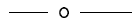
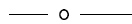


PRIMER ENCUENTRO DE LA RADIOASTRONOMÍA ESPAÑOLA

“Memorial Lucas Lara”



ABSTRACT BOOK



Conference Program	1
Tuesday, May 9	
Abstracts	5
Wednesday, May 10	
Abstracts	13
Thursday, May 11	
Abstracts	19
Posters	
Abstracts	27
List of Participants	33

Conference Program

Tuesday, May 9

Start	End	Type	Topic	Speaker
08:30			Registration desk opens – Biblioteca de Ciencias	
09:30	10:00		Conference opening	AUTHORITIES & ORGANIZERS
10:00	10:15		Tribute to Lucas Lara	MARCAIDE
10:15	11:10	Invited	Massive star formation	GARAY
11:10	11:30		Break	
11:30	11:45	Oral	Evidencia de un disco de acreción y un chorro de alta velocidad asociados a una estrella de alta masa en formación	CURIEL
11:45	12:00	Oral	IRAS 20343+4129, a puzzling massive star-forming region	ESTALELLA
12:00	12:15	Oral	Rotating Structures in Massive Young Stellar Objects	BELTRÁN
12:15	12:30	Oral	Modelización de la emisión radio de amoníaco en protoestrellas de alta masa	OSORIO
12:30	12:45	Oral	The IRAM observatory and the 30-m telescope at Pico Veleta	UNGERECHTS
12:45	13:00	Oral	Radioastronomy at Robledo de Chavela Space Station: Host-Country time and PARTNeR	SUÁREZ
13:00	13:15	Oral	Very Long Baseline Interferometric Observations at Madrid Deep Space Communication Complex - MDSCC	GARCÍA-MIRÓ
13:30	15:30		Lunch	
15:30	16:30	Invited	I. The Long Wavelength Array (LWA) II. Radio Supernovae	WEILER
16:30	16:45	Oral	Structures and expansions of SN 1993J and SN 2004et	MARTÍ-VIDAL
16:45	17:00	Oral	Evolution of SN 2000ft in the luminous infrared galaxy NGC7469	ALBERDI
17:00	17:15	Oral	The supernova rate in Luminous and Highly-Luminous IR Galaxies	PÉREZ-TORRES
17:15	17:45		Break	
17:45	18:00	Oral	Estudio de envolturas circunestelares de estrellas AGB y post-AGB tempranas	CASTRO-CARRIZO
18:00	18:15	Oral	Observaciones radio de discos y jets en regiones de formación estelar	ANGLADA
18:15	18:30	Oral	SMA observations of magnetic fields around star forming regions	GIRART
18:30	18:45	Oral	La estructura interna de las condensaciones pre-estelares	TAFALLA
18:45	19:00	Oral	Evidence for transient clumps in dense cores of molecular clouds	MORATA

Wednesday, May 10

Start	End	Type	Topic	Speaker
09:30	10:15	Invited	e-VLBI	DIAMOND
10:15	10:30	Oral	Observational results on Galactic anomalous microwave emission	REBOLO
10:30	11:45	Oral	Interferometric Observations of the Cosmic Microwave Background	RUBIÑO
10:45	11:00	Oral	Anomalous microwave emission in the Galaxy: the role of hydrogenated fullerenes	IGLESIAS-GROTH
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11:30	12:15	Invited	The Square Kilometre Array	SCHILIZZI
12:15	12:30	Oral	Very high precision VLBI astrometry of the S5 polar cap sample sources	MARTÍ-VIDAL
12:30	12:45	Oral	GMRT search of radio counterparts of highly variable gamma-ray sources	PAREDES
12:45	13:00	Oral	The microquasar LS 5039, from radio to VHE gamma-rays	RIBÓ
13:00	13:15	Oral	Physical conditions and molecular chemistry in the Galactic Center	N. RODRÍGUEZ
13:00	13:15	Oral	Nuclear rings in non-barred galaxies	KNAPEN
13:30	15:00	Lunch		
15:00	15:40	Invited	Proper Motions of Gas and Stars in the Galaxy	L.F. RODRÍGUEZ
15:40	16:00	Oral	The motion of wind-driven shells	CANTÓ
16:00	16:15	Oral	Cygnus X-3 and its ejecta: do we see hot spots?	MARTÍ
16:15	16:45	Break		
16:45	19:00	DEBATE	Horizons for the Spanish Radioastronomy	PANEL

Thursday, May 11

Start	End	Type	Topic	Speaker
09:30	10:30	Invited	Highest-Resolution Radio Astronomy: The Quest for the Black Hole	ZENSUS
10:30	10:45	Oral	Observations of water masers towards young objects, planetary nebulae and AGNs at the Robledo Space Station	J.F. GÓMEZ
10:45	11:00	Oral	CCS, ammonia and water masers studies in low-mass young stellar objects	DE GREGORIO
11:00	11:30	Break		
11:30	12:30	Invited	Planet Formation Revealed by Submillimeter and Millimeter Radioastronomy	LESTRADE
12:30	12:45	Oral	Accessing to the innermost regions of active galactic nuclei	ROS
12:45	13:00	Oral	Compact relativistic jets and central regions of AGN	LOBANOV
13:00	13:15	Oral	VLBI diagnostics of jet instabilities in 0836+710	PERUCHO-PLA
13:15	13:30	Oral	On the nature of the double radio source MOST J1654.4-4337	COMBI
13:30	15:00	Lunch		
15:00	16:00	Invited	ALMA	MARTÍN-PINTADO
16:00	16:15	Oral	Theoretical aspects of the radio emission in microquasars	BOSCH-RAMÓN
16:15	16:30	Oral	VLA observations of four HI-deficient spirals in the Virgo cluster region	TORIBIO
16:30	16:45	Oral	Distancia a T-Tau con 0.5% de Precisión	TORRES
16:45	17:00	Oral	Catálogo de contrapartidas FIRST a fuentes ULXs / <i>A catalogue of FIRST counterparts to ULXs: Unveiling their nature</i>	D. PÉREZ
17:00	17:15	Oral	Observaciones multiépoca de la región central de L723	CARRASCO
17:15		Closing Remarks		

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Massive star formation

[Invited]

G. Garay (Univ. Chile)

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The birth process of massive stars is currently one of the most debated subjects in astrophysics. The understanding of the formation processes requires a detailed knowledge of the physical conditions of the cloud environment which are thought to play a critical role in determining the formation mechanism. In this contribution I will review recent results concerning the physical characteristics of the environment prior to and after the formation of massive stars. Particular emphasis is given to observations of molecular line emission in high density tracers, dust continuum emission, and radio continuum emission, which are providing key evidence concerning the physical processes that take place during the formation and early evolution of massive stars. The impact on this field expected to be produced with the advent of new radio astronomical facilities in the North of Chile will be discussed.

Evidencia de un disco de acreción y un chorro de alta velocidad asociados a una estrella de alta masa en formación

S. Curiel (IA-UNAM), P.T.P. Ho (CfA), N.A. Patel (CfA), J.M. Torrelles (ICE, CSIC-IEEC), L.F. Rodríguez (CRyA-UNAM), M.A. Trinidad (Univ. Guanajuato), J. Cantó (IA-UNAM), L. Hernández (IA-UNAM), J.F. Gómez (IAA-CSIC), G. Garay (Univ. Chile), G. Anglada (IAA-CSIC)

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Cepheus A es una región de formación estelar de alta masa muy compleja, que contiene un cúmulo de estrellas en formación, un flujo molecular multipolar y maseres de agua muy intensos. Para estudiar esta región compleja hemos llevado a cabo observaciones de muy alta resolución angular a varias frecuencias y durante varias épocas. En esta reunión presentaré resultados recientes de este estudio de monitoreo que estamos llevando a cabo con el VLA y de observaciones también recientes con el SMA. En particular, presentaré los resultados que muestran evidencia de un sistema chorro+protoestrella+disco asociado a la estrella de alta masa en formación HW2. Estos resultados apoyan la idea de que las estrellas masivas (por lo menos hasta 15 masas solares) se forman por colapso gravitacional.

IRAS 20343+4129, a puzzling massive star-forming region

R. Estalella (Univ. Barcelona), A. Palau (Univ. Barcelona), P.T.P. Ho (CfA), Henrik Beuther (CfA)

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IRAS 20343+4129 is a massive protostar candidate, at a distance of 1.4 kpc, displaying strong dust and CO emission from single-dish observations. Two IR sources lie inside the IRAS ellipsoid error: IRS 1 and IRS 3. We carried out 1.3 mm continuum and CO (2-1) observations with the SMA. A high-velocity bipolar outflow in the EW direction is detected clearly associated with IRS 1, the most embedded source in the region. Weak dust continuum emission is found toward IRS 1, with a mass of 0.2–0.5 M_{\odot} . These results suggest that IRS 1 is not a high-mass YSO, but an intermediate Class I source. The strongest dust condensations are associated with low-velocity extended gas and H₂ emission features at both sides of IRS 3. This suggests that dust is associated with the walls of an expanding cavity which could be produced by a stellar wind from IRS 3, or driven radiatively if we assume that IRS 3 is a B2 star. Globally, we found objects with different evolutionary stages that have been born in the same parental cloud. Their distribution seems to be determined by the cloud initial conditions and with triggering by a shock front driven by IRS 3.

Rotating Structures in Massive Young Stellar Objects

Maite Beltrán (Univ. Barcelona)

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I will report on the detection of four rotating massive toroids in two high-mass star-forming regions: G24.78+0.08 and G31.41+0.31. The toroids are perpendicular to known bipolar outflows and turn out to be unstable but long lived. The inferred accretion rates onto the embedded (proto)stars are high enough to support non-spherical accretion as a viable mechanism to form high-mass stars.

Modelización de la emisión radio de amoníaco en protoestrellas de alta masa

M. Osorio (IAA-CSIC), G. Anglada (IAA-CSIC), S. Lizano (CRyA-UNAM), P. D'Alessio (CRyA-UNAM)

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Se presenta un modelo para reproducir la distribución espectral de energía y la emisión de amoníaco del núcleo molecular caliente en G31.41+0.31, que presumiblemente alberga un estrella masiva en formación. En nuestro modelo el núcleo caliente es una envoltura en colapso sobre una estrella masiva que esta sufriendo una intensa fase de acreción. Para la envoltura se supone un modelo dinámico con el cual se ajusta la distribución espectral de energía y se determinan las distribuciones de densidad, velocidad y temperatura. Para estas distribuciones se calcula la emisión de amoníaco y se compara con observaciones de alta resolución angular con el VLA. Se encuentra que para reproducir la emisión observada se necesita una abundancia de amoníaco variable a lo largo de la envoltura, que resulta de la sublimación de moléculas de amoníaco contenidas en mantos de hielo en la superficie de granos de polvo.

The IRAM observatory and the 30-m telescope at Pico Veleta

H. Ungerechts (IRAM, Granada)

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An overview of the current capabilities of the 30-m telescope, recent developments, and results.

Radioastronomy at Robledo de Chavela Space Station: Host-Country time and PARTNeR

O. Suárez (LAEFF/INTA), O. Morata (LAEFF/INTA), O. Alles (LAEFF/INTA), C. García Miró (MDSCC, NASA/INTA), E. Moll (MDSCC, NASA/INTA), J.F. Gómez (IAA, CSIC)

`olga@laeff.inta.es`

The “Madrid Deep Space Communication Complex” (MDSCC), located in Robledo de Chavela (40 km west of Madrid), is one of the three tracking stations comprising the Deep Space Network (DSN) of JPL-NASA. There are five antennas at the station (one 70-m and four 34m antennas). These DSN stations are mainly devoted to the operation of interplanetary spacecraft launched by NASA and other space agencies. However, 3% of the antenna time at MDSCC is reserved for Spanish astronomers, to carry out radio astronomy observations, via the Host Country agreement. This time is managed by the “Laboratorio de Astrofísica Espacial y Física Fundamental”, (LAEFF) of INTA. One of the 34-m antennas, DSS-61, is devoted 100% of the time to the PARTNeR program. This educational project aims to approach Radio Astronomy (and science in general) to society, giving the opportunity to high school and university students to perform remote Radio Astronomy observations from their educational centers.

Very Long Baseline Interferometric Observations at Madrid Deep Space Communication Complex - MDSCC

C. García Miró, E. Moll (MDSCC, INTA/NASA)

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The Deep Space Network (NASA/JPL) antennas are among the most sensitive radio telescopes in the world and their contribution to the VLBI Networks is greatly appreciated. In this talk we will summarize the VLBI activities in which the Deep Space Stations in Spain, and in particular the MDSCC Complex in Robledo de Chavela, have been involved since the beginnings of this observational technique. The Robledo participation in High Sensitivity VLBI Observations has recently required important technical upgrades in the Complex. Our current goal is the participation in e-VLBI observations and in the e-EVN Project.

I. The Long Wavelength Array (LWA)

II. Radio Supernovae

[Invited]

K.W. Weiler (NRL)

Kurt.Weiler@nrl.navy.mil

I. The Long Wavelength Array (LWA)

The greatest discoveries in astronomy have accompanied technological innovations that have opened new windows of the electromagnetic spectrum. One of the last poorly explored regions lies between 100 MHz and the ionospheric cutoff at 10 MHz. In the last, variations in the ionosphere have limited ground-based instruments to small (< 5 km) apertures and hence relatively primitive angular resolution and sensitivity. Ever-increasing computing power combined with new wide-angle imaging algorithms, self-calibration techniques and angle-dependent calibration schemes, make it possible to overcome this restriction. With these advantages, the 74 MHz observing system at the VLA has elegantly demonstrated that connected element interferometry at low frequencies no longer needs to be limited by the ionospheric barrier.

Based on this success, new instruments such as the Long Wavelength Array (LWA), and further refinements to the calibration methods such as modeling gradients in the total electron count of the ionosphere, are now being developed. The LWA will be a very large-aperture (400 km) instrument located on the Plains of San Augustin in New Mexico, designed to meet specific scientific needs such as Cosmic Evolution research, and to build on the highly successful 74 MHz science already being done at the nearby VLA. A demonstration array (LWDA) is being built by the Southwest Consortium (SWC) with the cooperation of NRAO to test components and to further demonstrate the complementary nature of a LWA instrument with the VLA.

II. Radio Supernovae

The study of radio emission from extragalactic supernovae has resulted in the detection of a few tens of examples of Type Ib/c and Type II SNe of various sub-classes. No Type Ia supernova has ever been detected in the radio. Approaching 200 SNe of all types and sub-types have been studied without detection over the same interval.

Out of this extensive study of the radio emission from supernovae, several general observations can be made: (1) Type Ia SNe are not radio emitters to the detection limit of the VLA; (2) Type Ib/c SNe are radio luminous with steep spectral indices (generally, spectral index < -1) and a fast turn-on/turn-off, usually peaking at 6 cm near or before optical maximum; (3) Type II SNe (with various optically determined sub-types) show a range of radio luminosities with flatter spectral indices (generally, spectral index > -1) and a relatively slow turn-on/turn-off, usually peaking at 6 cm significantly after optical maximum; and (4) At least some type Ib/c SNe are related to the “soft-slow” subclass of gamma-ray bursters (GRBs).

From the radio data it is possible to classify the properties of supernovae and to develop and test models for the radio emission which match the light curves. Among the results of this work are estimates of the density and structure of the circumstellar material, the density evolution of the presupernova stellar wind, and insight into the last stages of stellar evolution before the explosion.

Structures and expansions of SN 1993J and SN 2004et

I. Martí-Vidal (Univ. Valencia), J.M. Marcaide (Univ. Valencia), A. Alberdi (IAA-CSIC)

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Radio emission has been detected from a small subset of supernovae. For those radiosupernovae that are strong radio emitters and are not too distant (≤ 20 Mpc) VLBI observations have been performed and, in some cases, high angular resolution images obtained. Thanks to VLBI observations, source structures and expansion decelerations have been determined and density profiles of both supernova ejecta and circumstellar medium characterized. We report on VLBI observations of SN 1993J and SN 2004et. In the case of supernova SN 1993J, the details of the expansion have been determined with astonishing detail. In the case of SN 2004et, the last radio supernova imaged with VLBI, some considerations about the physical conditions in which this supernova evolves can be made.

Evolution of SN 2000ft in the luminous infrared galaxy NGC7469

A. Alberdi (IAA-CSIC), L. Colina (IEM-CSIC), J.M. Torrelles (ICE, CSIC-IEEC), N. Panagia (Space Telescope Institute), A. Wilson (Univ. Maryland), et al.

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SN 2000ft is the first radio supernova detected in the circumnuclear starburst of a luminous infrared Seyfert 1 galaxy. It is located at a distance of 600 pc of the QSO-like nucleus of NGC 7469. We report the temporal evolution of SN 2000ft during the three years after its discovery. Although SN 2000ft has exploded in the dusty and very dense environment that exists in the nuclear regions of luminous infrared galaxies, it shows the radio evolution properties characteristic of radio supernovae identified as type II supernova, aside from some foreground free-free absorption. The peak luminosity and circumstellar matter opacity of SN 2000ft are similar to other compact radio sources detected in luminous infrared galaxies such as NGC 6240, Arp 299 and Arp 220, and identified as type II supernovae.

The supernova rate in Luminous and Highly-Luminous IR Galaxies

M.A. Pérez-Torres (IAA-CSIC) A. Alberdi (IAA-CSIC), L. Colina (IEM-CSIC), J.M. Torrelles (ICE, CSIC-IEEC)

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We started some time ago a radio monitoring of six highly luminous infra-red galaxies (HLIRGS; $11 \leq \log(L_{fir}/L_{sun}) \leq 12$) at 8.4 GHz using the VLA, with the main goal of determining the supernova and star-forming rates in the circumnuclear regions of this relevant class of galaxies, where a starburst and/or an AGN exist. More recently, we have also embarked ourselves into a multi-wavelength extension of such studies to lower luminosity infra-red galaxies (LIRGS; $10 \leq \log(L_{fir}/L_{sun}) \leq 11$) using the VLA at 8.4 GHz, MERLIN at 21 cm (HI observations), the SMA at 345 GHz (CO observations), and Chandra X-ray observations. We will give an account of the motivations and expectations from our LIRG and HLIRG studies, and present preliminary results of our HLIRG monitoring with the VLA.

Estudio de envolturas circunestelares de estrellas AGB y post-AGB tempranas

A. Castro-Carrizo (IRAM, Grenoble)

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Un estudio detallado y sistemático de las envolturas circunestelares (CSEs) de estrellas AGB y post-AGB tempranas se está llevando a cabo con el interferómetro milimétrico situado en Plateau de Bure (Francia) y el telescopio de 30m de Pico Veleta (España), pertenecientes a IRAM. Estamos cartografiando con una resolución inferior a $1''$ la emisión de las transiciones rotacionales CO J=2-1 y 1-0 en un total de 46 estrellas. La muestra se ha seleccionado teniendo en cuenta la gran diversidad de estos objetos, en cuanto a la química, tipos de variabilidad, etc. Los mapas obtenidos hasta el momento evidencian una gran variedad de estructuras circunestelares: anillos/arcs concéntricos, chorros colimados eyectados a gran velocidad, CSEs alargadas, asimetrías diversas en las regiones circunestelares más internas, halos, fragmentación, etc. Los primeros ajustes con modelos nos permiten derivar la morfología, cinemática y condiciones de excitación de las CSEs, así como parámetros clave en la formación de las mismas.

Observaciones radio de discos y jets en regiones de formación estelar

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Presentamos algunos resultados acerca de las propiedades de discos y jets asociados con objetos estelares jóvenes, obtenidas a partir de observaciones interferométricas de alta resolución angular. En particular, mencionaremos algunos resultados en relación a la formación de sistemas binarios.

SMA observations of magnetic fields around star forming regions

J. M. Girart (ICE, CSIC-IEEC), R. Rao (Submillimeter Array, Hilo, Hawaii), D. A. Marrone (CfA)

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We present recent results of polarized dust continuum emission towards star forming regions obtained with the Submillimeter Array (SMA) at 345 GHz. In particular, we will talk about the magnetic field, derived from the polarized dust emission observations, around the Class 0 protostellar binary system NGC 1333 IRAS 4A: at the scales traced by the SMA (300 AU) the field resembles the hour glass shape that is predicted by the standard models of a contracting molecular core. We will discuss the observed properties of the magnetic field and compare them with the theory.

La estructura interna de las condensaciones pre-estelares

M. Tafalla (OAN, IGN), J. Santiago (OAN, IGN), P. Myers (CfA), P. Caselli (CfA), C.M. Walmsley (Osservatorio Astrofisico di Arcetri), A. Crapsi (Leiden Observatory)

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Las condensaciones densas en nubes moleculares cercanas como Taurus y Auriga son las regiones de formación estelar más simples que conocemos, y en ellas, estrellas como el Sol se han estado formando durante el último millón de años. Por su simplicidad y cercanía, las condensaciones densas nos proporcionan la imagen más detallada de las distintas fases en la formación de una estrella, y en particular, nos permiten estudiar las condiciones anteriores al inicio del colapso gravitacional. Gracias a la combinación de observaciones en continuo y líneas moleculares a longitudes de onda milimétrica, el estudio de las condensaciones densas pre-estelares ha avanzado enormemente en los últimos años. Ahora sabemos que la mayoría de las condensaciones densas tienen una estructura física simple pero presentan una composición química inhomogénea debido a que gran parte de las moléculas se pegan a los granos de polvo en las zonas más densas y desaparecen de la fase gaseosa. Como la emisión molecular es crítica para determinar las condiciones físicas y la cinemática de las condensaciones densas, es necesario estudiar de forma autoconsistente las propiedades físicas y químicas del gas. En esta contribución, presentaré el resultado de un estudio detallado de dos condensaciones densas en la nube molecular de Taurus que combina observaciones en líneas y continuo milimétrico con un cálculo detallado del transporte radiativo. Este trabajo ha dado lugar a los primeros modelos autoconsistentes de la estructura interna de condensaciones pre-estelares.

Evidence for transient clumps in dense cores of molecular clouds

O. Morata (LAEFF/INTA), J.M. Girart (ICE, CSIC-IEEC), R. Estalella (Univ. Barcelona)

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After several years of work, we have found strong evidence - both observational and theoretical - that molecular clouds are clumpy on a scale that is normally unresolved and that most of these clumps simply dissipate into an interclump medium on a timescale on the order of 1-2 Myr. We have studied the small-size structure of the cores found in the regions L673 and HH 43 using different molecular transitions at moderate angular resolution with the FCRAO telescope and combining them with interferometric high angular resolution observations made with BIMA. We found that the clumpy structure detected with the BIMA telescope in L673 was real. We found a total of 15 clumps in our data cube, all of them resolved in our angular resolution, with diameters between 0.03 - 0.09 pc, masses between 0.03 and 0.036 solar masses, and densities between 0.6 and $4.6 \times 10^4 \text{ cm}^{-3}$. These results suggest that the region around the starless core of L673 is constituted by a heterogeneous medium of condensations, of various densities and at various stages of chemical evolution. We will show some preliminary results on the study of HH 43, which also seems to have a clumpy structure.

Wednesday, May 10

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09:30	10:15	Invited	e-VLBI	DIAMOND
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10:30	11:45	Oral	Interferometric Observations of the Cosmic Microwave Background	RUBIÑO
10:45	11:00	Oral	Anomalous microwave emission in the Galaxy: the role of hydrogenated fullerenes	IGLESIAS-GROTH
11:00	11:30	Break		
11:30	12:15	Invited	The Square Kilometre Array	SCHILIZZI
12:15	12:30	Oral	Very high precision VLBI astrometry of the S5 polar cap sample sources	MARTÍ-VIDAL
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12:45	13:00	Oral	The microquasar LS 5039, from radio to VHE gamma-rays	RIBÓ
13:00	13:15	Oral	Physical conditions and molecular chemistry in the Galactic Center	N. RODRÍGUEZ
13:00	13:15	Oral	Nuclear rings in non-barred galaxies	KNAPEN
13:30	15:00	Lunch		
15:00	15:40	Invited	Proper Motions of Gas and Stars in the Galaxy	L.F. RODRÍGUEZ
15:40	16:00	Oral	The motion of wind-driven shells	CANTÓ
16:00	16:15	Oral	Cygnus X-3 and its ejecta: do we see hot spots?	MARTÍ
16:15	16:45	Break		
16:45	19:00	DEBATE	Horizons for the Spanish Radioastronomy	PANEL

e-VLBI*[Invited]*

P. Diamond (Jodrell Bank)

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The recent revolution in the telecommunications industry has fueled a related revolution in radio astronomy: it has enabled the realisation of high bandwidth data transmission and thereby is transforming the science that is possible with radio interferometry. I shall discuss the recent technical advances that make projects such as e-MERLIN and e-VLBI possible, I will also highlight the science that will shortly emerge from these instruments.

Observational results on Galactic anomalous microwave emission

R. Rebolo (IAC & CSIC), J.A. Rubiño (IAC), and the COSMOSOMAS team

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The correlation of high galactic latitude data from various CMB experiments with maps of dust thermal emission provides increasing evidence for a new dust-correlated Galactic emission process in the frequency range 10-60 GHz. The two radiometers of the COSMOSOMAS experiment of the IAC measured a high galactic latitude sky region of 6000 square degrees with a resolution of ~ 0.9 degrees at four independent frequencies in the range 11-17 GHz suitable to trace this so called "anomalous" emission. Maps with average sensitivity per beam of ~ 50 microK have been obtained. We discuss the contribution of CMB, synchrotron, free-free and unresolved extragalactic radiosources to these maps. Clear evidence is found for a dust correlated microwave emission component in the COSMOSOMAS data. The spectral energy distribution of this component is consistent with predictions for electric dipole radiation of spinning dust. Future CMB missions like Planck will have to consider this new galactic emission process if primordial anisotropies are to be measured with microK precision.

Interferometric Observations of the Cosmic Microwave Background

J.A. Rubiño (IAC), R. Rebolo (IAC & CSIC)

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The status of CMB anisotropy observations using centimeter-wavelength interferometers is reviewed with emphasis on the results obtained with the Very Small Array, a 14-elements interferometer located at Teide Observatory (Tenerife). A description of the VSA observations of primordial CMB fluctuations will be presented, and the constraints imposed on the parameters describing the cosmological model (curvature of the Universe, baryon content, dark matter and dark energy) and the inflationary epoch (slope of the primordial spectrum, running spectral index) will be discussed. In addition, we review the Sunyaev-Zeldovich observations obtained with this interferometer both in clusters of galaxies, and more important, in supercluster scales. Numerical simulations predict that an important fraction of the baryonic mass in the local Universe should be found in a phase called "warm/hot diffuse gas", with temperatures within 10^5 to 10^7 K, although there is no clear detection of this baryonic component to date. We have used Sunyaev-Zeldovich effect observations to trace the presence of these missing baryons.

Anomalous microwave emission in the Galaxy: the role of hydrogenated fullerenes

S. Iglesias-Groth (IAC)

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We investigate the potential of hydrogenated forms of fullerenes as carriers of the the anomalous microwave emission recently detected in our Galaxy by several Cosmic Microwave Background experiments. This dust-correlated microwave emission is observed in the range 10-50 GHz with a spectral energy distribution inconsistent with that of classical foreground emission processes: synchrotron, free-free or vibrational dust emission. We compute the rotation rates and electric dipole emission of hydrogenated icosahedral fullerenes (single and multishell fullerenes) in various phases of the interstellar medium. Using the formalism of Draine & Lazarian for the rotational dynamics of these molecules. We find effective rotation rates in the range 5-70 GHz with a trend toward lower rotational frequency as the radius of the molecule increases. Owing to the moderately polar nature of the CH bond, fullerenes are expected to have a net dipole moment and produce electric dipole radiation. Adopting the same size distribution and abundances proposed for fullerenes in the study of the UV extinction bump, we predict the dipole electric emission of mixtures of fullerenes for various levels of hydrogenation. We find good agreement with the observations. Hydrogenated fullerenes could be the carriers of the diffuse anomalous microwave emission recently detected by the COSMOSOMAS and WMAP experiments at high galactic latitude. Results are also presented for several individual molecular cloud complexes where the spectral energy distribution of this anomalous emission has been measured in detail.

The Square Kilometre Array

[Invited]

R. Schilizzi (International SKA Project Office)

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The Square Kilometre Array (SKA) is a global project to design and build a new generation radio telescope at metre to centimetre wavelengths. It will have a collecting area of order one million square metres spread over at least 3000 km, a sensitivity 50 times higher than the current most sensitive interferometer, an instantaneous field of view (FOV) of several tens of square degrees and the possibility of more than one FOV allowing multiple simultaneous use. It will be an extremely powerful survey telescope with the capability to follow up individual objects with high angular and time resolution. The SKA science impact will be felt in astro-particle physics and cosmology, fundamental physics, galactic and extragalactic astronomy, and solar system science. Technological innovation, closely paralleling commercial IT developments, is key to the design concepts under investigation and to the target cost of 1 billion Euros. Data transport rates are likely to be in the range of tera-bits/sec, with Pflops capacity required for the central processor. Much of the required technology is being developed in the course of the construction of several 1Pathfinder instruments. The final system design is planned from 2008 to 2010. Four possible locations for the telescope are under evaluation with a final choice expected in 2008. Construction of the array will take most of the next decade.

Very high precision VLBI astrometry of the S5 polar cap sample sources

I. Martí-Vidal, J.M. Marcaide, J.C. Guirado (Univ. Valencia)

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We report on the first astrometric analysis of the thirteen extragalactic radio sources of the complete S5 polar cap sample at 15.4 GHz. We will describe new algorithms developed to facilitate the use of differential phase delay in global astrometric observations. From this global fit, we obtain preliminary estimates of source positions with precisions that range from 50 to 100 μ as.

GMRT search of radio counterparts of highly variable gamma-ray sources

J.M. Paredes (Univ. Barcelona), J. Martí (Univ. Jaén), D.F. Torres (ICE, Univ. Autónoma Barcelona), G.E. Romero (Inst. Argentino de Radioastronomía; Facultad Ciencias Astronómicas y Geofísicas, UNLP, Argentina), J.A. Combi (Univ. Jaén), V. Bosch-Ramon (Univ. Barcelona), C.H. Ishwara-Chandra (NCRA, TIFR Pune), A.J. Muñoz-Arjonilla (Univ. Jaén), J.R. Sánchez-Sutil (Univ. Jaén)

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We have carried out with the GMRT interferometer multi-epoch observations at 21 cm wavelength of a selected sample of the most variable unidentified EGRET sources in the galactic plane, with pointings being separated within time scales of months. Several variable radio sources have been discovered in most fields whose flux density has changed more than 30% amplitude in time scales of months. So far, the observed variability makes these objects so far the best candidate radio counterparts to the EGRET sources. If radio emission and γ -rays are produced in a jet-like source, as we have modelled theoretically, then both types of radiation should appear variable in time and correlated.

The microquasar LS 5039, from radio to VHE gamma-rays

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The microquasar LS 5039 has been extensively studied since its discovery six years ago. It is the first of such sources exhibiting emission from radio wavelengths to very high energy gamma-rays. I will present an overview of the multiwavelength source properties together with the most recent observational results. In particular, I will focus on a recent VLA multifrequency monitoring that reveals moderate variability, apparently uncorrelated with the orbital period, and a persistent optically thin radio spectrum. The radio jets of LS 5039 are different from the partially self-absorbed jets with flat spectral index detected in other microquasars.

Physical conditions and molecular chemistry in the Galactic Center

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I will present recent results on the study of the neutral and ionized gas in the the central 400 pc of the Galaxy. The widespread emission observed by ISO in the fine structure lines of ionized atoms like O, N, C, S, Si and Ne indicates the presence of a diffuse component ionized by a UV radiation field with an effective temperature of $\sim 30,000$ K (Rodríguez-Fernández & Martín-Pintado 2005). The observations of the fine structure lines have also allowed us to quantify the effect of the UV radiation on the heating of the neutral gas. The neutral gas heated in Photon-Dominated Regions (PDR) amounts at most to 30% of the total column density of warm gas as derived from direct observations of the warm H₂ (Rodríguez-Fernández et al. 2004). The bulk of the gas should be heated by mechanical processes like shock waves. Shocks are also required to explain the widespread large abundances of complex organic molecules like methanol and refractory molecules like SiO. I will also present a recent survey to study the kinematics of the dense gas and I will discuss the implications on the possible origin of the shocks (Rodríguez-Fernández, Combes & Martín-Pintado, submitted).

Nuclear rings in non-barred galaxies

J. H. Knapen, E. Brinks (Univ. Hertfordshire)

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Nuclear rings occur in around one-fifth of local spiral galaxies, and are important tracers of both the galactic dynamics and the star formation processes occurring in the central regions. By far most nuclear rings occur in barred galaxies, and the origin, evolution, and properties of the rings can be explained very well within a framework of bar-induced dynamical processes. A small number of nuclear rings, however, occur in galaxies which have no trace of a bar, and may result from asymmetries in the gravitational potential of the host galaxy due to, e.g., a weak oval distortion, a historical bar which has now disappeared, or a past interaction event. Such an interaction might leave traces in the form of counter-rotating gas and stars in the nuclear regions, and/or distortions in the HI outskirts of the host galaxy. We illustrate this discussion with optical imaging and HI radio interferometry from the WSRT and the VLA for two galaxies, NGC 278 and NGC 7217, which shows how in the former case we indeed see evidence for a past minor merger from distortions in the HI data, but how, in contrast, in the latter case the HI retains regular morphology and kinematics across the complete disk.

Proper Motions of Gas and Stars in the Galaxy

[Invited]

L.F. Rodríguez (CRyA-UNAM)

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There are some advantages in getting old. One of them is that you can use your old data to search for proper motions by comparing with new observations of the same object. I will present radio results of proper motions of gas and stars in our Galaxy that allow in some cases the determination of distances and masses and in others a much deeper understanding of the origin and evolution of the source studied. Among the examples presented, I will include the expansion motions observed in planetary nebulae, Herbig-Haro objects and ultracompact H II regions, as well as the accurate distance determinations to young stars in Taurus and the proper motions of young massive stars in Orion that may indicate the merging of two stars in the recent past, only 500 years ago.

The motion of wind-driven shells

J. Cantó (IA-UNAM), A.C. Raga (Instituto de Ciencias Nucleares, UNAM), L. Adame (IA-UNAM)

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We present a method for solving problems in which a stellar wind interacts with the surrounding environment through the production of a “double radiative shock” structure. This condition is generally met in problems involving winds ejected from young stars. We describe a method that can be applied to problems of winds with arbitrary time and angular dependence, interacting with a stationary environment with an arbitrary density distribution. We apply the method to the interaction of: a steady wind (with an instantaneous “turning on”) with a power law environmental density stratification, a “wind-jet” ejection with a toroidal environmental density stratification, and to the interaction of an isotropic wind a clumpy environmental. These three examples illustrates the wide range of possible applications of the proposed method. We also show a comparison between some of our thin shell solutions and 3D isothermal gasdynamic simulations of the flows. These comparisons are used as an evaluation of the applicability of our thin shell solutions to the real flows.

Cygnus X-3 and its ejecta: do we see hot spots?

J. Martí, D. Pérez, P. Luque, J.L. Garrido (Univ. Jaén), J.M. Paredes (Univ. Barcelona), et al.

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We summarize the results of our radio observations of the well known microquasar Cygnus X-3 carried out with the Very Large Array during the latest years, including the most recent ones in 2005. Our main goal has been to study the transient arc-second extended ejecta of this source and its possible interaction with the surrounding interstellar medium (ISM). The possible hot spot nature of two nearby radio sources, symmetrically located with respect to the microquasar and along the jet position angle, is discussed based on the new data available. Complementary near infrared observations, in both narrow and broad-band filters, are also reported.

Thursday, May 11

Start	End	Type	Topic	Speaker
09:30	10:30	Invited	Highest-Resolution Radio Astronomy: The Quest for the Black Hole	ZENSUS
10:30	10:45	Oral	Observations of water masers towards young objects, planetary nebulae and AGNs at the Robledo Space Station	J.F. GÓMEZ
10:45	11:00	Oral	CCS, ammonia and water masers studies in low-mass young stellar objects	DE GREGORIO
11:00	11:30	Break		
11:30	12:30	Invited	Planet Formation Revealed by Submillimeter and Millimeter Radioastronomy	LESTRADE
12:30	12:45	Oral	Accessing to the innermost regions of active galactic nuclei	ROS
12:45	13:00	Oral	Compact relativistic jets and central regions of AGN	LOBANOV
13:00	13:15	Oral	VLBI diagnostics of jet instabilities in 0836+710	PERUCHO-PLA
13:15	13:30	Oral	On the nature of the double radio source MOST J1654.4-4337	COMBI
13:30	15:00	Lunch		
15:00	16:00	Invited	ALMA	MARTÍN-PINTADO
16:00	16:15	Oral	Theoretical aspects of the radio emission in microquasars	BOSCH-RAMÓN
16:15	16:30	Oral	VLA observations of four HI-deficient spirals in the Virgo cluster region	TORIBIO
16:30	16:45	Oral	Distancia a T-Tau con 0.5% de Precisión	TORRES
16:45	17:00	Oral	Catálogo de contrapartidas FIRST a fuentes ULXs / <i>A catalogue of FIRST counterparts to ULXs: Unveiling their nature</i>	D. PÉREZ
17:00	17:15	Oral	Observaciones multiépoca de la región central de L723	CARRASCO
17:15		Closing Remarks		

Highest-Resolution Radio Astronomy: The Quest for the Black Hole

[Invited]

A. Zensus (MPIfR)

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Radio observations with Very Long Baseline Interferometry provide the highest resolution in astronomy. Combining earth-bound with space-based telescopes and advancing the observations to mm-wavelengths increases the resolution even further. These methods enable us to probe directly the vicinities of the presumed central black holes in active galactic nuclei and the powerful jets emanating from these objects. This talk aims at providing a review of the results in this exciting research domain and discusses the opportunities for future work possible with the advent of new instrumental developments.

Observations of water masers towards young objects, planetary nebulae and AGNs at the Robledo Space Station

J.F. Gómez (IAA, CSIC), O. Suárez (LAEFF-INTA), I. de Gregorio-Monsalvo (LAEFF-INTA), C. García-Miró (MDSCC INTA/NASA), E. Moll (MDSCC INTA/NASA), T.B.H. Kuiper (JPL, USA)

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The 70m antenna at NASA's Deep Space Station in Robledo de Chavela is being regularly used to carry out molecular line observations at 1 cm. In this range, it is one of the most sensitive radio telescopes in the world. In this talk, we will show the results of several systematic surveys for water maser emission towards different types of objects, which have been complemented with subsequent interferometric observations. In a search for this emission in Bok globules, we have detected 6 new water masers, while only 3 cases were known in such globules before our work. In the sources for which its morphology could be determined, maser emission seems to trace collimated jets. A search for planetary nebulae allowed us to detect the second water maser known in this type of objects (IRAS 17347-3139). We have also participated, together with the Canberra Station, in the SAMBA project (lead by SAO), a search for megamasers in AGNs. This survey has yielded a total of 15 new detections in Seyfert 2 and LINERS.

CCS, ammonia and water masers studies in low-mass young stellar objects

I. de Gregorio-Monsalvo (LAEFF/INTA), J.F. Gómez (IAA-CSIC), C.J. Chandler (NRAO, Socorro), O. Suárez (LAEFF/INTA), T.B.H. Kuiper (JPL), J.M. Torrelles (ICE, CSIC-IEEC), G. Anglada (IAA-CSIC), L.F. Rodríguez (CRyA, UNAM), E. Jiménez-Bailón (RSSD-ESA, Madrid), C. García-Miró (MDSCC, INTA/NASA), E. Moll (MDSCC, INTA/NASA)

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In this talk we present a sensitive and systematic CCS survey (complemented with ammonia observations) at 1 cm, toward a sample of low-mass young stellar objects known to harbor water maser emission, using the NASA's 70 m antenna at Robledo de Chavela, Spain. We have used the properties of these molecules as tools for obtaining information about the physical conditions and stage of the evolution of low-mass young stellar objects. Our main purposes were to search for the youngest protostars and to find the best candidates to perform interferometric CCS, ammonia and water masers observations, in order to study at higher resolution the structure, kinematics and physical properties of star-forming regions. In addition, we show VLA high-resolution observations in CCS, ammonia and water masers towards the Class 0 source B1-IRS. Three different clumps were detected, whose kinematical pattern is interpreted as gas interacting with the molecular outflow that exists in the region. In these observations we have observed for the first time a spatial anticorrelation between CCS and ammonia at scales of $\simeq 5''$.

Planet Formation Revealed by Submillimeter and Millimeter Radioastronomy

[Invited]

J.-F. Lestrade (Obs. Paris)

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Dusty and gaseous protoplanetary disks in Keplerian rotation around pre-main-sequence stars, grain growth within these disks and fully mature belt of debris left around main-sequence-stars have been revealed by observations in the submillimeter and millimeter. These observations are fairly consistent with the core-accretion model sketched by Safronov for planetary formation. However, the short time scale required to build a Jupiter-mass planet in less than 10 Myr before the gas has been blown out is still a major issue in this theory. The alternative model of planet formation by gravitational instabilities is not ruled out. We shall review the prospect offered by ALMA and Herschel to clarify this issue at the root of our understanding of how planets have formed in the Solar System and elsewhere.

Accessing to the innermost regions of active galactic nuclei

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The intensive monitoring of radio sources via very-long-baseline interferometry observations in total intensity and polarization (e.g., 2cm VLBA Survey and its extension, MOJAVE) yields a general view of the nature of active galactic nuclei (AGN), and to study the relativistic jets in detail. The knowledge on the ejection of new superluminal components and the kinematics of those along the relativistic jets is now consolidated in a large data base. This, together with new studies of the X-ray light curves and spectra (e.g., 3C 120 and NGC 1052) provides new clues on the relationship between the changes in the accretion flows at the AGN disc, probed by X-rays, and the kinematical behaviour of the relativistic flows. I will present recent results and ongoing multi-wavelength observations on this field. Beyond this concrete aspect, I will address some developments in the field of high resolution radio interferometry from the technical aspects and towards the new instrument for the next decade, the Square Kilometre Array.

Compact relativistic jets and central regions of AGN

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Compact relativistic jets can be used for probing physical conditions in the immediate vicinity of the central engine of AGN. Continuum emission from the jet plasma can also excite optical broad-line emission in the subrelativistic outflow surrounding the jet. Recent results connecting manifestations of the jet activity to basic properties of AGN will be discussed in this contribution.

VLBI diagnostics of jet instabilities in 0836+710

M. Perucho, A. Lobanov (MPIfR)

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We present the results from multi-epoch VLBI observations of the jet in 0836+710 aimed at studying structures generated by the growth of Kelvin-Helmholtz instability in the jet. We present fits to the ridge lines, discuss pattern motions arising from the evolution of the helical modes of the instability and derive basic physical parameters of the jet. This information will be further analysed with detailed 3D-RMHD numerical simulations based on the observational results.

On the nature of the double radio source MOST J1654.4-4337

J.A. Combi (Univ. Jaén; Inst. Argentino de Radioastronomía), G.E. Romero, P. Benaglia (Inst. Argentino de Radioastronomía; Facultad Ciencias Astronómicas y Geofísicas, UNLP, Argentina), M. Sugizaki (Stanford Linear Accelerator Center)

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We report the discovery of two unidentified X-ray sources within the radio contours of the double source MOST J1654.4-4337, listed in the Molonglo Galactic Plane Survey (MGPS). We study the multi-wavelength properties of this double X-ray/radio system in order to unveil its physical nature. The low X-ray absorption column densities measured on the line of sight to the sources are similar, indicating that both sources are nearby and, possibly, physically associated. The radio source has an elongated structure aligned in the same direction of the X-ray sources and it is also positionally coincident with a strong infrared source. Based on the gathered multi-wavelength information, we suggest that the radio/X-ray sources might be associated with the termination shocks of jets produced by a young stellar object.

ALMA

[Invited]

J. Martín-Pintado (DAMIR-CSIC)

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The Atacama Large Millimeter Array (ALMA) is an international collaboration between Europe and the North America to build a synthesis radio telescope. ALMA will consist of 50 12 meter antennas operating at millimeter and submillimeter wavelengths between 30 and 900 GHz. ALMA is being built at the Chajnantor altiplateau in Chile, 5.000 metres above sea level. Japan has recently joined the ALMA enhancing the project by providing the Atacama Compact Array, several 12 meter antennas and receivers for some bands. ALMA will produce images of the dust continuum emission and of spectral lines with unsurpassed angular resolution and sensitivity of the cold regions of the Universe, which are dark in the optical. ALMA will make fundamental contributions to the understanding a great variety of fundamental processes, like planet and star formation and the formation and evolution of galaxies and galaxy clusters in the early Universe. I will summarize the main capabilities of ALMA and present some examples of the kind of science that ALMA will allow the astronomical community to address. I will also discuss the importance of an early involvement of the Spanish groups in the development of ALMA to make an efficient exploitation of this instrument during its construction phase.

Theoretical aspects of the radio emission in microquasars

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Non thermal radio emission from microquasars, which are X-ray binaries presenting relativistic jets, can be originated in different regions basically associated to these jets. The mechanism behind such radiation is of the synchrotron type, and this can occur in the inner compact regions of the microquasar jets, in the more extended parts of these structures, or in ejections or blobs effectively detached from the central object which powers these outflows. I will briefly present the main characteristics of the different theoretical models to explain radio emission, commenting also on the consequences of such models at higher energies.

VLA observations of four HI-deficient spirals in the Virgo cluster region

M.C. Toribio (Univ. Barcelona), J.M. Uson (NRAO, USA), J.M. Solanes (Univ. Barcelona), E. Salvador-Solé (Univ. Barcelona)

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We present preliminary results of the analysis of neutral hydrogen properties of four gas-deficient spiral galaxies based on deep 21-cm imaging with the VLA. The galaxies, NGC 4307, NGC 4356, NGC 4411B, and NGC 4492, belong to the Virgo cluster region and their most probable Tully-Fisher distances inferred from the literature suggest that they are all likely located on a probable background group well behind M87. Previous one-dimensional HI data from these probable peripheral spirals indicate that they have gaseous deficiencies comparable in strength to those measured in the centers of Virgo and other rich galaxy clusters. In case their actual distances were confirmed, that would reinforce the idea that galaxies fall into clusters already preprocessed. We expect that these observations can help us to identify the physical process(es) behind the HI deficiency of galaxies located in cluster regions, as well as to gain further insight into the connection between the properties of galaxies and their environment.

Distancia a T-Tau con 0.5% de Precisión

R.M. Torres (CRyA, UNAM), L. Loinard (CRyA, UNAM), A. Mioduszewski (NRAO, Socorro), L.F. Rodríguez (CRyA, UNAM)

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Haciendo observaciones multi-época con el VLBA a una longitud de onda de 3.6 cm, se ha determinado el paralaje trigonométrico de T Tauri Sur (Loinard et al. 2005) con muy alta precisión (0.5%). Es posible obtener una precisión de hasta 10% para fuentes a 2 kpc con sólo 6 observaciones. Debido a lo anterior, se extendió el proyecto para obtener paralajes trigonométricos muy precisos para otras 7 estrellas jóvenes: 4 en Tauro y 5 en Rho-Ophiuchus, con observaciones cada 3 meses durante un año y medio. Con estas fuentes será posible obtener una estimación de la distancia promedio al complejo de Tauro y la nube de Rho-Ophiuchus, las dos regiones de formación estelar de baja masa más cercanas. Dado que mucho de lo que conocemos acerca de las regiones de formación estelar jóvenes es derivado de las observaciones de estas regiones, la precisión de la distancia a estos complejos será de gran impacto para estudios de formación estelar.

Catálogo de contrapartidas FIRST a fuentes ULXs / *A catalogue of FIRST counterparts to ULXs: Unveiling their nature*

D. Pérez-Ramírez, J.R. Sánchez Sutil, A. Muñoz, J. Martí, J.L. Garrido, P. Luque (Grupo de Investigación FQM-322, Univ. Jaén)

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Las fuentes X ultraluminosas (ULXs) aparecen hoy como un fenómeno bastante común. Detectadas en varias galaxias cercanas como fuentes extranucleares emisoras en rayos X, sus luminosidades aparecen a menudo en exceso de órdenes de hasta $\sim 10^{39}$ erg s⁻¹. Sin embargo, aunque su existencia ha sido observacionalmente establecida, su naturaleza física es aún incierta. Se han establecido diversas hipótesis acerca del objeto detrás de estas manifestaciones tan energéticas, barajándose como posibles candidatos desde microblázares a agujeros negros de masa intermedia (IMBH). Presentamos resultados de un trabajo de búsqueda de contrapartidas radio en FIRST a fuentes ULXs localizadas en galaxias cercanas con objeto de intentar establecer su naturaleza física. Basándonos en una identificación sistemática entre los más recientes y extensos catálogos de ULXs y datos de FIRST de archivo, hemos conseguido compilar un catálogo de 70 coincidencias posicionales, la mayor parte de ellas localizadas en la zona nuclear de tales galaxias. De entre esta selección, hemos podido identificar 11 casos no registrados previamente de fuentes que no siendo nucleares muestran radio emisión asociada a emisión X, representando éstos los casos más relevantes y prometedores. Discusiones particulares de algunos de ellos son presentadas.

Ultraluminous X-ray sources (ULXs) represent a common phenomena nowadays. These sources detected in several nearby galaxies appear as extranuclear X-ray emission sources with luminosities in excess of about $\sim 10^{39}$ erg s⁻¹. Although their existence has been observationally well established, their nature remains still controversial. There have been suggested several hypothesis about the nature of the object behind such energetic manifestations, and several candidates have been presented from microblazars to intermediate mass black holes (IMBHs). We present results of a search for FIRST radio counterparts to ULXs located in nearby galaxies in order to constrain and help to establish their physical nature. Based on a systematic cross-identification of the most recent, available and extensive ULXs catalogues and FIRST archival data, we were able to compile a catalogue of 70 positional coincidences, most of them located within the nuclear region of these galaxies. Among the compiled sources, we identify for the first time 11 cases not previously registered. These cases are not nuclear and show radio emission associated with X-ray emission. These particular sources represent for our study the most relevant and promising cases to be analysed. Individual discussion for some of them will be given.

Observaciones multiépoca de la región central de L723

C. Carrasco-González (IAA-CSIC), G. Anglada (IAA-CSIC), L.F. Rodríguez (CRyA, UNAM), J.M. Torrelles (ICE, CSIC-IEEC)

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Presentamos los resultados de un seguimiento realizado con el VLA a 3.6 cm a lo largo de 5 años de los objetos estelares jóvenes en la región central del flujo molecular L723. Los resultados de las observaciones, que alcanzan una resolución angular de 0.3 segundos de arco, muestran variaciones en la estructura de la fuente VLA2, sugiriendo la presencia de dos objetos jóvenes separados entre sí por ~ 80 UA. Estos objetos, que posiblemente constituyen un sistema binario, presentan eyecciones múltiples y en direcciones distintas y son responsables del flujo molecular cuadrupolar observado a gran escala.

Posters

Topic	Author
VLBI studies of the fast scintillating quasar, PKS 1257-326	ALGABA
Synchrotron radio emission from secondary leptons in microquasar jets	BORDAS
Sequential star formation in IRAS 00213+6530	BUSQUET
Nuevos datos sobre la estructura de la radiofuente W80	CERSOSIMO
Proper Motions of the SiO J=1 - 0 Emission Line in the L1448 Molecular Outflow	FERNÁNDEZ CANEL
Madrid Deep Space Communication Complex as Radio Astronomy Observatory	GARCÍA-MIRÓ
A kinematic study of the irradiated collapsing dense core ahead of HH 80N	MASQUE
VLA-D observations of the candidate rare 23.1 GHz methanol maser towards NGC7538	MONTES
Radio-continuum emission from the eta-Carinae nebula	MONTES
PARTNeR: Radio Astronomy for students	MORATA
Interaction and on-going star formation in a closely-packed environment	PALAU
Proyectos de ASAAF-UCM observando con PARTNeR	SÁNCHEZ
Study of water masers in evolved stars with the 70-m Robledo de Chavela antenna	SUÁREZ
1.3 cm Continuum and Water Maser Observations Toward IRAS 20126+4104	TRINIDAD
Radiotelescopio de la Universidad Complutense	ZAMORANO

VLBI studies of the fast scintillating quasar, PKS 1257-326

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Radio emission from cosmic sources is scattered as it passes through the turbulent, ionised interstellar medium (ISM) of the Galaxy. For very compact sources, e.g. pulsars and some quasars, this scattering can produce temporal variations in the measured flux density, known as interstellar scintillations (ISS). Observations of ISS can be used to probe the structure of the turbulent ISM, and in the case of quasars, also to probe source structure on microarcsecond scales. PKS 1257-326 is a flat-spectrum radio and X-ray emitting quasar, or "blazar", at redshift 1.3, which shows large, unusually rapid flux density variations at cm wavelengths that have been shown to be due to ISS. Unlike the (few) other known sources which show such rapid scintillations, PKS 1257-326 has significant extended structure and thus offers a unique opportunity to investigate the structure of a distant quasar jet from kiloparsec to sub-parsec scales.

Synchrotron radio emission from secondary leptons in microquasar jets

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We present a model to estimate the synchrotron radio emission generated in microquasar jets due to secondary pairs created via decay of charged pions produced in proton-proton collisions, which take place between stellar wind ions and jet relativistic protons. The particle energy distribution of the secondaries along the jet is consistently calculated taking into account the energy losses due to synchrotron and inverse Compton processes, as well as adiabatic expansion. Different parameter values are explored and the corresponding spectral energy distributions are presented and discussed. We conclude that secondary leptonic emission represents a significant though hardly dominant contribution to the total radio emission, with interesting observational consequences that might be tested in the future.

Sequential star formation in IRAS 00213+6530

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IRAS 00213+6530 with a $12.9 L_{\odot}$ belongs to the molecular cloud M120.1+3.0 in the Cepheus OB4 star-forming region, at a distance of 850 pc. A molecular outflow was discovered in CO (1-0) and single-dish ammonia observations detected two condensations, one of them centered on IRAS 00213+6530. Two centimeter continuum sources, VLA 9 and VLA 10, are found near the IRAS catalog position. We present the results of VLA 3.6 cm and 7 mm continuum observations, as well as NH_3 (J,K)=(1,1) and (2,2) inversion transition observations toward this low-mass star-forming region. The millimeter continuum observations resolve the centimeter source VLA 10 in two components, that seem to harbor young stellar objects (YSOs) in a different evolutionary stage. In addition, in NH_3 we find evidence of local heating and line broadening in the dense core containing the YSOs.

Nuevos datos sobre la estructura de la radiofuente W80

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La radiofuente catalogada W80 es claramente detectada a frecuencias cercana a 2.6 GHz. La emisión de la radiación continua está localizada alrededor de la coordenada Galáctica G85-0.5 y se extiende en un área de 3° de diámetro. Las imágenes ópticas en la región muestran las nebulosas de Norte América y del Pelicano. Estudios previos sugieren que la región es un objeto único con grumos de densidad electrónica de 9 cm^{-3} , bajo la hipótesis que el objeto está 1.0 Kpc de distancia. En este trabajo se obtienen resultados de la distancia y se calculan nuevos parámetros físicos del gas ionizado utilizando la emisión de líneas de recombinación. El análisis de los perfiles sugiere que W80 se compone de al menos tres estructuras localizadas a diferentes distancias entre 0.75 y 2.66 Kpc. Se utiliza un modelo simple para calcular la densidad del gas. Se asumió una temperatura electrónica constante, $T_e = 6600 \text{ K}$. La densidad electrónica obtenida se encuentra entre 4 y 12 cm^{-3} .

Proper Motions of the SiO J=1 - 0 Emission Line in the L1448 Molecular Outflow

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L1448 is a very young, class 0 stellar object powering a spectacular and highly collimated molecular outflow. Observations have detected an extremely high velocity (EHV) SiO component along the outflow. Here we present preliminary results from observations carried out with the VLA interferometer in the B, C and D configurations on 2005, of the SiO J=1 - 0 with sub arcsecond resolution. The aim of this project is to measure proper motions of the outflow by comparing these maps with previous ones obtained in the 2000 with the VLA, also in the B, C and D configurations.

Madrid Deep Space Communication Complex as Radio Astronomy Observatory

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This poster describes the Madrid Deep Space Communication Complex (MDSCC) as a Radio Astronomy Observatory. Radio Astronomy observations are regularly performed at MDSCC using five different antennas in the Complex. Their technical characteristics are described here as well as the equipment that is used to carry out Single Dish and Interferometric Observations. The MDSCC antennas are available to Spanish astronomers by means of the Host Country Agreement between NASA and the Spanish Government. The poster provides guidelines on how to observe at MDSCC.

A kinematic study of the irradiated collapsing dense core ahead of HH 80N

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HH 80N is the optically obscured northern counterpart of the Herbig-Haro 80/81 objects. It is associated with a quiescent dense clump ahead of HH 80N, where star formation signatures have been found, namely a CO bipolar outflow, and a CS ring structure of 0.24 pc of radius with a supersonic infall speed of 0.6 km/s. The photochemistry induced by UV photons coming from HH object produces the enhancement of several molecular species. We present in this work the results from the exhaustive study, carried out with the BIMA array, of several species and transitions to trace the infall motion detected in CS and to study the effect of the outflows in triggering or speeding up the star formation process.

VLA-D observations of the candidate rare 23.1 GHz methanol maser towards NGC7538

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We report observations of the 23.1 GHz methanol (CH_3OH) transition towards the massive star forming region NGC 7538 IRS1. Observations were done with student time of the VLA-D. Our spectrum shows the two velocity components (labeled here as S and W for the strong and weak respectively) reported by Wilson et al. (1984). From a gaussian fit we obtained lower limits to brightness temperatures of $T_{\text{B,S}} > 545$ K and $T_{\text{B,W}} > 214$, and the measured linewidths are $\Delta\nu_{\text{S}} = 0.83$ Km s⁻¹ and $\Delta\nu_{\text{W}} = 1.77$ Km s⁻¹. We argue that S is indeed a maser, while W could be thermal. S and W positions seem to be the same, and they appear fairly unresolved for our $\sim 3''$ beam. Our detection coincides spatially and in velocities with 6.7 GHz and 12.2 GHz methanol masers reported in literature and with a rare 4.8 GHz formaldehyde (H_2CO) maser. Thus, IRS1 may be the only known object with these two rare masers. This suggests that the physical conditions that give rise to these two poorly understood maser transitions may be related.

Radio-continuum emission from the eta-Carinae nebula

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In this work we present an analytic model to compute theoretically the intensity and the spectral index of the free-free radiation produced by shocks in the inner emission nebula around eta-Carinae. In our model, we consider an interacting stellar wind scenario where an isotropic outburst collides with a preeruptive spherical wind. As a result of the interaction, a two-shock wave structure (working surface) is formed, and generates the development of a little nebula (with an angular size $\theta \sim 6''$) embedded within the larger bipolar Homunculus. Using reasonable parameters for the wind powered by η Car during the minor eruption of the 1890s, we study the evolution of the working surface formed as a result of a sudden increase in the wind velocity at the injection radius. We show that the working surface emits continuum radiation that can contribute to the total radio-continuum flux detected from this source.

PARTNeR: Radio Astronomy for students

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PARTNeR is the acronym for Academic Project with NASA Radio Telescope at Robledo. The 34-m antenna in Robledo de Chavela is used by high schools, universities, and amateur astronomers to learn about radioastronomy and physics, and to get interested in science. The main project we have is the observation of radio-bursts in X-ray binaries. High school teachers joining our program are given a training course to learn the basis of Radio Astronomy. They also receive some practical lessons to teach children the physical fundamentals of Radio Astronomy. At Universities, PARTNeR is a tool to carry out practical lessons in Physics, Astrophysics or Engineering for undergraduate or graduate students. We propose some activities the students can develop during the observations and the data reduction.

Interaction and on-going star formation in a closely-packed environment

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We observed with the BIMA and VLA arrays the continuum emission at 3.15 mm, and the $\text{CH}_3\text{OH}(2-1)$, $\text{N}_2\text{H}^+(1-0)$ and $\text{NH}_3(1,1)$ and $\text{NH}_3(2,2)$ emission toward IRAS 20293+3952, a UCHII region containing a variety of protostellar and pre-protostellar objects in its surroundings. The dense gas traced by N_2H^+ and NH_3 shows two different clouds, a main cloud to the east of the UCHII region, of ~ 0.5 pc of size, and a western cloud, of ~ 0.15 pc. The dust emission reveals two strong components in the northern side of the main cloud, BIMA 1 and BIMA 2, associated with YSOs driving molecular outflows, and two fainter components in the southern side, BIMA 3 and BIMA 4, with no signs of stellar activity. Regarding the CH_3OH , we found strong emission in a fork-like structure associated with outflow B from Beuther et al. (2004b), as well as two CH_3OH clumps forming a ridge associated with outflow A. We built rotational temperature and column density maps, and found that the rotational temperature is higher in the northern side of the main cloud, around 22 K, where there are most of the YSOs in the cloud, than in the southern side, around 16 K. Given the low rotational temperatures, high NH_3 column densities, and the lack of infrared emission and outflows associated, BIMA 3 and BIMA 4 in the south of the main cloud, and also the western cloud, seem to be starless cores. The strong chemical differentiation found in the region is likely a consequence of a density gradient across the main cloud, higher in the north than in the south. Finally, interaction between the sources is important, possibly triggering the collapse in some cases.

Proyectos de ASAAF-UCM observando con PARTNeR

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Presentamos los primeros resultados preliminares de las campañas de observación de Sgr A* y BL Lac, cuya variabilidad se ha estudiado a lo largo de las campañas de observación en 2004 y 2005. La Asociación de Astrónomos Aficionados de la Universidad Complutense de Madrid, ASAAF-UCM, participa en el proyecto académico PARTNeR. Hemos desarrollado un programa de aprendizaje de forma que los miembros de ASAAF-UCM participan activamente desde el planteamiento de los objetivos científicos, pasando por la elaboración de una petición de tiempo de observación, hasta la realización de las observaciones y el análisis de los datos, para lo que se ha desarrollado un software de reducción.

Study of water masers in evolved stars with the 70-m Robledo de Chavela antenna

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We are performing a survey of water masers in a sample of post-Asymptotic Giant Branch (post-AGB) stars and Planetary Nebulae (PNe) selected by their IRAS colours, using the 70m antenna in Robledo de Chavela. Water masers are usually pumped in the envelope of the star during the AGB stage. Water molecules were believed to be destroyed by the ionizing radiation when the star enters the PNe stage and its effective temperature reaches values higher than ~ 20000 K. Therefore no water masers were thought to be present in PNe before until as recently as 2001, when the first one was discovered. Only another PNe, detected at Robledo, has been reported to harbor water masers and few searches have been done so far to try to detect more of them. Our ongoing survey of water masers in evolved stars aims to establish the moment and conditions needed for the pumping of this emission, from a fairly large sample of targets (~ 110 sources). Our new detections so far include a post-AGB star and two possible PNe.

1.3 cm Continuum and Water Maser Observations Toward IRAS 20126+4104

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We present simultaneously the 1.3 cm continuum and H₂O maser emission toward the high-mass protostar IRAS 20126+4104 with the VLA in its A configuration. We detected an unresolved continuum source (I20126N(1.3cm)) nearly coinciding with the strongest peak of the northern double continuum source previously detected at 3.6 cm in the field and suggested to be a radio jet. In addition, we have detected 29 water maser spots, 21 of which are tightly grouped in a cluster of $\sim 0.1''$ size displaced $\sim 0.07''$ (~ 120 AU) northwest from I20126N(1.3cm). Analyzing the spatio-kinematical distribution of the VLA water masers we propose that their motions also show, in addition to the proper motions (reported by Moscadelli and collaborators) on the order of 100 km/s seen in the plane of the sky, a component of rotation with velocities on the order of 20 km/s.

Radiotelescopio de la Universidad Complutense

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El observatorio UCM dispone de un radiotelescopio basado en la experiencia de la NASA Radio Jove. Este radiotelescopio, que en principio está concebido para ser desplazado y efectuar observaciones fuera de Madrid, está actualmente montado en la terraza de la facultad de Físicas de la UCM. Este radiotelescopio es el resultado del trabajo de varios estudiantes que han sido dirigidos por el prof. Jaime Zamorano a lo largo de los últimos cursos. El radiotelescopio consiste en dos dipolos de 7 m de largo que trabajan en 20 MHz (banda decamétrica) y está diseñado para detectar señales del Sol (tormentas solares), Júpiter y del Centro Galáctico.

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