

# X Reunión Científica de la Sociedad Española de Astronomía

## Libro de Resúmenes

ADEIT - Fundación Universidad-Empresa, Valencia

Del 9 al 13 de Julio de 2012



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### **Comité Organizador Científico (SOC)**

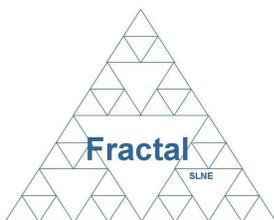
Javier Gorgas (Universidad Complutense de Madrid; Presidente)  
Jose Carlos Guirado (Universidad de Valencia)  
Carme Jordi (Universidad de Barcelona)  
Luisa Lara (Instituto de Astrofísica de Andalucía, CSIC)  
Jesús Maíz Apellániz (Instituto de Astrofísica de Andalucía, CSIC)  
Vicente Quilis (Universidad de Valencia)  
Javier Trujillo Bueno (Instituto de Astrofísica de Canarias)  
María Rosa Zapatero Osorio (Centro de Astrobiología, CSIC-INTA)

### **Comité Organizador Local (LOC)**

Miguel Ángel Aloy (Universidad de Valencia)  
Rebecca Azulay (Universidad de Valencia)  
Jose Carlos Guirado (Universidad de Valencia; Presidente)  
Jose María Ibáñez (Universidad de Valencia)  
Enric Marco (Universidad de Valencia)  
Vicent Martínez (Universidad de Valencia)  
Amelia Ortiz (Universidad de Valencia)  
Vicent Quilis (Universidad de Valencia)  
Eduardo Ros (Universidad de Valencia)  
Julia Suso (Universidad de Valencia)



La Sociedad Española de Astronomía (SEA) desea agradecer el apoyo de los siguientes patrocinadores:





## Programa general

Lunes, 9 de julio de 2012

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09:00–09:40	Apertura y bienvenida
09:40–09:55	El Plan Nacional de Astronomía y Astrofísica, por Rafael Bachiller
09:55–10:10	El Plan Nacional de Aeronáutica y Ciencias del Espacio, por Jesús Martín Pintado
10:10–10:30	Presentación del Programa IDEAS 2012, por Esther Rodríguez Blanco
10:30–11:00	“Early Science Education in Primary Schools (ENCIENDE)”, por José Miguel Rodríguez Espinosa

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11:00–11:30 **Pausa café**




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11:30–11:55	“Analysis of the spatial distribution of stars, gas and dust in nearby galaxies” por Juan Carlos Muñoz Mateos (premio SEA a la mejor tesis doctoral en Astrofísica del año 2010)
11:55–12:20	“The origin of dwarf early-type galaxies” por Elisa Toloba Jurado (premio SEA a la mejor tesis doctoral en Astrofísica del año 2011)
12:20–13:00	“Las observaciones del Earthshine: del cambio climático a la Astrobiología” por Enric Pallé
13:00–13:40	“Bar driven secular evolution in disc galaxies : The role of dark matter and gas” por Lia Athanassoula

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13:40–15:30 **Comida**

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15:30–17:20 Galaxias y Cosmología. Sesión C1. Salón de Actos  
Instrumentación y Computación. Sesión I1. Salón de Grados  
Ciencias Planetarias. Sesión P1. Aula 1.1

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17:20–17:50 **Pausa café**

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17:50–19:30 Galaxias y Cosmología. Sesión C2. Salón de Actos  
Instrumentación y Computación. Sesión I2. Salón de Grados  
Ciencias Planetarias. Sesión P2. Aula 1.1

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**Martes, 10 de julio de 2012**

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09:00–11:00 Galaxias y Cosmología. Sesión C3. Salón de Actos  
 La Vía Láctea y sus Componentes. Sesión G1. Aula 1.1  
 Instrumentación y Computación. Sesión I3. Salón de Grados

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11:00–11:30 **Pausa café**



11:30–12:10 “Gaia: The challenge begins” por Jordi Torra  
 12:10–12:50 “X-ray and gamma-ray astrophysics as a powerful tool to study stellar explosions: models, observations and challenges for the instrumentation” por Margarita Hernanz  
 12:50–13:30 “Digging Deep into the (U)LIRG phenomenon: When Radio Beats Dust” por Miguel Ángel Pérez-Torres  
 13:30–15:30 Reunión de grupo: Almuerzo con astrónomas. Aula 1.4

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13:30–15:30 **Comida**

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15:30–17:20 Galaxias y Cosmología. Sesión C4. Salón de Actos  
 La Vía Láctea y sus Componentes. Sesión G2. Salón de Grados  
 Física Solar. Sesión S1. Aula 1.1  
 Ciencias Planetarias. Sesión P3. Aula 1.3  
 Reunión de grupo: Programa Galileo de Formación de Profesores. Aula 1.4

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17:20–17:50 **Pausa café**

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17:50–19:30 Galaxias y Cosmología. Sesión C5. SALón de Actos  
 Ciencias Planetarias. Sesión P4. Salón de Grados  
 Física Solar. Sesión S2. Aula 1.1  
 Reunión de grupo: Programa Galileo de Formación de Profesores. Aula 1.4  
 19:30–21:30 Reunión de grupo: MIRADAS. Aula 1.3  
 19:45–21:45 Reunión de grupo: Ciencias Planetarias. Aula 1.4

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**Miércoles, 11 de julio de 2012**

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09:00–11:00 Galaxias y Cosmología. Sesión C6. Salón de Actos  
La Vía Láctea y sus Componentes. Sesión G3. Aula 1.1  
Instrumentación y Computación. Sesión I4. Salón de Grados

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11:00–11:30 **Pausa café**

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11:30–12:10 “The CO<sub>2</sub> and H<sub>2</sub>O Cycles on Mars” por Nicolas Thomas

12:10–12:50 “Cosmic Architecture: Numerical Simulations in Astrophysics and Cosmology”  
por José María Ibañez

12:50–13:30 “X-ray jets and eruptions in the Sun: numerical models and observations” por  
Fernando Moreno-Insertis

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13:30–15:30 **Comida**

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15:30–17:20 XX Asamblea General de la Sociedad Española de Astronomía

17:50–19:30 Reunión de grupo: ALHAMBRA

Reunión de grupo: MIRADAS

Reunión de grupo: RAVET

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**Jueves, 12 de julio de 2012**

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09:00–11:00	Galaxias y Cosmología. Sesión C7. Salón de Actos La Vía Láctea y sus Componentes. Sesión G4. Aula 1.1 Instrumentación y Computación. Sesión I5. Salón de Grados
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11:00–11:30	<b>Pausa café</b>
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	<b>Sesión especial “50 años de ESO”</b>
11:30–12:10	“ESO-50 años de cooperación” por Xavier Barcons
12:10–12:40	“The European Extremely Large Telescope: present status and perspectives” por Adrian Russell
12:40–13:10	“El observatorio conjunto ALMA: génesis, primeros resultados y expectativas futuras” por Pere Planesas
13:10–13:30	“ESO Outreach Network (ESON): La red de divulgación científica de ESO” por Miguel Mas y Natalia Ruiz

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13:30–15:30	<b>Comida</b>
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15:30–17:20	Galaxias y Cosmología. Sesión C8. Salón de Actos La Vía Láctea y sus Componentes. Sesión G5. Salón de Grados Física Solar. Sesión S3. Aula 1.1
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17:20–17:50	<b>Pausa café</b>
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17:50–19:30	Galaxias y Cosmología. Sesión C9. Salón de Actos Enseñanza y Divulgación de la Astronomía. Sesión E1. Salón de Grados Física Solar. Sesión S4. Aula 1.1
17:50–19:45	Reunión de grupo: SKA
19:45–21:45	Reunión de grupo: WEAVE

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**Viernes, 13 de julio de 2012**

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09:00–11:00	Galaxias y Cosmología. Sesión C10. Salón de Actos La Vía Láctea y sus Componentes. Sesión G6. Aula 1.1 Instrumentación y Computación. Sesión I6. Salón de Grados
11:00–11:30	<b>Pausa café</b>
11:30–12:10	“Determinación de abundancias químicas en estrellas” por Carlos Allende Prieto
12:10–12:50	“The growth of magnetic fields in progenitors of gamma-ray bursts” por Miguel Ángel Aloy
12:50–13:30	“The Square Kilometer Array: a challenge for ~2020 to which Spain can contribute in 2012” por Lourdes Verdes Montenegro
13:30–15:30	<b>Comida</b>
15:30–17:20	Galaxias y Cosmología. Sesión C11. Salón de Actos Enseñanza y Divulgación de la Astronomía. Sesión E2. Salón de Grados
17:20–17:50	<b>Pausa café</b>
17:50–19:00	Actos de clausura y despedida

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# Conferencias invitadas en las Sesiones Plenarias



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## Determinación de abundancias químicas en estrellas

Carlos Allende Prieto (Instituto de Astrofísica de Canarias)

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Desde sus arranques en el siglo XIX, la espectroscopía estelar ha evolucionado de artesanía a producción industrial. Después de describir brevemente como se deriva la composición química de estrellas, me centraré en los avances más recientes en el campo, y las aplicaciones más revolucionarias. Hablaré también de los problemas más acuciantes y posibles soluciones. Dedicaré parte del tiempo a describir algunos de los proyectos en marcha más radicales o de interés para la comunidad astronómica española.

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## The growth of magnetic fields in progenitors of gamma-ray bursts

Miguel Ángel Aloy (Universitat de València)

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In the last years, it has become clear that ultraintense magnetic fields are likely behind the phenomenology observed in gamma-ray bursts. A fundamental question to be answered is how field strengths in excess of  $10^{14} - 10^{15}$  G can be produced starting from tiny seed magnetic fields. In this talk I will review some of the mechanisms which, presumably, can explain the huge growth of the magnetic field in the context of gamma-ray bursts.

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## Bar driven secular evolution in disc galaxies : The role of dark matter and of gas

Lia Athanassoula (LAM, Marseille)

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After a rapid formation phase, disc galaxies undergo a lengthy phase of secular evolution, which, due to its duration, can influence their properties as much, if not more than the initial formation phase. This evolution is principally driven by the bar, which redistributes both matter and angular momentum within the galaxy. Most of the angular momentum emitted from the bar region is absorbed by the dark matter halo, so that bars create a strong link between baryonic and dark matter. Thus stronger bars can be found in galaxies in which the halo has absorbed more angular momentum. There is, however, a third player in this angular momentum exchange game, and that is gas. We will discuss the role of each of the three players in this game (stellar component in the bar region, dark matter halo and gas) and what the resulting evolution can be. We will also discuss the effect that a halo triaxiality, such as found in cosmological simulations, can have on the evolution of the disc galaxy and its components. Finally we will tackle the long-standing question of whether bars are short- or long-lived.

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## X-ray and gamma-ray astrophysics as a powerful tool to study stellar explosions: models, observations and challenges for the instrumentation

Margarita Hernanz (Institut de Ciències de l'Espai; CSIC)

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An historical review of the satellites working in the X-ray and gamma-ray domain will be presented, with emphasis on the recent advances and current challenges regarding the instrumentation. The importance of high energy astrophysics for the understanding of the Cosmos will be summarized, with a particular emphasis on stellar explosions, which play a crucial role on the origin of the chemical elements in the Universe.

## Cosmic Architecture: Numerical Simulations in Astrophysics and Cosmology

José María Ibáñez (UV)

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Quoting M. Norman: “As in other fields of science, numerical simulation has emerged as the third methodology alongside observation/experimentation and analytic theory. It is, together with theory and observation/experimentation, one of the three basic paradigms for the advancing of science and engineering”.

In Astrophysics and Cosmology there are many computation-intensive fundamental problems whose solutions can only be advanced and understood by applying high performance computing and communications technologies and resources. Examples of grand challenge simulations are those trying to give answer to fundamental questions as: how do stars and stellar systems form?, how do planetary systems form and evolve?, how do we study the Sun to explore fundamental astrophysical processes?, how do supernovae and gamma-ray bursts work?, how do black hole accretion, jets and outflows operate?, can we observe strong gravity in action?, how did the structure of the cosmic web evolve?, how did the Milky Way, and galaxies, form?, what the universe is made of?, where is the Universe going to?

I will try to summarize the answers to the above questions provided by numerical simulations carried out by using high-performance computing resources.

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## X-ray jets and eruptions in the Sun: numerical models and observations

Fernando Moreno Insertis (IAC)

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The Sun is famous for its violent eruptions (flares, CMEs), which directly affect the heliosphere and Earth’s magnetosphere. In recent years, a range of solar space missions and last-generation ground-based installations have allowed the observation with unprecedented detail of the eruptions themselves and, also, of their sources and the related phenomena. Some of these eruptions are seen to be accompanied by fast and hot plasma jets, detected in soft X rays since the 1990s. In many cases those jets are produced as a consequence of episodes of magnetic flux emergence from the solar interior.

For a decade now, we have carried out a project of three-dimensional numerical modeling of the launching of jets in the solar corona and, more generally, of the process of magnetic flux emergence from the interior. Magnetic flux is emerging continually across the solar surface on a large range of spatial scales, from the large active regions that lead to sunspots, to tiny magnetic bipoles seen to appear within granular convection cells. If, upon emergence, the magnetic region reaches sufficiently high in the atmosphere, its magnetic field lines may collide with preexisting magnetic systems in the corona and magnetic reconnection may ensue. In the reconnection, hybrid field lines, linking the emerging bipole to the preexisting coronal field lines are produced via ohmic diffusion. The corona is magnetically-dominated, so the reconnection process can easily lead to high temperatures (several million Kelvin) and velocities of hundreds of km / s for the reconnected plasma.

In this lecture I will describe the X-ray jets and the major physical processes in them as found by means of our 3D numerical models. Various possibilities of comparison with observations can be carried out. The Hinode satellite has provided in the past years detailed X-ray and EUV observations of these objects, allowing for statistical conclusions to be drawn. Our models reproduce morphology, velocities and temperatures of the observed jets. Further, they allow a full 3D view of the distribution of various physical quantities and permit to unveil the intricacies of the reconnection process.

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## Las observaciones del Earthshine: del cambio climático a la astrobiología

Enric Palle (IAC)

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Las observaciones de la luz cenicienta en el alado oscuro de la Luna proporcionan la oportunidad de estudiar la luz reflejada al espacio por el planeta Tierra de forma integrada sobre toda la porción visible desde la Luna. Medidas detalladas de la cantidad de luz reflejada y sus variaciones temporales y espaciales han resultado muy útiles tanto para el estudio de la variabilidad del balance radiativo del planeta y sus implicaciones para el cambio climático, como para el estudio de aquellos rasgos que conforman los biomarcadores globales y señalan la presencia de vida desde el espacio. De especial interés son también un caso muy especial de luz cenicienta, aquella que se observa durante los eclipses de Luna. En esta charla repasare las observaciones del earthshine sobre todo en la última década y lo que hemos aprendido de ellas.

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## Digging Deep into the (U)LIRG phenomenon: When Radio beats Dust

Miguel Ángel Pérez Torres (IAA)

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Local Luminous and Ultra-Luminous Infra-Red Galaxies (LIRGs and ULIRGs) have become increasingly relevant for Cosmology and Galaxy formation studies over the last decade, as they seem to be the nearby cousins of high- $z$  star-forming galaxies. The huge distances to the high- $z$  star-forming galaxies makes detailed, high-spatial resolution studies impossible, so studies of their local analogues would be of much help. Even at local ( $D < 250$  Mpc) distances, linear resolution of optical or even NIR telescopes is still relatively poor, and to make things worse, (U)LIRGs are “dusty beasts”, thus preventing to dig deep into their central regions. The most direct way of tackling this problem is via high-angular radio observations, whose emission is not hampered by dust.

I will present the main results obtained by our team in the last few years, on high-angular resolution radio studies of nearby Luminous and Ultra-Luminous Infrared Galaxies (LIRGs and ULIRGs, respectively). Those results include, among others, the impressive discovery of an extremely prolific supernova factory in the LIRG Arp 299-A ( $D=45$  Mpc), the monitoring of a large number of very compact radio sources, the precise location of the long-sought AGN in Arp 299-A and, more recently, the evidence for the existence of nuclear disks ( $< \sim 100$  pc in size) in starburst galaxies from the radial distribution of supernovae. I will also show detailed results for a few other “petty” objects, and will end by presenting LIRGI (lirgi.iaa.es): Luminous Infrared Galaxy Inventory, an eMERLIN Legacy Project aimed at making similar studies on a large (42) sample of local LIRGs and ULIRGs. This study will allow us to trace variations in AGN, SNe and SNR properties as a function of the starburst properties. In particular the critical question concerning these galaxies -whether the dust in the central kpc is heated by a starburst, or an active galactic nucleus (AGN), or a combination of both- will be unambiguously solved.

All those results show that high-angular resolution radio ( $< \sim 0.2''$ ) studies of nearby (U)LIRGs are of high relevance for the comprehension of both local and high- $z$  starbursting galaxies.

## El observatorio conjunto ALMA: génesis, primeros resultados y expectativas futuras

Pere Planesas (Observatorio Astronómico Nacional)

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ESO es uno de los socios principales de ALMA, el observatorio astronómico terrestre más sofisticado y multinacional jamás construido. Las observaciones científicas con ALMA se iniciaron, dentro del ciclo 0 de Primera Ciencia, hace unos 9 meses con un instrumento limitado en su número de antenas y receptores, pero plenamente competitivo con los instrumentos similares existentes. Actualmente se están publicando los primeros resultados observacionales, al mismo tiempo en que se cierra el plazo de presentación de propuestas para el ciclo 1 de Primera Ciencia. Mientras tanto, la construcción de ALMA prosigue en Chajnantor (Chile), a 5000 m de altura. En esta ponencia se describirán la historia, los primeros resultados científicos y las capacidades futuras de ALMA, un observatorio que durante décadas será imprescindible en diversos campos de la Astrofísica.

## Early science education in primary schools (ENCIENDE)

José Miguel Rodríguez Espinosa (Instituto de Astrofísica de Canarias)

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We live in a society that is more educated than it was just decades ago. The number of student obtaining a degree is now substantially larger than it has ever been. However, science literacy in the society lags behind, and in fact our XXI century society is not really reaping the benefit of an inclusive scientific education.

The Spanish Confederation of Scientific Societies (COSCE) is aware of this problem and has started a programme to promote science education in the early stages of education, as a seed for a more scientifically literate society. The ENCIENDE project aims at putting together both scientists and teachers, in an effort to help primary schools teachers to better cater for the naturally inquisitive minds of children. In my talk I will explain what ENCIENDE is and the actions we are trying to carry out.

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## The CO<sub>2</sub> and H<sub>2</sub>O Cycles on Mars

Nicolas Thomas (Physikalisches Institut, Universität Bern)

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Carbon dioxide is the main constituent (~95%) of the atmosphere of Mars. Nearly a third of this CO<sub>2</sub> atmosphere participates in the annual condensation-sublimation cycle. The cycle results in a series of remarkable phenomena which are observed regularly by the High Resolution Imaging Science Experiment (HiRISE) onboard NASA's Mars Reconnaissance Orbiter (MRO). These include the production of 100 m high gas jets and the possible initiation of high latitude dune motion.

There are also subtle interactions between the CO<sub>2</sub> sublimation process and the sublimation of surface water ice near the poles. Water ice is probably present just beneath the surface over much of the northern hemisphere. Small amounts participate in a direct sublimation into the atmosphere which can be followed by re-condensation onto the retreating CO<sub>2</sub> cap (thereby explaining the temporal evolution of IR spectra of polar regions). There is, in addition, first evidence of a transition into the liquid phase at low latitudes.

In the presentation, we shall discuss evidence for these phenomena and show how MRO has contributed to our understanding of volatile processes on Mars.

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## Gaia: The challenge begins

Jordi Torra (University of Barcelona)

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By the end of 2013 Gaia will be in its path to L2. After four months of commissioning a waterfall of scientific data, flowing during five years, will start feeding a complex data processing system aimed to deliver the impressive amount of unprecedented high quality data expected from the mission.

We will summarize the key aspects of the mission and review its present status and plans until the start of operations. We will describe the data reduction system as well as the present plans and schedule for releasing scientific data.

The multidimensional view of the Galaxy provided by Gaia will open a new era for the understanding of its history, the main goal of the mission, but Gaia data will have an important impact in a large number of topics from solar system studies to fundamental physics. The use of available simulated data and the expected science performances allow the potential users to evaluate Gaia capabilities in a particular field.

National and international plans to fully exploit the vast amount of Gaia data that are going on, as well as observational campaigns to complement the satellite data are relevant aspects that will be also considered in the presentation.

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## The Square Kilometer Array: a challenge for ~2020 to which Spain can contribute in 2012

Lourdes Verdes Montenegro (IAA)

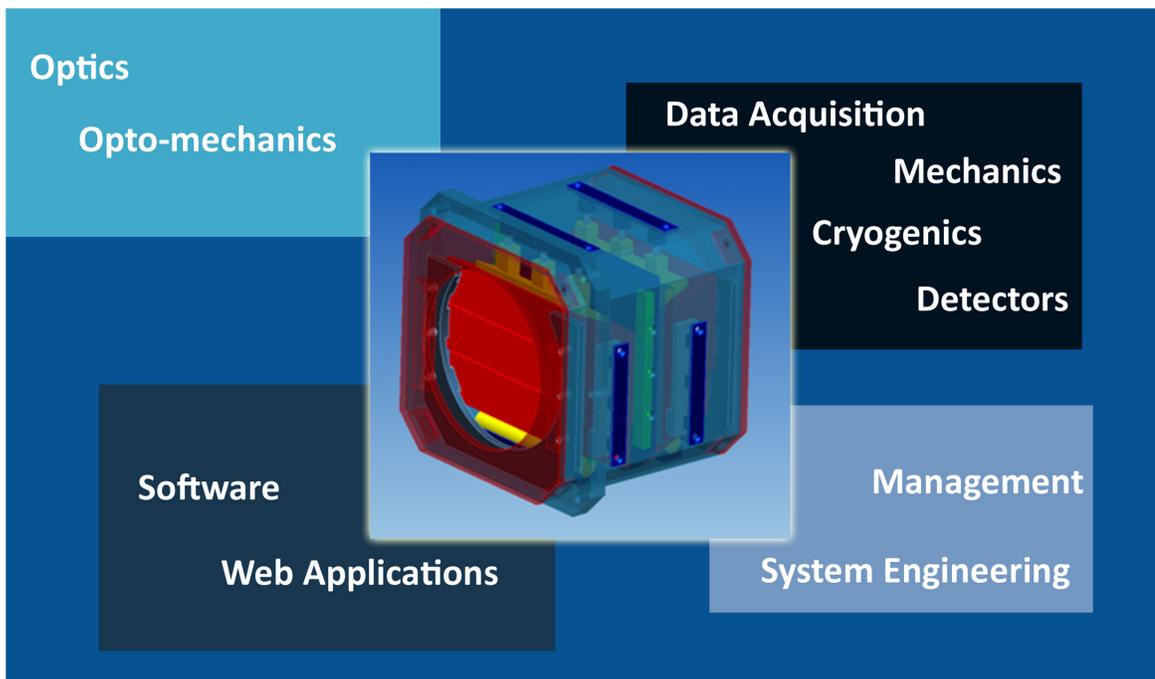
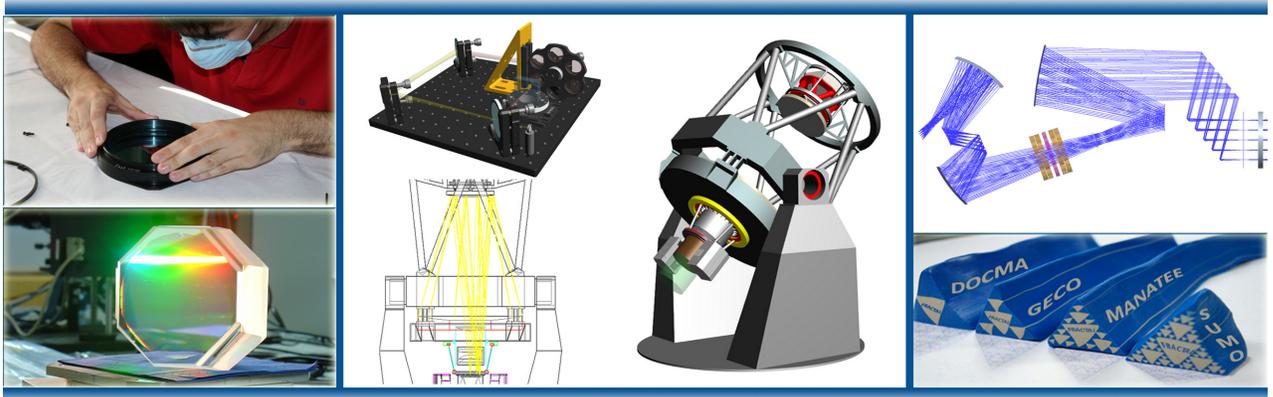
lourdes@iaa.es

The SKA, composed of several hundreds of 3 different types of antennas with separations up to 3000 km, and up to 200 square degrees field of view, will be the largest, most sensitive, and most difficult radio telescope ever to be built. It will be able to provide fundamental answers in areas such as the dark era, when gas in galaxies was first turned in stars and the first black holes formed, star formation in nearby galaxies from stellar birth to death, faint extragalactic emission, magnetism in galaxies, extrasolar planets, or confrontation of Einstein predictions with pulsars and black holes observations. The technological challenges involved offer an unprecedented opportunity to collaborate in the development of hardware and software technologies. The energy requirements of the SKA provide an opportunity to accelerate technology development in scalable renewable energy generation, distribution, storage and demand monitoring and reduction. Data transport will reach over a hundred times the current global internet traffic data rates, delivering as much data as the full world-wide web. Processing this data torrent in real time will require high-performance distributed computing as well as data storage and innovative retrieval technologies in the exascale. This way to do science, based on data-intensive interdisciplinary cooperation, is the base of the concept of e-Science, which necessarily includes outreach as an indissoluble part of the knowledge-based human progress.

The scientific and technological challenges and opportunities that SKA can bring to the Spanish community will be described in this talk. The two coordinated, ongoing activities in Spain will be also presented: the Red Española del SKA, led by the Universidad de Valencia, and the VIA-SKA project, led by the Instituto de Astrofísica de Andalucía (IAA-CSIC). While the former is focused on the science of SKA and pathfinders, the latter studies the feasibility of the Spanish Industrial Participation in the SKA. Those initiatives involve researchers and engineers from IAA (CSIC), Instituto de Física de Cantabria (CSIC), Centro de Astrobiología (CISC), Institut de Ciències de l'Espai (CSIC-IEEC), Instituto Geográfico Nacional, Universidad de Granada, Barcelona, Cantabria, Valencia, Jaen and Carlos III, Instituto Astrofísico de Canarias and Universidad Politécnica de Cartagena.



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# Galaxias y Cosmología: Orales



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**SESIÓN C1, LUNES DE 15:30 A 17:20** (Moderador: Eduard Salvador)

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15:30–15:50	C	Javier Navarro González	Fully cosmological virtual galaxies from MASCLET
15:50–16:10	C	José Oñorbe Bernis	Feedback from massive stars in dwarf galaxy formation
16:10–16:30	C	Julia Campa	Measuring the scatter in the mass richness relation using the correlation function of galaxy cluster
16:30–16:50	C	Susana Planelles Mira	Cosmological shock waves
16:50–17:20	I	Rosa Domínguez	Galaxy Formation and Evolution in a Cosmological Context: Some News from Self-Consistent Hydrodynamical Simulations

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**SESIÓN C2, LUNES DE 17:50 A 19:30** (Moderador: Isabel Márquez)

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17:50–18:10	C	José Sabater Montes	Entorno, interacción y sus efectos sobre la actividad nuclear en una muestra de 300.000 galaxias
18:10–18:30	C	Omaira Gonzalez Martín	The AGN inner parts seen at MIR wavelengths
18:30–18:50	C	Jacobo Ebrero Carrero	AGN winds as probes of cosmic feedback: the case of Mrk 509
18:50–19:10	C	Silvia Mateos Ibáñez	The Bright Ultra-hard XMM-Newton Survey: WISE-MIR selection of luminous AGN
19:10–19:30	C	Pol Martí Sanahuja	Photo-z Study for the PAU@WHT Survey

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**SESIÓN C3, MARTES DE 9:00 a 11:00** (Moderador: Pablo Pérez González)

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09:00–09:30	I	Almudena Alonso	Star formation and AGN activity in local Luminous Infrared Galaxies
09:30–09:50	C	Miguel Sánchez Portal	SAFIR: testing the AGN and starburst activity with the Herschel Space Observatory
09:50–10:10	C	Cristina Ramos Almeida	Probing nuclear activity versus star formation at $z \sim 0.8$ using near-IR multislit spectroscopy
10:10–10:40	I	Eduard Salvador	Halos de materia oscura y fluctuaciones primordiales de densidad
10:40–11:00	P	1ª Sesión de pósteres	Coordina Vicent Quilis

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**SESIÓN C4, MARTES DE 15:30 A 17:20** (Moderador: Ignacio Trujillo)

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15:30–16:00	I	Brad Gibson	Spirals with Supercomputers: Have We Finally Got it Right?
16:00–16:20	C	Johan H. Knapen	Secular evolution in disk galaxies
16:20–16:40	C	Marja Kristin Seidel	Constraints on secular evolution in unbarred spiral galaxies: understanding bulge and disk formation
16:40–17:00	C	Patricia Sánchez-Blázquez	Quantifying the mixing due to bars
17:00–17:20	C	Isabel Pérez Martín	Evolución de las barras en galaxias de disco: cambios estructurales en los últimos 7 Gyr

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**SESIÓN C5 MARTES, DE 17:50 A 19:30** (Moderador: Elena Ricciardelli)

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17:50–18:10	C	Raúl Cacho Martínez	Impact of gas flows on the metallicity of barred galaxies
18:10–18:30	C	Rubén García Benito	The star formation history of galaxies spatially resolved: CALIFA perspective
18:30–18:50	C	Tomás Ruiz Lara	Poblaciones estelares en las partes externas de las galaxias espirales con datos IFU de CALIFA
18:50–19:10	C	Raffaella Anna Marino	IFS and multi-wavelength imaging of nearby spiral galaxies: NGC5668 as a pilot case for MEGARA
19:10–19:30	P	2ª Sesión de pósteres	Coordina Vicent Quilis

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**SESIÓN C6 MIÉRCOLES, DE 9:00 A 11:00** (Moderador: Patricia Sanchez-Blazquez)

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09:00–09:20	C	Elena Ricciardelli	The MIUSCAT stellar population models: constraints from optical photometry
09:20–09:40	C	Anna Ferré-Mateu	Edades jóvenes y otras propiedades intrigantes de las galaxias compactas masivas locales
09:40–10:00	C	Luis Alberto Díaz García	Old stellar population studies in multifilter spectrophotometric data
10:00–10:20	C	Agnieszka Rys	3D view on Virgo and field dwarf elliptical galaxies: late-type origin and environmental transform
10:20–10:40	C	Ignacio Martín Navarro	Kinematical mapping of the outskirts of elliptical galaxies using the OSIRIS Tunable Filters at GTC: a novel approach
10:40–11:00	C	Ricardo Pérez Martínez	OSIRIS and Herschel view of Cluster of Galaxies CL0024+1652

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**SESIÓN C7, JUEVES DE 9:00 A 11:00** (Moderador: Mercedes Mollá)

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09:00–09:20	C	Rubén Herrero Illana	La distribución radial de supernovas en starbursts nucleares
09:20–09:40	C	Enrique Pérez Montero	El nitrógeno como trazador químico de la evolución de las galaxias en el Universo Local y temprano
09:40–10:00	C	Fernando Fabián Rosales Ortega	The Oxygen Abundance Determination in the IFU Era
10:00–10:20	C	Ana Belén Morales Luis	Oxygen abundance from strong-line methods at extremely low metallicities
10:20–10:40	C	Vasiliki Petropoulou	Environmental imprint on galaxy chemical enrichment
10:40–11:00	C	Mª Carmen Sánchez Gil	Corrugated Velocity Pattern in the Spiral Galaxies: NGC278, NGC1058, NGC2500 & UGC3574

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**SESIÓN C8, JUEVES DE 15:30 A 17:20** (Moderador: Susana Planelles)

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15:30–16:00	I	Begoña Ascaso	Witnessing galaxy clusters: from maturity to childhood
16:00–16:20	C	Pablo Arnalte-Mur	The evolution of galaxy clustering since $z = 1.5$ in the ALHAMBRA Survey
16:20–16:40	C	William Schoenell	Recovering physical properties from the ALHAMBRA photometry
16:40–17:00	C	Yolanda Jiménez Teja	CHEF applications to the ALHAMBRA survey
17:00–17:20	C	Txitxo Benitez	The JPAS Survey

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**SESIÓN C9, JUEVES DE 17:50 A 19:30** (Moderador: Miguel A. Aloy)

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17:50–18:10	C	Roberta Zanin	MAGIC: two eyes for the gamma-ray Universe
18:10–18:30	C	Alberto J. Castro-Tirado	SWIFT J1644+57 : the formation of a jet in real time
18:30–18:50	C	Javier Gorosabel	The distribution of equivalent width in GRB host galaxies
18:50–19:10	C	Rubén Sánchez-Ramírez	Estudio multifrecuencia del primer GRB detectado con ALMA
19:10–19:30	C	Carlos Hugo López Caraballo	Observational Study of the Polarization of the Anomalous Microwave Emission

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**SESIÓN C10, VIERNES DE 9:00 A 11:00** (Moderador: Txitxo Benitez)

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09:00–09:20	C	Jordi Cepa Nogué	The OTELO project
09:20–09:40	C	Pablo G. Pérez González	SHARDS: a spectro-photometry of distant red and dead massive galaxies
09:40–10:00	C	Antonio Cava	Scanning emission line galaxies through the SHARDS survey
10:00–10:20	C	Ignacio Trujillo	The entertaining live of massive galaxies
10:20–10:40	C	Fernando Buitrago Alonso	Massive galaxies: born as disks, dead as spheroids
10:40–11:00	C	Carlos López San Juan	El papel dominante de las fusiones en la evolución en tamaño de las galaxias masivas desde $z = 1$

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**SESIÓN C11, VIERNES DE 15:30 A 17:20** (Moderador: Mirian Fernández Lorenzo)

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15:30–15:50	C	Lucía Rodríguez Muñoz	Physical properties from deep spectroscopy of dwarf star-forming galaxies at intermediate redshift
15:50–16:10	C	María Trinidad Tapia Peralta	Growth in size of the massive ellipticals galaxies by dry mergers
16:10–16:30	C	Esther Mármol Queraltó	Satellite galaxies: the infalling pieces of the puzzle of massive galaxies
16:30–16:50	C	Luis Alberto Aguilar Chiu	Searching for the missing satellites of the Milky Way in the Gaia universe
16:50–17:20	I	Carme Gallart	What stars tell us about galaxies: star formation and chemical evolution histories in the Local Group

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I = Conferencia Invitada, C = Contribución Oral



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## Sesión C1 (lunes 9, 15:30-17:20)

Salón de Actos

### Fully cosmological virtual galaxies from MASCLET

Javier Navarro González (UV)

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We present the study of the most massive galaxies ( $M_* > 10^{11} M_\odot$ ) found in a cosmological simulation performed with MASCLET (Mesh Adaptive Scheme for Cosmological structure evolution) and analyzed with HALMA (HALo finder for MASclet).

We focus on the structure of these virtual galaxies, analyzing their radial gradients, morphology, kinematics and chemical characteristics.

By classifying galaxies depending on their merging history, morphology or kinematics we have found that the most relevant differences in the profiles appear when they are separated according to their merging history.

We suggest that some of those differences could be explained due to the spatial segregation of the stellar populations formed in-situ and ex-situ.

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### Feedback from massive stars in dwarf galaxy formation

José Oñorbe Bernis (University of California Irvine), James S. Bullock

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I will present hydrodynamical simulations of the formation of dwarf galaxies starting from cosmological initial conditions at high redshift. In these simulations, a novel numerical implementation of stellar feedback resulting from momentum imparted to the ISM by radiation, supernovae, and stellar winds has been used. Our final objects have structure and stellar populations consistent with observed dwarf galaxies. The dark matter halos associated with these objects indicate that feedback from massive stars plays a critical role in shaping the galaxy mass function, the structure of the interstellar medium (ISM), and the low efficiency of star formation. I will discuss the significance and possible implications of this result.

## Measuring the scatter in the mass richness relation using the correlation function of galaxy cluster

Julia Campa (CIEMAT)

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Clusters of galaxies are becoming a powerful tool to constrain cosmological parameters. This has motivated the design of a new wide-area cluster surveys at mm, optical/near infrared, and X-ray wavelengths. These surveys will have the potential to find hundreds of thousands of clusters. The ability to constrain the cosmological parameters from the evolution of galaxy clusters counts is limited by the knowledge of the cluster mass. Accurate constraints require a precise model relating observables to total mass. We present a method to constrain the scatter in the mass observable relation by making use of the bias measured in the cluster correlation function. Since our goal will be to constrain the scatter in maxBCG cluster sample of optically selected clusters from SDSS and in the future Dark Energy Survey cluster sample, in this work the observable will be the richness. First we will study the bias in halos on a past lightcone using N-body simulations to study the errors that come from Halo Model prediction. Finally we assign richness to dark matter halos in the simulation to test our method. We compare the bias measured in clusters with the model and describe the results for the scatter measurements.

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## Cosmological shock waves

Susana Planelles Mira (OATS-INAF), Vicent Quilis

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Cosmological shock waves, developed during the formation and evolution of cosmic structures, encode crucial information on the hierarchical formation of the Universe as well on its thermalization. They also play an essential role in galaxy cluster properties, contributing very efficiently to the virialization of haloes.

In this contribution, we analyse an Eulerian adaptive mesh refinement (AMR) hydrodynamical and N-body simulation in a LCDM cosmology specially developed for the study of cosmological shock waves. The simulation incorporates common cooling and heating processes for a primordial gas. The combination of a new shock-capturing algorithm together with the ASOHF halo finder (Planelles & Quilis, 2010) allows us to study in detail some of the main features of the cosmological shock waves developed during the hierarchical evolution of the simulated Universe. We pay special attention to discuss the spatial and morphological distribution of shocks within the computational box as well as the correlations between the shock Mach numbers and some of the main halo properties. We also analyse the connexion between the formation and evolution of shocks with the dynamical history of the cluster haloes.

## Galaxy formation and evolution in a cosmological context: some news from self-consistent hydrodynamical simulations

*[Conferencia Invitada]*

Rosa M. Domínguez Tenreiro (Universidad Autónoma de Madrid)

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One of the main challenges for astronomers and cosmologists is to understand how and when galaxies formed, and later on evolved, within the framework of the expanding universe described by the concordance model of cosmology. We are now in a decade where this understanding is expected to increase dramatically. Indeed, computing power, computer codes and modeling techniques have made substantial progresses. At the same time, the observational technical capacities have experienced an historical change, making it possible to get sensible informations coming from deeper and deeper regions in the Universe.

In this talk I will explain how hydrodynamical simulations are designed to implement the physical laws and processes relevant to galaxy formation and evolution in a cosmological context. Some results will be presented related to both, elliptical and spiral galaxies, as well as to their groupings and their merger rates along cosmological ages. Particular attention will be paid to the question of how well do the simulated galaxies confront real ones. A positive answer allows us to use the simulations as a tool to understand some of the complex physical processes underlying galaxy formation and evolution that cannot be directly observed. A report on some of them will close the talk.

**Sesión C2 (lunes 9, 17:50-19:30)****Salón de Actos****Entorno, interacción y sus efectos sobre la actividad nuclear en una muestra de 300.000 galaxias**

José Sabater Montes (IfA, University of Edinburgh), P. Best, M. Argudo-Fernández, S. Verley  
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El origen y la evolución de galaxias está íntimamente ligado con el de los agujeros negros supermasivos que muchas de ellas albergan. La interacción entre galaxias puede activar los agujeros negros supermasivos de su interior, mientras que la actividad nuclear podría estar detrás de la supresión de la formación estelar en entornos densos como los cúmulos. De esta manera, estos fenómenos de retroalimentación pueden jugar un papel fundamental en la evolución de galaxias. Sin embargo la relación entre el entorno, la interacción y la actividad nuclear no está del todo clara, encontrándose incluso resultados contradictorios en la literatura.

Presentamos un estudio realizado con una muestra de  $\sim 300.000$  galaxias del Sloan Digital Sky Survey (SDSS) para las que se han cuantificado tres parámetros de entorno (densidad, fuerza de marea, riqueza del grupo) junto con la actividad nuclear obtenida a partir de datos ópticos y de radio. La distinción entre entorno e interacción con galaxias compañeras, y la discriminación entre los distintos modos de acreción dominantes en el núcleo activo (alta excitación vs. baja excitación), nos permite conciliar los resultados aparentemente contradictorios encontrados hasta ahora en la literatura.

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## The AGN inner parts seen at MIR wavelengths

Omaira González Martín (IAC), J.M. Rodríguez-Espinosa, C. Muñoz-Tuñon, J. Rodríguez Saurin  
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We have compiled a sample of 25 nearby AGN having T-ReCS/Gemini archival data. T-ReCS offers nearly diffraction limited resolution in the mid IR, allowing the study of the AGN central few hundreds parsecs. Our aim is twofold:

1) The Star-formation AGN relation: The correlation between the masses of SMBHs and the properties of their galaxy bulges suggests that the growth of the bulge and the central AGN is connected (Ferrarese & Merrit 2000). Recently, Diamond-Stanic and Rieke (2012), using mid-IR Spitzer data, show that the star-formation is linked to the AGN only inside the 1 kpc neighbourhood of the AGN. However, they also claim that this relation depends on the spatial distribution of the star formation. The high angular resolution provided by T-ReCS/Gemini allows studying this relation in detail, disentangling the nuclear from the extended star formation. Both the mid-IR aromatic feature at  $11.3\mu\text{m}$  and the nebular [NeII] $12.8\mu\text{m}$  line will be used to trace the SFR while other indicators, such as [S IV] $10.5\mu\text{m}$ , will be used as tracers of the AGN.

2) The AGN obscuring tori: The unified model proposes the existence of a dusty torus surrounding the central source, blocking the Broad-line Region emission in Type-2 Seyferts (Antonucci 1993). This obscuring material has been measured at X-ray and mid-IR wavelengths. Often this optically thick material is more extended in the IR than at X-ray wavelengths. Moreover, while Type-1 AGN show the Si feature in emission, the Type-2 AGN show it in absorption. This result can be explained by the clumpy torus models (Nenkova et al. 2002). The high spatial resolution of the TReCS data will help us ascertaining the obscuration fraction originated by the dusty torus.

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## AGN winds as probes of cosmic feedback: the case of Mrk 509

Jacobo Ebrero Carrero (SRON - Netherlands Institute for Space Research)

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Outflowing gas in active galactic nuclei (AGN), seen as blue-shifted absorption lines in UV and X-ray spectra, is recognized as an important structural feature. The high frequency of occurrence of UV and X-ray absorption suggests that the absorbing gas has a high covering fraction, and that is present in all AGN. The AGN wind both heats and removes the interstellar medium (ISM) of the host galaxy, effectively stopping further star formation, and removing the fuel for further black hole growth as well as influencing the surrounding intergalactic medium. If the kinetic luminosity injected in the medium is high enough, then the impact on the host galaxy is sufficient to regulate galaxy growth (cosmic feedback).

Despite the obvious importance of understanding the structure and energetics of such outflows, we are only beginning to learn about the acceleration mechanism, the location of the gas in the context of the unification scheme of AGN, and its geometry. Here we present the results of a successful multi-wavelength campaign on the Seyfert 1 galaxy Mrk 509. The source was observed in the X-ray domain by Chandra and XMM-Newton, and simultaneously in the UV domain with the Cosmic Origins Spectrometer onboard the Hubble Space Telescope. We thus obtained one of the best characterization of an outflow in an AGN, and set limits on its location and possible launching mechanisms. We found that the outflowing absorbing gas is located at pc-scale distances, likely associated with thermally-driven winds originated in the putative dusty torus that surrounds the AGN engine.

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## The Bright Ultra-hard XMM-Newton Survey: WISE-MIR selection of luminous AGN

Silvia Mateos Ibáñez (IFCA)

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Flux-limited hard X-ray surveys at intermediate fluxes, carried out over significant solid angles have proved to be extremely efficient in selecting AGN samples bright enough for reliable optical identifications and for detailed studies of their properties and evolution. These surveys are a unique resource for determining the Universe's accretion history.

The Bright Ultra-hard XMM-Newton Survey (BUXS) is the largest, among the existing XMM-Newton and Chandra surveys, flux-limited sample of bright sources selected at 'ultra-hard' X-ray energies (4.5-10 keV). BUXS consists of 258 objects detected over a total sky area of 44.4 deg<sup>2</sup>. 251 (97%) sources are currently identified, 144 as type-1 AGN and 107 as type-2 AGN. BUXS has uniform imaging from SDSS and full coverage in the NIR and MIR from 2MASS, UKIDSS and NASA's WISE with a MIR detection rate of 98%. This rich set of multiwavelength data makes BUXS a unique survey resource to characterize the obscured accretion phenomenon in the Universe up to the crucial epoch when the accretion power of the Universe peaked, redshift~1.

Using the high quality optical, X-ray and MIR data available for all sources we have investigated the power of MIR selection to reveal the population of AGN up to redshifts~1-2. We have defined a new 'AGN selection box' using WISE colours with high completeness for selection of both type-1 and type-2 AGN, especially at high luminosities, and that suffers low contamination from non-AGN source populations. Our new MIR color selection will be an important tool to search for the most heavily obscured Compton-thick AGN. Compton-thick AGN could account for a large fraction of the supermassive black hole growth however they have escaped detection. In this talk I will present the main results of this study.

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## Photo-z Study for the PAU@WHT Survey

Pol Martí Sanahuja (IFAE Barcelona)

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The PAU@WHT Survey will study the properties of Dark Energy (DE) using the observations of Redshift Space Distortions (RSD) and Weak Lensing Magnification (MAG) from galaxy cross-correlations as main cosmological probes. The instrument used for this purpose, PAUCam, will be installed at the prime focus of the WHT in La Palma. Unlike other photometric instruments, PAUCam will use a filter set composed of 42 narrow bands and the 6 standard ugrizY wide bands. It can cover 2 deg<sup>2</sup> per night in all filters, delivering low-resolution (R~50) spectra for 30000 galaxies, 5000 stars, 1000 quasars, and 10 clusters per night. Photo-z simulations applied on mock catalogues, with either template-based codes or training methods, tell us that very precise redshifts  $\sigma(z)\sim 0.0035(1+z)$  can be achieved for galaxies with  $i(\text{AB}) < 22.5$ . A typical photo-z precision  $\sigma(z)\sim 0.035(1+z)$  is also achieved for galaxies with  $22.5 < i(\text{AB}) < 23.7$ . Moreover, these results are valid not only for LRGs but all types of galaxies. Such redshift accuracy combined with a large galaxy density can provide a highly competitive determination of the DE parameters, even covering only a moderate area.

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## Sesión C3 (martes 10, 09:00-11:00)

Salón de Actos

### Star formation and AGN activity in Local Luminous Infrared Galaxies

*[Conferencia Invitada]*

Almudena Alonso Herrero (IFCA, CSIC-UC)

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Luminous infrared galaxies (LIRGs) are defined as having infrared (8-1000micron) luminosities in the range  $LIR = 10^{11}-10^{12} L_{\odot}$ . Although an active galactic nucleus (AGN) may contribute, it is believed that the bulk of their IR luminosity is produced by dust heated by intense star-forming activity. If all the IR emission is related to the star-formation activity, the IR luminosities of these galaxies imply star formation rates of between 17 and 170  $M_{\odot}/yr$ . In this talk I will review recent results on the powering mechanisms of local LIRGs using X-ray, optical, and infrared observations. In particular I will discuss the bolometric contribution of AGN to the IR luminosity as well as the properties (sizes, luminosities, and distribution) of the star forming regions of local LIRGs.

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### SAFIR: testing the AGN and starburst activity with the Herschel Space Observatory

Miguel Sánchez Portal (Herschel Science Centre, ESAC), Cristina Ramos-Almeida, Pilar Esquej,  
Almudena Alonso-Herrero, Manuel Castillo, Ana M. Pérez García and the SAFIR team

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We present results from the Seyfert and star formation Activity in the Far-Infrared (SAFIR) project. This Herschel Space Observatory guaranteed-time programme, recently completed, is aimed at performing PACS & SPIRE imaging photometry in the 70, 100, 160, 250, 350 and 500 micron bands of a sample of 18 nearby Seyfert 1 and 2 galaxies.

The goals of the project include:

a) Star formation in AGN hosts: AGN and starburst activities, being among the most energetic extragalactic processes, have been studied separately until the past decade, when evidence that the two phenomena are related and, most frequently, coexistent started to accumulate. The FIR peak of cold dust emission constitute a powerful tracer of star formation. However, the study of such an important feature in the innermost regions of nearby AGN hosts has been, until the advent of Herschel, seriously limited by the low spatial resolution and limited spectral coverage of the existing facilities. Our new data, given the unprecedented angular resolution and spectral coverage of the Herschel Space Observatory start to overcome this limitation, allowing us to probe the cold and very cold dust components across the galaxy and even in the nuclear and circum-nuclear regions.

b) Characterising the physical nature of AGN infrared emission: we are performing multi-component SED fitting (AGN, starburst and host galaxy), combining existing ground and space-based data from UV to MIR with Herschel FIR observations. The new, high resolution Herschel data are allowing us to unveil the nature of the dusty torus (e.g. clumpy vs. smooth, flared disc), breaking model degeneracies.

## Probing nuclear activity versus star formation at $z\sim 0.8$ using near-IR multislit spectroscopy

Cristina Ramos Almeida (IAC), José Miguel Rodríguez Espinosa, José Antonio Acosta Pulido, Almudena Alonso Herrero, Ana M. Pérez García y Nayra Rodríguez Eugenio

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Presentamos espectros multiobjeto en el infrarrojo cercano (NIR) para una muestra de 30 AGNs a  $z\sim 0.8$  seleccionados en rayos-X y con detección en el infrarrojo medio (MIR) en la tira extendida de Groth (EGS). Hasta el momento ésta es la mayor muestra de AGNs observada espectroscópicamente en el NIR, y es representativa de un cartografiado mayor, de aproximadamente un centenar de AGNs, de los cuales la mitad tienen distribuciones espectrales de energía (SEDs) dominadas por la emisión del AGN, mientras que en la otra mitad, el AGN está enmascarado por la emisión de la galaxia anfitriona y/o la extinción, especialmente en el óptico. Detectamos H alfa en la mayoría de nuestros espectros infrarrojos y, tras sustraer la componente debida al AGN, calculamos tasas de formación estelar (SFRs), las cuales comparamos con las obtenidas a partir de la emisión en  $24\ \mu$  (también descontaminadas de emisión procedente del AGN). No encontramos diferencias significativas entre las SFRs medidas para las galaxias con SEDs dominadas por el AGN y los AGNs oscurecidos. Además, las SFRs son compatibles con las medidas en galaxias con formación estelar al mismo desplazamiento al rojo. A pesar del reducido tamaño de nuestra muestra, concluimos que la presencia del AGN no parece tener una influencia importante en la formación estelar a  $z\sim 0.8$ , es decir, no encontramos evidencias de AGN feedback.

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## Halos de materia oscura y fluctuaciones primordiales de densidad

[*Conferencia Invitada*]

Eduard Salvador Solé (UB-IEEC)

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Hoy día, gracias a las simulaciones de N-cuerpos, se tiene una idea bastante clara y detallada de las propiedades de los halos de materia oscura que constituyen el esqueleto de las galaxias y sus agrupaciones. Concretamente, en el caso mejor estudiado de la materia oscura fría (CDM), están perfectamente caracterizadas su estructura y cinemática así como su subestructura. Todas estas propiedades, además de jugar un papel crucial en la formación y evolución de las galaxias, tienen implicaciones cosmológicas de gran calado. Por ejemplo, dichas propiedades parecen entrar en contradicción con el perfil de densidad de las galaxias de bajo brillo superficial (LSB) o con la abundancia y distribución de masas de los satélites de la Vía Láctea. Por esta razón, se empieza a dudar si no habrá que considerar el caso de materia oscura tibia (WDM), más difícil de simular pero cuyas características se cree que podrían solventar esos problemas. Con todo y pese a que los sistemas autogravitantes no colisionales vienen siendo estudiados desde hace más de 30 años, las propiedades de los halos simulados permanecían por explicar. Recientemente se ha podido por fin resolver este viejo problema. En esta charla presentaré un modelo exacto de halo que permite comprender de donde proceden las propiedades que presentan dichas estructuras en las simulaciones numéricas y, lo que es aún más importante, deducirlas analíticamente a partir del espectro de fluctuaciones primordiales de densidad.

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## Sesión C4 (martes 10, 15:30-17:20)

Salón de Actos

### Spirals with Supercomputers: Have We Finally Got it Right?

*[Conferencia Invitada]*

Brad Gibson (University of Central Lancashire, UK / Monash Centre for Astrophysics, Australia)

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The history of disk galaxy simulation is dotted with remarkable successes, tempered by frustrating impasses, including an inability to recover anything remotely similar to the Milky Way. Recent advances suggest that we might have made a breakthrough by generating essentially bulgeless disks. I will examine the evidence for this new-found optimism and identify where the shortcomings suggest we should be concentrating our future efforts.

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### Secular evolution in disk galaxies

Johan H. Knapen (IAC), the S4G team

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The detailed study of the different structural components of nearby galaxies can supply vital information about the secular, or internal, evolution of these galaxies which they may have undergone since their formation. We highlight a series of new studies based on the analysis of mid-infrared images of over 2000 local galaxies which we are collecting within the Spitzer Survey of Stellar Structure in Galaxies (S4G). In particular, we will discuss new results on the thick and thin disk components of galaxies, which turn out to be roughly equally massive, and whose properties indicate that the thick disks mostly formed in situ, and to a much lesser degree as a result of galaxy-galaxy interactions. We will also report on the research into local galaxy morphology, kinematics and stellar populations that we will perform over the coming four years within the EU-funded initial training network DAGAL (Detailed Anatomy of GALaxies), led by the IAC.

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### Constraints on secular evolution in unbarred spiral galaxies: understanding bulge and disk formation

Marja Kristin Seidel (IAC)

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Our understanding of the formation and evolution of disk galaxies has been growing over the past decade and recent studies show exciting results concerning star formation histories (SFH) of barred and non-barred disk galaxies. Our study focuses on low redshift spiral unbarred disk galaxies investigating stellar populations along the major and minor axes via line strength analysis and full spectral fitting techniques. With our sample of six well-chosen face-on spiral galaxies spanning all spiral Hubble types Sa-Scd (Sa, Sab, Sb, Sbc, Sc, Scd), we have studied the impact of different secular evolution processes and present intriguing properties concerning the SFHs of bulge and disk of these galaxies. Additionally we are complementing our stellar population analysis with stellar kinematics in order to constrain the main mechanisms responsible for the disk heating phenomena in this type of galaxies. Furthermore combining our analyses helps us to understand the nature of bulges in spiral galaxies and the relation to their surrounding disks.

## Quantifying the mixing due to bars

Patricia Sánchez-Blázquez (UAM)

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We will present star formation histories and the stellar and gaseous metallicity gradients in the disk of a sample of 50 face-on spiral galaxies with and without bars with the aim of quantifying the redistribution of mass and angular momentum in the galactic disks due to bars by comparing both the gas-phase and star-phase metallicity gradients on the disk of barred and non-barred galaxies. Numerical simulations have shown that strong gravitational torque by non-axisymmetric components induce evolutionary processes such as redistribution of mass and angular momentum in the galactic disks (Sellwood & Binney 2002) and consequent change of chemical abundance profiles. If we hope to understand chemical evolution gradients and their evolution we must understand the secular processes and re-arrangement of material by non-axisymmetric components and vice-versa. Furthermore, the re-arrangement of stellar disk material influences the interpretation of various critical observed metrics of Galaxy evolution, including the age-metallicity relation in the solar neighborhood and the local G-dwarf metallicity distribution. Perhaps the most obvious of these aforementioned non-axisymmetric components are bars - at least 2/3 of spiral galaxies host a bar, and possibly all disk galaxies have hosted a bar at some point in their evolution.

While observationally it has been found that barred galaxies have shallower gas-phase metallicity gradients than non-barred galaxies, a complementary analysis of the stellar abundance profiles has not yet been undertaken. This is unfortunate because the study of both gas and stars is important in providing a complete picture, as the two components undergo (and suffer from) very different evolutionary processes.

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## Evolución de las barras en galaxias de disco: cambios estructurales en los últimos 7 Gyr

Isabel Pérez Martín (Universidad de Granada)

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Presentamos evidencias observacionales de la evolución de los principales parámetros que caracterizan la dinámica de las barras. Se discutirán los resultados sobre la evolución del tamaño y patrón de velocidad de las barras obtenidos de un estudio morfológico de galaxias de alto- y bajo-redshift. En este trabajo vemos que el patrón de velocidad y el tamaño de las barras estudiadas han permanecido constantes en los últimos 7 Gyr. Discutiremos la implicación que tienen estos resultados en el intercambio de momento angular y evolución de las diferentes componentes estructurales de la galaxia. Relacionaremos estos resultados con los obtenidos del estudio de poblaciones estelares en barras y bulbos de galaxias espirales de distintos tipos morfológicos para discutir la formación y el tiempo de vida de la barra.

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## Sesión C5 (martes 10, 17:50-19:30)

Salón de Actos

### **Impact of gas flows on the metallicity of barred galaxies**

Raúl Cacho Martínez (UCM), Patricia Sánchez Blázquez, Javier Gorgas  
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The relative contribution of secular galaxy evolution to the construction and transformations of spiral galaxies is a hot topic under an intense debate. Numerical simulations predict that bars represent a very important mechanism for triggering gas inflows that lead to central star formation and that change both, the gas-phase and stellar phase metallicities in the center of the galaxies. Understanding this mechanism is very important to understand the distribution of metals in our own Galaxy, which is crucial at the arrival of the GAIA survey. Currently, there are only a few studies comparing the central gas-phase metallicity in galaxies with and without bars, with contradictory results. In this talk, I will present a comparative study of the gas-phase and stellar metallicities in the center of galaxies with and without bars in a sample of SDSS galaxies. These results are helping us to understand the relative contributions of bars-induced gas inflows in producing radial mixing.

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### **The star formation history of galaxies spatially resolved: CALIFA perspective**

Rubén García Benito (IAA-CSIC)  
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CALIFA (Calar Alto Legacy Integral Field Area) is a 3D spectroscopic survey of 600 nearby galaxies that we are obtained with PPaK@3.5m telescope of CAHA. This is a pioneer survey that will have a significant impact on the evolution of galaxies since for the first time the star formation history of galaxies are resolved in their subcomponents (bulge and disk). This is the kind of productive projects that can be done by an intermediate size telescopes in the next decade to understand how galaxies form and evolve.

This talk is related with the results that our group is obtaining resolving spatially the star formation history of galaxies using spectral synthesis techniques. Here, we obtain how the mass and metallicity are assembled in the first 100 galaxies already observed in the 3D CALIFA survey. We present the results stacking the data in the color-magnitude diagram. We find that galaxies grow inside-out, and there is a good correlation between the metallicity radial gradient and mass and color of the galaxy. The evolution of the metallicity gradients are also obtained to constrain the relevance of the monolithic collapse and mergers models along the color-magnitude diagram.

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## Poblaciones estelares en las partes externas de las galaxias espirales con datos IFU de CALIFA

Tomás Ruiz Lara (Universidad de Granada), Estrella Florido (UGR), Isabel Pérez (UGR)

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Presentamos los resultados preliminares de un proyecto dedicado a estudiar las poblaciones estelares en las partes más externas de las galaxias espirales. Los principales objetivos son acotar modelos de formación galáctica, desentrañar posibles procesos de migración radial, relacionar poblaciones estelares con los diferentes tipos de perfiles de brillo superficial para estudiar los procesos que los causan y recuperar historias de formación estelar hasta las partes más externas de los discos de estas galaxias. Para ello utilizaremos los datos espectroscópicos de campo integral (IFU) facilitados por la colaboración CALIFA, a la que pertenecemos. Hemos elegido una submuestra de 60 galaxias espirales de baja inclinación dentro de la muestra de CALIFA. Con estos datos y con las nuevas técnicas de ajustes de poblaciones estelares a partir de espectros completos, somos capaces de obtener parámetros estelares y romper la degeneración edad-metalicidad hasta grandes distancias galactocéntricas. Además, las distribuciones de luz y masa de estas galaxias están siendo caracterizadas mediante perfiles de brillo superficial en las bandas  $g$ ,  $r$  e  $i$  de SDSS y con observaciones profundas suplementarias en NIR.

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## IFS and multi-wavelength imaging of nearby spiral galaxies: NGC5668 as a pilot case for MEGARA

Raffaella Anna Marino (UCM), R. A. Marino, A. Gil de Paz, M. García-Vargas, A. Castillo-Morales, M.C. Eliche-Moral, J. Gallego, S. Pascual, J. Zamorano, E. Carrasco, J. M. Vilchez-Medina, F. M. Sánchez-Moreno and MEGARA Tea

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In order to improve our understanding of the mechanisms that drive the evolution of disk galaxies we analyze the full bi-dimensional spectral cube of the nearby spiral galaxy NGC 5668, which was obtained as a mosaic of 6 pointings, covering a total area of  $2 \times 3$  arcmin<sup>2</sup>, obtained with the PPAK Integral Field Unit at the Calar Alto (CAHA) observatory 3.5 m telescope. From these data we obtain the bidimensional spatial distribution maps of the attenuation of the ionized gas, and chemical abundances of oxygen. We find a mean ionized-gas attenuation of  $A_V \sim 1$  mag, with the gas attenuation appearing larger than the continuum attenuation by a factor of 3. With respect to the oxygen abundance, we find that, while inwards of  $r \sim 36'' \sim 4.4$  kpc  $\sim 0.36$  ( $\frac{D_{25}}{2}$ ) the derived O/H ratio follows the radial gradient typical of the disks of spiral galaxies, the abundance gradient beyond  $r \sim 36''$  flattens out. The multi-wavelength surface brightness profiles of NGC 5668 are compared with those predicted by chemo-spectrophotometric evolutionary models of galaxy disks in the context of the inside-out scenario of disk formation. Both the deviations of the color profiles and the shape of the metallicity radial distribution indicate that a secondary mechanism, possibly gas transfer induced by the presence of a young bar, must have played a role in shaping the recent chemical and star formation histories of NGC5668 beyond what is predicted by the inside-out scenario. This study demonstrates the strength of the combination of IFU and multi-wavelength imaging data. With MEGARA, the future optical IFU & MOS for 10.4-m GTC we will fill the gap currently existing in astronomical instrumentation with high spectral resolution and large area coverage simultaneously addressing such fundamental issues in galactic structure and evolution.

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## Sesión C6 (miércoles 11, 09:00-11:00)

Salón de Actos

### **The MIUSCAT stellar population models: constraints from optical photometry**

Elena Ricciardelli (UV)

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In this contribution we present the MIUSCAT stellar population models based on fully empirical stellar spectral libraries (MILES, Indo-U.S., CaT) at moderately high resolution, covering the range 3500-9500Å. The models are tested in their ability to reproduce the colors of globular clusters and quiescent galaxies. Although the match with the integrated colours of Milky Way GCs is remarkable, we show how the optical colours of nearby ETGs pose a challenge to present-day stellar population models. We investigate a number of possible explanations and establish the importance of alpha-enhanced models to bring down the discrepancies with observations.

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### **Edades jóvenes y otras propiedades intrigantes de las galaxias compactas masivas locales**

Anna Ferré-Mateu (IAC)

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Over the past few years a revolution on our understanding of the formation and assembly of galaxies has occurred: massive galaxies in the Early Universe were found to be much more compact than their local counterparts. This finding has triggered a strong debate on how these objects evolved to the present day massive galaxy population and on what mechanism is causing this size growth. We have found a tiny fraction of such compact galaxies in the Local Universe, as predicted by some models, opening the possibility of exploring their formation mechanisms in great detail. I will present the intriguing properties of these galaxies, which, unlike the expectations, show unprecedented large fractions of young stellar components. These object also present disk morphologies, strong rotation curves and high velocity dispersions and do not follow the relations of present day massive ellipticals or spirals. Nearby compact massive galaxies are almost perfect counterparts in terms of size, mass shape and age of the compact massive galaxies at  $z=2$ .

## Old stellar population studies in multifilter spectro-photometric data

Luis Alberto Díaz García (CEFCA), Javier Cenarro  
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In this talk we present first results on the stellar population analysis for a sample of thousands of Early-Type galaxies up to redshift  $\sim 1$  in the ALHAMBRA survey, allowing us to face how and when these galaxies were formed and have evolved throughout cosmic time. The analysis has been performed making use of a generic code developed by our team to study and recover the main parameters of old stellar populations as seen by large scale multi-filter surveys, such as J-PAS, J-PLUS or ALHAMBRA. The code is based in spectral energy distribution fitting techniques based on error-weighted  $\chi^2$  minimization tests and MonteCarlo simulations. As main input ingredient, we use well flux-calibrated SSP models covering the full optical spectral range, like MIUSCAT (Vazdekis et al. 2012). The main output parameters are redshift (photo-redshift), age, metallicity, extinction, initial mass function, stellar masses and emission lines. We overall find that the bulk of the stellar content of early-type galaxies was formed at high redshifts, showing hints for more massive ellipticals being 1-2 Gyr older than less massive ones.

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## 3D view on Virgo and field dwarf elliptical galaxies: late-type origin and environmental transform

Agnieszka Rys (IAC), Jesús Falcón-Barroso (IAC), Glenn van de Ven (MPIA)  
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In our contribution we will show the effects of environmental evolution on cluster and field dwarf elliptical galaxies (dEs), presenting the first large-scale integral-field spectroscopic data for this galaxy class. Our sample consists of 12 galaxies and no two of them are alike. We find that the level of rotation is not tied to flattening; we observe kinematic twists; we discover large-scale kinematically-decoupled components; we see varying gradients in line-strength maps: from nearly flat to strongly peaked in the center. The great variety of morphological, kinematic, and stellar population parameters seen in our data supports the claim that dEs are defunct dwarf spiral/irregular galaxies and points to a formation scenario that allows for a stochastic shaping of galaxy properties. The combined influence of ram-pressure stripping and harassment fulfills these requirements, still, the exact impact of the two is not yet understood. We have thus further investigated the properties of our sample by performing a detailed comprehensive analysis of its kinematic, dynamical, and stellar population parameters. We have inferred the total (dark and baryonic) matter distribution by fitting the observed stellar velocity and velocity dispersion with the solutions of the Jeans equations. We have run Schwarzschild's orbit-superposition models to gain insights into the orbital makeup of our galaxies. We have obtained 2D age, metallicity, and enrichment information from both line-strength and full-spectrum fitting analysis. This combined knowledge of the dynamical properties and star-formation histories, together with model predictions for different formation mechanisms, will be used to quantitatively determine the actual transformation paths for these galaxies.

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## Kinematical mapping of the outskirts of elliptical galaxies using the OSIRIS Tunable Filters at GTC: a novel approach

Ignacio Martín Navarro (IAC), A. Bongiovanni, A. Vazdekis, J. Cenarro, M. Koleva, M. Beasley, J. Cepa  
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We have developed an innovative “index scanning technique” to map the stella.

## OSIRIS and Herschel view of Cluster of Galaxies CL0024+1652

Ricardo Pérez Martínez (INSA / XMM-Newton), Miguel Sánchez Portal, Jordi Cepa, Irene Pintos, Ana M. Pérez García

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CL0024+1652 is a cluster of galaxies at  $z \sim 0.4$  presenting several substructures that suggests it is in the last stages of group accretion. The galaxy transformations involved in this process are far from being completely understood. Our study focuses in those related to the variation in morphology and star formation activity by observing emission line galaxies at different wavelengths, from optical to far infrared, making use of OSIRIS at GTC and PACS at Herschel. In particular, the usage of OSIRIS in Tunable Filter mode makes it possible to scan  $H\alpha$ /[NII],  $H\beta$ , [OII]3727 and [OIII]5007 up to 2.5 virial radii with unprecedented depth and exposure time efficiency. Moreover, the joint analysis of these data together with those at  $24\mu m$  from Spitzer and  $100\mu m$  and  $160\mu m$  from PACS not only does it allow us to distinguish star forming vs AGN galaxies, but also quantify the star formation hidden by dust obscuration. This study is being developed within the GLACE program, that intends to study the evolution of emission line galaxies in clusters across the cosmic time. It searches for star formation activity and/or AGNs in clusters in three different redshift windows ( $\sim 0,40$ ,  $\sim 0,63$  and  $\sim 0,86$ ), providing a unique view of the evolution of cluster galaxies along such redshift range.

## Sesión C7 (jueves 12, 09:00-11:00)

Salón de Actos

### La distribución radial de supernovas en starbursts nucleares

Rubén Herrero Illana (IAA), Miguel Ángel Pérez-Torres, Antxon Alberdi

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En las interacciones entre galaxias parecen desencadenarse intensos procesos de formación estelar masiva y posiblemente acreción en un agujero negro supermasivo, transportándose grandes cantidades de gas molecular al kiloparsec central. En este trabajo (Herrero-Illana et al., 2012, aceptado para publicación) hemos estudiado la distribución radial de supernovas y remanentes de supernova en las zonas nucleares de las galaxias con fuerte formación estelar M82, Arp 299-A y Arp 220 con el objetivo de caracterizar los brotes de formación estelar nuclear en estas galaxias y estudiar su compatibilidad con escenarios que proponen la formación de discos nucleares de  $\sim 100$  pc en las regiones centrales de este tipo de galaxias.

Para ello hemos usado datos de archivo de observaciones radiointerferométricas a muy alta resolución angular de M82 y Arp 220, así como observaciones públicas de VLBI de Arp 220 y Arp 299-A y datos propios de Arp 299-A obtenidos con el European VLBI Network.

De este estudio hemos derivado los parámetros de escala característicos de los hipotéticos discos nucleares de estas galaxias, que oscilan entre los  $\sim 20$ -30 pc para Arp 299-A y Arp 220 y los  $\sim 160$  pc de M82. La distribución radial de supernovas para los discos nucleares de Arp 299-A y Arp 220 es también consistente con un perfil de densidad superficial que obedece a una ley de potencias con exponente  $\gamma = 1$ , tal y como predicen simulaciones numéricas hidrodinámicas.

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### El nitrógeno como trazador químico de la evolución de las galaxias en el Universo Local y temprano

Enrique Pérez Montero (IAA)

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El nitrógeno como trazador químico de la evolución de las galaxias en el Universo Local y temprano. Las líneas de emisión de oxígeno en el óptico se utilizan de manera exhaustiva como trazadores del contenido en metales de las regiones de gas ionizado por episodios masivos de formación estelar. Su alta luminosidad les hace ser detectadas desde el Universo Local hasta en galaxias “starburst” a alto corrimiento al rojo. En ocasiones en que estas líneas no son detectadas por el cubrimiento espectral o por el corrimiento al rojo, las líneas de nitrógeno se pueden usar como sustitutas. No obstante, el cociente de las abundancias de nitrógeno y oxígeno, que tienen un origen nucleosintético diferente, introduce una variable que debe ser tenida en cuenta para una correcta interpretación del status evolucionario de los objetos en que se miden. Esta contribución detallará los riesgos de usar trazadores de la metalicidad basados en líneas ópticas de [NII], introducirá nuevos métodos para derivar el cociente N/O y para su correcta interpretación y mostrará resultados del estudio de este cociente en galaxias con formación estelar del Universo Local (por ejemplo, las galaxias guisantes verdes) y en la evolución de su relación con la masa estelar en muestreos a alto corrimiento al rojo (por ejemplo, en zCOSMOS).

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## The Oxygen Abundance Determination in the IFU Era

Fernando Fabián Rosales Ortega (UAM), S. F. Sánchez, R. Kennicutt, A. Díaz

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Hitherto, most studies devoted to the chemical abundance of extragalactic nebulae have only been able to measure the first two moments of the abundance distribution: the mean metal abundances of discs and their radial gradients. However, most of the observations targeting nebular emission have been made with single-aperture or long-slit spectrographs, resulting in a small number of galaxies studied in detail, a small number of HII regions studied per galaxy, and a limiting coverage of these regions within the galaxy surface. The advent of Multi-Object Spectrometers and Integral Field Spectroscopy (IFS) instruments with large fields of view now offers us the opportunity to undertake a new generation of emission-line surveys, based on samples of scores to hundreds of HII regions and full two-dimensional (2D) coverage of the discs of nearby spiral galaxies. In the last few years we started a major observational programme aimed to study the 2D properties of the ionized gas and HII regions in a representative sample of nearby face-on spiral galaxies using IFS. We have catalogued more than 2500 HII regions with good spectroscopic quality in 38 galaxies; to our knowledge, this is by far the largest 2D spectroscopic HII region survey ever accomplished. The spatially-resolved information provided by these observations are allowing us to test and extend the previous body of results from small-sample studies, while at the same time open up a new frontier of studying the 2D oxygen abundance on discs and the intrinsic dispersion in metallicity, progressing from a one-dimensional study (radial abundance gradients) to a 2D understanding, allowing us at the same time to strengthen the diagnostic methods that are used to measure HII region abundances in galaxies.

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## Oxygen abundance from strong-line methods at extremely low metallicities

Ana Belén Morales Luis (IAC), Sanchez Almeida, Muñoz Tuñon, L. Aguerri, Terlevich, Terlevich, and Vilchez

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The determination of oxygen abundance in nebulae requires measuring a significant number of emission lines distributed along a wide spectral range (e.g., Stasinska 2002astro.ph..7500S, Perez Montero & Díaz2003MNRAS.346..105P, Perez Montero & Diaz2005MNRAS.361.1063P). The required measurements are hard to obtain at high redshift, where sources are very faint, and where the accessible spectral range is limited. These difficulties are often overcome using empirical relationships between the oxygen abundance and the fluxes in a small number of strong lines (e.g., Pagel et al. 1979MNRAS.189...95P; Genzel et al. 2012ApJ...746...69). The so-called strong-line methods are often the only practical alternative for metallicity estimate at high redshift. In this sense, the low metallicities range is particularly important since high redshift objects are primitive and so of low metallic content. One of the most widely used relationships links the oxygen with the ratio between [NII]6583 and H $\alpha$  (Denicolo et al. 2002MNRAS.330...69D). This relationship shows a large scatter at low metallicity (Pettini & Pagel 2004MNRAS.348L..59P). In an effort to bring down the errors, we re-calibrated the relationship using a large sample of extremely metal-poor galaxies (Morales Luis et al 2011ApJ...743...77M). The SDSS spectra of the galaxies were all analyzed in the same way to minimize systematic errors. To our surprise, the decrease of scatter reveals that the ratio [NII]6583 to H $\alpha$  seems to be independent of metallicity at low oxygen abundance ( $12+\log(\text{O}/\text{H}) < 7.6$ ). This result casts doubts on the metallicities of high-redshift objects based on the relationship. We plan to explain how the re-calibration was carried (including the sample selection and the abundance determinations). In addition, we will try explain what produces the lack of correlation.

## Environmental imprint on galaxy chemical enrichment

Vasiliki Petropoulou (IAA)

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Recent results will be presented on the metal enrichment of low-mass star-forming galaxies in local Universe clusters. The environmental effect on the chemical evolution of these galaxies will be discussed. We have used spectroscopic data from the SDSSIII-DR8 and we have derived the gas-phase O/H and N/O abundances. We have then examined the Mass-Metallicity Relation of this sample of cluster galaxies, and we have found well defined sequences. A flattening of the slope of these sequences has been observed for galaxies located in the core of the two more massive clusters of the sample, suggesting that the effect of the cluster environment depends both on the galaxy mass and the host cluster mass. Based on these results we explore cluster-specific effects (e.g. ram-pressure stripping, pressure confinement etc), predicted by hydrodynamic models, capable of yielding the observed mass-dependent enhancement of the metallicity.

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## Corrugated velocity pattern in the spiral galaxies: NGC278, NGC1058, NGC2500 & UGC3574

M<sup>a</sup> Carmen Sánchez Gil (Universidad de Cádiz), Emilio Alfaro Navarro, Enrique Pérez Jiménez

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We report the detection, in H $\alpha$ , of a radial corrugation in the velocity field of a sample of nearly face-on, spiral galaxies: NGC 278, NGC 1058 & UGC 3574. This pattern was previously detected in NGC 5427, Alfaro et al. 2001 (This work is the continuation of that one).

This kinematical behaviour is similar to the one expected in a galactic bore generated by the interaction of a spiral density wave with a thick gaseous disk, as modeled by Martos & Cox (1998). The origin could be spiral arms and collisions with high-velocity clouds, large-scale perturbations, such as gravitational interactions. Some authors also explored the possibility of undulations along spiral arms, induced by magneto-gravitational instabilities (Nelson 1985; Gómez de Castro & Pudritz 1992; Kim, Hong, & Ryu 1997; Franco et al. 2001).

Flux and velocity peaks are cross-correlated with a similar displacement for all the observed spiral arms. The preliminary diagnostic diagrams, using the [NII]6584/H $\alpha$  vs. [SII](6717+6731)/H $\alpha$  ratios, indicate that the main ionization mechanism is due to high energetic photons. Although some portion of the gas appears to be ionized by low-velocity shocks.

The analysis of these velocity patterns does not provide a final answer about the morphogenesis of velocity corrugations, but constrains the proposed models for explaining its origin.

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## Sesión C8 (jueves 12, 15:30-17:20)

Salón de Actos

### Witnessing galaxy clusters: from maturity to childhood

*[Conferencia Invitada]*

Begoña Ascaso (IAA-CSIC)

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Galaxy clusters are the largest structures in Universe. They are very important as both cosmological probes and astrophysical laboratories.

Several methods have been developed to detect galaxy clusters with different techniques (optical, X-rays, Weak Lensing and Sunyaev-Zeldovich effect) providing cluster samples with a well-characterized purity and completeness rates up to moderate redshift ( $z < 1.2$ ). These samples allow us to study the systematic of different methods and to obtain reliable mass estimations. On the contrary, high redshift clusters only started to be explored very recently with the advent of deep IR and X-ray data surveys, providing the first proto-clusters ( $z > 1.5$ ) ever detected.

In this talk, I will introduce these techniques and review some of the cluster samples obtained while stressing particular striking cases. I will discuss their relevance in terms of cosmological and galaxy evolution constraints and finally, I will mention the cluster science predictions for the next generation surveys.

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### The evolution of galaxy clustering since $z=1.5$ in the ALHAMBRA Survey

Pablo Arnalte-Mur (Durham University, UK), The ALHAMBRA Team

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The study of galaxy clustering at different redshifts is an important tool to obtain information about the process of growth of structures in the Universe, and about galaxy formation and evolution. We present the results of our measurements of the clustering of galaxies at different redshifts ranging from  $z=0.3$  to  $z=1.5$  using data from the ALHAMBRA Survey. This photometric survey has mapped a total area of  $4 \text{ deg}^2$  using a total of 20 medium-band optical filters, and three broad-band NIR filters. It thus provides a deep sample ( $I < 25$ ) with very accurate photometric redshift measurements (error  $\leq 1.5\%$ ). We measure the correlation function for different galaxy samples to study the evolution with redshift of the clustering properties of different galaxy populations. In particular, we show how the dependence of bias on luminosity steepens with respect to the relation found at low redshift. These clustering measurements also provide a way to study the relation between galaxies and their host haloes during a period which represents the central 50% of the history of the Universe.

## Recovering physical properties from the ALHAMBRA photometry

William Schoenell (IAA), Narciso Benitez, Alberto Molino, Begoña Ascaso, Yolanda Jiménez Teja  
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On galaxy spectra, one can find mainly two features: emission lines, which tell us about the gas content, and the continuum plus absorption lines, which tell us about the stellar content. In the past years, we developed a Spectral Synthesis code (<http://starlight.ufsc.br>) which we used to fit the stellar populations of 926246 galaxies from the SDSS with models from Bruzual and Charlot (2003), giving us important physical properties (masses, star formation histories, etc.) to study how galaxies form and evolve in time. Emission lines are also studied, after measuring them from the starlight subtracted spectrum.

Photometry, on the other hand, is much more limited, as it does allow us to confidently retrieve all those physical properties that the resolution of spectroscopy brings us. However, with the recent development of redshift surveys with ultra-narrow filters ( $\sim 100 \text{ \AA}$ ) (like ALHAMBRA, J-PAS and DES), it is interesting to know how confidently we can retrieve information of the physical properties and the gas content of galaxies from photometric data.

Our aim in this work is to answer, using simulated photometry data, three fundamental questions: Can we measure stellar age and metallicity distributions? Can we separate star-forming galaxies from AGN? Can we measure emission lines, nebular abundances and extinction?

To accomplish this, we selected a sample of 300k galaxies from the SDSS and divided them in two groups: 200k Objects and a Base of 100k. We corrected the spectra to  $z=0$  and converted them to filter fluxes. Using a statistical approach, we calculated a Probability Distribution Function for each property of each Object and the Base. Since we have the properties of all the data from the STARLIGHT-SDSS database, we could compare them with the results obtained from summaries of the PDF (mean, median, etc).

Our preliminary results show that we retrieve the weighted average of the log of the galaxy age with a good error margin ( $\sigma \approx 2 \text{ dex}$ ), and similarly for quantities such as mass-to-light ratio, mean stellar metallicity, etc. We are currently refining the statistical method in order to get better results, as well as investigating its power to correctly classify galaxies according to emission line schemes, but on the basis of photometry alone. If successful, future photometric surveys will be much more useful than anticipated.

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## CHEF applications to the ALHAMBRA survey

Yolanda Jiménez Teja (IAA), Txitxo Benítez, Begoña Ascaso, Alberto Molino, William Schoenell  
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Las bases CHEF (de Chebyshev y Fourier) se desarrollaron como una herramienta matemática especialmente diseñada para el análisis de imágenes astronómicas, en particular, de galaxias. Son un conjunto de bases matemáticas construidas en coordenadas polares a partir de funciones racionales de Chebyshev (para la componente radial) y series de Fourier (para la coordenada angular), que han demostrado ser altamente precisas y muy compactas, arrojando mejores resultados que otras técnicas ampliamente conocidas y utilizadas en la actualidad como son GALFIT y las bases shapelet.

Son numerosas las aplicaciones prácticas que se han desarrollado más allá del modelado morfológico, como por ejemplo la deconvolución de la PSF, el cálculo de parámetros fotométricos y morfológicos (como el flujo, el centroide, la elipticidad, etc.), la simulación realista de galaxias complejas, la substracción de galaxias brillantes en cúmulos, la estimación del shear para la medición del efecto lente gravitacional débil y la medición de la fotometría en arcos de lensing.

En esta presentación nos gustaría mostrar los resultados alcanzados al aplicar esta técnica a datos procedentes del proyecto ALHAMBRA, mostrando tanto los altamente satisfactorios resultados alcanzados, como la capacidad, velocidad y eficiencia del algoritmo CHEF para trabajar de forma automática con la gran cantidad de datos provenientes de este cartografiado.

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## The JPAS Survey

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The Javalambre-PAU Astrophysical Survey (J-PAS) is a project that will image  $>9000$  deg<sup>2</sup> with a dedicated 2.5m telescope and a 5 sq.deg, 1.3M pixel camera. The survey is optimized to measure the radial scale of the Baryonic Acoustic Oscillations and scheduled to start in May 2014. J-PAS will use 54 contiguous filters with 136Å width (but spaced about 100Å apart) in the range 3700–9100Å, plus two broad U and Z band filters, and will reach a  $5\sigma$  over 3" aperture magnitude depth of AB=22.5-23.5, depending on the wavelength. The NB filter photometry, combined with a Bayesian photo-z algorithm, will provide  $\Delta z \sim 0.003(1+z)$  for  $\sim 100$  million galaxies, both early types (up to  $z \sim 1.05$ ) and late types (up to  $z \sim 1.3$ ), reaching an effective volume to measure radial BAO of  $\sim 11$ Gpc<sup>3</sup>. In addition, J-PAS will yield high-quality photo-z ( $\Delta z \sim 0.01(1+z)$ ) and low-resolution spectroscopy for hundreds of millions of other galaxies, including a very significant high-redshift population. J-PAS will provide a low-resolution ( $R \sim 50$ ) spectrum for every pixel of the sky, promising important breakthroughs in many areas of Astrophysics. We describe the status of the project, and describe in detail its potential for several scientific questions.

**Sesión C9 (jueves 12, 17:50-19:30)****Salón de Actos****MAGIC: two eyes for the gamma-ray Universe**

Roberta Zanin (UB), on behalf of the MAGIC collaboration

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MAGIC is a system of two atmospheric Cherenkov telescopes for gamma-ray astronomy in the very-high energy range, from some tens of GeV up to tens of TeV. Located in the Canary island of La Palma (Spain), MAGIC has the lowest energy threshold among the instruments of its kind, well suited to study the still poorly explored energy band below 100 GeV. Although the space-borne gamma-ray telescope Fermi/LAT is sensitive up to 300 GeV, gamma-ray rates drop fast with increasing energy, and statistics are scarce above few GeV. Therefore, only recently the combination of MAGIC and Fermi/LAT observations have allowed to bridge the missing gap in the high-energy component of astrophysical spectra of active galactic nuclei, pulsar wind nebulae and supernova remnants. In addition, it has allowed the detection of the pulsed gamma-ray emission from the Crab pulsar up to 400 GeV.

This talk will provide a review of the most important results recently obtained by the MAGIC collaboration, and their consequences for the understanding of very high energy gamma-ray production in various astrophysical sources.

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**SWIFT J1644+57 : the formation of a jet in real time**

Alberto J. Castro-Tirado (IAA), et al.

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We describe the evolution of Swift J1644+57, whose unique X-ray properties have led several groups to interpret its behavior as corresponding to an extraordinary event of tidal disruption of a star by a supermassive black hole in the nucleus of a ( $z = 0.3545$ ) galaxy, as derived by GTC. Multiwavelengths observations during 1-yr have proven to be essential to reveal the long term nature of the emission in this source. In particular, we identify for the first time the properties of a forming relativistic jet. In our interpretation of the phenomenon, we leave the still open possibility that it may correspond to the onset of a dormant AGN, but this may only be tested with longer term X-ray, millimetre and centimetre monitoring.

## The distribution of equivalent width in GRB host galaxies

Javier Gorosabel (IAA-CSIC)

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Gamma-ray burst (GRB) afterglows shine, during a brief period of time as the most luminous objects that can be detected in the Universe. They have been observed at almost any redshift, from our nearby environment (the nearest one, at  $z=0.08$ ) to the very distant Universe (the current record holder was found to be at  $z=9.4$ ). Their optical spectra is well reproduced by a clean, simple power law, making them ideal light houses to probe the interstellar medium of the galaxies that host them at any redshift.

Here we use the largest sample of GRB afterglow spectra that has been collected until now to perform a statistical study of the interstellar medium in which these objects are found. By analysing the distribution of equivalent widths of the most prominent absorption features we evaluate the different types of environments that host GRBs and study their diversity. From our data we derive the typical properties of the ISM, ionisation ratios, star formation rates, composition, abundances, etc., study their evolution through the history of the visible Universe and compare them with samples of quasar DLAs and star forming galaxies. We propose a series of tools to easily compare individual spectra with the global sample. GRBs occur in environments with varied compositions, metallicities and ionisations, showing little evolution with redshift.

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## Estudio multifrecuencia del primer GRB detectado con ALMA

Rubén Sánchez-Ramírez (IAA-CSIC)

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Se presentará la campaña observacional de más de 2 meses de duración llevada a cabo para el estudio del afterglow del Gamma-Ray Burst GRB 110715A, así como los primeros resultados y conclusiones.

Para el seguimiento de este evento, muy intenso pero fuertemente oscurecido por el polvo interestelar, se activaron observatorios de radio (ATCA), submilimétricos (APEX y ALMA) y óptico/infrarrojo (GROND/2.2m y X-Shooter/VLT), además de contar con los datos en el óptico/ultravioleta (UVOT) y en rayos X (XRT) proporcionados por Swift, el satélite que descubrió el estallido. 110715A representa la primera detección (y única hasta el momento) de un GRB con ALMA, el cual se utilizó como prueba de observación de oportunidad durante la etapa de comisionado del observatorio. También se mostrarán los primeros resultados del análisis espectral del afterglow, del que se obtienen parámetros físicos tanto del propio evento como de la galaxia anfitriona y del material situado en la línea de visión. Por último, se realizará una breve discusión sobre el posible impacto de este estudio en el campo

## Observational Study of the Polarization of the Anomalous Microwave Emission

Carlos Hugo López Caraballo (IAC), Ricardo Génova, José Alberto Rubiño y Rafael Rebolo  
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The anomalous microwave emission (AME) is an emission process in the 20-60 GHz microwave frequency range, which is spatially correlated with the far infrared dust emission, and can not be explained in terms of the three known physical mechanisms of diffuse emission in the Galaxy: free-free, synchrotron and thermal dust (vibrational) emission.

Over the last 10 years there have been plenty of studies of this emission in different Galactic clouds, which have helped to understand its properties and to test different theoretical models. Its study is also important because it is a significant foreground for CMB experiments. Given the current interest for the detection of a B-mode signal in the CMB polarization, it is important to characterize its polarization. Furthermore, the still unknown polarization level of the AME can help to disentangle between different proposed theoretical models to explain this emission. However, up to now, very few attempts have been done in this direction.

In this talk we will present a review of the current measurements and constraints on the AME polarization. In particular, we will focus in the Perseus Molecular Complex, where we have the best upper limits of the AME polarization.

In addition, we have used the seven-year Wilkinson Microwave Anisotropy Probe (WMAP) data in order to study the polarization of the AME in Perseus and other new regions.

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## Sesión C10 (viernes 13, 09:00-11:00)

Salón de Actos

### The OTELO project

Jordi Cepa Nogué (IAC), OTELO Project Team  
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The OTELO project is the extragalactic survey currently under way using the tunable filters of the instrument OSIRIS at the GTC. OTELO is already providing the deepest emission line object survey of the universe up to a redshift 7. In this contribution, the status of the survey, and the first results obtained will be presented.

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### SHARDS: a spectro-photometry of distant red and dead massive galaxies

Pablo G. Pérez González (UCM), SHARDS Team  
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SHARDS, an ESO/GTC Large Program, is an ultra-deep (26.5 mag) spectro-photometric survey with GTC/OSIRIS designed to select and study massive passively evolving galaxies at  $z=1.0-2.3$  in the GOODS-N field using a set of 24 medium-band filters (FWHM $\sim$ 17 nm) covering the 500-950 nm spectral range. Our observing strategy has been planned to detect, for  $z>1$  sources, the prominent Mg absorption feature (at rest-frame  $\sim$ 280 nm), a distinctive, necessary, and sufficient feature of evolved stellar populations (older than 0.5 Gyr). These observations are being used to: (1) derive for the first time an unbiased sample of high- $z$  quiescent galaxies, which extends to fainter magnitudes the samples selected with color techniques and spectroscopic surveys; (2) derive accurate ages and stellar masses based on robust measurements of spectral features such as the Mg(UV) or D(4000) indices; (3) measure their redshift with an accuracy  $\Delta(z)/(1+z)<0.02$ ; and (4) study emission-line galaxies (starbursts and AGN) up to very high redshifts. The well-sampled optical SEDs provided by SHARDS for all sources in the GOODS-N field are a valuable complement for current and future surveys carried out with other telescopes (e.g., Spitzer, HST, and Herschel).

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## Scanning emission line galaxies through the SHARDS survey

Antonio Cava (UCM), P.G. Perez-Gonzalez and SHARDS Team

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SHARDS (Survey for High-z Absorption Red & Dead Sources) is an unbiased ultra-deep spectro-photometric survey with GTC@OSIRIS aimed at selecting and studying massive passively evolving galaxies at  $z=1.0-2.3$  using a set of 24 medium-band filters (FWHM  $\sim 17$  nm) at 500-950 nm in GOODS-N. Our observing strategy is optimized to detect at  $z > 1$  the prominent Mg absorption feature at rest-frame  $\sim 280$  nm, a distinctive, necessary, and sufficient feature of evolved stellar populations. Nonetheless, the data quality allow a plethora of studies on galaxy populations, including Emission Lines Galaxies (ELGs) about which we have started our first science verification project presented in this contribution. We provide details on the selection procedures, measurement and first analysis of ELGs in SHARDS, demonstrating the huge capability of the survey in providing emission line properties (redshift estimates, EWs, line fluxes, SFRs, ...) for a large galaxy sample spanning from local H-alpha to high-z Lyman-alpha emitters.

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## The entertaining live of massive galaxies

Ignacio Trujillo (IAC)

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Once understood as the paradigm of passively evolving objects, the discovery that massive galaxies experienced an enormous structural evolution in the last ten billion years has opened an active line of research. The most significant pending question in this field is the following: which mechanism has made galaxies to grow largely in size without altering their stellar populations properties dramatically? The most viable explanation is that massive galaxies have undergone a significant number of minor mergers which have deposited most of their material in the outer regions of the massive galaxies. This scenario, although appealing, is still far from being observationally proved since the number of satellite galaxies surrounding the massive objects appears insufficient at all redshifts. The presence also of a population of nearby massive compact galaxies with mixture stellar properties is another piece of the puzzle that still does not nicely fit within a comprehensive scheme. I will review these and other intriguing properties of the massive galaxies in this contribution.

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## Massive galaxies: born as disks, dead as spheroids

Fernando Buitrago Alonso (University of Edinburgh)

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Present day massive ( $M_{\text{stellar}} > 10^{11} M_{\odot}$ ) galaxies are composed mostly of early-type objects. To ascertain whether this was also the case at higher redshift, we have compiled over a thousand massive galaxies at  $0 < z < 3$  with HST imaging and spectroscopic redshifts for the majority of them. We have further analyzed using 3D spectroscopy another sample of 10 massive galaxies at  $z = 1.4$ . Both works highlight the progressive change between a late-type/peculiar nature at  $z > 2$  and a predominance of early-type morphologies only since  $z = 1$ . Many projects are confirming this picture, especially from the CANDELS survey. However, the question about the origin of this galaxy population still remains. We focus in the novel UltraVISTA survey. Its exceptional coverage (YJHK<sub>s</sub> imaging over the COSMOS field) and large area ( $1.5 \times 1.2 \text{ deg}^2$ , twice UKIDSS UDS, reaching 1 mag deeper) enable us to go to  $3 < z < 7$  in looking for suitable progenitors for the high-z massive galaxy population. I will present the status of our research including the galaxy mass functions from this survey.

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## El papel dominante de las fusiones en la evolución en tamaño de las galaxias masivas desde $z = 1$

Carlos López San Juan (CEFCA), O. Le Fèvre, O. Ilbert, L.A.M. Tasca y los grupos  
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Presentamos el estudio detallado de la tasa de fusiones mayores (diferencia de masas  $\mu \geq 1/4$ ) y menores ( $1/4 < \mu \leq 1/10$ ) de las galaxias masivas (masa estelar  $> 10^{11} M_{\odot}$ ) hasta  $z = 1$ , estimadas mediante estadística de pares en el muestreo COSMOS. La tasa de fusiones mayores de las galaxias masivas crece con  $z$ , mientras que la tasa de fusiones menores es prácticamente constante. Tras separar las galaxias en tipo tempranos (ETGs) y espirales, encontramos que tanto la tasa de fusiones mayores como la de fusiones menores para las ETGs es un factor 2-3 mayor que para las espirales. Nuestras tasas de fusiones implican que las ETGs han sufrido 0.9 fusiones (0.45 mayores y 0.45 menores) desde  $z = 1$ , y que estas fusiones han incrementado  $\sim 30\%$  la masa estelar de la ETG masiva típica en ese tiempo. Hemos estimado que las fusiones con  $\mu \geq 1/10$  pueden explicar  $\sim 55\%$  de la evolución en tamaño de las ETG masivas desde  $z = 1$ . El “sesgo evolutivo” (las galaxias masivas más jóvenes son más extensas que sus análogos más antiguos) puede explicar otro  $\sim 20\%$ , mientras que hemos estimado que las fusiones menores con  $\mu < 1/10$  podrían contribuir con un  $\sim 20\%$  adicional. El  $\sim 5\%$  restante ha de ser debido a otros procesos (p.ej. expansión adiabática o sesgos observacionales). Además, este escenario reproduce la evolución en masa y en la dispersión de velocidades de las galaxias masivas. Nuestros resultados sugieren, tras explorar todas las posibles incertidumbres en el escenario propuesto, que las fusiones son las principales causantes de la evolución en tamaño de las ETG masivas a  $z < 1$ , dando cuenta de un  $\sim 50\text{-}75\%$  de esta evolución.

## Sesión C11 (viernes 13, 15:30-17:20)

Salón de Actos

### Physical properties from deep spectroscopy of dwarf star-forming galaxies at intermediate redshift

Lucía Rodríguez Muñoz (UCM), Jesús Gallego, Armando Gil de Paz, Pablo Pérez-González,  
Laurence Tresse, Olivier Le Fèvre  
`lucia.rodriguez.munoz@fis.ucm.es`

Dwarf galaxies remain as one of the most important and missing pieces of the great puzzle of formation and evolution of galaxies. Due to their low luminosities, their study has been mainly biased to the local universe or clusters, which implies a certain limitation in our knowledge of their formation redshift and properties along the cosmological time, strong observational tests to recent models of formation and evolution of low-mass galaxies.

Using the multiwavelength database RAINBOW, that provides photometric redshifts and masses estimations, we selected a representative sample of dwarf galaxies in the EGS and GOODS-S cosmological fields, at intermediate redshifts ( $0.3 < z_{\text{phot}} < 1$ ). We considered two different criteria: objects with stellar mass  $< 10^8 M_{\odot}$ , and the classic definition of Blue Compact Dwarf galaxies ( $MB,0 > -18.5$ ,  $(B-V)_0 < 0.6$ ,  $\text{Seff},B,0 < 23 \text{ mag/arcsec}^2$ ). We present the results of the spectroscopic study of our sample, carried out using own spectra obtained with VLT/VIMOS and complemented with previous data from DEEP and VVDS surveys. These observational data provide spectroscopic redshifts and measurements of emission lines such as [OII]3727, Hbeta, [OIII]4959,5007 and Halpha that allow the estimation of the physical properties. We also use some spectral indexes to estimate the epoch of formation of their stellar populations.

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### Growth in size of the massive ellipticals galaxies by dry mergers

María Trinidad Tapia Peralta (IAC), Marc Balcells, A. César González García e Ignacio Trujillo  
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Massive galaxies have grown a factor of 4 in size since  $z=2$  to the present. The reasons of this growth remain unclear. Within the possible mechanisms that have been suggested to explain this evolution, the accretion of satellites by the massive galaxies seems to be the most promising one. To understand the details of this growth we have performed a set of 10 N-body simulations, in which the merging history and the orbits of the accreted satellites by the massive galaxy are extracted from hydrodynamical cosmological simulations. Our simulations show that the accretion of satellites is able to produce a growth in size by a factor of  $\sim 4-6$  and a growth in mass by a factor of  $\sim 2$ ; the growth occurs because satellite material is deposited in the outer part of the main galaxy. Therefore, our simulations predict that there should be a gradient in age and metallicity in the outer parts of the massive galaxies. Finding these variations will become a new observational challenge to put the final piece in the puzzle of the evolution of the massive galaxies.

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## Satellite galaxies: the infalling pieces of the puzzle of massive galaxies

Esther Marmol Queralto (IAC)

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Accretion of minor satellites has been postulated as the most likely mechanism to explain the significant size evolution of the massive galaxies over cosmic time. A direct way of probing this scenario is to measure the frequency of satellites around massive galaxies at different redshifts. We have searched for satellites around 629 massive ( $M_{star} \sim 10^{11} M_{\odot}$ ) galaxies from the near-infrared Palomar/DEEP-2 survey within a projected radial distance of 100 kpc. We find that the fraction of massive galaxies with satellites remains basically constant and close to 30 % for satellites with a mass ratio down to 1:100 up to  $z=1$ , and  $\sim 15\%$  for satellites with a 1:10 mass ratio up to  $z=2$ . We find that the satellites present higher specific star formation rates than the massive galaxies. The analysis of the colors indicates that the satellites are, in average, 1 Gyr younger than the massive galaxies that host them. This rejuvenated material is likely to be placed in the outskirts of the massive objects. The challenge to find this age gradient in nearby massive galaxies is opened.

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## Searching for the missing satellites of the Milky Way in the Gaia universe.

Luis Alberto Aguilar Chiu (IEEC-ICC), C. Mateu, T. Antoja, O. Valenzuela, S. Hidalgo, A. Aparicio, F. Figueras, A. Brown

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The current LCDM cosmological model predicts a large numbers of satellites in the halo of a galaxy like ours. The large discrepancy with observations poses the currently unsolved “missing satellites problem”. The discovery of very faint dwarf galaxies opens up the possibility of a large population of yet, undiscovered such systems, that may represent the missing satellites and which current surveys have only glimpsed.

We present a study to assess the detectability of ultra faint dwarf galaxies (UFGX’s) or even fainter ones using the future Gaia database. We use the mock Gaia catalogue of Brown et al. (2005) as a background to an extensive library of synthetic UFGX’s, with diverse values for their structural parameters, as well as positions and motion within the Galaxy.

We exploit the added astrometric information that Gaia will provide, to devise an identification technique that uses a matching between peaks in the sky and proper motion planes identified using the wavelet transform.

In this presentation we will show the results of our study of the detectability of UFGX’s using this technique and comment on the prospects for its use in the real Gaia database when it becomes available.

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## What stars tell us about galaxies: star formation and chemical evolution histories in the Local Group

*[Conferencia Invitada]*

Carme Gallart (IAC)

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Galaxy evolution can be studied in the greatest detail for resolved nearby galaxies, using color-magnitude diagrams reaching the oldest main sequence turnoffs, stellar spectroscopy, and variable stars. I will illustrate this through a review of our latest results on a sample of isolated Local Group dwarf galaxies, and on the Magellanic Clouds.



# Galaxias y Cosmología: Pósteres



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## Evolution of Brightest Cluster Galaxies Over the Past 7 Billion Years

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We present a study of the formation and evolution mechanisms of the brightest cluster galaxies (BCGs) over cosmic time. By comparing high- $z$  ( $z \sim 0.9$ ) massive galaxies in clusters and groups of the Cl1604 supercluster with those in local clusters ( $z \sim 0$ ), we noticed striking differences in the morphologies and structural parameters of these galaxies. This sample, coupled with the results of numerical simulations and semi-analytic models, allows us to directly infer the mechanisms that shape and evolve BCGs over the past  $\sim 7$  Gyrs.

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## Integral Field Spectroscopy of Local Luminous Compact Blue Galaxies

África Castillo Morales (UCM), J. Gallego-Maestro, J. Pérez-Gallego, R. Guzmán, F. Ocaña

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In the last decade, various observational studies have highlighted the key role that Luminous Compact Blue Galaxies (LCBGs) play in galaxy evolution over cosmic time-scales. LCBGs are high surface brightness starburst galaxies bluer than a typical SBc and with typical  $L^*$  luminosities, which are undergoing a major burst of star formation. We know now that LCBGs are the principal contributor to the evolution of the blue  $L^*$  galaxies in the last  $\sim 8$  Gyr (Mallen et al. 1999, Melbourne et al. 2007). They are as well a major contributor to the observed increase in the SFR density of the universe at  $z < 1$  (Guzmán et al. 1997, Vergani et al. 2008). And, finally, and more interesting from a cosmological point of view, LCBGs may be lower mass counterparts of the star-forming galaxy population at  $z \sim 3$ , including Lyman Break Galaxies (Steidel et al. 2003). In order to understand the nature of LCBGs and its role in galaxy evolution we have selected a representative sample of 22 LCBGs within 100 Mpc from the SDSS, UCM and Markarian catalogs that best resemble the properties of the distant LCBGs. We have obtained three dimensional optical spectroscopy observations with PPAK at CAHA in two different spectral configurations v300 and v1200. In this talk we would like to show the results already published in Castillo-Morales et al. 2011 and Pérez-Gallego et al. 2011 about the spatial distribution of physical (such as extinction, SFR and metallicity) and kinematical properties of the galaxy NGC 7673 as a prototypical LCBG and the kinematical analysis of the ionized gas in the sample. The analysis of the 2D maps provided by integral field spectroscopy together with the information at different wavelengths will help to fully understand the origin and the nature of the violent star formation events observed in this type of galaxies.

## Properties in the UV for the CALIFA sample

Cristina Catalán Torrecilla (Universidad Complutense de Madrid), Armando Gil de Paz, África Castillo Morales

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The Calar Alto Legacy Integral Field Area survey (CALIFA survey) has been designed to be the first survey to provide Integral Field Spectroscopy (IFS) data for a statistical sample of all galaxy types ( $\sim 600$  galaxies) in the local Universe ( $0.005 < z < 0.03$ ) covering the optical wavelength. We compare these data with the ones in the UV range obtained by GALEX (GALaxy Evolution eXplorer) satellite at both far-UV (FUV) and near-UV (NUV) wavelengths. The main objective of our work will be to provide a robust determination of the star formation rate (SFR) in galaxies as a crucial element to understand galaxy evolution. We will focus on the analysis of this property using different tracers/calibrators:  $H\alpha$ -line emission (from CALIFA), FUV continuum (from GALEX), and infrared luminosities (from Spitzer & WISE). Besides a global comparison of the total SFR in the sample we will also identify those galaxies where these estimates clearly depart suggesting the presence of significant amounts of hidden star formation or variations in the IMF. Once these objects are identified we will study the spatial distribution of the different SFR tracers to know whether the discrepancies are ubiquitous in each galaxy or they are associated to specific, individual regions. The SFRs can be derived using Kennicutt (1998) relations, taking into account that in the case of FUV continuum is necessary FUV luminosity corrected for attenuation, for  $H\alpha$  we need the extinction-corrected  $H\alpha$  luminosity and finally, in the case of IR, we use the total infrared emission (when possible) or, alternatively, from the sum of the observed short-wavelength (Spitzer 24 micron or WISE 22 micron) infrared and FUV luminosities. At the time of submitting this abstract, two of such spiral galaxies have been identified within CALIFA, NGC6394 and NGC7549, in both cases the presence of regions of obscured star formation has been discovered.

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## Population Synthesis Models in 2D/3D: some rules

Miguel Cerviño (IAA-CSIC)

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Population synthesis models are a tool extensively used to make inferences about the evolutionary status of stellar populations. In this work I examine the implicit priors assumed to obtain inferences by comparing observational data with population synthesis models. As a result from this kind of study, I show how a higher spatial resolution can be used to obtain better "global" (but not spatially detailed) properties of the system. I also show that a pixel-by-pixel (or IFU by IFU) analysis would provide biased results unless they take into account the correlations of stellar populations between different resolution elements (pixels or IFUs) and a prior hypothesis on the projected stellar mass distribution (equivalent to a prior hypothesis on the star formation history).

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## Distribución espacial de las poblaciones estelares de la galaxia enana de Fornax

Andrés del Pino Molina (Instituto de Astrofísica de Canarias (IAC)), Hidalgo, S., Aparicio, A., Gallart, C., Stetson, P.

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Presentamos la distribución espacial de las poblaciones estelares de la galaxia enana de Fornax usando las estrellas resueltas de su diagrama color-magnitud y su historia de formación estelar. Fornax presenta una distribución diferenciada de sus poblaciones estelares: en el centro predominan estrellas principalmente de edad intermedia y jóvenes, mientras que en las zonas exteriores predominan las poblaciones más viejas.

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## Constraining the number of satellites around massive compact galaxies at redshift $z \sim 1$

Luis Alberto Díaz García (CEFCA), Javier Cenarro

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In the last years, it has been confirmed by several studies that the size of spheroids (galaxies with Sersic indices larger than 2.5) strongly decreases with the increasing redshift, by up to a factor of 4 at redshift around 2 (see e.g. Trujillo et al. 2007). One of the potential mechanisms to explain such a size evolution with redshift are minor mergers (see e.g. López-SanJuan et al. 2012; Mármol-Queraltó et al. 2012). Using HST/ACS data from the Extended Groth Strip, in this poster we present a statistical analysis of the number of minor satellites around a sample of massive ( $M \sim 10^{11} M_{\text{sun}}$ ) compact and normal galaxies with  $n > 2.5$  at redshift  $z \sim 1$ .

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## Molecular gas in high- $z$ radio galaxies: CO(1-0) survey with the Australia Telescope Compact Array

Bjorn Emonts (CASS Australia Telescope National Facility)

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With Spain's involvement in ESO, millimeter astronomy with the Atacama Large Millimeter Array (ALMA) will take a prominent role in astrophysical research this decade. The Australia Telescope Compact Array (ATCA) is a southern open-access radio telescope with millimeter capabilities that can provide excellent complementary science to ALMA, in particular regarding the study of molecular gas in the Early Universe. I will review the ATCA's millimeter capabilities and show the final results of a survey for molecular CO(1-0) gas in an unbiased sample of 13 high-redshift proto-cluster radio galaxies. This includes bright CO(1-0) emission in the  $z=2$  radio galaxy MRC 0152-209, which we imaged at high resolution. The CO(1-0) in MRC 0152-209 is spread across many tens of kpc and shows an intriguing misalignment with stellar tidal features in optical HST imaging, revealing an extensive reservoir of cold gas has not (yet) been depleted by star formation or radio source feedback. Results of our survey provide insights into the co-evolution of active black-holes and their massive host galaxies in the early Universe.

## SDSS (g-r) colors of isolated galaxies

Mirian Fernández Lorenzo (IAA), J. Sulentic, L. Verdes-Montenegro, J.E. Ruiz, J. Sabater and S. Sánchez

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Several processes can affect a galaxy over its lifetime causing it to evolve rapidly or via slower secular evolution. Since most fast processes are caused by interactions, if effects of companions are minimized, as is true for isolated galaxies, it is possible to focus on secular evolutionary processes.

We report on a recent study of the SDSS (g-r) colors of isolated galaxies in the AMIGA project (Analysis of the interstellar Medium of Isolated GALaxies; <http://www.amiga.iaa.es>). Assuming that color is an indicator of the star formation history, this work better records the signature of passive star formation via pure secular evolution. We focused on median values for the main morphological subtypes found in the AMIGA sample (66 % Sb-Sc and, surprisingly, 14 % E/S0) and compared them with equivalent measures for galaxies in denser environments.

The main results of this first-look at colors include: 1) a tendency for AMIGA spiral galaxies to be redder than similar type galaxies in close pairs, but 2) no clear difference when we compare with galaxies in other (e.g. group) environments; 3) a Gaussian distribution of the (g-r) color of isolated galaxies, as might be expected in the case of pure secular evolution; and 4) a smaller median absolute deviation (almost half) in colors for isolated galaxies compared to both wide and close pairs. Surprisingly, isolated and non-isolated early-type galaxies show similar (g-r) colors. We will speak about the lack of a specific green valley population in our sample where most spirals redder than (g-r)=0.7 have spurious colors. Finally, we will discuss how the passive star formation in very isolated galaxies is probably causing the redder colors and smaller color dispersions of AMIGA spiral subtypes compared with close pairs where star formation is enhanced by interaction.

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## Evolutionary paths among red galaxy types at $z < 1.5$ and their late buildup through major mergers

Jesús Gallego Maestro (Universidad Complutense Madrid), Mercedes Prieto, M. Carmen Eliche-Moral, Marc Balcells, David Cristóbal-Hornillos, Peter Erwin, David Abreu, Lilian Domínguez-Palmero, Angela Hempel, Carlos López-Sanjuan, Rafael guzmán, Pablo G. Péro

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Recent observations seem to disagree with hierarchical models of galaxy formation on the epoch of definitive buildup of massive E-S0's and on the role played by major mergers in it. We re-address this question by analysing the morphology, structural distortion level, and star formation enhancement of a sample of massive galaxies ( $M_* > 5 \times 10^{10} M_\odot$ ) lying on the Red Sequence and its surroundings at  $0.3 < z < 1.5$ . We define galaxy classes that can be directly associated to intermediate stages of major mergers and to their final products at  $0.3 < z < 1.5$ . We report observational evidence for the first time on the existence of an evolutionary sequence from the red irregular disks, evolving into red irregular spheroids, and ending as regular spheroids during at  $0.3 < z < 1.5$ . This evolutionary path traces the conversion of blue disks into E-S0's through major mergers at all redshifts and has dominated the buildup of massive red galaxies in the last  $\sim 9$  Gyr, but mainly at  $0.7 < z < 1.5$ . This finding proves that, although the progressive settlement of the Red Sequence results from different evolutionary mechanisms taking place at different epochs and masses at  $z < 1.5$ , major mergers have played the dominant role in the definitive buildup of present-day massive E-S0's at  $0.7 < z < 1.2$ , in agreement with hierarchical scenarios of galaxy formation.

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## Estudio de objetos variables en el infrarrojo cercano y medio en el campo cosmológico GOODS-N

Judit García González (UCM/IFCA), P.G. Pérez-González, V. Villar, A. Alonso-Herrero  
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Se presentará el análisis de observaciones Spitzer de archivo en el campo cosmológico GOODS, tomados en varias épocas, con el objetivo de detectar y estudiar las propiedades de los objetos variables en las zonas del cielo que cuenta con los datos más profundos en el infrarrojo cercano y medio. El objetivo principal es estudiar galaxias con núcleos galácticos activos (AGN) detectados de acuerdo a su variabilidad, analizando y comparando sus propiedades con muestras de AGN seleccionadas con métodos alternativos.

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## Análisis cosmológico de los cartografiados J-PAS y J-PLUS

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Here we present preliminary results on the computation of two-point statistics in the spatial distribution of Luminous Red Galaxies in the ALHAMBRA survey. The clustering of galaxies at intermediate and high redshifts is a powerful test of the standard cosmological model, since it makes clear cut predictions that can be confronted directly with observations. However, the limited area covered by the ALHAMBRA survey limits this analysis to relatively small scales, where non-linear effects are more important and hence comparison with linear theory is more difficult to interpret. We compare our results with expected level of shot noise and provide the first attempts to estimate the bias in those highly non-linear scales. The statistical techniques used in this work will also be applied in the Javalambre Physics of the Local Universe Survey (J-PLUS) and Javalambre PAU Astrophysical Survey (J-PAS), both to be conducted from the Observatorio Astrofísico de Javalambre, (OAJ).

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## Study of the AGN population at intermediate redshifts in the SHARDS survey

Antonio Hernán Caballero (IFCA), A. Alonso-Herrero, P. Pérez-González et al.  
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SHARDS is an ongoing ESO/GTC large program that is obtaining photometry of the GOODS-North field in 25 medium-band filters in the 500-950 nm range using the OSIRIS instrument. It is designed to study the properties of high- $z$  massive galaxies, but it can also provide very valuable information about the population of AGN at intermediate redshifts ( $z \sim 0.5-2$ ). We are selecting AGN with different methods, including, infrared power law AGN candidates, X-ray selected luminous AGN, and broad line AGN. The main goal is to use the SHARDS data to characterize the properties (photometric redshifts, properties of the host galaxies, and stellar populations) of the unobscured and obscured populations of AGN at intermediate redshifts, and compare them with those of the non-AGN population at similar redshifts.

## Variabilidad en rayos X de LINERs

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Los núcleos activos de galaxias (AGNs) son objetos alimentados por fenómenos energéticos que no pueden ser clara y directamente atribuidos a estrellas. Los LINERs (Low Ionization Narrow Emission-line Regions) parecen ser el extremo de baja potencia de la secuencia de AGNs con las más bajas tasas de Eddington, pero albergando a los agujeros negros más masivos.

Uno de los parámetros más importantes por obtener en AGNs es el tamaño de la emisión del AGN, lo que puede obtenerse a partir de la variabilidad de la emisión observada. Recientes investigaciones en el UV (Maoz et al. 2005) y rayos X (Younes et al 2011, González-Martín et al 2011) ponen de manifiesto que los LINERs, que se habían supuesto no variables, realmente sí lo son.

A partir de este trabajo se añaden más evidencias de la variabilidad en rayos X en LINERs. Los datos se han tomado de los archivos de Chandra y XMM-Newton, seleccionando LINERs con observaciones en diferentes épocas. Nuestro estudio permitirá validar el escenario en el que el agujero negro supermasivo se “apaga”, y la actividad nuclear se detiene, a medida que la galaxia se muestra como una galaxia normal en reposo.

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## Luminous Infrared Galaxy Inventory (LIRGI)

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LIRGI es un proyecto de legado del radio interferómetro eMERLIN cuyo objetivo es caracterizar la emisión nuclear y circumnuclear de 42 de las galaxias más luminosas del hemisferio norte hasta una distancia de 260 Mpc. La comprensión de la física de estos objetos locales es crucial para trazar la historia de formación estelar del Universo a desplazamientos al rojo mayores. Aunque centrado en el estudio a alta resolución angular del radio continuo a 6 y 18 centímetros con eMERLIN, estamos llevando a cabo observaciones complementarias con otros instrumentos como EVLA o el radio telescopio de 30 metros de IRAM en Granada, para profundizar en el estudio de estos objetos.

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## Dynamical Masses of Local star-forming galaxies from UCM Survey

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Aims:

- Virial masses of UCM survey galaxies from kinematic study of ionized gas.
- Calibrations applicables to different redshift surveys.
- Dynamical masses of UCM survey galaxies from rotational curves study.
- Comparison with stellar photometric masses, calculated from synthesis models population

Conclusions:

We have obtained a relationship between virial and stellar masses. Currently we have 91 galaxies included in this poster. The result provides a calibration good enough to be used for future galaxies surveys.

This result confirms that velocity widths provide a good estimation of the mass of a galaxy when high spatial resolution spectroscopy is not available.

The H $\alpha$  emission line rotation curve is representative enough of the real galaxy rotation curve (i.e. gravitational potential).

The dynamical masses of the galaxies studied in this work are consistent with the stellar masses estimated with population synthesis models.

The dynamical masses obtained are systematically smaller than virial masses, but there are no evidence of simple relationship. These galaxies have a nuclear stellar formation burst that, in most cases, could dominate the velocity dispersions obtained from the spectra.

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## Investigando formación estelar en cuásares a alto redshift con Herschel

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El crecimiento de los núcleos galácticos activos (AGN) y los procesos de formación estelar se producen habitualmente en entornos muy oscurecidos por grandes cantidades de gas y polvo. Observaciones en rayos X y en el IR permiten penetrar en esta clase de entornos y estudiar dichos fenómenos. En particular, las observaciones en el IR ofrecen información detallada acerca de los niveles de polvo y la formación estelar. Aunque en los últimos años se ha avanzado de una forma importante, todavía se desconoce el impacto de los AGN en la formación y crecimiento de las galaxias que los contienen.

Este estudio se centra en investigar las propiedades y el entorno de cinco cuásares oscurecidos a redshifts donde sabemos que se producen las mayores tasas de formación estelar y de crecimiento de los agujeros negros. Todos estos objetos presentan fuerte emisión en ondas submilimétricas (indicativa de intensa formación estelar) y sobredensidades de fuentes en dicha banda. Nuestras observaciones con PACS+SPIRE de Herschel en los campos alrededor de dichas fuentes nos permiten estudiar el nivel de formación estelar, las masas de polvo y la obtención de redshifts fotométricos de los objetos detectados. Presentaremos la naturaleza y propiedades de las fuentes, su relación con los cuásares centrales y su relevancia para los modelos de coevolución de AGN y galaxias.

## IFS and multi-wavelength imaging of nearby spiral galaxies: NGC5668 as a pilot case for the CALIFA s

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In order to improve our understanding of the mechanisms that drive the evolution of disk galaxies we analyze the full bi-dimensional spectral cube of the nearby spiral galaxy NGC 5668, which was obtained as a mosaic of 6 pointings, covering a total area of  $2 \times 3 \text{ arcmin}^2$ , obtained with the PPAK Integral Field Unit at the Calar Alto (CAHA) observatory 3.5 m telescope. From these data we obtain the bidimensional spatial distribution maps of the attenuation of the ionized gas, and chemical abundances of oxygen.

We find a mean ionized-gas attenuation of  $A_V \sim 1 \text{ mag}$ , with the gas attenuation appearing larger than the continuum attenuation by a factor of 3. With respect to the oxygen abundance, we find that, while inwards of  $r \sim 36'' \sim 4.4 \text{ kpc} \sim 0.36 \left(\frac{D_{25}}{2}\right)$  the derived O/H ratio follows the radial gradient typical of the disks of spiral galaxies, the abundance gradient beyond  $r \sim 36''$  flattens out.

The multi-wavelength surface brightness profiles of NGC 5668 are compared with those predicted by chemo-spectrophotometric evolutionary models of galaxy disks in the context of the inside-out scenario of disk formation. Both the deviations of the color profiles and the shape of the metallicity radial distribution indicate that a secondary mechanism, possibly gas transfer induced by the presence of a young bar, must have played a role in shaping the recent chemical and star formation histories of NGC5668 beyond what is predicted by the inside-out scenario. This study demonstrates the strength of the combination of IFU and multi-wavelength imaging data. With the CALIFA project -Calar Alto Legacy Integral Field Area survey- we will provide the largest and most comprehensive wide-field IFU survey of disk-galaxies carried out to date, addressing such fundamental issues in galactic structure and evolution.

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## ALHAMBRA-survey: A new tool for photometric-z calibration in absence of spec-z information

Alberto Molino Benito (IAA), Narciso Benítez

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ALHAMBRA (Advance Large Homogeneous Area Medium Band Redshift Astronomical, Moles et al. 2005) is an extragalactic survey optimized to carry out a cosmic tomography of the contents of the Universe over most of Cosmic history. By spanning the whole optical (range covering from 3500Å to 9700Å &#778;A, discretized in 20 contiguous, equal-width, non overlapping, medium-band filters) plus the standard JHKs near-infrared bands, over a total area of 4 squared degrees on the sky is imaged.

ALHAMBRA-team has developed a novel technic to calibrate its own photometric redshifts in absence of any spectroscopic-z information. By comparing with a sample of  $\sim 3000$  spectroscopic-z galaxies, ALHAMBRA is capable to provide homogeneous & robust photo-z ( $dz < 0.013(1+z)$ ) for almost 0.5 million galaxies.

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## ALHAMBRA-survey: Bayesian Photometric Redshifts with 20+4 photometric bands for 4 squared degree

Alberto Molino Benito (IAA), Narciso Benítez

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ALHAMBRA (Advance Large Homogeneous Area Medium Band Redshift Astronomical, Moles et al. 2005) is an extragalactic survey optimized to carry out a cosmic tomography of the contents of the Universe over most of Cosmic history. By spanning the whole optical range (covering from 3500Å to 9700Å, discretized in 20 contiguous, equal-width, non overlapping, medium-band filters) plus the standard JHKs near-infrared bands, over a total area of 4 squared degrees on the sky is imaged, ALHAMBRA-survey is capable to provide homogeneous and accurate photometric-redshift measurements ( $dz < 0.013(1+z)$ ) for almost 0.5 million galaxies, spread over 8 different regions of the sky.

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## Photometrical properties of young star clusters and mixed populations

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We present and discuss the synthetic photometrical properties of SSP resulting from POPSTAR code. Colors in Johnson and SDSS systems,  $h\alpha$  and  $h\beta$  luminosities and equivalent widths, and ionizing region size, have been computed for a wide range of metallicity ( $Z = 0.0001 - 0.05$ ) and ages (0.1Myr to 20Gyr). The main difference of these models with respect to previous works in the literature is that colors have been calculated with the emission lines contribution to the broad band color, so they include both, stellar and nebular components, plus the emission lines. Moreover we calculate the evolution of the cluster and the region geometry a consistent way. We present SSP's contaminated and uncontaminated colors (in both Johnson and SDSS systems) and show the importance of emission line contribution when Photometry is used as a tool to characterize stellar populations.

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## The evolution of abundances in a massive young stellar cluster during the massive stars winds phase

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We have computed the evolution of the total ejected mass and its He, C, N and O abundances for a massive young stellar cluster with a given initial mass function and a range of initial abundances. Our computations include the mass loss from massive stars during their winds phase including the Wolf-Rayet (WR) stage and the mass ejected during the supernova events. Results indicate that the composition of the cluster during the WR phase is vastly oversolar in these 4 elements for all initial abundances. C and O may reach more than 50 times the solar value.

## The impact of the elemental abundances of the galaxies hosting SNIa over the Hubble diagram

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The metallicity of the progenitor system producing a Supernova type Ia could play an important role in the estimate of the maximum luminosity of the explosion. This dependence should change the calibration between the light curve parameters of SN Ia and its absolute magnitude. To test this idea, we apply the metallicity dependent theoretical calibration by Bravo et al. (2010) to a sample of 42 SNe-Ia in the range  $z \leq 0,4$  selected from the existing data of Sloan Digital Sky Survey (SDSS) for which we have estimated the elemental abundances. We analyze the impact over the absolute magnitude determined for the SNIa and over the Hubble diagram.

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## The role of bars in shaping disk breaks as probed by S4G

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The different processes governing the secular evolution of galactic disks are encoded in the present-day stellar density profiles of nearby galaxies. It is now widely known that most disks exhibit a broken exponential profile, with an inner disk followed by a steeper outer one. Radial rearrangement of stars and angular momentum can play a significant role here, thus making disk breaks a key probe of secular evolution. From an observational perspective, most of what we know about breaks comes from optical data, which can be biased by radial variations in extinction, metallicity and stellar age. I will present results of a study of disk breaks framed within the Spitzer Survey of Stellar Structure in Galaxies (S4G). This is a volume-, magnitude- and size-limited survey of over 2300 nearby galaxies imaged at 3.6 and 4.5 microns, which allows us to peer through dust at the old stellar backbone of disks. I will describe the main structural properties of breaks at this wavelength regime. In particular, I will highlight the similarities and differences between breaks in barred and unbarred galaxies as a function of the total stellar mass, and discuss the corresponding implications on disk evolution scenarios.

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## The Valencian GALAXY-zoo

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We present the sample of the most massive galaxies ( $M^* > 10^{11} \text{Mo}$ ) found in a fully cosmological simulation performed with MASCLET (Mesh Adaptive Scheme for Cosmological structure Evolution). The upper (lower) panel shows the merger (quiet) galaxies depending on mass and redshift. We use the ssp MILES models to make our galaxies bright and to study some observables of our fully cosmological synthetic galaxies.

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## Integral Field Spectroscopic Analysis of a sample of local Luminous Compact Blue Galaxies (LCBGs)

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Local LCBGs are the closest counterpart of the high  $z$  outburst population. These objects are crucial as a local reference for compact star-forming galaxies observed at cosmological distances. We have obtained 2-D spectroscopy in the 3700-7000Å range with PPAK instrument (at 3.5m CAHA) for a sample of 22 local Luminous Compact Blue Galaxies. We focus and analyze in detail physical properties of the star-forming regions in this sample such as extinctions, star formation rates and metallicities. This study together with the kinematic analysis of the ionized gas discussed in Pérez-Gallego, et al. (2011) will help to understand the nature of this type of galaxies.

In this poster we show the results of three galaxies chosen as prototypes of the three kinematic classes observed by Pérez-Gallego, et al. (2011): rotating disk (RD), perturbed rotation (PR) and complex kinematics (CK). The derived 3D maps allow us to test model predictions on the origin and evolution of these massive starbursts. Insights about the role of mergers and supernova galactic winds can be obtained by, for instance, identifying decoupled kinematic components within the velocity fields of these objects and cross-correlating these kinematic components with morphological information. Furthermore, clues about the trigger mechanism for the current burst in such galaxies may be found.

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## FIR emission of selected star-forming galaxies

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In this work we present the rest-frame UV to FIR properties of a sample of Lyman-alpha emitters (LAEs) at  $z=2.5$  and  $z=0.3$  and Lyman-break galaxies (LBGs) at  $z=0.8$ . On the optical side, we analyze their properties by fitting Bruzual & Charlot (2003) templates to their observed SEDs, which enables the determination of their age, UV continuum slope, SFR, dust attenuation, and stellar mass, and the relations between them. We also employ HST/ACS images to study their morphology and physical sizes. By using their PACS/FIR detections (which picks up the more massive and IR-brighter galaxies) we also analyze their dust attenuation and SFR as obtained from the combination of UV/IR emission and their relation with stellar mass, UV and IR luminosities, UV continuum slope, morphology or physical sizes. Since we use both SED-fitting and IR/UV emission we can compare the results for dust attenuation and SFR obtained from those methods and study the reliability of SED-fitting procedures as a function of different parameters, such as IR luminosity or redshift. Additionally, we compare the physical properties of LAEs and LBGs with other populations of galaxies at their same redshifts in order to know the differentiating properties of both kind of star-forming sources.

## Contribución de las fusiones menores en el crecimiento de las galaxias elípticas

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El estudio de la evolución de los tamaños de las galaxias elípticas apunta a que la estructura de estos objetos ha cambiado radicalmente con el tiempo. Estas observaciones retan la visión tradicional surgida del análisis detallado de las poblaciones estelares de las galaxias elípticas cercanas. Según estos estudios, las galaxias elípticas se formaron rápidamente en el universo temprano y han evolucionado sin ningún tipo de cambio salvo el envejecimiento de sus poblaciones.

Para resolver la discrepancia entre las observaciones de las galaxias cercanas y el estudio de los objetos lejanos se ha propuesto la acreción continua de nuevo material a través de fusiones menores.

En este trabajo presentamos los diagramas de línea índice-índice de varias galaxias elípticas. Estos diagramas son el único modo de explorar si las fusiones menores son un mecanismo plausible; ya que la observación mediante imágenes presenta problemas debido a los efectos del “cosmological dimming”, mientras que el análisis de las poblaciones estelares de las galaxias del universo cercano no es sensible a episodios de formación estelar pequeños que hubieran sucedido con una antelación mayor de 0.5 Gaños.

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## Unveiling the hidden SN population in local LIRGs with EVLA/NACO observations

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We present 8.4 GHz EVLA observations of our EVLA/NACO observing program, aimed at obtaining the most complete picture so far of the SN activity in the nuclear regions of local LIRGs by a combined search at radio (EVLA) and near-IR wavelengths. Using the EVLA at 8.4 GHz and near-IR adaptive optics (AO) observations from the ESO VLT and the Gemini-N telescope over the two years covered by our combined radio/NIR effort will at least double the number of radio detected SNe in LIRGs with observations also at other wavelengths. Our distance limited ( $D \leq 110$  Mpc) sample of 11 starburst-dominated LIRGs has been selected to optimize the searches at both radio and near-IR wavelengths, to allow the detection of most of the 20 CCSNe expected over the period covered by our observations. This will yield important information on the hidden population of SNe, allowing us to constrain their nature and the way they interact with the CSM. Ultimately, our programme will allow us to constrain the number of SNe missed in LIRGs, which is a crucial piece of information to derive the star formation history of the Universe from CCSN rate observations.

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## Baryon Census in Hydrodynamical Simulations of Galaxy Clusters

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The global baryon content of the largest galaxy clusters is expected to accurately trace the matter content of the universe and, therefore, it can be used to reliably determine the matter density parameter. However, this fundamental assumption is challenged by the growing evidence from optical and X-ray observations that the total baryon mass fraction increases towards rich clusters. In this context, we investigate the dependence of stellar, hot gas, and total baryon mass fractions as a function of cluster mass. To do so, we study the baryon mass fraction in a set of hydrodynamical simulations of galaxy clusters performed using the Tree+SPH code GADGET-3. These clusters have been re-simulated using various subsets of baryonic processes including radiative cooling, star formation, galactic winds and AGN feedback. We investigate the dependence of the baryon fraction upon the different models of baryon physics and we discuss the consequences of these results in the context of determining the cosmic matter density parameter.

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## Measuring Magnification Bias in Photometric Galaxy Surveys

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In this contribution, we analyze how cosmic magnification may be detected in \*upcoming\* large photometric \*galaxy\* surveys. This effect arises as an enhancement or decrease of galaxy/quasar number counts at very high redshifts due to the magnifying weak lensing effect of intervening matter in the line of sight. It shows up in observations as a correlation or anti-correlation with low redshift galaxies. The size of this correlation is directly related to the galaxy bias and cosmological parameters. We provide a very brief overview of the theory, relating observations to cosmology, and some past observations. Then we focus on two particular cases: the Dark Energy Survey (DES) that will cover 5000 square degrees and reach  $i_{AB} < 24$  making measurements up to  $z \sim 1.4$  with a photo- $z$  resolution of  $0.05(1+z)$ ; the Physics of the Accelerating Universe \*Survey\* (\*PAU\*) at the William Herschel Telescope, which will initially cover 200 square degrees and reach the same depth with a much higher photo- $z$  resolution of  $0.0035(1+z)$ . For this, we employ the simulations specifically prepared for both of the surveys and study the most important error contributions in each of the cases.

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## Spectroscopic analysis of Stephan's Quintet

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The Stephan's Quintet is probably the most famous compact galaxy group, it has been observed and studied in a wide range of wavelengths. However, few spectroscopic observations exist for all members of the group, which limits the study of the complex physical processes taking place in the galaxy interaction. We present spatially-resolved spectroscopic observations of the Stephan's Quintet from the PPAK IFS Nearby Galaxies Survey: PINGS. We make use of the IFS data to analyse the gas properties and the stellar population of these galaxies. We perform a comparative analysis of the chemical abundances and gas ionization conditions between different morphological regions, trying to understand the influence of metallicity and ionization properties in interacting galaxies.

## The TANAMI project

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The TANAMI (Tracking AGN with Austral Milliarcsecond Interferometry) program is performing a detailed VLBI monitoring of extragalactic gamma-ray sources south of declination -30 degrees. This program is observing at two radio frequencies (8 and 22 GHz), and it is a key component of the joint quasi-simultaneous observations with the Fermi Gamma-ray Space Telescope and ground based observatories to test blazar emission models. We describe the TANAMI program and present selected results from the  $\sim 80$  sources being observed.

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## Frequency of Active Galactic Nuclei in isolated galaxies compared to clusters and compact groups

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We present a study of the effects of environment and interactions on nuclear activity focussing on both radio and optical types of active galactic nuclei (AGN). We compare the frequency of occurrence of AGN in samples of galaxies in: 1) dense environments (clusters) or 2) affected by short-range interactions (compact groups) with 3) the AMIGA sample of isolated galaxies (Analysis of interstellar Medium of Isolated GALaxies; <http://amiga.iaa.es/>). The latter sample minimizes external effects experienced by samples 1) and 2) allowing us to infer the role of intrinsic processes.

Account was taken of possible biases caused by the morphology-density and luminosity-density relations. Our study shows that radio nuclear activity is strongly influenced by environment while such an influence is not clear for optical nuclear activity. Further insight into this topic could be obtained by considering separately effects of large scale environment and those due to one-on-one interactions. A careful study that makes use of a sample of  $\sim 300.000$  Sloan Digital Sky Survey galaxies, and takes into account these differences, is presented in a companion talk.

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## Estudio espectrofotométrico en el infrarrojo cercano y visible de una muestra seleccionada en H $\alpha$

Alejandro Sánchez de Miguel (Dep. Astrofísica y CC. de la Atmósfera UCM), Jesús Gallego, Víctor Villar, Pablo G. Pérez González, Nicolás Cardiel, Jaime Zamorano, José Acosta Pulido

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Presentamos los resultados del análisis espectroscópico de las galaxias seleccionadas usando los datos obtenidos dentro de la exploración UCM de filtro estrecho sintonizado en H $\alpha$  a  $z=0.84$ . Se dispone de espectros infrarrojos para 12 galaxias y datos de DEEP II para 70 galaxias, 26 de ellas calibradas en flujo. Se discute en el trabajo la metalicidad, extinción y otras relaciones estructurales de estas galaxias. Se discuten diferentes métodos de corrección de extinción, en particular la relación  $EV(\text{GAS})(B-V) / EV(\text{ESTRELLAS})(B-V)$ . Los datos son compatibles con la no evolución en metalicidad.

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## GRB 100316A: Observaciones de un evento a alto redshift con OSIRIS

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Se mostrarán los resultados de las observaciones ToO (Target of Opportunity) realizadas unas horas después de la detección de este Gamma-Ray Burst (GRB) con el Gran Telescopio de Canarias (GTC). Las observaciones espectroscópicas son las primeras con resultados satisfactorios llevadas a cabo para un afterglow con el GTC. Dichas observaciones, ejecutadas con OSIRIS muestran un continuo suave truncado por un DLA (Damped Ly- $\alpha$  Absorber). Ligeramente desplazada de la traza del afterglow se detecta una línea de emisión en la zona del DLA que interpretamos como emisión Ly- $\alpha$  proveniente de la galaxia anfitriona a  $z=3.115$ . Así mismo se presentará el análisis de las curvas de luz construidas con GTC y CAHA 1.23m.

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## Searching for galactic sources in the Swift GRB catalog

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Since the early 90s Gamma Ray Bursts have been accepted to be of extra-galactic origin thanks to the isotropic distribution observed by BATSE and the redshifts observed in some of their optical or infrared counterparts. Nevertheless, there have been a few cases that upon further examination have turned out to be of galactic origin. In this work we will conduct several statistical analyses to determine the degree of contamination by galactic sources of different samples taken from the Swift GRB catalog. This poster will detail the proposed methodology.

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## Reliable selection of high-redshift radio-loud quasars

Diego Tuccillo (IFCA), J. I. Gonzalez-Serrano, R. Carballo, R. McMahon

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We present results of our investigation aimed to a reliable and efficient selection of Radio Loud (RL) quasars in two different redshift ranges. In the first part, we look at the redshift range  $3.6 < z < 4.4$  over the whole SDSS footprint of 11,663 sq.deg. using a cross matching between FIRST radio sources and SDSS imaging data in the ugriz bands. Using a Neural Network machine-learning technique we found a list of new candidates for quasars with  $3.6 < z < 4.4$ . We present the results obtained from the spectroscopic identification of the candidates, scheduled at the NOT telescope and at the SPM telescope in March-June 2012.

In the second part we extend the selection to the redshift range  $4.4 < z < 5.4$  using the near-infrared data from the UKIDSS survey including objects that are detected on the UKIDSS data but undetected in SDSS data. We will discuss different aspects of the data mining involved in our investigation, as well as the reliability and efficiency in using Neural Network techniques for this kind of astronomical problems.

## The Bright End of the Lyman Break Galaxy Luminosity Function in ALHAMBRA, J-PLUS and J-PAS Surveys

Kerttu Viironen (CEFCA)

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The methodology and first results of the Lyman Break Galaxy search in the ALHAMBRA (A Large Area Multimedium-Band Optical and Near-Infrared Photometric Survey) data are presented. Also the future plans to extend the search to the J-PLUS (Javalambre Photometric Local Universe Survey) and J-PAS (Javalambre-PAU Astrophysical Survey) databases, once available, are discussed.

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## Estudio Molecular de CO en galaxias cercanas

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El trabajo consiste en el estudio de observaciones realizadas con el radiotelescopio APEX (Chile) de la emisión molecular de CO (e isótopos) en las galaxias NGC 253, NGC 4945 y Arp220. Como resultado del análisis presentamos razones isotópicas de CO y columnas de densidad del gas.

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## Buildup and evolution of the sequence of S0 Hubble types through minor mergers

Jaime Zamorano (Universidad Complutense de Madrid), M. Carmen Eliche-Moral, A. César González-García, Jesús Gallego, Marc Balcells, J. Alfonso L. Aguerri, Mercedes Prieto

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The traditional picture of S0's (usually considered a transition class between spiral and elliptical galaxies) is drastically changing in the last years. Recent studies prove that environmental processes (such as ram pressure or tidal stripping, and harassment) and internal secular mechanisms (such as bars) lead to a subsequent galaxy starvation, providing a natural explanation for the transformation of the traditional Hubble type sequence (Sa-Sb-Sc) into a parallel one of S0's (S0a-S0b-S0c), as claimed by Kormendy & Bender (2011). This has left minor mergers in the background of S0's formation scenarios. However, the analysis of the scaling relations between some photometric parameters of bulges and disks in nearby S0's lead to contradictory conclusions concerning the mechanism responsible of their formation. We address this question by investigating whether the remnants resulting from N-body simulations of minor mergers onto S0c and S0b galaxies evolve within the sequence of S0 Hubble types obeying photometric scaling relations compatible with observations. These models show that externally-driven processes may change galaxy structure towards a strong coupling of bulge and disk parameters, by triggering processes on the primary disk that are commonly ascribed to internal secular evolution, such as transient spirals and bars. The present models suggest that minor mergers may have contributed noticeably to the buildup and evolution within the sequence of S0 Hubble types, mainly in environments where these processes have governed galaxy evolution, as galaxy groups.

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## Multiwavelength study of the galaxy population in the young cluster RXJ1257.2+4738 at $z=0.866$

Irene Pintos Castro (Instituto de Astrofísica de Canarias), Miguel Sánchez-Portal, Bruno Altieri,  
the GLACE team and the Herschel High-z Clusters team

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We present the first results of a study on the impact of the environment in the evolution of galaxies using a multiwavelength analysis of the young cluster RXJ1257.2+4738, from the optical to the far infrared, covering two virial radii. Our data set includes new observations of the GLACE survey - g',r',i',z' bands with OSIRIS/GTC and J band with LIRIS/WHT- and PACS and SPIRE imaging photometry, along with existing MIPS and IRAC observations. We have processed GMOS spectra that confirm 24 cluster members, and calculated photometric redshifts for the rest. With our wide wavelength coverage we build spectral energy distributions, allowing us to determine total luminosities, stellar masses and star formation rates for the cluster members.

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## On variability in obscured and unobscured AGNs

Jana Polednikova (IAC)

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Quasars belong to the most energetic phenomena in the universe. Physical processes at the origin of them can be explained in the framework of the 'AGN unified scenario'. The unified scenario predicts two classes of quasars - obscured and unobscured ones, depending on the orientation of the dusty torus which surrounds the central supermassive black hole. Variability is ubiquitous in AGN, and may be produced by several phenomena that would produce different footprints. Determining the nature, how and where do the variations originate, is a key subject to understand the differences between the different types of objects.

We report first multiwavelength light curves from an observational campaign at Observatorio del Teide, aimed at both types of AGNs in optical and near infrared regimes.



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# **La Vía Láctea y sus Componentes: Orales**



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**SESIÓN G1, MARTES DE 9:00 a 11:00** (Moderador: Benjamín Montesinos)

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09:00–09:20	C	Alessandro Ederoclite	Towards a New Paradigm for Recurrent Novae? The 2011 outburst of T Pyx
09:20–09:50	I	Cristina Zurita	Nuevos resultados en el estudio de las Binarias Transitorias de rayos-X
09:50–10:20	I	Susana Iglesias Groth	Fullerenos y PAHs en el medio interestelar
10:20–10:40	C	Miguel Penadés Ordaz	Analysis of optical DIBs with the largest ever samples of high-quality massive-star spectra
10:40–11:00	C	Belén López Martí	A multiwavelength study of young stars in the elephant trunk

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**SESIÓN G2, MARTES DE 15:30 A 17:20** (Moderador: Ignacio Negueruela)

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15:30–15:45	C	Jonay I. González Hernández	The fast spiral-in of a star to a black hole as seen by GTC
15:45–16:00	C	Alba Fernández Martín	Ionization structure and chemical abundances of the Wolf-Rayet nebula NGC6888 with IFS
16:00–16:15	C	Rubén Pedro Hedrosa	The first determination of the $^{14}\text{N}/^{15}\text{N}$ ratios in Galactic AGB carbon stars
16:15–16:30	C	Belén Arroyo Torres	The atmospheric structures and fundamental parameters of the red supergiants AHSco, UYSct, and KWSgr
16:30–17:00	I	Ivan Martí-Vidal	The atmospheres of evolved stars from infrared interferometry
17:00–17:20	C	Ricardo Génova Santos	Constraints on the Anomalous Microwave emission with Planck and Cosmosomas

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**SESIÓN G3, MIÉRCOLES DE 9:00 A 11:00** (Moderador: Artemio Herrero Davó)

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09:00–09:20	C	Maria Anna Czekaj	The new version of the Besançon Galaxy Model: one step closer to Gaia
09:20–09:40	C	Josep Manel Carrasco Martínez	White Dwarfs with Gaia
09:40–10:00	C	Francesca Figueras Siñol	Towards a reliable star formation history of the galactic disk in the Gaia era
10:00–10:20	P	1ª Sesión de pósteres	Coordina Jesús Maíz Apellániz
10:20–10:40	C	Diego de la Fuente Guillén	Descubrimiento y estudio espectroscópico del cúmulo Galáctico masivo Mercer 81
10:40–11:00	C	Sebastián Ramírez Alegría	MASGOMAS Project: Two new massive and young Galactic clusters

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**SESIÓN G4, JUEVES DE 9:00 A 11:00** (Moderador: Carmen Sánchez Contreras)

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09:00–09:20	C	Alba Aller Egea	A new planetary nebula around the hot subdwarf star 2M1931+4324
09:20–09:40	C	Mónica Wendolyn Blanco Cárdenas	Unveiling the Sculpting Process of Planetary Nebulae with the Very Large Telescope
09:40–10:00	C	Martín Antonio Guerrero Roncel	Charge-exchange reactions in the planetary nebula Abell 30?
10:00–10:20	C	Jesús Maíz Apellániz	A new family of optical/NIR extinction laws
10:20–10:40	C	Manuel Núñez Díaz	The deep spectrophotometric mosaic of the Orion Nebula. Preliminary results
10:40–11:00	P	2ª Sesión de pósteres	Coordina Jesús Maíz Apellániz

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**SESIÓN G5, JUEVES DE 15:30 A 17:20** (Moderador: Juan Fabregat)

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15:30–15:50	C	Jorge Sanz Forcada	Star formation in the outer Galaxy: the young cluster NGC 1893
15:50–16:10	C	Carolina Sabín San Julián	Quantitative analysis of OVz stars in 30 Doradus
16:10–16:40	I	Nuria Huélamo	Discos protoplanetarios y formación de objetos subestelares
16:40–17:00	C	Benjamín Montesinos Comino	DUST around NEarby Stars (DUNES): descripción del proyecto y resultados
17:00–17:20	C	Ignacio Mendigutía	Accretion properties of pre-main sequence stars

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**SESIÓN G6, VIERNES DE 9:00 A 11:00** (Moderador: Jesús Maíz Apellániz)

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09:00–09:30	I	Inmaculada Martínez-Valpuesta	A bar/bulge model for the Milky Way
09:30–09:50	C	Santi Roca Fàbrega	On the galactic spiral arms nature as revealed by the kinematics of the stellar component
09:50–10:10	C	Merce Romero-Gómez	The invariant manifolds and the Milky Way galactic bar
10:10–10:30	C	Hugo Tabernero Guzmán	Chemical tagging of stellar kinematic groups
10:30–11:00	I	Jorge Peñarrubia	Dwarf galaxies and the formation of the Milky Way

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I = Conferencia Invitada, C = Contribución Oral

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## Sesión G1 (martes 10, 09:00-11:00)

Aula 1.1

### Towards a New Paradigm for Recurrent Novae? The 2011 outburst of T Pyx

Alessandro Ederoclite (CEFCA)

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T Pyxidis is a recurrent nova which underwent explosions at semi-regular intervals of about 22 years between 1890 and 1966. On the 14th Apr 2011, it started its sixth (long overdue) known outburst. In this talk, I present a multi-site campaign aimed at the follow up of this object from the optical (with intermediate and high resolution spectroscopy) to the sub-millimeter regime and I summarize some of our findings which challenge some of the common understandings of novae.

In fact, the sub-mm observations represent the first ever detection of a recurrent nova in this wavelength range and they suggest the underlying object to be magnetic, which may have significant implications on the description of the nature of the peculiar long-term behaviour of this star. The optical and near infrared observations may actually imply that the two populations of novae (Fe II and He/N) suggested by Williams (1992) are, in fact, a byproduct of the speed class and may have significant repercussions on the whole nova theory.

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### Nuevos resultados en el estudio de las Binarias Transitorias de rayos-X

*[Conferencia Invitada]*

Cristina Zurita (IAC)

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La mejor prueba de la existencia de los agujeros negros estelares viene de la observación de las llamadas Binarias de rayos-X Transitorias (XTs). Estos sistemas binarios, formados por un objeto compacto y una estrella de baja masa, sufren violentas erupciones en las que su brillo aumenta de manera espectacular. Es entonces cuando pueden ser detectadas por los satélites de rayos-X. Cuando termina la erupción y la estrella compañera vuelve a dominar la emisión óptica, se pueden llevar a cabo estudios dinámicos para establecer, al menos, un límite para la masa del objeto compacto. Con todo, tras más de cuarenta años de trabajo, sólo se ha podido confirmar la presencia de agujeros negros en 17 sistemas de una población estimada de 5000 aunque unas 33 XTs han sido clasificadas como posibles sistemas con agujeros negros de acuerdo a sus propiedades en rayos-X.

Actualmente se han puesto en marcha programas para detectar aquellas XTs que permanecen en estado de quietud y que no han podido ser descubiertas por los satélites de rayos-X. En cualquier caso, pese a lo limitado de la muestra actual, la distribución de masa de los agujeros negros estelares nos da información muy valiosa, no sólo acerca de la formación y evolución de estos sistemas binarios, sino sobre la física fundamental subyacente. Por otro lado, su estudio durante la erupción nos permite estudiar la variabilidad y la evolución de los discos de acreción en sistemas binarios. En esta charla se hará un repaso de los últimos resultados obtenidos en el campo de las Binarias Transitorias de rayos-X.

## Fullerenos y PAHs en el medio interestelar

*[Conferencia Invitada]*

Susana Iglesias Groth (IAC)

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Revisaremos trabajo teórico, observaciones astronómicas y medidas en laboratorio de la nueva forma del carbono conocida como fullerenos y sus formas hidrogenadas (fulleranes). Estas moléculas pueden ser responsables de bandas difusas interestelares, del UV “bump”, rasgo principal en las curvas de extinción observadas en muchas líneas de visión de nuestra Galaxia y otras galaxias y de la emisión anómala microondas descubierta en varias regiones de formación estelar, en nubes moleculares y regiones HII. Las detecciones recientes de los fullerenos C60 y C70 en nebulosas planetarias de nuestra Galaxia y en la nube de Magallanes refuerzan la hipótesis de que los fullerenos y fulleranes son comunes en el medio interestelar y podrían contribuir de manera relevante a estos procesos. Otros agentes potenciales de procesos de emisión anómala de microondas y de bandas de extinción interestelar son los hidrocarburos policíclicos aromáticos (PAHs). Resumiremos los esfuerzos realizados para lograr la identificación de los PAHs más simples, naftaleno y antraceno, en regiones de emisión anómala microondas.

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## Analysis of optical DIBs with the largest ever samples of high-quality massive-star spectra

Miguel Penadés Ordaz (IAA), Maíz Apellániz, Jesús and Gosss Team

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Almost a century after the discovery of diffuse interstellar bands (DIBs), their origin remains unclear. In this talk we will present our results on optical DIBs from two sources of high-quality modern spectra of OB stars. On the one hand, intermediate-resolution ( $R = 2500$ ) blue-violet spectra for 1100 stars obtained with the Galactic O Star Spectroscopic Survey (GOSSS). On the other hand, high-resolution ( $R = 23\,000 - 46\,000$ ) optical spectra for 400 stars obtained from three different surveys: OWN, IACOB, and NoMaDS. The  $R = 2500$  sample allows us to reach a larger sample with an average larger extinction while the  $R = 23\,000 - 46\,000$  sample provides access to more DIBs and allows for the resolution in velocity of some ISM features. For each spectrum we have measured the equivalent widths of 10-40 DIBs and interstellar lines (e.g. Ca II H+K, Na D1+D2) and, in the case of GOSSS, the equivalent width of H beta in emission if the star is located in an H II region. We have also derived from auxiliary data or compiled from the literature values for the reddening, extinction law, H I column density, and H alpha emission. All of this constitutes the most complete collection ever of optical information on the ISM within 3 kpc of the Sun. We are analyzing the correlations between all of the collected quantities to discriminate between different possible origins of the DIBs. One of the points we have already discovered is that the relatively poor (compared to e.g. a given DIB and  $E(B-V)$ ) correlation between Ca II H+K and  $E(B-V)$  is caused by the combination of saturation and velocity structure effects in the Calcium lines.

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## A multiwavelength study of young stars in the elephant trunk

Belén López Martí (CAB), Amelia Bayo, María Morales Calderón, David Barrado

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The IC~1396 HII region ( $d \simeq 800 \text{ pc}$ ), with a diameter of about  $3^\circ$ , is an ideal site to study triggered star formation. The region is excited by the O6.5 star HD~206267 in its center, and it contains several young clusters with ages ranging from about 10 Myr to less than 1 Myr. The youngest stellar populations are associated with over a dozen cometary globules in the region, small, isolated clouds with a characteristic morphology: They have dense cores surrounded by ionized rims facing the exciting star, and tails extending in the opposite direction. Especially interesting is the cometary globule IC~1396A, also called “the Elephant Trunk Nebula”, which is located to the west of HD~206267. The globule is adjacent to the Tr~37 cluster ( $\sim 3$  Myr), and therefore, two populations of different age coexist in the same area of the sky. We present the results of a multiwavelength study of young stars in IC~1396A. Our targets are selected combining optical (WFC/INT), near-infrared (Omega2000/CAHA 3.5m) and mid-infrared (IRAC/*Spitzer*) photometry. NICS/TNG near-infrared and/or OSIRIS/GTC optical spectroscopy are used to confirm their youth and to derive spectral types for these objects, showing that they are early to mid-M stars. The photometric and spectroscopic information is used to study the properties of the stars (accretion, circumstellar material, spatial location). The implications for the triggered star formation picture are discussed.

## Sesión G2 (martes 10, 15:30-17:20)

Salón de Grados

### The fast spiral-in of a star to a black hole as seen by GTC

Jonay I. González Hernández (IAC)

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The orbital motion of secondary stars of a X-ray binary system is believed to vary with time due to different phenomena which depends essentially on the mass ratio of the binary components and duration of the period itself. Black hole binary systems with large mass-ratios and short periods of several hours are expected to change their orbital period due to magnetic braking, gravitational radiation or even more sophisticated theories which use alternative descriptions of gravity, like the Braneworld gravity. The black hole X-ray binary XTE J1118+480 offers a unique opportunity to test these models, composed by a subsolar-mass late type secondary star orbiting a 6 solar-mass black hole in a 4.1-hr period. We have obtained spectroscopic observations in three nights of January and February at the 10.4m GTC telescope installed at the Observatorio del Roque de los Muchachos in La Palma (Spain) with the OSIRIS medium-resolution spectrograph. Using these data we determine the time at the inferior conjunction of the secondary star in each night which in combination with previous determinations has allowed us to derive the orbital period derivative. Here we present the detection of a negative period derivative in the black hole X-ray binary XTE J1118+480 and discuss the implications for magnetic braking and black hole mass evaporation.

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### Ionization structure and chemical abundances of the Wolf-Rayet nebula NGC6888 with IFS

Alba Fernández Martín (IAA)

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The study of nebulae around Wolf-Rayet (WR) stars gives us clues about the mass-loss history of massive stars as well as about the chemical enrichment of the interstellar medium (ISM). In particular, the wind-blown bubble NGC6888 associated with the WN6 star WR136 represents one of the most suitable candidates to search for the observational footprint of the interactions between the ISM and stellar winds.

In this contribution we will present a study of the nebula NG6888 with integral field spectroscopy using the PPAK spectrograph at the 3.5m telescope in Calar Alto in the optical range performing both two and one-dimensional analyses. Attending to the 2D analysis in the northeast part of NGC6888, where previous studies have shown X-ray emission, we have obtained maps of the extinction structure and electron density. Furthermore, we have produced statistical frequency distributions of the radial velocity and diagnostic diagrams that have revealed two main behaviours in the X-ray emitting zone. On the other hand, we have performed a thorough study of integrated spectra in nine regions over the whole nebula deriving physical parameters and abundances. Finally, we propose a scenario for the evolution of NGC6888 to explain the features observed. Our scheme is supported by comparison to models of WR ring evolution.

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## The first determination of the $^{14}\text{N}/^{15}\text{N}$ ratios in Galactic AGB carbon stars

Rubén Pedro Hedrosa (Universidad de Granada), Carlos Abia, Bertrand Plez, Inmaculada Domínguez

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During the AGB phase, tiny solid grains are formed in their cool envelopes and ejected into the ISM through stellar winds. These grains eventually can be trapped in meteorites and recovered in the Solar System. The mainstream SiC grains are believed to be formed in the envelopes of low mass AGB carbon (C) stars. Nevertheless, one of the fundamental problems of these grains concerns their  $^{14}\text{N}/^{15}\text{N}$  ratios. The full range of measured values  $10^2 - 10^4$ , cannot be explained by theoretical nucleosynthesis models. Indeed, a minimum value of  $\sim 1000$  is theoretically expected at the beginning of AGB phase. Here, we derive for the first time,  $^{14}\text{N}/^{15}\text{N}$  ratios in a sample of 15 Galactic AGB C-stars of solar metallicity. The analysis is based on CN lines in the 8000 Å region using high resolution ( $R \sim 160000$ ) and high signal-to-noise ( $S/N > 100$ ) spectra. High quality spectra at 2.2  $\mu\text{m}$  were also analysed to provide accurate estimates of the CNO abundances and metallicity. Our differential analysis respect to the reference star TX Psc ( $^{14}\text{N}/^{15}\text{N} \sim 2000$ ), reveals that the N ratios in the sample cluster in three groups. The intermediate ( $[^{14}\text{N}/^{15}\text{N}]_{\text{TXPsc}} \sim 0,0$ ) and high ( $[^{14}\text{N}/^{15}\text{N}]_{\text{TXPsc}} \geq 0,5$  dex) ratio groups cover nicely the ratios found in SiC grains, supporting their C-star origin. Interesting enough, we found low ratios ( $[^{14}\text{N}/^{15}\text{N}]_{\text{TXPsc}} \leq -0,5$  dex) in the three carbon stars of SC-type in our sample, which opens the possibility that some SiC grains may have been formed in these peculiar stars. However, no theoretical nucleosynthesis scenario is able to explain such low N ratios in low mass C-stars. Correlations with other abundance features in these stars (C and O ratios, F and s-elements abundances) are investigated to find a solution to the puzzle.

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## The atmospheric structures and fundamental parameters of the red supergiants AHSco, UYSct, and KWSgr

Belén Arroyo Torres (UV), M. Wittkowski and J. M. Marcaide

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Red supergiants (RSGs) are candidates for supernovae progenitors. Hence, the determination of their fundamental parameters is of much relevance. It has been shown that RSGs have extended atmospheres with complex molecular shells. Thus, the determination of the fundamental parameters can only be accomplished in conjunction with an adequate characterization and modelling of those shells.

We will present our results for the RSGs, AHSco, UYSct, and KWSgr. We have carried out spectro-interferometric observations in the near-infrared bands (K2.1 and K2.3) with the VLTI/AMBER instrument with spatial- and spectral-resolutions of 3 milliarcseconds and 1500, respectively. We have modelled our observations with PHOENIX model atmospheres. While these models reproduce the spectroscopic data satisfactorily, they have difficulties in fitting the spectro-interferometric data. The positions of these two RSGs in the HR diagram has been estimated. Those results will be discussed.

## The atmospheres of evolved stars from infrared interferometry

*[Conferencia Invitada]*

Iván Martí-Vidal (Onsala Space Observatory)

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We report on K-band VLTI/AMBER observations of a small sample evolved stars (Asymptotic Giant Branch, AGB, and Red Super-Giants, RSG). From the spectrally-dispersed visibilities, we measure the stellar 'effective' diameter as a function of observing wavelength (i.e., basically, the extent in the atmospheric opacity for each spectral channel). These data can be used to estimate stellar parameters by fitting elaborated radiative-transfer models. Although the models are able to fit the data of most of our stars in some regions of the spectrum, there are strong effects (in both the CO band heads and the pseudo-continuum beyond 2.3 microns) that cannot be modelled satisfactorily. Some ad-hoc assumptions need to be done, and some modifications must be performed in the stellar models, to help explain all the peculiarities found in our data.

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## Constraints on the Anomalous Microwave emission with Planck and Cosmosomas

Ricardo Génova Santos (IAC)

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The anomalous microwave emission (AME) was discovered in 1996 as a statistical correlation between COBE microwave data and infrared maps tracing the thermal dust emission. Since then, it was recognized the importance of its characterization, as it can provide important information about the ISM physical properties, and also because it is an important contaminant of CMB maps in the frequency range 20-60 GHz. There has been a strong observational effort in the last decade in this respect, with observations of this emission in many Galactic clouds. Also, several articles have been devoted to the theoretical modelling of the physical mechanism giving rise to this emission, being electric dipole emission from spinning dust grains the one that seems to fit better the observations.

In the talk that I am proposing I would review the current observational status of this field, emphasizing recent observations with Planck and the Cosmosomas experiment (Planck collaboration et al. 2011, A&A 536, A20). Recent results from Planck have shown the most precise spinning dust spectra measured to date. Also, Planck high frequency channels (100 to 857 GHz) have provided, for the first time, the possibility to accurately trace the raise of the thermal dust spectrum. On the other hand, Cosmosomas data in the frequency range 10-20 GHz are crucial to pin down the turnover of the spectrum at low frequencies predicted by the spinning dust models. Finally, I will also describe the recent discovery of AME in the Pleiades reflection nebula (Genova-Santos et al. 2011), an environment with different physical characteristics to those where AME has been studied up to now.

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## Sesión G3 (miércoles 11, 09:00-11:00)

Aula 1.1

### The new version of the Besançon Galaxy Model: one step closer to Gaia

Maria Anna Czekaj (UB-IEEC), A. Robin, F. Figueras, X. Luri

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The construction of a dynamical model of the Milky Way from the upcoming Gaia data will require a complex comparison between models and data in the space of the observables. To be ready for this challenge, in my PhD thesis, we have optimized the Besançon stellar population synthesis model. In this new version, almost ready, ingredients as critical as the IMF, the SFR, the binary fraction, the age-metallicity relation and the age-kinematic relation can be fitted to the observed data. That is this new version is not any more a single stars generator, but it considers binary systems maintaining constraints on the local mass density. The optimization includes also the use of most updated evolutionary tracks and model atmospheres. Various scenarios for those parameters have been checked against the Tycho-2 data.

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### White Dwarfs with Gaia

Josep Manel Carrasco Martínez (UB-ICC), C. Jordi, S. Catalán, P.-E. Tremblay, R. Napiwotzki, X. Luri, A. Robin, P. Kowalski

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The Gaia mission (ESA) will begin observing very soon (launch is scheduled in 2013) and the scientific community is preparing for the maximal scientific return. In White Dwarfs (WD) field Gaia will provide a substantially enlarged in number sample of very cool WD compared with the presently known WDs. This will allow for better characterization of the atmospheric parameters of these stars, especially the H/He relative abundances, which is essential for precise WD cosmochronology and studying stars formation rate in the past. As WD (specially in 'very cold' regime,  $T_{\text{eff}} < 5000$  K) are very faint, they have been very hard to study and only the closest ones have been observed until now. But Gaia, through its 5 years survey of the whole sky until magnitude 20-25 (depending on the color of the source), will provide a lot of new science in this field by detecting a lot of faint WD.

Using synthetic stellar spectral energy distribution libraries and the most recent Gaia transmission curves, we derive Gaia colors of three different kinds of WD (pure-H, pure-He and Mixed composition with H/He= 0.1). Relationships and color-color diagrams between different common photometric systems (Johnson-Cousins, SDSS and 2MASS) and Gaia are provided allowing making predictions of how WDs will look like in Gaia BP/RP spectrophotometry.

We also compare the estimations of number and types of WD observed in every galactic population derived with Gaia Universe Model Simulator (GUMS, used in the preparation of Gaia mission) and with a commonly used model by scientific community in the study of WD populations (Napiwotzky, 2009). Our estimations provide that some thousands of 'very cold' regime WD will be observed for the first time with Gaia.

## **Towards a reliable star formation history of the galactic disk in the Gaia era**

Francesca Figueras Siñol (ICC-UB), S. Hidalgo, M. Czekaj, A. Aparicio, J.M. Carrasco, C. Gallart, C. Jordi, A. Robin

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A new tool is being developed to derive the Star Formation (SF) and chemical enrichment history of the galactic disc through comparison of future Gaia data with synthetic color magnitude diagrams (CMD). First steps are being conducted joining two powerful algorithms: IAC-pop/MInnIAC (Aparicio & Hidalgo 2009), a code that has widely and very successfully being applied to external galaxies, and the new version of the Besançon Galaxy Model, that allow a good control of the IMF, SF and chemical enrichment, among others. A first tuning of these algorithms to the main characteristics of the Gaia data will be presented, emphasizing the role of the accurate parallaxes, the astrometric and photometric errors and the Gaia observational constrains. Preliminary tests demonstrate that the methodology proposed here has huge capabilities so the strategy to incorporate higher complexity will be discussed.

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## **Descubrimiento y estudio espectroscópico del cúmulo Galáctico masivo Mercer 81**

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El auge experimentado por la astronomía infrarroja en los años 90 ha hecho posible la detección de cientos de candidatos a cúmulos masivos jóvenes oscurecidos, revelando una considerable cantidad de formación estelar en el disco Galáctico.

Uno de estos candidatos, Mercer 81, fue detectado en el 2005 dentro de una búsqueda sistemática de sobredensidades de estrellas. Con el objeto de su confirmación como cúmulo masivo, se realizó fotometría infrarroja con NICMOS (HST), buscando estrellas con líneas de emisión. Contrariamente a lo esperado, las estrellas más brillantes no parecían formar parte de un cúmulo masivo. Pero sorprendentemente, se encontró, dentro del mismo campo, un grupo de estrellas más ténues que sí presentaban fuertes emisiones y por tanto podían ser muy masivas; esto constituyó un redescubrimiento del verdadero cúmulo.

Tras un primer estudio espectroscópico con ISAAC (VLT) de cuatro de las estrellas con líneas de emisión, se deduce que es un cúmulo abundante en estrellas Wolf-Rayet ricas en Nitrógeno (WN). A partir de la clasificación estelar y la medida de la distancia, se ha concluido que Mercer 81 es un cúmulo masivo joven situado junto al extremo más distante de la barra Galáctica.

En este trabajo se presentan los resultados del primer estudio fotométrico y espectroscópico realizado de Mercer 81, incluyéndose además los espectros de una segunda campaña de observaciones recientes de otras estrellas masivas del cúmulo.

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## MASGOMAS Project: Two new massive and young Galactic clusters

Sebastián Ramírez Alegría (IAC), Artemio Herrero, Antonio Marín-Franch

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We present two new massive clusters, discovered during the second phase of our project MASGOMAS (MAssive Stars in Galactic Obscured MAssive clusterS). The second phase of the project focuses on a systematic search of OB-type star candidates overdensities. We also present new near-infrared photometry (J, H and Ks) and mid-resolution follow-up spectroscopy (H and K), obtained with LIRIS at ORM (La Palma), for the stellar content of the new massive clusters.

With these data we have confirmed that Masgomas-1, the first candidate discovered by us, is a young and massive cluster, probably exceeding  $10^4$  solar masses, which hosts both an OB-type and an RSG population. We have also determined the cluster distance and extinction, placing it in the Scutum-Centaurus arm, but far from the arm base (where RSGC1, RSGC2, RSGC3, Alicante8 and Alicante 10 clusters are located), and closer to the Sun.

For our second new massive cluster candidate (Masgomas-4), we have spectroscopically confirmed the presence of a massive stellar population, but the deeply embedded stellar population in the nuclear regions of the candidate remains without spectral classification. The future spectral classification for the young, highly reddened, and possibly massive stellar population will allow us to determine if Masgomas-4 is a single massive cluster or two different young clusters in the same sight of view.

**Sesión G4 (jueves 12, 09:00-11:00)****Aula 1.1****A new planetary nebula around the hot subdwarf star 2M1931+4324**

Alba Aller Egea (Universidade de Vigo), A. Ulla, L.F. Miranda, P. Thejll, R. Oreiro, C. Rodríguez-López, M. Manteiga, E. Pérez

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Hot subdwarf O (sdO) stars are blue low-mass stars evolving towards the white dwarf phase, although their origin is not well understood yet. They occupy a broad region in the HR diagram that is crossed by evolutionary tracks of post-Asymptotic Giant Branch (post-AGB), post-Red Giant Branch and post-Extended Horizontal Branch stars. In this context, investigating the association of sdO stars with planetary nebulae (PNe) is essential to confirm a post-AGB origin or to favour other progenitors. We are involved in a comprehensive research to try to detect new PNe around known sdO stars by means of deep imaging and intermediate-resolution long-slit spectroscopy.

In this work, we present the first results of this ongoing project: the detection of a new planetary nebula around 2M1931+4324 and the confirmation of this star as a true sdO star. Narrow-band images reveal a bipolar nebula, an additional extended elliptical structure, and high-excitation outer knots and filaments. Faint [OIII] line emission is detected in the spectrum of the bipolar shell indicating a very low-excitation. From the analysis of the spectrum of 2M1931+4324 we obtain an effective temperature of about 59000 K and a surface gravity of  $\log(g)$  about 5.2, which are typical of sdO stars.

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## Unveiling the Sculpting Process of Planetary Nebulae with the Very Large Telescope

Mónica Wendolyn Blanco Cárdenas (IAA)

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Planetary nebulae (PNe) are one of the most intriguing astrophysical objects. This evolutionary phase of low and intermediate-mass stars has revealed a wild variety of complex morphologies, but the shaping mechanisms of PNe are still under intense debate. The observations point out that the onset of the asymmetry observed in PNe already originates at the end of the AGB phase or during the post-AGB phase. The study of late AGB stars, post-AGB stars, proto-PNe and young PNe provides us a unique opportunity to investigate the sculpting processes of these objects, but optical observations are hampered by the large obscuration caused by their dusty envelopes. Here we report mid-IR observations obtained using VISIR at the VLT of a sample of post-AGB star candidates, water fountains (post-AGB stars with high-velocity water maser emission) and H<sub>2</sub>O-PNe (PNe so young that still harbor water maser emission) that provide us with important information of the morphology and physical properties of their dusty envelopes.

The investigation of the shaping mechanisms requires observations at an even higher spatial resolution than that provided by VISIR. Long baseline interferometric observations with AMBER and MIDI at the VLTI may provide the required spatial resolution, but the imaging capabilities are very limited and the observations are complex and very time-consuming. Spectroastrometry can provide more robust results at a lower observational cost. We will soon obtain spectroastrometric observations at very high spectral resolution ( $R \sim 100000$ ) with CRIFES at the VLT for a representative sample of complex and extremely bipolar PNe with strong evidences of disks. Our exploratory program will open a new window to probe whether an ionized, molecular and/or dust disk exist in the innermost regions of late post-AGB stars, proto-PNe and young PNe.

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## Charge-exchange reactions in the planetary nebula Abell 30?

Martín Antonio Guerrero Roncel (IAA)

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Charge-exchange reactions occur when a highly ionized plasma interacts with cold, neutral material. The ions in the plasma capture electrons from neutral atoms, resulting in a cascade to the ground state that will produce X-ray emission with energies characteristic of the ions. A typical astrophysical situation where charge-exchange reactions take place is the interaction between the solar wind and comets, when highly ionized ions of carbon and oxygen pick up electrons from neutral hydrogen in the coma of comets approaching the Sun. As a result, comets are nowadays recognized to be bright X-ray sources.

Charge-exchange reactions may be important in many other astrophysical scenarios. Here I report the recent detection by Chandra and XMM-Newton of soft X-ray emission associated to the hydrogen-poor cometary knots surrounding the born-again central star of the planetary nebulae Abell 30. The spectral and spatial properties of some components of the diffuse X-ray emission can be interpreted in terms of charge-exchange reactions between the fast stellar wind and the hydrogen-poor knots in this planetary nebula.

## A new family of optical/NIR extinction laws

Jesús Maíz Apellániz (IAA), VFTS collaboration

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We have generated a new one-parameter family of extinction laws intended to replace the Cardelli et al. (1989) family. The new laws have been obtained using two state-of-the-art surveys: the VLT-FLAMES Tarantula Survey, which obtained high-resolution spectra of 1000 stars in 30 Doradus, and the WFC3-ERS survey, which obtained HST multiband photometry of a number of starburst regions, including 30 Doradus. Hence, our input data clearly surpass in quality and quantity the photometry and spectral types used by Cardelli et al. to derive their extinction laws almost a quarter of a century ago. Even though obtained for 30 Doradus, we have positively tested their applicability to Galactic stars (the main differences between the MW, LMC, and SMC extinction laws occur in the UV, not in the optical/NIR). The new family of extinction laws solve two outstanding problems: the failure of the Cardelli et al. laws to accurately describe the Strömgren colors and indices for highly extinguished stars and the inability of optical/NIR photometry to determine effective temperatures of massive hot stars.

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## The deep spectrophotometric mosaic of the Orion Nebula. Preliminary results

Manuel Núñez Díaz (IAC), C. Esteban, A. Mesa-Delgado

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We present a deep spectrophotometric mosaic of the Orion Nebula obtained with the Potsdam Multi-Aperture Spectrophotometer (PMAS) at Calar Alto Observatory. The aim of the observations has been to determine the spatial distribution of physical conditions and chemical abundances across the nebula and at different morphological structures. The 64 arcsec long hexagonal fiber bundle (PPAK) has been used to obtain a complete mosaic of the central 4 arcmin of the nebula in about 20 fields. The spectra of the mosaic cover the whole optical spectral range and permits to derive: a) different line intensity ratios covering all possible ionization states in the nebula; b) electron densities from several diagnostics based on [S II], [O II], [Cl III] and [Fe III] line ratios; c) dust extinction distribution, e) electron temperatures from [O III], [N II] and [SII] line ratios as well as the Balmer jump; f) the distribution of ionic and total abundances determined from collisionally excited lines; g) ionic abundances from C II and O II from recombination lines and the abundance discrepancy factor. We will give an overview of the actual status, preliminary results and future goals of the project.

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## Sesión G5 (jueves 12, 15:30-17:20)

Salón de Grados

### Star formation in the outer Galaxy: the young cluster NGC 1893

Jorge Sanz Forcada (CAB), L. Prisinzano, G. Micela, M. Caramazza, S. Sciortino

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Stellar formation in the outer Galaxy is expected to be less conspicuous due to less favorable conditions. Several stellar forming regions in the outer Galaxy have shown similar characteristics to others in the inner Galaxy. The very recent episodes of stellar formation in NGC 1893 (age  $\sim 1.5$  Myr) demonstrates it. This cluster is an optimal laboratory to study stellar formation phenomena: it includes the presence of at least 6 O-type stars, two pennant nebulae, dark nebular clouds, and a high disc frequency among its members. We are conducting a series of papers on this cluster based on multiwavelength data, including Spitzer and Chandra observations. We study membership, morphology of the cluster, the spatial distribution of stellar ages and circumstellar discs, and the influence of the massive stars of the cluster in the evolution of circumstellar discs. NGC 1893 has shown similar characteristics to other stellar forming regions at closer distances to the Sun. The ionizing UV flux from massive stars plays an important role in the earlier dissipation of circumstellar discs in closer stars. There is a disc frequency of 52% in a sample complete in the mass range 0.35-2 Ms. This frequency is slightly lower than the values found in clusters of similar age at closer distance. We attribute this to the faster disc evaporation by radiation of massive stars, the use of a different mass range in each case, and/or the method employed to select stars with and without discs. We also study the structure of the Galaxy by using the infrared photometry of NGC 1893 to find the positions of interstellar dust and gas concentrations at different distances. The data reveal a different reddening law, towards the anticenter of the Galaxy, to that determined from other regions.

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### Quantitative analysis of OVz stars in 30 Doradus

Carolina Sabín San Julián (IAC), Sergio Simón-Díaz, Artemio Herrero, Miriam García and the Tarantula-FLAMES collaboration

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In contrast to normal OV stars, OVz stars are characterized by a HeII4686 absorption-line stronger than other He lines. They have been suggested to be young and subluminous massive stellar objects with high gravities and weaker winds when compared to normal OV stars.

We have tested these hypotheses in a sample of OV and OVz stars in 30 Doradus (LMC) and found no substantial different behaviour between the two samples. For this test, we have used multiepoch, high resolution and SNR spectra observed within the VLT Tarantula-FLAMES Survey. We have used the IACOB grid tool for quantitative automatic analysis of O stars, developed at the IAC.

In addition, we have been able to reproduce the behaviour of OVz stars as a function of their stellar parameters by means of a grid of FASTWIND atmosphere models and show that there are no fundamental differences between OV and OVz stars.

## Discos protoplanetarios y formación de objetos subestelares

*[Conferencia Invitada]*

Nuria Huélamo (CAB-LAEFF)

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Los discos circunestelares que rodean a las estrellas jóvenes son la cuna de los sistemas planetarios. En esta charla revisaré los resultados más recientes relacionados con la evolución de estos discos, su contenido en gas y polvo, y la conexión entre el disco y la formación de planetas. En el caso de objetos subestelares (enanas marrones y objetos de masa planetaria) explicaré los mecanismos de formación más aceptados hasta la fecha, y las evidencias observacionales que apoyan cada uno de ellos.

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## DUST around NEarby Stars (DUNES): descripción del proyecto y resultados

Benjamín Montesinos Comino (CAB), Carlos Eiroa y equipo DUNES

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DUNES es un Open Time Key Project del observatorio espacial Herschel cuyo objetivo es explorar, mediante los instrumentos PACS y SPIRE, una muestra de 133 estrellas FGK de secuencia principal del entorno solar en busca de 'discos debris'. Estos discos son el resultado de la colisión de planetesimales formados en los discos protoplanetarios de esas estrellas durante las primeras decenas de millones de años de evolución. Con la totalidad de las estrellas observadas, presentamos en esta charla un resumen global de los resultados y algunos ejemplos llamativos de objetos individuales.

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## Accretion properties of pre-main sequence stars

Ignacio Mendigutía (UAM), Benjamín Montesinos, Alcione Mora, Carlos Eiroa, Bruno Merín, Rene Oudmaijer, Gwendolyn Meeus, James Muzerolle, Nuria Calvet

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Planetary systems are formed from the evolution of gas and dust disks that surround most young stars. Apart from planet formation, there are other physical mechanisms driving disk evolution, such as dust grain growth and settling, or photoevaporation. One major challenge of modern Astrophysical research is to determine the dependence of these mechanisms on the stellar mass and age. In particular, estimating the incidence of planet formation as a dominating disk clearing mechanism is a fundamental question: do all disks form planets?, which are the stellar properties most favourable for planet formation?. This type of issues could be addressed from the observational characterization of circumstellar disks, estimates of the amount of inner disk gas transferred to the star per time unit -mass accretion rates- being crucial.

Nowadays there is consensus on the way that disk matter is accreted onto the star, at least for low-mass pre-main sequence objects ( $< 1 M_{\odot}$ ; T Tauris). Magnetospheric accretion models are successfully applied to these stars, allowing us to estimate their accretion rates from different tracers. Recently (Mendigutía et al. 2011, A&A, 535, A99), we have been able to estimate accretion rates also for intermediate-mass pre-main sequence objects ( $1 < M/M_{\odot} < 6$ ; Herbig Ae/Bes). I will summarize the analogies and differences between the accretion properties and accretion tracers found for the T Tauri and Herbig Ae/Be regimes. I will describe how the accretion and disk properties could be pointing to different physical mechanisms driving disk evolution, depending on the stellar mass range considered (Mendigutía et al. 2012, submitted to A&A).

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## Sesión G6 (viernes 13, 09:00-11:00)

Aula 1.1

### A bar/bulge model for the Milky Way

*[Conferencia Invitada]*

Inma Martínez-Valpuesta (Max-Planck Institute for Extraterrestrial Physics)

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During the last year we have tested a simulated barred galaxy with some of the observational data available for the Milky Way. In particular, we focus on the bar-boxy bulge of the Milky Way. We will present these results comparing the observations and the model, and the corresponding quantitative agreement between them.

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### On the galactic spiral arms nature as revealed by the kinematics of the stellar component

Santi Roca Fàbrega (UB-ICC), O. Valenzuela, M. Romero-Gómez, T. Antoja, F. Figueras, B. Pichardo

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We present results of test particles and full self-consistent isolated N-body simulations of Milky Way type galactic disks conducted to map the dynamics of spiral arms and the evolution of the large scale stellar kinematic response to non-axisymmetric structures (bar and spiral arms). The high number of disk particles and small time step and few parsecs spatial resolution in the disk allow us to study the internal properties of the stellar velocity distribution. We found that second and third order moments of the velocity distribution function are good indicators of both the velocity ellipsoid misalignment and the level of kinematic substructure in and out of the arms and the bar. We analyze the correlation between these kinematic tracers and the properties of the non-axisymmetric components such as its transient nature of the spirals and its density contrast. Future application to Gaia data to constrain the galactic potential is discussed.

Our N-body simulations also reveal two different behaviors for the Spiral Arm Pattern speed. Whereas sub-dominant disc cases present transient spiral arm features co-rotating with particles, Milky Way like galaxies with higher disk/halo ratio develops a bar and transient spiral compatible with a pattern speed constant in radius. Both cases significantly depart from the TWA steady spiral arm density wave theory. Such results may have potential to be applied to archaeological studies of the Milky Way disks and high implication to the secular evolution of galaxies.

## The invariant manifolds and the Milky Way galactic bar

Merce Romero-Gómez (UB-ICC), L. Athanassoula, T. Antoja, F. Figueras  
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How many bars does the Milky Way have? This question has arisen due to recent results from theoretical models and N-body simulations. In this talk, firstly, we will present the results the invariant manifolds provide in this direction. We compute for the first time the longitude – line of sight velocity diagram of orbits trapped by the manifolds in five different Galactic potentials with different configurations, namely one bar (the COBE/DIRBE bar), two bars misaligned (the COBE/DIRBE and the Long bars) and the two bars aligned. Secondly, we present the results from test particle simulations where the bar has one of the three configurations above. In particular, we study whether the kinematic structures in the Gaia sphere (4-5kpc from the Sun) will be able to distinguish among the three cases. Finally, we will link these results with what Gaia will see in the inner parts of the Milky Way.

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## Chemical tagging of stellar kinematic groups

Hugo Tabernero Guzmán (UCM), D. Montes, J.I. González Hernández  
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Stellar Kinematic Groups are kinematical coherent groups of stars which might share a common origin. These groups spread through the Galaxy over time due to tidal effects caused by galactic rotation and disc heating, however the chemical information survives. The aim of chemical tagging is to show that abundances of every chemical element must be homogeneous among candidate members. We have studied the case of the Hyades Supercluster and the Ursa Major Moving Group for kinematically selected FGK stars, based on high-resolution spectroscopic observations obtained at the 1.2 m Mercator Telescope with HERMES Spectrograph. Stellar atmospheric parameters ( $T_{eff}$ ,  $\log g$ ,  $\xi$  and  $[Fe/H]$ ) have been determined using an own-implemented automatic code (StePar) which makes use of the sensibility from iron EWs measured in the spectra. We have derived the chemical abundances of several elements and their  $[X/Fe]$  ratios. Thus, we finally perform a careful differential abundance analysis using a known member of each cluster as a reference star, with the aim to clarify the origin of these kinematical groups.

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## Dwarf galaxies and the formation of the Milky Way

*[Conferencia Invitada]*

Jorge Peñarrubia (IoA, Cambridge UK)  
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Dwarf spheroidal galaxies are key objects in the current cosmological paradigm: first, they are the least luminous galaxies, likely signaling the minimum halo mass at which gas can be accreted and converted into stars. Second, they all have ancient stellar populations, providing clues on star formation/feedback processes at early stages of the Universe. Third, they are the most numerous satellites about the Milky Way and M31, helping us to uncover the hierarchical formation of galaxies. And fourth, they appear to be the most dark matter dominated galaxies in the known Universe, which allow us to directly test a number of different cosmological predictions. In this talk I will present the results of two recent papers where we use observational data to constrain the presence (or the lack thereof) of (i) dark matter cusps and (ii) dark substructures (also called "dark galaxies") in the haloes wherein dwarf galaxies are embedded. I will also discuss the implications of these results for the formation of Milky Way galaxies.

# **La Vía Láctea y sus Componentes: Pósteres**



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## The warp of the Milky Way as seen by Gaia

Hoda Abedi (IEEC-ICC-UB), L. Aguilar, F. Figueras, M. Romero-Gómez

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We present a first evaluation of the Gaia capabilities to trace the dynamics of the galactic warp. We define a geometric model for the warp and apply it to the disc component of the Allen & Santillan (1991) axisymmetric potential for the Milky Way. We define two cases, namely the control case, which is the original Allen & Santillan potential, and the “warped” case, where we modify the disc component. We use test particle simulations to integrate initial conditions in both cases. In the “warped” case, we introduce the warp adiabatically to preserve the statistical equilibrium. Then we compare both, control and warped configurations, simulate Gaia astrometry - including expected errors - and check the level of significance of difference between them.

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## CARMENES. III. Preliminary low-resolution spectroscopic characterisation

Francisco Javier Alonso-Floriano (Universidad Complutense de Madrid), D. Montes, J. C.

Morales, J. A. Caballero, A.Klutsch, R. Mundt et al.

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In this contribution we summarise our ongoing project of characterisation of late-type M-dwarfs aimed to define the input catalogue of CARMENES (Calar Alto high- Resolution search for M-dwarfs with Exoearths with Near-infrared and optical Echelle Spectrographs), a next-generation instrument to be built for the 3.5 m telescope at Calar Alto Observatory. We have used the CAFOS spectrograph at the 2.2 m Calar Alto telescope for observing over 300 stars from our initial sample and Lépine & Gaidos (2011) with a spectral resolution  $R \sim 1500$ . We have performed a spectral-type classification of the targets by comparing their acquired spectra with those of spectral type standard stars observed during the same observing runs, and using spectral indices well calibrated for M-dwarfs such as, TiO index. We have also derived chromospheric activity indicators (i.e. H $\alpha$ , H $\beta$ ). Our final goal is to choose the best candidates to be observed with this next-generation spectrograph and prepare the CARMENCITA (CARMENES Cool star Information and daTa Archive) database.

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## Searching for common proper-motion companions in the Local Association and its young kinematic subgroups

Francisco Javier Alonso-Floriano (Universidad Complutense de Madrid), J. A. Caballero, D.

Montes

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We describe the results of an ongoing project aimed to identify new members of young associations by searching for common proper-motion companions to already-known members. We have used the Aladin sky atlas of the Virtual Observatory and the 2MASS and PPMXL astrophotometric catalogues to look for new common proper-motion pairs in the the Local Association and its young kinematic subgroups (Tucana-Horologium, beta Pictoris and TW Hydrae, up to now). We have discovered several new late-type spectral type stellar companions that increase the number of members in these associations. For one of the new identified objects we have taken low-resolution spectroscopy to confirm its young nature and characterise its stellar properties. A detailed study of Tucana-Horologium has provided an unprecedented view of the moving group nucleus around beta Tuc, which lies at the centre of the remnant of the cluster that originated the group.

## Binary stars in loose associations

Rebecca Azulay Romero (Universidad de Valencia), J. C. Guirado (Universidad de Valencia)  
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Precise determinations of dynamical masses of pre-main-sequence (PMS) stars are necessary to calibrate PMS stellar evolutionary models, whose predictions are in disagreement with measurements for masses below  $1.2 M_{\odot}$ . Binary stars in young, nearby loose associations are particularly good candidates, since all members share a common age. We will present the result of VLBI observations directed to determine the orbital motion of several binaries. These measurements would provide precise calibration points for testing PMS models of low-mass stars.

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## Studies on the Corona of Open Clusters

Lola Balaguer Núñez (ICC-IEEC-UB), C. Jordi, J.L. Muñíos, D. Galadí-Enríquez, E. Masana  
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High quality proper motions on an extended area of a selection of open clusters will let us study the coronas of open clusters with unprecedented accuracy. We are in the process of obtaining astrometry with the Meridian Circles of San Fernando CMAF at El Leoncito (Argentina) and CMRM at La Palma of an area few times around the known radius (from Webda) of the selection of clusters. We will make use of Stromgren wide-field photometry to complement their characterization.

We have already analysed the old open cluster M67, deriving properties for 2738 stars fainter and, in a wider area, than any previous precise survey in the cluster region. With new data from the CMAF we have covered an area of about  $2^{\circ} \times 1.4^{\circ}$  and down to 17 magnitude in  $r'$ . Proper motions are then used to determine the membership probabilities of stars in the region, applying parametric and non-parametric approaches to cluster/field segregation. Adding photometric criteria, we obtained a preliminary list of 557 probable member stars, up to a distance  $0.96^{\circ}$  from the cluster centre.

These are preliminary results on our work that will lead us to the most complete study of its structure, dynamics and mass segregation up to date. Between the clusters already measured we have: NGC1817, NGC2112, NGC2355, NGC3680, NGC2509, NGC1893, NGC2264, Blanco I, Teusch 10, Teusch 51, Ruprecht 32, Bochum 6.

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## CARMENES. IV. CARMENCITA, the input catalogue archive

Jose A. Caballero (CAB), Caballero, Cortés-Contreras, López-Santiago, Morales,  
Alonso-Floriano, Dorda, Klutsch, Montes, Mundt, Reiners, Ribas, Alonso-Santiago  
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CARMENES, the new near-infrared/optical high-resolution spectrograph for the 3.5m Calar Alto Telescope, is expected to see its first light in early 2014. Before that, we must have chosen carefully the 300 M dwarfs to which CARMENES will look for telluric exoplanets with the radial-velocity method. CARMENCITA, the CARMENES Cool dwarf Information and daTa Archive, will be the most comprehensive database on M dwarfs ever built, with dozens of parameters measured by us or compiled from the literature (from accurate coordinates and proper motions, through spectral types, magnitudes, H $\alpha$  and X-rays, to vsini or multiplicity at all separations) for almost 1000 of the brightest, latest M dwarfs in the solar neighbourhood.

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## CARMENES. V: CARMENCITA M dwarfs in multiple systems

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With the help of CARMENCITA, the CARMENES Cool dwarf Information and daTa Archive, we investigate the membership in double, triple or higher-order systems of almost 1000 of the brightest, latest M dwarfs in the solar neighbourhood. We use data compiled from the literature and measured by us. Angular separations range from a few tenths of arcseconds to several arcminutes, which translate into a very wide interval of projected physical separations. Studying M dwarfs in multiple systems provide information on a wealth of topics, e.g. from dynamical masses, through distance and metallicity, to the formation and evolution of weakly bound systems.

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## Stellar Clusters with Massive Stars: Environment and Stellar Content

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Massive stars play a crucial role in galaxy evolution, yet in spite of this importance the formation of high-mass stars is not a well-known process. From a theoretical point of view, there are three main hypotheses for their formation: a) monolithic collapse of protostellar cores; b) competitive accretion within a proto-cluster molecular cloud; and c) coalescence of protostellar cores and low-mass stars in very dense environments.

It is obvious that the success of the proposed different scenarios for the formation of massive stars is going to depend on their Galactic location and on the properties of the molecular cloud where they have been formed. Likewise, the stellar population coeval to the massive stars will be strongly influenced by the dominant mechanism in the formation of their highest-mass stars. This means that the cluster members will show IMFs, spatial distribution according to mass, age spread and massive stars to pre-main-sequence stars ratios highly conditioned by the dominant mechanism in the formation of their most massive members. Furthermore, the presence of massive stars can affect the survival of circumstellar disks around the low-mass stars of the cluster.

As of two years ago, the Stellar Systems Group of the IAA has begun an observational programme of stellar clusters containing massive stars, whose main objective is the characterization of their stellar population using UBVR<sub>I</sub>JHK and H $\alpha$  photometry to obtain the physical parameters of the cluster and to determine the Mass Function of the member stars, their spatial distribution by mass range and the quotient of populations of different masses and evolutionary states for: a) isolated clusters and b) clusters contained within more extensive stellar formation regions. In this workshop, we will present preliminary results for some clusters that we have currently under study.

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## Primer catálogo de fuentes variables observadas con INTEGRAL/OMC

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La cámara óptica (OMC) a bordo del observatorio espacial INTEGRAL de la ESA proporciona fotometría en la banda V de Johnson. Con una abertura de 50 mm y un campo de visión de 5 $\times$ 5 grados, la OMC puede detectar fuentes ópticas más brillantes que V $\sim$ 18 de una lista de objetos de interés científico previamente seleccionada. En esta contribución presentamos el primer catálogo de fuentes variables observadas con la OMC formado por más de 5000 objetos variables. Gracias al gran intervalo temporal que cubren los datos (más de 7 años) se ha podido realizar un estudio de la periodicidad determinando períodos para más de 1000 objetos.

## Modeling the SED of Water-Fountain sources

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Water-fountains are late asymptotic giant branch (AGB) and post-AGB stars with high-velocity water maser emission (velocity spread  $> 50$ - $100$  km/s) that traces one of the earliest known manifestation of collimated mass-loss in evolved stars. Optical and mid-infrared observations with high angular resolution toward these sources typically reveal a bipolar structure with a dark equatorial waist, which might correspond to a torus. These features are surrounded by an extended and optically thick dusty envelope, whose emission dominates the far infrared wavelength range. However, the presence of either a disk or a torus could be better traced at mm and submm wavelengths where the envelope is optically thin and therefore, one can probe the innermost regions. We report 1 mm observations, carried out with the IRAM 30 m telescope, of 8 of the 13 candidate water-fountain sources reported to date. Using these data, together with observations at shorter wavelengths taken from the literature, we built the spectral energy distribution (SED) between 0.8-1300 micras of these sources. The broad band SEDs are fitted with radiative transfer models that include a star, a circumstellar disk or toroid, and an expanding shell. The modeling of the sources allows us to estimate physical parameters of the components such as masses, sizes, dust grain properties, and geometry. Our radiative transfer models indicate that, in order to fit the data at longer wavelengths, we require a massive disk, with a mass similar to that of the envelope ( $\sim 1$  solar mass). The exact values of the parameters depend on the actual distance to the sources, which is uncertain in most cases. These results are relevant in order to start to address important problems such as the shaping mechanism of planetary nebulae or the missing mass that originally was expelled by the progenitor star.

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## The Progenitors of stripped-envelope Supernovae

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We will present the results of our analysis of Hubble Space Telescope (HST) and deep ground-based images, to isolate the massive progenitor stars of several stripped-envelope supernovae (SNe), e.g., the highly-extinguished Type Ic SNe 2003jg in NGC 2997 and 2004cc in NGC 4568. Despite the fact that, generally, the progenitors are not directly detected, our analysis can help characterize, e.g., the dusty environments in which the stars exploded and, therefore, provides constraints on the nature of the progenitors.

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## **REG y GREAT: dos redes científicas trabajando para optimizar la explotación científica de Gaia**

Francesca Figueras Siñol (ICC-UB (IEEC)) y C. Jordi, en representación de los participantes españoles en REG y GREAT

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A un año del lanzamiento del satélite Gaia de la ESA (Agosto 2013) España y Europa cuentan ya con dos redes temáticas dedicadas a preparar la explotación científica de los datos que ofrecerá el satélite: GREAT (Gaia Research for European Astronomy Training), financiada por la European Science Foundation y REG (Red Española para la explotación científica de Gaia) financiada por el MICINN. Estas redes, abiertas a la comunidad internacional, han aceptado los desafíos que nos ofrece Gaia: revolucionar nuestro conocimiento sobre la Vía Láctea y sus componentes, trazar la distribución de materia oscura en nuestro universo local, caracterizar los objetos del sistema solar, ... y muchos más. Aquí se detallan la estructura de estas redes, la participación española, y las tareas presentes y futuras que tienen planteadas.

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## **The GTC Variable Star One-Shot Project**

David García-Álvarez (IAC/GTC), Thomas Dall, GTC Team, VSOP Team

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Stellar variability types are assigned on the basis of lightcurve appearance, which often remains unchallenged without further observational evidence. VSOP (Variable Star One-shot Project) is a large international collaboration, which has so far obtained spectra of more than 1200 stars during the past few years. Operationally this program is perfectly suited for a modern, efficient observatory, providing GTC with a large pool of filler observations. We have been awarded 60hrs for 2012A and plan to apply for observing time in future semesters. Scientifically, our aims are: (1) obtain first spectroscopy of all unstudied variable stars in both hemispheres, (2) provide data products to the public in a fast and automatic way, (3) generate an influx of serendipitous discoveries across all fields of astrophysics.

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## **Espectroscopía de rayos-X con XMM-Newton de sistemas binarios de rayos-X de alta masa**

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Estudiar las líneas de emisión en los espectros de sistemas binarios de rayos-X es una herramienta fundamental para el estudio de la materia que rodea el objeto compacto y el fenómeno que produce esas líneas. Aquí presentaremos un estudio centrado en las líneas de fluorescencia que se observan en la región de Fe K para distintos sistemas binarios de rayos-X de alta masa, usando observaciones de XMM-Newton.

## UV Survey of Central Stars of Planetary Nebulae: Occurrence and Variability of Stellar Winds

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The occurrence of a stellar wind in the central star of a planetary nebula (CSPN) is revealed by the presence of P Cygni profiles of high-excitation lines overimposed on its stellar continuum. We have used the entire Far-Ultraviolet Spectroscopic Explorer (FUSE) archive to investigate the occurrence and variability of P Cygni profiles of high-excitation lines. All useful spectroscopic observations have been merged to produce the highest quality spectra that can be used to assess the occurrence of stellar winds through the P Cygni profiles of high-excitation lines. The individual spectra have been compared to search for variability in the P Cygni profile. P Cygni profiles of high-excitation lines have been found in more than 40 CSPNe, with a clear correlation between the ionization potential of the lines and the effective temperature of the star. Ten CSPNe show variability in the P Cygni profile of high-excitation lines, preferentially in the unsaturated P V and Si IV lines, but also in saturated C III and O VI lines. The CSPNe with variable P Cygni profiles have similar stellar and wind properties that suggests they are not in an evolved evolutionary status. Some of the CSPNe with variable P Cygni profile show O VI lines, while their effective temperature are insufficient to produce this ion. We suggest that this ion is produced by Auger ionization from X-rays associated to shocks in their stellar winds as is the case of super-ions in OB stars.

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## Gallery of exoplanetary oddities: the star that flares too much

María Magdalena Hernán Obispo (Universidad Complutense de Madrid), J. R. Barnes, M. C.

Gálvez-Ortiz, A. Golovin, S. R. Kane, E. de Castro, M. Cornide, et al.

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In this contribution we present the results of the study of the magnetic field of the system of a late-type young active star and its close-in giant planet.

In addition to the impact of stellar activity on planets, it is not unreasonable to suppose some impact of a close-in massive planet on the magnetic activity of its host star. The mere presence and movement of the planet could distort and perturb the stellar magnetic field and might affect the structure of the stellar corona.

To study the stellar activity we have carried out both echelle spectroscopic and photometric monitoring. The aim of this work is to map the active regions at different atmospheric levels. The simultaneous study of photospheric and chromospheric active regions is a powerful tool that allows us to trace, reconstruct and model the magnetic field structure. Previous results show a high level of stellar activity despite the moderate rotational velocity of the star. The overall picture shows that the magnetic field of this star is a complicated puzzle to reconstruct.

A comparison of the eight years light curves reveals a configuration of photospheric spots that is very persistent over time, suggesting the presence of active longitudes. The fact that the activity indices are strongly modulated with the synodic period of the system, rather than the photometric period as expected, lead us to suspect a possible star-planet interaction. The periodic passage of the planet could trigger the active regions, producing an enhancement of the emission. Also, we have detected flaring activity modulated with the synodic period of the system.

In short, studying the configuration of the magnetic field of this system is a challenge of great importance, which will enlarge our understanding of star-planet interactions, as well as stellar and planetary dynamos.

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## Young stars in the CO Cepheus void and its surrounding

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After mixing in the Galactic plane, the youngest stars are barely discernible from old ones. We have identified several RasTyc stars for which the lithium content is higher than that of the members of the Pleiades cluster. Furthermore, five of them are even concentrated within a few degrees, inside the CO Cepheus void, and likely constitute a new young association. To discover further members, we used multivariate analysis methods for selecting optical and infrared counterparts of ROSAT All-Sky Survey/XMM-Newton X-ray sources that were cross-identified with late-type stars. Based on our spectroscopic observations of this dataset, we discovered new lithium-rich field stars that are mainly located in the sky area surrounding the Cepheus void. These sources have properties rather similar to those of the TW Hydrae association members, although they turn out to be slightly older and placed in the Northern hemisphere. We also highlighted the presence of a population of Pleiades-like sources, mostly projected in front of the Galactic plane. All these young stars in the field are of great importance to give new insight into the process of stellar formation outside standard star-forming regions.

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## X-ray emission in zeta-Ori

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Nearby star-forming regions are ideal laboratories to study high-energy emission processes but they usually present high absorption what makes difficult to detect the stellar population inside the molecular complex. As young late-type stars show high X-ray emission and X-ray photons are little absorbed by interstellar material, X-ray dedicated surveys are an excellent tool to detect the low-mass stellar population in optically absorbed regions. In this work, we present a study of the star-forming region Zeta-Ori and its surrounding. We combine optical, infrared and X-ray data. Properties of the X-ray emitting plasma and infrared features of the young stellar objects detected in the XMM-Newton observation are determine. The southern part of the Orion B giant molecular cloud complex harbor other star forming regions, as NGC 2023 and NGC 2024, regions where other authors have performed similar studies. We use this regions to compare the obtained results. We study the spectral energy distribution of X-ray sources. Combining these results with infrared features, the X-ray sources are classified as class I, class II and class III objects. The X-ray spectrum and lighth curve of detected X-ray sources is analyzed to found flares. We use a extinction-independent index to select the stars with circumstellar disk, and study the relationship between the present of disk and the flare energy. The results are similar to others studies and we conclude that the coronal properties of class II and class III objects in this region do not differ significantly from each other and from stars of similar infrared class in the ONC.

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## A multipurpose 3-D grid of stellar models

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The last two decades have produced a proliferation of stellar atmosphere grids, evolutionary tracks, and isochrones which are available to the astronomical community from different internet services. However, it is not straightforward (at least for an inexperienced user) to manipulate those models to answer questions of the type: What is the spectral energy distribution of a 9000 K giant? What about its J-band magnitude for different metallicities? What can I tell about the mass of a star if I know that its unreddened B-V color is -0.05 and its luminosity in solar units is  $10^5$ ? The answers to those questions is indeed in the models but a series of transformations and combinations involving different variables and models are required to obtain them. To make the available knowledge more user friendly, I have combined a number of state-of-the-art sources to create a 3-D (effective temperature, luminosity, and metallicity) grid of stellar models for which I provide calibrated SEDs and magnitudes as well as auxiliary variables such as mass and age. Furthermore, I have generated a grid of extinguished magnitudes using the recent Maíz Apellániz et al. (2012) extinction laws and incorporated them into the Bayesian code CHORIZOS.

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## Frecuencias y Modos de Oscilación de Estrellas Variables en Sigma Orionis y NGC 6811

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A star is classified as variable if its apparent magnitude changes over time, whether the changes are due to variations in the star's actual luminosity, or to variations in the amount of the star's light that is blocked from reaching Earth. We study variable stars in two open clusters of very different age:  $\sigma$  Orionis (age: 3 Myr; distance: 385 pc) and NGC6811 (age: 600 Myr; distance: 1150 pc). While in the NGC6811 stars we expected to detect pulsations and calculate the frequency spectra, from which deriving information about stellar interior using astroseismological models, in  $\sigma$  Orionis we expected to detect variability in stars produced by cool and hot spots on their surfaces because of magnetic activity, as well as flares, and by occulting circumstellar discs. The study of NGC6811 is part of an international campaign to complement Kepler data with ground-based multi-colour data to identify oscillation modes. We observed for two weeks at the IAC-80 telescope on the Observatorio del Teide and analysed the data. For  $\sigma$  Orionis, we used images obtained by R. Naves during nine nights in the winter of 2008-2009. Apart from confirming the photometric variability of several known T-Tauri stars and of a B2Vpe star, we identified the stars Mayrit524060 and Mayrit344337 to be variable for the first time. While Mayrit344337 is a T-Tauri star known to display X-ray flares, lithium in absorption and H $\alpha$  in strong emission, Mayrit524060 displays pulsation-like variability with amplitude 0.017mag and period 14.89 cycles/day. Because of its early spectral type, it may be the  $\sigma$  Scuti star found in  $\sigma$  Orionis, and probably in the whole Orion star-forming region. We showed preliminary results on frequencies and power spectra of Mayrit524060 which may become a cornerstone for the study of the interior of very young stars of masses slightly larger than that of the Sun.

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## The Gaia Universe Model

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The Universe Model used for the Gaia simulations is statistically analyzed. We describe the different ingredients include in it, with special attention to the stellar component. According to the model, we show that Gaia will be able to observe 1.1 billion of stars, several millions of galaxies, up to 1 million of quasars and about 50000 supernovas during the 5 years of mission.

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## Tunable Filter absorption line spectroscopy of the galactic bar: metallicity gradients

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Measuring the stellar metallicity distribution from a large sample of stars can be a very useful tool to constraint the chemical evolution models which produce the different formation scenarios for the bulge. However, classical spectroscopy of individual stars is observationally expensive and the surveys done so far fail due to the small number statistics. Recently, with the advent of tunable filter tomography, a new way to obtain low resolution spectroscopy of large samples of stars has been opened. Here, we present the preliminary results on the measurement of the stellar metallicity at two different positions along the Milky Way bar ( $l=15\text{deg}$  and  $l=27\text{deg}$ ) using the GTC-OSIRIS red etalon. Our metallicity measurements are based on the CaII triplet observed in red giant stars, which has been demonstrated as good tracer of the metallicity, and its calibration to  $[\text{Fe}/\text{H}]$  is determined for globular cluster red giants in previous investigations.

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## Kinematics of exoplanet host stars: membership in young moving groups and the thin/thick disc

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We present a detailed study of the kinematics of known exoplanets host stars with known parallactic distance, and precise proper motion and radial velocity measurements, from where the Galactic space motions ( $U$ ,  $V$ ,  $W$ ) were computed. For the stars with  $U$  and  $V$  velocity components inside or near the boundaries that determine the young disc population, we have analyzed the possible membership in the classical moving groups and nearby loose associations with ages between 10 and 600 Ma. For the candidate members, we have compiled the information available in the literature in order to constrain their membership by applying age-dating methods for late-type stars. We identify several dozen young exoplanet host star candidates, many of which were considered to have solar-like ages. We also look for old exoplanet host stars in the Galactic thick disc and the thin-thick transition.

## Cool stars: spectral library of high-resolution echelle spectra and database of stellar parameters

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During the last years our group have undertake several high resolution spectroscopic surveys of nearby FGKM stars with different spectrographs (FOCES, SARG, SOFIE, FIES, HERMES). A large number of stars have been already observed and we have already determined spectral types, rotational velocities as well as radial velocities, Lithium abundance and several chromospheric activity indicators. We are working now in a homogeneous determination of the fundamental stellar parameters (Teff, log g, metallicity, [Fe/H], and microturbulent velocity) and differential abundance analysis of all these stars.

Some fully reduced spectra in FITS format have been available via ftp and in the World Wide Web by Montes et al. (1997; 1998; and 1999) and some particular spectral regions of the echelle spectra are available at VizieR by López-Santiago et al. (2010).

We are now working in made accessible all the spectra of our different surveys in a Virtual Observatory (VO) compliant library and database accessible using a common web interface following the standards of the International Virtual Observatory Alliance (IVOA). The spectral library includes F, G, K and M field stars, from dwarfs to giants. The spectral coverage is from 3800 to 10000 Å, with spectral resolution ranging from 40000 to 80000. The database will provide in addition the stellar parameters determined for these spectra.

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## Estudio de las líneas de CIV y SiIV en estrellas Ap

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Durante el estudio y distribución espacial de las líneas de CIV y SiIV interestelar se observó que las estrellas Ap presentaban tales líneas en cualquier dirección de observación y no sólo en aquellas en las que se espera gas caliente, como era el caso para las estrellas B6-A6 sin ninguna peculiaridad. (2012 AJ 143, n° 2, art. 28) : “High ionization species in the nearby ISM from an exhaustive analysis of the IUE INES database”, Freire Ferrero R., Morales Durán C., Halbwegs J.-L., Cabo Cubeiro A. M.

En este rango espectral no es esperable encontrar, en estrellas normales, líneas de elementos altamente ionizados por lo cual la presencia de estas líneas en estrellas que no presentan envoltura puede ser atribuida al medio interestelar.

Estamos estudiando los posibles mecanismos de formación de tales líneas en los espectros ultravioleta de estrellas Ap.

Presentaremos ahora el estudio de las líneas de CIV y SiIV (estelar e interestelar) de las estrellas Ap, su variabilidad, su relación con una posible emisión en rayos X o con una posible binaridad, con el tipo de peculiaridad y su distribución espacial.

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## Type IIb SN 2011fu: spectral and light curve evolution

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Supernovae explosions (SNe) are one of the utmost and influential events in the universe. Among other interests, these objects are essential to set constraints on progenitors and possible explosion mechanisms. They are also very useful tools to probe theoretical models of stellar evolution. Advances in technology have helped to increase the number of well-observed SNe over time. This has permitted the detailed study of some subclasses of SNe, which so far have been considered rare events. Among these events are core-collapse Type IIb SNe, which appear to be hybrids between normal Type II SNe (those characterized by H emission) and Type Ib/c (those that do not exhibit H features in their spectra but possibly HeI). In this talk I will present the main photometric and spectroscopic characteristics of SN 2011fu, a peculiar type IIb supernova discovered in September 2011 in UGC1626. Thanks to a large collaboration (which includes many European Institutions), I have acquired a wide set of observational data of SN 2011fu since its discovery up to the end of February of 2012. While the spectral features of this supernova are in principle similar to those of canonical type IIb SNe, its light curve (LC) closely resembles that of SN 1993J. This similarity can allow us to suggest constraints on SN 2011fu's progenitor scenario.

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## CARMENES science case and M-dwarf sample

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CARMENES (Calar Alto high-Resolution search for M-dwarfs with Exoearths with Near-infrared and optical Echelle Spectrograph) is an instrument to be built for the 3.5m telescope of the Calar Alto Observatory. This instrument consists of two separate spectrographs (R=85000) covering the optical and the near-infrared bands. It will achieve a radial velocity precision of 1 m/s and will monitor about 300 stars during 5 years. The main goal of this survey is the discovery of Earth-like planets in the habitable zone of late-type stars, a kind of star-planet systems still almost unexplored. In order to achieve this goal, we are compiling all the known late-type stars from different surveys and catalogs (Palomar/Michigan State University Survey, RECONS, Bochanski et al. 2005, Lépine & Gaidos 2011, for example). At the moment, the CARMENES input list have more than 2000 targets. However, very few of these M-dwarfs have accurate known fundamental properties such as the spectral type. Therefore, in order to select the best possible targets to be monitored with this spectrograph, we are performing low-resolution spectroscopic observations. This observations are being used to derive the spectral type of the stars as well as to estimate their magnetic activity level through the analysis of activity indicators such as the H $\alpha$  emission line. This is very important because stellar activity is a source of radial velocity jitter that can mask the presence of exoplanets. In this poster we summarize the science case of CARMENES and the current status the input list, the properties of the targets and the results of our observations. A part from the CARMENES targets, this work will provide the largest sample of M-dwarf stars with properties accurately determined.

## **New insights into the peculiar X-ray pulsar MXB 0656-072**

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The X-ray transient MXB 0656-072 is a poorly studied member of high-mass X-ray binaries. Based on the transient nature of the X-ray emission, the detection of pulsations, and the early-type companion, it has been classified as a Be X-ray binary. However, the flaring activity covering a large fraction of a giant outburst is somehow peculiar. In this work, we investigate the multiwavelength variability of the high-mass X-ray binary MXB 0656-072. We carry out optical spectroscopy and analyse all RXTE archive data, performing a detailed X-ray colour, spectral, and timing analysis of both giant (type-I) and normal (type-II) outbursts from the system. Results. From optical spectroscopy, we classify the optical counterpart as a O9.5Ve star, confirming its Be nature. From the study of type-I outbursts we unveil a 100 days periodicity, most likely associated with the orbital period of the system. Balmer lines in emission in the optical spectra, long-term X-ray variability, and the spin period / orbital period relation, are fully consistent with the system being a Be/XRB. The peculiar feature that characterises the type-II outburst is flaring activity, which occurs during the whole outburst peak, before a smoother decay. We interpret it in terms of magneto-hydrodynamic instability. We explored for the first time the aperiodic X-ray variability of the system, finding a correlation of the central frequency and rms of the main timing component with luminosity, which extends up to a “saturation” flux of  $1 \times 10^{-8}$  erg cm<sup>2</sup> s<sup>-1</sup>. A correlation between timing and spectral parameters was also found, pointing to an interconnection between the two physical regions responsible for both phenomenologies.

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## **Variables tipo Delta Scuti y Gamma Doradus en cúmulos estelares abiertos**

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Las estrellas variables en cúmulos abiertos son una herramienta importante para probar las teorías de estructura y evolución estelar ya que los parámetros como distancia, edad, enrojecimiento y composición química inicial puede asumirse que son los mismos para todas las estrellas que pertenecen al cúmulo y pueden conocerse con precisión.

En este trabajo hemos realizado una extensa revisión bibliográfica acerca del conocimiento actual de variables tipo Delta Scuti y Gamma Doradus en cúmulos estelares abiertos buscando encontrar posibles correlaciones entre las propiedades pulsacionales de las variables y los parámetros físicos de los cúmulos a los que pertenecen. Igualmente hemos iniciado una búsqueda sistemática de este tipo de variables en cúmulos abiertos utilizando los telescopios del Observatorio de Sierra Nevada, en particular el T35 que es un telescopio dedicado especialmente a la búsqueda de variables en cúmulos, en esta comunicación se presentarán los primeros resultados.

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## The overall systematic trends in the kinematics of the hottest gas in massive star forming regions

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Since hot molecular cores are considered the cradle of massive stars, the study of their gas kinematics is key to better understand the physical processes leading to massive star formation. Previous observations of rotational transitions from vibrationally excited levels of HC<sub>3</sub>N (hereafter HC<sub>3</sub>N\*) towards the Sgr B2M and Sgr B2N hot cores, revealed the existence of two systematic trends in these high-mass star forming regions: i) a decrease of the linewidth with increasing energy of the vibrational levels involved in the transition; and ii) an increase of the linewidth with the size of the HC<sub>3</sub>N\* emitting region. It is necessary to clearly establish whether these trends are also found toward other hot cores. Here, we present observations of several rotational transitions of HC<sub>3</sub>N\* toward a sample of 10 hot cores whose luminosities span from several 10<sup>3</sup> to ~10<sup>8</sup> solar luminosities. Our results show that the systematic trends for the HC<sub>3</sub>N\* linewidths are preserved toward the observed hot cores. This is explained by the fact that the emission from the lower energy transitions of HC<sub>3</sub>N\* likely shows a contribution from high-velocity shocked gas arising from molecular outflows. This suggests that molecular outflows and/or solid rigid rotation are the major agents, over collapse and/or keplerian rotation, affecting the global kinematics in massive star forming regions. In addition, our HC<sub>3</sub>N\* data reveals a correlation between the linewidths of the HC<sub>3</sub>N\* 1v6 and 1v7 lines and the total luminosity measured in these regions, suggesting that HC<sub>3</sub>N\* is an excellent tool to link the gas kinematics of hot cores with their global properties such as total luminosity.

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## VFTS 658: una estrella WR aislada de su cúmulo

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Recientemente, estudios realizados a partir de los espectros en el visible e infrarrojo de los miembros más masivos (de tipo WN5h) del cúmulo R136a en 30 Dor en la Gran Nube de Magallanes han puesto en duda el hasta ahora más que aceptado límite superior de masa inicial estelar de 150 masas solares. El motivo es que el estudio de los miembros más masivos de un cúmulo puede verse seriamente contaminado por otras estrellas del cúmulo, debido al alto grado de hacinamiento.

El descubrimiento de una nueva estrella Wolf-Rayet, VFTS682 (WN5h), aislada a 30 pc del cúmulo R136, representa una gran oportunidad para esclarecer el dilema del rango inicial de masas. Más aún, su estudio permitirá establecer si esta nueva WR se ha formado “in situ” o por el contrario ha sido eyectada desde el núcleo de R136. A pesar de que los estudios fotométricos en el visible e infrarrojo cercano revelan que se trata de un objeto muy masivo y luminoso, la ausencia de observaciones espectroscópicas en el infrarrojo cercano no ha permitido establecer una conclusión definitiva sobre su elevada luminosidad (ya sea por un enrojecimiento anómalo o por la presencia de una estrella compañera roja en la línea de visión).

Presentamos los resultados del análisis —mediante el código de modelos de atmósfera CMF-GEN—, de la emisión de la nueva estrella WR, VFTS682, desde el visible al infrarrojo cercano, a partir de una serie de espectros obtenidos con el espectrógrafo XSHOOTER en el VLT.

## Optical and NIR Spectroscopic analysis of OB Stellar Atmospheres

Klaus Simón Rübke Zúñiga (Instituto de Astrofísica de Canarias), Artemio Herrero, Miriam Garcia and Sergio Simón

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OB stars are very active actors shaping their environment and contributing to the chemical and dynamical evolution of their host galaxies. Accurate analyses of massive stars are thus a key ingredient in our interpretation of the light coming from the Milky Way and nearby galaxies. These analyses rely in the use of state-of-the-art model atmospheres, that have to be as realistic as possible. In our project, we aim at testing the self-consistency of our model atmospheres when carrying out simultaneous analyses in the optical and the near IR. This is particularly relevant for our Galaxy, where extinction obscures the optical wavelengths and the inner OB population can only be studied in the IR. As a first step, we present here stellar parameters for a few stars derived from the optical and the NIR, and compare the results.

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## The unparalleledly massive, fast outflow of the pre-Planetary Nebula IRAS 19374+2359

Carmen Sánchez Contreras (CAB), Sergio Martín (ESO), Raghvendra Sahai (JPL/Caltech)

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At some point in the late-AGB stage, a process (or processes) becomes operative that accelerates and imposes bipolarity upon the slow, spherical AGB winds. What produces bipolarity in these objects and at what stage does bipolarity manifest itself are key questions that remain yet poorly understood.

We present CO (115 & 230GHz) mapping of IRAS19374+2359, an extreme pre-PN with an unparalleledly massive, fast molecular outflow discovered in our OVRO Post-AGB CO1-0 emission Survey (referred to as OPACOS). We present sub-arcsecond resolution 12CO, 13CO (2-1) and 1.3mm-continuum emission maps recently obtained with the Submillimeter Array (SMA). The prominent 300 km/s-broad wings and the lack of an intense, low-velocity CO line core in IRAS19374 indicate that most or all of the molecular gas participates in the high-velocity flow. From our CO data, we estimate a total mass in the molecular outflow of  $\sim 1 M_{\odot}$  and an unprecedentedly large value for the linear momentum carried of  $\sim 45 M_{\odot} \text{ km/s}$ . Our SMA maps show CO emission arising from a  $\sim 3'' \times 2''$  hourglass-shaped molecular flow aligned with the optical lobes; a linear velocity gradient along the lobes as well as equatorial expansion at the nebula waist are found. The spatio-kinematic structure of this object is in support of a jet-envelope entrainment scenario in which a substantial amount of directed momentum is transferred to large parts of the dense AGB wind by interaction with fast, collimated post-AGB jets.

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## Ciencia-VO en el marco del Observatorio Virtual Español

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Desde su origen, el objetivo prioritario del Observatorio Virtual ha sido el de permitir el desarrollo de líneas de trabajo que, de otra manera, no hubiera sido posible realizar o se hubieran llevado a cabo de manera muy ineficiente. La Astronomía multirrango y los proyectos que requieren el manejo de grandes volúmenes de información son dos campos que claramente se han beneficiado de la existencia del Observatorio Virtual.

La colaboración con grupos científicos con proyectos que se pudieran beneficiar del uso de una metodología VO ha sido una de las líneas de trabajo más importantes en el marco del Observatorio Virtual Español. Este tipo de colaboraciones han producido excelentes resultados tal y como lo refleja el número de artículos publicados, los cuales representan casi un 30% de todos los artículos de ciencia-VO publicados a nivel mundial.

En esta presentación describiremos las características generales de estas colaboraciones así como los resultados más relevantes obtenidos.

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## El sondeo espectroscópico de estrellas O Galácticas (GOSSS): Estrellas brillantes del hemisferio Sur

Alfredo Sota Ballano (IAA), Maíz Apellániz, Jesús, Barbá, Rodolfo H., Walborn, Nolan R., Alfaro, Emilio J., Gamen, Roberto C., Morrell, Nidia I., Arias, Julia I., Penadés Ordaz, Miguel

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Presentamos los últimos resultados de GOSSS, el sondeo espectroscópico de estrellas O Galácticas. En 2011 publicamos el primer grupo de espectros del proyecto, el cual contenía 184 espectros de estrellas O brillantes con  $\delta > -20$ . En ese primer artículo se presentó un nuevo atlas espectral y se actualizaron los criterios de clasificación. Aquí presentamos los resultados del segundo bloque de estrellas, 200 objetos brillantes con  $\delta < -20$ . Entre los dos bloques hemos generado la biblioteca de espectros de estrellas O Galácticas más completa jamás compilada y eso nos ha permitido introducir una nueva categoría espectral (Ofc), descubrir nuevos casos de tipos espectrales poco frecuentes (p.ej. Of?p) y analizar la relación entre la rotación y el enriquecimiento en nitrógeno. También presentamos el estatus del proyecto tras haber observado más de 1500 estrellas y los planes de futuro con respecto al estudio de la extinción, la distribución espacial de las estrellas masivas en el entorno solar y la IMF.

## StePar: an automatic code for stellar parameter determination

Hugo Taberero Guzmán (Universidad Complutense de Madrid), J.I. González Hernández, D. Montes

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We introduce a new automatic code (StePar) for determining stellar atmospheric parameters (Teff, logg, and [Fe/H]) in an automated way. StePar employs the 2002 version of the MOOG code (Snedden 1973) and a grid of Kurucz ATLAS9 plane-parallel model atmospheres (Kurucz 1993). The atmospheric parameters are obtained from the EWs of 263 Fe I and 36 Fe II lines (obtained from Sousa et al. 2008) iterating until the excitation and ionization equilibrium are fulfilled. StePar uses a Downhill Simplex method (Press et al. 1992) that minimizes a quadratic form composed by the excitation and ionization equilibrium conditions. Atmospheric parameters determined by StePar are independent of the stellar parameters initial-guess for the problem star, therefore we employ the canonical solar values as initial input. StePar can only deal with FGK stars from F6 to K4, also it can not work with fast rotators, veiled spectra, very metal poor stars or Signal to noise ratio below 30. Optionally StePar can operate with MARCS models (Gustafson et al. 2008) instead of Kurucz ATLAS9 models, additionally Turbospectrum (Alvarez and Plez 1998) can replace the MOOG code and play its role during the parameter determination. StePar has been used to determine stellar parameters for some studies (Taberero et al. 2012 and Wisniewski et al. 2012). In addition StePar is being used to obtain parameters for FGK stars from the GAIA-ESO Survey.

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## Emisión de Rayos X en nebulosas Wolf-Rayet

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Estudiamos la emisión de rayos X en nebulosas alrededor de estrellas Wolf-Rayet. En particular presentamos observaciones de las únicas 2 nebulosas Wolf-Rayet que emiten en rayos X (S 308 y NGC 6888) y las comparamos con modelos radiativo-hidrodinámicos recientes. Junto con estos modelos, podemos predecir qué nebulosas pueden o no emitir rayos X.

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## Formación estelar secuencial en Casiopea

Sergio Velasco (IAC), Miriam García, Ignacio Negueruela

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Las estrellas masivas ( $M > 9M_{\odot}$ ) suelen formarse en asociaciones OB, con uno o varios cúmulos abiertos no muy masivos y un halo de estrellas jóvenes dispersas. Presentamos los primeros resultados de un proyecto para entender los mecanismos de formación estelar secuencial en asociaciones OB y en concreto en la región de Casiopea, localizada en  $l=110-125^{\circ}$ . Para ello analizamos espectros de estrellas masivas pertenecientes a cúmulos en dicha región tomados con el espectrógrafo IDS en el telescopio INT (2.5m) del ORM. Los tipos espectrales derivados, combinados con fotometría, nos permitirán una estimación más precisa del enrojecimiento hacia objetos individuales, y situar las estrellas en el diagrama HR con menor incertidumbre. En conjunto, los resultados caracterizarán la edad y la masa de los diferentes cúmulos; las diferencias relativas entre ellos nos permitirán evaluar si existe formación estelar secuencial en Casiopea, y en su caso, caracterizarla.

## Complejidad molecular en envolturas de estrellas evolucionadas ricas en oxígeno: IKTAU y OH231.8+4.2

Luis Velilla Prieto (CAB-INTA-CSIC), Carmen Sánchez Contreras, José Cernicharo Quintanilla  
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Las estrellas evolucionadas y sus envolturas circunestelares (CSE, Circumstellar Envelope), son eficientes factorías para la creación de moléculas y granos de polvo, enriqueciendo eventualmente el medio interestelar. Presentamos el estudio químico preliminar de dos envolturas de estrellas AGB ricas en oxígeno, apoyándonos en las observaciones que hemos realizado con el radiotelescopio de 30 metros de IRAM (Instituto de Radioastronomía Milimétrica) en Granada, un barrido espectral en el rango milimétrico.

Mediante este estudio pretendemos mejorar el conocimiento de la estructura, física y química de ambos objetos, IKTAU y OH231.8+4.2, analizando además, la influencia de choques de alta velocidad debida a la interacción de vientos post-AGB con la CSE, para el caso particular de OH231.8+4.2.

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## An analytical Model of Accretion onto White Dwarfs

Nataly Ospina (ICE, IEEC-CSIC)  
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I will present our project devoted to study the structure of the emission region (temperature, density and gas velocity distributions) and X-ray spectrum emitted by this region using the analytical model presented by Frank et al. (2002). We have obtained the temperature, density and gas velocity distributions of the emission region for different masses of white dwarfs and at different positions in the shock coordinate. Also, we calculated the emitted spectrum for different masses and at different intervals of  $z$  with the principal objective of study the accretion at different points of the emission region.



# Ciencias planetarias: Orales



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**SESIÓN P1, LUNES DE 15:30 A 17:20** (Moderador: Luisa Lara)

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15:30–15:50	C	Jesús Maldonado Prado	Metallicity of solar-type stars with debris discs and planets
15:50–16:10	C	Holger Voss	Exoplanetary transits as seen by Gaia
16:10–16:40	I	Ricardo Hueso	Tormentas Atmosféricas en el Sistema Solar
16:40–17:00	C	Santiago Pérez-Hoyos	Distribución vertical de nubes en Saturno durante la gran tormenta de 2010
17:00–17:20	C	Manuel Domingo Beltrán	Estudio de la densidad de mezclas binarias de hielos de interés astrofísico

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**SESIÓN P2, LUNES DE 17:50 A 19:30** (Moderador: Enric Pallé)

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17:50–18:20	I	Ignasi Ribas	Planet detection and characterization around low-mass stars: from CARMENES to EChO
18:20–18:50	I	Enric Pallé	Las observaciones del Earthshine: del cambio climático a la astrobiología
18:50–19:10	C	Enrique Herrero Casas	Modeling the photosphere of active stars
19:10–19:30	C	Aurora Ullán Nieto	Seguimiento fotométrico de exoplanetas con el telescopio robótico del Centro de Astrobiología

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**SESIÓN P3, MARTES DE 15:30 A 17:20** (Moderador: Olga Prieto Ballesteros)

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15:30–15:50	C	Josep María Trigo Rodríguez	Estudio de condritas carbonáceas de la colección Antártica de NASA: implicaciones para Marco Polo-R
15:50–16:10	C	Carles Eduard Moyano Cambero	Estudiando acondritas SNC para profundizar en la evolución de la atmósfera de Marte
16:10–16:40	I	Adriano Campo Bagatín	El cinturón trans-neptuniano 20 años después de 1992QB1
16:40–17:00	C	Paula Benavídez	Destrucción de TNOs binarios debido a la perturbación gravitatoria de un cuerpo externo
17:00–17:20	C	José Luis Ortiz	Resultados de ocultaciones estelares por Objetos Transneptunianos

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**SESIÓN P4, MARTES DE 17:50 A 19:40** (Moderador: José Luís Ortíz)

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17:50–18:00	P	Sesión de pósteres	Coordina Luisa Lara
18:00–18:30	I	Olga Prieto Ballesteros	La habitabilidad potencial del sistema de Júpiter: Ganímedes, Europa y Calisto
18:30–19:00	I	Noemi Pinilla Alonso	Reservas Heladas del Sistema Solar: Información Congelada en el Tiempo
19:00–19:20	C	Rene Duffard	Minerales hidratados en el cinturón principal de asteroides
19:20–19:40	C	Fernando Moreno Danvila	Cometa 22P/Kopff: Caracterización del polvo basado en observaciones multiespectrales

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I = Conferencia Invitada, C = Contribución Oral



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## Sesión P1 (lunes 9, 15:30-17:20)

Aula 1.1

### Metallicity of solar-type stars with debris discs and planets

Jesús Maldonado Prado (UAM), C. Eiroa, E. Villaver, B. Montesinos, A. Mora

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Understanding the origin and evolution of stars and planetary systems is one of the major goals of modern Astrophysics. Debris discs are, strictly speaking, signatures of planetesimal systems, the building blocks of planets. Therefore, it is interesting to compare the properties of these stars with those known to harbour planets. In this contribution, we use high-resolution spectra to derive homogeneous metallicities of solar-type stars with/without debris and planets. Our results suggest that there is trend towards higher metallicities from stars with neither discs nor planets to stars hosting giant planets. Several trends on stars hosting debris discs and giant-planets have been identified, these planets tend to be cool and their host stars tend to show low values of the dust luminosity. We also find evidence of an anticorrelation between the luminosity of the dust and the planet eccentricity. The full implications of these findings will be discussed in this contribution.

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### Exoplanetary transits as seen by Gaia

Holger Voss (IEEC), Carme Jordi, Claus Fabricius, Josep Manel Carrasco, Xavier Luri

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The ESA cornerstone mission Gaia will be launched in 2013 to begin a scan of about one billion sources in the Milky way and beyond. During the mission time of 5 years (+ one year extension) repeated astrometric, photometric and spectroscopic observations of the entire sky down to magnitude 20 will be recorded. Therefore, Gaia as an All-Sky survey has enormous potential for discovery in almost all fields of astronomy and astrophysics. Thus, Gaia will also be a nearly unbiased survey for transiting extrasolar planets. 50 to 200 epoch observations will be collected during the mission for about 1 billion sources. Based on latest detection probabilities derived from the very successful NASA Kepler mission, our knowledge about the expected photometric precision of Gaia in the white-light G band and the Gaia scanning law, we will analyze how many transiting exoplanets candidates Gaia will be able to detect. We include the entire range of stellar types in the parameter space for our analysis as potential host stars, as they will be observed by Gaia. We will be able to show statistics for expected distributions of the transiting exoplanets in planetary radius, orbital period and distance to the host star. Additionally we will provide information about the expected distribution of the host star parameters stellar mass, radius and effective temperature. Combining all this information enables us to answer the most interesting question: Will Gaia be able to detect Super-Earths in the habitable zone of cool dwarfs?

## Tormentas Atmosféricas en el Sistema Solar

*[Conferencia Invitada]*

Ricardo Hueso Alonso (UPV/EHU)

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Las atmósferas de los planetas del sistema solar presentan características físicas variadas y extremas con respecto a la atmósfera terrestre. De la tenue y fría atmósfera de Marte o la densa y cálida atmósfera de Venus en el caso de los planetas terrestres, a las gigantescas atmósferas de los planetas exteriores, pasando por la atmósfera de nitrógeno y metano de Titán. Su estudio permite comparar el funcionamiento de la atmósfera de nuestro propio planeta con mecanismos semejantes pero bajo condiciones muy diferentes. La mayoría de estos mundos exhibe el desarrollo de fenómenos violentos de convección de rápido desarrollo análogos a las tormentas terrestres y alimentados por la liberación de calor latente al condensarse uno de los gases de su atmósfera. Estudiando estas tormentas hemos podido aprender aspectos claves y a veces ocultos de la dinámica general de esas atmósferas. Un ejemplo es la estructura profunda del complejo sistema de vientos de los planetas gigantes Júpiter y Saturno, inaccesible a la observación directa pero determinante en el comportamiento de las perturbaciones convectivas de gran escala que se desarrollan en estas atmósferas. Este es el caso por ejemplo de la última Gran Mancha Blanca de Saturno, la mayor tormenta convectiva observada en tiempos recientes y que ha podido estudiarse en detalle gracias a las observaciones de la nave espacial Cassini y a las efectuadas con grandes instalaciones terrestres, pero también gracias a las observaciones con pequeños telescopios operados por astrónomos amateurs de todo el mundo, permitiendo un seguimiento continuo de su evolución global. Otro caso de gran interés es el estudio de la actividad convectiva en Titán, donde el metano puede formar tormentas con fuertes flujos de precipitación que modelan parte de la superficie de esta luna experimentando este mundo un ciclo metanológico análogo al ciclo hidrológico de la atmósfera terrestre.

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### Distribución vertical de nubes en Saturno durante la gran tormenta de 2010

Santiago Pérez-Hoyos (UPV/EHU), José Francisco Sanz-Requena, Agustín Sánchez-Lavega

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En diciembre de 2010 se desencadenó en las latitudes templadas del hemisferio norte de Saturno una tormenta que, con el paso de los meses, acabó transformándose en un fenómeno de escala global. Estas tormentas, denominadas comúnmente GWS (“Great White Spots”), suceden en Saturno aproximadamente cada 20 o 30 años y las razones de su formación permanecen por el momento desconocidas. En este trabajo presentamos los resultados relativos a la estructura vertical de nubes y aerosoles en la región donde tuvo lugar el fenómeno y a lo largo de su evolución temporal. Para ello, se han utilizado imágenes tomadas por el instrumento ISS de la sonda espacial Cassini en órbita en torno al planeta. Utilizando métodos de transporte radiativo, establecemos la estructura vertical de las nubes y nieblas capaz de dar cuenta de la reflectividad observada en diferentes longitudes de onda. Los resultados muestran un núcleo central fuertemente elevado sobre su entorno y rodeado de una serie de estructuras peculiares asociadas a la intensa dinámica organizada en el entorno de la tormenta.

## **Estudio de la densidad de mezclas binarias de hielos de interés astrofísico**

Manuel Domingo Beltrán (Universidad Politécnica de Valencia), Miguel Ángel Satorre Aznar, M<sup>a</sup> Carmen Santonja Moltó, Ramón Luna Molina, Carlos Millán Verdú

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En este trabajo presentamos los resultados de una serie de experimentos de laboratorio realizados para obtener la densidad de mezclas binarias de hielos de interés astrofísico.

Hemos encontrado que para unas mezclas la densidad es igual a la esperada según la media ponderada, mientras que para otras es menor.

Los resultados se intentan explicar adecuadamente teniendo en cuenta la porosidad de las moléculas puras implicadas en la mezcla. Cuando ambas moléculas implicadas son porosas, la densidad de la mezcla es la media ponderada, pero si al menos una de ellas no lo es, la densidad es menor.

**Sesión P2 (lunes 9, 17:50-19:30)**

Aula 1.1

**Planet detection and characterization around low-mass stars: from CARMENES to EChO***[Conferencia Invitada]*

Ignasi Ribas (IEEC-CSIC)

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Just two decades after the first discoveries of planets outside our Solar System, we now count exoplanets by hundreds and have been able to investigate some of their atmospheric properties. Thus far we are just witnessing the tip of the iceberg of the planet distribution but Nature is already surprising us with an unsuspected variety of planet classes and structures. With the ever-improving technical capabilities, the possibility of finding hot and massive planets has extended to smaller planets (terrestrial) with mild surface temperatures (habitable). Although the eventual discovery of an Earth analog is clearly of great relevance, the identification and study of a statistically significant sample of planets, from Jupiters to Earths, from hot to temperate, from orbiting high- to low-mass stars, will be the only way to understanding planet formation and architecture, and ultimately placing our Solar System in context. The CARMENES M-star radial velocity experiment and the EChO planet characterization mission are aimed at addressing different but complementary aspects of this broad picture. In this talk I will discuss these two instrumental projects and how they fit into the current and future efforts in the field of exoplanet research.

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**Variaciones en los tránsitos de exoplanetas**

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Las variaciones en los periodos y en las duraciones de los tránsitos de exoplanetas permiten inferir algunas de sus propiedades orbitales.

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## Modeling the photosphere of active stars

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Stellar activity in late-type main sequence stars induces photometric modulations and apparent radial velocity variations that may hamper the detection of Earth-like planets and the measurement of their size, mass and atmospheric properties. The effect of stellar activity in the photosphere is seen in the form of spots and faculae, whose relationship with stellar parameters such as mass and age is still not well understood. Significant improvement in our knowledge of activity effects on starlight will be crucial to make the most of present and future planet search instruments (HARPS-N, CARMENES, ESPRESSO) and space missions (EChO). In this work we present a methodology to simulate spectra from the spotted photosphere of a rotating star. We use NextGen2 atmosphere models to generate synthetic spectra for the stellar surface, spots and faculae. The spectrum of the entire visible face of the star is obtained by summing the contribution of a grid of small surface elements and by considering their individual Doppler shifts and limb darkening coefficients obtained from Kurucz models. Using such simulator time series spectra can be obtained covering the rotation period the star or longer. By convolving these with the known passband for a specific instrument, this can be used to study the chromatic effects of spots and faculae on photometric modulation and radial velocity jitter. A methodology is also presented to obtain spot-model maps of stars using a similar approach. This allows, from the high precision photometry currently available from space missions like Kepler or CoRoT, to obtain accurate information on the presence of spots and their long-term behavior.

Our results will allow us to investigate the effects of activity patterns on the measurable stellar flux and hence define the best strategies to optimize exoplanet search and measurement experiments.

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## Seguimiento fotométrico de exoplanetas con el telescopio robótico del Centro de Astrobiología

Aurora Ullán Nieto (CAB), M.T. Eibe, L. Cuesta

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En esta contribución se presentarán algunos resultados obtenidos por el Grupo de Telescopios Robóticos del Centro de Astrobiología. Durante los últimos meses, nos hemos concentrado en el seguimiento fotométrico de varios exoplanetas teniendo en cuenta ciertas características que hacen que sean apropiados para ser observados con un telescopio de 50 cm: magnitud, período orbital, duración y profundidad de su tránsito, precisión fotométrica necesaria, óptimas condiciones de visibilidad, etc. Se mostrará un estudio de sus curvas de luz, así como también de la variabilidad de sus estrellas fuera de tránsito.

## Sesión P3 (martes 10, 17:50-19:40)

Aula 1.3

### Estudio de condritas carbonáceas de la colección Antártica de NASA: implicaciones para Marco Polo-R

Josep Maria Trigo Rodríguez (IEEC), Jordi Llorca, Carles E. Moyano Cambero et al.

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Mediante dos espectrómetros de alta resolución estamos realizando un estudio sistemático de la reflectividad espectral (desde 0.2 a 40  $\mu$ ) de varias decenas de condritas carbonáceas pertenecientes a la colección Antártica de NASA. Los datos obtenidos de algunos de estos meteoritos permiten profundizar en el origen de estos raros meteoritos y quizás identificar algunos de sus cuerpos progenitores. Intentamos responder a ciertas preguntas tales como: ¿son ciertos cometas progenitores de algunas de estas condritas?. Se describirán también las principales implicaciones de estos estudios para la futura caracterización de los primitivos asteroides condriticos que planean estudiar las misiones OSIRIS-REx (NASA) y Marco Polo-R (ESA).

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### Estudiando acondritas SNC para profundizar en la evolución de la atmósfera de Marte

Carles Eduard Moyano Cambero (ICE-CSIC), Josep María Trigo-Rodríguez, Francisco Javier Martín-Torres, Jordi Llorca

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Las acondritas marcianas, conocidas por su acrónimo SNC (de los tres grupos: Shergottitas, Nakhlitas y Chassignitas), retienen en sus fases minerales producidas por procesos de impacto valiosa información sobre la composición de la atmósfera de Marte en los tiempos en que fueron impulsados en órbita heliocéntrica. En esta charla se revisa nuestro conocimiento actual al respecto y sus principales implicaciones para conocer la evolución atmosférica del planeta rojo.

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### El cinturón trans-neptuniano 20 años después de 1992QB1

*[Conferencia Invitada]*

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El 12 de septiembre de 1992 fue descubierto 1992QB1, confirmando las predicciones de Edgeworth (1943), Kuiper (1951) y Fernández (1980), sobre la existencia de un cinturón de cuerpos más allá de la órbita de Neptuno. En 20 años, nuestro conocimiento acerca de la estructura de esa región del Sistema Solar ha ido mejorando y se empieza a definir su entramado dinámico y algunas características físicas de estos cuerpos. Análogamente al caso del cinturón de asteroides, a medida que avanza el conocimiento de la región trans-neptuniana, mejora nuestra comprensión de los mecanismos físicos y dinámicos que llevaron el Sistema Solar a formarse y evolucionar hasta la situación en la que lo observamos actualmente.

## **Destrucción de TNOs binarios debido a la perturbación gravitatoria de un cuerpo externo**

Paula Benavidez (Universidad de Alicante), Ricardo Gil-Hutton, Adriano Campo Bagatin, Marcela Cañada-Assandri, Cecilia López Sisterna, María F. Calandra, Guillermo Bernabeu Pastor  
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La abundante presencia de sistemas binarios en la población de TNOs es un tema actualmente relevante en el estudio del Sistema Solar exterior, es decir, en el Cinturón de Edgeworth-Kuiper. La importancia de este tema se basa en el hecho de que el comprender cómo estos sistemas, con características tan peculiares (binarios de masas comparables y grandes separaciones), han logrado sobrevivir durante la evolución dinámica y colisional de la región, permitiría delimitar características importantes de la población primordial.

Los mecanismos usualmente considerados para la destrucción de binarios son:

- a) una colisión catastrófica;
- b) una colisión con un proyectil pequeño con suficiente cantidad de movimiento;
- c) una perturbación gravitatoria por un encuentro con un tercer cuerpo.

En el presente trabajo se muestra un estudio estadístico preliminar para estimar la eficiencia del mecanismo c) para desligar sistemas binarios de igual masa asumiendo escenarios con diferentes parámetros iniciales.

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## **Resultados de ocultaciones estelares por Objetos Transneptunianos**

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En poco más de 2 años se ha pasado de no haber conseguido detectar una ocultación causada por TNOs jamás (a pesar de los muchos esfuerzos durante casi dos décadas en la comunidad internacional), a haber realizado la detección de 7 ocultaciones causadas por objetos gigantes como: Varuna, Eris, 2003AZ84, Makemake y Quaoar, y otro relativamente pequeño, como 2002TX300. Seis de estas ocultaciones fueron pronosticadas y detectadas por nuestro grupo en amplias colaboraciones internacionales. En esta charla se presentarán los hallazgos más destacados asociados a estos eventos, que dan importante información física de los cuerpos involucrados, desde tamaño, forma y albedo, hasta la posible presencia de atmósferas.

<p style="text-align: center;"><b>Sesión P4 (viernes 13, 15:30-17:20)</b> <b>Salón de Grados</b></p>
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**La habitabilidad potencial del sistema de Júpiter: Ganímedes, Europa y Calisto**

*[Conferencia Invitada]*

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La habitabilidad de un planeta es la capacidad de éste para que en alguno de sus ambientes aparezca y pueda desarrollarse la Vida. Si atendemos a la Vida tal y como la conocemos en la Tierra, hay tres parámetros fundamentales que restringen la habitabilidad planetaria; estos son: el agua líquida, las fuentes de energía que mantengan el metabolismo de los organismos y los nutrientes. La definición astrofísica clásica de habitabilidad tiene en cuenta solamente ambientes de las superficies planetarias. Sin embargo, el descubrimiento de evidencias de grandes masas de agua líquida en el interior de algunos satélites de hielo del sistema solar exterior ha forzado a extender dicho concepto a los ambientes profundos. Es el caso de los satélites de Júpiter, Europa, Ganímedes y Calisto, o de los de Saturno, Encelado y Titán.

Los tres grandes satélites de hielo del sistema de Júpiter con océanos internos tienen características físicas y geológicas dispares entre sí. Su estudio comparativo permite evaluar los parámetros que restringen la habitabilidad en el Universo. Ganímedes es el mayor satélite del sistema solar, tiene un campo magnético inducido único y una superficie plagada de accidentes tectónicos producto de las tensiones internas ocurridas durante su evolución. Sus características principales son comparables a las de algunos exoplanetas recientemente descubiertos que parecen tener también océanos profundos atrapados entre distintas capas de hielo de agua. Por otra parte, Europa podría ser actualmente activa, según indican las estructuras geológicas recientes de su superficie. Algunas de estas estructuras están asociadas a materiales interesantes desde el punto de vista astrobiológico y podrían poner en contacto los reservorios de agua con la superficie. Europa constituye un paradigma de ambiente acuoso en contacto con silicatos como los que hay en planetas terrestres. Por último, Calisto es el satélite con la superficie más antigua del sistema, llena de cráteres de impacto, pero cuyo grado de diferenciación interna es todavía un enigma. Es el único ejemplo conocido de mundo aparentemente inactivo con un océano.

La determinación del potencial de habitabilidad del sistema de Júpiter es uno de los temas principales de la misión JUICE (Jupiter and ICy moons Explorer), que ha sido propuesta a la Agencia Espacial Europea (ESA) como misión de tipo L en el contexto del programa Cosmic Vision. Si finalmente se lleva a cabo esta misión, que está aún en competición con otras presentadas también a este programa de la ESA, constituirá el principio de la exploración astrobiológica propiamente dicha del sistema solar exterior.

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## Reservas Heladas del Sistema Solar: Información Congelada en el Tiempo

*[Conferencia Invitada]*

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En el año 1992 se anunció el descubrimiento de 1992 QB1, el primer objeto trans-Neptuniano, confirmando la existencia de objetos helados orbitando más allá de Neptuno. Esta confirmación, sin embargo, abrió un gran número de cuestiones acerca del origen, evolución y naturaleza del Sistema Solar.

Desde ese momento hasta ahora, el estudio de los objetos trans-Neptunianos ha sido uno de los campos más activos de las ciencias planetarias. Son numerosos los proyectos que a través de la espectroscopía y la fotometría se han dedicado a la caracterización de estas pequeñas reservas de hielo. Su existencia, así mismo, ha contribuido a mejorar (o complicar) los modelos dinámicos de formación del Sistema Solar.

Ahora, 30 años después, podemos decir que nuestra idea del Sistema Solar es bastante diferente a la que teníamos en el año 1992. Algunos cambios incluso han trascendido del ambiente científico al saber popular y podemos afirmar sin temor a equivocarnos, que nuestro sistema solar, el que estudiamos en el cole, no es el mismo que el de nuestros hijos.

En esta charla repasaré los principales descubrimientos realizados en este campo en las últimas tres décadas, y que han sido cruciales para configurar la visión actual del Sistema Solar: los más de 1000 nuevos objetos descubiertos en el cinturón trans-Neptuniano; los planetas enanos; las reservas de hielo en el cinturón de asteroides y los interesantes detalles aportados por la sonda Cassini, acerca de las heladas lunas de Saturno.

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## Minerales hidratados en el cinturón principal de asteroides

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In order to determine how significant and homogeneous is the presence of hydrated minerals in the surface of asteroids we have started a long-term program to obtain visible reflectance spectra of main belt asteroids with the  $0.7\mu\text{m}$  absorption band previously detected. Our observations are done using CAFOS at the 2.2m telescope in the Calar Alto Astronomical Observatory. To search for any variation in the position, width, and depth of this absorption band, and correlations with other physical/dynamical parameters of the object, we obtain a spectrum every quarter of its full rotational period. Here we present the results for a preliminary set of 60 asteroids.

## Cometa 22P/Kopff: Caracterización del polvo basado en observaciones multiespectrales

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Presentamos un estudio detallado del polvo del cometa 22P/Kopff basado en observaciones realizadas durante las apariciones de 2009, 2002, 1996 y 1983, tanto en el visible como en el infrarrojo. Los datos en el visible corresponden a imágenes en el rojo obtenidas en el observatorio de Sierra Nevada en 2009, en el Canada-France-Hawaii Telescope en 2003, y en el observatorio japonés Kiso, en 2002. Los datos de 1996 y 1983 corresponden a la observación de “trails” en el infrarrojo ( $12 \mu$ ) mediante los satélites ISO e IRAS. Hemos realizado un estudio con nuestro modelo de Monte Carlo con objeto de encontrar el mejor ajuste a todos datos observacionales y determinar los parámetros fundamentales del polvo de este cometa, tales como tasa de producción, distribución de tamaños, velocidades de eyección y anisotropías en la eyección. El modelo también se apoya en resultados obtenidos por el grupo amateur Cometas.Obs, que han proporcionado curvas de luz y el parámetro  $Af\rho$  para la apariciones de 2002 y 2009. En este trabajo presentamos los resultados encontrados y discutimos su relevancia.

# Ciencias planetarias: Pósteres



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## Efectos de colisiones craterizantes en pequeños asteroides

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Los asteroides pequeños (<10 km) sufrieron colisiones frecuentes por parte de cuerpos todavía más pequeños a lo largo de su historia colisional. Se suele aceptar que estas colisiones den lugar a cráteres de tamaños proporcionales a los cuerpos que los producen. Sin embargo, hay una serie de cuestiones poco claras acerca de la morfología de los cráteres producidos por pequeños proyectiles. ¿Hay pérdida neta de masa en el caso de asteroides con muy baja gravedad?, ¿Cuánta masa se erosiona en ese caso? , ¿Este efecto acumulativo podría ser responsable de alguna de las características observadas por las sondas espaciales?, ¿La falta de cráteres pequeños en asteroides como Itokawa está relacionada con el comportamiento de la masa eyectada tras las colisiones? Intentamos buscar respuestas a estas preguntas por medio de simulaciones numéricas utilizando el código de N-cuerpos PKDGRAV. Presentamos resultados iniciales de colisiones a velocidades hasta 1 km/s sobre superficies con estructura granular, resaltando la fracción de masa perdida en la colisión y el incremento consiguiente en la cantidad de movimiento final del cuerpo. Este último aspecto tiene interesantes aplicaciones en la desviación de futuros potenciales NEAs con probabilidades elevadas de colisión con la Tierra.

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## Seguimiento de la circulación general de la atmósfera de Júpiter con imágenes obtenidas por pequeños telescopios

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Uno de los rasgos más característicos de la atmósfera del planeta Júpiter es su estructura global de de vientos caracterizada por la existencia de vientos zonales intensos alternantes en latitud y vinculada a las zonas brillantes y bandas oscuras del planeta. Este sistema de vientos presenta una marcada estabilidad temporal, si bien la estructura de algunas de sus bandas cambia fuertemente de manera cuasi-periódica. El sistema de vientos se muestra también estable frente a perturbaciones dinámicas como el desarrollo de grandes tormentas convectivas o los impactos de los años 1994 y 2009. En la actualidad astrónomos aficionados de todo el planeta obtienen imágenes de Júpiter al límite de resolución de sus telescopios utilizando la técnica de “lucky imaging” y aportan sus imágenes a bases de datos que las centralizan. En este trabajo se analizan imágenes de la mayor calidad posible de la base de datos del International Outer Planet Watch (IOPW) con la finalidad de estudiar posibles variaciones temporales de pequeña escala en el perfil zonal de vientos del planeta. Para ello se utilizan pares de imágenes separados por una o dos rotaciones planetarias en la que los vientos pueden calcularse a partir del desplazamiento de los detalles nubosos presentes en ambas imágenes. Para la medida de estos desplazamientos se utiliza tanto una técnica de correlación de imágenes como el seguimiento manual de detalles nubosos en varias imágenes. Aunque este tipo de estudios se habían realizado anteriormente con imágenes de alta calidad procedentes de misiones espaciales o el telescopio espacial Hubble la posibilidad de estudiar la circulación general del planeta con imágenes obtenidas con pequeños telescopios abre una nueva vía al estudio continuado de la dinámica atmosférica de Júpiter debido a la gran cobertura temporal de las mismas.

### Observaciones submilimétricas del cometa C/2004 Q2 (Machholz)

Miguel de Val-Borro (Max Planck Institute for Solar System Research), P. Hartogh, C. Jarchow, M. Rengel, G. L. Villanueva, M. Küppers, N. Biver, D. Bockelée-Morvan, J. Crovisier

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Las líneas de emisión de varias moléculas en el cometa C/2004 Q2 (Machholz) se observaron en Enero de 2005 a una distancia heliocéntrica de 1.2 AU por medio de observaciones de alta resolución con el Heinrich Hertz Submillimeter Telescope (HHSMT) en el Arizona Radio Observatory (ARO). Hemos obtenido las tasas de producción de varias moléculas volátiles (CH<sub>3</sub>OH, HCN, H<sup>13</sup>CN, HNC, H<sub>2</sub>CO, CO y CS) comparando las intensidades observadas con simulaciones de las líneas de emisión. Los perfiles sintéticos se calculan usando un código de transporte radiativo que incluye colisiones entre las moléculas y electrones y los efectos de la excitación de los niveles vibracionales fundamentales por la radiación solar infrarroja. Las razones de abundancia calculadas con respecto al ácido cianhídrico son CO/CH<sub>3</sub>OH/H<sub>2</sub>CO/CS/HNC/H<sup>13</sup>CN/HCN = 29.5/9.5/2.0/0.55/0.036/0.015/1. Estos valores son comparables con los observados en cometas de la familia de Júpiter, lo cual sugiere que C/2004 Q2 (Machholz) ha tenido una historia térmica similar.

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### Morfología y dinámica del Vórtice Polar Sur de Venus mediante observaciones de VIRTIS a bordo de la nave Venus Express

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El canal infrarrojo del instrumento VIRTIS-M a bordo de la nave Venus Express de la ESA obtiene imágenes del hemisferio sur de Venus en múltiples longitudes de onda y de resolución espacial relativamente alta (15-30 km/pix en las latitudes subpolares). En este trabajo presentamos un estudio de la variable morfología del Vórtice Polar Sur en dos niveles de altura, correspondientes a la nube inferior y a la nube superior, y un estudio dinámico basado en las medidas del campo de viento en el vórtice obtenidas mediante seguimiento de nubes en un amplio conjunto de imágenes. Presentamos resultados obtenidos en imágenes del lado nocturno en el infrarrojo cercano (1.74 micras), sensible a la nube inferior (~45 km), y en imágenes del infrarrojo térmico (3 – 5 μ), sensible a la nube superior (~65 km) tanto en el lado nocturno como en el diurno del planeta. Tenemos un total de 7080 trazadores para la nube inferior y 5160 para la superior, que fueron obtenidos con un algoritmo de correlación de imágenes supervisado por un operador con diferentes herramientas de visualización. El análisis de estas medidas muestra que apenas existe cizalla vertical del viento en la atmósfera polar o en el propio vórtice. También analizamos las escalas de tiempo asociadas a diferentes morfologías del vórtice, que incluyen la estructura dipolar y formas más irregulares, con transiciones entre las diferentes morfologías. Exploramos las diferentes dinámicas asociadas a la variable morfología del vórtice mostrando mapas de vorticidad local y comparaciones con las morfologías del vórtice.

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## Modelos numéricos de la GWS de Saturno de 2010

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El 5 de diciembre de 2010, una tormenta de origen convectivo se produjo en el hemisferio norte de Saturno a unos 37°N. En los meses siguientes, la tormenta se convirtió en una perturbación a escala planetaria que alteró la morfología de la región comprendida entre los 25°N y 45°N e interactuó dinámicamente con los vientos zonales del planeta en ese intervalo de latitudes. Dada la abundancia de las sustancias condensables en la troposfera de Saturno, es razonable suponer que la principal especie química responsable de la liberación de energía suficiente para disparar una actividad convectiva tan vigorosa es el agua a ~10 bares de profundidad. Hemos usado el modelo de circulación global, EPIC para explorar la estructura vertical de la atmósfera de Saturno entre los 10 bares y la baja estratosfera usando como indicador la tormenta. EPIC es un modelo numérico que resuelve las ecuaciones de Navier-Stokes para un fluido en rotación con geometría esférica. El modelo supone que globalmente la atmósfera se encuentra en equilibrio hidrostático y que los movimientos son adiabáticos. En las simulaciones los parámetros libres son la potencia por unidad de área del flujo de energía inyectado en la atmósfera por la tormenta, la cizalla vertical del viento, la estructura térmica vertical, la latitud a la que se produce la tormenta y la variación vertical de la deposición de energía. Nuestros resultados son capaces de reproducir con precisión la evolución dinámica de los aspectos generales de la tormenta. Las simulaciones nos indican que la alta troposfera de Saturno está débilmente estratificada por debajo de la tropopausa y que los vientos zonales deben crecer hacia niveles de presión más elevados hasta los 10 bares.

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## Optimizing exoplanet searches

Enrique Herrero Casas (Institut de Ciències de l'Espai (CSIC-IEEC)), Ignasi Ribas, Carme Jordi  
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Exoplanet searches using the transit technique are providing new findings at a fast pace. Most exoplanet transit detection programs that are currently underway are focused on large catalogs of stars with no pre-selection. This necessarily makes such surveys quite inefficient, because large amounts of data are processed for a relatively low transiting planet yield.

In this work we investigate a method to increase the efficiency of a targeted exoplanet search with the transit technique by preselecting a subset of candidates from large catalogs of stars. Assuming spin-orbit alignment, this can be done by considering stars that have higher probability to be oriented nearly equator-on (inclination close to 90°).

We use activity-rotation velocity relations for low-mass stars to study the dependence of the position in the activity-vsini diagram on the stellar axis inclination. We compose a catalog of G-, K-, and M-type main sequence simulated stars using isochrones, an isotropic inclination distribution and empirical relations to obtain their rotation periods and activity indexes. Then the activity-vsini diagram is filled and statistics are applied to trace the areas containing the higher ratio of stars with inclinations above 80°. A similar statistics is applied to stars from real catalogs with  $\log(R'_{HK})$  and vsini data to find their probability of being equator-on.

We present the method used to generate the simulated star catalog and the subsequent statistics to find the highly inclined stars from real catalogs using the activity-vsini diagram. Several catalogs from the literature are analysed and a subsample of stars with the highest probability of being equator-on is presented.

Assuming spin-orbit alignment, the efficiency of an exoplanet transit search in the resulting subsample of probably highly inclined stars is estimated to be two to three times higher than with a global search considering no pre-selection.

## **Primeros Resultados Científicos de la Estación de Videodetección de Bólidos y Meteoros de la UCM**

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Se presentan los resultados científicos de la Estación de Videodetección de Bólidos y Meteoros de la UCM obtenidos durante el año 2011. Destaca la campaña observacional del estallido de las Dracónidas 2011 con el apoyo una estación móvil y el lanzamiento de un globo estratosférico. A esta campaña se une la explotación de los datos de todo el año dentro de la colaboración de la Red Española sobre Bólidos y Meteoritos (SPMN). Además del esfuerzo realizado en la divulgación de este campo y de los resultados obtenidos, el proyecto se ha abierto aún más a la sociedad con estudiantes de Licenciatura y Grado en Física de la UCM que han participado en la reducción y análisis de los datos, a través de Trabajos Académicamente Dirigidos y diversas colaboraciones.

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## **Fotometría planetaria desde un observatorio docente**

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Las imágenes de los planetas, en particular de los planetas gigantes, que se obtienen desde telescopios con aberturas modestas se han convertido en una valiosa fuente de información para los astrónomos profesionales. Más allá de la obtención de imágenes muy detalladas, que permiten realizar medidas dinámicas, es posible también desarrollar una metodología relativamente sencilla de calibración fotométrica de las imágenes por referencia a observaciones profesionales. Esto permite el análisis en términos de un modelo atmosférico analítico como el que presentamos aquí. En este trabajo mostramos, en forma de actividad práctica orientada a alumnos de grado o similares, el procedimiento para obtener imágenes utilizables de Júpiter y Saturno y, a partir de ellas, información sobre el espectro y ubicación en altura de las nubes principales de estos planetas. Todas las imágenes aquí presentadas han sido tomadas con el telescopio de 20" del Observatorio Astronómico del Aula EspaZio Gela en el contexto del Proyecto Fin de Máster perteneciente al Máster en Ciencia y Tecnología Espacial UPV/EHU.

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## **The Dust Environment of Comet 81P**

Francisco José Pozuelos Romero (Instituto de Astrofísica de Andalucía-CSIC), Dr. Fernando Moreno Danvila

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Estudio del polvo ambiental en el cometa 81P/Wild 2 durante su último paso post-perihelio. Dentro del marco del desarrollo de códigos para la obtención de las propiedades del polvo cometario, cuyo principal objetivo es la misión Roseta, en la cual el Instituto de Astrofísica de Andalucía está involucrado.

# Física Solar: Orales



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**SESIÓN S1, MARTES DE 15:30 A 17:20** (Moderador: Javier Trujillo)

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15:30–16:00	I	Luis Bellot Rubio	High-speed flows in the solar photosphere as observed by Hinode and SUNRISE
16:00–16:20	C	Vicente Domingo Codoñer	Pequeños Elementos Magnéticos Brillantes e Irradiancia Solar Total
16:20–16:40	C	Carlos Cristo Quintero Noda	Photospheric jets description using SUNRISE/IMaX and HINODE/SP data
16:40–17:00	C	Milan Gosic	Flux budget of a supergranular cell
17:00–17:20	C	Lotfi Yelles Chaouche	Power and velocity spectra of the photospheric surface flows

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**SESIÓN S2, MARTES DE 17:50 A 19:30** (Moderador: Marian Martínez González)

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17:50–18:20	I	Javier Rodríguez Pacheco	EPD: el detector de partículas energéticas de Solar Orbiter
18:20–18:40	C	Judith Palacios Hernández	Fuentes solares de los sucesos geoeffectivos en Septiembre de 2011
18:40–19:10	I	Nazaret Bello González	New Insights on Sunspots from Spectro-polarimetric Observations
19:10–19:30	C	Sara Esteban Pozuelo	Velocidades Doppler en twisting motions de filamentos penumbrales

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**SESIÓN S3, JUEVES DE 15:30 A 17:25** (Moderador: José Carlos del Toro)

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15:30–16:00	I	Jaume Terradas	MHD Waves in Coronal Structures: Observations & Modelling
16:00–16:20	C	Antonio Jesús Díaz Medina	KH and RT instabilities in partially ionized plasmas
16:20–16:40	C	Roberto Soler	Ondas de Alfvén resonantes en plasmas parcialmente ionizados de la atmósfera solar
16:40–17:00	C	José Luis Ballester Mortes	Thermal Instabilities in prominence plasmas
17:00–17:20	C	David Orozco Suárez	Determinación de las propiedades magnéticas de protuberancias mediante los efectos Hanle y Zeeman
17:20–17:25	P	Sesión de pósteres	Coordina Javier Trujillo

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**SESIÓN S4, JUEVES DE 17:50 A 19:30** (Moderador: Nazaret Bello)

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17:50–18:20	I	Pere L. Pallé	Secular measurements of the solar gravitational redshift
18:20–18:50	I	Marian Martínez González	"Zeeman Doppler Imaging" el magnetismo estelar
18:50–19:10	C	Edgar S. Carlin Ramírez	Scattering polarization in the Ca II Infrared Triplet with Velocity Gradients
19:10–19:30	C	Andrés Asensio Ramos	Model selection and signal detection. A Bayesian perspective

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I = Conferencia Invitada, C = Contribución Oral



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## Sesión S1 (martes 10, 15:30-17:20)

Aula 1.1

### High-speed flows in the solar photosphere as observed by Hinode and SUNRISE

*[Conferencia Invitada]*

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Except in sunspot penumbrae, very few instances of high-speed photospheric flows were known a few years ago. The situation has changed dramatically thanks to the extremely high spatial resolution measurements provided by Hinode, SUNRISE, and the Swedish 1-m Solar Telescope. Using these data, supersonic flows have been discovered both in the quiet Sun and in active regions, in places where they were completely unexpected. Most of them are directed downward, but there are also cases of upward and horizontal motions. Quiescent, relatively stable structures that harbor supersonic flows include granular cells, small-scale flux tubes undergoing convective collapse, pores, light bridges, and sunspot penumbrae (at all radial distances). An overview of these flows will be given, emphasizing their properties and effects on higher atmospheric layers.

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### Pequeños Elementos Magnéticos Brillantes e Irradiancia Solar Total

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La irradiancia solar y sus variaciones y consecuencias permanecen como uno de los temas más importantes en el estudio del Sol, tanto refiriéndonos a cambios temporales rápidos como a las variaciones de muy largo periodo histórico.

Las contribuciones a la irradiancia por parte de pequeños elementos magnéticos brillantes empiezan a ser analizadas ahora más en profundidad, gracias a que las nuevas técnicas observacionales y de post-procesado permiten diferenciarlos mejor.

Aplicar generalizaciones de la contribución de estos elementos al Sol global parece una simplificación excesiva, a la vista de la variación de su presencia en diferentes latitudes y momentos del ciclo solar. Estudios sobre estas variaciones se consideran importantes para afinar más la influencia de los pequeños elementos magnéticos.

Mediante análisis, realizados a partir de datos observacionales obtenidos por instrumentos abordo Hinode y SoHO y de telescopio Solar Sueco (SST) en La Palma usando técnicas punteras, determinamos la influencia que los pequeños elementos brillantes en distintas latitudes del Sol pueden contribuir a las variaciones de la irradiancia a lo largo del ciclo solar.

## Photospheric jets description using SUNRISE/IMaX and HINODE/SP data

Carlos Cristo Quintero Noda (IAC), Valentín Martínez Pillet  
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Strong flows (likely to be supersonic) present in the Quiet Sun have been recently discovered by SUNRISE/IMaX. The amount of information about them is not enough yet to establish an scenario for their formation and evolution. The aim of this work is to understand the mechanism of formation of these events. We aim to understand how they appear, their relation with the surrounding fields: linear polarization, distance to mixed polarity regions, location in continuum maps and the shape of the highly Doppler shifted profiles.

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## Flux budget of a supergranular cell

Milan Goscic (IAA), L. Bellot Rubio, D. Orozco Suarez, Y. Katsukawa  
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To understand the formation of small-scale magnetic fields in the quiet Sun and their contribution to the solar activity, it is essential to investigate the properties of internetwork magnetic fields. Using Hinode/NFI line-of-sight magnetograms of very high sensitivity ( $7 \text{ Mx/cm}^2$ ), spatial resolution ( $0.16 \text{ arcsec/pixel}$ ), and cadence ( $90 \text{ s}$ ), we follow the evolution of magnetic elements inside of a supergranular cell located at disk center. In 5 hours of continuous measurements covering an area of  $20.8 \times 23.2 \text{ arcsec}^2$ , we manually track 2415 magnetic elements from appearance to disappearance and derive their physical properties. The median values of the magnetic flux, effective diameter, lifetime, and horizontal velocity are  $3 \times 10^{17} \text{ Mx}$ ,  $0.48 \text{ Mm}$ ,  $5.5 \text{ min}$ , and  $1.7 \text{ km/s}$ , respectively. We also investigate how the physical parameters of the individual elements vary as a function of time, flux, and spatial position. Using this unique data set, we determine with unprecedented accuracy the flux emergence and disappearance rate in the solar internetwork.

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## Power and velocity spectra of the photospheric surface flows

Lotfi Yelles Chaouche (IAC), F. Moreno-Insertis  
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We study the power and velocity spectra of the solar photospheric convective flows. The approach we use includes observations and simulations. The observational data is taken from IMaX time series onboard SUNRISE. The simulated 3D MHD photospheric flow is computed for 3 different cases implementing an average vertical magnetic field of  $0\text{G}$ ,  $50\text{G}$  and  $100\text{G}$  respectively. In order to reproduce observational conditions, we compute Stokes profiles outgoing from the MHD cubes, then smear these profiles spatially and spectrally using an appropriate PSF to match the observational conditions. The vertical velocity is calculated through the Doppler shift of the Stokes-I profiles, while the horizontal velocity is obtained through Local correlation tracking (LCT) applied to the continuum intensity images. The power and velocity spectra of observed and simulated surface flows are obtained using the usual Fourier analysis. These spectra are a powerful tool to explore how the energy is deposited through a large range of length scales varying from sub-granular to meso-granular ones. The first results indicate a compatibility between the observed and simulated spectra. The simulated convective energy is deposited at the granular scale and redistributed over smaller scales in a similar manner to the observed one implying that the simulations are properly handling the diffusive and viscous processes responsible for the solar turbulent cascading.

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## Sesión S2 (martes 10, 17:50-19:30)

Aula 1.1

### EPD: el detector de partículas energéticas de Solar Orbiter

*[Conferencia Invitada]*

Javier Rodríguez Pacheco (Universidad de Alcalá de Henares)

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Solar Orbiter será la primera misión del programa Cosmic Vision de la ESA en ser lanzada. Su instrumentación científica puede dividirse en dos grandes grupos: instrumentos de teledetección e instrumentos de medidas *in situ*. Dentro de esta última categoría, EPD será el encargado de proporcionar datos sobre las partículas energéticas solares (PES).

Esta conferencia comenzará con una breve presentación de las PES, su origen, aceleración, inyección y transporte en el medio interplanetario y las grandes preguntas que, tras cuarenta años de investigación espacial, siguen en busca de una respuesta definitiva.

A continuación se hará una breve introducción a los detectores de partículas energéticas y sus principios básicos de funcionamiento, para posteriormente presentar al instrumento Energetic Particle Detector (EPD), describiendo brevemente los cinco diferentes sensores que lo componen.

Por último finalizaremos la conferencia presentando someramente la misión Solar Orbiter y sus grandes retos, tanto científicos como tecnológicos.

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### Fuentes solares de los sucesos geoefectivos en Septiembre de 2011

Judith Palacios Hernández (Universidad de Alcalá), Antonio Guerrero, Consuelo Cid, Elena Saiz, Yolanda Cerrato

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A la luz de los sucesos geoefectivos del 8 al 20 de Septiembre de 2011, con la ayuda de datos de medio interplanetario, se han analizado las posibles causas solares de estos sucesos, donde las CME (eyecciones de masa coronal) y los CH (agujeros coronales) juegan un papel fundamental. Las propiedades de estos agujeros coronales, como el área y el campo magnético, se estudian a través de imágenes de SDO, tanto en AIA 193A como en magnetogramas longitudinales de HMI. Las regiones activas donde se originan las CMEs también se analizan a través de datos de AIA y LASCO.

## New Insights on Sunspots from Spectro-polarimetric Observations

*[Conferencia Invitada]*

Nazaret Bello González (University of Freiburg)

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The generation, evolution, and dissipation of cosmic magnetic fields remains to be a fundamental problem in astrophysics. The Sun, as the closest star that can be resolved on a small spatial scale, offers the unique opportunity to gain understanding on the magnetic field generated in the solar interior and its transport from the convection zone into the photosphere, the chromosphere, and the corona. These processes severely challenge our understanding of solar magneto-hydrodynamics. Especially the emergence of magnetic flux into the solar photosphere. How this flux reorganizes to form the magnetic phenomena of active regions like sunspots and pores? What is the crucial ingredient that initiates the transformation from a pore into a sunspot? Where does the magnetic flux that is needed to form a penumbra come from? What is the role of the observed dynamics in the formation of sunspots? We will address these and other questions to give new insights on the nature of sunspots as seen from spectro-polarimetric observations.

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## Velocidades Doppler en twisting motions de filamentos penumbrales

Sara Esteban Pozuelo (IAA), Luis Ramón Bellot Rubio

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Los twisting motions son movimientos aparentes laterales a lo largo de los filamentos penumbrales que se observan como fluctuaciones de intensidad (Ichimoto et al., 2007; Zakharov et al., 2008; Bharti et al., 2010). El objetivo de este trabajo es la detección de velocidades Doppler en twisting motions de filamentos penumbrales fotosféricos situados en regiones perpendiculares a la línea de simetría de la mancha. Para ello, se han utilizado datos espectropolarimétricos de alta resolución de una mancha solar alejada del centro del disco obtenidos mediante el instrumento CRISP del SST. El método consiste en la visualización conjunta de series temporales de imágenes del continuo y de mapas de velocidad Doppler a lo largo de la línea de visión a diferentes profundidades. Estos dopplergramas han sido generados mediante el análisis de los bisectores de la línea de Fe I 630 nm. Finalmente, se dará una interpretación de los movimientos detectados y su evolución temporal.

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**Sesión S3 (jueves 12, 15:30-17:25)****Aula 1.1****MHD Waves in Coronal Structures: Observations & Modelling***[Conferencia Invitada]*

Jaume Terradas (Universitat de les Illes Balears)

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A review of MHD waves in the solar corona over the last three decades is presented, covering both observations and theoretical aspects. Observations indicate that waves are ubiquitous in many coronal structures, being transverse kink waves in coronal loops the most clear example. Theoretical models have been developed to explain these waves in terms of magnetohydrodynamic (MHD) modes. The models have evolved from simple idealised systems to complex configurations. In this review we show how the comparison between observations and theory has allowed the growth of coronal seismology as a tool to probe the plasma conditions in the solar corona.

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**KH and RT instabilities in partially ionized plasmas**

Antonio Jesús Díaz Medina (IAC), Roberto Soler, Jose L. Ballester

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We study the modifications of the classical criteria for the Kelvin-Helmholtz and Rayleigh-Taylor instabilities in a partially ionized plasma in the two-fluid description. The plasma is composed of a neutral fluid and an electron-ion fluid, coupled by means of particle collisions. Our results show that the presence of neutrals modifies the linear growth rate. This is specially relevant for the parameters in the range appropriate for solar prominences.

## Ondas de Alfvén resonantes en plasmas parcialmente ionizados de la atmósfera solar

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Recientes observaciones han mostrado la ubicua presencia de ondas Alfvénicas propagándose en la atmósfera solar. Absorción resonante, causada por la no homogeneidad del plasma en la dirección perpendicular al campo magnético, es un mecanismo eficiente para la atenuación de ondas de Alfvén. En plasmas coronales totalmente ionizados, la longitud de atenuación por absorción resonante es inversamente proporcional a la frecuencia de la onda. Este resultado es consistente con las observaciones de ondas atenuadas en la corona solar. Sin embargo, también se observan ondas Alfvénicas propagándose en espículas cromosféricas, donde el plasma está parcialmente ionizado debido a la relativamente baja temperatura de la cromosfera. Este hecho hace que nos preguntemos si la longitud de atenuación de ondas de Alfvén resonantes sigue siendo inversamente proporcional a la frecuencia cuando el plasma está parcialmente ionizado o, por lo contrario, esta dependencia se ve modificada debido al efecto de las colisiones entre iones y neutros. En este trabajo realizamos un estudio teórico sobre la atenuación espacial de ondas de Alfvén resonantes en tubos de flujo magnético parcialmente ionizados. Encontramos que la contribución de la absorción resonante a la longitud de atenuación es inversamente proporcional a la frecuencia, como en el caso totalmente ionizado, mientras que la contribución de las colisiones entre iones y neutros es inversamente proporcional al cuadrado de la frecuencia. El efecto de la absorción resonante domina para frecuencias típicas observadas. Finalmente, discutimos las implicaciones de nuestros resultados sobre el papel de la cromosfera como un filtro pasa-bajas para ondas Alfvénicas que pueden alcanzar la corona.

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## Thermal Instabilities in prominence plasmas

José Luis Ballester Mortes (Universitat Illes Balears), R. Soler, M. Goossens, S. Parenti

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Prominences plasmas are often considered as fully ionized plasmas. However, at least the cool plasma usually observed in  $H\alpha$  is partially ionized. Here, we will present recent research on thermal instabilities in fully and partially ionized prominence plasmas

## Determinación de las propiedades magnéticas de protuberancias mediante los efectos Hanle y Zeeman

David Orozco Suárez (IAC), A. Asensio Ramos, J. Trujillo Bueno

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En esta contribución mostramos (a) nuevas observaciones espectropolarimétricas de protuberancias solares asociadas a regiones en calma y (b) su interpretación mediante un eficiente código de inversión de los perfiles de Stokes producidos por la polarización de los niveles atómicos y la acción conjunta de los efectos Hanle y Zeeman. Las observaciones se tomaron con el Tenerife Infrared Polarimeter en el multiplete del Helio neutro a 1083.0 nm y usando el sistema de óptica adaptativa del “Vacuum Tower Telescope” (Observatorio del Teide), lo que nos ha permitido obtener tanto series temporales a distancias fijas del limbo solar como mapas de los perfiles de Stokes en amplios campos de visión que incluyen espículas y protuberancias. La aplicación del código de inversión nos ha permitido obtener mapas de las propiedades magnéticas y dinámicas, así como algo de información sobre la estructura térmica y de densidad del plasma. Las señales de polarización circular producidas por el efecto Zeeman y los perfiles de polarización lineal dominados por la polarización de los niveles atómicos y su modificación por el efecto Hanle nos ayudan a determinar, no solo la orientación del campo, sino también su módulo. Finalmente discutimos los posibles modelos compatibles con la configuración magnética obtenida de los perfiles de Stokes del Helio neutro y discutimos la información adicional que obtenemos a partir de imágenes proporcionadas por el telescopio espacial SDO en el EUV.

**Sesión S4 (jueves 12, 17:50-19:30)**

Aula 1.1

**Secular measurements of the solar gravitational redshift***[Conferencia Invitada]*

Pere L. Pallé (IAC)

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The solar spectrophotometer “Mark-I”, located at the Observatorio del Teide and continuously operated for the last 36 years, provides a high precision measurement of the radial velocity of the Sun-as-a-star which has enabled the study of the small velocity fluctuations produced by normal modes solar oscillations and the characterization of its spectrum. Furthermore, because of its high sensitivity and long term instrumental stability also provides a daily accurate determination (few parts in  $10^3$ ) of the velocity offset: mainly the so-called “solar gravitational red-shift”. In the present work, first results of the analysis of this parameter over the period 1976-2011 are presented.

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**“Zeeman Doppler Imaging” y el magnetismo estelar***[Conferencia Invitada]*

Marian Martínez González (IAC)

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Los campos magnéticos juegan un papel fundamental en la estructura y evolución estelar a lo largo de todo el diagrama Hertzsprung-Russell (HR). Pero no solamente son importantes para la misma estrella, también pueden afectar a su entorno, es decir, a los posibles planetas que la orbiten.

Aún siendo tan importantes, generalmente, es complicado detectar su presencia y aún más obtener una medida fiable de su intensidad y de su topología. La única forma precisa de obtener estas medidas es utilizando técnicas polarimétricas y, más concretamente, estudiando la polarización en líneas espectrales. El problema de la polarización es que los parámetros que la caracterizan (los parámetros de Stokes) tienen signo; pueden ser positivos o negativos y, en principio, la contribución total en objetos no resueltos como las estrellas da lugar a señales muy débiles debidas a cancelaciones.

Esto puede sobrellevarse si tenemos en cuenta que las estrellas rotan (y muchas, muy rápido). El efecto Doppler debido a la rotación estelar rompe la simetría y evita estas cancelaciones, haciendo que las señales (aunque débiles) sean detectables con los instrumentos modernos. Esta idea es lo que se denomina ‘Zeeman Doppler Imaging’, es decir, el efecto Doppler hace visibles las señales de polarización. Esto ha permitido conocer qué tipo de campos magnéticos habitan en muchas estrellas a lo largo del diagrama HR. Además, en el caso de rotores rápidos (principalmente estrellas de tipo tardío) y usando observaciones a lo largo de la rotación de la estrella (tomografía) se ha podido conocer en detalle la estructura superficial de estrellas cercanas al Sol. En esta charla, se presentará la técnica de ‘Zeeman Doppler Imaging’ y se hará un breve resumen de como ésta ha permitido consolidar el campo del magnetismo estelar.

## Scattering polarization in the Ca II Infrared Triplet with Velocity Gradients

Edgar S. Carlin Ramírez (IAC), Manso Sainz R., Asensio A., Trujillo Bueno J.

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Magnetic field topology, thermal structure and plasma motions are the three main factors affecting the polarization signals used to understand our star. In this theoretical investigation, we focus on the effect that gradients in the macroscopic vertical velocity field have on the non-magnetic scattering polarization signals, establishing the basis for general cases. We demonstrate that the solar plasma velocity gradients have a significant effect on the linear polarization produced by scattering in chromospheric spectral lines. In particular, we show the impact of velocity gradients on the anisotropy of the radiation field and on the ensuing fractional alignment of the Ca ii levels, and how they can lead to an enhancement of the zero-field linear polarization signals. This investigation remarks the importance of knowing the dynamical state of the solar atmosphere in order to correctly interpret spectropolarimetric measurements, which is important, among other things, for establishing a suitable zero field reference case to infer magnetic fields via the Hanle effect.

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## Model selection and signal detection. A Bayesian perspective

Andrés Asensio Ramos (IAC)

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Inferring the physical properties of a plasma typically depends on the physical model proposed to explain the observables. I will discuss how the Bayesian formalism allows us to choose the most plausible model. I will also show how the same scheme can be applied to the reliable detection of spectroscopic and/or spectropolarimetric signals buried in the noise.



# Física Solar: Pósteres



## SOPHISM, SO/PHI Software Simulator

Julián Blanco Rodríguez (GACE/UV), Valentín Martínez Pillet, SO/PHI Team

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PHI, Polarimetric and Helioseismic Imager, es un instrumento para observación solar que irá a bordo de la misión Solar Orbiter (ESA/NASA), prevista para el 2017. Esta misión orbitará alrededor del Sol, acercándose hasta 0.28 UA, en un plano fuera de la eclíptica, permitiendo una mejor observación de las altas latitudes solares.

SO/PHI es un instrumento que está siendo desarrollado por un consorcio internacional (Alemania, Francia, EEUU, Suecia, Australia,..), con amplia participación española (INTA, IAC, IAA/CSIC, GACE/UV, UPM, UB). Es un instrumento complejo, compuesto de dos telescopios (High Resolution Telescope y Full Disk Telescope), para observaciones espectropolarimétricas en la línea de hierro de 6173 Angstroms basado en el uso de un etalón Fabry-Pérot en montura telecéntrica y cristales líquidos.

A consecuencia de la complejidad del instrumento y de la misión, que atravesará una gran variedad de distancias y soportará amplios gradientes térmicos, se está desarrollando paralelamente al instrumento un simulador en software del mismo, SOPHISM.

El simulador reproduce, partiendo de simulaciones MHD como datos de entrada, todos los efectos del instrumento, incluyendo difracción, curvas espectrales del prefiltro y etalón, modulación y demodulación polarimétrica, detectores, etc.

Desviaciones frente al comportamiento nominal del instrumento como polarización instrumental debida a efectos térmicos, aberraciones, etc. están también incluidas con diferentes grados de realismo.

En este trabajo se presentan algunos ejemplos de dichas desviaciones, en el apuntado/vibración del satélite y en el comportamiento de los cristales líquidos, y sus efectos en los parámetros de Stokes obtenidos.

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## Evolución magnética de fáculas observadas con IMAx

Julián Blanco Rodríguez (GACE/UV), Judith Palacios Hernández, Iballa Cabello García, Vicente Domingo Codoñer, SUNRISE Team

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La misión SUNRISE, consistente en un telescopio de 1 metro de diámetro montado en un globo estratosférico, fue lanzada en Junio del 2009 por encima del círculo polar ártico. La altura de vuelo del globo, de aproximadamente 36 km, permitió estar por encima de la mayor parte de la atmósfera, posibilitando observaciones de gran calidad con el instrumento IMAx y, además, el estudio de líneas espectrales en el ultravioleta con el instrumento SUFI. Su recorrido circumpolar en el verano ártico, permitió a su vez una observación continua del Sol sin ciclos día-noche.

El instrumento IMAx/SUNRISE es un espectropolarímetro, desarrollado por un consorcio de instituciones españolas, basado en el uso de un etalon Fabry-Pérot y de cristales líquidos para el análisis polarimétrico. La línea espectral elegida fue la de hierro a 5250.2 Angstroms, obteniendo el vector de Stokes completo con una cadencia temporal alrededor de 30 s y una resolución espacial de aproximadamente 0.15-0.18 segundos de arco.

La calidad de los datos, así como la información magnética obtenida de los parámetros de Stokes y la rápida cadencia temporal, han sido usados en este trabajo para estudiar elementos magnéticos próximos al limbo solar, concretamente, fáculas del limbo. Gracias a la evolución temporal obtenida, se pueden observar emergencias y cancelaciones de campo en los entornos de la concentración magnética de la fácula en sí, dando lugar a un paisaje de rápida reconfiguración del campo. Se estudian las características de los campos de diferentes fáculas así como sus alrededores, analizando este fenómeno. Junto con ello, se observa la influencia en capas solares superiores gracias a datos de SUFI.

## Estudio de pequeñas estructuras magnéticas de la fotosfera solar

Iballa Beatriz Cabello García (IPL-Universidad de Valencia)

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El estudio de pequeñas estructuras magnéticas de la fotosfera solar resulta de enorme importancia para la comprensión del comportamiento global del Sol. Las pequeñas escalas espaciales y temporales en las que se desarrollan algunas de estas estructuras hacen indispensable el uso de imágenes de muy alta resolución para su estudio. Para la obtención de estas imágenes, aparte de instrumentación avanzada, se han desarrollado sofisticadas técnicas computacionales que compensan la degradación atmosférica y las aberraciones del telescopio, mejorando así la resolución espacial.

En este trabajo se presentan imágenes en G-band obtenidas con el Swedish Solar Telescope y restauradas mediante una de dichas técnicas computacionales de post-procesado, llamada Multi-Frame Blind Deconvolution, en la que se combinan múltiples imágenes adquiridas en un corto intervalo de tiempo. Las imágenes resultantes poseen una resolución próxima al límite de difracción del telescopio ( $0.1''$ ), y permiten el estudio de propiedades asociadas a pequeñas estructuras brillantes presentes en la fotosfera solar, conocidas como Bright Points. El estudio de estas propiedades se realiza a partir de medidas de intensidad.

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## Magneto-acoustic wave coupling through the photosphere to the corona

Irantzu Calvo Santamaría (Instituto de Astrofísica de Canarias), Elena Khomenko, Paul Cally y Manuel Collados Vera

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Magneto-acoustic and Alfvénic waves are ubiquitous in solar coronal loops, possibly being excited by photospheric motions. It is not clear, though, how these waves get so high, having obstacles such as the acoustic cut-off frequency, reflection and refraction of fast MHD waves and also the strongly reflecting transition region. In this contribution we report on 2D numerical modelling of waves in magnetic arcade structures extending from photospheric layers through the transition region to the corona. Waves in the arcade are excited by sub-photospheric p-modes. We discuss the behaviour of waves, their conversion and propagation properties and possible mechanisms allowing their escape through the transition region.

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## Scattering Polarization in the Ca II Infrared Triplet using HD Models of the Solar Atmosphere

Edgar S. Carlin Ramírez (Instituto de Astrofísica de Canarias), Asensio A., Trujillo Bueno J.

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We present the results of calculating the temporal evolution of the scattering polarization signals in the CaII IR triplet using HD models of the solar atmosphere. We compare with the static case and analyze the effects of the time-averaging, the velocity-free approximation and the micro-turbulent velocity of the solar plasma. The aim is to evaluate the possibility of characterizing the zero-field reference case for measuring the chromospheric magnetic field via the Hanle effect.

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## The Solar Physics Group of the IAA in numbers

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A summary will be presented of the history of the IAA's Solar Physics Group. The people, scientific and technical activities, the several milestones occurred so far, and the achievements will be reviewed.

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## Twist, Writhe, and Helicity in the Inner Penumbra of a Sunspot

Basilio Ruiz Cobo (IAC), Klaus G. Puschmann

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The aim of this work is the determination of the twist, writhe, and self-magnetic helicity of penumbral filaments located in an inner sunspot penumbra. For this purpose, we inverted data taken with the spectropolarimeter on board Hinode with the SIR (Stokes Inversion based on Response function) code. For the construction of a three-dimensional geometrical model we applied a genetic algorithm minimizing the divergence of  $\vec{B}$  and the net magnetohydrodynamic force, consequently a force-free solution would be reached if possible. We estimated two proxies to the magnetic helicity frequently used in literature: the force-free parameter  $\alpha$  and the current helicity term  $h_{c_z}$ . We show that both proxies are only qualitative indicators of the local twist as the magnetic field in the area under study significantly departs from a force-free configuration. The local twist shows significant values only at the borders of bright penumbral filaments with opposite signs on each side. These locations are precisely correlated to large electric currents. The average twist (and writhe) of penumbral structures is very small. The spines (dark filaments in the background) show a nearly zero writhe. The writhe per unit length of the intraspines diminishes with increasing length of the tube axes. Thus, the axes of tubes related to intraspines are less wrung when the tubes are more horizontal. As the writhe of the spines is very small, we can conclude that the writhe reaches only significant values when the tube includes the border of an intraspine.

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## “Veo el universo un poco más pequeño”

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aeronáuticas. O regresar a la tierra para desarrollar tecnologías y productos de concentración solar fotovoltaica, y tecnologías de defensa y seguridad. Incluso explorar lo más profundo del ser humano con nuestros avances en robótica médica, que amplían las posibilidades de la cirugía.



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# Instrumentación y Computación: Orales



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**SESIÓN I1, LUNES DE 15:30 A 17:20** (Moderador: M<sup>a</sup> Luisa García Vargas)

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09:00–09:30	I	José Carlos del Toro	The Polarimeter and Helioseismic Imager for Solar Orbiter
16:00–16:20	C	Jordi Cepa Nogué	OSIRIS/GTC: status and lessons learned
16:20–16:40	C	Armando Gil de Paz	MEGARA, the future IFU & MOS for GTC
16:40–17:00	C	Stephen Eikenberry	MIRADAS: The Next-Generation Infrared Spectrograph for GTC
17:00–17:20	C	Enrique Solano Márquez	Explotación científica de los archivos científicos de GTC y Calar Alto

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**SESIÓN I2, LUNES DE 17:50 A 19:30** (Moderador: Jordi Torra)

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17:50–18:10	C	Javier Castañeda Pons	Data processing and instrument calibration systems of Gaia
18:10–18:30	C	Claus Fabricius	Gaia Photometry
18:30–18:50	C	Juan de Dios Santander Vela	How the Virtual Observatory helped building the ALMA Science Archive
18:50–19:10	C	Rainer Schoedel	Holographic imaging: sharp images for everyone
19:10–19:30	C	Alejandro Sánchez de Miguel	ISS nocturnal images as a scientific tool against Light Pollution: Flux calibration and colors

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**SESIÓN I3, MARTES DE 9:00 A 11:00** (Moderador: Ignasi Ribas)

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09:00–09:20	C	José Luis Gálvez Sánchez	The WFM instrument of LOFT mission
09:20–09:40	C	Javier Cenarro	El Observatorio Astrofísico de Javalambre: Estado Actual y Desarrollos Futuros
09:40–10:00	C	Mercedes López Morales	The Exoplanet Characterization Observatory (EChO): the Next Tool to Study Exoplanet Atmospheres
10:00–10:20	C	Agustín Sánchez Lavega	PlanetCam: Una cámara para la observación planetaria usando la técnica “lucky imaging”
10:20–10:40	C	Pedro J. Amado González	CARMENES: A Radial-Velocity Survey for Terrestrial Planets in The Habitable Zones of M Dwarfs
10:40–11:00	C	David Barrado Navascués	HEXA: una máquina para cartografiados espectroscópicos

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**SESIÓN I4, MIÉRCOLES DE 9:00 A 11:00** (Moderador: Luis Bellot)

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15:30–16:00	I	Pedro Álvarez	El GTC. Presente y futuro
09:30–10:00	I	Manuel Collados	EST: the largest and most sensitive spectropolarimeter
10:00–10:20	C	Javier Trujillo Bueno	The Scientific Motivation of the Chromospheric Ly-alpha Spectropolarimeter
10:20–10:40	E	Gaizka Murga (IDOM)	IDOM, desarrollo de Proyectos de Astronomía (Enclosures, Telescopios e Instrumentación)
10:40–11:00	P	Sesión de pósteres	Coordina Miguel Ángel Aloy

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**SESIÓN I5, JUEVES DE 9:00 A 10:50** (Moderador: Ana Inés Gómez de Castro)

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09:00–09:30	I	Sergi Girona	HPC in Spain and Europe: BSC-RES-PRACE
09:30–09:50	C	Mauro López del Fresno	OMC automatic variable star classification
09:50–10:10	C	José Antonio Escartín Vigo	Smoothed Particle Hydrodynamics: Checking a tensor approach to calculating gradients in astrophysics
10:10–10:30	C	Miguel Santander-García	SHAPEMOL: el compañero de SHAPE en la era molecular de ALMA y HERSCHEL
10:30–10:50	E	Marisa García Vargas (FRACTAL)	Participación de FRACTAL en proyectos liderados por la Astronomía española

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**SESIÓN I6, VIERNES DE 9:00 A 11:00** (Moderador: Lourdes Verdes Montenegro)

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09:00–09:20	C	José Enrique Ruiz del Mazo	Ciencia digital: reproducibilidad y visibilidad en Astronomía
09:20–09:40	E		SENER
09:40–10:10	I	Juan de Dios Zornoza	The ANTARES neutrino telescope
10:10–10:40	I	Ana Inés Gómez de Castro	Estado del proyecto WSO-UV y del instrumento español ISIS en 2012
10:40–11:00	C	J. Ricardo Rizzo Caminos	Improvements to Host Country Radio Astronomy at Robledo: another antenna, a new receiver, a new backend

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I = Conferencia Invitada, C = Contribución Oral, E = Conferencia Corporativa

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## Sesión I1 (lunes 9, 15:30-17:20)

### Salón de Grados

### The polarimeter and helioseismic imager for solar orbiter

*[Conferencia Invitada]*

José Carlos del Toro (IAA-CSIC)

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The Polarimetric and Helioseismic Imager (SO/PHI) is the biggest and most demanding remote-sensing instrument of the ESA's Solar Orbiter mission to be launched in 2017. The mission is an ambitious effort for gathering solar information with both remote-sensing and in-situ instruments at the unprecedented distances of 0.29 AU and at 30° far from the ecliptic plane. The most salient scientific goals and the current state of the instrument design are summarized in this talk. It is a (differential) diffraction-limited imager with polarization and spectroscopic capabilities. Images are alternatively obtained through two telescopes, one providing a full solar disk image and another with a field of view of 8,4 arcmin and a spatial resolution of 1 arcsec (equivalent to 0.3 arcsec as seen from the Earth). Spectroscopy is made with a Fabry-Pérot interferometer that has 100 mÅ resolution. Polarimetry is made with liquid crystal variable retarders (LCVRs) aimed at obtaining accuracies of  $10^{-3}$ . Spain has a 40% contribution to the instrument through a consortium of institutes. Such a contribution guarantees visibility and responsibilities at a co-PI-ship level. The technological heritage of the instrument is fully Spanish as the IMAx (Imaging Magnetograph eXperiment) for the Sunrise mission can be considered a precursor. Indeed, emphasis will be made on explaining those key technologies lying on the Spanish side.

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### OSIRIS/GTC: status and lessons learned

Jordi Cepa Nogué (IAC), OSIRIS Instrument Team

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OSIRIS is the optical Day One instrument, and so far the only Spanish instrument, currently operating at the GTC. Building and testing an instrument for a 8-10m-class telescope with non-previous commissioning in turn, has represented a truly unique experience. In this contribution, the current status, the last commissioning results, and some lessons learned will be presented.

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### MEGARA, the future IFU & MOS for GTC

Armando Gil de Paz (UCM), J. M. Vilchez, E. Carrasco, F. M. Sanchez-Moreno, J. Gallego, and  
MEGARA Instrument & Science teams

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I will summarize the status of MEGARA, the future optical spectrograph of the 10.4m GTC, along with the plans of the Science Team for the scientific exploitation of this facility instrument. MEGARA includes two IFU bundles of  $14 \times 12$  arcsec<sup>2</sup> (0.685-arcsec spaxels) and  $10 \times 8$  arcsec<sup>2</sup> (0.48-arcsec spaxels) FOV that will deliver spectral resolutions between  $R=6000$  and  $25,000$  and a Multi-Object Spectrograph (MOS) component with a multiplexing of  $\times 100$  in  $3.5 \times 3.5$  arcmin<sup>2</sup> that will reach a spectral resolution of  $R=19,000$ . MEGARA will see first light at GTC in 2015.

## MIRADAS: The Next-Generation Infrared Spectrograph for GTC

Stephen Eikenberry (University of Florida), MIRADAS Consortium

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MIRADAS is a near-infrared multi-object R=20,000 echelle spectrograph for the 10.4-meter Gran Telescopio Canarias, being built by a consortium of institutes in Spain, USA, and Mexico. It will be the most powerful astronomical instrument of its kind, with an observing efficiency more than an order of magnitude greater than current capabilities for 10-meter class telescopes. The MIRADAS science team includes more than 40 scientists from 8 institutions in the GTC community. In this talk, I will give an overview of the MIRADAS instrument, its development status, and particularly focus on the science capabilities and opportunities it will provide to the GTC scientific community.

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## Explotación científica de los archivos científicos de GTC y Calar Alto

Enrique Solano Márquez (CAB)

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Los archivos de datos (en particular aquéllos que proporcionan datos reducidos y productos de alto nivel) son infraestructuras de investigación básicas para la astronomía moderna tal y como lo demuestra el alto grado de utilización que la comunidad hace de las mismas.

El Observatorio Virtual Español es el responsable de los archivos de datos del Gran Telescopio Canarias y del Observatorio de Calar Alto. La apertura de ambos sistemas de archivo tuvo lugar a finales de 2011 y en la actualidad cuentan con decenas de miles de observaciones públicamente accesibles.

En esta presentación se describirán las principales funcionalidades de ambos sistemas así como los desarrollos previstos a corto-medio plazo.

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<p style="text-align: center;"><b>Sesión I2 (lunes 9, 17:50-19:30)</b> <b>Salón de Grados</b></p>
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### Data processing and instrument calibration systems of Gaia

Javier Castañeda Pons (IEEC)

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The Gaia mission will provide unprecedented positional and velocity measurements of about one billion stars in our Galaxy and throughout the local group. The data processing system is an integral and critical part of the mission. We are developing the Initial Data Treatment system, which will process the raw data arriving from the satellite in near-realtime. It will provide a first estimation of the satellite attitude, the image parameters, and a first cross-match with a reference catalogue. We are also developing the Intermediate Data Updating system, which calibrates the instrument response and refines such image parameters and cross-match by running on the complete set of raw data, once or twice a year during the mission. Such massive re-processing needs a super-computer such as MareNostrum, where it is planned to run the system. In this paper we describe these data processing systems and we show their preliminary results obtained with simulated data.

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### Gaia Photometry

Claus Fabricius (IEEC), C. Jordi, J.M. Carrasco, H. Voss, M. Weiler

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The Gaia instrument is planned for launch in 2013, observing the whole sky between magnitudes 6 and 20 during 5 years. It will give high accuracy astrometry (positions, parallaxes, proper motions), photometry in three broad bands (G (wide), BP (blue), and RP (red)) and spectrophotometry in BP and RP. In addition, it will measure radial velocities for the brighter stars.

The final results are expected three years after the end of mission, i.e. in 2021, but a number of early releases are planned. The first photometric release, only for well observed sources, is expected at the end of 2016, while preliminary astrometry and G photometry will be released already in late 2015 and early 2016.

The spectrophotometry is obtained from the combination of many individual, slit-less spectra. The individual observations have somewhat different dispersion and PSF, and we describe the strategy adopted for the start of mission for obtaining a combined spectrum for each source, and comparable epoch spectra for variable sources. We also discuss possibilities for mitigation of non-linear effects in the CCD detectors, especially charge transfer inefficiency.

We finally address more advanced data treatments that may be applied in the late mission either for all sources or for a subset. This may be needed to better separate spectra in crowded areas and for double stars, and to get the full benefit for the brighter sources.

## How the Virtual Observatory helped building the ALMA Science Archive

Juan de Dios Santander Vela (IAA), Felix Stoehr

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The Atacama Large Millimeter Array (ALMA) radio interferometer has started Early Science observations, providing a copious stream of new, high-quality astronomical datasets of unprecedented sensitivity and resolution. In this talk we will present how existing Virtual Observatory (VO) technologies and software packages, together with Web 2.0 techniques, were leveraged to provide scientists with the ALMA Science Archive (ASA): an easy to use, multi-parameter discovery tool for ALMA data, ultimately integrated with the VO. We will also show the advantages of this approach, which allowed for faster software development, and a decoupling of the ALMA Front-end Archive (AFA), and the ASA.

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## Holographic imaging: sharp images for everyone

Rainer Schoedel (IAA)

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Being able to image large fields at the diffraction limit of large telescopes is one of Astronomy's oldest dreams. The standard way toward achieving this goal is to throw lots of money at it and build ever more sophisticated adaptive optics (AO) systems. As an alternative, leaner way, I present an algorithm for speckle holography that has been optimised for diffraction limited imaging of crowded fields. Holographic imaging can be equal, or even superior, to the capabilities of currently available AO systems. It generally supersedes existing AO systems at short near-infrared to optical wavelengths. Holography outperforms lucky imaging because it makes use of the entire speckle clouds and reduces the need for frame selection, thus leading to higher Strehl and improved sensitivity. I will present the exciting results of our tests and will discuss the virtues and vices of the technique that can emulate a multi-conjugate adaptive optics system. Holography works from optical to mid-infrared wavelengths and can be used with any instrument capable of sufficiently fast readout and data storage, such as NaCo, VISIR, HAWK-I, or ASTRALUX. I will point out the situations in which holographic imaging has unique advantages. Finally, I will briefly discuss the scientific projects that could profit from a dedicated wide-field speckle camera.

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## ISS nocturnal images as a scientific tool against Light Pollution: Flux calibration and colors

Alejandro Sánchez de Miguel (UCM), Zamorano Calvo, Jaime, Gómez Castaño, José, Pascual Ramírez, Sergio, López Cayuela, Marian, Challupner, Peter and Martín Martínez, Guillermo

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The potential of the night pictures of the Earth taken from the International Space Station (ISS) with a Nikon D3s digital camera to fight against light pollution is shown. We have developed a method to perform absolute photometric calibration measuring fluxes of the stars recorded in the pictures. The calibrated images are being compared with energy consumption data as a measure of light pollution. A catalog of nocturnal images from the ISS has been created using a semi-automatic procedure. The typical colors of the most important cities of the world are analyzed. Our aim is to classify their color temperature and to distinguish the proportion and lamp types of the pollution sources, and to determine the energy emitted to the sky from satellite images.

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<b>Sesión I3 (martes 10, 09:00-11:00)</b> <b>Salón de Grados</b>
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### **The WFM instrument of LOFT mission**

José-Luis Gálvez Sánchez (ICE), M. Herranz, L. Álvarez, D. Karelin  
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LOFT, the Large Observatory For X-ray Timing, was recently selected by ESA as one of the four medium class space missions concepts of the Cosmic Vision Programme 2015-2025, that will compete for a launch opportunity in 2020-2022.

The LOFT mission comprises two instruments: the Large Area Detector (LAD), a 12 m<sup>2</sup> collimated X-ray detector in the 2-30 keV range, with unprecedented timing capabilities, and the Wide Field Monitor (WFM), a coded-mask wide field X-ray monitor. Both instruments are based on silicon detectors.

The WFM has large field of view, which will permit to observe about 50 % of the LAD accessible sky at once, in the same energy range. Its main goal is providing good triggers for the LAD. The WFM is also designed to catch transient/bursting events down to a few mCrab fluxes and will provide for them data with fine spectral and timing resolution (up to 10  $\mu$ sec).

The Institute of Space Sciences (CSIC-IEEC) in Barcelona is deeply involved in the LOFT mission, sharing the leadership of the WFM instrument with DTU Space in Denmark. We are responsible of the mechanics of such instrument including its structural and thermal design. The WFM baseline is composed by a set of 4 units (each unit corresponds to 2 co-aligned cameras) covering a field of view of 180°  $\times$  90°. The structure of each camera lies on its own coded mask, 150 $\mu$ m thick, a collimator and the detector plane, providing fine (arc minutes) angular resolution. The detector plane will operate at -20°C, in order to achieve an energy resolution of less than 500eV, FWHM, in the 2-50 keV energy range.

## El Observatorio Astrofísico de Javalambre: Estado Actual y Desarrollos Futuros

Javier Cenarro (CEFCA)

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El Observatorio Astrofísico de Javalambre (OAJ; <http://www.cefca.es>) es una nueva instalación astronómica situada en la Sierra de Javalambre de Teruel que consta esencialmente de dos telescopios de gran campo. El primero, JST (Javalambre Survey Telescope, también llamado T250), es un telescopio de 2.55m con un campo de visión de 3 grados de diámetro, concebido fundamentalmente para llevar a cabo grandes cartografiados astronómicos. Su principal cometido científico para los próximos años es llevar a cabo J-PAS (<http://j-pas.org>), un cartografiado de 8000 grados cuadrados en 54 filtros ópticos estrechos (más 2 filtros anchos en los extremos azul y rojo del rango óptico) que proporcionará un espectro de baja resolución de cada píxel del cielo hasta magnitud  $AB \sim 22.5$ . El segundo telescopio, JAST (Javalambre Auxiliary Survey Telescope, también llamado T80), es un telescopio de 83cm de espejo primario y 2 grados de visión que durante los dos primeros años de operación se dedicará fundamentalmente a realizar J-PLUS, un cartografiado previo en la misma región de cielo de J-PAS con un conjunto de 12 filtros estrechos, intermedios y anchos. J-PLUS se define para realizar la calibración fotométrica de J-PAS así como para una gran multitud de otros casos científicos. En esta charla se resume el estado actual del OAJ en lo referente al desarrollo de sus telescopios, obra civil e instalaciones auxiliares, así como el plan de trabajo y operación previsto para los próximos años.

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## The Exoplanet Characterization Observatory (EChO): the Next Tool to Study Exoplanet Atmospheres

Mercedes López Morales (ICE), Ignasi Ribas, Maria Rosa Zapatero Osorio, Enric Pallé

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The Exoplanet Characterization Observatory (EChO) is an ESA mission currently assessed for an expected launch in 2022-2024. EChO will be the first dedicated mission to investigate exoplanet atmospheres and will highly impact our understanding of those worlds by providing continuous visible to mid-infrared spectral coverage of a wide range of planets, from gas giants to low-mass planets. During its five-year lifetime EChO will allow us to measure the chemical composition of the exoplanet atmospheres, their temperature, albedo and atmospheric circulation mechanisms, and for the first time put the atmospheric properties of the planets in our Solar System on the wider context of planetary systems in the Universe. In this talk we would like to present EChO to the Spanish astronomical community by providing a description of the science of the mission, some design details, and the Spanish contribution to the project.

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## PlanetCam: Una cámara para la observación planetaria usando la técnica “lucky imaging”

Agustín Sánchez Lavega (UPV/EHU), J. F. Rojas, R. Hueso, S. Pérez-Hoyos, L. de Bilbao, G. Murga, J. Ariño

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PlanetCam es una cámara diseñada para observar los planetas y otros objetos brillantes del Sistema Solar a muy alta resolución espacial, en el límite de difracción óptico del telescopio, usando la técnica “lucky imaging”. PlanetCam observará simultáneamente los planetas mediante el uso de un dichroico en las rangos óptico (400 nm-  $1\mu\text{m}$ ) e infrarrojo cercano NIR (1-2.5  $\mu\text{m}$ ), cada uno de los dos canales con su óptica de amplificación y sistema de filtros. PlanetCam utiliza para el canal visible un detector Andor sCMOS que proporciona más de 100 fps con tamaño de pixel de 6.5  $\mu\text{m}$ . El canal NIR actualmente en fase de proyecto utilizará un FPA de HgCdTe trabajando a 150 fps con pixel de 15-30  $\mu\text{m}$ . La adquisición simultanea de imágenes al límite de resolución del telescopio en ambos canales (visible y NIR) en diferentes longitudes de onda utilizando dos ruedas de filtros en cada canal, permitirá estudiar de manera detallada tanto la dinámica atmosférica de los diferentes planetas como su estructura de nubes. PlanetCam ha sido diseñada para ser transportable y acoplable a diferentes telescopios. Las primeras pruebas del canal visible de la cámara se realizarán utilizando los telescopios de 1.23 m del Observatorio de Calar Alto y de 1 m del Observatorio del Pic-du-Midi (Francia).

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## CARMENES: A Radial-Velocity Survey for Terrestrial Planets in The Habitable Zones of M Dwarfs

Pedro J. Amado González (IAA), A. Quirrenbach and the CARMENES consortium

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CARMENES (Calar Alto high-Resolution search for M dwarfs with Exo-earths with Near-infrared and optical Echelle Spectrographs) is a next-generation instrument to be built for the 3.5m telescope at the Calar Alto Observatory by a consortium of Spanish and German institutions. Conducting a five-year exoplanet survey targeting  $\sim 300$  M stars with the completed instrument is an integral part of the project. The CARMENES instrument consists of two separate spectrographs covering the wavelength range from 0.52 to 1.7  $\mu\text{m}$  at a spectral resolution of  $R \sim 82,000$ , fed by fibers from the Cassegrain focus of the telescope. The spectrographs are housed in a temperature-stabilized environment in vacuum tanks, to enable a 1m/s radial velocity precision employing a simultaneous ThAr calibration. This contribution intends to provide the Spanish community with a review of the current status of the project.

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## HEXA: una máquina para cartografiados espectroscópicos

David Barrado Navascués (CAHA), J. Aceituno, U. Thiele, S. Pedraz, D. Galadí

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Se realizará una presentación del proyecto de telescopio de 6.5m especializado en la realización de cartografiados espectroscópicos.

**Sesión I4 (miércoles 11, 09:00-11:00)****Salón de Grados****El GTC. Presente y futuro***[Conferencia Invitada]*

Pedro Álvarez (GRANTECAN S.A., IAC)

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Se presenta de forma sucinta el estado actual del telescopio GTC y los resultados de su operación tras tres años de funcionamiento, prestando especial atención a su utilización por parte de la comunidad astronómica española.

Brevemente también se mostrarán los planes de desarrollo futuro y las expectativas para nuestra comunidad en el uso científico y tecnológico de la instalación.

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**EST: the largest and most sensitive spectropolarimeter***[Conferencia Invitada]*

Manuel Collados (IAC)

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Magnetic field plays a crucial role to understand most phenomena happening in the solar atmosphere. Sunspots, flares, prominences, coronal mass ejections are well known examples of its interaction with the solar plasma. In all these processes, it exchanges energy with matter, either to increase its magnetic energy or to release it in the form of heat or particle acceleration. To study the properties of this interaction, one needs to analyze the imprint it leaves in the radiation through the polarization induced in spectral lines, via the Zeeman and Hanle effects. Outside sunspots, the polarization degree of the light that is received is usually well below one part in one thousand or ten thousand, which requires sophisticated techniques to measure it accurately. To complicate further more the situation, telescopes use mirrors and these introduce undesired polarization which is two or three orders of magnitude larger than that caused by the magnetic field of solar structures. For this reason, present telescopes doing polarimetry require an adequate modelling and to correct the measured data from these spurious effects. The European solar Telescope (EST) has been designed to overcome these difficulties. In this communication, I will present some science cases of solar magnetic phenomena and their polarized spectral properties and will discuss how EST will facilitate the observer their detection, even at the lowest level.

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## The Scientific Motivation of the Chromospheric Ly-alpha Spectropolarimeter

Javier Trujillo Bueno (IAC), varios coautores (L. Belluzzi, R. Manso Sainz, J. Stepan, etc.)

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The Chromospheric Lyman-alpha Spectropolarimeter (CLASP) is an experiment for measuring the linear polarization of the hydrogen Ly-alpha line using a FUV telescope and a high-sensitivity polarimeter carried by a NASA sounding rocket. This project was initiated as a collaboration between Japan, USA and Spain and it is presently under development including also other European teams. The hydrogen Ly-alpha line originates in the enigmatic transition region of the Sun, where the temperature suddenly jumps from 10000 K to 1000000 K and the plasma changes from partially to fully ionized. In order to understand how this can be possible it is crucial to determine the strength and geometry of the magnetic field of the solar transition region, whose primary emission is in the FUV and EUV spectral regions. The aim of this contribution is to explain with the help of detailed radiative transfer simulations the scientific motivation for CLASP, which is to open a diagnostic window for magnetic field measurements in the outer solar atmosphere.

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## IDOM, desarrollo de Proyectos de Astronomía (Enclosures, Telescopios e Instrumentación)

*[Charla Corporativa]*

Gaizka Murga (IDOM)

IDOM es una empresa de ingeniería multidisciplinar que proporciona soluciones de ingeniería y llave en mano para proyectos complejos que impliquen mecánica aplicada, diseño estructural, electrónica y control. IDOM está presente en 34 oficinas distribuidas en 16 países en cinco continentes.

La experiencia de IDOM en Proyectos de Astronomía incluye enclosures de telescopios (como los de E-ELT y ATST), sistemas de telescopio (sistemas Folded Cassegrain del GTC, telescopio de QUIJOTE CMB) e instrumentación (PlanetCam, FastCam e instrumentación de QUIJOTE CMB).

<p style="text-align: center;"><b>Sesión I5 (jueves 12, 09:00-11:00)</b> <b>Salón de Grados</b></p>
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**HPC in Spain and Europe: BSC-RES-PRACE**

*[Conferencia Invitada]*

Sergi Girona (Barcelona Supercomputing Center)

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La ponencia explicará los servicios HPC disponibles para la comunidad científica, así como los recursos y los mecanismos para acceder a ellos. Se presentarán los recursos Españoles (disponible a través del BSC y la RES) y los Europeos (disponibles a través de PRACE).

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**OMC automatic variable star classification**

Mauro López del Fresno (CAB (INTA-CSIC)), Luis Manuel Sarro Baro, Enrique Solano Márquez

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The Optical Monitoring Camera (OMC), on-board the ESA mission INTEGRAL, has stored more than 190.000 light curves for almost 10 years. Among the targets included in its input catalogue there is a relevant amount of variable stars. In many cases, OMC has gathered photometric information of sufficient quality to enable a stellar variability analysis of those stars.

In this contribution we show the full pipeline of our classification system, from the period calculation to the final membership classification. We also include relevant points of the system such as the parameters used for filtering good quality light curves, specific optimizations applied to the classification algorithms and a comparison between the SIMBAD classification and ours.

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**Smoothed Particle Hydrodynamics: Checking a tensor approach to calculating gradients in astrophysics**

José Antonio Escartín Vigo (UPC), Domingo García-Senz, Rubén Martín Cabezón Gómez

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We describe and check a novel formulation of Smoothed Particle Hydrodynamics (SPH) that can be applied to simulate astrophysical systems. The method relies in a tensor approach to the gradient of density which is more accurate than the standard procedure due to its better renormalization properties. The proposed scheme fully conserves momentum and energy in isentropic flows and is less susceptible to the tensile instability.

The resulting algorithm is verified using a variety of well-known test in both, reduced two-dimensional systems as well as fully three-dimensional astrophysical scenarios, as for example the evolution of a supernova remnant or the stability of a polytrope. The analysis of these test cases suggest that the method is able to improve the results of the standard technique with only a moderate overload in the computational time.

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## SHAPEMOL: el compañero de SHAPE en la era molecular de ALMA y HERSCHEL

Miguel Santander-García (OAN), Valentín Bujarrabal, Wolfgang Steffen, Nico Koning

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La instrumentación radioastronómica de nueva era constituye una valiosa herramienta para el estudio del Universo: ALMA alcanzará una sensibilidad y una resolución espacial sin precedentes, mientras que Herschel/HIFI ha abierto una nueva ventana (la mayor parte del rango submilimétrico y de infrarrojo lejano sólo es accesible desde el espacio) desde la que estudiar el gas templado ( $\sim 50$ - $1000$  K), esencialmente inaccesible desde radiotelescopios terrestres.

Por otro lado, el programa informático SHAPE se ha asentado en los últimos años como el estándar en el modelizado espacio-cinemático que da cuenta de la morfología y el campo de velocidades de diferentes tipos de nebulosas (nebulosas planetarias, protoplanetarias y nebulosas alrededor de estrellas masivas, aunque también puede ser aplicado a regiones H II y nubes moleculares). Aunque el modelizado con SHAPE incorpora la solución de las ecuaciones de transferencia radiativa, ésta sólo está disponible en especies atómicas, y no moleculares.

Conscientes de la creciente importancia del desarrollo de herramientas informáticas que faciliten el análisis de los datos moleculares de los observatorios de nueva era, presentamos el código informático SHAPEMOL, un complemento de SHAPE con el que pretendemos llenar el nicho molecular, hasta ahora vacío. SHAPEMOL implementa un modelado espacio-cinemático con cálculos precisos (en condiciones de no equilibrio termodinámico local) de excitación de líneas y transferencia radiativa en especies moleculares. Este código —que ya ha sido probado con éxito para estudiar las condiciones de excitación de la envoltura molecular de la nebulosa planetaria NGC 7027 con datos de Herschel/HIFI—, permite por el momento realizar transferencia radiativa en líneas de CO desde  $J=1-0$  hasta  $J=16-15$  (a la que pronto se sumarán otras especies). SHAPEMOL, junto con SHAPE, permite crear fácilmente tanto mapas sintéticos para comparar con observaciones interferométricas, como perfiles sintéticos de las líneas de estudio seleccionadas para comparar con las observaciones de antenas únicas.

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## Participación de FRACTAL en proyectos liderados por la Astronomía española

*[Charla Corporativa]*

Marisa García Vargas (FRACTAL)

FRACTAL SLNE es una empresa privada fundada en 2005 con actual sede en Las Rozas de Madrid. FRACTAL desarrolla proyectos de instrumentación y software liderados por programas científicos y presta servicios de Gestión e Ingeniería de Sistemas, en particular para la Astrofísica profesional. FRACTAL ha trabajado en algunos de los proyectos punteros de los principales observatorios y centros de investigación en Astrofísica, y esta charla resume nuestra contribución. Además FRACTAL participa en varios proyectos de I+D+i, entre ellos el proyecto VIENTOS para estudiar posibles elementos de pupila novedosos para los instrumentos de la nueva generación de grandes telescopios.

**Sesión I6 (viernes 13, 09:00-11:00)****Salón de Grados****Ciencia digital: reproducibilidad y visibilidad en Astronomía**

José Enrique Ruiz del Mazo (IAA), Lourdes Verdes-Montenegro, Susana Sánchez, Juan de Dios Santander-Vela, Julián Garrido, WF4EVER Team

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La ciencia que se realiza en Astronomía es ciencia digital, desde las propuestas de observación hasta la publicación final, pasando por los datos y el software utilizado: cada uno de los elementos y acciones que intervienen en la producción científica podría registrarse en soporte electrónico. Este hecho no impide que el resultado final de un experimento sea aún difícil de reproducir. Este procedimiento puede ser largo, tedioso, no fácilmente accesible o comprensible, incluso para el propio autor. La reproducibilidad es uno de los pilares del método científico, y la extracción de información relevante en el diluvio de datos actual y futuro es clave en Astronomía. Al mismo tiempo, disponemos de una rica infraestructura de archivos, datos observacionales y publicaciones. Esta podría utilizarse de forma mucho más eficiente si disfrutáramos de una mayor visibilidad de la producción científica que evite las reinversiones y duplicación de esfuerzo. El grupo AMIGA (Análisis del Medio Interestelar de las Galaxias Aisladas, IAA-CSIC, <http://amiga.iaa.es>) afronta estos dos retos en el proyecto europeo “Wf4Ever: Advanced workflow preservation technologies for enhanced Science” con el fin de posibilitar la preservación de la metodología en repositorios semánticos escalables que faciliten su descubrimiento, acceso, inspección, explotación y distribución. Estos repositorios almacenan los experimentos en “objetos de investigación” digitales cuyos principales constituyentes son los workflows científicos. Estos proporcionan una visión global e interpretación científica clara del experimento además de la automatización del método, yendo más allá de los habituales pipelines que normalmente acaban en el procesado de datos. Se presentarán los resultados actuales del proyecto Wf4Ever y más concretamente cómo el uso, mediante el software Taverna, de workflows científicos con datos de Hyperleda y SDSS puede contribuir a mejorar la reproducibilidad del experimento y a una utilización más eficiente de los archivos astronómicos, facilitando la difusión de la metodología científica y su reuso.

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**SENER***[Charla Corporativa]*

## The ANTARES neutrino telescope

*[Conferencia Invitada]*

Juan de Dios Zornoza Gómez (IFIC)

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Neutrino astronomy has become a mature experimental technique in the last years. Neutrinos have specific advantages with respect to more traditional probes used in astronomy. Photons are absorbed at high energies due to their interaction with matter and radiation, so they cannot reach us above a few hundreds of TeV. Cosmic rays are also absorbed by matter and radiation. Moreover they are deflected by magnetic fields in the Universe, which makes very difficult to pinpoint their sources. Neutrinos, on the contrary, are neutral and only interact weakly, so they are unique tools to study the Cosmos at high energies. The main scientific scopes of neutrino telescopes are the search for cosmic sources and the study of the nature of dark matter. Candidate cosmic neutrino sources are gamma-ray busters, active galactic nuclei, supernova remnants, magnetars and microquasars. The observation (or non-observation) of neutrinos from these sources will help us to understand the origin of cosmic rays and the production mechanisms (hadronic vs. leptonic) of gamma-rays from some sources. The search for dark matter is based on the hypothesis that dark matter candidates like the neutralinos would accumulate in massive objects like the Sun, producing neutrinos after their annihilation, which can be detected by neutrino telescopes.

The ANTARES neutrino telescope is located in the Mediterranean Sea at a depth of 2475 m. It consists of a tri-dimensional array of photomultipliers which detect the Cherenkov radiation induced by relativistic muons produced in the interaction of high energy neutrinos with the nearby water and rock. It was completed in 2008 and has provided rich data. In this talk I will present the main results of the experiment so-far, which includes the map of the Southern neutrino sky, the results of the search for dark matter in the Sun, etc.

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## Estado del proyecto WSO-UV y del instrumento español ISSIS en 2012

*[Conferencia Invitada]*

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El WSO-UV es un telescopio espacial con un primario de 1.7 m que estará en órbita geosíncrona a partir de 2016. El WSO-UV es un telescopio ultravioleta que permitirá realizar imagen y espectroscopia de baja (500), media (2000) y alta (55000) resolución en el rango espectral de 1150 a 3150 Angstroms. En esta contribución se presentará el estado actual del proyecto y del instrumento español ISSIS (Imaging and Slitless Spectroscopy Instrument for Surveys).

## Improvements to Host Country Radio Astronomy at Robledo: another antenna, a new receiver, a new wide

J. Ricardo Rizzo Caminos (CAB), T. B. H. Kuiper, C. García Miró, J. Cernicharo, A. Pereira Ríos, I. Sotuela, M. Franco, J. M. Castro Cerón, J. R. Larrañaga, L. Ojalvo

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NASA hosts three complexes worldwide built for spacecraft tracking, although their sensitive antennas are suitable for their use in Radio Astronomy. Since more than a decade, INTA has managed guaranteed Spanish time at the complex located in Robledo de Chavela, in the frame of the Host Country Radio Astronomy (HCRA) program. Until now, the vast majority of the scientific results were achieved using a K-band (18 to 26 GHz) receiver, attached to the 70m antenna, and a narrow-band autocorrelator.

In the recent years, we have undertaken two large instrumental projects: (1) the incorporation of a second antenna (34m in diameter), working in Q-band (38 to 50 GHz); and (2) the design and construction of a complete wideband backend, which may operate with both the Q- and K-band receivers, providing instantaneous bandwidths from 100 MHz to 6 GHz, and resolutions from 6 to 200 kHz.

The Q-band receiver has a typical temperature of 40K, and system temperatures below 100K. In Q-band, the antenna has an angular resolution around 40", and good values of aperture efficiency (50%) and sensitivity (7 Jy/K).

On the other hand, the new wideband backend is expanding the HCRA possibilities due its bandwidth, versatility, spectral resolution and stability of the baselines. Its IF processor splits each of the two circular-polarization signals, and downconverts them to four base-band channels, 1.5 GHz width. Two different frequencies may be tuned independently. Digitalisation is done through FPGA-based FFT spectrometers, which may be independently configured.

Once end-to-end assembled, the commissioning of the new backend was done using the 34m antenna in Q-band. In this contribution we report the main characteristics of both the antenna recently incorporated to HCRA, and the wideband backend. After a summary of the commissioning results and current capabilities, the timeline of operations and procedures to observe are presented.

# Instrumentación y Computación: Pósteres



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## MuSICa en GRIS

Ariadna Calcines Rosario (IAC), Manuel Collados, Roberto L. López

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Presentamos el diseño de una unidad de campo integral basada en el concepto de image slicer con capacidad multi-rendija diseñada para el telescopio solar de 4 metros, EST. La IFU descompone un campo bidimensional de 80 segundos de arco cuadrados en 8 rendijas de 200 segundos de arco de largo por 0.05 de ancho. Es, además, compatible con dos modos de observación: espectroscópico y espectro-polarimétrico, ofreciendo versatilidad. Esta unidad de campo integral va acoplada al espectrógrafo de alta resolución y campo integral de EST. Como prototipo se ha diseñado un image slicer para GRIS, el espectrógrafo del telescopio solar GREGOR, cuyo diseño se presenta asimismo en esta comunicación.

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## How to build a cheap remote solar-powered site monitor

Alberto J. Castro-Tirado (IAA-CSIC), Sergey Guziy

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We describe the design, installation and operation (since 2006) of a low-cost remote site monitoring station (weatherstation + cloud-monitoring camera). We discuss changes made to the hardware and software after the original installation and outline how we allowed for remote/in-the-field modification and upgrade of the software without risking loss of contact. Finally, we present some of the recent data from the station situated on a peak (1500m height) south of Granada.

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## Making difficult computations in hardware devices

José Carlos del Toro Iniesta (IAA)

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Modern instruments involve increasingly more complicated computational needs. Both ground-based and space-borne instrumentation need faster computational means that enable on-line processing that may include very difficult mathematical algorithms. Prompted by the development of the Polarimetric and Helioseismic Imager for Solar Orbiter, the Solar Physics Group of the IAA (CSIC) is designing an electronic inverter of the radiative transfer equation in an FPGA. This device or some other that slightly differs from it can be of help for a number of spectropolarimetric instruments and, most importantly, the techniques developed for this inverter can easily be translated to other algorithms useful for other instruments. This communication will introduce the inverter and outline its possible applications.

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## Integración de diversos instrumentos en un único ordenador

Manuel Domingo Beltrán (Universidad Politécnica de Valencia), Miguel Ángel Satorre Aznar, M<sup>a</sup> Carmen Santonja Moltó, Ramón Luna Molina, Carlos Millán Verdú

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En un laboratorio de investigación habitualmente se usan en un mismo experimento múltiples aparatos e instrumentos de medida conectados cada uno de ellos a un ordenador condicionado a un sistema operativo concreto. Ello produce escasez de espacio, dispersión física de los datos experimentales y problemas de sincronización cuando éstos se registran en función del tiempo.

En nuestro laboratorio de Astrofísica Experimental hemos centralizado mediante máquinas virtuales en un único ordenador las medidas realizadas por múltiples dispositivos como: espectrómetro de masas, espectrómetro UV-Vis, controlador de temperatura, sensores de temperatura y presión, fotómetros y microbalanza de cuarzo.

## Observatorio Astrofísico de Javalambre - Observation Scheduler And Sequencer

Alessandro Ederoclite (CEFCA)

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Observational strategy is a critical path in any large survey. The planning of a night requires the knowledge of the fields observed, the quality of the data already secured, and the ones still to be observed to optimize scientific returns. Finally, field maximum altitude, sky distance/brightness during the night and meteorological data (cloud coverage and seeing) have to be taken into account in order to increase the chance to have a successful observation.

To support the execution of the J-PAS project at the Javalambre Astrophysical Observatory, we have prepared a scheduler and a sequencer (SCH/SQ) which takes into account all the relevant mentioned parameters.

The scheduler first selects the fields which can be observed during the night and orders them on the basis of their “figure of merit”. It takes into account the quality and spectral coverage of the existing observations as well as the possibility to get a good observation during the night.

The sequencer takes into account the meteorological variables in order to prepare the observation queue for the night.

During the commissioning of the telescopes at OAJ, we expect to improve our figures of merit and eventually get to a system which can function semi-automatically.

This poster describes the design of this software.

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## Status of the Canarias InfraRed Camera Experiment (CIRCE) for the Gran Telescopio Canarias

Stephen Eikenberry (University of Florida), Team CIRCE

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CIRCE is a near-infrared 1-2.5 micron imager, polarimeter and low-resolution spectrograph intended as a visitor instrument for the Gran Telescopio Canarias. It is being built largely by graduate students and postdocs, with help from the UF astronomy engineering group, and is funded by the University of Florida and the U.S. National Science Foundation. CIRCE is intended to help fill the gap in time between GTC first light and the arrival of EMIR, and will also provide the following scientific capabilities to complement EMIR after its arrival: high-resolution imaging, narrowband imaging, high-time-resolution photometry, imaging- and spectro-polarimetry, low-resolution spectroscopy. In this poster, we review the status of CIRCE and future prospects. The CIRCE vacuum jacket and handling cart are complete and tested in the laboratory. The CIRCE optical system has been fabricated, aligned, and tested, resulting in seeing-limited image quality down to seeing of <0.3-arcseconds FWHM. The main cryogenic mechanisms have been built and successfully tested under cryogenic conditions. Final integration of the system is ongoing in early 2012, to be followed by system level testing. We expect CIRCE to be ready to ship to GTC in the 2012B semester.

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## ISFAA, prospects for an implicit Smoothed Particle Hydrodynamics

José Antonio Escartin Vigo (UPC), Domingo García-Senz

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The explicit nature of the smoothed particle hydrodynamics technique restricts its applications to dynamical phenomenae such as collisions or explosions. Nevertheless a large field of applications in astrophysics are related to quasi-hydrostatic evolution as for instance the pre-explosive stage leading to novae or Type Ia supernovae or advanced stellar evolutionary phases. If we want to apply the SPH technique to these systems an implicit scheme has to be built. Nevertheless devising an implicit SPH presents a number of numerical difficulties which have prevented its development until recent times (C.Knapp 2000). We explain the main features of an parallelized implicit SPH called ISFAA (Implicit SPH for Astrophysical Applications) which extends the work of Knapp by including a more powerful numerical scheme, and incorporates artificial viscosity, gravity, conductive transport and nuclear reactions. We have checked the scheme through several tests such as simulating a the wall heating shock test, Sedov like explosion or stability of a massive white dwarf. These tests were calculated using a low number of particles (20,000). Our conclusion is that although the scheme is promising it would be necessary to make use of supercomputers to carry out realistic calculations with ISFAA. Another important improvement would be to enhance the stability of the numerical scheme in order to increase the time step to overpass the Courant time-step in a larger factor which until now is around 50.

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## Using Boosted Decision Trees for Star-Galaxy separation

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We present an application of a particular machine-learning method (Boosted Decision Trees, BDT) to separate stars and galaxies from their catalog characteristics. This application is based on the BDT implementation in the Toolkit for Multivariate Analysis (TMVA) for ROOT, a physics analysis package widely used in high energy physics. The main goal is to improve from simple thresholding cuts on standard separation variables that may be affected by local effects such as blending, badly calculated background levels or which do not include information in other bands. We explain the basics of decision trees and the training sets used for the cases that we analyze. The improvements are shown using very detailed simulated data from the Dark Energy Survey as well as from the Sloan Digital Sky Survey Data Release 7.

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## TES-based microcalorimeter for future X-ray astronomy missions

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The XMS (X-ray Microcalorimeter Spectrometer) is an instrument prototype with imaging capability in X-rays and high-spectral resolution. This instrument is a microcalorimeter based on transition edge sensors (TES). As part of the Spanish contribution to the advancement of the XMS, we present the work carried out by the X-ray astronomy group at the Instituto de Física de Cantabria in collaboration with SRON. The main task involves the development of software for this prototype with the purpose of instrument calibration, X-ray pulse detection and energy resolution calculations.

## **A CdTe/CdZnTe pixel detector for gamma-ray spectrometry with imaging and polarimetry capability**

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In the last few years we have been working on feasibility studies of future instruments in the gamma-ray range, from several keV up to a few MeV, in collaboration with other research institutes. High sensitivities are essential to perform detailed studies of cosmic explosions and cosmic accelerators, e.g., Supernovae, Classical Novae, Supernova Remnants (SNRs), Gamma-Ray Bursts (GRBs), Pulsars, Active Galactic Nuclei (AGN).

Cadmium Telluride (CdTe) and Cadmium Zinc Telluride (CdZnTe) are very attractive materials for gamma-ray detection, since they have already demonstrated their great performance onboard current space missions, such as IBIS/INTEGRAL and BAT/SWIFT, and future projects like ASIM onboard the ISS. However, the energy coverage of these instruments is limited up to a few hundred keV, and there has not been yet a dedicated instrument for polarimetry.

Our research and development activities aim to study a gamma-ray imaging spectrometer in the MeV range based on CdTe detectors, suited either for the focal plane of a focusing mission or as a calorimeter for a Compton camera. In addition, our undergoing detector design is proposed as the baseline for the payload of a balloon-borne experiment dedicated to hard X- and soft gamma-ray polarimetry, currently under study and called  $C\mu$ SP (CZT  $\mu$ -Spectrometer Polarimeter). Other research institutes such as INAF-IASF, DTU Space, LIP, INEM/CNR, CEA, are involved in this proposal.

We will report on the main features of the prototype we are developing at the Institute of Space Sciences, a gamma-ray detector with imaging and polarimetry capabilities in order to fulfil the combined requirement of high detection efficiency with good spatial and energy resolution driven by the science.

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## **Using RTM to study the wv content and eliminate telluric lines from high-resolution optical spectra**

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Using radiative transfer models to study the water vapor content and eliminate telluric lines from high-resolution optical spectra The Radiative Transfer Model (RTM) and the retrieval algorithm, incorporated in the SCIATRAN 2.2 software package developed at the Institute of Remote Sensing/Institute of Environmental Physics of Bremen University (Germany), allows to simulate, among other things, radiance/irradiance spectra in the 2400-24 000 Å range. In this work we present the applications of RTM to two case studies. In the first case the RTM was used to simulate direct solar irradiance spectra, with different water vapor amounts, for the study of the water vapor content in the atmosphere above Sierra Nevada Observatory. Simulated spectra were compared with those measured with a spectrometer operating in the 8000-10000 Å range. In the second case the RTM was used to generate telluric model spectra to subtract the atmospheric contribution and correct high-resolution stellar spectra from atmospheric water vapor and oxygen lines. The results of both cases are discussed.

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## Tests of VPHGs in the NIR at cryogenic temperature

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We report on the performances measured at room temperature and in cryogenic conditions of a set of NIR Volume Phase Holographic Gratings (VPHGs) manufactured at the Miguel Hernández University (Elche, Spain) aimed at their use in astronomical instrumentations. VPHGs are novel optical components which can replace standard ruled transmission gratings, offering some advantages. Instead of a surface modulation, a diffraction index modulation printed in a volume of material generates the diffraction according to the required specifications. While VPHGs are becoming an option for instruments working in the optical regime at room temperature, their use is still minimal in the NIR wavebands due to the stringent requirements imposed by the cryogenic environment. But their good properties in terms of high transmission and compact mechanical design are kept even in cryogenic, so efforts to develop such devices functional at cryogenic temperatures are underway in several institutions. We report results on transmission and wavefront deformation of newly manufactured VPHGs. These results were achieved through a collaborative effort within the European network OPTICON, WP6 New Materials and Processes in Astronomical Instrumentation, and whose participating institutions are Instituto de Astrofísica de Canarias, Universidad Miguel Hernández, Osservatorio Astronomico di Brera (INAF) and Politecnico di Milano.

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## The Gaia spectrophotometric standard stars

Carme Jordi Nebot (Universitat de Barcelona, ICC-IIEEC), J.M. Carrasco, E. Pancino, G.

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We describe the ongoing observational survey aimed at building a grid of approximately 200 spectrophotometric standard stars (SPSS), with an internal of 1% precision and tied to Vega within a few percent, for the absolute flux calibration of Gaia photometry.

Until to now, more than 350 observing nights were devoted to the project, distributed in several observatories (70 nights at CAHA in Almería, 50 nights at TNG in La Palma, 30 nights at NTT in La Silla, 120 nights at San Pedro Mártir, México, 80 nights in Loiano, Italy, and many partial nights with robotic REM in La Silla) and for both spectroscopic and photometric campaigns. Only 4% of spectroscopic targets remain to be observed, hopefully during 2012, and the work for the next years will be to finalize the reduction of such amount of data in a homogeneous way. Additional observations will be still needed for continuing the monitoring of variability (short and long term) in order to discard non optimal candidates.

The absolute flux Gaia calibration approach, the criteria for the selection of SPSS candidates and their list will be presented. The link between Vega and our SPSS will be ensured with three ““pilars””, that will enable to calibrate our ground-based calibrators (primary SPSS). These primary SPSS, in turn, will enable to calibrate our Gaia Grid (secondary SPSS). We also discuss a short list of notable rejected SPSS candidates and difficult cases, based on identification problems, literature discordant data, visual companions, and variability. In fact, all candidates are also monitored for constancy (within  $\pm 5$  mmag approximately). In particular, we report on two candidates that were found variable during our short-term (1-2 h time series) constancy monitoring, one of them is a CALSPEC standard named 1740346, which is probably of delta Scuti type, and the other G 192-41, of still unclear variability type.

## Deep blank field catalogue for medium- and large-size telescopes

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The observation of /blank fields/, regions of the sky devoid of stars down to a given threshold magnitude, constitutes one of the typical important calibration procedures required for the proper reduction of astronomical data obtained following typical observing strategies. In this work, we have used the Delaunay triangulation to search for /deep blank fields/ throughout the whole sky, with a minimum size of 10 arcminutes diameter and an increasing threshold magnitude from 15 to 18. The result is a catalogue with the deepest blank fields known so far, which have demonstrated to be extremely useful for medium and large size telescopes. This catalogue is accessible through the VO tool TESELA, where the the user can retrieve, and visualise using Aladin VO tool, the /deep blank fields/ available near a given position in the sky.

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## First light panoramic instruments for the Observatorio Astrofísico de Javalambre

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The Observatorio Astrofísico de Javalambre (OAJ) is a new astronomical facility located at the Sierra de Javalambre (Teruel, Spain) whose primary role will be to conduct all-sky astronomical surveys. The OAJ facility will have two wide-field telescopes: the JST; a 2.55-m telescope with a 3° diameter FoV, and the JAST; a 0.83-m telescope with a 2° diameter FoV. In this talk I will present the JAST and JST first light panoramic instruments.

T80Cam is a wide-field camera that will be mounted at the Cassegrain focus of the JAST. It is intended for surveys, starting with the planned J-PLUS (Javalambre Photometric Local Universe Survey) survey, a twelve-band photometric all-sky survey. T80Cam is equipped with an STA 1600 detector. This is a 10k-by-10k, 9 $\mu$ m pixel CCD that covers a large fraction of the JAST's FoV with a pixel scale of  $\sim 0.5''$ /pixel.

JPCam is a 14-CCD mosaic camera using the new e2v 9k-by-9k 10 $\times$ 956 $\mu$ m pixel detectors, providing a pixel scale of  $\sim 0.2''$ /pixel. The cryostat, detector mosaic and read electronics is being supplied by e2v while the mechanical structure, housing the shutter and filter assembly, is being designed and constructed by a Brazilian consortium led by INPE (Instituto Nacional de Pesquisas Espaciais). Four sets of 14 filters are placed in the ambient environment, just above the dewar window but directly in line with the detectors. The camera is designed to perform the Javalambre-PAU Astrophysical Survey (J-PAS), a BAO survey of the northern sky. The J-PAS survey will use 56 filters, 54 narrow-band filters ( $\sim 13.8$ nm) equi-spaced between 350 and 1000nm plus 2 broad-band filters to achieve unprecedented photometric red-shift accuracies for faint galaxies over  $\sim 8000$  square degrees of sky.

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## Use of Observing Time and Scientific Productivity of the Isaac Newton Group of Telescopes

Javier Méndez (Isaac Newton Group of Telescopes), Ian Skillen

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We provide an overview for the use of observing time and the scientific productivity of the Isaac Newton Group of Telescopes (Roque de los Muchachos Observatory, La Palma, Spain) over recent years, including statistics on the numbers of proposals, oversubscription factors, technical and weather downtime and paper counts.

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## The Service Programme of the Isaac Newton Group of Telescopes

Javier Méndez (Isaac Newton Group of Telescopes)

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The Isaac Newton Group of Telescopes (ING) Service Programme aims at providing astronomers with a rapid and flexible tool for obtaining small sets of observations on the William Herschel Telescope up to 8 hours. This can be used to try new ideas or complement a regular observing programme allocated on the ING telescopes, for instance. Proposals are accepted from principal investigators working in an institution located in the United Kingdom, the Netherlands or Spain, but also regardless the nationality of the host institution. A Monthly deadline for application submission takes place at midnight on the last day of each month but urgent requests submitted at any time can also be accepted. Proposals are generally withdrawn from the scheme after a one year period. In this poster we provide an overview of the programme and some statistics.

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## Fotometría y el Observatorio Virtual

Carlos Rodrigo Blanco (CAB)

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Si bien existen datos fotométricos disponibles para un gran número objetos en diferentes rangos de longitud de onda, la tarea de construir una distribución espectral de energía combinando observaciones de orígenes distintos (por ejemplo, para compararla con modelos teóricos y estimar propiedades físicas del objeto) exige, por lo general, un conocimiento más preciso del origen de esos datos.

Uno de los objetivos del observatorio virtual es definir un conjunto de estándares que faciliten el acceso y manejo de datos fotométricos de diferentes catálogos, especificando las características del filtro observacional con el que han sido obtenidos, los puntos cero, etc.

En esta presentación describiremos la contribución del Observatorio Virtual Español en este campo, tanto en la definición de estándares como en el desarrollo de herramientas de análisis y servicios de datos.

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## Contaminación lumínica en España 2012: Mapa de brillo de fondo de cielo y de emisión contaminante

Alejandro Sánchez de Miguel (Dep. Astrofísica y CC. de la Atmósfera UCM), Zamorano Calvo, Jaime, Gómez Castaño, José, Pascual Ramírez, Sergio, López Cayuela, Marian, Challupner, Peter, Martín Martínez, Guillermo, Pila Díez, Beremice, Gallego Maestro, Jesus, Ocaña, Francisco, Fernandez, Alberto

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Presentamos un mapa preliminar de brillo de fondo de cielo para España basado en las medidas realizadas en la Comunidad de Madrid y el mapa de emisión elaborado gracias a las imágenes de tomadas desde la Estación Espacial internacional. Estos datos han sido contrastados con los datos de consumo energético de la provincias españolas. Se proporciona una estimación de emisión/gasto para cada provincia española y su evolución desde 1992 - 2010.

## Workflows científicos e infraestructuras en la escala de los ExaBytes

Susana Sánchez Expósito (Instituto de Astrofísica de Andalucía - CSIC), J.E. Ruiz, L. Verdes-Montenegro, J.D. Santander-Vela, A. Ruiz-Falcó, R. Badía.

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El reto tecnológico que supone instrumentos astronómicos como el Square Kilometer Array (SKA) capaces de generar volúmenes de datos multidimensionales en el rango de los ExaBytes, exige que evolucionen tanto las infraestructuras de computación y de almacenamiento como las herramientas usadas por los astrónomos para el análisis de los datos.

AMIGA4GAS (AMIGA para GLT, ALMA y SKA pathfinders), es un proyecto coordinado entre el Instituto de Astrofísica de Andalucía (IAA-CSIC) y la Fundación Centro de Supercomputación de Castilla y León (FCSCCL), liderado por el grupo AMIGA (Análisis del Medio Interestelar de las Galaxias Aisladas, <http://amiga.iaa.es>) del IAA-CSIC, en el que colabora el Barcelona Supercomputing Center (BSC).

Este proyecto trata de abordar este reto tecnológico desde tres frentes:

(\*)Desarrollo de estándares para el Observatorio Virtual que permitan consultas de datos multidimensionales y servicios de análisis.

(\*)Implementación de workflows científicos como herramienta que proporciona automatización, modularidad y adaptabilidad del experimento, reproducibilidad de los resultados y que fomenta las buenas prácticas en la metodología del astrónomo permitiendo una eficaz explotación de los datos.

(\*)Federación de infraestructuras de computación y almacenamiento como medio para ofrecer una plataforma común en la que ejecutar los workflows científicos y mejorar el aprovechamiento de los recursos.

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## Photometric calibration of the J-PAS and J-PLUS surveys

Jesús Varela López (CEFCA), Nicolas Gruel, David Cristóbal, Mariano Moles

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J-PAS (Javalambre-PAU Astrophysical Survey) will be a multiband survey of 8000 deg<sup>2</sup> of the sky that will be carried out from the Observatorio Astronómico de Javalambre (OAJ, Teruel, Spain). In order to do such large survey it will be installed in the OAJ a high étendue 255cm telescope (Javalambre Survey Telescope, JST) equipped with a very wide field camera with 14 CCDs and a system of 54 narrow band filters plus 2 intermediate band filters.

The characteristics of a survey like this one make unfeasible to perform a traditional calibration procedure observing standard stars every night, and, therefore, an alternative is needed. For this reason, a previous survey of the same region (Javalambre Photometric Local Universe Survey, J-PLUS) will be carried out with an on-purpose 80cm telescope equipped with a 2deg<sup>2</sup> camera and a system of 12 filters. The filter system will allow to identify the stellar spectral type of a large number of stars in the sky from which synthetic magnitudes in the J-PAS filter system will be computed. The comparison of the synthetic magnitudes with the observed ones will be used to calibrate the photometry in the J-PAS fields. Finally, once the whole survey is finished, it will be possible to perform an “übercalibration” to improve the internal photometry of the whole survey.

In this contribution I will present in more detail the whole process of photometric calibration of the J-PLUS and the J-PAS surveys.

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## Oportunidades observaciones con LOFAR

Lourdes Verdes-Montenegro (Instituto de Astrofísica de Andalucía), J. Sabater

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LOFAR (LOW Frequency ARray) es el nuevo radiointerferómetro de baja frecuencia (de 10 a 250 MHz) diseñado por ASTRON, cuyo centro se encuentra en el noreste de los Países Bajos. A las 33 estaciones localizadas en los Países Bajos se unen 8 estaciones internacionales que ya se encuentran operativas. La máxima distancia entre estaciones es de  $\sim 1.400$  km, con la que se obtiene una resolución máxima de 0,2 segundos de arco a 250 MHz. Además del radiotelescopio, LOFAR también funciona como una red distribuida de sensores multipropósito usada para geofísica y agronomía.

Actualmente se está realizando el sondeo Multifrequency Snapshot Sky Survey (MSSS), que servirá para realizar un primer modelado del cielo necesario para calibrar los datos que LOFAR generará. MSSS cubrirá todo el hemisferio norte con una resolución mínima de 120 segundos de arco y una sensibilidad de entre 5 y 15 mJy/haz. El primer ciclo de propuestas de observación abierto a la comunidad internacional se abrirá entre mayo y julio de este año (2012). La ciencia y tecnología desarrollada por LOFAR servirá como precursora para el Square Kilometer Array (SKA), el nuevo proyecto global para construir un radiointerferómetro de nueva generación con un área colectora de  $1 \text{ km}^2$ . En este póster se destacarán las principales características del interferómetro así como de la primera llamada a propuestas.

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## Observing with the Telescopi Joan Oró at the Montsec Astronomical Observatory

Francesc Vilardell Sallés (IEEC), J. Colomé, J. Sanz, P. Gil, I. Ribas

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The Joan Oró Telescope (TJO) is a 0.8-m robotic telescope placed at the Montsec Astronomical Observatory (OAdM, Catalonia, Spain). In summer 2010, the TJO finished its robotization and started the scientific exploitation phase. Through internal calls for proposals, the members of the institutions involved in the project are obtaining the first scientific results. The TJO is going now one step further and is currently preparing a public call for proposals by October of 2012. The procedure used to interact with the observers in this autonomous telescope will be explained. We will also describe current projects aimed at increasing the scientific return of the facility.

## Goals and strategies in global control design of the OAJ robotic observatory

Axel Yanes Díaz (CEFCA), S. Rueda, J.L. Antón, F. Rueda, M. Moles, A.J. Cenarro, A. Marin-Franch, A. Ederoclite, N. Gruel, J. Varela, D. Cristobal-Hornillos, S. Chueca, M. Chioare, L. Guillen

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There are many ways to solve the challenging problem of making a high performance robotic observatory from scratch.

The Observatorio Astrofísico de Javalambre (OAJ) is a new astronomical facility located at the Sierra de Javalambre (Teruel, Spain) whose primary role will be to conduct all-sky astronomical surveys. The OAJ control system has been designed under a global point of view including not only astronomical subsystems but also infrastructure and other facilities.

Three main factors have been considered in the design of a global control system for the robotic OAJ: quality, reliability and efficiency. We propose a control integrated architecture design in order to improve operation processes, minimize resources and obtain high cost reduction maintaining quality requirements.

The OAJ subsystems considered for the control integrated architecture are the following: two wide-field telescopes (a 2.55-m telescope, T250, and a 0.82-m telescope, T80) and their instrumentation, active optics subsystems, facilities for sky quality monitoring (seeing, extinction, sky background, sky brightness, clouds distribution, meteorological station), domes and several infrastructure facilities such as water supply, glycol water, water treatment plant, air conditioning, compressed air, LN2 plant, illumination, surveillance, access control, fire suppression, electrical generators, electrical distribution, electrical consumption, communication network, Uninterruptible Power Supply and two main control rooms, one at the OAJ and other remotely located in Teruel at 40km from the observatory, connected through a microwave radio-link.

Here we present the OAJ strategy in control design to achieve maximum quality efficiency for the observatory processes and operations, giving practical examples of our approach.

# Enseñanza y Divulgación de la Astronomía: Orales



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**SESIÓN E1, JUEVES DE 17:50 A 19:30** (Moderador: Enric Marco)

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17:50–18:20	I	Eloi Arisa Alemany	Proyecto UNAWWE & astronomía en países desfavorecidos
18:20–18:50	I	Vicent Martínez	Teaching and Communicating Astronomy: Two Sides of the Astronomer's Profession
18:50–19:10	C	Ana Inés Gómez de Castro	Recursos didácticos para la introducción de la investigación espacial y astronómica en las aulas
19:10–19:30	C	Salvador José Ribas Rubio	La Ruta de los Orígenes tiene parada en el Montsec. Observaciones y otras actividades educativas
19:30–19:35	P	Sesión de pósteres	Coordina Enric Marco

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**SESIÓN E2, VIERNES DE 15:30 A 17:20** (Moderador: Nicolás Cardiel)

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15:30–16:00	I	Jaime Zamorano	Proyecto NIXNOX. Disfrutando de los cielos oscuros
16:00–16:20	C	Enric Marco Soler	Contaminación lumínica en los parques naturales valencianos. Donde la luz no solo molesta a los astrónomos
16:20–16:40	C	Antonio Pérez Verde	Red Española de Divulgación de Astronomía
16:40–17:00	C	José A. Caballero	Collaborating with "professional.amateurs: low-mass stars in fragile multiple systems
17:00–17:20	C	Carlos Rodrigo Blanco	Un proyecto de ciencia ciudadana para la identificación de NEAs utilizando archivos astronómicos

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I = Conferencia Invitada, C = Contribución Oral



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<p style="text-align: center;"><b>Sesión E1 (jueves 12, 17:50-19:30)</b> <b>Salón de Grados</b></p>
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**Proyecto UNAWE - astronomía en países desfavorecidos**

*[Conferencia Invitada]*

Eloi Arisa Alemany (Universidad Politécnica de Catalunya)

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El proyecto UNAWE nació en 2005 con la voluntad de que los niños y las niñas de cualquier país y condición, tuvieran contacto con la astronomía. Este es el primer intento a gran escala de usar la astronomía como herramienta para inspirar y educar a los más pequeños. Los recursos del proyecto están abiertos a todos, pero principalmente están dirigidos a niños y niñas de 4 a 10 años de edad. El proyecto está presente en países de todo el mundo, englobando y apoyando las actividades que se realizan en ellos.

El proyecto europeo, EU-UNAWE, financiado por la Unión Europea, incluye seis países, concretamente Alemania, Italia, Holanda, Reino Unido, Sudáfrica y España. EUNAWE-España basa su actividad en la realización de cursos de formación para maestros y profesoras: en Barcelona en noviembre de 2011, en Granada y Madrid en febrero de 2012 y en Pamplona en mayo de 2012. Así como en la publicación de material didáctico que va desde actividades prácticas y experiencias a cuentos y relatos para niños realizados por maestros en todos el mundo de habla hispana. Todo ello se puede visitar en la web del programa.

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**Teaching and communicating Astronomy: two sides of the astronomer's profession**

*[Conferencia Invitada]*

Vicent Martínez (Observatorio Astronómico, Universidad de Valencia)

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In this contribution I will talk about the common aspects of two different activities in which many of us are involved: teaching astronomy at the university and communicating astronomy to a general audience.

I will focus more on How, trying to learn about successful (or else) experiences of different astronomers (and other scientists) teaching in class or communicating science to the public in different media: in front of a live audience, in a web page, in an article for a magazine or a newspaper, writing books, making a video for youtube, talking to a camera in a TV program, or even dealing with special audiences (communicating astronomy to blind people, for example).

In all these cases, I will try to put the emphasis in the need for the astronomer to transmit his/her own passion for the topic he/she wants to teach or communicate. It is not easy in a class to captivate the audience's attention and keep it alive, but this must be the goal. The audience (both the students in class and the general public) should share with the astronomer the enthusiasm about what is a fascinating story. When an astronomer is communicating with a general audience, he or she is telling a story. This is quite different from just translating to the layman language the results that were published on a scientific paper.

## **Recursos didácticos para la introducción de la investigación espacial y astronómica en las aulas**

Ana Inés Gómez de Castro (UCM), Fátima López Martínez, Faustino Organero, Victor Rodrigo Gudiel, et al  
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En la contribución se presentarán algunos de los proyectos puestos en marcha a escala europea y española para llevar la investigación científica a las aulas (DISCOSMOS, G-HOU, EU-HOU, GTTP). Se ofrecerá con posterioridad a los profesores asistentes interesados la oportunidad de utilizar algunas de las herramientas y de participar en una sesión de formación.

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## **La Ruta de los Orígenes tiene parada en el Montsec. Observaciones y otras actividades educativas**

Salvador José Ribas Rubio (MONTSEC)  
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El proyecto europeo “La Ruta de los Orígenes” es un proyecto POCTEFA de cooperación territorial entre socios del sur de Francia y de Catalunya. Entre los ámbitos de este proyecto destaca la astronomía y las ciencias del espacio. En particular, la “parada” del Parc Astronòmic Montsec nos ha permitido poner en marcha una serie de actividades educativas variadas. Se están realizando estancias de intercambio entre escolares a ambos lados de los Pirineos así como la puesta en marcha de nuevos talleres y actividades observacionales. Aunque quizá uno de los puntales astronómicos sea la puesta en marcha de actividades de observación guiada en remoto a través de Internet.

Las observaciones guiadas remotas funcionan de forma que los escolares pueden seguir la observación que se realiza desde el Centre d’Observació de l’Univers, hacer consultas sobre ella e incluso intervenir en la misma. Para ello hemos tenido que instalar una serie de equipos en el Centro para la vigilancia del entorno y de los telescopios (cámaras IP, automatismos en cúpula, enchufes controlados por red, etc) y hacerlo de forma que pudiera ser inteligible para su puesta en práctica frente a escolares.

En paralelo a las observaciones guiadas remotas, se ha puesto en marcha el sistema informático para poder realizar actividades de webcasting de eventos astronómicos de especial relevancia, como han sido el eclipse parcial de Sol de inicios de 2011 o será la expedición a “la búsqueda” del Tránsito de Venus 2012.

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## Sesión E2 (viernes 13, 15:30-17:20)

Salón de Grados

### Proyecto NIXNOX: Disfrutando de los cielos oscuros

*[Conferencia Invitada]*

Jaime Zamorano (UCM)

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El proyecto NIXNOX de la Sociedad Española de Astronomía (SEA) es una colaboración Pro-Am con el fin de encontrar lugares con cielo oscuro. Las medidas del brillo de fondo de cielo están siendo obtenidas por astrónomos aficionados con ayuda de fotómetros SQM (Sky Quality Meters). No se buscan sitios remotos sino parajes accesibles por personas con niños. El principal objetivo consiste en motivar a los ciudadanos para que salgan a observar el cielo nocturno. NIXNOX proporcionará información para responder a la pregunta: ¿Dónde puedo llevar a mi familia a observar las estrellas?

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### Contaminación lumínica en los parques naturales valencianos. Donde la luz no solo molesta a los astrónomos

Enric Marco Soler (UV), Ángel Morales Rubio (Dep. de Química Analítica, UV y Coordinadora en Defensa de los Bosques del Turia), Joan Manuel Bullón (Agent Mediambiental-Cap de Zona, GV y Agrupació Astronòmica de la Safor)

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La contaminación lumínica no solo afecta a la observación astronómica; además ejerce efectos profundos sobre la fauna y la flora que vive alrededor de la noche y de la cadencia de luz. Está bien documentado internacionalmente que un exceso de puntos de luz artificial que irradian indiscriminadamente en todas las direcciones resulta incompatible con la vida animal nocturna. Los parques naturales valencianos se encuentran muy afectados por el problema, y salvo el Parc Natural de l'Albufera, ningún estudio en profundidad se ha realizado hasta la fecha en ellos.

El Parc Natural del Túria cubre un área de protección de 4692 hectáreas. Su proximidad al área metropolitana de Valencia le hace sufrir una gran presión urbanística, que se manifiesta en fuegos, talas, vertederos incontrolados, contaminación del agua, del suelo y del aire. Pero la polución causada por el exceso de luz afecta el entorno y el interior del parque. En el 2011, una intensa campaña de recogida de datos y su presentación en un congreso internacional, así como la denuncia y difusión en los medios de comunicación y en los municipios implicados están empezando a obtener tímidos resultados como la reciente aprobación de la ordenanza de prevención de la contaminación lumínica de Paterna, la principal población del parque con 66000 habitantes.

Actualmente las medidas del fondo de cielo nocturno se han extendido a otros parques naturales y áreas de interés mas alejadas del área metropolitana de Valencia para evaluar, en primer lugar la contaminación lumínica y posteriormente ver cómo afecta a las comunidades animales y vegetales.

Los parques naturales en los que se presentan resultados son: Serra Calderona, Serra d'Espadà, Chera-Sot de Chera, Puebla de San Miguel; y las áreas de interés comarca de los Serranos y l'Ombria del Benicadell.

Este trabajo se ha realizado con la colaboración de astrónomos aficionados.

## Red Española de Divulgación de Astronomía

Antonio Pérez Verde (CAB)

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La Red Española para la Divulgación de la Astronomía comenzó a funcionar en julio de 2011. Un año después, mostraremos los datos numéricos que representan la divulgación en Astronomía que se ha hecho en España.

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### Collaborating with “professional amateurs”: low-mass stars in fragile multiple systems

José A. Caballero (CAB), Genebriera, Tobal, X. Miret, Rica Romero, Cairol, N. Miret, Novalbos, Montes, Klutsch

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The boundary between professional and amateur astronomers gets narrower and narrower. I am presenting several real examples, most of them published in refereed journals, of works resulting from my fruitful collaboration with the Observatori Astronòmic del Garraf, Observatorio de Tacande, key amateur astronomers in Spain and colleagues at the Universidad Complutense de Madrid. The common denominator of these works is the search for binaries, mostly nearby, wide, common proper-motion pairs with low-mass stellar components, but there is also room for the first comprehensive survey of wide resolved pairs in the sigma Orionis cluster.

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### Un proyecto de ciencia ciudadana para la identificación de NEAs utilizando archivos astronómicos

Carlos Rodrigo Blanco (CAB), Enrique Solano

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Existe un número importante de asteroides cercanos a la Tierra cuyas órbitas es importante conocer con gran precisión para prevenir posibles colisiones futuras con nuestro planeta.

Para ello es necesario realizar observaciones del objeto en diferentes épocas. Cuantas más observaciones tengamos de cada objeto y más separadas en el tiempo, mejor conoceremos su órbita.

En el Observatorio Virtual hay disponibles millones de imágenes de proyectos de cartografiado de grandes zonas del cielo en las que sería posible encontrar algunos de estos objetos y medir su posición con precisión. No obstante, la realización manual de este tipo actividades requiere una gran cantidad de tiempo y recursos.

Teniendo en cuenta esto y que a su vez es un tema atractivo para el público en general, en el Observatorio Virtual Español hemos desarrollado una aplicación que nos ha permitido poner en marcha un proyecto de ciencia ciudadana en el que cualquier persona interesada puede acceder a imágenes astronómicas y medir con precisión la posición de asteroides cercanos a la Tierra.

Hasta el momento (marzo 2012), el sistema cuenta con más de 3000 usuarios registrados quienes han producido más de 1500 medidas nuevas (publicadas por el Minor Planet Center) para más de 350 asteroides cercanos a la Tierra.

En esta presentación se describirán las principales características del proyecto.

# Enseñanza y Divulgación de la Astronomía: Pósteres



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## Buscando vida en el Universo

Luis Cuesta Crespo (CAB), UCC-CAB

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Buscando vida en el Universo es un proyecto divulgativo del Centro de Astrobiología que pretende mostrar a través de experimentos sencillos la actividad científica del centro. Esta propuesta sirve de guía para presentar el plan de actividades de la Unidad de Cultura Científica del CAB.

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## Aplicación y uso del Observatorio Virtual en la enseñanza de la Astronomía y la Astrofísica en la Universitat Internacional Valenciana (VIU)

Pascual D. Diago Nebot (VIU), Juan Gutiérrez-Soto (VIU), José Enrique Ruiz del Mazo (IAA-CSIC) y Enrique Solano Márquez

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El máster en Astronomía y Astrofísica de la Universitat Internacional Valenciana (VIU) es un claro ejemplo de cómo el desarrollo actual de las Tecnologías de la Información y Comunicación (TIC) y de los métodos de e-Learning están revolucionando el sector de la enseñanza a distancia tradicional.

Dentro de este marco, presentamos en esta pequeña aportación en formato póster, aplicaciones concretas del uso de las herramientas proporcionadas por el Observatorio Virtual (VO) aplicadas a la enseñanza de la Astronomía y la Astrofísica en los modelos de educación superior y sus resultados de aprendizaje.

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## Linking the Roque de los Muchachos Observatory with the local secondary schools

Javier Méndez (Isaac Newton Group of Telescopes), The LPIYA Group

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In 2009 the participating organisations at the Roque de los Muchachos Observatory started a programme to reach every secondary school student from La Palma every year, with the intention of offering a first-hand approach to the world of research and an inspiring and fruitful experience to both students and teachers. Here we report on the first years of operation, our conclusions and some ideas for the future.

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## Determinación de la Calidad de Cielo en el Parque Nacional de Monfragüe

David Rodríguez-Estecha Álvarez (Escuela de Ingenieros Industriales de Extremadura), Florentino Sánchez-Bajo

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El Parque Nacional de Monfragüe, ubicado en la provincia de Cáceres, presenta unas condiciones excepcionales para la observación astronómica. En el póster, exponemos los resultados obtenidos sobre la evolución estacional de la transparencia atmosférica, abundancia y tamaño de los aerosoles atmosféricos así como brillo de fondo durante algunas noches de pasado año y del actual.

## Divulgación del Programa Consolider-GTC

Natalia Ruiz Zelmanovitch (Centro de Astrobiología, CSIC-INTA), Miguel Mas, Emilio Alfaro  
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El Gran Telescopio Canarias (GTC) es uno de los mayores telescopios del mundo de su clase. El proyecto CONSOLIDER INGENIO 2010-GTC, “Primera Ciencia con el Gran Telescopio CANARIAS (GTC): La Astronomía Española en Vanguardia de la Astronomía Europea”, financiado por el Ministerio de Ciencia e Innovación (MICINN), ha aprovechado el GTC como trampolín para conseguir Ciencia puntera con datos de GTC, mayor implicación de la comunidad astronómica en proyectos de instrumentación astronómica, ha utilizado el GTC como palanca para conseguir una importante participación española en la nueva generación de telescopios gigantes (ELTs) y comunicar a la sociedad los principales resultados. El programa Consolider-GTC (2006-2012), ha promovido la difusión de la astronomía llevada a cabo por los miembros de la colaboración con diferentes actividades: noticias, reportajes, entrevistas, atención a los medios, difusión de resultados científicos, vídeos, exposiciones, charlas y, para cerrar el año, se han diseñado una serie de unidades didácticas con el fin de ponerlas a disposición de los profesores de secundaria y un vídeo sobre “Cómo nace un instrumento”.

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## Proyectos educativos basados en observatorios remotos y robóticos

Juan Ángel Vaquerizo Gallego (CAB)

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Los observatorios remotos y robóticos educativos son cada vez más numerosos. En el presente trabajo presentamos el nuevo proyecto CESAR (Cooperation through Education in Science años Astronomy Research) y las sinergias que se han establecido con el proyecto PARTNeR (Proyecto Académico con el Radio Telescopio de NASA en Robledo).

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## Reuniones de Grupo

### **RG1: CSUG** (reunión abierta)

Lunes 9, 16:00 – 17:20

Lugar: Hemiciclo

Contacto: Pedro Álvarez (pedro.alvarez@gtc.iac.es)

Reunión del Comité de Seguimiento de la Utilización del GTC (CSUG)

### **RG2: Almuerzo con astrónomas** (reunión no abierta)

Martes 10, 13:30 – 15:30

Lugar: Aula 1.4

Contacto: Isabel Márquez (isabel@iaa.es)

La comisión de la SEA “Mujer y astronomía” propone esta sesión abierta, a la que están invitadas todas las personas interesadas, y donde tendremos la oportunidad de encontrarnos para debatir la situación de las mujeres astrónomas. Contaremos con la intervención de Pilar López Sancho, profesora de investigación del CSIC y presidenta del grupo de “Mujeres y Física” de Real Sociedad Española de Física, que cumple en 2012 sus 10 años de andadura.

### **RG3: “Discover the Cosmos. E-ciencia en los Institutos.”**

**Programa Galileo de Formación de Profesores** (reunión no abierta)

Martes 10, 15:30 – 19:30

Lugar: Aula 1.4

Contacto: Ana Inés G3mez de Castro (anai\_gomez@mat.ucm.es) y Pere Blay (pere.blay@uv.es)

M3s informaci3n: <http://www.site.galileoteachers.org/>

### **RG4: “MIRADAS”** (reunión no abierta)

Martes 10, 19:30 – 21:30

Mi3rcoles 12, 17:50 – 19:30

Lugar: Aula 1.3

Contacto: Francisco Garz3n (fgl@iac.es)

Reunión del Equipo Científico de MIRADAS (MIRADAS Science Working Group meeting)

**RG5: “Ciencias Planetarias” (reunión abierta)****Martes 10, 19:45 – 21:45****Lugar: Aula 1.4****Contacto: Adriano Campo Bagatín (acb@ua.es)**

Reunión de la comunidad de ciencias planetarias y exploración espacial, en el ámbito del Sistema Solar.

**RG6: “El catálogo ALHAMBRA: AB~26, 23 filtros, 3 grados cuadrados, 450,000 objetos” (reunión abierta)****Miércoles 11, 17:50 – 19:30****Lugar: Salón de Actos****Contacto: Alberto Fernández Soto (fsoto@ifca.unican.es)**

El objeto de esta reunión abierta es presentar los primeros resultados completos del Proyecto ALHAMBRA a la comunidad nacional. ALHAMBRA ha sido el primer proyecto a largo plazo con tiempo garantizado en el Observatorio de Calar Alto. El catálogo que será abierto a la comunidad en breve contiene datos fotométricos y de redshift de más de 400,000 galaxias, cuásares y estrellas, hasta una profundidad AB~25. Diferentes grupos de trabajo están ya analizando este catálogo y presentarán los resultados iniciales y el estado actual de sus estudios. Presentaremos también las características generales del catálogo y las herramientas para su utilización.

**RG7: “RAVET” (reunión abierta)****Miércoles 11, 17:50 – 19:30****Lugar: Aula 1.4****Contacto: Vicent Quilis (vicent.quilis@uv.es)****RG8: “SKA” (reunión no abierta)****Jueves 12, 17:50 – 19:45****Lugar: Aula 1.3****Contacto: Jose Carlos Guirado (guirado@uv.es)**

En esta reunión, abierta a todos los asistentes, se comentarán los principales objetivos científicos de la comunidad española en relación con KSP de SKA.

**RG9: “Reunión del Grupo Científico Español de WEAVE” (reunión no abierta)**

**Jueves 12, 19:45 – 21:45**

**Lugar: Aula 1.4**

**Contacto: J. A. López Aguerri (jalfonso@iac.es), F. Figueras (cesca@am.ub.es), C. Jordi (carne@am.ub.es)**

La reunión tiene por objetivo estructurar la colaboración del grupo e informar sobre los avances en el diseño del instrumento y la ejecución del proyecto.



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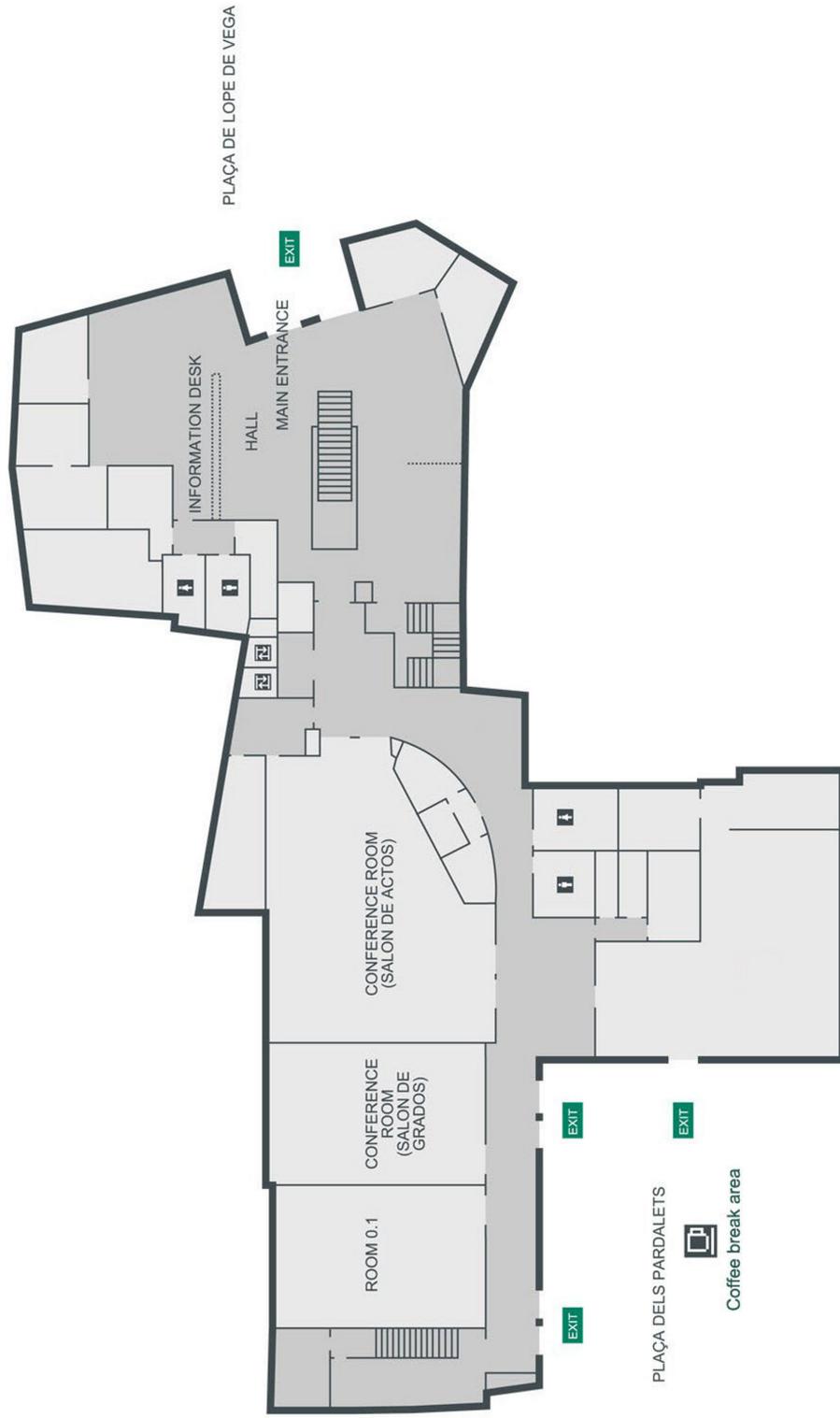


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