacional at San Pedro Mártir (OAN-SPM). The reduction process was performed in a standard manner using DAOPHOT. The values of the calculated extinction coefficients are 0.177 for B, 0.081 for V, 0.034 for R and 0.082 for I. We also obtain the photometric magnitudes and colours for a number of stars in the cluster. These results allowed us to produce several colour-magnitude diagrams.

Photometric search for accretion disks in young clusters: NGC 2414 **II-38**

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Observations indicate that young stars with ages of aproximately 1 million years show an infrared excess arising from an optically thick accretion disk, but that it is very rare to find infrared emission from objects over 10 Myr of age. Moreover, it seems that optically thick disk emission disappears in objects older than 30 Myr. Thus, observations of star clusters with ages in the range of 1 to 10 Myr allow us to search for stars which are still have ongoing accretion disk processes and are likely

forming planetesimals or planets. NGC 2414 is located at a distance of 3.4 kpc and has an estimated age of 9.5 Myr. For this cluster, we have obtained optical and near-infrared photometry (*UBVRI* bands) at the 1.5 m telescope at the San Pedro Mártir Observatory (OAN-SPM). In addition, we have retrieved near-infrared photometry (*JHK* bands) for cluster stars from the 2MASS survey public data archive. We have obtained color-magnitude and color-color diagrams. From these diagrams we have identified a dozen stars showing an infrared excess. Given the age estimation for the cluster, these stars might be good candidates to be at the main stage of planet formation.

Using stellar mixing prescriptions to study the circumstellar/interstellar medium of massive stars **II-39**

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We use the mixing prescriptions of a stellar evolution code (STERN) to follow the evolution of surface abundances of light or radioactive isotopes in order to study the circumstellar/interestellar medium environment of massive stars in OB associations. We have followed massive star models (10, 30, 45$M_{\odot}$) including rotational mixing and without. We observe that the emission of ^{26}Al in the stellar winds of rotating models of massive stars is enhanced compared to non-rotating models.

Search for new open clusters towards the star-forming regions **II-40**

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One of the main goals of the "VVV — Vista Variables in the Via Lactea" ESO Large survey (Minniti et al. 2010) is to search for new star clusters of different ages. In order to trace the early stages of star-cluster formation we carrying out a survey of infrared star clusters and stellar groups in the directions of known massive-star-formation regions associated with methanol maser emission and hot molecular cores. Using Longmore et al. (2009) and Churchwell et al. (2006, 2007) up-to-date lists of star-forming regions, we have identified by visual inspection 35 small star-cluster candidates. Almost all of them seem to be very young indeed, because most of the mass is still concentrated in the gas.

Estudio estadístico de la rotación axial en las estrellas A con nuevas determinaciones de $v \sin i$ **II-41**

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Con el objetivo de realizar un estudio estadístico de la rotación axial en las estrellas A se observaron todas las que se encuentran listadas en el Bright Star Catalogue, es decir más brillantes que 6.5 en el visual, para el hemisferio sur. Se obtuvieron más de 1000 espectros con el espectrógrafo de banco EBASIM desde CASLEO y se determinó el parámetro $v \sin i$ con el método expuesto por Diaz et al. (2010). En esta primera comunicación se presentan las primeras determinaciones sobre la muestra realizada con la aplicación sistemática del método El analisis estadistico se realizara poniendo especial énfasis en las estrellas Ap y en el sincronismo de las binarias.

Time variability in simulated ultracompact and hypercompact H II regions **II-42**

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Ultracompact and hypercompact H II regions appear when a very massive star (with a mass larger than about 15 solar masses) starts to ionize its own environment. Recent observations of time variability in these objects are one of the pieces of evidence that suggest that at least some of them harbor stars that are still accreting from an infalling molecular accretion flow that becomes ionized in its innermost part. We present an analysis of the time variability of the H II regions formed in the 3D radiation-hydrodynamic simulations presented by Peters et al. (2010), who found radio-continuum flux and size variations that are in qualitative agreement with the available observations. This work aims to quantify the variability expected from the simulations, and to search for correlations between the observed properties of the H II regions, such as flux and size, with other quantities, such as density and ionization rate. We find that a small but non-negligible fraction of observed H II regions should present detectable flux variations on timescales of 10 years, with positive variations being more likely to happen than negative variations. Most of the rapid variability is produced by the interaction of the infalling neutral accretion flow and the inner ionized gas.

The structure of BB Doradus in quiescence **II-43**

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BB Doradus is a nova-like variable which was suggested to be of the SW Sextantis subtype. In the framework of a large campaign to study this kind of objects, we observed BB Dor during its quiescent state in 2009. The optical spectra are dominated by Balmer lines in emission. From the line profiles, as well as from the phase of the radial velocity curves, we conclude that no accretion takes place and that the line emission comes solely from the secondary star. We also find satellite lines similar to those seen in AM Her in quiescence. While these lines have been seen in several Polars, this is the first such detection in a nova-like star. We will present these results and discuss possible interpretations.

Accretion in detached post-common-envelope binaries **II-44**

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Cataclysmic Variables (CVs) are thought to form from initially detached binaries that go through a common-envelope phase as the more massive star expands. The separation of the resulting, still detached, red dwarf/white dwarf binary continues to decrease due to angular momentum loss. Eventually, the Roche lobe of the red dwarf will come into contact with the stellar surface, thus enabling mass-transfer via Roche-lobe overflow, and marking the start of the proper CV phase. However, there is evidence for ongoing accretion already in the still detached post-common-envelope binary (PCEB). A strong, and comparatively easy to observe indicator is the presence of multiple components in the Hα emission line. Until 2009, only two such PCEBs were known. Since then we have conducted a survey on all detached PCEBs in the southern hemisphere with orbital periods less than 5 h. Here, we will report on the results of this survey and their implications.

A new method for rotational velocity determination **II-45**

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We have designed a new method for $V \sin i$ determination using the Fourier transform of the cross-correlation function between the object spectrum and a template.

The method takes into account the variation of the limb-darkening coefficient with wavelength and temperature and avoids the problem of dealing with calibrations, which depend on the different authors. The methods used all the spectral features of particular spectral regions, thereby increasing the precision of the determinations. We have applied the method to A-type stars.

Automatic and quantitative spectral classification **II-46**

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We present here a system of artificial neural networks for automatic classification of stellar spectra. The principal advantage of this system is its ability to classify stellar spectra with signal-to-noise ratio as low as 20 with an accuracy better than two spectral subtypes. We defined a set of spectral indices and measured them over each stellar spectrum. This information is used to train and validate the artificial neural networks. Some of those indices could be used also to quantitatively classify stellar spectra. We present here the comparison of both classifications: automatic and quantitative.

Can stellar rotation shape planetary nebulae? **II-47**

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There are many scenarios proposed for the formation and shaping of bipolar planetary nebulae, though none of them is accepted as universally valid and it is most probable that different nebulae are formed by different mechanisms. In this poster we present another alternative scenario based on the effects of the stellar rotation on the stellar radiation field. The reaction of a spherical shell to an axisymmetic radiation field is explored and we show that the shell is ionized in a bipolar pattern. This is not the observed bipolar nebula but a structure formed in the very early stages of the post-AGB evolution. We speculate that the nuclear region of an AGB contracts at the cessation of thermonuclear reactions. This stellar remnant partially conserves its angular momentum and increases its rotational velocity about 2 orders of magnitude. Thus, the proto CSPN first has an axisymmetric radiation field due to the gravitational darkening, and then its wind is axisymmetric. The radiation field forms a bipolar structure which eventually evolves to a typical bipolar nebula.

Planetary systems

Interspecies momentum transport in collisionless plasmas due to the two-stream instability in a four component system **II-48**

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We study the linear development of the two-stream plasma instability in the interaction of a stationary, heavy ion plasma and a stream of H^+ plasma. This study is a step towards understanding the collisionless interaction of the Solar wind with the plasma environment of non-magnetic obstacles, such as Venus, Mars or comets. On the basis of a four fluid treatment of the system, a dispersion relation for the instability is derived and eigenfunctions for the fastest growing modes are determined in order to understand the development of the instability as a function of the configuration parameters: relative velocity, plasma densities and ion mass ratio. We analyze the acceleration of the heavy ion population as a result of the interaction and discuss the meaning of this result in order to understand the acceleration of ioniospheric O^+ ions in Venus, by the Solar wind. The results presented in this work may also be relevant to other astrophysical scenarios involving collisionless plasmas, such as in the interaction of stellar winds with ISM plasma condensations.

Ondas e inestabilidades en el plasma magnetosférico de Saturno **II-49**

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Se presentarán los análisis aplicados a datos observacionales provenientes de la misión *Cassini-Huygens* (instrumentos MAG y CAPS) que muestran la existencia de ondas e inestabilidades que ocurren en el plasma magnetosférico de Saturno. Nuestro estudio se centra en las ondas ion ciclotrón y los modos tipo espejo, los cuáles pueden crecer en un plasma debido a anisotropías en la temperatura, $T_\perp / T_\parallel \gg 1$.

Este tipo de ondas y modos han sido observados recientemente por Cassini a diferentes distancias radiales. Se ha encontrado que las ondas ion ciclotrón pueden crecer con frecuencias cercanas a las girofrecuencias de iones pertenecientes al grupo de agua (O^+, OH^+, H_2O^+ ó H_3O^+), se caracterizan por ser poco compresivas y se propagan paralelamente al campo magnético del medio, B_0. Por otro lado, los modos tipo espejo se caracterizan por ser altamente compresivos además de presentar cambios en la densidad que están anti-correlacionados con cambios en la magnitud del campo B_0. Finalmente se presentarán resultados obtenidos a partir de un código de dispersión llamado WHAMP, con el que se ha explorado en el régimen lineal de teoría cinética de plasmas, la posibilidad de encontrar crecimiento de este tipo de ondas y modos dadas las condiciones del plasma observadas por *Cassini*.

Analysis of the evolution of traps for protoplanets considering disk photoevaporation **II-50**

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When the first extra-solar planets were found, their identification as hot Jupiters was surprising. In order to explain the position of these hot planets in contrast to gaseous giants planets from the Solar System, the disk-planet interactions have been studied. Some theoretical works show that low-mass planets (< 15 terrestrial masses), do not have accelerated gas accretion and as a result they do not modify the disk density entering into type II migration (Lin & Papaloizou 1986). On the other hand, the star emits EUV photons (> 13.6 eV), which are able to ionize the neutral gas from the protoplanetary disk, which gives rise to the formation of a disk atmosphere. We defined the gravitational radius where the kinetic energy of H II is equal to gravitational potential at the start. At radii larger than the gravitational radius, H II atoms are unable to remain gravitationally bound and as a consequence the gas is ejected from the disk: this process is known as a photoevaporation. During the intermediate evolutive stage of disk, photoevaporation becomes dominant over viscous effects in the disk, which results in fast evolution of its structure. In this stage a gap is forming at the gravitational radius, which represents a jump in the surface density profile. Data from Masset et al (2006), show that a jump in the surface density profile may trap protoplanets and drive them with the jump. For our study, the planet-disk interaction during the intermediate stage is analyzed using the hydrodynamic code FARGO (a fast eulerian transport algorithm for differentially rotating disks, Masset 2000). We included photoevaporation in the code similar to that described by Hollenbach et al. (1994). In this work, we initially put a surface density profile according to the solution of the diffusion equation for a viscous

disk (Clarke et al. 2001, Matsuyama et al. 2003, Ruden 2004). Using these tools we simulate the migration of low-mass planets around the gravitational radius, before and during the gap formation. Our preliminary results show that during this stage of the disk evolution the gap formation does not have an important affect on the planet position.

Estadística en sistemas planetarios usando un modelo sencillo de acreción: comparación con sistemas extra-solares **II-51**

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Se estudian distribuciones espaciales de masa y excentricidad de planetas formados a partir de un modelo sencillo de acreción planetaria [1]. Este modelo se basa en la conservación de masa, momento angular y en la estabilidad de los sistemas respecto al déficit de momento angular. Durante el proceso de acreción de masa en discos protoplanetarios gravitacionales, la cantidad física que se conserva es el momento angular, es por esto que lo hemos tomado como el parámetro representativo de los sistemas planetarios. En los experimentos numéricos, se han incluido restricciones físicas sobre las velocidades relativas de los protoplanetas a acretar y una probabilidad de acreción proporcional a la masa. Se presentan resultados estadísticos que muestran que con estas restricciones físicas, los planetas se forman sistemáticamente en zonas preferenciales. Introduciendo variables de escala apropiadas, estos resultados son universales con respecto al momento angular total del sistema, a la masa del disco protoplanetario y a la masa de la estrella central. Se muestra una comparación con algunos sistemas extra-solares conocidos.

[1] J. Laskar, Phys. Rev. Lett 84, 3240 (2000).

Instrumentation

Estudio astro-climatológico del sitio del Observatorio Astronómico Nacional en San Pedro Mártir II-52

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Realizamos un análisis de la llamada astroclimatología del Observatorio Astronómico Nacional en San Pedro Mártir, con los datos públicos del proyecto Thirty Meter Telescope que se obtuvieron de 2004 a 2008. Usamos datos de radiación solar, seeing, velocidad y dirección del viento, entre otros, obtenidos con diversos equipos: Weather Station, Monitores DIMM y MASS, etc. En este estudio obtuvimos algunos parámetros que nos permiten caracterizar las condiciones astroclimatológicas del OAN-SPM, en particular las relacionadas con la calidad de las imágenes astronómicas.

We have undertaken an astro-climatological survey of the Observatorio Astronómico Nacional using public data from the Thirty Meter Telescope project taken during the period 2004–2008. The information we use was provided by the Weather Station, the DIMM and MASS monitors, etc., and corresponds to Solar radiation, seeing, velocity and wind direction. In this study we obtain some parameters needed to characterize the astro-climatological conditions of this observing site, and in particular those related to the quality of astronomical images.

Filtrado morfológico de imágenes astronómicas en Matlab II-53

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El presente trabajo expone el uso de filtros morfológicos aplicados al reconocimiento y separación de galaxias y estrellas en imágenes astronómicas. Estos filtros fueron implementados en Matlab usando las propiedades de dilatación y erosión, donde

se procesaron 6 imágenes distintas en escalas de grises de 256 tonos con tamaños entre 405 $\times$ 1620 y 525 $\times$ 1800 píxeles aproximadamente. Para el proceso se uso un elemento estructural de disco de 4 $\times$ 4 y 8 $\times$ 8 píxeles después de someter a la imagen por un filtrado top-hat y binarización. Una de las finalidades del presente trabajo consiste en desarrollar en Matlab un ToolBox completo de procesado de imágenes enfocado para el uso de la comunidad astronómica. Se ofrece también una comparación con las herramientas disponibles en el SExtractor centrándose en los recursos y técnicas de separación galaxia-estrella en imágenes astronómicas de alta resolución.

The Large Millimeter Telescope: alignment of the primary surface and the path to first-light **II-54**

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I will review the current status of the Large Millimeter Telescope project, including the alignment and testing of the telescope optics, the installation of the scientific instruments, commissioning activities and the preparations for the "first-light" observations.

Other

To obtain surfaces in the optical laboratory in the formation process of technology students **II-55**

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We show relevant aspects involved in the formation process of technology students regarding the knowledge and application of construction techniques of optical surfaces, the mathematical principles involved, knowledge of the verification testing curve, and the practical procedure of generating, grinding, polishing and the configuration, encouraging the students to engage with the technological aspects needed in the development of these optical surfaces and the basic techniques to build them.

About pulsar dynamical evolution **II-56**

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Based on ν vs. $\dot{\nu}$, and $\dot{\nu}$ vs. $\ddot{\nu}$ diagrams and four evolutive models, synthetic pulsar populations are generated. We compare these synthetic populations with 238 pulsars reported by Hobbs et al. (2004, MNRAS, 353, 1311). Our goals are: (1) to understand which physical process is responsible for the rotational energy loss of pulsars, and (2) to determine physical parameters such as age, magnetic field strength, and braking index, in order to perform a dynamical evolution study. Preliminary results are presented.

Mirando al cielo: organización de eventos públicos masivos para observación del cielo

II-57

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A partir del 2008 hemos colaborado en la organización de varios eventos masivos para mirar el cielo, como son: el 19 de febrero de 2008 en el Zócalo de la Ciudad de México, el 31 de Enero del 2009 en Teotihuacan, el 24 de Octubre del 2009 en Tlaxcala, el 14 de Noviembre del 2009 en Otumba, el 6 de Marzo del 2010 en Juchitepec y el 17 de abril del 2010 en Tlaxcala.

Los criterios con que se han ido realizando los eventos van cambiando adaptándonos a lo que el municipio puede ofrecernos, a la problemática política, económica y social de cada lugar. Por ejemplo, un punto importante es que hemos introducido una actividad económica, la cual se lleva a efecto con la venta de productos artesanales del lugar que se realiza conjuntamente con el evento. Se busca una actividad cultural propia del lugar y de la cual se encargan las autoridades del Municipio de tramitar. Es importante la participación de la gente del lugar en diversas actividades de apoyo, y la participación mediante capacitación de las escuelas que apoyan en actividades docentes y en la observación con telescopios.

En todas ellas el primer punto es pedir los permisos correspondientes de uso de suelo a las autoridades del Municipio y pedir se involucren las autoridades en la realización del evento dejando en ellos el 90% de la realización del evento. El segundo es localizar una zona segura donde se puede realizar la observación con un marco de seguridad para todos los visitantes, tanto en movimiento, es decir evitar zonas inclinadas, zonas con desniveles, zonas con huecos, zonas con escaleras, zonas resguardadas, zonas de conflicto político, y además ver la viabilidad para la observación, zonas despejadas en sus horizontes (sin edificios colindantes), sin alumbrados cercanos, muy amplias. Una zona ideal son las zonas de actividades deportivas, la zona de pista. A continuación se realizan funciones de posibilidades de eventos culturales, selección de los mas idóneos, contratación de elementos y el contacto con las autoridades involucradas.

Lo importante es poder mirar el cielo con el telescopios, pero debemos prevenir que puede haber condiciones de clima que no lo hagan viable, de ahí la importancia de tener actividades culturales y académicas que complementen la observación con telescopios. Un caso interesante fue el 17 de abril del 2010, pudimos observar que la gente está dispuesta a esperar en fila, o bajo la lluvia a que despeje para mirar a través de un telescopio. De ahí la importancia de las alternativas que podamos ofrecerles, permitiéndoles se diviertan y aprendan dentro de un espacio seguro.

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