

Libro de resúmenes

XII REUNIÓN CIENTÍFICA DE LA SOCIEDAD ESPAÑOLA DE ASTRONOMÍA

Bilbao 18-22 Julio de 2016 Bizkaia Aretoa

ÍNDICE GENERAL

COMITÉS	4
Comité Organizador Científico (SOC)	4
Comité Organizador Local (LOC)	4
PATROCINADORES	5
RESUMEN PROGRAMA GENERAL	7
PLANO BIZKAIA ARETOA	
PROGRAMA CIENTÍFICO GENERAL	9
CONFERENCIAS PLENARIAS	14
SESIÓN MONOGRÁFICA SOBRE JWST	
SESIÓN MONOGRÁFICA SOBRE SKA	21
SESIÓN ESPECIAL: INVITACIÓN A LA SOCIEDAD BRASILEÑA DE ASTRONOMÍA	
CIENCIAS PLANETARIAS	
Sesión CP: martes 19 julio - tarde	
Sesión CP: miércoles 20 julio - mañana	
Sesión CP: miércoles 20 julio - tarde	31
Sesión CP: jueves 21 julio - mañana	
Pósteres	
ENSEÑANZA Y DIVULGACIÓN	
Sesión ED: lunes 18 julio - tarde	
Sesión ED: miércoles 20 julio - mañana	
Sesión ED: jueves 21 julio - tarde	
Pósteres	
FÍSICA SOLAR	56
Sesión FS: lunes 18 julio - tarde	
Sesión FS: miércoles 20 julio - tarde	
Sesión FS: viernes 22 julio - mañana	61
Pósteres	
GALAXIAS Y COSMOLOGÍA	67
Sesión GC: lunes 18 julio - tarde	67
Sesión GC: martes 19 julio - mañana	70
Sesión GC: martes 19 julio - tarde	73
Sesión GC: miércoles 20 julio - mañana	
Sesión GC: miércoles 20 julio - tarde	
Sesión GC: jueves 21 julio - mañana	
Sesión GC: jueves 21 julio - tarde	
Sesión GC: viernes 22 julio - mañana	
Sesión GC: viernes 22 julio - tarde	91
Pósteres	
INSTRUMENTACIÓN Y SUPERCOMPUTACIÓN	107
Sesión IS: martes 19 julio - mañana	

Sesión IS: martes 19 julio - tarde	
Sesión IS: jueves 21 julio - mañana	
Sesión IS: jueves 21 julio - tarde	
Sesión IS: viernes 22 julio - mañana	
Pósteres	
LA VÍA LÁCTEA Y SUS COMPONENTES	
Sesión VL: lunes 18 julio - tarde	
Sesión VL: martes 19 julio - mañana	
Sesión VL: miércoles 20 julio - mañana	
Sesión VL: miércoles 20 julio - tarde	
Sesión VL: jueves 21 julio - mañana	
Sesión VL: jueves 21 julio - tarde	
Sesión VL: viernes 22 julio - mañana	
Sesión VL: viernes 22 julio - tarde	
Pósteres	
REUNIONES DE GRUPO	

<u>COMITÉS</u>

Comité Organizador Científico (SOC)

- Francesca Figueras
- Almudena Alonso Herrero
- Santiago Arribas
- Andrés Asensio Ramos
- Carlos Hernández-Monteagudo
- Agustín Sánchez-Lavega
- Rainer Schödel
- Eva Villaver

Comité Organizador Local (LOC)

La organización local corre a cargo del Grupo de Ciencias Planetarias de la Universidad del País Vasco/Euskal Herriko Unibertsitatea (UPV/EHU), dirigido por Agustín Sánchez-Lavega y formado por profesores e investigadores de la Escuela de Ingeniería de dicha universidad:

- Agustín Sánchez-Lavega
- Naiara Barrado-Izagirre
- Santiago Pérez-Hoyos
- José Félix Rojas
- Ricardo Hueso
- Arrate Antuñano
- Jesús Arregi
- Teresa del Río Gaztelurrutia
- Itziar Garate-Lopez
- Jon Legarreta
- Iñaki Ordoñez
- Hao Chen Chen
- Jose Fco. Sanz-Requena (UEMC)

PATROCINADORES

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















WEAVE. Sistema de Traslación de Foco primario SENER ha diseñado e implementado el Sistema deTraslación de Foco (STF) para el William Herschel Telescope.

Liderando la innovación en Espacio y Astronomía

SENER está presente en el campo de la astronomía terrestre y las grandes instalaciones científicas desde el año 2000 y cuenta con una amplia cartera de proyectos que avalan la calidad de sus soluciones, para clientes como el Instituto de Astrofísica de Canarias (IAC) y el Observatorio Europeo Austral (ESO).











PLANO BIZKAIA ARETOA



PROGRAMA CIENTÍFICO GENERAL

Lunes, 18 de julio de 2016	
9:00 - 9:40	Apertura y Bienvenida
9:40 - 10:00	Rafael Bachiller, gestor del Plan Estatal de Investigación: Área de Ciencias del Espacio, España-ESO y el área AYA del Plan Estatal de I+D+i
10:00 - 10:20	Ramón García-López, gestor del Plan Estatal de Investigación: Área de Ciencias del Espacio
10:20 - 10:40	Jordi Torra, coordinador de la RIA
10:40 - 11:00	Javier Gorgas, presentación del estudio de Recursos Humanos de la SEA
11:00-11:30	Patrocinado por:
11:30-12:00	Tim de Zeeuw, Ten years of Spain and ESO
12:00 - 12:20	Roberto Sanchís, The shortest period planets. Premio SEA a la mejor tesis doctoral en Astrofísica del año 2014.
12:20 - 12:40	Ariadna Calcines, Design of an Integral Field Spectrograph for the European Solar Telescope. Premio SEA a la mejor tesis doctoral en 'Instrumentación, Computación y Desarrollo Tecnológico en Astronomía y Astrofísicaaño 2014.
12:40 - 13:00	Ignacio Martín -Navarro, Galactic archeology: unearthing the early Universe through stellar populations analysis. Premio SEA ex aequo a la mejor tesis doctoral en Astrofísica del año 2015.
13:00 - 13:20	Joel Sánchez Bermúdez, Depicting massive stars physics with infrared interferometry. Premio ex aequo SEA a la mejor tesis doctoral en Astrofísica del año 2015.
13:20-15:30	Pausa comida
15:30-17:25	Sesión plenaria monográfica JWST (modera: Luis Colina)
	The James Webb Space Telescope
	16:00 Pablo Pérez-González
	JWST- Surveys at high redshift
	IWST- Internal structure in Galaxies
	16:40 Rosa Zapatero Osorio
	JWST- Exoplanets and substellar objects
	1/:00 Noemi Pinilla
	17:20 Luis Colina
	JWST – Concluding remarks
17:20-17:50	Pausa café Patrocinado por:
17:50-19:45	Sesiones Paralelas

PROGRAMA CIENTÍFICO GENERAL

Martes, 19 de julio de 2016	
9:00-11:00	Sesiones Paralelas
11:00-11:30	Pausa café Patrocinado por:
11:30-13:30	Sesión Plenaria
	Núria Huélamo Circumstellar disks and planetary systems: the ESO view
	Carme Jordi The Gaia mission delivers its first data release
	Luisa Lara New Science from Rosetta
13:30-15:30	Pausa comida
15:30-17:20	Sesión plenaria monográfica SKA (modera: Lourdes Verdes- Montenegro)
	 15:30 Philip John Diamond SKA, the Square Kilometer Array 15:55 Lourdes Verdes Montenegro The Spanish participation in the Square Kilometre Array (SKA) 16:20 Diego Herranz (IFCA) Cosmic Dawn, Reionization Epoch and Synergies with CMB radiation 16:35 Ivan Agudo (IAA) An overview of AGN studies with SKA on the parsec scale 16:50 Miguel Ángel Pérez-Torres (IAA) Core-collapse and Type Ia SNe, and Nearby Normal and Luminous Infrared Galaxies 17:05 Guillem Anglada (IAA) Protoplanetary Disks, Jets, and the Birth of the Stars
17:20 - 17:50	Pausa café Patrocinado por:
	added value solutions
17:50 - 19:45	Sesiones Paralelas

e.

Miércoles, 20 de julio de 2016	
9:00-11:00	Sesiones Paralelas
11:00-11:30	Pausa café Patrocinado por:
11:30-13:30	Sesión Plenaria
	Mercedes Mollá The evolution of the Oxygen abundance radial gradient and its relation with the star formation and the infall rate histories
	Thaisa Storchi Bergmann Feeding and feedback of Supermassive Black Holes in the present day Universe
	Javier Cenarro J-PAS and J-PLUS: large sky multi-filter surveys from the Observatorio Astrofísico de Javalambre
13:30 - 15:30	Pausa comida
15:30 - 17:20	Sesión Plenaria
	Manuel Collados EST: El futuro de la física solar en Europa
	Manel Martínez The Cherenkov Telescope Array (CTA): a unique opportunity for the Spanish Astrophysics community
	Carlos Peña Garay Astroparticles and Cosmology
17:20 - 17:50	Pausa café Patrocinado por: tecnalia Inspiring Business
17:50-19:45	Sesiones Paralelas

PROGRAMA CIENTÍFICO GENERAL

Jueves, 21 de julio de 2016	
9:00-11:00	Sesiones Paralelas
11:00 - 11:30	Pausa café Patrocinado por: Cryovac
11:30-13:30	<u>Sesión Plenaria</u>
	Glenn Orton The Juno Mission
	Jens Chluba Science with CMB Spectral Distortions: a New Window to Early-Universe and Particle Physics
	Xavier Barcons Athena: the ESA's X -Ray observatory to study the Hot and Energetic Universe in the late 2020s
13:30 - 15:30	Pausa comida
15:30-17:20	Sesiones Paralelas
17:20 - 17:50	Pausa café
17:50-19:45	Asamblea SEA

Viernes, 22 de julio de 2016	
9:00 - 11:00	Sesiones Paralelas
11:00-11:30	Pausa café
11:30-13:30	Sesión Plenaria: Homenaje a Javier Gorosabel Ana Nicuesa GRBs afterglows Jens Hjorth The GRBs, a review La ciencia y la persona de Javier Gorosabel Antxon Alberdi, Miguel Mas Hesse, Alberto Castro-Tirado, Benjamín Montesinos, Antonio de Ugarte, Rubén Sánchez, Agustín Sánchez
	Fin del acto a cargo de J. Gorgas (presidente SEA) y J. Vilchez (director IAA)
13:30 - 15:30	Pausa comida
15:30-17:20	Sesiones Paralelas
17:30	Clausura de la XII Reunión Científica de la SEA

CONFERENCIAS PLENARIAS

Ten years of Spain and ESO-Spain

Tim de Zeeuw (Director general de ESO)

ESO is an international organisation for astronomy founded in 1962 by five countries. Spain joined in 2006 as the 12th Member State. ESO currently has 15 Member States in Europe with Brazil poised to become the 16th. Together these countries represent approximately 30 percent of the world's astronomers. ESO operates optical/infrared observatories on La Silla and Paranal in Chile, partners in the sub-millimetre radio observatories APEX and ALMA on Chajnantor and has started construction of the Extremely Large Telescope on Armazones. It may also operate the southern Cherenkov Telescope Array near Paranal. La Silla hosts robotic and national telescopes as well as the venerable 3.6m telescope, which is a premier facility for exoplanet research through radial velocity studies, and the NTT which is increasingly focused on transient follow-up. Paranal is ESO's flagship observatory. The four 8.2m units of the Very Large Telescope, the Interferometer and the survey telescopes VISTA and VST constitute a unique integrated system which supports 16 powerful facility instruments, including adaptive-opticsassisted imagers and integral-field spectrographs, with half a dozen more on the way including the GRAVITY experiment and the ESPRESSO spectrograph both of which can use all four 8.2m telescopes at the same time. The Adaptive Optics Facility with its four laser guide stars and deformable secondary mirror will enable diffraction limited observations over most of the sky as of 2017. Paranal science highlights include the characterisation of the supermassive black hole in the Galactic Centre, the first image of an exoplanet, ultra-deep spectroscopy of the early Universe and milli-arcsecond imaging of evolved stars and active galactic nuclei. The construction of the E-ELT with its 39m primary mirror is on track for first light in 2024 as an integral part of the Paranal system with an initial complement of three powerful instruments and excellent adaptive optics capabilities. The single dish APEX antenna, equipped with spectrometers and wide-field cameras, contributes strongly to the study of high-redshift galaxies and of star- and planet-formation. ALMA is the world's most powerful radio telescope, and is transforming our understanding of the cold Universe, through high-resolution, high-sensitivity observations. The presentation will provide a brief overview of ESO's current programme with emphasis on recently added observing capabilities, consider the excellent collaboration with Spain, and will also include a forward look.

The Juno mission

Glenn Orton (JPL, California Institute of Technology, USA, Juno Science team)

Despite years of study, the structure and composition of Jupiter's interior is remains largely unknown, even though it contains key information on the formation and evolution of the solar system in general. The Juno mission will address the poorly known properties of the interior. This mission is the second in a series of NASA's "New Frontiers" missions that began with the New Horizons mission to Pluto and another Kuiper-belt object. The Juno spin-stabilized and solar-powered spacecraft began its journey to Jupiter in August of 2011 and was inserted into orbit around Jupiter in early July. This Jupiter orbit insertion (JOI) maneuver placed the spacecraft into two 53-day orbits, which will be followed by a maneuver that moves the spacecraft into a sequence of highly elliptical 14-day orbits. After the first 14-day "cleanup" orbit, the spacecraft will continue a series of over thirty 14-

day orbits, skimming only 5,000 km above Jupiter's cloud tops on each orbit. lts orientation is optimized for remote sensing in several of the first orbits and gravity sensing for all other orbits. Juno's investigation of Jupiter's interior has three thrusts. One is to map the magnetosphere over all longitudes using in-situ sampling of the magnetic field, electric field, plasma waves and particles in order to determine how the magnetic field is connected to the atmosphere - particularly to atmospheric auroras. Another is to do high-precision mapping of Jupiter's gravity field using precise measurements of the perturbation of the spacecraft's orbit using Doppler tracking. The third is to determine the abundance and map the distribution of gaseous ammonia and water in the deep troposphere, using microwave measurements of Jupiter's thermal output measured from beneath the synchrotron radiation that obscures this spectral region from Earth-based observations. Juno will also be the first mission to offer an instrument, a "color" CCD camera, to make images of Jupiter's clouds for which anybody on the Earth who is interested forms the experiment team: internet-enabled voting will determine where the camera should be pointed on the closest approach ("perijove") of each orbit. The Juno mission is operated by the Jet Propulsion Laboratory, California Institute of Technology, for the US National Aeronautics and Space Administration.

The European Solar Telescope

Manuel Collados (IAC)

Con la primera luz prevista para 2026, el Telescopio Solar Europeo (EST) representa el mayor esfuerzo conjunto realizado por la comunidad europea de física solar. Recientemente incluido como proyecto estratégico a nivel europeo, mejorará considerablemente las capacidades observacionales actuales, gracias a sus cuatro metros de diámetro. Su diseño está especialmente pensado para estudiar con el máximo detalle los fenómenos magnéticos que ocurren en la atmósfera solar, minimizando para ello dos aspectos cruciales. Por una parte, su diseño polarimétricamente compensado está concebido para que la polarización instrumental introducida por los diferentes elementos del camino óptico se cancele. Este es un aspecto fundamental para poder determinar fluctuaciones muy pequeñas del campo magnético, tanto espaciales como temporales. En segundo lugar, el diseño incluye un poderoso sistema de óptica adaptativa multiconjugada (MCAO) para poder corregir óptimamente las distorsiones introducidas en el frente de ondas por la turbulencia atmosférica. Con este sistema de MCAO, EST pretende poder medir el sol al límite de difracción, con una resolución de unos 20 km. El diseño está completado con un conjunto completo de instrumentos que operarán simultáneamente. para poder extraer la máxima información de la dinámica, termodinámica y magnetismo del plasma solar en sus diferentes capas. Con este ambicioso esquema, EST pretende llegar a entender cómo se concentra la energía magnética en las capas profundas de la atmósfera de sol, cómo se propaga hacia capas más altas y cómo se libera en ellas, dando lugar al calentamiento y la aceleración del plasma, observables, por ejemplo, como fulguraciones y eyecciones de masa. En esta charla, se presentará la situación actual del proyecto, así como sus perspectivas de desarrollo futuro, haciendo énfasis en los principales desarrollos tecnológicos y en los nuevos modelos de operación que se están diseñando con los telescopios actuales.

The Cosmic Microwave Background and future cosmology

Jens Chluba (Kavli Institute for Cosmology Cambridge, UK)

Since COBE/FIRAS we know that the CMB spectrum is extremely close to a perfect blackbody. There are, however, a number of processes in the early Universe that should create spectral distortions at a level that is within reach of present day technology. I will give an overview of recent theoretical and experimental developments, explaining why future measurements of the CMB spectrum will open up an unexplored window to earlyuniverse and particle physics, with possible non-standard surprises but also several guaranteed signals awaiting us. I will also highlight the complementarity of the distortion signals and the CMB anisotropies, illustrating how future distortions measurements will shed new light on different inflation models.

New Science from Rosetta

Luisa M. Lara (IAA)

Rosetta, the most ambitious space mission of the European Space Agency, arrived at comet 67P/Churyumov-Gerasimenko almost two years ago. During this time, Rosetta spacecraft has been orbiting the comet and its robotic lander Philae successfully landed on the surface. The instruments on-board Rosetta are allowing us to observe the nature of a comet in an unprecedented way, providing us with a wealth of information from this witness of the Solar System formation. It is now when we must begin to fit the pieces of what we are learning in this enormous puzzle that is the formation of our Solar System.

The GRBs, a review

Jens Hjorth (Denmark) (TBC)

Circumstellar disks and planetary systems: the ESO view

Núria Huélamo (CAB, INTA-CSIC)

Circumstellar disks are the cradle of planetary systems. They are very common around young stars and brown dwarfs, and their properties (e.g. dust and gas content, morphology) differ depending on their evolutionary stage. Different observations have shown that disks dissipate after ~10 million years. Therefore, planetary systems should form in a short lapse of time, although the exact mechanism is still unknown. In this talk I will show some of the most remarkable findings in the field of circumstellar disks, and discuss how ESO facilities have contributed to this knowledge.

The Gaia mission status and first data release

Carme Jordi (ICCUB-IEEC)

Gaia astrometric satellite is in its science operational phase since July 2014. At an average rate of about 50 million elementary observations per day, Gaia scans the full sky once every six months. Gaia Data Release 1 (GDR1), expected by end of summer 2016, will contain astrometric and photometric results for more than 1 billion stars brighter than magnitude 20 based on observations acquired during the first 14 months of its operational phase. For about two million of the brighter stars (down to magnitude ~11.5) positions, parallaxes, and proper motions have been obtained to Hipparcos-type precision through a combination with the earlier Hipparcos and Tycho-2 positions. For the remaining stars, positions at epoch J2015.0 have been obtained by essentially neglecting their proper motions and parallaxes. Positions and proper motions will be given in a reference frame aligned with the ICRF radio/VLBI frame at epoch J2015.0. We give an overview of the current status of the mission, the Data Processing and Analysis Consortium operations, the on-going validation processes, the expected contents of GDR1, and the prospects for the future releases. We emphasize that although GDR1 data are based on very provisional and incomplete calibrations, the results represent a huge improvement in the available fundamental stellar data.

GRBs afterglows

Ana Nicuesa (TLS Tautenburg)

Desde su fortuito descubrimiento en 1967, los estallidos de rayos gamma o GRBs (del inglés Gamma-Ray Bursts) representan en la actualidad una de las ramas más productivas de la astronomía moderna. Esto se debe en gran parte a las numerosas conexiones que los GRBs tienen con otras disciplinas como la Cosmología, las supernovas, la evolución estelar, la física nuclear, las astropartículas o la astronomía gravitacional de ondas etc. A esta primera explosión de rayos gamma que es un fenómeno de muy corta duración, le acompaña una post-luminiscencia o afterglow que produce una curva de luz única. Los afterglows se pueden observar desde los rayos X, la franja óptica, el infrarojo y las ondas de radio. Los afterglows de los GRBs son una de las pocas herramientas que tenemos para estudiar el universo primitivo y por ende la formación de las primeras estrellas o la expansión del Universo. En esta charla me centraré en los afterglows de los GRBs y trataré de describir cuál ha sido el avance en el conocimiento de estos fenómenos desde su descubrimiento hasta la actualidad, destacando especialmente las aportaciones de nuestro compañero Javier Gorosabel Urkía.

The Cherenkov Telescope Array

Manel Martínez (IFAE)

The Cherenkov Telescope Array (CTA) will be soon the most important observatory worldwide for Very High Energy (VHE) Gamma Ray Astronomy. With an improvement in sensitivity and energy coverage of one order of magnitude over the present installations, much better energy and angular resolutions, full sky coverage and over thousand sources expected, CTA will open wide the highest energy window of the electromagnetic spectrum. That window will prove essential for the understanding of the most energetic and extreme phenomena in the universe, and to discover unexpected sources and new phenomena. Furthermore, the northern site will be located at the Roque de los Muchachos Observatory (ORM), and that shall place the Spanish Astrophysics Community in a privileged position to propose observations, access the data and led its scientific exploitation. The status of the project, its plans, its scientific goals, the role of the Spanish VHE gamma ray community, and the opportunities that CTA will provide to all the Spanish Astrophysicists will be discussed.

Astroparticle Physics and Cosmology

Carlos Peña Garay (IFIC, Valencia & LSC, Canfranc)

Astroparticle physics is a rapidly growing field of research which includes over three thousand European researchers working on scientific questions entangled between astrophysics, particle physics and cosmology in over fifty laboratories. Some branches of astroparticle physics have shown groundbreaking successes, others have greatly improved their levels of sensitivity. In particular, I will discuss topics in neutrino and dark matter physics. The study of cosmic neutrinos has opened a new window by observing the interior of stars. It can also address the fundamental consequences in the role of these particles in cosmic evolution and to sharpen our view of the sky at extreme energies to, among others, identify the origin of the most energetic cosmic rays. Dark matter, discovered in a variety of observations, remains elusive to detection in particle physics instruments and to production in the most energetic accelerators. More sensitive experiments, but also new observations are needed to help identify the nature of dark matter. I will argue on new observations in astronomy, astrophysics and cosmology which can play an essential role in discovering fundamental physics phenomena in nature.

Xavier Barcons (IFCA)

Athena (Advanced Telescope for High ENergy Astrophysics) is the X-ray observatory mission selected by ESA to address the Hot and Energetic Universe theme, due for launch in 2028. Athena will study the assembly of hot baryons into groups and clusters, their chemical evolution, measure their mechanical energy and characterise the ~40% of the Universe's baryons expected to reside in intergalactic filamentary structures. At the same time, it will study how accretion into supermassive black holes across cosmic time influences galaxies and clusters through feedback processes. Athena will also have a fast target of opportunity capability, enabling studies and usage of GRBs and other transient sources. All classes of astrophysical objects, where high-energy phenomena take place, can be studied with Athena. The Athena mission concept is that of a single large-aperture grazing-incidence X-ray telescope, utilizing a novel technology (Si pore optics) developed in Europe, with 12m focal length and 5 arcsec HEW angular resolution. The focal plane contains two instruments. One is the Wide Field Imager (WFI) providing sensitive widefield of view imaging and low resolution spectroscopy, as well as bright source observation capability. The other one is the X-ray Integral Field Unit (X-IFU) delivering spatially resolved high-resolution X-ray spectroscopy over a limited field of view. Synergies with other facilities (ALMA, E-ELT, SKA etc) are being identified and developed. Spain has an important role in Athena, with a significant contribution to the X-IFU instrument, including the dewar for the detector cooling system, the algorithms for the on-board pulse detection software, and a leading scientific contribution. Spain also leads the Athena Community Office, set up to help optimizing the participation of the more than 800 scientists which are helping to shape up the mission through its working groups.

SESIÓN MONOGRÁFICA SOBRE JWST

The James Webb Space Telescope

Pierre Ferruit (ESA JWST Project Scientist)

The James Webb Space Telescope (JWST), scheduled for launch in October 2018, will be one of the great observatories of the next decade. JWST and its suite of 4 instruments will provide imaging, spectroscopic and coronagraphic capabilities over the 0.6 to 28.5 micron wavelength range and will offer an unprecedented combination of sensitivity and spatial resolution to study targets ranging from our Solar System to the most distant galaxies. In this presentation, I will first give an overview of the capabilities of the mission and present its latest status. I will then give details on the scientific timeline and the organization of the first observation cycles that should of interest for future observers.

JWST- Exoplanets and substellar objects

Rosa M. Zapatero-Osorio (CAB, CSIC-INTA)

JWST- Internal structure in Galaxies

Cristina Ramos Almeida (IAC)

As a pathway for understanding the role of JWST in the study of the internal structures of nearby galaxies, I will summarize relevant results obtained using infrared data from spaceand ground-based telescopes. The Spitzer Space Telescope and the Herschel Space Observatory have been fundamental for investigating star formation and nuclear activity in galaxies thanks to their unprecendented sensitivities. On the other hand, ground-based infrared facilities such as SINFONI, and the MIDI interferometer on the 8m VLT and CanariCam on the 10 m Gran Telescopio CANARIAS allowed us to reach the pc-scale resolution necessary to resolve the innermost region of nearby galaxies and study the impact of internal processes on large-scale galaxy properties. In the JWST era, the improvement in both sensitivity and spatial resolution will represent a major step forward in our understanding of galaxy interiors.

JWST- Surveys at high redshift

Pablo Pérez González (UCM)

I will present the capabilities of JWST in the context of the study of galaxy evolution based on photometric and spectroscopic surveys in the optical and, especially, in the near- and mid-infrared. In particular, I will discuss how JWST can help us to understand the very first phases in the formation of galaxies.

JWST – Solar System. El Sistema Solar que está por venir: ¿preparado para el JWST?

Noemí Pinilla (Florida Space Institute)

El telescopio espacial James Webb (JWST, por sus siglas en inglés) será puesto en órbita a lo largo del año 2018. El diseño de este telescopio y de su carga instrumental, construido a través de una colaboración entre la NASA y la ESA, se ha planificado para que su El JWST, con un espejo primario de 6.5 m, irá equipado con cuatro instrumentos y podrá observar en modo fotométrico, espectroscópico o coronográfico. Así mismo, ha sido equipado con capacidad de seguimiento de objetos con movimiento propio, para proporcionar grandes prestaciones en el campo de la observación de objetos no sidéreos. Todo esto hace que las expectativas, por parte de la comunidad planetaria, respecto a investigaciones basadas en observaciones de objetos de nuestro sistema solar sean muy altas. Estas además abarcan tanto objetos brillantes (p. ej. planetas), como los menores y más oscuros (p. ej. algunos objetos transneptunianos y asteroides primitivos). En esta charla repasaremos algunos ejemplos de proyectos que podría facilitar el JWST cubriendo parte de las condiciones especiales de los peculiares objetos en nuestro sistema solar. También repasaremos las fechas claves para optar a tiempo de observación en este telescopio, y las herramientas ya disponibles para prepararse a tal fin. El principal objetivo de esta charla es que la comunidad española de científicos planetarios comience ${
m a}$ experimentar cierto sentimiento de anticipación. Así mismo se proporcionará la información básica necesaria para prepararse para la gran revolución que JWST significará en el conocimiento del Sistema Solar en la próxima década.

SESIÓN MONOGRÁFICA SOBRE SKA

SKA, the Square Kilometer Array

Philip John Diamond (Director of the SKA project)

The Square Kilometre Array will, when complete, be the largest scientific facility on Earth. It is a radio telescope, designed to tackle some of the most dramatic scientific questions of our time. It will explore fundamental physics through exploring the nature of gravity and gravitational waves; it will provide an enormously powerful probe of magnetism across the Universe; it will provide movies of the early evolution of the Universe and help us to understand the nature of Dark Energy and Dark Matter. It will also enable us to explore the origins of life through observations of bio-molecules, opening up the field of astrobiology. I will describe the principal scientific goals of the SKA and the facility that is being designed to address those goals. I will describe the current status of the project and the schedule for construction and scientific observations.

The Spanish participation in the Square Kilometre Array (SKA)

Lourdes Verdes Montenegro (IAA-CSIC)

In the previous talk the Square Kilometre Array (SKA) project will be presented by its Director General (DG), Phil Diamond. The aim of this presentation is to complement the SKA international view with a revision of the Spanish participation in SKA project, explaining as well the current status of its participation and opportunities of involvement. Spain is actively participating in the SKA detailed design phase, both at a scientific and technological level. The potential of SKA for fundamental breakthroughs in Astrophysics, Physics, and Astrobiology has made that the Spanish SKA White Book has been published, with more than 125 authors who have summarized in 29 chapters the interest of the Spanish scientific community, and participation in 7 SKA Science Working Groups. At the same time, among the 100 companies and research institutions across 20 countries that are contributing to SKA design, 11 Spanish research centres and 11 companies participate in several work packages (Dishes, Signal & Data Transport, Central Signal Processor, Science Data Processor, Telescope Manager, and Infrastructure). This Spanish technological participation in the SKA, with an estimated financial value of ~€2M, has been officially acknowledged by the SKA Board. Since October 2013 a representative of the Spanish government has been regularly invited to participate in the SKA Board meetings. Furthermore, at the beginning of 2014, the Board of the Spanish Astronomy Infrastructures Network endorsed the recommendation issued by the Radio Astronomy Infrastructures working group on the interest of the scientific community and industry that Spain explores the possibility to join the SKA project as Full Member before the construction phase starts. The interest of the Spanish community and industry was restated during the SKA Spanish day held in October 2014 and a new SKA Spanish Industry Day was organized in CDTI last February. Last December a letter from Secretary of State was sent to SKA DG to establish a dialog between Spain and SKA aiming at exploring scenarios for Spain to join SKA.

Cosmic Dawn, Reionization Epoch and Synergies with CMB radiation

Diego Herranz (IFCA)

In this talk we will review the theoretical and observational prospectives of Cosmology and Large Scale Structure studies with the upcoming centimetre and meter wave radio astronomy experiments, as reflected in the recently released 'Spanish Square Kilometre Array White Book', with a focus of the Cosmic Dawn and the Age of Reionization. Centimeter and meter wave radio astronomy will undoubtedly be one of the most powerful tools for Cosmology during the first half of the XXIst century. Many of the fundamental questions of modern Cosmology, such as the nature of the dark energy and dark matter that dominate the dynamics of the Universe, and their role during the dark ages and the Cosmic Dawn of the Universe, will be answered by the SKA and/or similar experiments, in combination with other cosmological probes such as the Cosmic Microwave Background. The Spanish astronomical community has a strong interest in actively participating in these developments, and we have both the expertise and the critical mass that are necessary to play a relevant role in the scientific exploitation of SKA, if Spain gains participation as a full member in the project.

Active Galactic Nuclei at Radio Wavelengths

Ivan Agudo (IAA)

Active galactic nuclei (AGN) are the most powerful long-lived sources of radiation known so far. They can outshine their own host galaxies and produce, from their central supermassive black holes, pairs of powerful relativistic jets radiating huge amounts of radiation all the way across the electromagnetic spectrum. Some of the main questions related to the mechanisms involved on the nature of AGN are related to their parse or sub-parsec scales, where relativistic jets are formed, collimated and accelerated with the help of the accretion disk and wound magnetic fields in the surroundings of the super-massive black holes. Despite decades of study, the exact role of the magnetic field and its structure, the composition and dynamics of the ejected jets, the feedback effect of the jets on the gas and dust that surrounds the central engine, and their relation to nearby star formation are not well understood yet. The SKA, with its unprecedented sensitivity and polarization capabilities, will allow for an unprecedented step forward in the field. In this talk, I will give an overview about the possible impact of such new SKA observations.

Supernovae and Nearby Normal and Luminous Infrared Galaxies

Miguel Angel Pérez-Torres (IAA)

The Square Kilometre Array (SKA) will routinely provide microJy sensitivity and subarcsecond angular resolutions at radio wavelengths. Planned SKA surveys will image vast numbers of nearby galaxies, which are expected to provide a cornerstone in our understanding of star-formation and accretion activity in the local Universe. Here, we present some of the key continuum and molecular line studies of local galaxies, as well as studies of core-collapse and thermonuclear runaway supernovae, where the SKA will have a significant scientific impact and where the Spanish astrophysical community is particularly active.

Protoplanetary Disks, Jets, and the Birth of the Stars

Guillem Anglada (IAA)

Young stars are surrounded by rotating disks of gas and dust. These disks play an essential role in regulating the mass accretion onto the star and are the precursors of exoplanetary systems. Accretion disks also play an important role in driving the bipolar collimated ejections (jets) that remove the excess of angular momentum and allow the star to reach its final mass. Jets are partially ionized and their continuum free-free emission at centimeter wavelengths is a powerful tool to study at small scale (10-100 au) the region where they originate. Observations of the dust thermal emission at centimeter wavelengths are also well suited to study the distribution of dust grains that have evolved up to centimeter sizes and trace the signatures of planet formation in protoplanetary disks. I will present some recent results from VLA and ALMA observations of disks and jets in young stellar objects, and I will discuss future prospects with the SKA in this field.

SESIÓN ESPECIAL: INVITACIÓN A LA SOCIEDAD BRASILEÑA DE ASTRONOMÍA

La Sociedad Brasileña de Astronomía ha aceptado nuestra invitación a participar en la XII Reunión Científica. Conjuntamente hemos programado dedicar una de nuestras sesiones plenarias a mostrar la relevante e histórica colaboración científica entre ambos países. Contaremos con las siguientes conferencias plenarias invitadas de científicos brasileños y españoles, ejemplo del desarrollo actual de proyectos de investigación conjuntos entre ambos países.

Galactic Chemical Evolution

Mercedes Mollá (CIEMAT, Spain)

We will analyze the evolution of oxygen abundance radial gradient resulting from our chemical evolution models calculated with different prescription for the star formation rate (SFR) and for the infall rate forming the disks in order to analyze the relation with both quantities and with their ratio SFR/infall. We will also compare with cosmological simulations and with the existing data, mainly with the planetary nebulae abundances **obtained by the Sao Paulo and Itajubà astronomy groups with which we collaborate.**

AGN and Luminous Infrared Galaxies

Thaisa Storchi Bergmann (UFRGS, Brasil)

Since the discovery of the nature of Quasars – Supermassive Black Holes (SMBH) being fed at the nuclei of galaxies, and of the M-sigma relation – SMBH mass versus velocity dispersion of galaxy bulges, we have concluded that SMBH form early in the Universe (z>8) in the nuclei of galaxies and co-evolve with them via feeding and feedback processes of the SMBH. Although this evolution was stronger in the past, it is in the present day Universe that we can resolve the mechanisms of the feeding and feedback of SMBHs that occur in the inner kiloparsec. Our goal is to map and quantify these mechanisms to constrain the co-evolution of SMBHs and their host galaxies using mostly Integral Field Spectrographs to resolve the inner kiloparsec of nearby active galaxies in order to: (1) map and quantify gas inflows (feeding); (2) map the circumnuclear stellar population and its kinematics (to look for signatures of bulge growth); (3) map and quantify gas outflows in order to constrain the feedback processes. In this talk, I will discuss results of our recent work on these three topics and the implications for the evolution of galaxies.

J-PAS and J-PLUS: large sky multi-filter surveys from the Observatorio **Astrofísico de Javalambre**

Javier Cenarro (CEFCA, Spain)

During the first years of operation, the Observatorio Astrofísico de Javalambre, in Teruel, will be mostly devoted to conduct two large sky multi-filter surveys making use of two telescopes of large field of view, JST/T250 and JAST/T80, and their respective panoramic instrumentation, JPCam and T80Cam. These surveys, managed and developed within a long-term Spanish-Brazilian collaboration of astronomers who cover most fields in Astronomy and Cosmology, are the Javalambre Physics of the Accelerating Universe Astrophysical Survey (J-PAS; <u>http://www.j-pas.org</u>) and the Javalambre Photometric Local Universe Survey (J-PLUS; <u>http://www.j-plus.es</u>). J-PAS will observe 8500 sq.deg of the sky visible from Javalambre with a set of 54 narrow-band contiguous optical filters plus 5 broader ones, performing in the end as a low resolution integral field unit for the Northern

CONFERENCIAS PLENARIAS SESIÓN ESPECIAL: INVITACIÓN A LA SOCIEDAD BRASILEÑA DE ASTRONOMÍA

hemisphere. It will provide unprecedented spectral energy distributions for every pixel of the sky, and ultimately for more than 200 million galaxies and stars. In advance, J-PLUS has started to observe the same sky area of J-PAS with 12 narrow, intermediate and broadband filters aimed to provide the photometric calibration of J-PAS, and unprecedented multicolor data for many fields of the Astrophysics. Both J-PAS and J-PLUS will provide powerful 3D views of the Universe that will be made publicly available to the community as legacy projects. In addition, a replica of the JAST/T80 telescope and T80Cam have been installed at the CTIO in Chile to conduct similar surveys from the Southern hemisphere with an identical filter set. In this talk I will present the origin, motivation, characteristics and main scientific goals of the J-PAS and J-PLUS projects as well as the Spanish-Brazilian collaboration making them happen.

CIENCIAS PLANETARIAS

Sesión CP: martes 19 julio - tarde

Exoplanet atmospheres

(Conferencia Invitada) Antonio García Muñoz

In only two decades since the first identification of a planet outside the Solar System, exoplanet science has established itself as a mature field of astrophysics. As the survey of the sky in the search of as-of-yet undiscovered planets goes on, the field is steadily expanding its focus from detection only to detection and characterization. Indeed, exoplanet atmospheres have become highly-prized targets of observations. The information to be grasped from the atmospheres provides valuable insight into the formation and evolution of the planets and, in turn, into how unique our Solar System is. Ultimately, a dedicated search for life in these distant worlds will have to deal with the information encoded in their atmospheres. In recent years there has been rapid progress on both the theoretical and observational fronts in the investigation of exoplanet atmospheres. Theorists are predicting the prevailing conditions (temperature, chemical composition, cloud occurrence, energy transport) in these objects' envelopes, and are building the frameworks with which to approach the interpretation of observables. In parallel, observers have consolidated the remote sensing techniques that drove the field during the early years (e.g. transmission spectroscopy), and are now venturing into techniques that hold great promise for the future (e.g. direct imaging, phase curves). With a number of space missions soon to fly and ground-based telescopes/instruments to be commissioned, all of them conceived during the exoplanet era, the field is set to experience unprecedented progress. In this talk, I will summarize our current understanding of exoplanet atmospheres, identify some of its deficiencies, and discuss what we can expect from the data to arrive.

The Oldest Planets

Eva Villaver

Close-in planets are in jeopardy, as their host stars evolve off the main sequence (MS) to the subgiant and giant phases. In this talk, I will summarize the influences of the stellar mass, mass-loss prescription, planet mass, stellar rotation, irradiation, tides, and eccentricity on the orbital evolution of planets as their parent stars evolve to become giants. I will compare the expectations derived from the theoretical work with the detections of the TAPAS project: an intense monitoring of planetary candidates that are identified within the PennState-Torun planet search. The TAPAS project carried out with HARPS-N has yielded record breaker planetary systems (i.e. the most massive and oldest star found to be hosting a close-in giant planet) that can set constraints to theoretical models on poorly known parameters such as general migration mechanisms, energy deposition models in hot Jupiters and tidal forces.

C/O vs. Mg/Si ratios in solar type stars: the HARPS sample

Luc**ía Suárez Andrés**

The determination of the chemical composition of extrasolar planets has been the subject of numerous studies in the last years. While the composition of the atmosphere of planets can be observed through, e.g., the absorption of the star light, the composition of the solids remains difficult to estimate. As both planetesimals and planets are formed in the same environment, their composition is expected to be the same as their host star. Elemental ratios are important as they govern the distribution and formation of chemical species in the protoplanetary disc: the C/O ratio controlls the amount of carbides and silicates that can be formed while Mg/Si gives information about the silicate mineralogy. Silicates are an important ingredient in the formation of rocky planets, as they are the most abundant component of the mantle and crust of these planets. We present a uniform study of C/O and Mg/Si element abundance ratios for 140 stars with detected planets and 558 stars without detected planets obtained using high resolution spectra from the HARPS sample. We will discuss the implications of these ratios on the nature of planets that could have been formed in those planetary systems.

Modeling the photosphere of active stars for exoplanet search Albert Rosich Salgado

Stellar activity patterns are responsible for jitter effects observed at different timescales and amplitudes in the measurements obtained from photometric and radial velocity time series observations. These effects are usually considered just noise, and the lack of a characterization and correction strategy represents one of the main limitations to detect the signals of small exoplanets. However, this activity patterns have structure, and are not purely random noise associated to active regions (spots, faculae...) but they can be modeled and studied those effects in exoplanet searches. Accurate simulations of the stellar photosphere based on the most recent available models for main sequence stars can provide synthetic photometric and spectroscopic time series data. These may help to investigate the relation between activity jitter and stellar parameters when considering different active region patterns. Moreover, jitters can be analyzed at different wavelength scales (defined by the passbands of given instruments or space missions) in order to design strategies to remove or minimize them. In this work we present the StarSim-2 tool, which is based on a model for a spotted rotating photosphere built from the integration of the spectral contribution of a fine grid of surface elements, including all significant effects affecting the flux intensities and the wavelength of spectral features produced by active regions and transiting planets. In addition, simultaneous fits of photometry and activity indicators have been performed using StarSim-2, providing an approach to infer the radial velocity signal from high precision photometry and the indices derived from crosscorrelation function (CCF), which are not affected by the presence of a planetary system around the star.

Li-rich giants with substellar companions, a hint of planet engulfment?

Elisa Delgado Mena

Li abundances are expected to be totally depleted in red giants due to the dilution experienced during the first dredge-up. However, several Li-rich giant stars have been observed in the field and in clusters and their origin is still not clear. Recently, we have found 3 red giants showing a clear enhanced Li in 3 open clusters included in a planet search program. Interestingly, the only two stars with a detected substellar companion in our sample are Li-rich giants. One of the planet hosts, NGC2423No3, might lie close to the luminosity bump on the HR diagram, a phase where Li production by the Cameron-Fowler process is supported by extra-mixing to bring fresh Li up to the surface. On the other hand, NGC4349No127 is a more massive and more evolved giant that seems to be in the He-burning phase or approaching the AGB. We evaluate the orbital evolution of hypothetical planets in these systems and discuss the possibility that the Li enhancement is triggered by the engulfment of a planet, considering that close-in planets hardly survive the RGB tip and the early AGB phases. We suggest that the plausible accretion of planets (and the

provoked instabilities) on the early AGB might be one of the causes to trigger the needed extra-mixing in order to produce Li enhancement through the Cameron-Fowler mechanism, as observed in other early AGB stars.

Evolución temporal del transporte de componentes minoritarios en atmósferas exoplanetarias: exploración del espacio de parámetros.

Juan Luis **Gómez González**

Considerando la difusión molecular y el transporte turbulento, este último haciendo uso del coeficiente de difusión turbulenta, K(z), se ha calculado la distribución vertical de componentes minoritarios en atmósferas de planetas extrasolares. La ecuación diferencial que rige tal dinámica permite considerar la presencia de diversos fenómenos que pueden ocurrir bien en las fronteras del dominio de estudio, bien en una determinada región de altura (Lara et al. 2014). El objetivo del trabajo es explorar cómo se redistribuyen los componentes atmosféricos con la introducción de flujo material procedente del interior planetario o del medio circundante al exoplaneta considerando también que la atmósfera pueda estar sujeta a procesos de pérdida en ambas fronteras. Se lleva a cabo un estudio de sensibilidad de los resultados frente a los diferentes parámetros considerados. Con ello, a largo plazo se propone buscar una explicación factible para la composición guímica de aquellos exoplanetas en los que la metalicidad de su estrella y la fotoquímica proporcionan respuestas insuficientes. En particular, como banco de pruebas, el proyecto se centra en Jupiters calientes como los ampliamente estudiados HD 188753 b y HD 209458 b. Para los gigantes gaseosos se asumen que a presiones superiores a 10 bar la composición se corresponde a la configuración de termo-equilibrio químico correspondiente a la metalicidad de sus estrellas y que a regiones de presión menor a 10 bar tiene lugar la manifestación de procesos fotoquímicos. Este procedimiento se extenderá en el futuro a mini-Neptunos como GJ1214b (Menou et al. 2012). Referencias; L. M. Lara et al. A&A 566, A 143 (2014) Menou, K. Ap. J. Lett., 744, L16 (2012)

Small Bodies Near and Far: un proyecto europeo H2020 para estudiar en detalle cuerpos menores

Rene Duffard

We will develop a benchmark study that will address critical points in reconstructing physical and thermal properties of near- Earth, main-belt, and trans-Neptunian objects. The combination of the visual and thermal data from the ground and from astrophysics missions (like Herschel, Spitzer and Akari) is key to improving the scientific understanding of these objects. The development of new tools will be crucial for the interpretation of much larger data sets from WISE, Gaia, JWST, or NEOShield-2, but also for the operations and scientific exploitation of the Hayabusa-2 mission. Our approach is to combine different methods and techniques to get full information on selected bodies: lightcurve inversion, stellar occultation's, thermo-physical modelling, radiometric methods, radar ranging and adaptive optics imaging. The applications to objects with ground-truth information from interplanetary missions Hayabusa, NEAR-Shoemaker, Rosetta, and DAWN allows us to advance the techniques beyond the current state-of-the-art and to assess the limitations of each method. The SBNAF project will derive size, spin and shape, thermal inertia, surface roughness, and in some cases even internal structure and composition, out to the most distant objects in the Solar System. Another important aim is to build accurate thermo-physical asteroid models to establish new primary and secondary celestial calibrators for ALMA, SOFIA, APEX, and IRAM, as well as to provide a link to the high-quality calibration standards of Herschel and Planck. The target list comprises recent interplanetary mission targets, main-belt objects, representatives of the Trojan and Centaur populations, and all known dwarf planets (and candidates) beyond Neptune.

Sesión CP: miércoles 20 julio - mañana

Resultados de las observaciones del instrumento REMS (MSL–Curiosity) en el cráter Gale

> (Conferencia Invitada) Javier **Gómez**-Elvira

A lo largo de casi dos años el instrumento REMS, a bordo del rover Curiosity, ha estado recogiendo datos de las condiciones ambientales en Marte. Estos datos han permitido seguir la evolución de la temperatura del aire y del suelo, de la presión, de la humedad relativa, de la radiación ultravioleta y del viento a lo largo de este periodo. En la presentación se van a mostrar estos resultados y las estudios que se han realizado a través de ellos.

Dinámica de las Regiones Polares de Saturno

Arrate Antuñano

Las regiones polares de Saturno presentan al nivel de las nubes superiores aspectos dinámicos únicos en el sistema solar, entre otros la presencia permanente de una onda hexagonal en el hemisferio norte, ausente en el sur, que encierra una intensa y estrecha corriente en chorro de 100m/s, así como sendos vórtices ciclónicos centrados en ambos polos con velocidades de hasta 140m/s. Paralelamente, toda la región polar, de 70° al polo, presenta una rica variedad de morfologías nubosas cubiertas por una capa de niebla meridionalmente variable. Hasta la actualidad no existe una explicación convincente de la naturaleza de estos fenómenos polares. En este estudio se analizan, por un lado, las condiciones para el desarrollo de la inestabilidad barotrópica y baroclínica del jet que encierra el hexágono y del simétrico en el hemisferio sur que pudieran explicar la existencia de una onda hexagonal en el norte y no en el sur. A partir de los perfiles de viento y vorticidad medidos en un trabajo anterior (A. Antuñano et al. 2015) presentamos un modelo numérico que permite calcular las tasas de crecimiento de dichas inestabilidades en ambos jets bajo determinadas condiciones en la troposfera de Saturno. Por otro lado, analizamos la morfología de las nubes polares y su relación con los vientos hasta ahora medidos. Encontramos que en ambas regiones polares existen una gran cantidad de nubes compactas (100-600km) con una separación media de 300-400km que se extienden desde 65 a 90 grados de latitud. Además, entre junio 2013 y septiembre 2014 se ha observado una rápida variación en la morfología del vórtice polar norte creándose una región con escasa presencia de nubes entre 88.5° y 88.9° norte. Finalmente analizamos la variación temporal, entre 2009-2014, del vórtice polar norte, el tamaño y número de nubes en toda la región y su relación con los vientos medidos en las fechas de junio 2013, abril 2014 y septiembre 2014.

No lightning detection in Venus Atmosphere as seen from VIRTIS Venus Express Visible channel

Alejandro Cardesin Moinelo

Lightning is known to occur in the atmospheres of Earth, Jupiter, Saturn, Uranus and Neptune but its occurrence on Venus remains controversial. Although its presence has been published several times in the past years, always on the basis of detected electromagnetic pulses, the subject is still not clear and it is generally agreed that optical evidence would settle the issue. The Venus Express mission has been observing the Venusian atmosphere continuously since 2006, producing great amounts of imaging and spectral data that could allow us to detect the evidence of lightning events. The huge data set of the VIRTIS instrument has been analysed in the past years covering a wide range of scientific objectives from the thermal emission of the surface up to the composition and dynamics of the upper atmosphere. However there is still an important amount of scientifically valuable information that has not yet been exploited, in particular for the lightnings where no clear evidence has yet been found. In this study, a dedicated search algorithm was developed and used to perform the most comprehensive search for lightning done so far in the VIRTIS-M Venus Express data archive. In total, 13 tests were conducted with different configurations, analysing the night side of Venus in all visible bands during the whole mission duration (8 years). Even though many particular events were found in each search test, the statistical analysis showed no clear evidence of lightning.

Study of high-altitude clouds and plumes in the Martian atmosphere with VMC-Mars Express

Hao Chen Chen

The nature of the high-altitude clouds in Mars and the physics behind this phenomenon is a problem that still remains open nowadays. This study is oriented to contribute to a better understanding of these events by reviewing, evaluating and analysing new sources of image data. This included the review of the existing image database for the Mars Express Visual Monitoring Camera (VMC). The study of the VMC database identified several cases for limb layered detached clouds, estimated their altitudes (40 to 80 km) and located then areographically and seasonally (mostly during local winter); as well as dust storm formations. This study has been complemented by comparing with other images taken at the same period by the Hubble Space Telescope (HST) and the Mars Reconnaissance Orbiter Mars Color Imager (MRO-MARCI). The use of a non-scientific instrument such as VMC proved to be highly helpful for science tasks and observations. Further work with combined observations using these different instruments is proposed on this subject.

Pluto's alkanes, as seen from the laboratory

Ramón Luna Molina

The New Horizons mission has awaken again the scientific interest for the Pluto-Charon system. The first data published supports the idea, presented almost fifteen years ago, of the presence of terrains mainly formed by pure methane. Irradiation modifies the surface composition, and enriches it of more complex materials. The most abundant irradiation byproducts are alkanes. The presentation discusses the effects on physical and spectroscopic characteristics of possible mixtures formed, focusing on the results obtained for the CH4:C2H6 mixture.

Presión y temperatura en el cráter Gale de Marte medidas con el

instrumento REMS a bordo de Curiosity durante 1159 soles

Iñaki Ordóñez Etxeberria

Desde el 6 de agosto de 2012 la estación meteorológica REMS (Gomez-Elvira et al., Space Science Reviews, 170), alojada en el rover Curiosity sobre la superficie de Marte, ha estado enviando datos diarios de las condiciones meteorológicas en el interior del cráter Gale. Este cráter se encuentra en la región ecuatorial del planeta (4.6S, 137.5E), en la frontera de la dicotomía entre las tierras altas del hemisferio sur, y las zonas más bajas del hemisferio norte. En este trabajo se presentan los datos relativos a los sensores de presión y de temperatura de este instrumento, durante los primeros 1159 soles (días marcianos) de Curiosity en Marte. Por un lado, el análisis de los valores diarios obtenidos por REMS, permiten realizar una interpretación estacional de las variaciones meteorológicas registradas en los casi dos años marcianos de datos disponibles. Por otro lado, se ha realizado un estudio exhaustivo de variaciones bruscas de presión (duración de unos pocos segundos a una decena de segundos y caídas de presión de en torno a 0.5-2.0 Pascales), algunas de las cuales pueden ser producidas por el paso de vórtices convectivos tipo "dust devils" (Gomez-Elvira et al., 2014, Journal of Geophysical Research: Planets, 2013JE004576). La variedad de los resultados muestran una superficie sometida a frecuentes variaciones de presión producidas por turbulencia asociada a la circulación sobre la superficie y una actividad de vórtices convectivos muy débil. Además de su caracterización y clasificación, se presentan los resultados de la periodicidad y número de este tipo de eventos, y su relación con las condiciones estacionales analizadas anteriormente.

Nubes y nieblas en el polo Norte de Saturno (Onda Hexagonal) en base a imágenes Cassini/ISS

José Francisco Sanz Requena

En este trabajo presentamos un análisis de la estructura vertical nubosa y las características ópticas del aerosol en la región entre 50º y 90ºN de Saturno, basado en datos adquiridos por la cámara ISS de la sonda espacial Cassini en 2013. Hemos dividido este rango de latitudes en 6 regiones bien diferenciadas entre las cuales distinguimos latitudes inferiores y superiores a la Onda Hexagonal, comprendida entre 73° y 78.5°N, que rodea el polo Norte del planeta. En las latitudes más cercanas al Polo, entre 76.5° y 90°N, separamos las regiones en función de su estructura en filtros profundos. Las imágenes han sido navegadas (PLIA) y calibradas fotométricamente en reflectividad absoluta (CISSCAL) utilizando los filtros UV1, BL1, VIO, MT2, CB2 y MT3 (258, 451, 727, 752 y 890 nm). Estos filtros cubren dos bandas de absorción del metano y un continuo intermedio. Las observaciones cubren además geometrías de visión e iluminación muy diver sas, con ángulos de fase entre 5.48° y 124.45°. El código de transporte radiativo e inversión utilizado en este trabajo ha sido NEMESIS (Non-linear optimal Estimator for Multivariate Espectral analySIS). La reflectividad del planeta en las diferentes longitudes de onda utilizadas constriñe las propiedades y estructura vertical de la niebla estratosférica y de la niebla troposférica de la región del polo norte de Saturno. Los resultados son consistentes con un modelo de dos capas de nieblas y una nube semiinfinita cuyas propiedades se ajustan con dichos modelos. Además, estos resultados señalan distintas alturas de las nubes y propiedades microfísicas de las partículas dependiendo de cada una de las regiones analizadas. La información que extraemos de este trabajo es fundamental para los modelos de desarrollo dinámico ya que proporciona los niveles a los cuales la compleja dinámica observada ha sido medida.

Sesión CP: miércoles 20 julio - tarde

Actualización de las investigaciones sobre la estructura interna de pequeños cuerpos del sistema solar formados mediante procesos de reacumulación gravitatoria

Rafael Andrés Alemañ Berenguer

Una gran cantidad de los pequeños cuerpos del sistema solar se formaron como resultado de procesos de reacumulación gravitatoria tras sucesos catastróficos de colisión que, como etapa inicial, fragmentaron y disgregaron cuerpos progenitores que podían ser de tipo monolítico o estar previamente fragmentados ellos mismos. En esta comunicación se presentan los nuevos avances logrados en la investigación sobre la estructura interna de estos pequeños cuerpos, estimando parámetros característicos (densidad, porosidad, elongación o momento angular, entre otros), mediante la variación de las condiciones en una serie de simulaciones realizadas mediante programas específicos de cálculo numérico. Tales variaciones abarcan desde distintos tamaños finales del objeto reacumulado, hasta diferentes valores para el coeficente de restitución normal asociado a la interacción por contacto entre las partículas constituyentes del cuerpo en cuestión.

Asteroid Impact & Deflection Ass**essment (AIDA): misión ESA**-NASA al NEA binario (65803) Didymos

Adriano Campo Bagatin

La misión espacial AIDA (Asteroid Impact and Deflection Assessment) es una misión conjunta NASA - ESA cuyo objetivo es utilizar el asteroide binario (65803) Didymos para comprobar la tecnología disponible para misiones con operaciones en proximidad de cuerpos con muy baja gravedad, incluyendo el aterrizaje de un módulo, dotado de instrumentación científica, sobre el secundario de ese sistema. Además, la misión pretende comprobar la eficiencia de la tecnología disponible para la desviación de asteroides de pocos centenares de metros en órbitas de colisión con la Tierra. El asteroide binario Didymos está formado por un cuerpo principal, de unos 800 m de diámetro rota al límite de la estabilidad en apenas 2.26 h en torno a su propio eje. El satélite, de unos 150 m de tamaño, rota en unas 12 h en torno al cuerpo principal, a una distancia de 1.18 km del primario. Las observaciones son compatibles con una órbita prácticamente circular. La misión se vertebra en dos partes. La ESA es responsable de la sonda AIM (Asteroid Impact Mission), cuyo lanzamiento está previsto para octubre 2020 y cuyo objetivo es caracterizar completamente el sistema binario, en particular sus características físicas y orbitales. AIM incluye un lander que aterrizaría sobre el cuerpo secundario para realizar -entre otrasmedidas de tomografía radar para conocer la estructura interna de ese satélite. Por otra parte, la sonda estadounidense DART (Double Asteroid Redirection Test) es el proyectil que impactará sobre el satélite de Didymos, con una masa de unos 300 kg. DART impactaría sobre su objetivo en octubre de 2022 a una velocidad relativa de 6.5 km/s. AIM volvería a caracterizar los parámetros orbitales del sistema para determinar la desviación causada por la colisión.

PRIMitive Asteroids Spectroscopic Survey (PRIMASS): First Results

Julia de León

NASA OSIRIS-REx and JAXA Hayabusa 2 sample-return Missions have targeted two near-Earth asteroids: (101955) Bennu and (162173) Ryugu, respectively. These are primitive asteroids that are believed to originate in the inner belt, where five distinct sources have

been identified: four primitive collisional families (Polana, Erigone, Sulamitis, and Clarissa), and a population of low-albedo and low-inclination background asteroids. Identifying and characterizing the populations from which these two NEAs might originate will enchance the science return of the two missions. With this main objective in mind, we initiated in 2010 an spectroscopic survey in the visible and the near-infrared to characterize the primitive collisional families in the inner belt and the low-albedo background population. This is the PRIMitive Asteroids Spectroscopic Survey – PRIMASS. So far we have obtained more than 250 spectra using telescopes located at different observatories. PRIMASS uses a variety of ground based facilities. Most of the spectra have been obtained using the 10.4m Gran Telescopio Canarias (GTC), and the 3.6m Telescopio Nazionale Galileo (TNG), both located at the El Roque de los Muchachos Observatory (La Palma, Spain), and the 3.0m NASA Infrared Telescope Facility on Mauna Kea (Hawai, USA). We present the first results from our on-going survey (de Leon et al. 2016; Pinilla-Allonso et al. 2016; Morate et al. 2016), focused on the Polana and Erigone families, with visible and near-infrared spectra of more than 200 objects, most of them with no previous spectroscopic data. Our survey is already one of the largest database of primitive asteroid spectra, and we keeps obtaining data on the Sulamitis and the Clarissa families, as well as on the background low-albedo population.

Estudio detallado del Centauro Bienor

Estela Fernández-Valenzuela

Los centauros son objetos con órbitas comprendidas entre Neptuno y Júpiter, por lo que son dinámicamente inestables. Provienen del cinturón transneptuniano y son los progenitores directos de los cometas de la familia de Júpiter. Contienen información importante sobre la formación del Sistema Solar y sobre las partes más externas de éste. Son por ello muy interesantes y apenas se conocen unos pocos centenares, menos que objetos transneptunianos, lo que los hace más relevantes aún. Bienor no es solo un centauro, sino uno de los de mayor tamaño que se conocen y por todo ello su estudio es doblemente importante. Más aún cuando resulta que dos centauros de tamaño similar al de Bienor como son Cariclo y Quirón, poseen anillos. En este trabajo presentamos resultados de observaciones de fotometría de series temporales de Bienor realizadas en dos campañas en 2014 y 2015. Las observaciones muestran un considerable descenso en la amplitud de las variaciones rotacionales con respecto a las primeras medidas que se realizaron en 2000. Esto indica que el ángulo que forma el eje de rotación de Bienor con respecto a la Tierra ha cambiado considerablemente en el intervalo de tiempo de 15 años, debido al movimiento orbital de Bienor. A partir de estos datos y recurriendo a otros dos resultados de la bibliografía se ha podido construir un modelo fotométrico para determinar la orientación del eje de rotación de Bienor, y para determinar las dimensiones de los tres ejes del elipsoide triaxial (que se usa como forma de partida para este cuerpo). En el pasado esto sólo se ha podido hacer para otros tres centauros. En el presente trabajo se muestran los resultados del mejor ajuste y las posibles implicaciones en cuanto a la posible existencia o no de un anillo, que debería dejar algún rastro en la fotometría.

V-type and Vesta family asteroids in the VISTA - VHS survey (MOVIS)

Javier Licandro

Basaltic asteroids (V-types) are fragments of large bodies whose interiors reached the melting temperature of silicate rocks and subsequently differentiated. The most representative V-type is (4) Vesta, which was for long time the only known. V-type VNIR (0.4 - 2.5 microns) spectra is characterized by two deep absorption bands around 1 and 2 microns, associated to the presence of pyroxene on their surfaces. The majority of V-types are in the inner part of the asteroid main belt (MB). Most of them are current or past

members of the large Vesta collisional family. Consistently, a large fraction of the Vesta family members present a V-type spectrum. Some V-type asteroids are unlikely scattered Vesta family asteroids. In particular several are in the middle and outer MB. Their existence is explained by the presence of multiple basaltic asteroids in the early Solar System. In particular the presence of V-types in the outer main belt challenged the models of the radial extent and the variability of the early Solar System temperature distribution, which generally do not predict melting temperature in this region. We use the Moving Objects VISTA Survey (MOVIS), our compilation of the observations of known minor bodies of the solar system by the all sky, near infrared, VISTA-VHS (VISTA Hemisphere Survey) survey (Popescu et al 2016) to identify new V-types. VISTA-VHS uses the Y, J, H, and Ks broad-band filters, it aim to image the entire southern hemisphere. Popescu et al. (2016) compiled the colors of 39.947 minor bodies in the MOVIS-C catalogue and show that the distributions in color-color plots allow to differentiate taxonomic classes. A total of 477 V-type candidates has been identified in MOVIS-C using the (Y-J) vs (J-Ks) plots, 233 of them belongs to the Vesta family while 244 are non-Vesta family members. Particularly interesting are the 6 V-type candidates identified in the outer MB. In this work we present and discuss the results of our search, an analysis of the near-infrared color distribution of the V-types found in and out of the Vesta family.

TROY: a la caza de los primeros exotroyanos

Jorge Lillo-Box

La detección de sistemas planetarios en las últimas dos décadas ha proporcionado una gran muestra con variadas propiedades: desde gigantes gaseosos extremadamente cercanos a su estrella hasta planetas más pequeños que Mercurio, y desde planetas en formación a planetas a punto de ser engullidos por su estrella. Esta diversidad solo se explica si los procesos de formación y evolución planetaria son también diversos dependiendo de las condiciones del sistema. Para desentrañar estos procesos se ha tratado de buscar las consecuencias que los diversos mecanismos tienen en la arquitectura de un sistema planetario (excentricidad, oblicuidad de la órbita, composición de la atmósfera planetaria, etc.). Sin embargo, sabemos que existen objetos que son trazadores directos de la historia de un sistema planetario por ser productos directos de su formación: los planetas troyanos, cuerpos atrapados en los puntos de estabilidad de la órbita de un planeta. L as características físicas y dinámicas de estos objetos nos pueden dar una gran cantidad de información sobre el nacimiento y formación del sistema planetario, al igual que ocurre en nuestro Sistema Solar con los troyanos de Júpiter, la Tierra o Neptuno. El proyecto TROY tiene como principal objetivo la detección de los primeros troyanos co-orbitando con planetas extrasolares. En esta charla, contaré los primeros resultados del proyecto así como las posibilidades de encontrar estos valiosos objetos con la instrumentación actual y futura (con la llegada de ESPRESSO, PLATO, CHEOPS o JWST) y cómo podemos descifrar la historia evolutiva de un sistema planetario a través del estudio de estos objetos.

Sesión CP: jueves 21 julio - mañana

Protoplanetary disk components from the study of the most pristine chondrites

Marina Martínez-Jiménez

The components of non-differentiated meteorites so-called chondrites are direct evidence of the materials forming the protoplanetary disk 4.5 Gyr ago. These first solids were preserved in their parent bodies because they were never exposed to a high degree of thermal metamorphism [1]. In those primitive meteorites were identified stellar grains, and isotopic anomalies that provide information on the stellar environment where the Sun formed. Up to date 15 chondrite groups have been identified [1] and designated with one or two letter symbol and have a characteristic chemical composition [1]. The evident chemical differences among the chondrite groups led to the idea that each group represents rocks coming from a different reservoir [2,3].

Evidence of fast growth of planetesimals in HL Tau protoplanetary disk has been found using ALMA [4]. It suggests that the accretion of materials occurred probably faster than previously thought, and opens the possibility of an inner disk formed by rings from which the different groups of chondrites accreted [5,6]. We will revisit current data about the formation ages of chondritic parent bodies in order to compare with observed ring time scales. From the bulk components of chondrite groups, we can likely infer the existence of size-sorting processes at work in the inner disk. In fact, it has been found that gas-melt interaction played a key role in the evolution of mineralogy, bulk chemical and isotopic compositions of chondrules [5]. Therefore, the size and composition of chondrite components can provide valuable information about the physico-chemical conditions in protoplanetary disks.

REFERENCES

[1] Weisberg M.K. et al., In Meteorites and the Early Solar System II (2006), Univ. Arizona Press, Tucson, AZ, USA, 19. [2] Hutchison R., In Meteorites: A Petrologic, Chemical and Isotopic Synthesis (2004). CUP, Cambridge, UK. [3] Trigo-Rodríguez J.M. and J. Blum, Publ. Astron. Soc. Australia, 26 (2009) 289-296. [4] Zhang K. et al. (2015) Ap J. Lett. 806, article id. L7, 6 pp. [5] Libourel G. et al. (2006) Earth Planet. Sci. Lett. 251, 232-240. [6] Martínez-Jiménez, M.; Trigo-Rodríguez, J. M. (2014) 45th LPSC, LPI pub., abs.#1364. [7]

Detection of SO towards the transitional disk AB Auriga: the sulfur chemistry in a proto-solar nebula

Asunción Fuente

The formation of planetesimals requires that primordial dust grains grow from micron-to km-sized bodies. As dust grains grow, they start to decouple from the gas and drift radially towards the central star. Therefore, planetesimal formation has to happen in time-scales shorter than radial drift. One way to halt the inward drift is by developing a local maximum in the radial surface density of the gas that would act as a dust trap. Dust traps have been identified in transitional disks using the dust continuum emission at longer wavelengths (mm).

Our team has imaged the transitional disk around the Herbig Ae star, AB Auriga, in dust continuum emission at 1mm, and the 13CO 2-1, C18O 2-1, SO 5_6-4_5 and H2CO 3_(0,3)-2_(0,2) lines using the NOEMA interferometer (IRAM). This is the first image of SO ever in a protoplanetary disk (PPD). The dust continuum and C18O emissions present the horseshoe morphology that is characteristic of the existence of a dust trap, proving that this disk is at the stage of forming planets. However, SO presents uniform emission all over the disk. We interpreted that the uniform SO emission is the consequence of the SO molecules being rapidly converted to SO2 and frozen onto the grain mantles at the high densities of the disk midplane (> 10^7 cm-3). SO is the second S-bearing molecule detected in a PPD (the first was CS) and opens the possibility to study the sulphur

chemistry in a proto-solar nebula analog. Besides the high level of sulfur in the Sun (S/Si ?0.5), sulfur is widespread in the Solar System. The comprehension of the sulfur chemistry is of paramount importance to understand the formation of our own planetary system.

Magnetic Cycles and Rotation Periods of Late Type Stars

Alejandro Suárez Mascareño

Stellar activity induces periodic low amplitude radial velocity variations similar to those of Keplerian origin. Characterizing the stellar behaviour and its influence in the radial velocity is a key element when aiming to detect small rocky planets. Magnetic cycles similar to that of the Sun have been observed in many other stars. While extensive work has been conducted in FGK stars over many decades, M-dwarfs have not received as much attention with only a few tens of long-tem activity cycles reported in the literature. We have determined the rotation and cycles for a sample of main sequence stars, being 60% of them M-dwarfs, using light-curves from the ASAS photometry survey and time series of spectroscopic indicators from HARPS spectra. We study the statistics of stellar cycles and rotation and their relationships. We find that M-dwarf cycles follow a distribution similar to solar type stars, but peaking at slightly shorter periods. While the distrib ution of rotation periods is different for each spectral type, steadily increasing the period length when decreasing the temperature. This information allows to distinguish between stellar induced radial velocity signals and planetary signals, and to clean the radial velocity curve from stellar origin signals.

Carbonaceous chondrites at the nanoscale using UHRTEM: clues on mineral condensation, hydration, and physics at work in the protoplanetary disk

Josep María Trigo-Rodríguez

Undifferentiated asteroids and comets contain the sediments of Solar System creation, including the first solid particles condensed around the Sun about 4.6 Gyrs ago and a minor amount of dust from nearby stars [1-3]. We present here a study of the properties of two pristine CM carbonaceous chondrites (CCs) at the nanoscale. Our goal is to study the way in which they incorporated water from the protoplanetary environment. These CCs are formed by mm-sized glassy spherules with silicate composition called chondrules, plus Ca-Al-rich refractory inclusions (CAIs), and metal grains. These components are surrounded by a fine-grained matrix, which is a mixture of several ingredients, including minor mineral phases, stellar grains and organic compounds [3]. We have chosen two pristine CM chondrite falls for study: Murchison and Cold Bokkeveld with distinctive degrees of pre-terrestrial (parent body) aqueous alteration (Trigo-Rodríguez et al., 2006, GCA 70, 1271). The meteorite sections were thinned in a ring using a Fischione 1050 ion mill at CIC (Granada University), and then analyzed by UHRTEM (ultra high resolution transmission electron microscopy) using a FEI Titan G2 60-300 microscope. Murchison meteorite contains well-preserved metallic-Fe-Ni-bearing, olivine- and pyroxene-rich chondrules and a comminuted matrix of highly unequilibrated mineral phases and complex organics (Trigo-Rodríguez et al., 2015, 46th LPSC, abs. #1198). As most of the CM chondrites are breccias and their components were broken and comminuted, a highly unequilibrated matrix is consistent with a minor collisional compaction. We conclude that Murchison parent body aqueous alteration was not so extensive than the experienced by Cold Bokkeveld, so our observations of the first support the existence of hydration of some specific minerals in the protoplanetary disk or in precursor planetesimals [9]. The scenario in which that aqueous alteration occurred is still debated, but Murchison at the nanoscale shows textural features that are consistent with pre-accretionary hydration of some mineral phases.

Physical and spectral properties of the Chelyabinsk ordinary chondrite as support information for future impact deflection missions to asteroids

Carles Eduard Moyano Cambero

The feasibility of using a kinetic projectile to deflect an asteroid is currently being explored. The Asteroid Impact and Deflection Assessment (AIDA) mission concept wants to perform an in situ test for the first time. It is an ESA and NASA international collaboration to develop two complementary concepts: the Asteroid Impact Mission (AIM), and the Double Asteroid Redirect Test (DART). AIDA would be the first mission proving our capacity to impact and deflect a small size Near-Earth Asteroid (NEA) with a kinetic projectile, but also will provide us with information about the physical properties of this binary system. On this study we use indentation data on the Chelyabinsk LL5-6 ordinary chondrite breccia to obtain information about the mechanical properties of this meteorite. Most NEAs are S-type asteroids, typically associated with ordinary chondrites, and therefore indentation data on this meteorite can provide relevant information about the mechanica I properties and shock degree of its parent body, and several other similar asteroids belonging to the NEA population. This kind of study will provide information of great interest for future missions such as AIDA, as the results are relevant in the context of understanding our potential to deflect asteroids. In order to properly relate the meteorites studied in the laboratory with asteroids, we also compare reflectance spectra in the ultraviolet to near-infrared wavelengths obtained from different samples and lithologies of the Chelyabinsk meteorite.

ORISON, un estudio de viabilidad sobre instrumentación en la

estratosfera con muchas utilidades en la ciencia del sistema solar.

Jose Luis Ortiz

ORISON es un proyecto financiado dentro del programa H2020 para hacer un estudio de viabilidad de una posible infraestructura científica cuya meta principal estaría en el campo de la astronomía y la astrofísica. En el provecto se pretende analizar la utilización, desde la estratosfera, de telescopios muy ligeros con diámetro del orden de 50cm, así como alguna otra instrumentación auxiliar de bajo peso dentro de la carga útil, que iría estabilizada. Las condiciones en la estratosfera, a unos 35km de altura, donde se llega con globos, son similares a las del espacio y un telescopio de dimensiones modestas rinde mucho mejor que un telescopio terrestre de dimensiones muy superiores, particularmente en cuanto a resolución espacial y en cuanto a estabilidad fotométrica se refiere. Las condiciones en la estratosfera también ofrecen una garantía de observación frente al mal tiempo y también permiten observar durante el día. La idea es que las mis iones pudieran ser de corta duración, ser lanzadas desde lugares no cercanos a los polos, e implicar cargas útiles de peso bajo para que el coste pudiera ser reducido y asumible, muy por debajo del coste de los lanzamientos de los ambiciosos programas de globos de la NASA. Por todo ello, su aplicabilidad en el campo de investigación de la física del sistema solar es alta, ya que permitiría abordar con garantías estudios de eventos críticos en el tiempo, que en el sistema solar se dan con frecuencia, y también permitiría realizar investigaciones de fenómenos transitorios, así como seguimientos bastante continuados de planetas, cometas, asteroides, objetos transneptunianos y otros cuerpos. En esta charla se presentarán algunos posibles casos científicos y se buscará recabar el aporte de potenciales usuarios interesados, para la definición de las características de la infraestructura que pudiera atraer a un conjunto amplio de científicos.
Detección de meteoros desde globos estratosféricos de bajo coste con cámaras de alta sensibilidad

Alejandro Sánchez de Miguel

Desde el año 2010 se han realizado varias misiones entre el Dep. de Astrofísica y CC. de la Atmósfera de la UCM y el proyecto Daedalus para la detección de meteoros desde la estratosfera. En las ultimas campañas se ha utilizado un nuevo tipo de cámara de alta sensibilidad capaz de superar la sensibilidad del ojo humano en este tipo de detección, siendo las primeras detecciones de meteoros en varias bandas desde la estratosfera y en alta resolución. Se mostrará cual ha sido la evolución del método y sus posibilidades futuras.

Pósteres

Adriano Campo Bagatin

A large number of Near Earth Asteroids (NEAs) in the range of a few hundred meters to a few kilometers in size are found to have relatively high spin rates (less than 4 hr, down to ~2.3hr). Due to their high spin rate local acceleration near their equator may in some case be directed outwards so that lift off of near-equatorial material is possible. In particular, this is the case of the primary of the (65803) Didymos binary system, target of the ESA-NASA led AIDA mission. What are the effects of that phenomenon on surface material at any asteroid latitude and distance from the surface? What is the mass density around this object?

Science Opportunity Analysis for the Jupiter Icy Moons Explorer (JUICE)

Alejandro Cardesin Moinelo

JUICE is the first large mission chosen in the framework of ESA's Cosmic Vision 2015-2025 program. JUICE will survey the Jovian system with a special focus on the three Galilean Moons. Currently the mission is under study activities during its Definition Phase. For this period the future mission scenarios are being studied by the Science Working Team (SWT). The Mission Analysis and Payload Support (MAPPS) and the Solar System Science Operations Laboratory (SOLab) tools are being used to provide active support to the SWT in synergy with other operational tools used in the Science Operations Department at the European Space and Astronomy Centre (ESAC) in order to evaluate the feasibility of those scenarios. This contribution will outline the capabilities, synergies as well as use cases of **the mentioned tools focusing on the support provided to JUICE's study phase on the study** of its critical operational scenarios and the early developments of its Scien ce Ground Segment demonstrating the added value provided to planetary science missions.

CN observations of comet 67P/Churyumov-Gerasimenko

Miguel de Val-Borro

We present spectroscopic observations with the robotic 2-m Liverpool Telescope at the Roque de los Muchachos observatory for monitoring the activity of co**met 67P/Churyumov-Gerasimenko during its latest post-perihelion apparition. The LOTUS and SPRAT instruments were used to obtain low resolution near-UV and optical spectroscopy in the wavelength ranges from 3200** A° to 6400 A° and 4000 Å to 8000 Å, respectively, since **September 2015 with a few days cadence. The CN emission at 3880** A° **is clearly detected in the LOTUS observations, as well as several weak bands of the carbon-chain molecules C2 (4738, 5165 and 5635 A') and C3 (4050 A'**). We followed the evolution of the gas production rates computed with a Haser spherical model for daughter species as an indicator of comet activity, and compared with the dust production from the reflected continuum brightness in the SPRAT spectroscopy data to derive dust-to-gas ratios.

Estudio experimental del factor preexponencial de la ecuación de

Polanyi-Wigner para el hielo de metanol

Georgina Gisbert Pérez

El estudio de la cinética de desorción del metanol en estado sólido es necesario para conocer cómo se comporta dicha molécula en entornos astrofísicos. Este proceso ha sido ampliamente estudiado usando la ecuación de Polanyi-Wigner, en la cual uno de los parámetros necesarios, aunque apenas estudiado a día de hoy debido a su dificultad, es el factor pre-exponencial. En este trabajo presentamos un método novedoso para calcular dicho parámetro y obtener por primera vez cómo influye la temperatura.

Observaciones de Urano y Neptuno en telescopios españoles: Calar Alto/PlanetCam, WHT/Ingrid y GTC/Osiris

Ricardo Hueso Alonso

La observación astronómica de las atmósferas de Urano y Neptuno presenta desafíos únicos. Ambos planetas son objetos relativamente débiles (magnitud visual +5.3 y +7.7) y poseen diámetros angulares muy pequeños (3.7" y 2.3" en oposición). Además las nubes de hielo de metano que los cubren poseen muy poco contraste en luz visible. Ambos mundos poseen atmósferas muy dinámicas, especialmente Neptuno, dominadas por intensos vientos zonales que llegan a alcanzar los 450 m/s y en las que se observa una evolución estacional del patrón de nubes en bandas zonales que cubren estos mundos. Gracias a la presencia de abundante metano atmosférico, en longitudes de onda del infrarrojo cercano las nubes empiezan a contrastarse gracias a bandas de absorc**ión de** metano en las que las estructuras elevadas se vuelven brillantes. Además de forma esporádica e impredecible ambos mundos son susceptibles de desarrollar estructuras brillantes de posible origen convectivo cuya actividad puede extenderse a varios meses. En los últimos años, hemos obtenido observaciones de Urano y Neptuno con instrumentos capaces de mejorar la resolución de las imágenes por debajo del seeing atmosférico gracias a la técnica de imagen afortunada (observación rápida y selección de mejores frames para su apilado). Presentaremos imágenes de Urano y Neptuno obtenidas por los instrumentos OSIRIS del GTC así como con los instrumentos AstraLux y en particular nuestro instrumento PlanetCam UPV/EHU ambos funcionando en el 2.2m de Calar Alto. Estas observaciones se compararán con otras adquiridas tanto por astrónomos aficionados capaces de resolver detalles en Urano y Neptuno, como en imágenes obtenidas con óptica adaptativa por los telescopios WHT y Keck así como con el Hubble. Se discutirá en particular la evolución de dos tormentas convectivas de gran interés en Urano (2014) y en Neptuno (2015) y la necesidad de combinar información de diferentes telescopios para avanzar en el estudio de estos planetas.

Un paso más allá: modelado de atmósferas exoplanetarias

Manuel Lampón González-Albo

Desde los primeros descubrimientos de planetas extra solares a finales de la década de los 80 y principios de los 90 (Campbell, B. et al. ApJ 1988; Wolszczan, A., and D.A. Frail. Nature 355, 145, 1992,...etc.) el interés por saber más acerca de ellos no ha dejado de crecer. Los estudio centrados en las propiedades macroscópicas de los exoplanetas (i.e. masa, radio, temperatura de equilibrio, parámetros orbitales: excentricidades, separaciones, periodos...etc. y las propiedades de sus estrellas) han revelado valiosa información con la que se ha podido establecer que los exoplanetas son realmente frecuentes (Fressin, F., et al, ApJ 766, 81, 2013; Cassan, A., et al. Nature 481, 167, 2012) y extraordinariamente diversos (como puede derivarse de los catálogos exoplanet.eu ó exoplanets.org). Sin embargo con estas propiedades no es posible contestar a preguntas como ¿Qué hay en su interior?, ¿de qué están hechos?, ¿cómo se han formado y evolucionado?. Para ello es preciso dar un paso más allá y llegar a sus atmósferas. De esta forma, las propiedades macroscópicas de los exoplanetas deben complementarse con la observación de sus atmósferas (espectros de transmisión, térmicos...etc.), con datos obtenidos en los laboratorios (secciones eficaces de absorción, parámetros termodinámicos...etc.) y con modelos que puedan procesar y ayudar a interpretar tal volumen de información.

Con la primera medida de un espectro de absorción atmosférica de un exoplaneta (Charbonneau D., et al. ApJ., 568, 377-**384, 2002) el número de observaciones de atmósferas exoplanetarias no solo no ha dejado de crecer, sino que se espera un futuro** prometedor con la puesta en marcha de proyectos como JWST, NGTS o E-ELT entre otros.

El trabajo que presentamos es el primer paso para construir modelos que puedan responder a las necesidades que requiere el estudio de atmósferas exoplanetarias, y que contemplan fenómenos químicos, dinámicos, térmicos...Se persigue su versatilidad y completitud para ser capaz de recrear las atmósferas de una gran diversidad de exoplanetas.

Mass determination of K2-19b and K2-19c from radial velocities and transit timing variations

David López Fernández-Nespral

We present FIES@NOT and HARPS-N@TNG radial velocity follow-up observations of K2-19, a compact planetary system hosting three planets,of which the two larger ones, namely K2-19b and K2-19c, are close to the 3:2 mean motion resonance. The masses of these larger planets have previously been derived from transit timing only. An analysis considering only the radial velocity measurements is able to detect only K2-19b, the largest and more massive planet in the system, with a mass of 71.7+-6.3 M. We also used the TRADES code to simultaneously model both our RV measurements and the existing transit-timing measurements. We derived a mass of K2-19b of 59.5+7.2-11.4 M and of K2-19c of 9.7+3.9-2.0 M. A prior K2-19b mass estimated by Barros et al. (2015), based exclusively on transit timing measurements, is only consistent with our combined TTV and RV analysis, but not with our analysis based purely on RV measurements. K2-19b supports the suspicion that planet masses and densities involving TTV data are systematically lower than those based purely on RV measurements.

A possible water ice cloud in Jupiter's stratosphere

Manuel López Puertas

Jupiter's atmosphere has been sounded in transmission from UV to IR, as if it were a transiting exoplanet by observing Ganymede while passing through Jupiter's shadow during a solar eclipse. An eclipse of Ganymede was first observed on 06/10/2012 using LIRIS at WHT in La Palma Observatory, Spain and repeated later on 18/11/2012 by observing a second eclipse with XSHOOTER at VLT in Paranal Observatory. A first analysis of the observations has been reported by Montañes-Rodríguez et al. (ApJL, 2015). Here we focus on a more detailed analysis of the VIS and near-IR spectral regions with particular emphasis on the signatures of water ice. With this technique we obtain limb transmission spectra of Jupiter's atmosphere. During the eclipse, the spectral features of the Jovian atmosphere are imprinted in the sunlight that, after passing through Jupiter's planetary limb, is reflected from Ganymede toward the Earth. The ratio spectrum of Ganymede before and during the eclipse removes the spectral features of the Sun, of the local telluric atmosphere on top of the telescopes, and the spectral albedo of Ganymede. The spectra show strong extinction due to the presence of aerosols and haze in the atmosphere and strong absorption features from CH4. In addition, the spectra show two broad features near 1.5 and 2.0 µm that we tentatively attribute to a layer of H2O ice in Jupiter's stratosphere. While the spectral signatures seem to be unequivocally attributed to

crystalline water ice, to explain the strong absorption features requires a large amount of water ice. This poses a major problem for reconciling the low water vapour abundance's in Jupiter stratosphere as measured by HERSCHEL (Cavalie et al.,2013) and the large concentrations of water ice very small particles (~0.01 µm) required to explain our spectra.

The Sulamitis collisional family: primitive hydration

David Morate González

Asteroid families are formed by the fragments produced by the disruption of a common parent body resulting from a collision event. Primitive asteroids (C complex and subclasses) in the Solar System are believed to have undergone less thermal processing compared with the differentiated asteroids (S complex and subclasses). The study of primitive asteroid families provides information about the Solar System formation period. The Sulamitis collisional family is located in the inner part of the asteroid belt, and, together with other three families (Polana, Clarissa, and Erigone) and a population of background asteroids, it is believed to be the origin of the two primitive Near-Earth asteroids that are the main targets of the NASA's OSIRIS-REx and JAXA's Hayabusa 2 missions, (101955) Bennu and (162173) Ryugu, respectively. These steroids will be visited by spacecrafts and a sample of their surface material will be returned to Earth. Therefore, understanding of the families that are considered potential sources will enhance the scientific return of the missions. The goal of this work is to compositionally characterize the Sulamitis collisional family. Asteroid (752) Sulamitis has been classified as a primitive C-type object, and we expect the members of this family to be compositionally consistent with the spectral type of the parent body. We have obtained visible spectra (0.5-0.9 microns) of a significant number of members of the Sulamitis family, using the OSIRIS instrument at the 10.4m Gran Telescopio Canarias. We performed a taxonomical classification of these asteroids, finding that the number of primitive asteroids in our sample is in agreement with the hypothesis of a common primitive parent body. In addition, we have found a significant fraction of asteroids in our sample that present evidences of aqueous alteration, the same as we found in a previous study for the Erigone collisional family (Morate et al. 2016). This might point to a similar origin of these bodies, and we discuss the possibility of a relationship between the two parent bodies.

Simulations of transit spectra of Hot Jupiters in the infrared branch of CARMENES (1-**1.7 \mu m)**

Alejandro Sánchez López

Transmission spectroscopy in the primary transit of an exoplanet has proven to be very useful for obtaining information of exoplanet atmospheres from both ground-based facilities and space telescopes. On the other hand, The Calar Alto high-Resolution search for M dwarfs with Exoearths with Near-infrared and optical Échelle Spectrographs (CARMENES) instrument has started being operative very recently. In this work, we explore the capabilities of CARMENES for extracting information of Hot Jupiter atmospheres taking advantage of its ultra-stability, its wide spectral interval (0.55-**1.7 µm)**, and high spectral resolution (R=82000). In particular, the latter allow us to separate the Earth's telluric components from the exoplanet's atmospheric signature. Here we present simulations of primary transit transmission spectra of Hot Jupiters in the 1-1.7 µm spectral range where several molecules, such as water vapour, carbon monoxide, carbon dioxide and methane, have strong ro-vibrational bands. Sensitivity studies are presented for the range of expected concentrations of these species, as well as for the current range of temperature profiles. Our simulations have been performed using the line-by-line Karlsruhe Optimized and Precise Radiative Transfer Algorithm (KOPRA) adapted for exoatmospheres. Some preliminary results will be presented for two Hot Jupiters, HD 189733b and HD 209458b.

Análisis del jet ecuatorial de Saturno a partir de una tormenta

persistente y de rápido movimiento observada desde Tierra y con el HST en 2015.

Agustín Sánchez-Lavega

La dinámica del ecuador de Saturno al nivel de las nubes superiores está regida por la presencia de una intensa corriente en chorro hacia el Este cuya naturaleza, estructura tridimensional y variabilidad temporal, son complejas y objeto de debate. El Ecuador es una región de alto interés dinámico ya que está sometido al ciclo estacional de insolación, aumentado por el efecto de la sombra de los anillos del planeta, lo que sirve de test y control a los modelos que intentan explicarlo. Además, el ecuador ha sido el seno de tres de los seis casos conocidos de tormentas gigantes en el planeta, denominadas "Grandes Manchas Blancas", que perturban toda la región en la que emergen, y cuya recurrencia y predicción son aún imposibles. Todo ello hace del ecuador de Saturno un excelente laboratorio natural en donde estudiar la generación de jets en planetas gigantes con importantes consecuencias para el estudio de la dinámica en los planetas extraso lares. Presentamos en este trabajo un estudio de la estructura tridimensional y de los cambios temporales en el jet ecuatorial del planeta en base a la presencia de una estructura dinámica estable, brillante en longitudes de onda rojas, y de movimiento muy rápido, observada en imágenes obtenidas con diversos telescopios en Tierra en 2015, entre otros usando "PlanetCam" en el telescopio 2.2 m de Calar Alto, y con la "Wide Field Planetary Camera" del Telescopio Espacial Hubble en tres órbitas concedidas de tiempo de director del HST (GO/DD programa 14064).

Buscando material alrededor del asteroide activado 596 Scheila a partir de ocultaciones estelares

Pablo Santos Sanz

596 Scheila es uno de los asteroides más grandes del cinturón principal considerado desde 2010, cuando se observó con apariencia cometaria, cometa del cinturón de asteroides. Los cometas del cinturón de asteroides son objetos intrigantes de los que sólo conocemos ~12. Estos objetos tienen órbitas asteroidales -entre Marte y Júpiter- pero presentan comportamientos cometarios, como cierta actividad que puede llevarles a desarrollar comas. En el caso de Scheila la actividad pudo ser inducida por el impacto de un pequeño asteroide de ~35m que impactó contra él a ~5km/s (Moreno et al 2011; Jewitt et al. 2011). Por tanto, se piensa que fue transitoriamente activado por esta colisión. Con objeto de estudiar el polvo que pudo haber quedado alrededor de Scheila tras la colisión y analizar si pudo haber evolucionado hacia un anillo tenue, hicimos previsiones de ocultaciones estelares observables desde Canarias o la Península Ibérica en 2015-16. Encontramos 3 posibles eventos favorables involucrando estrellas suficientemente brillantes para poder detectar ocultación. La más favorable fue el 16 de Diciembre de 2015, no observada por mal tiempo, para la que se obtuvo tiempo en varios telescopios de Canarias. Una nueva oportunidad se produjo el 6 de Enero de 2016 con una estrella de magnitud similar a Scheila: sólo un telescopio pudo obtener datos que no mostraron ocultación y sólo sirven para determinar una cota de la cantidad de polvo cerca de Scheila. Por fin, el pasado 21 de enero de 2016 Scheila pasó delante de una estrella de magnitud visual 14.8, ocultándola durante un breve lapso de tiempo desde los observatorios de La Hita (Toledo) y Albox (Almeria) se parados una distancia de ~260km. El análisis de ambas ocultaciones positivas ha permitido obtener el tamaño aparente, el albedo geométrico e inferir la forma, así como constreñir la presencia de material alrededor de Scheila. No obstante, la constricción de la densidad de polvo es pobre porque los telescopios eran pequeños y la estrella ocultada relativamente débil, por lo que la señal/ruido es menor que la deseada.

Middle atmosphere OH NLTE model and spectroscopy sensitivity study

Sandra Vázquez-Martín

In the middle atmosphere, the OH Meinel bands, which involve high-lying vibrational and rotational levels transitions, are in Non-Local Thermodynamic Equilibrium (NLTE) conditions. In this work we present a state-of-art NLTE model for the Meinel bands of OH including the most recent collisional rates and spectroscopic data, and we perform a sensitivity analysis of the spectroscopy uncertainties and their impact in the interpretation of atmospheric data. A comparison with previous modelling and data analysis shows that major efforts are needed in the understanding of the spectroscopy of OH.

Cheliábinsk and other February superfireballs

Sandra Zamora Arenal

Superfireballs are rare and a fascinating natural phenomenon. The number of them is limited, their reports have been scarce and estimating their numbers is difficult. With the increased use of newspapers during the mid XIX century, the registration of meteorrelated news grew dramatically. In addition, the digitalization of these sources opens up huge possibilities on the meteor research. This project has involved many collaborators in the context of a citizen science project. The research is based on the reports which appeared in the news dated back from more than 150 years ago and other databases such as the British Association for the Advancement of Science, SAO/NASA Astrophysics Data System and NASA-Fireball and Bolide Reports. We have an extensive database, 2393 registries of fireballs, that allows to reduce the uncertainty in estimation of their numbers. We have made a descriptive statistical analysis on the data, based on the mean and dispersion of the sample and on meteor shower properties. For the moment, we have found a number of abnormally concentrated events that cannot be explained by a Poisson distribution. The Chelyabinsk meteor was a superbolide that entered Earth's atmosphere over Russia on 15 February 2013 (03:20 UTC). It was observed over a wide area of the region. It became a brilliant superfireball and their light was brighter than the Sun up to 100 km. Also, in the same month of this year, other meteors were observed and mentioned in newspapers. With these events we have analyzed statistically two significant overabundance peaks that we found in February. They are very interesting because during this period we found no evidence of fireball showers. These intervals are centered in February 12 and 22 (323° and 333° solar lengths) and it is probable that the first are connected with the Chelyabinsk event date. In addition, the last publications of Nasa Bolide Reports support that these superbolide streams are real. We start to pinpoint the radiant in order to characterize these concentrations and to determine their origin scenario.

<u>ENSEÑANZA Y DIVULGACIÓN</u>

Sesión ED: lunes 18 julio - tarde

NANOCOSMOS: un viaje a lo pequeño

Natalia Ruiz Zelmanovitch

El proyecto ERC* "Gas y polvo, de las estrellas al laboratorio: explorando el NANOCOSMOS" no es solo un proyecto europeo en la frontera de la ciencia y la tecnología. NANOCOSMOS es también el viaje de un equipo multidisciplinar de profesionales en busca de respuestas. Juntos, construirán y utilizarán diversas herramientas para descubrir qué les ocurre a los granos de polvo cuando nacen en las envolturas de las estrellas evolucionadas. El proyecto se lanza desde sus inicios al gran público para compartir la aventura que vive una nanopartícula creada en un laboratorio. En esta presentación daremos a conocer algunos aspectos científicos y los pasos del proyecto para hacerlo llegar tanto a la comunidad investigadora como al público general. *ERC, European Research Council.

Divulgación a la carta: proyectos del IAC para cada audiencia

Alfred Rosenberg González

La divulgación eficiente requiere distintas aproximaciones en función de las características de nuestra audiencia. Presentamos en esta charla diversos proyectos divulgativos de éxito enfocados a colectivos específicos: alumnos de primaria, secundaria y bachillerato, profesores y público adulto en general. El Proyecto SolarLab, el Teatro Infantil "¿Sueñan los títeres con el Cosmos?" y presentaciones en teatros como "Explorando el Universo" son tres proyectos con los que hemos alcanzado a más de 300 profesores, 1.650 alumnos de 4º y 5º de primaria, unos 2.000 adultos y 80.000 estudiantes de secundaria de la Comunidad Canaria durante los últimos dos años. Les contamos nuestra experiencia...

Roque de los Muchachos Observatory: Taking astronomy to the local Secondary Schools and beyond

David Garcia Alvarez

Seven years ago the participating organizations at the Roque de los Muchachos Observatory in La Palma, Spain, started a programme to take astronomy into every local secondary school on yearly basis. The programme was intended to offer a first-hand approach to the research world and at the same time produce an inspiring and fruitful experience to both students and teachers. Here we report on the goals accomplished so far, our conclusions, and some ideas for the future. More information can be obtained at <u>http://www.lpiya.org/nuestrosalumnos</u>

El Princip**io Cero de la Divulgación**

Laura Toribio San Cipriano

Para los niños el universo puede ser algo tan excitante como lejano. Gracias a la financiación de la Sociedad Española de Astronomía, varios estudiantes del Instituto de Astrofísica de Canarias hemos realizado seis talleres gratuitos en el Museo de la Ciencia y

el Cosmos de La Laguna, dirigidos a niños de entre 6 y 12 años. El objetivo es que, durante una hora, se sumerjan en la Astronomía de una forma fresca y divertida, de ahí su nombre: 'Chapuzón Cósmico'. Con los más pequeños empezamos con un taller sobre el Sol, la Tierra, la Luna y sus movimientos, mientras que el segundo trató sobre las constelaciones. Los niños con edades intermedias pudieron aprender más tanto del Sistema Solar y sus planetas, como del Sol en particular. Con los más mayores nos centramos inicialmente en las galaxias y finalmente nos atrevimos con la evolución estelar. Sin perder el enfoque didáctico de las actividades, los talleres fueron llevados a cabo siempre de forma dinámica e interactiva, tratando de que los niños viesen, tocasen y jugasen con los nuevos conceptos que les proporcionamos. En total, más de 150 niños han podido disfrutar de esta actividad, y con ella esperamos haber aumentado su curiosidad sobre el universo que les rodea. En esta charla queremos compartir nuestra valoración de la experiencia, los recursos que hemos empleado para ello, las dificultades encontradas y recibir sugerencias para futuras actividades.

STARS4ALL proyecto de concienciación ciudadana sobre contaminación lumínica

Jaime Zamorano Calvo

STARS4ALL es un proyecto europeo que tiene como misión principal concienciar a la ciudadanía sobre los problemas que causa la contaminación lumínica. Dentro del consorcio se han identificado varias iniciativas que se ponen ya en marcha este año y se desarrollarán otras a lo largo del proyecto. Las iniciativas procederán en gran parte de las asociaciones ciudadanas. La UCM continuará con 'Cities at Night' y se encargará de aumentar la red de fotómetros de medida de brillo de cielo nocturno de la REECL a una red europea. Para ello desarrolla un fotómetro de bajo coste.

Amplificación (o no) de la contaminación lumínica por la nubosidad

Salvador José Ribas Rubio

La Contaminación Lumínica es cualquier efecto adverso producido por la luz artificial, uno de sus tipos más característicos es la emisión directa o indirecta de luz hacia el cielo (skyglow). Por otro lado, una de las formas más habituales de evaluar dicha contaminación es la medida del brillo del fondo de cielo (NSB) desde la superficie terrestre. La luz difundida hacia el cielo puede interactuar con la presencia de masas de nubes o nieblas alterando el brillo de fondo cielo en relación a la ausencia de dichos fenómenos atmosféricos, y por tanto viéndose reflejado su efecto en las medidas de fondo de cielo. En nuestro caso dicha medida se realiza mediante los dispositivos Sky Quality Meter (SQM), probablemente los más comunes para este propósito. Una de las dificultades de la evaluación de esta interacción es el acceso a datos fiables y precisos del estado del cielo de forma simultánea a las medidas SQM. Actualmente se encuentra en marcha la Xarxa de Contaminació Lumínica de Catalunya (XCLCat), un plan piloto entre el Parc Astronòmic Montsec y la Generalitat de Catalunya de monitoreo del brillo del cielo. Esta red dispone de algunas de sus estaciones situadas en emplazamientos en los que se dispone de ceilómetro, un dispositivo láser IR que analiza detalladamente el estado del cielo en cuanto a nubosidad y aerosoles. En este estudio se presenta el análisis realizado en la ciudad de Barcelona combinando medidas SQM con datos de nubosidad. Estos resultados nos muestran como las nubes en zonas urbanas aumentan en más de 2 magnitudes el brillo de fondo de cielo. Este hecho va se había detectado en estudios en otras ciudades como Berlín o Hong Kong. Pero esta amplificación no se produce en todos los casos, la realización de un estudio equivalente en la zona protegida de la sierra del Montsec nos muestra el efecto contrario. Mostrando, por primera vez de forma cuantitativa, como las nubes pueden oscurecer el cielo nocturno debido al efecto de bloqueo de las fuentes de luz natural (estrellas, Via Láctea, etc).

Ciencia en Acción: una plataforma para la Astronomía

Rosa María Ros Ferre

En el año 2000 inicia su singladura Ciencia en Acción (CEA) como respuesta a una iniciativa del CERN, ESA y ESO para promover el estudio de las ciencias en Europa. No fue hasta el 2002 cuando desde la organización de CEA se propone "Adopta una Estrella" como un nuevo grupo de modalidades dirigidas a los alumnos de primaria y secundaria con el objetivo de fomentar vocaciones científicas, con la peculiaridad de pivotar sobre el eje central de la astronomía. Ésta, como "madre de todas las ciencias", se puede relacionar con cualquiera de las asignaturas que cursan los alumnos, lo que permite ofrecer diferentes perspectivas en los trabajos a desarrollar. Se propone a los estudiantes que elijan un astro o fenómeno astronómico para que lo "hagan suyo" e investiguen lo que más les interese del mismo. Lo cierto es que durante 14 años "Adopta una Estrella" ha involucrado a profesores y alumnos de más de 20 países de habla hispana o portuguesa, y en estos momentos es uno de los foros internacionales de intercambio de conocimiento más dinámico entre los alumnos no universitarios. Los proyectos seleccionados reciben una ayuda de viaje para poder asistir a un certamen final, pero aquellos autores que no pueden desplazarse por razones económicas (esencialmente los que proceden de países centro o sudamericanos) participan en una conexión on-line que suele llenar de expectativas a todos los asistentes y que destaca por ser muy emocionante. "Adopta una Estrella" se coordina desde sus inicios con "Catch a Star" organizado por la EAAE en colaboración con ESO y los trabajos de nuestros alumnos han conseguido numerosas distinciones dentro de esta convocatoria europea. Hasta el 2015 se han obtenido 42 galardones para trabajos concretos así como para escuelas o grupos de alumnos.

Sesión ED: miércoles 20 julio - mañana

La comisión Pro-Am de la SEA

(Conferencia Invitada) Ángel Rafael López Sánchez

La comisión Pro-Am de la SEA tiene como objetivo potenciar la colaboración de astrónomos aficionados en proyectos de astronomía profesional. En esta charla daré un resumen de alguno de los proyectos que tenemos en marcha y los resultados que están proporcionando. También mencionaré algunas de las actividades que tenemos planteadas para el futuro, entre ellas la preparación de talleres y cursos específicos desarrollados por astrofísicos para enseñar técnicas observaciones y de reducción y análisis de los telescopios e instrumentación que poseen los astrónomos aficionados españoles. El objetivo final es invitar a los astrofísicos españoles a proponer proyectos de investigación con astrónomos aficionados, dado que muchos poseen (i) un excelente equipo (ii) técnicas de procesamiento de datos (iii) mucho tiempo de observación y (iv) muchas ganas de trabajar con los profesionales.

"Admira el cielo", la astronomia llega a las escuelas públicas de Rio de Janeiro, Brasil.

Sandra Benitez Herrera

"Admira el cielo" es un proyecto de divulgación del Museo de Astronomía y Ciencias Afines de la ciudad de Rio de Janeiro en Brasil, que presta material astronómico de alta calidad a escuelas para promocionar actividades de divulgación en astronomía. El objetivo principal de este proyecto es investigar si acciones continuadas de este tipo contribuyen de forma positiva a la práctica pedagógica de los profesores en sus clases y como este mecanismo funciona específicamente. Asimismo, pretender evaluar la utilización de la astronomía como una herramienta inspiradora en la área de educación en ciencias y establecer una relación de mutua colaboración entre el museo y la escuela. El equipo de "Admira el cielo" ha diseñado un Astrokit compuesto de material astronómico y didáctico que consta de un telescopio solar, filtros solares, cartas con información sobre el sol y cartilla de actividades adaptadas a la realidad brasileña y su curriculum escolar. Los profesores interesados puede tomar prestado este material después de completar una capacitación dada por astrónomos del Museo. Al devolver el kit, los profesores son invitados a rellenar un cuestionario para dar sus impresiones sobre diferentes aspectos (e.g. utilidad y adecuación del material o cumplimiento de expectativas) para mejorar nuestro programa y para ser usados como estadísticas en estudios posteriores. En esta conferencia queremos discutir nuevas estrategias para atraer al público a interesarse por la ciencia, especialmente en lugares con menos recursos, como escuelas públicas. Asimismo no gustaría presentar nuestros resultados preliminares después de 2 años de proyecto. Finalmente, queremos resaltar la importancia de los museos de ciencias como lugares de educación no-formal y los beneficios resultantes de su relación con la escuela. Nota: las coordinadoras del proyecto "Admira el cielo" Sandra Benitez Herrera y Patricia Figuéiro Spinelli, son astrónomas asociadas a la Sociedad de Astronomía Brasileña (SAB).

Informatización de un telescopio en enseñanza secundaria.

Alfonso García Santiago

El trabajo que presentamos es la computerización de un telescopio refractor sobre una montura ecuatorial tipo EQ3 mediante arduino. El control de la montura lo hacemos desde tres interfaces distintas: Stellarium, un mando elaborado en android para teléfonos móviles y un segundo mando para pc realizado con Processing. Dicho trabajo fue realizado por los autores con el fin doble de introducir el interés por la astronomía, dentro del Departamento de Matemáticas; y el desarrollo de aplicaciones dentro de la asignatura Tecnología, en cuarto de la ESO. Es pues un proyecto colaborativo entre ambos Departamentos. Salvo el telescopio y la montura, todos los medios que hemos utilizado se pueden encontrar en cualquier instituto de secundaria: software libre (guadalinex v9), App inventor (en internet) y Processing (internet). El proyecto se ha llevado a cabo con el principio de reducir todos los costes posibles, dadas las posibilidades de la institución. Es coste final ha sido de aproximadamente 50 €. Hemos encontrado un germen de nuestro trabajo en internet. Fue desarrollado por David Vidal con el nombre de ArduGoto, un programa para arduino que se conecta a Stellarium y mueve los motores de la montura. Dicho programa adolece de serias deficiencias y errores que lo hacen prácticamente inservible. Hemos corregido dichos errores y hemos ampliado el programa incluyendo también la posibilidad de ser gobernado desde un teléfono móvil vía bluetooth, y desde un pc. Utilizar exclusivamente Stellarium para su control es engorroso, dada la interfaz extremadamente austera y poco versátil que tiene. Los mandos que hemos realizado tanto para android como para pc suplen todas esas deficiencias. Dado que el instituto dispone de una cámara Celestron NexImage, podemos ver las imágenes del ocular, y controlar el telescopio desde un ordenador remoto. Las imágenes son recogidas y enviadas a través del programa VLC, que permite streaming (también software libre). Es la simulación del funcionamiento de un gran observatorio hecho por y para los alumnos de secundaria.

Microdocumentales y cortos de ficción para divulgar la astronomía. El

canal de YouTube del portal conec.es

Vicent J. Martínez García

El poder de internet para divulgar la astronomía es innegable. En la red encontramos gran cantidad de vídeos cortos para divulgar conceptos o descubrimientos astronómicos (en canales de YouTube o Vimeo) con un número de vistas muy dispar. En esta comunicación hacemos un análisis de algunas de estas experiencias en el ámbito de la astronomía española y planeamos las claves para que esta actividad tenga un buen seguimiento. En particular, destacaremos el trabajo creativo del guionista, que ha de saber contar una historia en imágenes. Analizamos algunos vídeos de éxito del canal del portal de divulgación de la ciencia conec.es que cuenta con cerca de 200000 visitas. Presentaremos el corto científico co-financiado por la SEA: "Arco de Choque".

Gaiaverse: el portal de divulgación de Gaia

Eduard Masana Fresno

Gaiaverse es un portal de divulgación sobre la misión Gaia de la ESA desarrollado en el marco del proyecto GENIUS, un proyecto europeo financiado por la Comisión Europea. El objetivo de GENIUS es ayudar a difundir y aumentar el impacto de la misión astrométrica Gaia, lanzada por la ESA en diciembre de 2013 y cuyos primeros resultados se harán públicos en septiembre de 2016. Gaiaverse quiere convertirse en el centro de divulgación de la misión Gaia recogiendo todo tipo de materiales, ya sea presentaciones, vídeos, posters, folletos, herramientas, noticias... todos ellos disponibles a través del portal

gaiaverse.eu. Gracias a la red de colaboradores que participan en el portal, Gaiaverse está disponible actualmente en 11 idiomas, siendo de está manera una herramienta para la difusión de la misión Gaia en cada uno de los respectivos países, ofreciendo la posibilidad de mostrar o destacar noticias diferentes en cada uno de los diferentes idiomas.

Ecos del Cosmos: una astroexperiencia radiofónica en la Universitat de València

Enric Marco Soler

Durante los últimos tres años Ecos del Cosmos ha sido un programa radiofónico dedicado a difundir la actualidad astronómica a la comunidad universitaria y más allá, así como a divulgar temas de interés general astronómico. Para ello, el espacio astronómico de la Ràdio de la Universitat de València ha realizado entrevistas en directo a investigadores, ha indagado en las relaciones de la astronomía con las humanidades y con la sociedad, ha hecho concursos con los oyentes y ha explicado, de manera sencilla, las efemérides más importantes del mes. Una versión en castellano de Ecos del Cosmos se difundió en el programa de verano Jelo en verano de Onda Cero, programa conducido por Arturo Téllez.

Sesión ED: jueves 21 julio - tarde

Una estrella para Cervantes

(Conferencia Invitada) Javier Armentia Fructuoso

El concurso internacional NameExoWorlds, de la Unión Astronómica Internacional supuso en 2015 un hito único en la comunicación social de la astronomía, con participación directa de personas de todo el mundo. Para otorgar por vez primera nombres a mundos descubiertos en torno a otras estrellas en los últimos años solicitaron propuestas a asociaciones, museos, planetarios y otros grupos astronómicos de todo el mundo, sometidas posteriormente al veredicto público a través de un sistema de votación por internet, en la página nameexoworlds.jau.org. Más de medio millón de votos atestiguan que la iniciativa caló en un público muy amplio. Una de las propuestas fue elevada a través de la iniciativa de astrónomos y astrofísicos españoles de la Sociedad Española de Astronomía (SEA), entidad que colabora desde hace tiempo con el Instituto Cervantes para incluir la divulgación astronómica en castellano dentro de las ofertas culturales de este instituto público, para conmemorar a Cervantes y a cuatro personajes de su principal novela, el Quijote. El Planetario de Pamplona, como entidad promotora, fue responsable de coordinar las actividades y la campaña, aunando las iniciativas de muchos colectivos, instituciones culturales y educativas y medios de comunicación, a través de la web www.estrellacervantes.es y de las redes sociales, creando una experiencia de divulgación cultural integradora del carácter humanista que permitía la figura de Cervantes y sus personajes con la científica que supone el descubrimiento de los planetas extrasolares. Pero el proyecto sigue adelante en 2016, al conmemorarse los 4 siglos de la muerte del escritor. Conferencias y talleres, un programa de planetario producido por el Planetario de Pamplona y el Museo de las Ciencias de Castilla-La Mancha junto con SEA que será accesible y gratuito para todos los planetarios, y la propuesta de incluir a la "estrella Cervantes" en libros de texto y, en definitiva, hacerla parte de esa "herencia cervantina" que ahora además puede incorporar a la investigación científica.

International Astronomical Union's Astronomy for Equity and Inclusion

Amelia Ortiz-Gil

En esta charla presentamos las finalidades, objetivos y actividades puestos en marcha por el grupo de trabajo "Astronomía para la Igualdad y la Inclusión" que se ha formado dentro de la comisión C1 "Educación en Astronomía y Desarrollo" de la División C "Educación, Divulgación, Historia y Legado de la Astronomía" de la Unión Astronómica Internacional. El grupo de trabajo nació con el objetivo de desarrollar nuevas estrategias y recursos para facilitar el acceso a la Astronomía, tanto a nivel profesional como divulgativo, de personas con necesidades especiales o de aquéllas que podrían ser excluidas por razón de su raza o género (entre otros motivos). Está formado por astrónomos de la IAU y voluntarios externos pertenecientes a los ámbitos de la astronomía, educación y necesidades especiales, así como distintas organizaciones colaboradoras como las Oficinas de Astronomía para el Desarrollo (OAD) y para la Divulgación de la Astronomía (OAO) de la IAU, Astrónomos sin Fronteras (AWB), Galileo Teacher Training Program (GTTP) o Universe Awareness (UNAWE). Para conseguir los objetivos planteados se han puesto en marcha diversas iniciativas, reflejadas en la página web del grupo de trabajo, la creación de documentos sobre buenas prácticas y el establecimiento de una estrecha colaboración con el Grupo de Trabajo sobre Accesibilidad de la American Astronomical Society, también de reciente creación.

De efeméride en efeméride…proyectos transversales de divulgación del Instituto de Astrofísica de Canarias

Carmen del Puerto Varela

En el argot periodístico, una "percha" informativa es un argumento al que agarrarse, un instrumento paralelo que sostiene lo que de verdad interesa contar, una estrategia de comunicación y divulgación. Puede ser un evento, una fecha, una tendencia, un informe o una temática. Hace siete años tuvimos una de esas "perchas": Galileo construyó el primer telescopio de uso astronómico en 1609 y, cuatro siglos después, la Asamblea de las Naciones Unidas aprovechaba esa efeméride para hacer del 2009 el Año Internacional de la Astronomía y convertir a esta rama de la ciencia en trending topic. En 2015 tuvimos otra "percha" en el Instituto de Astrofísica de Canarias (IAC), un pretexto para potenciar aún más la divulgación de la Astronomía: celebrábamos los 30 años de la inauguración oficial de la sede central del IAC y de los Observatorios de Canarias. En esta comunicación se presenta la frenética actividad de divulgación que se asumió por este motivo así como los proyectos transversales que el IAC y las instituciones científicas presentes en los Observatorios de Canarias están llevando cabo en 2016 para, de nuevo, poner de moda la Astronomía, aprovechando efemérides importantes del año, como el 400 aniversario de la muerte de Cervantes, entre otras.

Astronomía accesible: Acercando el estudio del Universo a los

discapacitados visuales

Enrique Pérez Montero

Astronomía accesible (astroaccesible.iaa.es) es un proyecto realizado con la colaboración del IAA-CSIC y la ONCE para divulgar la astronomía al colectivo de personas con discapacidad visual y, por definición, sin la ayuda de contenidos basados en el uso de imágenes. Comenzó a funcionar de manera muy modesta hace dos años y tras recibir financiación de la SEA en 2015 y de la FECVT en 2016, le ha permitido crecer y expandirse. Las actividades y talleres presenciales que se han realizado en numerosos centros de la ONCE y congresos de divulgación, así como el desarrollo de materiales y de contenidos específicos en la página web han marcado un camino a seguir en el mundo de la divulgación científica entre las personas con necesidades especiales. En esta contribución se describen los logros alcanzados en estos dos años y se enumeran los objetivos de continuidad y de línea futura para seguir con esta labor divulgativa.

¿Orientaciones astronómicas en los asentamientos romanos? Aproximación al urbanismo romano a través de la arqueoastronomía

Andrea Rodríguez Antón

El hecho de que autores de la antigüedad como Higinio Gromático (*Constitutio*, 1) o Frontino (*De Agri Mensura*, 27) mencionasen la necesidad de seguir la trayectoria del sol a la hora de determinar la dirección del decumano de una ciudad, nos ha llevado a indagar si la astronomía jugaba un papel relevante a la hora de establecer la dirección de los dos ejes principales de ésta. Partiendo de este hecho y de resultados obtenidos en trabajos previos se ha realizado un estudio estadístico de las orientaciones de 80 ciudades romanas en la Península Ibérica, Hispania en tiempos romanos, que constituye la mayor muestra tomada de asentamientos romanos en un territorio. Para adquirir los datos in situ se han empleado brújulas de precisión, clinómetros y un GPS. También se ha complementado esta información mediante análisis con Sistemas de Información Geográfica sobre imágenes de satélite, ortofotografía y modelos digitales de terrenos que, aunque menos precisos, pueden servir a modo de sondeo preliminar. Con estos datos se ha obtenido la declinación de cada orientación medida con objeto de poder relacionarla con posiciones de cuerpos celestes, principalmente del sol. Los resultados preliminares muestran una distribución no homogénea de los resultados y acumulaciones en torno a valores de declinación solar relacionados con fechas de relevancia en el calendario romano. Con esto no podemos descartar que, entre otros factores, la observación astronómica fuese otro factor a considerar a la hora de trazar los ejes de una ciudad o establecer la orientación de sus estructuras principales más allá de objetivos meramente prácticos. Observación astronómica por otro lado necesaria para establecer algo tan relevante ayer y hoy como es el calendario.

Observatorios remotos y flipped classrooms, un maridaje astronómico

Juan Ángel Vaquerizo Gallego

La flipped classroom es una forma de "dar la vuelta" a la clase tradicional. Se trata de un **novedoso modelo pedadógico en el que se invierten los elementos tradicionales del aula**, tanto temporales como espaciales, de modo que a las explicaciones y ejercicios se les suman discusiones y proyectos, **realizados antes**, durante o después de la clase, individualmente o en grupo. En este contexto, los observatorios remotos encajan como anillo al dedo. Presentamos en la comunicación una propuesta "flipada" para enseñar astronomía en ESO y Bachilerato.

unitedsoundsofcosmos

Jose A. Caballero

We have been congratulated on the stage by a Nobel Prize (he was our curtain raiser), played our music in planetariums, museums and observatories throughout Spain, shocked audiences in rock concerts, written monthly on Musica universalis (the music that did not go in the Golden Voyager Record; Muse, MUSE and the Muses; Franco Battiato; a Javier Gorosabel's T-shirt with a Mozart's score...), made the second concert in 3D in Spain after Kraftwerk and broadcasted it live in Radio 3, mixed our music with poetry read aloud by a SEA ex-president, composed the soundtracks of CARMENES and QUIJOTE, made a videoclip on how computer simulate the formation of stars, been invited to play in the meeting of the ESO telescopes time allocation committee... All those moments will not be lost in time, like tears, but recollected in Bilbao during the meeting of the Spanish Astronomical Society.

Pósteres

El proyecto GalileoMobile: compartiendo astronomia con estudiantes y profesores de todo el mundo

Sandra Benitez Herrera

GalileoMobile es un proyecto internacional e itinerante de divulgación que busca llevar la astronomía a comunidades y escuelas con pocas posibilidades de acceso a este tipo de programas. A través de actividades de modalidad hands-on que abarcan distintos temas en astronomía, el proyecto pretende fomentar el interés por la ciencia en los jóvenes para así inspirarles a reflexionar sobre el mundo en el que viven. Igualmente, el proyecto trabaja de forma sistemática con los profesores de las escuelas, para que puedan realizar las actividades después de nuestra visita, y se conviertan así en agente multiplicadores, posibilitando la sostenibilidad y la continuación del proyecto. El equipo de GalileoMobile está compuesto por astrofísicos, educadores y periodistas que trabajan voluntariamente con el objetivo de hacer de la astronomía una herramienta global de acercamiento de las diferentes culturas. Desde 2008 y con el lema "bajo el mismo cielo" el proyecto ha viajado a países como Argentina, Brasil, Bolivia, Chile, Colombia, Ecuador, India, Peru, Uganda... alcanzando a más de 16000 estudiantes y 1500 profesores. En el año 2009 fuimos nominados como proyecto especial dentro del marco del Año Internacional de la Astronomía y en 2015 designados "Projecto Luz Cosmica" por la Unión Internacional de la Astronomía y parcialmente financiados por la Oficina de Desarrollo en Astronomía (Office for Astronomy Development – OAD). Para trasmitir el mensaje de unidad bajo el mismo cielo, hemos producido tres documentales y un "photo-book" mostrando nuestras experiencias y el trabajo realizado en los diferentes lugares visitados. Todo el material es exhibido y distribuido gratuitamente en escuelas y centros culturales. Nuestro último documental Año-Luz, que fue producido en 2015 coincidiendo con el Año Internacional de la Luz, fue seleccionado para exhibición en la ceremonia de clausura de dicho año en Mérida, México. En esta conferencia queremos presentar los logros alcanzados, así como nuestras próximas iniciativas que incluyen un proceso de evaluación e impacto a largo plazo.

Estrellas entre viñedos: maridaje de vino, música y astronomía

Laura Calero Hernández

El pasado 17 de abril se presentó en el municipio tinerfeño de Tegueste un vino innovador y ecológico, fruto de la colaboración de todos viticultores pertenecientes a la Asociación Vitivinícola AVITE. Esta asociación, junto con el Ayuntamiento del municipio y el Instituto de Astrofísica de Canarias bautizaron al vino "Sextante". El propósito era unir el patrimonio y la cultura de sus habitantes, ya que sus simbólicos "barcos", aunque por ser de mar adentro nunca necesitaron orientarse con el astrolabio, la brújula o la ballestina, sí representan a la vida campesina que tanto contempló el cielo buscando respuestas a sus quehaceres agrícolas y ganaderos. El evento incluyó la charla "El cielo de Tegueste" y un taller de observación astronómica impartido por aficionados, así como un concierto del famoso músico y timplista canario Benito Cabrera, que para la ocasión creó el espectáculo "Constelación", entremezclando la belleza de las imágenes del Cosmos con melodías canarias.

Moda Cósmica

Laura Calero Hernández

El Universo, como la Moda, tienen diferentes formas, tamaños, colores y patrones. Por lo tanto, la analogía entre ambos nos brinda una oportunidad ideal para explicar la belleza y la compleja física del Cosmos a través de una iniciativa innovadora. El Instituto de Astrofísica de Canarias (IAC) desarrolló en el 2015 el proyecto "Moda Cósmica" junto con la Escuela de Arte y Superior de Diseño (EASD) "Fernando Estévez" de Tenerife, para los ciclos formativos de Grado Superior de Estilismo de Indumentaria y Enseñanzas Artísticas Superiores de Diseño de Moda. El investigador Tariq Shahbaz y la Unidad de Comunicación y Cultura Científica (UC3) del IAC participaron activamente en la formación de los alumnos junto al equipo educativo del centro, así como en los recursos divulgativos posteriores, fundiendo arte y ciencia. Para divulgar la astronomía, además de la formación de alumnos, se han usado medios diversos en un desfile de moda organizado para el gran público el día 6 de junio y celebrado en la ciudad de La Laguna (Tenerife) ante unas 400 personas. Varios fueron los recursos planificados: desde un espectáculo de luz y sonido. un guión plagado de símiles astronómicos impartidos por una astrofísica y experta divulgadora, audiovisuales que exhibían imágenes espectaculares del cielo de Canarias, los modelos diseñados en las instalaciones telescópicas del Observatorio del Teide y hasta una pasarela al aire libre que reproducía un brazo de nuestra galaxia, la Vía Láctea. El proyecto, con financiación de la Fundación Española para la Ciencia y la Tecnología del Ministerio de Economía y Competitividad (FECYT), contó con la colaboración del centro de belleza Nuevo Stylo e Imagen, la empresa de modelos Quecapricho Olé, el Ayuntamiento de San Cristóbal de La Laguna y la Consejería de Educación, Universidades y Sostenibilidad del Gobierno de Canarias. Todo el proyecto puede consultarse en su página web: http://www.iac.es/modacosmica/

Primeros resultados de la variación espacial y temporal del brillo de

cielo nocturno del entorno de Valencia

Enric Marco Soler

Durante los últimos años se ha realizado un estudio de la calidad del cielo nocturno en el entorno del área metropolitana de Valencia. Para ello se ha usado un dispositivo Sky Quality Meter (SQM-LE) junto con un GPS con los cuales se ha cubierto un gran número de rutas desde localizaciones cercanas a la capital valenciana muy iluminadas hasta zonas muy oscuras situadas a más de 100 kilómetros de ella. Los objetivos del trabajo ha sido determinar la variación de la contaminación lumínica con respecto a la distancia a Valencia, localizar áreas con una gran calidad de cielo nocturno en aras a reclamar su protección y verificar la contribución de las poblaciones menores en el brillo del cielo. Dado que la contaminación lumínica también afecta a la biodiversidad, se ha incidido especialmente en estudiar el cielo nocturno de los parques naturales cercanos a la ciudad. Se han realizado trayectos nocturnos por el Parc de la Calderona, la Albufera y especialmente en el entorno del Parc del Túria. De nuestro estudio se concluye que estos parques están completamente degradados y necesitarían un plan urgente de protección contra la contaminación lumínica. Finalmente se presentan los primeros resultados de los detectores SQM LU fijos que tenemos dispersos por todo el territorio valenciano.

Espacio auditivo virtual: un recurso educativo para alumnos con discapacidad visual

Pere Pallé Manzano

Pretendemos implementar un sencillo proyecto instrumental, basado en el kit electrónico Arduino y el lenguaje de programación Scratch, para crear un sistema de emisión de sonidos a través de diversos altavoces. La combinación de estos sonidos creará un espacio auditivo 3D que permita 'colocar' objetos virtuales en el espacio, tales como planetas girando alrededor del Sol, estrellas en el cielo, gráficas y otros recursos didácticos clásicamente asociados a lo visual. De esta forma pretendemos acercar la astronomía y otras ciencias al público con discapacidad visual severa. La utilización de Arduino y Scratch tiene como intención mostrar de manera simple y amena a alumnos con intereses en programación y ciencias el funcionamiento de este recurso.

Assumpció Catalá, el primer telescopio español en femenino

S. J. Ribas

Maria Assumpció Català nació en Barcelona el 14 de julio de 1925. Pese al clima hostil de la guerra civil y de la posguerra, logró abrirse camino en un mundo científico académico reservado hasta entonces a los hombres. En 1971 se convirtió en la primera mujer que obtenía un doctorado en matemáticas en Barcelona y en 1974 en la primera astrónoma profesora numeraria de la universidad española

Rindiendo homenaje a nuestra profesora, compañera y amiga, en marzo de 2016 se inauguró el Telescopio Assumpció Catalá en el Centre d'Observació de l'Univers (Àger, Lleida) gestionado por el Consell Comarcal de la Noguera. Este telescopio aula, pionero en Europa, es un reflector Dall-Kirham de 50 cm, diseñado para que, de forma simultánea, 70 personas observen, aprendan y disfruten del cielo del Montsec. Hemos diseñado una exposición itinerante que nos permite, a la vez, enseñar astronomía y mostrar su legado, viendo así la impresionante evolución de la astronomía en nuestro país en las últimas décadas. Esas potentes herramientas de divulgación sirven para rendir homenaje a quien fue una gran profesional de la astronomía, una docente extraordinaria y, a partir de ahora, la primera mujer en dar nombre a un telescopio en territorio español.

<u>FÍSICA SOLAR</u>

Sesión FS: lunes 18 julio - tarde

First Scientific Results with the GREGOR Telescope

(Conferencia Invitada) Juan Manuel Borrero

The 1.5-meter GREGOR Telescope is located at the Spanish Observatory of El Teide in Tenerife. This telescope is currently the second largest solar telescope in the World . It saw first light in 2013 and became fully operational a year later. For the past two years GREGOR has gathered some of the best data ever recorded from the ground, thereby allowing us to investigate the solar magnetic field with unprecedented detail. GREGOR's data is freely available to all the scientific community. Moreover, observing time with GREGOR is available to the international community through the Solarnet/EST program. After briefly reviewing GREGOR's history, current instrumentation and capabilities, I will present some of its first scientific results on the quiet Sun magnetism (distribution of magnetic field vector in the solar internetwork), origin of sunspot fine structure (pernumbral brightness and energy transport), and magnetic connectivity between lower and upper atmosphere (simultaneous reconnection in the Photosphere and Corona). Some of these results have allowed us to settle some long standing controversies about the nature of the solar atmosphere. If time permits I will also introduce the new instruments that will be installed in the near future and that will greatly enhance the telescope's reach.

Inference of the magnetic field strength from transverse oscillations in solar atmospheric waveguides

Iñigo Arregui

The application of seismology diagnostic techniques to transverse oscillations of coronal waveguides is a source of information on the magnetic field strength. However, a number of assumptions on the density of the structures are needed to infer this physical quantity from the observed oscillation properties. We applied Bayesian inference to the problem of determining the magnetic field strength from the observed period or phase speed of transverse oscillations. This is done by computing the marginal posterior probability density functions for the waveguide density, the density contrast and the magnetic field strength using oscillatory properties of transverse oscillations under the assumption that they can theoretically be modelled as standing or propagating magnetohydrodynamic (MHD) kink modes. The obtained results indicate that the magnetic field strength can be inferred, even if the densities inside and outside the structure are largely unknown. When some information on plasma density is available, the method enables us to self-consistently include this information to further constrain the inferred magnetic field strength.

Prominence oscillations: Effect of a time-dependent background temperature

José Luis Ballester Mortes

Small amplitude oscillations in prominences are known from long time ago, and from a theoretical point of view, these oscillations have been interpreted in terms of standing or propagating linear magnetohydrodynamic (MHD) waves. In general, these oscillations have been studied by producing small perturbations in a background equilibrium with stationary physical properties. Taking into account that prominences are dynamic plasma

structures, the assumption of an stationary equilibrium is not realistic, therefore, our main aim is to study the effects produced by a non-stationary background on slow MHD waves which could be responsible for prominence oscillations. Assuming that the radiation term is proportional to temperature and a constant external heating, we have derived an expression for the temporal variation of the background temperature depending on the imbalance between heating and cooling processes. Furthermore, radiative losses together with paralle I thermal conduction have also been included as damping mechanisms for the waves. When temperature increases with time, the period of slow waves decreases and the amplitude of the velocity perturbations is damped. The inclusion of radiative losses enhances the damping. When temperature decreases with time, the period of slow waves increases and the amplitude of velocity perturbations grows while, as expected, the inclusion of radiative losses contributes to the damping of oscillations. There is observational evidence that in different locations of the same prominence, oscillations are damped or amplified with time. This temporal damping or amplification can be obtained by a proper combination of a variable background temperature, together with radiative damping. Furthermore, decayless oscillations could also be obtained with an appropriate choice of the characteristic radiation time.

Vector magnetic field of lateral downflows in sunspot penumbral filaments

Luis Bellot Rubio

We have inverted a time sequence of full Stokes polarimetric measurements of a sunspot at the disk center with a view to determine the magnetic properties of the weak downflows that occur at the edges of penumbral filaments. The observations were acquired with the Crisp Imaging Spectropolarimeter in the Fe I 6173 line at the Swedish Solar Telescope on La Palma under superb seeing conditions. They reveal the existence of lateral downflows with unprecedented clarity and allow their temporal evolution to be studied in detail. We find regular two-lobed circular polarization profiles at the position of the downflows. These profiles have small asymmetries and can be inverted successfully in terms of one-component magnetic atmospheres with constant parameters along the line of sight. The inversions show that the polarity of the vector magnetic field is usually the same in the downflows and the hosting filament. Sometimes we observe a third weak lobe in the red wing of the circular polarization profile, indicating the presence of opposite polarity fields. This suggests that the downflows drag the field lines but do not change their polarity except on rare occasions. We also study the azimuth of the magnetic field in an attempt to confirm the convective nature of the lateral downflows.

IMaX II: un nuevo magnetógrafo para Sunrise

Jose Carlos del Toro Iniesta (on behalf of the IMaX consortium)

El consorcio internacional Sunrise está preparando para 2020 un nuevo vuelo del observatorio estratosférico del mismo nombre. Con un buen número de cambios, la misión aspira a cubrir un hueco científico perfectamente compatible con el que cubren los grandes telescopios terrestres que estarán operativos o en preparación. Para dicho vuelo, el consorcio español IMaX está diseñando un magnetógrafo que mantiene el corazón principal del instrumento previo, pero que prepara una serie de cambios e innovaciones que le permitan ser aún más competitivo. En esta contribución presentaremos el concepto tanto de la misión como del nuevo IMaX II.

Oscilaciones Filamentosas en la Penumbra de una Mancha Solar

Ana Belén Griñón Marín

Desde principios del siglo XX se ha mostrado un gran interés en comprender los cambios morfológicos en las manchas solares y, en particular, la posible existencia de aparentes movimientos rotacionales y oscilaciones. Este tipo de estudios requieren una gran resolución espacial, pero también temporal, ya que una secuencia temporal grande nos proporciona mucha más información de los movimientos de las manchas. Con el lanzamiento del satélite Solar Dynamics Observatory (SDO, Pesnell et al. 2012), se abrieron nuevas oportunidades para poder hacer un seguimiento más detallado de las manchas solares al mejorar la resolución temporal conservando una buena resolución espacial. Por esto realizamos un estudio (Griñón-Marín et al. 2016 -enviado-) en el cual se buscaban oscilaciones torsionales. El resultado al que se llegó fue que no hay evidencia de este tipo de oscilaciones en las 25 manchas que se analizaron. Sin embargo, en algunas regiones localizadas en la penumbra de las manchas sí parece que se detectan ciertas oscilaciones con forma filamentosa y con periodos de varias horas. En la actualidad estamos estudiando estas oscilaciones así como su posible relación con estructuras de la mancha en capas superiores de la atmósfera. La presentación mostraría los resultados y la metodología seguida en el estudio.

Sesión FS: miércoles 20 julio - tarde

Space Weather: current developments in solar energetic particle events research

(Conferencia Invitada) Àngels Aran

Europe is working towards developing its own infrastructure for the monitoring and prediction of space weather. Recent efforts are placed into developing and coupling models for the prediction of the space weather in its different domains: heliosphere, magnetosphere, atmosphere and ground level. We will briefly overview the current status of the models applied to the description of the space weather conditions in the Earth's domains and we will focus in the description of models or tools build to predict some of the characteristics of solar eruptive phenomena, interplanetary (IP) shocks, and solar energetic particle (SEP) events. At present, 3-dimensional models describing the propagation of interplanetary shocks driven by coronal mass ejections are routinely run to estimate IP shocks arrivals at Earth. The combination of such models with SEP models of particle acceleration and transport is the next big step to be undertaken for the near-real time forecast of large SEP events. The main difficulty is that the current knowledge of the mechanisms involved in the generation of these SEP events is not complete yet. In addition to the models describing SEP events episodes, particle radiation models are used to estimate the fluence, peak intensity and worse case scenarios that interplanetary missions may encounter during their orbit. These models are based on the statistical treatment of SEP data measured in the last 40 years, and make assumptions of the variation of the SEP event size with the heliocentric radial distance from the Sun. We will present recent developments in one of these models.

Long-term variation of solar activity: recent progress

(Conferencia Invitada) José Manuel Vaquero Martínez

The concept of solar activity is a common term nowadays. However, it is not straightforwardly interpreted and it is ambiguously defined. A review of our knowledge of the long-term behavior of solar activity in the past is presented, as reconstructed using the indirect proxy method (millennial time scale) and the direct historical observations (secular time scale). The latest international efforts to obtain a series of sunspot numbers of the last four centuries are reviewed. Observations of sunspots during the Maunder minimum (1645-1715) are particularly interesting and they show the solar cycle during this period of Grand Minimum of solar activity. Finally, efforts to recover other useful information to improve our knowledge of past solar activity are reviewed: (i) sunspot catalogs, (ii) butterfly diagrams, (iii) tilt angles of sunspot groups, (iv) auroral observations and (v) records of geomagnetic storms.

Redifining the Boundaries of Interplanetray Coronal Mass Ejections from Observations at the Ecliptic Plane

Consuelo Cid Tortuero

On 2015 January 6-7, an interplanetary coronal mass ejection (ICME) was observed at L1. This event, which can be associated with a weak and slow coronal mass ejection (CME), allows us to discuss on the differences between the boundaries of the magnetic cloud and the compositional boundaries. A fast stream from a solar coronal hole bounding this ICME offers a unique opportunity to check the boundaries process definition and to explain differences between them. Using Wind and ACE data, we perform a complementary

analysis involving compositional, magnetic, and kinematic observations providing relevant information regarding the evolution of the ICME as travelling away from the Sun. We propose erosion at least at the front boundary of the ICME as the main reason for the difference of the boundaries, and compositional signatures as the most precise diagnostic tool for the boundaries of ICMEs.

High frequency jet-like phenomena in the presence of a null point

Irantzu Calvo Santamaria

Null points are one of the most intriguing structures in solar physics. The main reason for this is that they have never been observed. Nevertheless, theoretical and numerical studies predict these prominent discontinuities to be ubiquitous almost everywhere in the solar chromosphere and corona. The null points lead to reconnection events that can dissipate energy into heat, contributing to the chromospheric and coronal heating. Furthermore, the magnetic reconnection can also lead into very strong phenomena in the corona, such as, solar flares. In addition, wave propagation in the presence of a null point changes drastically compared to their behavior in the absence of those discontinuities. As the Alfvén speed is zero, the null points cannot be crossed by pure Alfvén waves, being these waves guided outwards the null point along the field lines. Additionally, fast magnetic waves are refracted around null points due to the strong gradient in the Alfvén speed. Therefore, the only waves that can physically cross the discontinuities are the acoustic-like or slow magneto-acoustic waves. In this work we study the shock waves interaction with a null point. In particular we analyze the interaction between hydrodynamic shock waves, developed in the chromosphere, and a null point, that results on a jet-like phenomenon. This phenomenon is periodic, resulting in a high frequency region around the null point.

Sumideros convectivos y campos magnéticos en el Sol en calma

Iker Sánchez Requerey

Los modelos teóricos de la convección solar predicen la existencia de flujos descendentes y localizados, capaces de aglutinar campos magnéticos y concentrarlos hasta alcanzar intensidades de kiloGauss. En esta charla analizaremos la relación entre sumideros convectivos y campos magnéticos a las escalas más pequeñas jamás observadas. Demostraremos cuantitativamente que los campos más intensos tienden a concentrase preferentemente en los sumideros. Asimismo, analizaremos en detalle el papel que juegan estos sumideros en los diferentes procesos evolutivos de las estructuras magnéticas del Sol en calma.

Sesión FS: viernes 22 julio - mañana

Abundancia d**e oxígeno en la fotosfera a partir de un modelo 3D** empírico

Melania Cubas Armas

Conocer la composición química del Sol es de vital importancia para muchas áreas de la Astrofísica. En particular, es importante determinar la abundancia de oxígeno, ya que es uno de los elementos más abundantes en el Universo. Las diferencias entre diversas determinaciones llevó a lo que hoy se denomina "la crisis del oxígeno solar". Actualmente se realizan nuevos estudios intentando reconciliar los diferentes conjuntos de abundancias, así como conseguir que éstas sean compatibles con las predicciones heliosismológicas sobre la velocidad del sonido en el Sol. En este trabajo usamos un modelo 3D empírico para determinar la abundancia de oxígeno solar. Para ello, usamos un análisis bayesiano para estimar el valor más probable para la abundancia de oxígeno en la fotosfera solar, teniendo en cuenta diferentes parámetros que afectan a nuestra determinación.

Campo magnético en un filamento de región activa

Carlos José Díaz Baso

Los filamentos o protuberancias solares son condensaciones de plasma frío que se encuentran suspendidos a alturas coronales. El campo magnético es quién parece sostener estas estructuras y evita que se disipen en la corona. Aún siendo un ingrediente tan fundamental, no se conoce bien su topología. En esta presentación, mostraremos observaciones espectropolarimétricas en 1083 nm de un filamento de región activa tomadas con el instrumento GRIS en el nuevo telescopio GREGOR. El rango espectral es interesante porque contiene una línea de silicio que traza la fotosfera junto a una línea de helio neutro que se forma básicamente en el filamento. Para estudiar el campo magnético con precisión haremos uso de dos códigos de inversión -- HAZEL y SIR -- para inferir las propiedades magnéticas y térmicas del filamento, así como el contexto fotosférico. Presentamos resultados preliminares, centrándonos en la topología del campo magnético del filam ento y estudiando su evolución temporal.

The solar gravitational redshift measured with the laser frequency comb in HARPS

Jonay I. González Hernández

The redshift of solar absorption lines was already noticed in 1896 and interpreted as pressure shifts in the plasma of the solar photosphere (Jewel 1896). It was Albert Einstein and its General Theory of Relativity (Einstein 1916) in 1916 who argued that the redshift was indeed mainly due to the difference in gravitational potentials between the solar **photosphere and the Earth's surface. Several attempts to measure the solar gravitational** redshift in the past have provided values close to the theoretical prediction of 633.7 m/s (e.g. Roca-Cortés & Pallé 2014). In 2006 ESO approached the group of Prof. Theodor Hänsch, the 2005 Nobel Prize in Physics, at the Max Planck Institute for Quantum Optics (MPQ), to study the possibility of using a laser frequency comb (LFC) for the calibration of high-resolution astronomical spectrographs. A collaboration was initiated between ESO, MPQ and Menlo GmbH, that later joined the IAC and more recently the UFRN. The LFC attached to the ultra-stable spectrograph HARPS (design to detect exoplanets with the radial velocity technique, Mayor et al. 2003) has been demonstrated to be a very accurate

calibration system, achieving short-term repeatability at the level of 2.5 cm/s (Wilken et al. 2012). Doppler shifts of the photospheric lines are related to the gravitational redshift and to dominant motions of the convective layers in which they form. During the commissioning campaign of the HARPS-LFC system, we acquired several solar spectra pointing the 3.6m-**ESO telescope in La Silla to the Moon's center. We have selected a** hundred Fe absorption lines with accurate laboratory wavelengths to measure with high precision the line cores and the equivalent widths of the lines. In this talk I will describe the HARPS-LFC system and will show our new measurement of the gravitational redshift of the Sun.

Solar tornadoes: a myth or reality?

Manuel Luna

Recent high-resolution and high-cadence observations have surprisingly suggested that prominence barbs exhibit apparent rotating motions suggestive of a tornado-like structure. Additional evidence has been provided by Doppler measurements. The observations reveal opposite velocities for both hot and cool plasma on the two sides of a prominence barb. This motion is persistent for several hours and has been interpreted in terms of rotational motion of prominence feet. Several authors suggest that such barb motions are rotating helical structures around a vertical axis similar to tornadoes on Earth. One of the difficulties of such a proposal is how to support cool prominence plasma in almost-**vertical structures against gravity. The support of the cool mass is a "sine qua non"** condition for such a hypothetical structures. In this work we model analytically a tornado-like structure and try to determine possible mechanisms to support the prominence plasma. We have found that the Lorentz force can indeed support the barb plasma provided the magnetic structure is sufficiently twisted and/or significant poloidal flows are present.

Observation of a chromospheric jet in the He 1083 nm multiplet

David Orozco Suárez

I report the observation of a chromospheric jet phenomena observed above a sunspot penumbra with the Tenerife Infrared Polarimeter instaled at the German Vacuum Tower **Telescope (Izaña Observatory, Tenerife). I argue that the jet could be form as a result of** reconnection between two magnetic structures. The observations were carried out in the He I 1083 nm multiplet line. This line provide information about the magnetic field configuration in the chromosphere. These data show the He I 1083 nm line in emission during the appearance of the jet, with two clear emission components with opposite supersonic Doppler shifts and with crossed magnetic field orientations. Using the data, I determine the energetics before, during, and after the reconnection events, i.e., the relationship between the kinetic, internal, magnetic and gravitational energies involved in the process. The analysis is complemented using SDO data.

Topología magnética de una región del polo norte del Sol

Adur Pastor Yabar

En el Sol, se consideran regiones polares a todas aquellas que están por encima de 60° de latitud. Estas regiones suelen presentar una polaridad neta no nula, a diferencia del sol en calma del cinturón de actividad, en el que las polaridades de las estructuras magnéticas están bastante equilibradas. A pesar de que no es raro observar la misma polaridad dominante en ambas regiones polares (Babcock, 1959), lo habitual es que cada polo

presente una polaridad opuesta a la de la otra región polar. Estas regiones siguen el ciclo solar de ~22 años, pero de forma desfasada (5-6 años) respecto del cinturón de actividad (Babcock & Babcock, 1959). Así, mientras en éste el cambio de polaridad ocurre en mínimos de actividad, en los polos este evento sucede durante los máximos. En esta contribución se presenta un estudio de la topología del campo magnético en una región del polo norte solar durante un máximo de actividad. Para el estudio se usaron I as líneas infrarrojas de Fel 15648.5 y 15652.8 angstrom. Las propiedades magnetohidrodinámicas se obtuvieron por medio del código SIR (Ruiz Cobo & del Toro Iniesta 1992). Se complementa este estudio con observaciones adicionales de regiones de sol en calma, una en el centro del disco y otra en el limbo oeste. El principal resultado consiste en que si bien las observaciones en el centro del disco y en el limbo oeste son compatibles con una misma distribución de campos magnéticos, en el caso del polo norte se tiene una población no observada en los anteriores. Referencias: Babcock, H. W., & Babcock, H. D. 1955, ApJ, 121, 349 Babcock, H. D. 1959, ApJ, 130, 364 Ruiz Cobo, B., & del Toro Iniesta, J. C. 1992, ApJ, 398, 375

Alfvén waves in multi-ion plasmas

David Martínez Gómez

High frequency waves in many plasmas of the solar atmosphere cannot be correctly described by ideal MHD and a more accurate model is required. Here, we study the **features of Alfvén waves in a two ion plasma with coronal conditions. We use a multi**-fluid approach and take into account the effects of collisions between both ions and the inclusion of Hall's term in the induction equation. Through the analysis of the corresponding dispersion relation and numerical simulations we check that ions are not as strongly coupled as in the low frequency limit. Hence, they cannot be treated as a single fluid. We find that high frequency waves can be decomposed in three clearly different oscillation modes. This behavior contrasts with the low frequency range where two of the **modes converge to the Alfvén frequency while the third one** is associated to the weighted average cyclotron frequency. In addition, the influence of elastic collisions between the ions is not negl igible for those high frequency modes since it produces an appreciable damping of some of them.

The cool surge following flux emergence in a radiation-MHD experiment

Daniel Nóbrega-Siverio

Cool, chromospheric-temperature ejections are key dynamical elements of the solar atmosphere. Surges, in particular, are low velocities phenomena (~< 50 km/s) with filamentary structures observed mainly in H (6563 Å), and also in Ca II H and He I 10830 Å. They often appear alongside EUV or X-Ray coronal jets as a result of the emergence of magnetized plasma from the solar interior. Even though observationally known for several decades now, understanding of the surges has progressed slowly. Idealized numerical experiments explain those ejections as being indirectly associated with the magnetic reconnection taking place between the emerging plasma and the magnetized coronal system. In this talk we present the results of a study of cool surges using a realistic treatment of the radiation transfer and material plasma properties, which were missing in previous works. We have carried out a 2.5D experiment of the emergence of magnetized plasma through (meso) granular convection cells and the low atmosphere to the corona using the radiation-magnetohydrodynamics code Bifrost. Through detailed Lagrange tracing, we show the formation and evolution of the cool ejection and, in particular, the role of the radiative losses, Joule heating and thermal conduction. In the launch phase, many plasma elements of the surge suffer accelerations well in excess of gravity; when

nearing the apex of their individual trajectories, instead, the plasma elements follow quasi-parabolic trajectories with acceleration close to the solar gravity. We also show how the formation of the cool ejection is mediated by a wedge-like structure composed of two shocks, one of which leads to the detachment of the surge from the original emerged plasma dome.

Pósteres

Alfven Waves in a partially ionized two-fluid plasma

Marc Carbonell Huguet

We study Alfven waves in a partially ionized plasma from the theoretical point of view using the two-fluid description. We consider the plasma is composed of an ion–electron fluid and a neutral fluid, interacting by particle collisions. We take the neutral–ion collision frequency and the ionization degree as free parameters. First, we perform a normal mode analysis. We find the modification due to neutral–ion collisions of the wave frequencies and study the temporal and spatial attenuation of the waves. In addition, we discuss the presence of cutoff values of the wavelength that constrain the existence of oscillatory standing waves in weakly ionized plasmas. Later, we go beyond the normal mode approach and solve the initial-value problem in order to study the time-dependent evolution of the wave perturbations in the two fluids. An application to Alfven waves in the low solar atmospheric plasma is performed and the implication of partial ionization for the energy flux is discussed.

Small-scale magnetic flux emergence in the quiet Sun: 3D radiationmagnetohydrodynamics modelling.

Fernando Moreno Insertis

Understanding the physics behind the emergence of magnetic flux on the smallest observed scales in the quiet Sun requires the use of radiation-magnetohydrodynamics modeling tools. In the past ten years, observational evidence has been obtained that magnetic flux reaches the surface also in what appear to be individual flux tubes or arches rising within granular cells, hence on sub-arcsecond scales: in that achievement the Spanish solar physics community has played an important role. This phenomenon clearly involves at least the uppermost layers of the solar interior, the photosphere, the chromosphere, and possibly also the low corona. Using the Bifrost code, we have created a realistic 3D magnetoconvection model adequate to the quiet Sun spanning from the top of the convection zone to the corona. We let magnetic flux emerge through the convection cells following its injection through the bottom of the box. We study the mode of appearance of the magnetic flux at the surface and different features of the emerging magnetic structures, including their subsurface origin and their interaction with the atmospheric layers at different levels. Comparison with observational results is also attempted to a limited extent using a-posteriori spectral synthesis of the numerical 3D snapshots for a few relevant spectral lines.

Analysis of the fluence of large solar energetic particle events in the period 2010-2013

Daniel Pacheco Mateo

In order to specify the radiation environment due to solar energetic particle (SEP) events, for interplanetary missions, it is necessary to use simulations of the particle intensity-time profiles measured by virtual observers located at different positions in the heliosphere. At present, the physics-based models applied for such a purpose including a moving source of particles are not able to model the portion of the SEP intensity enhancement occurring after the coronal/interplanetary shock crossing by the observer (i.e. the downstream region). This is the case, for example, of the shock-and-particle model used to build the SOLPENCO2 code. SOLPENCO2 provides with synthetic SEP event simulations the

statistical modelling tool developed in the ESA/SEPEM project for interplanetary missions (http://dev.sepem.oma.be/). This caveat from models may be addressed using SEP data. From observational studies, we know that the contribution of the downstream region of an SEP event to its total fluence can largely vary with the energy of the particles and from event to event. In this work, we present an analysis of several SEP events observed at 1 AU from 2010 to 2013. We identify the solar eruptive phenomena associated with these SEP events as well as the in-situ passage of interplanetary shocks. For each event, we quantify the amount of fluence accounted in the downstream region, i.e. after the passage of the shock. We discuss our results in terms of the heliolongitude of the observer with respect to the solar source site.

<u>GALAXIAS Y COSMOLOGÍA</u>

Sesión GC: lunes 18 julio - tarde

Astrophysical applications of quasar microlensing

(Conferencia Invitada) Evencio Mediavilla Gradolph

Gravitational Lenses offer a singular approach to study key problems in many fields of **Astrophysics and Cosmology. According to Einstein's theory, the curvature of light rays** increases with mass and gravitational lenses provide an opportunity to map the distribution of mass in a Universe in which virtually all matter is still of an unknown nature. Gravitational lensing phenomenology is also characterized by an extraordinary dissecting power that allows to resolve the innermost regions of quasars with spatial resolution comparable to the event horizon of the supermassive central black holes. We will present some recent results in quasar microlensing related to these research topics.

How galaxies look-like beyond 31mag/arcsec^2?

María Cebrián Renau

Detection of optical surface brightness structures with magnitudes fainter than 30 mag/arcsec^2 has remained elusive in current photometric deep surveys. We will show, for the first time outside the Local Group, the surface brightness profile down to 33 mag/arcsec^2 of two galaxies: UGC00180, an analogous to M31 located at 150 Mpc and NGC0493, an analogous to MW located at 25 Mpc. Using the 10.4 m Gran Telescopio de Canarias telescope, combined with an exquisite treatment of the sky subtraction and PSF effects, we reach similar depth as that obtained using star counts techniques in the Local Group. We find that the mass of the stellar halo of UGC00180 is (3+/-1)% of its total stellar mass, well in agreement with theoretical predictions for M31 or the Milky Way. On the other hand, data in two bands for NGC0493 gives us a clue on the kind of stellar populations we can expect at the lower surface birghtness limits. This work opens new frontiers not only in the study of outskirts of galaxies but also in the theories of galaxy formation. We will present our current work with GTC detecting low surface brightness structures such as satellites and streams.

The nuclear and extended mir-infrared emission of Seyfert galaxies

Ismael Garcia Bernete

We present subarcsecond resolution mid-infrared (MIR) images obtained with 8-10 mclass ground-based telescopes of a complete volume-limited (DL<40 pc) sample of 24 eyfert galaxies selected from the Swift/BAT nine month Catalog. We use those MIR images to study the nuclear and circumnuclear emission of the galaxies. Using different methods to classify the MIR morphologies on scales of ~200 pc, we found that the majority of the galaxies (75-79%) are extended or possibly extended and 21-25 % are point-like. In general, we find that the galaxies with point-like MIR morphologies are faceon or moderately inclined (b/a~0.4-1.0), and we do not find significant differences between the morphologies of Sy1 and Sy2. This extended emission is weak and compact and it represents ~30% of the total MIR emission of the galaxies in the sample. We obtain nuclear and circumnuclear MIR fluxes to investigate their correlation with different AGN and star formation indicators. We find that the nuclear MIR emission (inner ~70 pc) is strongly correlated with the X-ray emission (the harder the X-rays the better the correlation) and with the [O IV] lambda 25.89 micron emission line. We find the same results, although with more scatter, for the ircumnuclear MIR emission. This indicates that AGN photoionization is the dominant source of excitation of the nuclear and circumnuclear MIR emission.

ALMA Reveals the Turbulent Life of the Most Luminous Galaxy in the Universe

Tanio Diaz Santos

In this talk I will present results of spatially resolved ALMA [C II]157.7m observations of WISE 2246–0526, the most luminous galaxy known in the Universe. Located at a redshift z ~ 4.6 –only 1.3 Gyr after the Big Bang–, and hosting a super-massive black hole (SMBH) at its center, we find a strikingly uniform, ~600 km/s wide line emission across the entire galaxy on several kpc scales, a combination of properties not observed before in any other high redshift source. Such a large, homogeneous velocity dispersion indicates a highly turbulent interstellar medium (ISM). WISE 2246–0526 is unstable in terms of the energy and momentum that are being injected into the ISM, strongly suggesting that the gas is being blown away from the system isotropically, likely reflecting a cathartic state on its road to becoming an un-obscured quasar. Caught at a time when the Universe was ramping up to its peak of star formation and SMBH accretion, our ALMA observat ions clearly reveal extreme conditions in the ISM of the most luminous galaxy known, where the feedback from the powerful active galactic nucleus is having a strong impact on the evolution and fate of the entire system.

Uncovering Star Formation Feedback and Magnetism in Galaxies with Radio Continuum Surveys

Fatemeh Tabatabaei

Recent studies show the importance of the star formation feedback in changing the energetic and structure of galaxies. Dissecting the physics of the feedback is hence crucial to understand the evolution of galaxies. Full polarization radio continuum surveys can be ideally performed to trace not only star formation but also the energetic components of the interstellar medium (ISM). Using the SKA precursors, we have addressed the effect of massive star formation on the ISM of nearby galaxies and its consequences in the ISM energy balance. Our multi-scale and multi-frequency surveys show that cosmic rays are injected in star forming regions and lose energy propagating away in galaxies. Star formation also amplifies turbulent magnetic field on small scales (< 1 kpc). The large-scale ordered magnetic field is, on the other hand, found to be related to the dynamics of the galaxies. Our results indicate that the equipartition magnetic field could be the most energetic component of the ISM and hence important in formation of next generation of stars and larger structures in galaxies.

Galaxias reliquias: ¿dónde están?

Luis Peralta de Arriba

El descubrimiento de que las galaxias masivas crecen con el tiempo cosmológico supuso el pistoletazo de salida para la búsqueda de objetos que hayan sobrevivido hasta nuestros días sin experimentar cambios significativos (tanto en sus estructuras, como en sus poblaciones estelares). Sin embargo, y pese a los esfuerzos de la comunidad, hasta ahora sólo se conoce un candidato en firme para ser considerado una de estas reliquias: NGC 1277. Curiosamente, esta galaxia se encuentra en el centro de uno de los cúmulos cercanos más ricos: Perseo. ¿Es su ubicación un hecho azaroso? O por el contrario, ¿deberían los cazadores de reliquias centrar su búsqueda en los cúmulos? Para responder a esta pregunta, hemos llevado un análisis simultáneo y análogo usando simulaciones (Millennium I-WMAP7) y observaciones (NYU-SDSS). Nuestros resultados en los dos ámbitos concuerdan: es más probable encontrar reliquias en entornos más densos.

Decomposing de mid-infrared emission of AGN to study the disappearance of the torus at the low-luminosity end

Omaira Gonzalez-Martin

Low-luminosity active galactic nuclei (LLAGN) are key to understand the connection (perhaps evolutive) between normal and active galaxies. We have recently found that there are also key to study the connection between the AGN and its host. AGN at midinfrared are dominated by the clumpy torus emission. However, this torus is expected to disappear below the bolometric luminosity of Lbol=10E+42 erg/s. We have analysed the obscuration of 40 LLAGN (with bolometric luminosities 10E+38 — 10E+43 erg/s) using Spitzer/IRS spectra. We have found for the first time that the torus signatures disappear **below the predicted bolometric luminosity (González-Martín et al. 2015). However, this** behaviour could also be explained by the preponderance of the host galaxy compared with a weak AGN. We have analysed if the torus has disappeared or diluted by the host emission by the decomposition of the Spitzer/IRS spectra. We have found (1) strong evidence in favor of the smooth vanishment of the torus and (2) an intrinsic difference on the molecular gas content on these objects where the torus is vanishing (Gonzalez-Martin et al. 2016, to be submitted). The implications of these results on the framework of the Unified Model will be discussed.

Sesión GC: martes 19 julio - mañana

The QUIJOTE experiment. Project status and first scientific results.

(Conferencia Invitada) José Alberto Rubiño-Martin

I will review the current status of the QUIJOTE (Q-U-I JOint TEnerife) experiment, a new polarimeter with the aim of characterising the polarisation of the Cosmic Microwave Background, and other galactic or extragalactic physical processes that emit in microwaves in the frequency range 10-42GHz, and at large angular scales (1 degree resolution). The experiment has been designed to reach the required sensitivity to detect a primordial gravitational wave component in the CMB, provided its tensor-to-scalar ratio is larger than r~0.05. The project consists of two telescopes and three instruments which will survey a large sky area from the Teide Observatory to provide I, Q and U maps of high sensitivity. The first QUIJOTE instrument, known as Multi-Frequency Instrument (MFI), has been surveying the northern sky in four individual frequencies between 10 and 20 GHz since November 2012, providing data with an average sensitivity of 80 muK/beam in Q and U in a region of 20,000 square-degrees. The second instrument, or Thirty-GHz Instrument (TGI), is currently undergoing the commissioning phase, and the third instrument, or Forty-GHz Instrument (FGI), is in the final fabrication phase. Finally, I will describe the first scientific results obtained with the MFI. Some specific regions, mainly along the Galactic plane, have been surveyed to a deeper depth, reaching sensitivities of around 40 muK/beam. I will present new upper limits on the polarisation of the anomalous dust emission, resulting from these data, in the Perseus molecular complex and in the HII region W43. I will also discuss the polarisation of the synchrotron emission in some individual regions, like in the SNR W44, and in diffuse regions like the Fan or the region surrounding the Galactic centre, known as the Haze, which presents an excess of microwave polarisation with a counterpart in gamma rays.

Constraints on neutrino mass from galaxy surveys

Antonio J. Cuesta

Modern galaxy surveys probe a vast volume of the observable Universe with enough number density of objects to achieve a large signal-to-noise measurement of the galaxy power spectrum over a range of scales including both linear and non-linear scales. It is well established that linear theory predicts a suppression of the matter power spectrum on small scales which is sensitive to the total neutrino mass, which makes galaxy surveys appealing to set cosmological constraints on neutrino masses. Moreover, a proper treatment of non-linear evolution of the density field in the presence of massive neutrinos has been developed only recently, which makes it possible for current and upcoming surveys to take advantage of these technical developments to deal with mildly non-linear scales and obtain robust cosmological bounds on neutrino particle physics. I will present the current state of the art of the Large Scale Structure constraints on neutrino masses from the S DSS and WiggleZ galaxy surveys, combined with information from the Cosmic Microwave Background temperature and polarization anisotropies measured by the Planck satellite. The synergy between matter power spectrum and cosmic microwave background measurements is further enhanced by external cosmological constraints such as a precision measurement of the current expansion rate of the Universe or the distance-redshift relation from Baryon Acoustic Oscillations, which help break degeneracies with other cosmological parameters. I will describe how survey geometry plays an important role besides survey volume in neutrino mass constraints, and present prospective exciting forecasts on the neutrino mass hierarchy and comment on a possible neutrino mass detection within the reach of next-generation galaxy surveys.

On the ionizing photons budget of metal-poor star-forming galaxies: the case of IZw18

Carolina Kehrig

For very low metallicity (Z) environments, current models for single massive stars (rotating and not-rotating) predict very few, if any, Wolf-Rayet stars (WRs); in a similar sense, the predictions for the Hell budget of LyC photons from massive stars seem to be at odds with recent integral field spectroscopy (IFS) observations of low Z galaxies. The study of metal-poor star-forming (SF) galaxies at low redshifts is then crucial to test current stellar evolutionary models at low metallicity, and to constrain the LyC photons production. IFS allows these galaxies to be observed in their full extent providing absolute fluxes and eliminating dangerous aperture effects. We have performed a program to derive the photoionization budget and the WR content for a sample of metal-poor starbursts using IFS. Our new IFS observations have allowed us to measure their total number of ionizing photons and detect previously hidden WRs. We will highlight recent results for IZw18, the most metal-poor SF galaxy known in the local Universe. For the first time the entire nebular Hell4686-emitting region of IZw18 has been mapped and its total Hell-ionizing photon flux derived. The implications of these observations for the nature of ionizing sources in IZw18 will be discussed.

The sharpest view of the Universe

Eduardo Ros

Very-Long-Baseline Interferometry is experimenting a new era with the new resolutions reached at mm and sub-mm wavelengths and with antennas in space. I will report on recent results on active galactic nuclei, showing the finest details ever obtained in their relativistic outflows and the region close to the central, supermassive black hole.

Probing relativistic effects in the central engine

Mario Sanfrutos

Variable X-ray absorption has been observed in active galactic nuclei (AGN) on several time scales. Observations allow us to identify the absorber with clouds associated either with the clumpy torus (parsec scales, long time scales) or with the broad line region (short time scales). In the latter, the cloud size has been estimated to be of the order of few gravitational radii from the observed absorption variability. Such small cloud sizes are comparable to the X-ray emitting regions so that a detailed modelling of occultation events in AGN has the potential of enabling us to infer accurately the geometry of the system. We introduce a relativistic X-ray spectral model for occultation events. We present theoretical predictions on the different observables that can be inferred by studying X-ray eclipses in simulated XMM-Newton data. These include the size of the Xray emitting regions (corona and accretion disc) as well as more fundamental parameters such as the black hole spin and the system inclination. We find that absorption varies as a function of the energy range and that its maximum takes place when the approaching part of the accretion disc is covered. Therefore we study the H / S ratio light curves produced during an eclipse and use them to characterize the properties of the inner accretion disc and the corona in a new model-independent way.

The Close AGN Reference Survey (CARS): Uncovering the link between AGN and star formation with spatially-resolved multi-wavelength observations

Miguel Pérez Torres

We present the Close AGN Reference Survey (CARS, www.cars-survey.org), which combines spatially-resolved multi-wavelength observations from X-rays, optical/NIR, FIR, and radio observation for a well-defined sample of 35 luminous local unobscured AGN (0.01<z<0.06). The main aim of the project is to uncover the link between AGN and star formation activity in a statistically meaningful sample of galaxies. The heart of the survey is the panchromatic optical IFU observations obtained with the VLT-MUSE instrument, which allow us to measure the current star formation rate from the extinction-corrected H line, and relate this SFR to AGN parameters, host galaxy properties and AGN-driven outflows. The multi-wavelength data we are obtaining (HST, VLA, Chandra,...) add a global and resolved sensus of the multi-phase gas content and its properties in luminous AGNs. In this talk, we will present some preliminary results from this ongoing survey. In particular, we find that while a large fraction of the host galaxies are consistent with the so-called main-sequence of star formation, about 1/3 of the systems show evidence for low star formation activity. We are currently combining this information with the molecular (CO) and atomic gas (H I) content to test whether the supression of star-formation is related to a low gas content or, alternatively, to a low star formation efficiency. Our data will also permit to test whether the AGN luminosity correlates with the star formation rate (both globally and locally), as well as to investigate the relation of the host galaxy gas content as raw fuel for star formation and AGN activity.

In summary, CARS is a legacy survey that will greatly improve our understanding of the link between AGN and its host galaxy, and will turn into a reference sample for comparison with higher redshift AGN.
Sesión GC: martes 19 julio - tarde

Uncovering the most obscured AGN in X-ray and infrared surveys

(Conferencia Invitada) Silvia Mateos

Providing a complete census of the obscured Active Galactic Nuclei (AGN) is crucial to fully understand the cosmological growth of supermassive black holes (SMBH). Nevertheless, the contribution of obscured accretion to the total AGN radiative output remains uncertain. Compton-thick AGN could represent 20-30 per cent of the entire AGN population but have escaped detection so far. Thus, the majority of AGN still evade our census. Hard X-ray surveys (>few keV) are the most efficient way to trace accretion onto SMBHs, but miss Compton-thick AGNs. Mid-infrared (MIR) surveys are much less affected by extinction. Surveys at these wavelengths can potentially trace the elusive highly obscured accretion phenomenon. In particular, the all-sky Wide-field Infrared Survey Explorer (WISE) can fill the gap between local/deep surveys with IRAS/Spitzer, uncovering highly obscured accretion in the most extreme luminous AGN. In this talk I will present recent progress on the identification of obscured AGN at X-ray and MIR wavelengths using data from the wide-angle Bright Ultra-hard XMM-Newton Survey (BUXS). BUXS is one of the largest flux-limited sample of X-ray bright AGN selected at 'ultra-hard' energies (4.5-10 keV). BUXS includes 255 AGN detected over a sky area of 44.43 deg2. I will start presenting an AGN selection technique developed by our team based on the 3.4, 4.6, and 12 m WISE bands. To date this technique is the most reliable and efficient to detect luminous AGN in the literature and in addition can identify Compton-thick AGN with high efficiency. Then I will show the results from an identification program of a 12 m flux limited sample of 91 AGN candidates selected with WISE. Our survey is >100× deeper than previous all-sky MIR surveys such as IRAS, restricted by necessity to the local Universe. Furthermore, unlike most on-going MIR AGN surveys, the full 6 deg2 survey area has very deep X-ray coverage, necessary to robustly reveal Compton-thick obscuration.

Very-high-energy gamma rays from the Universe's middle age detection of the z=0.940 blazar PKS~1441+25 with Fermi-LAT and MAGIC

Josefa Becerra Gonzalez

The detection of Flat Spectrum Radio Quasars (FSRQs) in the Very High Energy (VHE, E>100 GeV) range is challenging, mainly due to their steep soft spectra in this energy band. Thus far, only five FSRQs are known to be VHE gamma-ray emitters. Observations in the VHE band are crucial to understand their emission, especially to constrain the location of the emitting region within the jet due to the absorption from their broad line region (BLR). The most recent member of the VHE FSRQ family is PKS 1441+25 (z=0.940) which was detected in this band for the first time by the MAGIC telescopes on April 2015. The observations were triggered by the flaring activity detected by the Fermi-LAT at High Energies (HE, 100 MeV<E<100 GeV). Aside from the gravitationally lensed VHE blazar QSO B0218+357 (z = 0.944), also detected by MAGIC, PKS 1441+25 is the most distant VHE blazar observed to date. For the first time, the VHE gamma-ray spectrum was used to indirectly probe the extragalactic background light at redshifts out to z ~ 0.94 from sensitive ground Cherenkov observations in the energy range from 40 to 250 GeV. In this contribution we will review the last results on the observations of VHE FSRQs with the MAGIC telescopes in a multi-wavelength context with special focus on the new detection of PKS 1441+25. We will discuss how VHE FSRQs can be used as a powerful tool to test the blazars structure as well as how blazars can be used as cosmic lighthouses to proof the cosmological backgrounds.

An X-ray and mid-infrared perspective on AGN unification

Francisco J. Carrera Troyano

The wide variety of AGN properties have been successfully accounted for in a broad sense recurring to an axisymmetric flattened obscuring structure (the "torus") which obscures the central engine from some lines of sight, giving rise to the simplest Unification Models, in which the appearance of an AGN depends fundamentally on the viewing angle between the line of sight and the symmetry axis of the torus. This overall agreement has been increasingly challenged in detail with recent results. We have used the hard-X-ray selected completely identified BUXS sample of 227 AGN to investigate the geometry of the torus and its relationship (or lack thereof) with the AGN luminosity, the X-ray absorbing column density NH and the optical AGN type (type 2 only with narrow emission lines, type 1 otherwise). We have modelled the mid-infrared emission with state of the art clumpy torus models to estimate the covering factor of the torus, finding that type 1 and 2 AGN have intrinsically different covering factor distributions, although with a significant overlap. The covering factor increases with NH, implying that dust extinction and X-ray absorption are geometrically related. Finally, higher luminosity type 1 objects tend to have lower covering factors as postulated by simple receding torus models, but this effect is smaller in type 2 AGN. We conclude that a successful modern attempt to construct a unification model for AGN has to take into account the geometrical covering factor of the torus and the AGN luminosity (in a non-trivial way), in addition to the viewing angle.

CO and Dust at High Redshift

Itziar Aretxaga

We present Early Science observations with the Large Millimeter Telescope, AzTEC 1.1 mm continuum images and wide bandwidth spectra (73-111 GHz) acquired with the Redshift Search Receiver, towards bright lensed and blank-field submillimetre galaxies. We robustly detect dust continuum emission for and CO emission lines. We find that one source shows spectroscopic multiplicity and is a blend of three galaxies at different redshifts (z = 2.040, 3.252, and 4.680), reminiscent of previous high-resolution imaging follow-up of unlensed submillimetre galaxies, but with a completely different search method, that confirm recent theoretical predictions of physically unassociated blended galaxies. Using independent estimations we infer gas-to-dust ratios and extend the L(CO)-L(FIR) correlation observed for local luminous and ultraluminous infrared galaxies to higher far-infrared and CO luminosities, establishing the efficiency of star formation at high redshift.

Exploring the spatially-resolved local galaxies with multi-filter surveys: A 2-D study of the ALHAMBRA galaxies

Izaskun San Roman

Current large cosmological surveys offer an opportunity to explore the spatial distribution of the stellar populations of local galaxies. We present here a 2-D analysis of the unresolved stellar populations of spatially-resolved objects. A combination of a Voronoi tessellation with spectral fitting diagnostics has opened a new way to disentangle the stellar population of spatially-resolved local galaxies. We have applied this novel technique to 42 early-type galaxies from the ALHAMBRA survey. With 20 medium-band (300 A) in the optical range and 3 broad-band filters in the near-infrared, we have tested the IFU-like capabilities of the survey. This study provides 2-D maps of age, metallicity and extinction for all ALHAMBRA early-type galaxies located at z < 0.3. In agreement with the literature, we find the gradients for galaxies identified as early-type to be on average slightly positive in age and negative in metallicity. These mildly negative metallicit y gradients support a merging scenario. The positive/flat age gradients would support a more uniformly distributed star formation or even secondary burst triggered by mergers.

On the evolution of simulated galaxies: the mass dependence in metallicity gradients.

Maider Miranda

Making use of a fiducial set of simulated disc galaxies spanning a wide range of mass, we examine the influence of stellar mass in the radial metallicity gradients and compare to observational trends. Our aim is to distinguish between scenarios of galaxy evolution. Our simulated galaxies form a homogeneous suite of field galaxies, organised in Milky Way analogues, irregulars and dwarfs. We study the gas-phase oxygen radial gradients and find that our Milky Way analogues reproduce the observations, but this does not happen for our dwarf galaxies; our gradients are too flat for stellar masses below 10^9 M_sun. For these galaxies, the total metal content is consistent with empirical scaling relations, but distributed incorrectly. We propose a mass-dependent modulation of feedback and/or star formation efficiency. Implementing such a mass-dependency must be handled with care, in order not to violate said empirical scaling relations.

Dust emission in simulated dwarf galaxies using GRASIL3D

Isabel M. Santos Santos

The submillimeter to far-infrared wavelength range of galaxy spectra, now available thanks to instruments like Herschel, has gained special importance as it gives information on the dust-reprocessed light emitted by young stars. In particular, this spectral range allows us to further study low mass-low metallicity galaxies, a challenging piece within the puzzle of galaxy formation in the near Universe, for which the amount of data is increasing in the last years. Their spectral energy distributions (SEDs) show some particular features as compared to normal, larger galaxies- that cannot be explained with the current models. In summary these are: 1.An excess of emission in the submm (~500 um), causing a flattening of the submm/FIR slope; 2.Broadening of the IR peak of the SED, implying the presence of warmer dust; 3.Less PAH emission lines. In order to fit the data, observers add new ad hoc extra dust components to their modelling, like modified black-bodi es, with whatever properties provide the best match. In this work the SEDs of a sample of 27 simulated dwarf galaxies have been calculated using the GRASIL-3D radiation transfer code. This code has the particularity that it separately treats the radiative transfer in dust grains from molecular clouds and cirruses, the respectively dense and diffuse components of the gas phase. The simulated galaxies have masses ranging from 1e6-1e9 Msol, and have been identified in a hydrodynamical cosmological simulation with initial conditions from the CLUES project. We report on a careful study of their IRAS, Spitzer and Herschel bands luminosities, as well as of their SFRs, dust and gas (HI & H2) mass contents. The results have been compared with observational data and a satisfactory agreement has been found, with GRASIL-3D reproducing naturally the particular spectral features mentioned above.We conclude that the GRASIL-3D two-component model gives a physical interpretation to the emission of low mass-low metallicity galaxies, with molecular clouds (cirruses) as the warm (cold) dust components needed to recover observations.

Sesión GC: miércoles 20 julio - mañana

Gravitational waves detected 100 years after Einstein's prediction.

(Conferencia Invitada) Alicia M Sintes

The last century has witnessed tremendous progress thanks to the observation of electromagnetic radiation. Gravitational waves, ripples in the space-time, are now the new messengers that allow us to open a new window to the Cosmos that could revolutionize our understanding of the Universe in which we live. The gravitational waves were detected, directly, for the first time by the LIGO detectors on the 14 September 2015. These waves came to Earth from a catastrophic event in the distant Universe. This confirms an important prediction of the theory of General Relativity of Albert Einstein from 1915 and opens an unprecedented new window in the Cosmos. This talk will explain what are these gravitational waves and how was the first discovery of Advanced LIGO.

Gravitational Waves and Black Hole Binary modelling

Francisco Jiménez-Forteza

On February 11, 2016 LIGO-Virgo collaboration announced the first direct gravitational detection on Earth. The signal matched the inspiral, merger and ringdown of two coalescing black holes with 36 and 29 solar masses as predicted by General Relativity. Furthermore, current astrophysical models predict that such sources may be the most dominant source for future detections in the advanced ground based gravitational wave detectors.

Therefore, it is essential to build accurate waveform models and develop optimal data analysis strategies to cover the whole parameter space consistently with these astrophysical predictions which will help to constrain mass and spin distributions, formation channels and stellar evolution variables. This talk summarizes some of the recent progress in exploring the binary black hole parameter space with numerical solutions of the Einstein equations and synthesize the numerical and perturbative results into analytical models of the waveforms and their impact in the detections.

A comprehensive study of the spatially-resolved SFR in nearby disk galaxies using CALIFA IFS data

Cristina Catalán-Torrecilla

Understanding the evolution of the SFR density by galaxy components (bulge, bar and disk) will shed some light on the models of galaxy formation and evolution. In this work, a two-dimensional photometric decomposition approach (GASP2D) is used to obtain these components. To provide a local benchmark, we analyze a sample of 300 nearby galaxies from the CALIFA Integral Field Spectroscopy (IFS) survey. The availability of this kind of data makes possible to go one step further as we can apply the previous photometric decomposition over 3D datacubes to disentangle the spatial distribution of the SFR over different components. This analysis allows us to better understand the correlation between the SFR and the stellar mass, the well-known Main Sequence (MS) relation for the star forming galaxies. This time, we are able to include in this diagram not only integrated values but also the corresponding ones for the disks. This study will give us a more detailed understanding of the following questions: is the correlation between stellar mass and SFR driven by galaxy mass alone? Are there any other parameters (such us the bulge mass) that play an important role? Are the results affected by the presence of nuclear bars?

Supernova environmental studies thorugh Integral Field Spectroscopy

Lluís Galbany

The advent of Integral Field Spectroscopy (IFS) applied to supernova (SN) environmental studies have shown the potential of this technique to characterize the local environment, measure directly the galactic environmental parameters at SN locations, and compare them to those at different locations of the galaxy. I will present the first statistical study using IFS of nearby SN host galaxies provided by the CALIFA survey, which consists of 132 SN of all types in 115 galaxies. We recovered the sequence in association of different SN types to the star-forming (SF) regions by using several indicators of the ongoing and recent SF related to both the ionized gas and the stellar populations. While the total ongoing SF is on average the same for the three SN types, SN lbc/llb tend to occur closer to SF regions and in higher SF density locations than SN II and SN Ia; the latter shows the weakest correlation. Core collapse SN (CCSN) also tend to explode at positi ons with younger stellar populations than the galaxy average, but the galaxy properties at SNIa locations are one average the same as the global galaxy properties. We found a sequence from higher to lower metallicity, form SN Ia to SN Ic-BL, and significant increasing ratio of SNIc at higher metallicities compared to other CCSN types. Our results support that none of the two proposed SN lbc progenitors scenarios can be excluded, and the most probable situation is a combination of both. Finally, I will present the the ongoing AMUSING survey that has already compiled a sample of more than 200 SN host galaxies using MUSE, the new IFS at VLT. AMUSING will be able for the first time to find direct correlations with such environmental parameters to the observed properties of the transients.

Probing the missing baryons around Virgo with Planck

Jose M. Diego

We present results based on the latest Planck data of the Sunyaev-Zeldovich effect produced by hot baryonic matter beyond the virial radius in the Virgo cluster. Our results show an abundance of baryons which agrees well with expectations for the elusive Warm Hot Intergalactic Medium (or WHIM). The results agree also with the expected signal inferred from X-ray observations but with small deviations that are possibly due to the non-spherical nature of the cluster. Finally, we show how based on simple principles and the measured distances to the Virgo cluster it is possible to constrain the Hubble parameter around values H=65 in excellent agreement with the latest constraints.

Outer-disk reddening and gas-phase metallicities: The CALIFA connection

Raffaella Anna Marino

I will present the results recently published in Marino et al. 2016 on the relation between the outer-disk ionized-gas metallicity gradients and the presence of breaks in the surface **brightness profiles of disk galaxies.** SDSS g'- and r'-band surface brightness, (g'-r') color, and ionized-gas oxygen abundance profiles for 324 galaxies within the CALIFA survey are used for this purpose. We perform a detailed light-profile classification finding that 84% of our disks show down- or up-bending profiles (Type II and Type III, respectively) while the remaining 16% are well fitted by one single exponential (Type I). The analysis of the color gradients at both sides of this break shows a U-shaped profile for most Type II galaxies with an average minimum (g'-r') color of 0.5 mag and a ionized-gas metallicity flattening associated to it only in the case of low-mass galaxies. More massive systems show a rather uniform negative metallicity gradient. The correlation between metallicity flattening and stellar mass results in p-values as low as 0.01. Independently of the mechanism having shaped the outer light profiles of these galaxies, stellar migration or a previous episode of

star formation in a shrinking star-forming disk, it is clear that the imprint in their ionizedgas metallicity was different for low- and high-mass Type II galaxies. In the case of Type III disks, a positive correlation between the change in color and abundance gradient is found, with the outer disks of Type III galaxies with lower masses showing a weak color reddening or even a bluing. This is interpreted as primarily due to a mass down-sizing effect on the population of Type III galaxies having recently experienced an enhanced inside-out growth.

Sesión GC: miércoles 20 julio - tarde

DES and PAU Galaxy Surveys

(Conferencia Invitada) Enrique Gaztañaga

I will present an update on the Dark Energy Survey (<u>www.darkenergysurvey.org</u>) PAU Survey (<u>www.pausurvey.org</u>).

The Dark Energy Survey (DES) is surveying a 5000 square degree area of the southern sky (roughly 1/8 of the total sky) over 525 nights using the new Dark Energy Camera (DECam) mounted on the Blanco 4-meter telescope at the Cerro Tololo Inter-American Observatory, perched high in the Chilean Andes. It is recording information on over 300 million galaxies to iAB-24. The Dark Energy Survey (DES) is an international, collaborative effort to map hundreds of millions of galaxies, detect thousands of supernovae, and find patterns of cosmic structure (weak lensing, baryon acoustic observations and Cluster abundance) that will reveal the nature of the mysterious dark energy that is accelerating the expansion of our Universe. DES began searching the Southern skies on August 31, 2013 and is currently analyzing the 3rd year of data, which already covers 5000 deg2 in broad bands g,r,i,Z,Y (plus several IR and millimeter bands from overlapping VHS/VISTA and SPT).

The PAU Camera saw first light in June 2015 and has successfully completed two observation periods in November 2015 and April 2016, starting its Science Survey programme. Over 5000 good science exposures have been taken, covering about 1.5 deg² of the sky using the full set of 40 narrow band filters and up to 5 deg² with a subset of them. This area is equivalent to about 500 deg² area with single band and single exposures taken in ~9 nights of good weather. The current PAU dataset has been reduced, calibrated and matched to deeper overlapping samples in about 1 day of real time. The result is about 75000 complete PAU low resolution spectra to iAB<23mag. The data reduction resulted in over 5 Terabytes and 71 million object measurements and was performed in record time using the PIC (www.pic.es) infrastructure and a preliminary PAUcam community pipeline. The PAU Survey aims to cover 100 deg² providing spectral information in fields where deep weak gravitational lensing data are available. This will result in new spectra for several million galaxies up to iAB<23 mag. Other science studies can be done with this camera which has the capability to determining SED for all objects in a large field of view. PAUcam can also be used for Broad Band imaging with ugrizY on 18 4Kx2K red-sensitive fully depleted CCD's of 15 m with a ~1 deg'2 FoV (with vignetting outside the central 40 arcmin diameter).

The Science Verification public release for the Dark Energy Survey

Ignacio Sevilla-Noarbe

We present the Dark Energy Survey Science Verification catalogs, a public data release with reduced and vetted data from the first months of data taking from this project (Science Verification period). This set of catalogs includes basic astrometry, photometry, and object classification for more than 25 million objects in approximately 200 square degrees of the southern sky. Shear catalogs and photometric redshifts are available as well for most of these, conforming a very rich dataset for the astronomical community to use. In this contribution, we describe the catalog creation process and its validation, as well as details for accessibility and content that might interest the community at large.

An Excess of Dusty Starbursts at z=2.2

Helmut Dannerbauer

A prominent feature of colour-magnitude diagrams of (local) clusters is the often socalled red sequence. These red-sequence galaxies are dominating the core of galaxy clusters and their members are massive, passive-evolving, early-type galaxies. The redsequence is found in clusters up to z=1.5 and its tightness proposes that they are formed in a short time scale beyond z=2. When and how these progenitors of the red-sequence are formed in clusters is one of the most hotly debated topics in extragalactic astronomy. Scenarios for their ancestors include in situ formation or accretion/falling into the cluster potential. Distant dusty starbursts with short time scales of building up the bulk of their stellar mass are promising candidates for being the ancestors of red-sequence galaxies.

Searching for massive, dusty starbursts thus offers a great opportunity to trace galaxy overdensities and therefore the cosmic web in the distant universe. With APEX-LABOCA we have uncovered an excess of these dusty, massive galaxies in the protocluster field of the radio galaxy MRC1138-262. Based on an exquisite multi-wavelength database, including Herschel/Spitzer infrared observations and VLA 1.4 GHz radio, we show that a large fraction of these starbursts are physically associated with the protocluster at z=2.16. Based on this initial discovery, we have conducted extensive observing campaigns with the radio interferometers ATCA and ALMA on these sources. I will present our observations of the molecular gas reservoir of several cluster members enabling us to investigate the environmental dependency of the amount of cold molecular gas and star formation efficiency. Based on our observations and the literature, I will discuss scaling relations and compare the molecular gas properties of (proto)cluster and field galaxies. Finally, I will match our results of this starburst overdensity with theoretical predictions and discuss the potential of revealing (proto)clusters of massive, dusty starbursts via submillimeter surveys.

Obscured Star Formation within Galaxy Clusters Cores

Lucía Rodríguez-Muñoz

Galaxy clusters represent ideal laboratories for disentangling the role of nurture versus nature in galaxy evolution. At intermediate redshifts, their population undergo the most significant evolution due to the transformation of infalling field galaxies from star-forming disk-dominated galaxies into passive bulge-dominated systems driven by interactions with the cluster environment. We present the first results of the study of the obscured SF processes populating the cores of a sample of ~20 galaxy clusters expanding over the redshift range between 0.2 and 0.9. In particular, we focus on clusters observed by the Herschel Lensing Survey (HLS; PI: Egami) and the Cluster Lensing and Supernova survey with Hubble (CLASH; PI: Postman). The outstanding UV to far-IR photometric datasets and spectroscopic data available on these fields, allow us to perform a high quality characterization of the star-forming galaxies populating these high density environments, as well as the analysis of the obscured SF processes as a function of redshift and cluster properties.

Efecto de las galaxias anfitrionas en las propiedades de las SNe la

Manuel Emilio Moreno-Raya

Presentamos un estudio sistemático de la relación entre las propiedades de las **Supernovas de tipo la (SNe la), y las características de sus galaxias anfitrionas, a partir de una muestra de 455 SNe la extraídas del Sloan Digital Sky Survey II (SDSS-II)** hasta z< 0.45. **Se han obtenido las abundancias de oxíg**eno de las galaxias mediante el uso de

calibradores empíricos y los parámetros de las SNe la mediante el ajuste de sus curvas de luz con SiFTO. Encontramos una correlación significante entre la masa estelar de las galaxias anfitrionas y los residuos del Diagrama de Hubble de SN la. Exploramos también el efecto que tiene la metalicidad en la masa de Níquel y en la masa eyectada en la explosión de las SNe la. Este trabajo es el paso previo a la inclusión de un parámetro adicional (relativo a las galaxias anfitrionas de SNe la) en los análisis cosmológicos para minimizar los errores sistemáticos que pudieran estar provocados por las caracterí sticas de las galaxias anfitrionas.

Carbon and Oxygen abundances in Magellanic Clouds: a study on the Abundance Discrepancy Problem and its implication for chemical evolution of galaxies

Laura Toribio San Cipriano

The knowledge of Carbon (C) abundances and its distribution in galaxies is an essential information to better understand the chemical evolution of the galaxies as well as the energy production in stars or the formation of organic molecules. Despite its significance, studies about radial gradients of C from HII regions spectra are scarce owing to this type of studies generally require observations from space and the measurement of UV collisionally excited lines (CELs) of CIII] 1907+09A, which is severely affected by uncertainties in the reddening correction and uncertainties in the electron temperature. Our group has been pioneer measuring C abundances in HII regions with an alternative method based on the faint CII 4267 Å optical recombination line (ORL). In this work, we present preliminary results of the analysis of very deep UVES@VLT optical spectra of HII regions in the LMC and SMC galaxies. The C/H, O/H and C/O ratios determined from ORLs are very c onstant along the galaxies, without clear evidences of radial gradients or localized chemical inhomogeneities. In particular, the C and O abundances in the HII regions of the SMC are virtually identical. We compare our O and C ORL abundances with those based from O and C CELs. The values of the abundance discrepancy factor (ADF) of both elements we find in the objects show a remarkable low dispersion in both galaxies, being systematically larger in the SMC than in the LMC. Finally, we compare our results for the Magellanic Clouds with previous ones we have obtained for other nearby more massive galaxies.

Sesión GC: jueves 21 julio - mañana

Primeros resultados del cartografiado OTELO

(Conferencia Invitada) Jordi **Cepa Nogué**

El cartografiado OTELO (OSIRIS Tunable Emission Line Object survey), está diseñado para detectar las principales líneas ópticas de emisión desde Lyman alpha hasta Balmer alpha a distintos desplazamientos al rojo, ubicadas en una ventana atmosférica relativamente libre de líneas del grupo hidroxilo y centrada a 925nm. No solamente es el cartografiado de imagen en emisión más profundo hasta la fecha, sino el que presenta una mayor sensibilidad en la detección de anchuras equivalentes fotométricas. En la presente contribución, una vez finalizadas las observaciones del primer apuntado en el campo extendido de GROTH, se detalla el proceso de reducción, calibración y control de calidad de los datos, así como la construcción del catálogo final incorporando los datos auxiliaraes. Finalmente se presenta un análisis preliminar del mismo y se señalan los aspectos más relevantes que conciernen a algunos casos científicos bajo estudio.

J-PAS: Status and Scientific potencial.

Narciso Benítez Lozano

The impending Javalambre-Physics of the Accelerating Universe Astrophysical Survey (J-PAS) is a very wide field, guasi-spectroscopic Survey to be carried out from the OAJ in Spain with a dedicated 2.5m telescope and a 4.7deg^2 camera with 1.2Gpix. Starting in the second half of 2016, J-PAS will observe 9000 deg^2 of the Northern Sky in 5 years and provide 0.003(1+z) precision photometric redshifts for nearly 100M of galaxies plus several million QSOs, sampling an effective volume of \sim 14 Gpc^3 up to z = 1.3. J-PAS will also detect and measure the mass of more than a hundred thousand galaxy clusters, setting constrains on Dark Energy which rival those obtained from BAO measurements. The key to the J-PAS potential lies in its innovative approach: the combination of 54 145A filters, placed 100A apart, and a multi-degree field of view which makes it a powerful "redshift machine", with the survey speed of a 4000 multiplexing low resolution spectrograph, but many times cheaper and much faster to build. Moreover, since the J-PAS camera is equivalent to a very large, 4.7deg^2 "IFU", it will produce a time-resolved, 3D image of the Northern Sky with a very wide range of Astrophysical applications in Galaxy Evolution, the nearby Universe and the study of resolved stellar populations. J-PAS will have a lasting legacy value in many areas of Astrophysics, serving as a fundamental dataset for future Cosmological projects.

9.5 Gyr of evolution of galaxies in clusters

Irene Pintos-Castro

"A database of 9.5 Gyr of evolution of galaxies in clusters" is an approved ESA EXPRO project to build a database of nine clusters at 0.4<z<1.6 observed by Herschel, in order to characterise their obscured star formation properties. For these clusters we have elaborated multi-wavelength catalogues of cluster member candidates (including the photometric redshift determination based on SED-fitting and Monte Carlo simulations), and built a comprehensive database containing a large set of physical properties (e.g. stellar mass, SFR, projected local density), an AGN discrimination, and a morphological classification for those clusters at z~1. With the full dataset in hand we are addressing two main questions: is there a reversal of the SFR" density relation in this sample? and, what is the relationship between the cluster mass and the total star formation rate? Regarding

GALAXIAS Y COSMOLOGÍA Sesión GC: jueves 21 julio - mañana

the last question we are extending the work of Popesso et al. (2015) with a cluster sample above z~0.8. Furthermore, with the AGN discrimination based on IRAC colours, we are able to analyse the fraction of AGN so we will trace also the AGN-density relation (Martini et al. 2009) and the evolution of this population up to z~1.6. In particular we will be able to study the fraction of AGN as a function of the local galaxy density at high redshift, and compare it with the SFR-density relation, to study the possible environmental co--evolution of both populations (Martini et al. 2013).

Cluster selection functions for next-generation surveys

Begoña Ascaso

The advent of next-generation surveys will provide a large number of cluster detections that will serve the basis for constraining cosmological parameters using cluster counts. I will present the methodology designed to obtain robust cluster selection functions for next-generation surveys. Then, I will display recent results obtained for three of these surveys: J-PAS, Euclid and LSST and their comparison with other future X-ray and SZ selection functions. Finally, I will discuss the importance of the mass-richness calibration, the use of realistic simulations and the model of systematic errors to obtain an accurate final Figure of Merit.

A rich overdensity at z=6.5

Jose Miguel Rodriguez Espinosa

We will show evidence that two close strong Lyman- emitters (LAEs) with redshifts around z = 6.5 detected by Ouchi et al. (2010) in the Subaru-XMM Deep Survey (SXDS) lie in a massive proto-galaxy cluster with ~ 4 × 1013 M_sun. Deep observations using three medium band filters with OSIRIS at the GTC allowed us to identify 45 additional LAE candidates at z 6.5 in the same field, showing that this is a high density environment with an over-density of ~2 compared to the general field. The whole over- dense region has a most likely mass of 4.0 ± 0.2 × 1014 M_sun. It is expected to undergo spherical (ellipsoidal) collapse at z 1.25 (1.03) and then accrete matter until becoming a Coma-like galaxy cluster of about 1.1 × 1015 M_sun (4.2 × 1015 M_sun) at z = 0.

Ultraviolet-line diagnostics of young stellar populations and the interstellar medium in primeval galaxies

Alba Vidal García

The new generation of telescopes, such as JWST, will collect high-quality spectra of thousands of high-redshift galaxies out to the epoch of reionization. To best interpret these observations in terms of constraints on the early star formation and chemical enrichment histories of galaxies, we need reliable models of not only the rest-frame optical and near-infrared emission, but also the rest-frame ultraviolet emission from young galaxies. In this context, I will present new models to compute the rest-frame ultraviolet emission from young galaxies at high redshift. The models include recent advances in the theories of stellar interiors and atmospheres to interpret the ionizing and non-ionizing radiation from star-forming galaxies and its transfer through the interstellar and circumgalactic media. I will show how such properties depend on current uncertainties in the evolution of massive stars and on the other main adjustable parameters of the models. I will also describe how the models can be used to interpret current and future observations of distant galaxies in terms of constraints on the stellar, interstellar and circumgalactic components.

An X-ray study of the lower-luminosity LIRGs from GOALS

Núria Torres-Albà

We present Chandra observations for a sample of 59 Luminous Infrared Galaxies (LIRGs) from the lower luminosity portion of the Great Observatory All-sky LIRG Survey (GOALS). The GOALS is a multiwavelegth study of the most luminous IR-selected galaxies in the local Universe, and this X-ray study, complimenting the previous work on the higher-luminosity sample, benefits from the imaging and spectroscopic data from HST, Spitzer and Herschel. With combined X-ray and mid-infrared diagnostics, AGN are found in 33% of the galaxies in the sample, a fraction lower than that found for the higher luminosity sample. The correlation study of far-IR and X-ray emission shows that the GOALS galaxies without traces of AGN appear to be underluminous in X-ray, compared to the previously studied star-forming galaxies with lower star formation rates. Results on X-ray spectral study of the sample will also be presented.

Sesión GC: jueves 21 julio - tarde

Abundances and kinematics in star forming galaxies probed by GRBs

(Conferencia Invitada) Christina Thöne

Gamma-ray bursts are connected to the explosion of very massive stars and some of the most luminous explosions in the Universe. Therefore, they can serve as powerful light houses that probe the dense ISM in their hosts at almost any redshift and not accessible by other types of observations, e.g. using quasars. Large samples of low resolution spectra now allow us to get some statistical results on abundance patterns, ionizations and distance of the material from the GRB itself. High resolution data, however, offer us a unique chance to look in detail at the actual distribution of material inside those galaxies including galactic outflows, variances in abundance patterns across the galaxy and even the intergalactic medium in the sightline towards us. In this talk I review the most interesting results using GRBs to study star-forming galaxies during nearly two decades and present some new findings from ongoing observations of large unbiased samples.

The Euclid and DESI Galaxy Surveys

(Conferencia Invitada) Francisco Javier Castander

Euclid is a European Space Agency mission to study dark energy. Its launch is scheduled for 2020. Euclid will have an optical imager and a near-infrared spectro-photometer with which it will carry two surveys. A wide field survey covering 15000 deg2 and a deep survey covering 40 deg2. Euclid will employ two main probes to study dark energy: weak gravitational lensing and galaxy clustering. For that purpose, it will measure the galaxy shapes of ~10**9 galaxies and measure the spectra and determine the redshift of tens of millions of galaxies. The Euclid data will be very valuable for other astronomical studies. The Dark Energy Spectroscopic Instrument (DESI) is a project to build a multifiber spectrograph for the Mayall 4-metre telescope at Kitt Peak, with the goal to obtain tens of millions of spectra to map the structure of the universe and study dark energy. DESI is a Stage IV ground-based dark energy experiment that will study baryon acoustic oscillations (BAO) and the growth of structure through redshift- space distortions (RSD) with a wide-area galaxy and guasar five-year redshift survey designed to cover 14,000 deg2. In addition to providing Stage IV constraints on dark energy, DESI will provide new measurements that can constrain theories of modified gravity and inflation, and that will measure the sum of neutrino masses.

Parameter splitting in dark energy: is dark energy the same in the background and in the cosmic structures?

José Luis Bernal Mera

With the advent of precision cosmology, the constraints on new physics beyond the standard cosmological model are stronger than ever. However, some slight tensions have appeared between the cosmological parameters inferred by probes of the expansion of the Universe (mainly CMB and BAO) and the observations of the growth of cosmic structures. Moreover, the true origin of the cosmic acceleration is still unknown and alternative dynamical models or modifications of General Relativity have been proposed. I present an empirical consistency test of General Relativity/dark energy by disentangling expansion history and growth of structure constraints. In General Relativity within

minimally coupled dark energy models, the expansion history fully determines the growth history, which is not necessarily true in modified gravity. In the context of standard wCDM, I replace each late-universe parameter that describes the behavior of dark energy with two meta-parameters: one describing geometrical information in cosmological probes and the other controlling the growth of structures. If the null hypothesis is fulfilled (i.e. the two meta-parameters coincide) the underlying model is correct. If it is not, then it could be a hint of a failure in the model, the necessity of extensions to it or systematics in the data. Thus, combining different cosmological data sets, this consistency test also works as a probe for systematics and inconsistencies in the data. I present a global analysis using state-of-the-art cosmological data sets. We find that probes which depend on the growth of structures prefer a weaker growth than that inferred by background probes. I discuss the different possible scenarios which may lead to this result. The fact that the result is mostly driven by a sub-set of galaxy cluster abundance data points to the need of a better understanding of this probe before interpreting the result found as a failure of GR+wCDM.

X-shooter spectroscopy of GRB afterglows

Antonio de Ugarte Postigo

Since its commissioning at ESO's Very Large Telescope in 2009 X-shooter has obtained spectroscopy of over 80 gamma-ray burst afterglows with redshifts ranging from 0.05 to 6.3. Thanks to its efficiency, broad wavelength coverage, and spectral resolution it has become the most efficient tool for gamma-ray burst afterglow spectroscopy. In this talk I will present the sample and some results of the analysis of absorption systems. The different features are compared with the characteristics of the explosion (duration, spectral shape, energetics, etc.) and with the properties of the host galaxy (mass, age, etc.) to improve our understanding of the nature of the explosions and how they interact with their environments. Using the large redshift range of the spectra collection we perform studies of the evolution of GRB environments across the history of the Universe and their relation with the evolution of star formation.

Cosmic Magnification on the Dark Energy Survey

Manuel García Fernández

Weak gravitational lensing of distant galaxies by the large scale structure of the Universe is a powerful probe of Cosmology. The two signatures of Weak Lensing involve a change in the shape (shear) and an increase in the observed flux (magnification) of background galaxies by intervening matter in the line of sight. The measurement of magnification using galaxy number counts has the advantage of being independent of the shape determination systematics such as seeing and PSF estimation at the cost of some loss in signal to noise. Recent photometric wide field surveys allow measuring accurately this phenomenon. In particular, the ongoing Dark Energy Survey (DES), will cover 5000 square degrees in the grizY bands. By the end of 2018, DES will have taken enough data to constrain cosmological parameters with high precision using the combination of four probes: clustering, supernovae, barion acoustic oscillation and weak lensing. We present here a methodology and first results in the detection of cosmic magnification in the Dark Energy Survey early data, and an application to constrain cosmological parameters is described.

Damped Lyman-alpha Systems bias: measurement and evolution

Ignasi Pérez i Ràfols

DLAs are a powerful probe of high density gas, which is a reservoir for the formation of galaxies. Therefore, studying the distribution of these absorbers can lead to a better understanding of galaxy formation and evolution. The bias of the DLAs has previously been measured by Font-Ribera et al. 2012. We update this measurement using BOSS DR12 data. The cross-correlation of DLAs with the Lyman-alpha forest is measured using 3 times more lines of sight than in the previous work. With this higher statistics we obtain an improved measurement on the DLA bias and better limits on its dependence on redshift and column density. We also find that the DLA bias is scale-independent. This result is expected if the DLAs are indeed tracers of the underlying matter density.

Sesión GC: viernes 22 julio - mañana

Inside-out formation of massive galaxies

Ignacio García de la Rosa

A significant fraction of the present day massive galaxies have compact cores embedded inside their disks or halos. Strikingly, those compact cores are similar to the massive highredshift quiescent compact galaxies, nicknamed red-nuggets. We present observational evidences and cosmological simulation results supporting an inside-out formation scenario, where present-day massive galaxies can begin as dense spheroidal cores (rednuggets), around which either a spheroidal halo or a disk are accreted later.

The stellar mass distribution of S4G disk galaxies and the signatures of bar-induced secular evolution

Simón Díaz-García

We use 3.6 m photometry for 1154 galaxies from the Spitzer Survey of Stellar Structure in Galaxies (S4G) to trace the old stellar structure of nearby disk galaxies with total stellar masses $8.5 < \log(M^*/Msun) < 11$ and Hubble types -3 = <T = <10. We characterize the stellar density profiles, the stellar contribution to the rotation curves, and the m=2 Fourier amplitudes as a function of M* and T, providing observational constraints for galaxy formation models to be tested with. We also describe the typical shapes and strengths of stellar bars in the S4G sample and link their properties to the total stellar mass and morphology of their host galaxy.

We re-scale galaxy images to a common frame determined (i) by the size in physical units, (ii) by their estimated disk scalelength, and for 748 barred galaxies (iii) by both the length and orientation of their bars. We stack the resized images to obtain statistically representative average stellar disks and bars in bins of M* and T.

Central mass concentrations in massive systems (>=10^10Msun) are substantially larger than in fainter galaxies and their prominence scales with T. For T=5-7 the bulges gradually disappear, and for the latest types most of the systems are pure disks.

We provide observational evidence for bar-induced secular evolution of disk galaxies. For a given M* bin, we find a significant difference in the stellar density profiles of barred and non-barred systems: (i) disks in barred galaxies show larger scalelengths and lower central surface brightnesses, (ii) the mean surface brightness profiles of barred and nonbarred galaxies intersect each other slightly beyond the mean bar length of the former group, most likely at the bar corotation, and (iii) the central mass concentration of barred galaxies is larger (by almost a factor 2 when T<5) than in their non-barred counterparts. We estimate the halo-to-stellar mass ratio within the optical disk and find an agreement with the best-fit model at z=0 in **ACDM** cosmological simulations, based on abundance matching and halo occupation distribution methods.

Search and characterisation of low redshift star-forming galaxies in SHARDS

Alejandro Lumbreras-Calle

SHARDS is a deep spectro-photometric survey covering the GOODS-North field with the 10.4m GTC telescope in La Palma. Taking advantage of its unique capabilities (in terms of depth and spectral coverage over a wide field of view) we developed a new algorithm able to identify low-redshift (z<0.35) star-forming galaxies by finding the OIII and Halpha emission lines. This new methodology provides with more accurate photometric redshifts,

measurements of equivalent widths, and absolute fluxes of the lines. We end up with a complete and fully charaterised sample of ~ 150 starburst galaxies.

We also fitted the UV (adding GALEX and ALHAMBRA data when possible) to NIR SED of the galaxies to a set of stellar and nebular templates with a homegrown routine. The models used up to two populations (one young and one evolved). The equivalent widths measured with SHARDS data provided key information in order to determined the rate between the two different stellar populations.

In this talk, I will present the preliminary results of this study. The main properties (e.g., mass, metallicity, and age) of the starburst sample will also be discussed in the current framework of galaxy evolution.

Unveiling the physics of AGN through X-ray variability

Lorena Hernández García

Although variability is a general property characterizing active galactic nuclei (AGN), it is not well stablished if the changes occur in the same way in every nuclei . The main purpose of this work is to study the X-ray variability pattern(s) in AGN selected at optical wavelengths in a large sample, including low ionization nuclear emission line regions (LINERs) and type 1.8, 1.9, and 2 Seyferts, using the public archives in Chandra and/or XMM-Newton. Spectra of the same source gathered at different epochs were simultaneously fitted to study long term variations, whereas the variability patterns were studied allowing different parameters to vary during the spectral fit. Whenever possible, short term variations from the analysis of the light curves and long term UV flux variability were studied. Short term variations at X-rays are only found in type 1.8 and 1.9 Seyferts, and variations in timescales of months/years are very common all AGN families. The main driver of the long term X-ray variations seems to be related to changes in the nuclear power, but other variability patterns cannot be discarded in a few cases, because changes of the column density or at soft energies are also found. We will discuss the geometry and physics of AGN through the X-ray variability analysis.

The formation and evolution of the Brightest Cluster Galaxies

Alfonso Aragon Salamanca

Brightest Cluster Galaxies (BCGs) are the most massive galaxies in the Universe. Understanding their formation and evolution is essential if we want to understand how massive galaxies and the structures they inhabit came to be. In this talk I will present some far-reaching results on the relationship between the internal properties (stellar masses, structural parameters and morphologies) of BCGs and their environment, both at low and high redshift. We find that most present-day cDs BCGs started their life as ellipticals, which subsequently grew in stellar mass and size due to mergers. In this process, the cD envelope developed. Furthermore, the growth of the BCGs in mass and size seems to be linked to the hierarchical growth of the structures they inhabit: as the groups and clusters became denser and more massive, the BCGs at their centres also grew. This process is nearing completion at the present time.

Garrotxa simulations: Hot gas distribution around Milky Way size galaxies at z=0

Santi Roca-Fabrega

We present a new set of cosmological simulations of galaxy formation using ART + hydrodynamics. In most of our realizations the main system has been evolved inside a 20 Mpc/h box and with a comoving spatial resolution of 109 pc. At z=0 our main systems have a Mvir = $6-8\cdot10^{11}$ Msun. In several of our models a well defined disk is formed inside the

dark matter halo and the overall amount of gas and stars is comparable with MW observations. Several non-axisymmetric structures arise out of the disk: spirals, bars and also warp and flare. A huge reservoir of hot gas is present at large distances from the disk, embedded in the dark matter halo region, but accounting only for about 50-80% of the "missing baryons". Gas column density, emission (EM) and dispersion (DM) measures have been obtained from inside the simulated disk at a position of 8 kpc from the center and at random directions, in order to obtain mock observations of hot gas emission/absorption. Ou r results reveal that the distribution of hot gas is highly non-isotropic. These results agree with observations Gupta et al. 2012 and Gupta et al. 2013. Also, hot gas metallic distribution is complex as a consequence of a recent accretion of a satellite galaxy, among others. After a careful analysis we confirm that due to the anisotropy in the gas distribution of hot gas in the galactic halo (Roca-**Fàbrega et al. 2016, submitted).**

Constraints on galaxy bias and σ 8 through the PDF of the galaxy number density

Pablo Arnalte-Mur

We present a full description of the N-probability density function of the galaxy number density fluctuations. This N-pdf is given in terms, on the one hand, of the dark matter correlations and, on the other hand, of the galaxy bias parameter. The method relies on the assumption commonly adopted that the dark matter density fluctuations follow a local non-linear transformation of the initial energy density perturbations. The N-pdf of the galaxy number density fluctuations allows for an optimal estimation of the bias parameter (e.g., via maximum-likelihood estimation, or Bayesian inference if there exists any a priori information), and of those parameters defining the dark matter correlations, in particular its amplitude (a). It also provides the proper framework to perform model selection between two competitive hypotheses. We test our formalism via simulations and apply it to the 7th release of the SDSS main sample (for a volume-limited subset with absolute magnitudes $M_r \leq -20$). We obtain competitive constraints on the parameters, b =1.193 \pm 0.074 and $\sigma_{\rm s}$ = 0.862 \pm 0.080, and show using different model selection criteria that galaxy biasing is clearly favoured. We apply the same model to the simpler case of the 1point PDF via the classical counts-in-cells method. We show that in this case the model produces a perfect fit to the SDSS observations for large cell radii (R > 20 Mpc/h) where we can neglect the effect of shot noise.

The temporal evolution of the metallicity gradient from unresolved studies of stellar populations

Patricia Sanchez-Blazquez

Recent numerical simulations have shown that the temporal variation of the metallicity gradients in disk galaxies offers a unique and under-utilised constraint on the uncertain nature of stellar feedback processes. Attempts to derive the evolution of the metallicity gradient with time have been classically done confronting the metallicity gradients obtained with stellar populations tracing different epochs of star formation. However, this approach is limited to those galaxies where stars can be resolved. We present the temporal evolution of the metallicity gradient in the CALIFA sample of disk galaxies to study the feedback efficiency as a function of mass and other morphological characteristics, providing with invaluable constrains to the theoretical models.

Sesión GC: viernes 22 julio - tarde

Cosmic Lighthouses at High-z: Absorption systems towards QSO and GRB lines of sight as cosmological probes up to the reionisation epoch

Rubén Sánchez Ramírez

Quasi-stelar objects (QSOs) and gamma-ray bursts (GRBs) are the most luminous backlight sources suitable for absorption line studies in a cosmological scale. Although these lighthouses only probe the intervening material along the line of sight from the source to the Earth, they have multiple advantages with respect to emission surveys studies: They are not limited by the luminosity of the system and abundance measurements are given directly from the line profile, amongst others. Being these backlight emitters randomly distributed on the sky, intervening detections are not biased against most luminous objects, and they can be used as cosmological probes to accurately determine average properties of the high redshift Universe. I will give a brief introduction to these methods and present our latest results, including inter-stelar and inter-galactic chemical studies at z>5, as well as our current and future work on this topic.

Searching for Lyman alpha sources in the ESO/GTC SHARDS survey

Pablo Arrabal Haro

El estudio de la reionización del universo pasa por un buen análisis de las galaxias con formación estelar a altos redshifts, dividiéndose estas en dos tipos diferenciados. Las Lyman Alpha Emitters (LAEs) y las Lyman Break Galaxies (LBGs), ambas caracterizadas por presentar una caída brusca de emisión hacia el azul de 121.6 nm conocida como el corte de Lyman. Con anterioridad se han llevado a cabo muchos estudios de estas galaxias a redshifts entre 2 y 6, sin embargo, las SFR calculadas son demasiado pequeñas para dar cuenta de la reionización del universo y las funciones de luminosidad no están demasiado exploradas a altos redshifts. En mi proyecto de tesis estoy utilizando datos profundos del catálogo ESO/GTC SHARDS para detectar y cuantificar este tipo de objetos a z~3.2-6.7. La profundidad de los datos, sumada a la relativa estrechez de los filtros de SHARDS nos permite muestrear fuentes muy débiles con buena precisión, por lo que podremos conseguir mucha información nueva. En esta charla hablaré del proceso de detección de estos objetos en el campo de GOODS-N usando el catálogo mencionado, así como del estudio preliminar de los mismos (obtención de las SEDs, distribución en redshifts, estimación de las SFRs...) y mostraré los candidatos más interesantes. Además, disponemos de una observación en curso para hacer espectroscopía multiobjeto con GTC/OSIRIS de los mejores candidatos.

What shapes the abundace and clustering evolution of Lyman-alpha emitters?

Siddhartha Gurung López

Lyman-alpha emitters consitute a relatively uniform sample of star-forming galaxies that can be studied in a very broad redshift range (0<z<7).

I make use of the latest version of the semi-analytical galaxy formation model GALFORM to study their abundance and clustering evolution. I find that the model requires an escape fraction of Ly-alpha photons that is higher towards higher redshifts, in agreement with observational estimates. In order to improve the match between model predictions and observations, I modify the AGN and SN feedbak prescriptions in GALFORM, and discuss how this impacts other GALFORM predictions. Finally, I discuss the potential of

using J-PAS to constrain galaxy formation models by using clustering and abundance measurements.

Star formation and AGN activity in the most luminous LINERs in the local universe

Isabel Márquez Pérez

This work presents the properties of 42 objects in the group of the most luminous, highest star formation rate LINERs at z=0.04 - 0.11. We obtain long-slit spectroscopy of the nuclear regions for all sources, and FIR data (Herschel and IRAS) for 13 of them. We measure emission line intensities, extinction, stellar populations, stellar masses, ages, AGN luminosities, and star-formation rates. We find considerable differences from other low-redshift LINERs, in terms of extinction, and general similarity to star forming (SF) galaxies. We confirm the existence of such luminous LINERs in the local universe, after **being previously detected at z 0.3 by Tommas** et al. (2012). The median stellar mass of these LINERs corresponds to the mass of $6 - 7 \times 1010M_{\odot}$

found in previous works to be critical for the peak of relative growth rate of stellar populations and therefore for the highest SFRs. Other LINERs although showing the same **AGN luminosities have lower SFR. We find that most of these sources have LAGN LSF** suggesting co-evolution of black hole and stellar mass. In general the position of local LINERs on the main-sequence of SF galaxies is related to their AGN luminosity.

Understanding the clumpy star- formation in local (U)LIRGs: A near-IR IFS perspective

Javier Piqueras López

The importance of Luminous and Ultraluminous infrared galaxies (U/LIRGs) in the context of the cosmological evolution of the star-formation has been well established in the last decades. They have been detected in large numbers at high-z (z>1) in deep surveys with Spitzer and Herschel, and they seem to be the dominant component to the star formation rate (SFR) density of the Universe beyond z~2. Although rare locally, nearby U/LIRGs are valuable candidates to study extreme cases of compact star-formation and coeval AGN. In particular, the study of local U/LIRGs using near-IR integral field spectroscopic techniques allows us to disentangle the 2D distribution of the star-formation using high spatial resolution, and characterise dust-enshrouded, spatially-resolved star-forming regions with great amount of detail. We present a comprehensive 2D IFS near-IR study of the extinction-corrected star-formation in a local sample of 10 LIRGs and 7 ULIRGs, based on VLT-SINFONI observations. We investigate the spatially-resolved distribution of the extinction-corrected star-formation rate (SFR) and star-formation rate surface density (Σ SFR) by analysing the Br and Pa emission of the galaxies of the sample. We also obtained integrated measurements of the SFR and Σ SFR, and identified a sample of 95 individual star-forming regions, characterised in terms of their size and Pa luminosity. These measurements will be discussed and compared with other SFR tracers like $H\alpha$, 24m and LIR, and other local and high-z samples of star-forming clumps.

Pósteres

Spectropolarimetric confirmation of the changing type Seyfert galaxy ESO362-G018

Beatriz Agís González

ESO362-G018 is an active galactic nucleus (AGN) which is classified as a Seyfert 1.5 galaxy, e.g. by Bennert et al. (2006). However, we have discovered an optical spectrum of this source which was taken during the 6dF Galaxy Survey, but it does not show the broad Balmer lines required to classify it as Seyfert 1 galaxy.

On the other hand, the results obtained by Agis-Gonzalez et al. (2014) in a X-ray analysis of this same source reveal that the inclination of ESO362-G018 i=53±50 is consistent with the picture of an AGN looked through the upper layers of a clumpy, dusty torus. Thus, according to the Unification Models of AGN and the clumpy nature of the torus, our interpretation of the different spectra is the following one. On 30th of January of 2003 (when the spectrum belonging to the 6dF survey was obtained), our line of sight intercepted a torus clump with much greater column density than its environment. Accordingly, the nucleus and the broad line region (BLR) would be obscured. This allowed only the narrow emission lines to emerge from the narrow line region (NRL). Otherwise, on 18th of September of 2004 (when the spectrum by

Bennert et al. 2006 was obtained) there is no clump to intercept and the BLR is not obscured so that the broad Balmer emission lines could be detected.

Polarimetric observations were fixed to confirm this scenario. Polarimetry does not only measure the amount of light per unit of time or wavelenght, but also how the electric

oscillates. At the same time, electric field oscillations are perturbed by mechanism or elements that breaks the symmetry in the radiative source. Thus, polarimetry becomes a powerful tool as it can afford information on the geometry structures that are below the resolution limit of telescopes, like AGNs.

In these new data, we could find the source in any of both stages: type 2, if we intercept a fortuitous torus clump, or type 1, if there is not any clump passing through our line-of-sight. Both cases will confirm the described picture. In case of discovering type 1 stage, spectropolarimetric data will provide us a polarized classification and help constrain established scattering models, e.g. Smith et al. (2002). If Type 2 stage is encountered, polarization should reveal polar scattering but also provide a periscopic view of the BLR so that broad lines seen from the top could be compared to broad lines seen along the line of sight.

The very high redshift component of the OTELO survey

Ángel Bongiovanni

Lyman-alpha emitters (LAEs) and Lyman-break galaxies (LBGs) stand out among the most used tools to study the galaxy formation in the early universe. Despite they constitute truly evolutionary probes of galaxy formation, evidence suggests that LAEs & LBGs correspond to different kinds of extragalactic sources regarding star formation modes, spatial distribution, gas and dust content, nuclear activity, apart from the way they are detected. Such differences gain special significance near the reionization redshift. The OSIRIS Tunable Filter Emission-Line -OTELO- project is a very deep, 2D-spectroscopic (R-700) blind tomography, defined on a spectral window of 21 nm and centered on 915 nm, which aims to obtains spectra of all emission line sources in the field, sampling unrelated cosmological volumes between z=0.4 and 6 (see contributions of Cepa et al. and Ramon-Perez et al. in this Meeting). Data from the OTELO's first pointing (Extended Groth Strip, EGS) and ancillary have been gathered and reduced. This contribution is specifically addressed to show the preliminary census and properties of LAEs & LBGs at z > 6 obtained through the exploitation of this survey, starting from color diagnostics and hybrid SED fitting, and including sharp considerations about their possible interlopers (e.g. cool Galactic stars and z ~ 1.3 post-starburst galaxies).

The outskirts of massive early-type galaxies at <z> = 0.65 in the Hubble Ultra Deep Field

Fernando Buitrago Alonso

The Hubble Ultra Deep Field (HUDF) opens up an unique window to witness galaxy assembly at all cosmic distances. Thanks to its extraordinary depth, it is a privileged tool to beat the cosmological dimming, which affects any extragalactic observations and has a very strong dependence with redshift – $(1+z)^4$ –. In particular, massive (M_{stellar}> 5x10¹⁰M_{sun}) Early Type Galaxies (ETGs) are the most interesting candidates for these studies, as they must grow in an inside-out fashion developing an extended stellar envelope/halo that accounts for their remarkable size evolution (~5 times larger in the nearby Universe than at z=2-3). To this end we have analysed the 6 most massive ETGs at z < 1 in the HUDF12. Because of the careful data reduction and the exhaustive treatment of the Point Spread Function (PSF), we are able to trace the galaxy surface brightness profiles up to the same levels as in the local Universe but at <z> = 0.65 (31 mag arcsec⁻²in all 8 HST bands, ~29 mag arcsec⁻²restframe or beyond 25 effective radii). This fact enables us to investigate the galactic outskirts or stellar haloes at a previously unexplored era, characterising their light and mass profiles, colors and for the first time the amount of mass in ongoing mergers.

About SFR inferences

Miguel Cerviño

We used the intrinsic algebra of synthesis models and explored how the SFR can be inferred from the integrated light without any assumption about the underlying star formation history (SFH). As result, We show that the constant SFR approximation is a simplified expression of deeper characteristics of synthesis models: It characterizes the evolution of single stellar populations (SSPs), from which the SSPs as a sensitivity curve over different measures of the SFH can be obtained. As results, we find that (1) the best age to calibrate SFR indices is the age of the observed system (i.e., about 13 Gyr for z = 0systems); (2) constant SFR and steady-state luminosities are not required to calibrate the SFR; (3) it is not possible to define a single SFR timescale over which the recent SFH is averaged, and we suggest to use typical SFR indices (ionizing flux, UV fluxes) together with untypical ones (optical or IR fluxes) to correct the SFR for the contribution of the old component of the SFH. Particular values of SFR calibrations are (almost) unaffect by this work, but the meaning of results obtained by SFR inferences is affected. In our framework, results such as the correlation of SFR timescales with galaxy colors, or the sensitivity of different SFR indices to short- and long-scale variations in the SFH, fit naturally. In addition, the present framework provides a theoretical guide-line to optimize the available information from data and numerical experiments to improve the accuracy of SFR inferences.

The SFR-Mass-Metallicity relation of galaxies free from aperture effects: the empirical correction from the CALIFA survey

Salvador Duarte Puertas

Galaxy spectroscopic fluxes in large massive surveys, such as SDSS, suffer from severe quantitative effects due to their uncomplete coverage by the aperture used in the observations. These effects, in turn, can not be easily expressed on a simple geometrically derived recipe as can be shown by the recent resulst from the CALIFA survey (Iglesias-

Paramo et al 2013). Properties like galaxy morphology, star formation pattern or precise dust distribution of each galaxy affect the observed spectra in a non trivial way. Therefore a realistic aperture correction must be applied to any single-aperture spectroscopy (i.e. from SDSS) in order to be able to represent the entire galaxy. Some model-based corrections have been developed leading to unrealistic approximations for total Halpha based star formation rate (SFR) or the galaxy metallicity. Given the relevance of these fundamental spectrophotometric properties for the construction of the fundamental Mass-Metallicity-SFR relation and for our understanding of galaxy evolution, we have used our empirically derived CALIFA survey aperture corrections to produce realistic SFR and metallicities of galaxies for an extended sample including all SDSS star-forming galaxies.

M31 @ Observatorio Astrofísico de Javalambre

Alessandro Ederoclite

M31 is undoubtedly the most important and studied extragalactic object of the Northern hemisphere. One of the dominant galaxies of the Local Group, M31 has a fundamental role in stellar evolution studies. This poster shows preliminary results of a monitoring program carried out with the JAST/T80 from the Observatorio Astrofísico de Javalambre, aimed at the study of the variables in this galaxy. This telescope's unique field of view and filter set allows for variability studies of unprecedented quality.

Selecting Seyfert galaxies with nuclear AGN-dominated far-infrared emission

Judit García González

We present far-infrared (FIR) 70 - 500 microns imaging observations obtained with Herschel/PACS and SPIRE of 33 nearby (median distance of 30 Mpc) Seyfert galaxies from the Revised Shapley-Ames (RSA) catalogue. We obtain the FIR nuclear (r = 1 kpc and r = 2kpc) and integrated spectral energy distributions (SEDs). We estimate the unresolved nuclear emission at 70 microns and we fit the nuclear and integrated FIR SEDs with a grey body model. We find that the integrated FIR emission of the RSA Seyferts in our sample is dominated by emission from the host galaxy, with dust properties similar to those of normal galaxies (non AGN). We use four criteria to select galaxies whose nuclear 70 microns emission is dominated by the AGN: (1) elevated 70/160 microns flux ratios, (2)spatially resolved, high dust temperature gradient, (3) 70 microns excess emission with respect to the fit of the FIR SEDs with a grey body, and (4) excess of nuclear SFR obtained from 70 m icrons over SFR from mid-infrared indicators. 16 galaxies (48 per cent of the initial sample) satisfy at least one of these conditions, whereas 10 satisfy half or more. After careful examination of these, we select six bona fide candidates (18 per cent of the initial sample) and estimate that 40 - 70 per cent of their nuclear (r = 1 - 2 kpc) 70 microns emission is contributed by dust heated by the AGN.

A new catalogue of Magellanic Cloud clusters with precise stellar population parameters.

Gabriel Gómez Velarde

We present a new catalogue of Magellanic Cloud clusters with precise stellar population parameters, including all the objects published up to June 2016. During the compilation preference is given to objects with existing deep HST photometry and/or metallicities based on individual objects spectroscopy. We compare the stellar population properties of the clusters included in the catalogue with other works, covering more objects, but based on shallower photometry and to the catalogues of Bica and collaborators. Our catalogue is biased towards brighter and more massive objects, which makes it extremely suitable for testing and calibrations stellar population models. To ensure this, we include extinction values towards the objects and some integrated-light properties.

The gas-to-dust ratio and molecular gas properties of (U)LIRGs

Rubén Herrero-Illana

In this talk I will present our IRAM 30m extensive survey of CO observations on a sample of 56 nearby, bright (ultra) luminous infrared galaxies, (U)LIRGs, selected from the Great Observatories All-Sky LIRG Survey (GOALS). Using Herschel photometric data, we have fitted the SED of our sources to a modified blackbody model, deriving the dust parameters (i.e., dust masses and temperatures), as well as the IR luminosity. We have compared the dust and gas content and, using local reference samples, we have constrained the CO-to-H2 conversion factor for (U)LIRGs. We have also studied the relation between the infrared and CO luminosities, as well as characterized the star formation efficiency and depletion time of these systems. Finally we have also reexamined the relationship between the 12CO/13CO ratio with dust temperature.

Characterisation of candidate ultra-bright sub-mm galaxies selected from VHS/WISE

Susana Igleasias Groth

Bright submillimetre galaxies at high redshifts appear to be forming stars at very high rates (1000 /yr). These dust-obscured galaxies in the nIR are very luminous at submillimetre wavelengths with star-forming regions 100 x larger and 106 times more luminous than in normal galaxies. Using as reference the near and mid- IR colours of the lensed sub-mm galaxy SMMJ2135-0102 (z=2.3259, K=18, J-K=2.5, W1-W3=3.3) we carried out a search for brighter analogues of similar colours using VISTA/VHS and WISE over a region of more than 6230 sq. deg.

For selected brightest candidates (K <18) detected in this search it has been requested time to make observations sub-mm, millimeter, optical and near IR (LABOCA / APEX, ALMA, VLT / X-shooter and GTC / OSIRIS). This is to measure their redshifts (expected in the range z = 1-2.5) and determine the properties and evolution of the characteristics of the dust.

The environmental dependence of the HI mass function in ALFALFA 70%

Michael Jones

The HI galaxy mass function represents a key component in our understanding of the gas content of galaxies, and studying how it evolves with environment is fundamental to developing a complete picture of galaxy evolution. We use the ALFALFA 70% catalogue, the largest uniform catalogue of extragalactic HI sources to date, to explore the environmental dependence of the HI mass function based on the projected neighbour densities in both SDSS and the 2MASS Redshift Survey. The Schechter function `knee' mass is found to increase by approximately 0.2 dex from the lowest to highest quartile of neighbours, and not with 2MRS. We interpret this as an indication of local, rather than larger scale, environmental dependence. In addition, we find no evidence for any change in the low-mass slope based on either definition of neighbour density, which is in tension

with numerous survey s of individual galaxy groups, which typically measure a flat slope. However, our latest results now give tentative evidence of changes in both the `knee' mass and the low-mass slope dependent on the largest scale structures in the local Universe, potentially providing a resolution to this tension and others.

The nuclear ring in NGC 7742 seen with MUSE

Johan Knapen

We present MUSE results on the kinematics and stellar populations of the face-on disk galaxy NGC 7742. This galaxy hosts a spectacular nuclear ring of enhanced star formation, which is unusual in that it is hosted by a non-barred galaxy and presumably instigated dynamically by an earlier interaction event which has also led to counterrotation gas and stellar components in its central kiloparsec region. We find evidence that the ring contains stars of up to a few 100 Myr old in addition to those that are just a few Myr old and are responsible for the observed Balmer emission. We confirm the known counterrotation but the superior spatial resolution and field of view of MUSE allow us to map the gas and stellar kinematics well outside the ring region and to deduce the presence of significant streaming motions. We present stellar population modelling within the ring but also in the regions inside and outside the ring, which prove that star formation is concent rated in but not limited to the ring. The combination of superb kinematics and population measurements allows us to unravel the detailed history of this spectacular circumnuclear starburst region.

Identifying and extracting HII regions from nearby galaxies with J-PLUS

Rafael Logroño García

The Javalambre Photometric Local Universe Survey (J-PLUS) has already started the data acquisition phase at the Observatorio Astrofísico de Javalambre (OAJ) in Teruel, Spain. Benefiting from the large field of view (2 deg^2) and the special set of 12 filters of the T80Cam at the T80 telescope, we aim to fully characterize the properties of HII regions in nearby galaxies. The first step involves the procedure to identify and extract these HII regions, which is presented in this poster. The detection image showing the excess of H+[NII] is constructed using a combination of the images in three filters (two SDSS broadband filters, r and i; and a narrow-band one centered in the H+[NII] rest-frame wavelength) following the prescriptions of Vilella-Rojo et al. (2015). We demonstrate the power of this method by comparing some of our images to those of other integral field spectrographs, remarking not only the HII regions but other special features such as a bsorption by old stellar populations. The entire procedure is included in a fully automatized pipeline that homogenizes the PSF, and identifies and extracts the HII regions from all the galaxies in the J-PLUS area, generating catalogs of these regions up to redshift z~0.015. After this first step, we will get spectral energy distributions using the 12 available filters. With them, we will study the impact of environment in the star formation properties of nearby galaxies, taking advantage of the unprecedented field of view that T80Cam offers.

The ALHAMBRA survey: B-band luminosity function of red and blue galaxies at z < 1 from PDF analysis

Carlos López San Juan

The next-generation large-area photometric and spectroscopic surveys will push the current methodologies to the limit, minimising the shot noise and cosmic variance errors and leaving systematic errors as the main source of uncertainty. We present a new methodology to compute accurate and unbiased luminosity functions in photometric redshift surveys. Our new method (i) uses the full probability distribution function (PDF) of the sources in the redshift - template space, (ii) works in real magnitudes thanks to the selection I-band PDF, ensuring 100% complete samples, (iii) statistically deals with red/blue segregations without pre-selection of the sources, (iv) provides the covariance matrix between redshifts and luminosities, including the cosmic variance, (v) consistently derives the associated galaxy bias function thanks to the dispersion of the data, and (vi) performs a 2D fitting in z - MB space, accounting by volume effects and the errors covariance. We applied our new method to the ALHAMBRA survey data, deriving the Bband luminosity function at 0.2 < z < 1.0 both for red and blue galaxies. Our results are in excellent agreement with previous spectroscopic works, confirming the luminosity decline of blue galaxies and the build-up of the red sequence. Moreover, we clearly trace the upturn of faint red galaxies and estimate their contribution to the total luminosity budget. This new methodology will be applied to J-PAS and other photometric redshift surveys in the future.

The Formation of Bulges, Discs and Two Component Galaxies in the CANDELS Survey at z<3

Berta Margalef Bentabol

The most massive galaxies in the local Universe can be classified as disc-dominated and spheroid-dominated (i.e. Hubble type). However, it is unclear how and when these dominant structures form and the possible connection between them. To address this issue we have investigated massive galaxies (logM>10) in the CANDELS fields at the epoch of 1<z<3, when the Hubble sequence forms, by fitting their light profiles with a single Sérsic fit, as well as with a combination of exponential and Sérsic profiles. We split our sample between having 1 component (disc/spheroid-like galaxies) and those formed by an `inner part' or bulge and an `outer part' or disc (2 components). I will show in this talk that the most massive galaxies are more likely to consist of a bulge and a disk compared to lower mass galaxies. The number of such 2-component systems decreases at higher redshift; by a factor of three from z=1 to z=3. We find that single `disc-like' galaxies have the highest relative number densities at all redshifts, and that 2-component galaxies have the greatest increase and become at par with discs by z = 1. We also find that the 2component systems have an increase in the sizes of their outer components, or `discs' by about a factor of three from z = 3 to z = 1.5, while the inner components or `bulges' stay roughly the same size. This suggests that these systems are growing from the inside out, whilst the bulges or protobulges are in place early in the history of these galaxies.

Hunting for the dark phases of galaxy formation with MUSE

Raffaella Anna Marino

Theoretical models suggest that the early phases of galaxies formation should involve an epoch when galaxies are gas rich and inefficient at forming stars: a dark galaxy phase. Here, I will present new results on the search for these dark galaxies at high redshift (z-3) obtained from the analysis of different MUSE deep fields part of the Guaranteed Time of Observation program. In particular, we take advantage of the quasar-induced, fluorescent

Lyman alpha emission to study and detect these otherwise invisible objects to our optical telescopes. On the basis of the few pioneering works from the literature, we already know that dark galaxies appear to be compact, gas-rich, and very inefficient at forming stars but the current sample is very limited. Thanks to the unprecedent capabilities of the MUSE instrument, we are now able to provide a more complete census of fluorescently illuminated dark galaxies as well as to analyze and characterize the main properti es of these intriguing objects with a unique spatial and spectral resolution.

Thick disk properties from ultra-deep Stripe82 imaging

Cristina Martínez Lombilla

Thick disks can give invaluable information on the formation and early evolution history of galaxies. Our goal is to use multi-band imaging to study their colours and structures in unprecedented detail. For that purpose, we have developed a technique to reach a surface brightness limit of 28.5-29 mag/arcsec^2 with the combined g, r, i bands images from The IAC Stripe82 Legacy Project. Our method consists, first of all, of making a careful analysis of the background and of the masking process. Then, we use IMFIT to perform reliable 2D fitting of the galaxy and its components, which allows us to obtain our PSF-convolved and deconvolved models as well as their residuals. This procedure will allow us to model thick disks at a range of redshifts and elucidate their formation and evolution. In this work we present the characterization of the thick disks in a carefully selected sample of edge-on galaxies. A study of the radial and vertical surface brightness profiles is presented, comparing between our data, the models, and each galactic component. We find that PSF effects are important, but can be accounted for by galaxy modelling. This means that the galaxy outskirts are strongly affected by faint wings of the PSF, which will be a very important issue when dealing with future ultra-deep LSST data.

Morphological analysis of OTELO survey galaxies

Jakub Nadolny

OTELO (OSIRIS Tunable filter Emission Line Objects) is an emission-line object survey covering a spectral range between 9070-9280 Å in a window of reduced airglow emission. The first pointing of OTELO, in the Extented Groth Strip (EGS), consists of 36 tomographic slices sampling at 6 Å, obtained with the red tunable filter of OSIRIS at the Gran Telescopio de Canarias (GTC). OTELO is designed to detect and distinguish (e.g with a EW vs. [Nii]/H diagram) active galactic nuclei, starburst galaxies or quasars, among others, using also auxiliary data available. The aim is to study galaxies evolution in a wide cosmic time-scale. The first analysis of 100% of the OTELO first pointing data shows a complete sample for an integrated flux of >= $2x10^{-18}$ erg cm² s⁻¹ with a limiting flux of about $1.8x10^{-20}$ erg cm^-2 s^-1. This makes OTELO the deepest catalog of emission line objects to date. The aim of the present contribution is to provide preliminary results of the morphology classification of a sample of the detected sources (+11k detections). We will use wellknown astrophysical tools (SExtractor, GALFIT) in order to obtain the main parameters that describe the galaxy light distribution and shape – Sersic index, Gini coefficient, second momentum of light M20, concentration, asymmetry etc., which are expected to provide reliable quantitative morphology. To this end we will use the HST/ACS (F606W, F814W) and the Canada-France-Hawaii Telescope Legacy Survey (g', r', i', z') as complementary data.

On the relation between X-ray absorption and optical extinction in AGN

Ignacio Ordovás Pascual

According to the Unified Model of Active Galactic Nuclei (AGN), an X-ray unabsorbed AGN should appear as unobscured in the optical (Type-1) and viceversa (Type-2). However, there is an important fraction (10-30%) of AGN whose optical and X-ray classifications do not match. To provide insight into the origin of such apparent discrepancies, we have conducted two analyses: 1) a detailed study of the UV-to-near-IR emission of two X-ray unabsorbed Type-2 AGN drawn from the Bright Ultra-Hard XMM-Newton Survey (BUXS); 2) a statistical analysis of the optical obscuration and X-ray absorption properties of 159 Type-1 AGN drawn from BUXS to determine the distribution of dust-to-gas ratios in AGN over a broad range of luminosities and redshifts. In our works we have also determined the impact of contamination from the AGN hosts in the optical classification of AGNs. Our studies are already provided very exciting results such as the detection of objects with ext reme dust-to-gas ratios, between 300-10000 times below the Galactic dust-to-gas ratio.

Witnessing the birth of the red sequence

lván Oteo Gómez

Exploiting the sensitivity and spatial resolution of ALMA, we have studied the morphology and the physical scale of the interstellar medium - both gas and dust - in SGP 38326, the most luminous star-bursting system known at z > 4. SGP 38326 contains a molecular gas reservoir among the most massive yet found in the early Universe, and it is the likely progenitor of a massive, red-and-**dead elliptical galaxy at z 3. Probing scales of 800 pc we** find that the smooth distribution of the continuum emission from cool dust grains contrasts with the more irregular morphology of the gas, as traced by the [CII] fine structure emission. The gas is also extended over larger physical scales than the dust. Our observations support a scenario where at least a subset of the most distant extreme starbursts are highly dissipative mergers of gas-rich galaxies.

A reliable interpolation method for CMB images

Javier Pascual Granado

An evenly sampled data set is a rare situation in astronomical data analysis. Systematic effects, contaminating sources, instrumental issues or accidental events can introduce gaps that make difficult fitting models and may lead to an inconsistent data analysis. The impact of missing data in astronomical data analysis is often mitigated by filling the gaps with predicted values. However, some algorithms are based on the principle of retouching, i.e. that an acquired image or dataset is modified in a way that is non-detectable for a human being who does not know the original image. One example are the gap-filling used for the missing patches in CMB images caused by the residual contributions of the galactic region. We show here the necessity of using a reliable gap-filling algorithm, that is, which is aimed to preserve the original information, to achieve an unbiased interpretation of the data. We study the possible extension to 2D images of an interpolation method already used effectively for filling the gaps in the light curves of pulsating stars observed by ultra-precise space missions.

A novel technique to characterize the merging channel of the galaxies

Luis Peralta de Arriba

Most massive galaxies have grown their sizes during cosmic time. Several mechanisms have been proposed to explain this growth, being minor mergers the most promising way. The key feature of this mechanism is that it can reproduce in a very efficient way the observed size growth. The number of satellites around the massive galaxies has also been used to support observationally minor-merging mechanism; however, this evidence has a big uncertainty because a merger time scale needs to be assumed. In this presentation we will use velocity dispersion measurements at high redshift as an opportunity to explore the structural properties of massive galaxies. This will allow us to constrain the different evolutionary mechanisms, and in particular to check whether minor mergers remain as the most favoured growth channel.

The radio luminosity function of supernova remnants in local galaxies

Naím Ramírez Olivencia

We investigate the existence of a universal radio luminosity function (LF) for supernova remnants (SNRs) in local galaxies, and the possible relations among the parameters characterising the LF and the relevant physical parameters of the host galaxies, namely the (global) star-formation rate (SFR) and interstellar medium (ISM) density. We used publicly available data from the literature to constrain the radio LF of SNRs at 1.4 GHz. We used a cumulative histogram and a variable bin size approach to deal with the typically small data samples available, and then applied standard Monte Carlo techniques to estimate the relevant physical parameters and their uncertainties. We find that the radio LF of SNRs in our sample can be well described by a single power law $n = A \times L^{beta}$ with a universal index beta = -2.31 +or- 0.03. This value is already corrected for SNR incompleteness, and does not include the effect of starburst galaxies in the sample. For each individual galaxy, the values of beta are close to the universal one. We also find that A is proportional to the star-formation rate (SFR) as A proportional to SFR ^0.87. On the other hand, we find that A is not directly linked to ISM density. We also stress that our method, which we apply here to the specific field of SNRs, is of general applicability and is more robust than previous approaches followed to obtain reliable LFs in this and other fields. We conclude that there exists a universal radio LF for SNRs in normal, nonstarbursting galaxies. The power law radio LF $n = A \times L^{beta}$, has a rather steep index (beta approx -2.30). We also conclude that A is a direct tracer of star-forming activity, but not of the ISM density.

Emitting objects in OTELO survey: AGN analysis

Marina Ramón Pérez

OTELO (Osiris Tunable Emission Line Object survey) has become the deepest emission-line survey to date using the Tunable Filters of the OSIRIS instrument at the GTC. The observations of OTELO's first pointing on the Extended Groth Strip have been completed. The data have been reduced and a final deep image with limiting flux of 1.8.10-20 erg/s/cm2/angstrom (mAB=27.18) has been obtained. Over this image, 11237 objects have been detected up to 3 sigma. A first multiwavelenght catalogue of all the objects in the field has been built using public archive data from X-Rays to Infrared. A selection of the emission-line candidates in the field has then been made. They account for about 10% of the total number of objects. Finally, the photometric redshifts of these potential emitting candidates has been derived. The procedure followed to discriminate between Star-Forming Galaxies and AGN includes diagnostic and color-color diagrams, as well as the complementary information in X-Rays and MIR. In this talk, we present the latest

results obtained from the analysis of the emitting sources found in OTELO field of view, focusing on the properties of the population of Active Galactic Nuclei (AGN) with special emphasis on low-luminosity ones.

Physical Properties and SFHs of Low-Mass Star-Forming Galaxies at Intermediate Redshifts

Lucía Rodríguez-Muñoz

The epoch when low-mass star-forming galaxies (LMSFGs) form the bulk of their stellar mass is uncertain. While some models predict an early formation, others favor a delayed scenario until later ages of the Universe. We present improved constraints on the physical properties and star formation histories (SFHs) of a sample of intermediate redshift LMSFGs selected by their stellar mass or BCD-like properties. Our work takes advantage of the deep UV-to-FIR photometric coverage available on the Extended-Chandra Deep Field-South and our own dedicated deep VLT/VIMOS optical spectroscopy programs. On the one hand, we estimate the stellar masses (M*), SFRs, and SFHs of each galaxy modeling their spectral energy distributions using a novel approach that (1) consistently combines photometric (broad-band) and spectroscopic (emission line fluxes and equivalent widths) data, and (2) uses physically-motivated SFHs with non-uniform variations of the SFR as a function of time. On the other hand, we characterize the properties of their inter-stellar medium by analyzing the emission line features visible in the VIMOS spectroscopy. The final sample includes 91 spectroscopically confirmed LMSFGs (7.3 <= log M*/Msun <= 9.5) at 0.3 < z < 1.0. They present typical values of SFR consistent with the main sequence of star forming galaxies over 2 dex in stellar mass, and high sSFR. Furthermore, they are characterized by strong emission lines, low metallicity, and an enhanced level of excitation. Our selection criterion based on mass gathers galaxies within a wide range of properties and possibly different evolutionary stages. Despite the individual differences, the average SFH that we obtain suggests a late and fast (~2 Gyr prior their observation) assembly scenario for this type of system.

Connecting interacting galaxies with manifolds

Merce Romero-Gomez

It is well known that two interacting galaxies generate tidal spiral arms. In this talk, we address the question of the formation of the tidal arms from a dynamical point of view. We model the two interacting galaxies as two point masses and we study the motion of the stars using the Restricted Three Body Problem, i.e. the two mass points are bound and circle around their center of mass. Even though it may seem a simple approximation, it has been shown in the literature to give an adequate description of the formation and early evolution of bridges and tails in interacting galaxies. We model the bridges and tails observed in interacting galaxies using the invariant manifolds associated to the Lyapunov orbits of the Lagrangian points of the galactic system.

ELAIS-N1

Jose Sabater Montes

I will present a poster of the latest LOFAR image of ELAIS-N1. This is the deepest image produced by the LOFAR Surveys Key Science Project and probably the deepest image of the full ELAIS-N1 area obtained at low frequencies. With a noise level of less than 100 micoJy at 150 MHz, we are able to detect several thousands of low-frequency sources in an area of about 30 square degrees of the sky.

Dust properties of nearby AGN and normal hosts from Herschel FIR photometry

Miguel Sánchez Portal

We are carrying out a study of the dust properties of spatially well- resolved AGN (mainly Seyfert) and normal hosts from FIR photometry obtained with the PACS and SPIRE instruments on-board the Herschel Space Observatory. We have chosen objects with an apparent size large enough to allow a detailed analysis of the spatial dust properties, notably emissivity, temperature and mass. Assuming an optically thin emission, the flux density can be expressed as f_nu ~ nu^beta B(nu, Tdust) where beta is the dust emissivity. Two components (warm and cold) are being considered. The spatial resolution of our **maps corresponds to that of the largest beam (SPIRE 500 m), with a pixel size of 14". We** are also producing maps of star formation rate (SFR). In this poster, we discuss the techniques in use, describe the sample and present some initial results.

GRB110715A: Challenging the forward shock afterglow theory with the first burst observed with ALMA

Rubén Sanchez-Ramirez

We will present the extensive follow-up campaign on GRB110715A at 17 different wavelengths, from X-ray to radio bands, starting 81 seconds after the burst and extending up to 74 days later. This is the first data-set to include an afterglow observation from the ALMA observatory. The broadband afterglow emission is modeled with sychrotron radiation using a numerical algorithm and determine the best fit parameters using Bayesian inference in order to determine the physical parameters of the jet and the medium in which the relativistic shock propagates. Although the general behavior can be roughly described by these models, none of them are able to fully explain all data points simultaneously. GRB110715A shows the complexity of reproducing extensive multi-wavelength broadband afterglow observations, and the need of good sampling in wavelength and time and more complex models to accurately constrain the physics of GRB afterglows.

Towards a new model of AGN: hints of an ionized outflowing clumpy torus

Mario Sanfrutos

We report on the long- and short-term X-ray spectral analysis of the polar-scattered Seyfert 1.2 galaxy ESO 323-G77, observed in three epochs between 2006 and 2013 with Chandra and XMM-Newton. Four high-resolution Chandra observations give us a unique opportunity to study the properties of the absorbers in detail, as well as their short time scale (days) variability. From the rich set of absorption features seen in the Chandra data, we identify two warm absorbers with column densities and ionizations that are consistent with being constant on both short and long time scales, suggesting that those are the signatures of a rather homogeneous and extended outflow. A third absorber, ionized to a lesser degree, is also present and it replaces the strictly neutral absorber that is ubiquitously inferred from the X-ray analysis of obscured Compton-thin sources. This colder absorber appears to vary in column density on long time scales, suggesting a nonhomogeneous absorber. Moreover, its ionization responds to the nuclear luminosity variations on time scales as short as a few days, indicating that the absorber is in photoionization equilibrium with the nuclear source on these time scales. All components are consistent with being cospatial and located between the inner and outer edges of the dusty, clumpy torus. Assuming cospatiality, the three phases also share the same pressure, suggesting that the warm / hot phases confine the colder, clumpy medium. We discuss further the properties of the outflow in comparison with the lower resolution XMM-Newton data.

GRB 120326A: Panchromatic observations of a FRED Burst with a late rebrightening

Juan Carlos Tello Salas

We present observations carried out in Radio, IR, Optical, X-ray and Gamma Rays of GRB 120326A. These observations provide further insight on the previously published data on this burst, and we use it to model, analyse and discuss the mechanism which caused this burst's unusual very late rebrightening.

The structural properties of the host galaxies of luminous type 2 active galactic nuclei at z~0.3.

Juan José Urbano Mayorgas

The nuclear activity in galaxies has become a topic of major importance in studies of galaxy formation and evolution. By characterizing the nature of the galaxies hosting the most powerful active galactic nuclei (AGN) we aim at understanding in more depth the role nuclear activity plays in the life cycle of all massive galaxies. For this, we have studied the morphological and structural properties of the host galaxies associated with 58 luminous type 2 AGN (high luminosity Seyfert 2 and obscured QSO2). Our study is based on high spatial resolution optical HST images. We focus on topics such as the galaxy types and structure, the incidence of merger/interactions features and possible correlations with AGN power proxies. In this poster we will present the methodology and preliminary results. We will put them in context of related works on type 1 and type 2 AGN.

X-ray study of the double radio relic merger cluster Abell 3376 with Suzaku

Igone Urdampilleta

Galaxy clusters are the largest virialised structures in the Universe, which form and grow by accretion and merging with galaxies and sub-clusters. During these processes largescale shocks can be produced, which are associated with diffuse radio structures known as radio relics. The shocks may accelerate electrons up to relativistic energies (Bell 1978; Blandford & Eichler 1987). These relativistic electrons generate radio emission through synchrotron radiation. However, not all the radio emission present in the merger cluster originates from synchrotron emission. The correlation between X-ray shocks and radio relics is still not well understood. Many earlier X-ray studies suffer from limited signal-tonoise around relics Therefore, there are (almost) no deep analyses of the spatial distribution of shock fronts in X-rays associated to radio relics. In this work, we present the X-ray analysis of the nearby double relic cluster Abell 3376, observed with Suzaku XIS. These deep observations cover the entire relic region in the outskirts of the cluster. They allow us to investigate the spatial differences between radio (non-thermal) and X-ray (thermal) components of the plasma. By comparing the properties of the radio and shock heated plasma, we estimate the dynamical age of the shock front. Their spatial distribution tells us how shocks propagate and heat the intercluster medium (ICM). The previous study of Akamatsu et al. 2012 (Publ. Astron. Soc. Jpn., 64) about the western relic shows the presence of a discontinuity in the ICM temperature and surface brightness profiles (meaning the pressure discontinuity), which is a clear evidence of a shock front. The present analysis aims to improve these results by adding the most recent measurements of the eastern radio relic. It provides us with a better understanding of the dynamical state of the gas during a merger scenario.

M33 @ Observatorio Astrofísico de Javalambre

Héctor Vázquez Ramió

M33, the Triangulum Galaxy, is a spiral galaxy in the Local Group. Given its brightness and its vicinity with Andromeda Galaxy (M31), it is one of the best studied objects of the Northern hemisphere. In this poster, we present observations carried out with the **JAST/T80 at the Observatorio Astrofísico de Javalambre. The extraordinary fiel**d of view of this telescope allows us to study the stellar populations of the galaxy with a single observation. Moreover, repeated observations have provided us the possibility to follow a variety of variable stars, among them the nova ASASSN-15th.

Plasma instability in the relativistic flow of 0836+710

Laura Vega Garcia

Space VLBI observations with RadioAstron provide an extraordinary improvement of angular resolution. In this talk, I will present the results obtained from RadioAstron imaging of the relativistic jet in the quasar 0836+710 at L, C, and K bands. The images of 0836+710 show a wealth of structure on scales ranging from 0.2 to 150 milliarcseconds, which enables a detaile study of shocks and plasma instability development in the flow. The instability present in the jet will be discussed using the jet ridge lines and their modelling, which will determine the different modes present on the jet. This also allows the determination of different jet physical parameters.

Spectral signatures of the star-forming galaxies at the epoch of reionization

Alba Vidal García

The NIRSpec spectrograph onboard the James Webb Space Telescope will collect highquality spectra of thousands of high-redshift galaxies; in particular, it will provide detailed information about the rest-frame ultraviolet and optical spectra of large samples of galaxies near the reionization epoch. In this context, it is crucial to develop sophisticated models to analyze the light emitted from galaxies, particularly to interpret in a reliable way the spectral signatures of primeval galaxies in terms of constraints on star formation and interstellar gas parameters. We use new-generation models of the ultraviolet emission from young star-forming galaxies to explore the nebular emission signatures of the production, absorption and loss of ionizing photons in primeval galaxies.

Measuring Halpha fluxes of nearby galaxies with J-PLUS photometric data

Gonzalo Vilella-Rojo

The Javalambre Physics of the Local Universe Survey (J-PLUS) is now being carried at the **Observatorio AstrofÃsico de Javalambre (OAJ) in Teruel**, **Spain. With an 83 cm telescope (T80) and a wide field camera (T80Cam), it will cover ~8500 degÂ² of the northern sky in the** following years. The camera is equipped with a set of 12 broadband, medium-band, and narrow-band filters placed all along the optical wavelength range. The broadband ones

are in common with SDSS, and the medium and narrow-band ones are placed in key stellar features to characterize the stellar types of millions of stars in the Milky Way.

Two of the narrow-band filters are of special interest for galaxy evolution studies; These are J0378, placed in the rest-frame wavelength of the forbidden [OII] emission, and J0660, centered in the Halpha+[NII] rest-frame wavelength. The latter of these two filters permits us to study the Halpha emission of thousands of galaxies in the nearby Universe (z<0.015), resolving individual star-forming regions within them.

In this talk, I will briefly present the main steps that are taken to retrieve a clean and unbiased measurement of Halpha from J-PLUS images. After this, I will present a comparison between our photometric measurements and spectroscopic ones, as measured by SDSS and the CALIFA surveys, for a sample of ~50 galaxies and star-forming regions already observed with T80Cam/T80. Finally, I will present the capabilities of J-PLUS to infer the Halpha Luminosity Function in the local Universe, which will be used to compute the present Star Formation Rate with an unprecedented set of homogeneous data

Estimating the size and abundance of dark matter subhaloes with gravitational millilensing

Héctor Vives-Arias

We use 13 gravitational lens systems with quadruply imaged QSOs and their observed flux ratio anomalies obtained using data in mid-infrared, radio or spectral narrow lines as a baseline, to estimate the amount of substructure in the dark matter halo of lens galaxies. We assume that the smooth gravitational potential of the galaxies is well modeled by a Singular Isothermal Ellipsoid (SIE) plus external shear (gamma) along with an additional Singular Isothermal Sphere (SIS) in some cases, and that the cause of the flux ratio anomalies is dark matter subhalos described by pseudo-Jaffe density profiles. Our Bayesian estimates for the Einstein radius of the subhalos (as a fraction of the Einstein radius of their corresponding lens galaxy) is b = 0.0009 - 0.0007 + 0.0031, and their abundance (as a fraction of the total surface density of the lens galaxy at the image positions) is alpha = 0.12 - 0.05 + 0.08.

INSTRUMENTACIÓN Y SUPERCOMPUTACIÓN

Sesión IS: martes 19 julio - mañana

Infrared Interferometry with the 2nd generation of VLTI instruments: GRAVITY and MATISSE

> (Conferencia Invitada) Rebeca **García López**

In the last decade near-IR interferometry has been consolidated as a fundamental tool to investigate astronomical phenomena at milli-arcsec (mas) resolution. Instruments such as AMBER, MIDI and PIONIER had delivered important results in many fields such as star formation, AGN and stellar evolution. A next generation of much powerful interferometric instruments is now on its way. GRAVITY and MATISSE working at near and mid-IR wavelengths will open the possibility of simultaneous image reconstruction and spectroscopic studies at different wavelengths from 2um to 10um. Their high angular resolution (ten times higher than the more sensitive E-ELT and JWST) at IR wavelengths will allow us to exploit the complementarity of sub-mm interferometry (e.g. ALMA) and IR interferometry. This provides a unique astronomical tool to investigate planet, star and black hole formation.

OCTOCAM: A fast multichannel imager and spectrograph for the Gemini observatory

Antonio de Ugarte Postigo

OCTOCAM has been proposed to the Gemini observatory as a workhorse imager and spectrograph that will fulfill the needs of a large number of research areas in the 2020s. It is based on the use of high-efficiency dichroics to split the incoming light in eight different channels, four optical and four infrared, each optimised for its wavelength range. In its imaging mode, it will simultaneously observe a field of 3'x3' in g, r, i, z, Y, J, H, and Ks bands. It will obtain long-slit spectroscopy covering the range between 3700 and 23500 Å with a resolution of 4000 and a slit length of 3 arcminutes. To avoid slit losses, the instrument will be equipped with an atmospheric dispersion corrector operating in the complete spectral range. Thanks to the use of state of the art detectors, OCTOCAM will allow high timeresolution observations and will have negligible overheads in the classical observing modes. It will be equipped with a unique integral field unit that will observe in the complete spectral range with an on-sky coverage of 9.7"x6.8". The integral field unit is based on an image slicer design composed by 17 slitlets, 0.4" wide each. Finally, a state-ofthe-art polarimetric unit will allow full Stokes spectropolarimetry in the complete spectral range between 3700 and 22000 Å. In this presentation I will give an overview the design of the instrument and the most relevant science cases for this project.

CAB contribution to HARMONI, first-light instrument of the E-ELT

Javier Piqueras López

HARMONI is the optical and near-IR integral field spectrograph (IFS) selected as a firstlight instrument for the European Extremely Large Telescope (E-ELT). With four spatial scales (60, 20, 10 and 4 mas) and a wide range of spectral resolving powers (500-20000), HARMONI will allow astronomers to address many of the E-ELT science cases. The Centro **de Astrobiología (CAB INTA/CSIC) and the Instituto de Astrofísica de Canarias (IAC) form** part of the international consortium developing HARMONI, participation that will constitute an unique scientific opportunity for the Spanish astronomical community, allowing access to the E-ELT as soon as it becomes operative, via the guaranteed time. We describe here the Spanish contribution to HARMONI, in particular the participation of CAB to design and manufacture two of the instrument sub-systems: the calibration unit and the secondary guiding sub-system. The calibration unit will simulate the optical output of the telescope, and provide the functionality needed to illuminate the focal plane in such a way that the following type of data can be obtained: data aimed at removing the instrumental signature from the raw data and to convert the data into a data product that uses physical units, data required for monitoring the status of the instrument, and data required for calibrating the secondary guiding subsystem. The secondary guiding subsystem basic requirement is to provide knowledge (relative or absolute) of the location of the science focal plane on timescales of a few seconds and longer (up to months), with an accuracy of 2mas or 0.1x the input FWHM (at H/K bands), whichever is greater. The subsystem should achieve this level performance for different observation modes, e.g. no-AO, GLAO and LTAO modes.

MEGARA, the new intermediate-resolution IFU&MOS for GTC: getting ready for the telescope

Armando Gil de Paz

MEGARA is the new optical spectrograph for the 10.4m GTC telescope that will soon offer to the community Integral-Field Unit (IFU) and Multi-Object Spectroscopy (MOS) capabilities within the entire optical window (360nm-970nm) with resolutions ranging from R=6000 to R=20000. MEGARA will be installed at GTC before the end of 2016. The MEGARA IFU (also called the Large Compact Bundle) fully covers an area of 12.5 x 11.3 arcsec^2 with hexagonal spaxels of 0.62" arcsec in diameter while the MOS is composed by a total of 92 robotic positioners (with each positioner equipped with a 7-spaxel mini-IFU) that move independently within overlapping patrol areas that all together cover an area of 3.5 x 3.5 arcmin², i.e. the flat and non-vignetted Field-of-View of the GTC Folded-Cass focus. The light is conducted by means of optical fibers to the MEGARA spectrograph that is kept static on the Nasmyth platform of GTC. Thanks to the use of high-efficiency optical fibers, VPH gratings and a state-of-the-art CCD detector (E2V CCD231-84) and to the large(st) collecting area of GTC, MEGARA will be unique for carrying out chemodynamical studies of very faint targets, both point-like and extended. The instrument is now in AIV phase at the LICA laboratory of the Universidad Complutense de Madrid and it will be shipped to GTC this upcoming November. MEGARA is being developed by a Consortium of institutions led by the Universidad Complutense de Madrid (UCM) but also includes the Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE, Mexico), the Instituto de Astrofísica de Andalucía (IAA-CSIC, Spain) and the Universidad Politécnica de Madrid (UPM, Spain)

The instrument is financed by GRANTECAN S.A. (the public company in charge of the operation of GTC) and by the Consortium institutions. In this talk I will present the main characteristics of the instrument and provide details on the status and results of the AIV phase, both at subsystem and already at system level, along with a description of its main scientific drivers. Laboratory acceptance is scheduled for September 2016.

Commissioning and Science Verification of the Javalambre Auxiliary Survey Telescope

Alessandro Ederoclite

Located at the Observatorio Astrofísico de Javalambre, the "Javalambre Auxiliary Survey Telescope" is an 80cm telescope with a unvignetted 2 square degrees field of view. The telescope is equipped with T80Cam, a camera with a large format CCD and two filter wheels which can host, at any given time, 12 filters. The telescope has been designed to provide optical quality all across the field of view, which is achieved with a field corrector. In this talk, I will review the commissioning of the telescope. The optical performance in the centre of the field of view has been tested with lucky imaging technique, providing a telescope PSF of 0.3", which is close to the one expected from theory. Moreover, the tracking of the telescope does not affect the image quality, as I will show that stars appear round even in exposures of 10minutes obtained without guiding. Most importantly, I will present the preliminary results of science verification observations which combine the two main characteristics of this telescope: the large field of view and the special filter set.
Primeros resultados del comisionado de EMIR

Francisco Garzón

En esta contribución se describen los primeros resultados en cuanto a las prestaciones de EMIR tras el comisionado del instrumento en GTC. EMIR es uno de los primeros instrumentos de uso común en el GTC, telescopio de 10m que opera en el Observatorio del Roque de los Muchachos (ORM), en la isla canaria de La Palma. La construcción de EMIR ha corrido a cargo de un consorcio de instituciones españolas y francesas, encabezado por el Instituto de Astrofísica de Canarias (IAC). En su diseño se ha primado el modo de operación de espectroscopía multiobjeto en la banda K, aunque el instrumento ofrece un amplio rango de modos de observación que incluyen imagen y espectroscopía, tanto de rendija larga como multiobjeto, en el rango espectral entre 0.9 y 2.5 micras. El desarrollo y fabricación de EMIR han sido financiados por GRANTECAN y el Plan Nacional de Astronomía y Astrofísica. Tras una intensa y extensa campaña dE verificación en el IAC, EMIR se envía al ORM en abril de 2016 para su instalación en la plataforma Nasmyth del GTC. Ya en el observatorio, y previo a su integración en el GTC, se realizan una larga serie de ensayos y pruebas destinados a verificar la funcionalidad de EMIR en el telescopio, y en particular la integración del sistema de control de EMIR dentro del sistema global de control del GTC, del que debe formar parte. Durante el comisionado, dividido en varios periodos, se verifican las funcionalidades de EMIR en el GTC, en operación combinada, se afinan sus modos de operación y se cuantifican sus prestaciones. Aquí se resume el resultado de la operación de EMIR en el GTC hasta la fecha.

Sesión IS: martes 19 julio - tarde

WEAVE: a new spectrograph for the William Herschel Telescope

(Conferencia Invitada) J. Alfonso L. Aguerri

WEAVE is a new optical spectrograph planned for the William Herschel Telescope in La Palma Island. This instrument combines a large field of view and high multiplexity. The spectrograph is being builded by an international consortium in which Spain has an important contribution. The instrument will produce several astronomical large-scale surveys that will answer key question about the formation and evolution of the Milky Way and other external galaxies; the role played by the environment in the evolution of galaxies; and the build-up of the large-scale structure in the Universe. In this talk I will give a summary about the status of the project.

GTC Science Operations and Instrumentation plan

Antonio Cabrera-Lavers

In this talk we describe the short- and medium- term instrumentation plan at the GTC, with the advent of the second generation instruments as EMIR or MEGARA along 2016, as well as the prepairing works for the future generation of instruments as MIRADAS and FRIDA. These, together with the current facilities available at the telescope, will make possible to provide access up to five different instruments to the users community from middle 2017, largely enhancing the scientific return from the telescope.

Gaia, an all-sky survey for standard photometry

Josep Manel Carrasco Martínez

Gaia ESA's space mission (launched in 2013) includes two low resolution spectroscopic instruments (one in blue, BP, and another in red, RP, wavelength domain) to classify and derive the astrophysical parameters for the observed sources. As it is well known, Gaia is a full-sky unbiased survey down to about 20th magnitude. The scanning law yields a rather uniform coverage of the sky over the full extent (a minimum of 5 years) of the mission. Gaia data reduction is a global one over the full mission. Both sky coverage and data reduction strategy ensure an unprecedented all-sky homogeneous spectrophotometric survey. Certainly, that survey is of interest for current and future on-ground and space projects, like LSST, PLATO, EUCLID and J-PAS/J-PLUS among others. These projects will benefit on the large amount (about one billion) and wide variety of objects available observed by Gaia with good quality spectrophotometry. Synthetic photometric derived from Gaia spectrophotometry for any passband can be used as to expand the set of standard sources for these new instruments to come. In the current Gaia data release scenario, BP/RP spectrophotometric data will be available in the third Gaia release (in 2018), but current preliminary results allow to estimate the precision of synthetic photometry derived from Gaia data. This already allows the preparation of the on-going and future surveys and space missions. This talk will address the exploitation of the Gaia spectrophotometry as standard photometry reference through the discussion of the sky coverage, the spectrophotometric precision and the expected uncertainties of the synthetic photometry derived from the low resolution Gaia spectra.

Operación del observatorio de Calar Alto 2016-2018

Jesus Aceituno Castro

La llegada del instrumento CARMENES al observatorio de Calar Alto y su puesta en funcionamiento desde el 1 de Enero de 2016, ha supuesto un cambio en la forma de actuar **en el centro. Este instrumento estará en funcionamiento durante el 80% del tiempo** total en el telescopio de 3.5m hasta finales del 2018 buscando planetas como la Tierra en zona

habitable. Esta comunicación dará detalles del instrumento, el modo de operación y el survey así como de otros proyectos actualmente en curso en el observatorio.

Preliminary optical design of an Active Optics test bench for space applications

Ariadna Calcines Rosario

In the last few decades, Active Optics has been applied to ground-based telescopes to correct deformations due to the effect of gravity, thermal expansion, wind or mechanical stress. Because of the way these effects scale with aperture size, this technique has become significantly more important in the era of the extremely large telescopes. Use of these techniques is essential to guarantee the optimal shape of the large primary mirror and, consequently to fully exploit the capabilities of these powerful instruments. In the new generation of space telescopes, large and lightweighted primary mirrors are required to observe faint sources with higher image resolution and better optical quality. The application of Active Optics to space telescopes corrects for: in-flight effects, thermoelastic deformations, radiation effects on optical materials and gravity release. It could also reduce the requirements on the manufacturing quality. This communication presents a preliminary optical design for a test bench conceived within European Space Agency's AOCC project (Active Optics Correction Chain for large monolithic mirrors). The design uses two deformable mirrors of 37.5 mm and 116 mm, the smallest mirror to generate aberrations and the largest to correct them. The smallest deformable mirror is monitored using an interferometer. One of the challenges of the optical design is the size of the corrective DM (116 mm). The rest of the system is configured as a multi-functional test bench capable of verifying the performance of a Shack-Hartman wavefront sensor as well as of a phase diversity based wavefront sensor. The third optical path leads to a high-order Shack-Hartmann wavefront sensor to monitor the entire system performance. The three distinct optical paths are designed as a multiple configuration file in Zemax.

High angular resolution at GTC: Science capabilities of FRIDA

Almudena Prieto

FRIDA imager and integral-field spectrograph shall provide the GTC community with diffraction-limited data of a 10 m telescope in the near-IR range, i.e., 25 to 40 mas in the 1 - 2.5 um range. These angular resolutions are a factor 15 improvement with respect to those of current and /or planned instruments for GTC. In this talk I will develop on science paths for FRIDA, with natural and laser guide star, that illustrate the potential and unique capabilities of FRIDA at GTC.

Sesión IS: jueves 21 julio - mañana

CARMENES: Commissioning and first scientific results at the telescope. A precursor for HIRES@E-ELT.

(Conferencia Invitada) Pedro J. Amado

CARMENES is the next generation instrument built for the CAHA 3.5m telescope by a large international consortium of 11 institutes in Spain and Germany. It consists of two separate highly-stabilized, high-resolution echelle spectrographs covering both the visible, from 550 to 950 nm, and the near-IR, from 950 to 1700 nm, wavelength ranges with spectral resolution of R=82,000. They are fed by fibres from the Cassegrain focus of the telescope and were designed and built to achieve high-accuracy radial velocities (~1 m/s) of nearby M-dwarf stars. This contribution overviews the main and unique design characteristics of CARMENES. The instrument MAIV phase was achieved in the last two years (2014-2015) and started commissioning in November 2015. The commissioning phases, both technical and scientific, took six full weeks in the last two months of 2015. They have shown that the instrument is well within requirements and performing to be able to achieve its objective, not proven before, of providing radial velocities precisions of 5 m/s, with a goal of 1 m/s in the near-infrared. The Guaranteed Time Observations (GTO) programme has started in January 1st, 2016. CARMENES is, therefore, currently conducting a radial-velocity survey of 300 M dwarfs with a precision sufficient for detecting Earth-like planets in their habitable zones. It is also being offered in open time by the CAHA. Its modular design is the idea in which HIRES, the next very high-resolution, high-fidelity spectrograph with wide wavelength coverage at the E-ELT, is based on. This EELT instrument will consist of four different high-resolution spectrographs covering the blue, the visible, the near-infrared (Y, J and H bands) and the K band. A proposal to the ESO call for Phase-A studies for a HIRES at the E-ELT was submitted by the HIRES consortium last December. This proposal was accepted by ESO and the Phase-A kick-off meeting between ESO and the consortium took place in March 22nd.

The Gaia archive: perspectives for the Gaia Data Release 1

Xavier Luri Carrascoso

The Gaia mission has recently completed two years of operations and, following the agreed release scenario, will make at the end of the summer 2016 its first data release (Gaia-DR1). These (and the future releases) data will be hosted at the central Gaia archive at ESA's European Space Astronomy Centre (ESAC) in Villafranca del Castillo, and the Gaia Data Processing and Analysis Consortium (DPAC) has been designing and implementing the archive system to serve it to the scientific community. This talk will review the design features of the Gaia archive, including its query interface, VO utilities, documentation system and (future) data mining facilities. Special emphasis will be made on the archive version that will shortly make available the Gaia-DR1 to the community, providing a practical overview for the future users of the Gaia data. The availability of the Gaia data at other data centres will be also discussed.

JPCam: Development of a 1.2 Gpixel Camera for the J-PAS Survey

Antonio Marín Franch

JPCam is a 14-CCD mosaic camera, using the new e2v 9k-by-9k 10 m-pixel, 16-channel detectors to be deployed on a dedicated 2.55 m wide-field telescope at the OAJ (Observatorio Astrofísico de Javalambre) in Aragon, Spain. The camera is designed to perform a Baryon Acoustic Oscillations (BAO) survey of the northern sky. The J-PAS survey strategy will use 54 relatively narrow-band (14.5 nm) filters equi-spaced between 370 and 920 nm plus 5 broad-band filters to achieve unprecedented photometric red-shift accuracies for faint galaxies over 8000 square degrees of northern sky. This paper presents an overview of JPCam as well as a brief outline of the main J-PAS project.

MIRADAS: The Multi-Object R=22K Near-IR Spectropolarimeter for the 10.4-meter GTC

Stephen S. Eikenberry

The Mid-resolution InfRAreD Astronomical Spectrograph (MIRADAS), a near-infrared multi-object echelle spectrograph operating at spectral resolution R=22,000 over the 1-**2.5µm bandpass, is being developed by an international consosrtium for the 10.4**-meter Gran Telescopio Canarias (GTC). The MIRADAS consortium includes the University of Florida, Universidad de Barcelona, Instituto de Astrofísica de Canarias, Universidad Complutense de Madrid, as well as industrial partners in the US and Europe. MIRADAS completed its Final Design Review in mid-2015, and is currently undergoing fabrication, with planned first light in 2018/2019. In this paper, we review the overall science drivers and system design for MIRADAS, including key technologies such as cryogenic robotic probe arms, macroslicer mini-IFUs, full Stokes polarimetry, and a highly flexible observing configuration.

Two years of daily Gaia data processing

Jordi Portell de Mora

After half a year of Commissioning, Gaia entered the nominal operations phase on July 2014. During these two years it has been observing, on average, more than 50 million transits of astronomical sources every day, meaning more than 25 GB of compressed data that must be timely processed. This is a requirement both on the technical side, to avoid accumulating all mission data for later offline processing, and on the scientific and mission health side, to continuously diagnose the spacecraft while obtaining preliminary science outputs. The Initial Data Treatment (IDT), coordinated by the IEEC Gaia team at the University of Barcelona, is the software system carrying out these near real-time duties. It must reconstruct self-contained scientific measurements from a variety of instrumental outputs, combining sample data with time and position information and measurement configurations. These raw measurements are then processed to generate intermediatelevel data products, including image centroids, fluxes in several bands, sky positions, preliminary proper motions and quality indicators. The spacecraft attitude must also be reconstructed with enough accuracy to allow a reliable cross-matching of observations against a reference star catalogue. All these outputs are essential for the execution of the main data reduction systems that will lead to the Gaia catalogue. In this paper we present the main results obtained by IDT during these two years, covering both technical and scientific aspects. We also describe and illustrate the improvements done in the algorithms and on the monitoring of their outputs.

Gaia astrometric instrument calibration and image processing

Javier Castañeda Pons

One of the main objectives of the Intermediate Data Updating (IDU) processing system in Gaia is to refine the Image Parameters (image location and flux) for the astrometric measurements using the more recent and thus most accurate calibrations and source catalogue parameters available. The computation of these image parameters is essential for the determination of the position, proper motion and parallax of the observed objects by the on ground processing systems of Gaia. For the achievement of this objective, IDU also includes one of the major calibration tasks of the Gaia processing, the LSF/PSF task. This task is in charge of the calibration of the astrometric instrument response in the form of an LSF/PSF library for all the 1D and 2D measurements and the different acquisition parameters available on-board. The LSF/PSF calibration is one of the more complex tasks as it depends not only on the raw observations but also in the global astrometric and phot ometric solutions of the Gaia catalogue sources and the link between the observations and the sources provided by the cross-match processing (also within IDU system). The LSF/PSF calibration process uses the latest calibrations to process the raw window samples and also the latest astrometric and cross-match solution to disentangle the

colour/chromatic dependency between observations of different sources. The capability of removing the chromatic dependency in the image parameters is essential to meet the formal requirements on the location estimation performance aimed for the final Gaia catalogue which can only be accomplished by iterating the execution of the IDU tasks with the global astrometric and photometric systems. All IDU tasks are executed in the same processing environment, the Marenostrum supercomputer from the Barcelona Supercomputing Center (BSC), which provides the enough processing resources required for one of the most demanding processing systems of the Gaia data reduction.

Sesión IS: jueves 21 julio - tarde

Simulating the Universe: From the large scales structures to the Local Universe

(Conferencia Invitada) Gustavo Yepes

Computer simulations are now a indispensable research tool in many scientific disciplines where the object of study is either very risky or impossible to experiment with it. This is certainly the case in Astrophysics. The only way to do experiments and test hypotheses of theoretical models is by creating virtual universes in large supercomputer facilites. Due to the extreme non-linear physical processes responsible for the formation and evolution of structures in the universe, computational astrophysics/cosmology is one of the disciplines which is always pushing the technical capabilities of current supercomputing resources to their limits. In this talk, I will review the work our group at UAM has been doing in the past 10 years in terms of the numerical experiments that have been carried out in the MareNostrum and other european supercomputers. These simulations cover a wide range of scales and physics models, from large volume dark matter only simulations aimed for galaxy redshift surveys, to more detailed simulations of the visible universe where gas dynamics and the complex physics of galaxy formation and evolution are modeled in great detail.

Supercomputing in modeling of solar processes

(Conferencia Invitada) Elena Khomenko

Supercomputing has arisen as a new method of research in astrophysics in our attempt to remedy the impossibility to perform experiments on our objects of research. It consists in performing numerical experiments on large supercomputer clusters to simulate, with high degree of realism, physical processes in stellar atmospheres and their interior. Among the recent successful examples in the field of numerical astrophysics, one can list the realism achieved in simulations of solar convection and magneto-convection, which has allowed to resolve the long standing problems of spectral line shapes and abundance determination derived from them; models of local dynamo; simulations of magnetic field emergence from the interior to the solar surface; numerical models of eruptive phenomena and reconnection; wave propagation and energy transport in solar magnetic structures, and so on. Spatial resolution of the simulations often exceeds that achieved in observations making them a valuable tool for predicting new phenomena to be searched for in observations. The major breakthrough to be achieved in the coming years will consist in taking into account the physical consequences of the very low degree of ionization of the solar atmospheric plasma on its dynamics, and on the energy ropagation and release. Such modeling requires multiple scales to be resolved simultaneously, from the smallest ones imposed but the micro-physics of partially ionized plasma, to the largest ones imposed by the size of typical solar structures. This constitutes a perfect challenge for a supercomputing experiment. In this contribution I will review recent results of the numerical modeling of solar process and will describe our recent effort to develop models incorporating plasma partial ionization into numerical codes.

New calibration techniques for low-frequency radio-astronomy data. Facet calibration in the Amazon cloud infrastructure

Jose Sabater Montes

The final user of new radio-astronomy data, like these produced by LOFAR (Low frequency Array; http://www.lofar.org) currently and by the SKA (Square Kilometre Array; https://www.skatelescope.org/) in the nearby future, faces several challenges: a) the effect of the ionosphere on wide-field low-frequency data is complex and relevant; b) calibration techniques are experimental and require new software and a flexible provision

of resources; and, c) the size and complexity of the data require a high amount of computing power and storage. In this talk I will present a new facet calibration technique that allows us to mitigate the effect of the ionosphere. I will also show how this technique has been implemented in cloud infrastructures like Amazon Web Services (as part of a SKA astrocompute proposal) which fulfils the need for a flexible high throughput computing resource. We applied this approach to the calibration of the ELAIS-N1 field, the primary deep field of the LOFAR Surveys project. We found that a cloud solution is suitable for the calibration of new generation radio-astronomy data, especially for users that do not have access to dedicated supercomputing resources or specialized support. The flexibility of the cloud permitted to adapt the size of the infrastructure used to the problem to be solved. This flexibility could also be very useful for the sharing of resources between users. All the solutions presented are currently working or nearly finished and could be valuable in the development of SKA data processing plans.

Cross-matching algorithm for Gaia

Marcial Clotet Altarriba

Cross Matching (XM) is an inherently difficult problem in astronomy. The assignation of which detection belongs to a given source is a complex issue that has deep implications in further usages of the data. Gaia provides a huge amount of new observations every day which must be linked to sources so that further data reduction can take place. The XM in Gaia, specifically in IDU, provides a consistent match between observations and sources in the working catalog for all downstream systems. The system is designed in three stages. First the input observations are processed by time in order to compute the sky coordinates and obtain the preliminary source candidates for each individual detection. Then, a second task groups the results to determine isolated groups of detections, avoiding boundary issues. Finally, the XM is resolved and provides the final relations between each observation and their corresponding source. The implemented XM system was used to successfully process more than 12 months of Gaia data, over 22 billion observations, covering the whole sky and provided consistent and reliable results. This first execution required about 34.000 CPU hours in the BSC MareNostrum supercomputer. The algorithm devised might be of interest for other projects.

Treatment of Spurious detections

Nora Garralda

Gaia is a space instrument that observes some 50 million point like sources per day in an autonomous way, using a rapid on-board detection software. The detection uses two sets of CCD, with a first detection followed by an explicit confirmation in order to remove detections due to e.g. cosmic rays. Nevertheless, false positives, detections of non-existing sources, or spurious detections, are frequent. The on board software was originally configured to observe up to magnitude 20, but during the mission this faint end limit has been extended up to magnitude 20.7. With this effort for increasing the magnitude limit, also the frequency of spurious detections has increased and for the first two years of mission it lies around 15%. The necessity of having a system dedicated to cleaning the spurious detections in the daily on ground processing was envisaged since the beginning of Gaia operations. A detection classifier algorithm is used to identify the spurious observations to prevent them from entering processing stages, where they would be added as new sources in the Gaia source list. Different types of spurious detections have being identified, e.g. detections located at the diffraction spikes of a bright source, false detections due to background noise or due to cosmic rays. A big effort has been put into identifying the different types and developing a model for the detection classification. The implemented software runs on a daily basis providing reliable results. This process is repeated later in the mission to reach higher reliability.

Sesión IS: viernes 22 julio - mañana

La Red Global de Telescopios Robóticos BOOTES

Alberto J. Castro-Tirado

We show the status of the BOOTES Network, which is expanding worldwide with five autonomous robotic observatories already deployed in Spain, New Zealand, China and Mexico. We briefly discuss the technical as well as the scientific aspects we have already achieved and the goals we are aiming at.

CIRCE: The NIR instrument of GTC

Stefan Geier

The Canarias InfraRed Camera Experiment (CIRCE) is the first NIR instrument at the Gran Telescopio Canarias (GTC). In my presentation I will give an overview of the instrument capabilities (besides imaging in JHKs there is now also polarimetry and spectroscopy available), data reduction procedures and first scientific outcomes.

Performing simulations for the WSO- UV Spectrographs

Pablo Marcos-Arenal

The World Space Observatory - Ultraviolet (WSO-UV) is a space telescope, equipped with a high resolution spectrograph (WUVS - WSO UltraViolet Spectrograph) that provides high resolution spectroscopy (R55,000) in two channels VUVES and UVES. VUVES is a far UV echelle spectrograph designed to observe point sources in the range 1020-1800 °A. UVES is the near UV echelle spectrograph, working in the range 1740-3100 °A. These instruments can be evaluated, in terms of performance, from an appropriate overall instrument model through simulations of the expected observations. Since it is not feasible to build and test a prototype of a space-based instrument, numerical simulations performed by an end-to-end simulator are used to model the noise level expected to be present in the observations. The performance of the instrument can be evaluated in terms of noise source response, data quality, and fine-tuning of the instrument design for different types of configurations and observing strategies. The WUVS Simulator has been implemented as a further development of the PLATO Simulator, adapting it to an echelle spectrograph and the WUVS instrument specific characteristics. It has been designed to generate synthetic time series of CCD images by including models of the CCD and its electronics, the telescope optics, the jitter movements of the spacecraft and all important natural noise sources. We provide a detailed description of several noise sources and discuss their properties, in connection with the optical design, the quantum efficiency of the detectors, etc. The expected overall noise budget of the output spectra is evaluated as a function of different sets of input parameters describing the instrument properties.

ESASky: The whole of space Astronomy at your fingertips

Belén López Martí

We will present ESASky, a new science-driven discovery portal for all ESA astronomical missions. This service will give users worldwide a simplified access to high-level science-ready products from ESA and other data providers, as well as to a number of catalogues. The portal features a sky exploration interface and a single/multiple target interface, and it requires no prior knowledge of specific details of each mission. Users can explore the sky in multiple wavelengths, quickly see the data available for their targets, and download the relevant products, with just a few clicks. A brief demo will accompany the presentation.

Completing the puzzle: AOLI full-commissioning fresh results and AIV innovations.

Sergio Velasco

The Adaptive Optics Lucky Imager (AOLI) is a new instrument designed to combine adaptive optics (AO) and lucky imaging (LI) techniques to deliver high spatial resolution in the visible, ~20 mas, from ground-based telescopes. Here we present details of the integration and verification phases explaining the defiance that we have faced and the innovative and versatile solution of modular integration for each of its subsystems that we have developed. Modularity seems a clue key for opto-mechanical integration success in the extremely-big telescopes era. We intend to present the very fresh preliminary results after its first fully-working observing run on the WHT.

¿Están protegidos de manera efectiva los observatorios de primera clase frente a la Contaminación lumínica?

Alejandro Sánchez de Miguel

En el momento actual se esta realizando una conversión masiva de tecnología de iluminación de las lámparas tradicionales de Sodio de Alta presión a lámparas LED. Algunos de los grandes observatorios del mundo como Mauna kea, Las Campanas, La Palma y Calar Alto tienen figuras de protección. Sin embargo, la legislación suele ir por detrás de las posibilidades técnicas. En la ponencia se destacaran cuales son los riesgos del cambio de iluminación para nuestros observatorios. Como las imágenes de satélite puede ser la herramienta definitiva para este control unido a los modelos de propagación de la contaminación lumínica. Se detallará algunas conclusiones de las campañas de prospección en Mauna kea y en La Palma en el año 2015.

Observation tools for EMIR

Elena Manjavacas

EMIR is a wide-field camera and a multi-object intermediate resolution near-infrared spectrograph (0.9-2.5 microns) for the GTC telescope in La Palma. EMIR will offer several observing modes: imaging mode and multi-object spectroscopy mode. In the imaging mode, the instrument provides a field of view of 6' x 6' with a pixel scale of 0.2"/pixel in ZJHK bands. In the multi-object mode, EMIR will be able to obtain spectrum of around 50 objects simultaneously, with a spectral resolution of 4000 in ZJH bands and 3500 in the K-band. I would like to present the observing tools that will be offered to the community to prepare future observations with EMIR.

UVESP: Ultraviolet Visible Echellé Spectropolarimeter For Stellar Astrophysics.

Gracia Belén Perea Abarca

UVESP is an efficient instrument designed for mid resolution (30,000) spectropolarimetric observations in the 119-888nm wavelength range. Spectropolarimetry introduces **challenging constraints in the image quality of the echellé design that are addre**ssed via the introduction of specific optical elements. UVESP design is significantly optimized with respect to previous similar instruments.

Pósteres

UV+IR mosaicking for study the extinction+emission of gas and dust clouds

Marcelo Armengot

The work with UV images presented in Armengot et al. (SEA XI 2014) allow the study of extinction through computer visual enhancing of these clouds. The composition with IR images of the same sky area introduces a new chance in the analysis of the features of these clouds (composition of gas and dust, temperature, size and shape). When the UV shadows are overlapped on the IR emission of dust grains from distant clouds, the main features of these clouds can be observed and measured. Here are our first experimental results applying these techniques in a data set of UV and IR files from the Taurus region. The results are compared with theoretical models. The software tools for enhancing and the available mosaic programs are referenced as well.

The Calar Alto observatory

Gilles Bergond

Calar Alto, as the largest observatory in continental Europe, offers a complete suite of optical and NIR instruments shared by five telescopes, standing on a 2200-m mountain overlooking the unique Tabernas desert (Almeria, Spain). We present an overview of the site characteristics and facilities available, including: - The 0.5-m telescope (CAB-INTA property); - The refurbished 0.8-m Schmidt telescope, used remotely by the European Spatial Agency to search for NEOs; - PANIC, the wide-field NIR camera on the 2.2-m telescope; - CARMENES, the high-resolution spectrograph (VIS and NIR arms) on the 3.5-m telescope, searching for Earth-like planets around nearby M dwarves (600+ GTO nights, survey started in January 2016). In addition to these and other imagers/spectrographs (e.g. the large PMAS IFU) directly available to the Spanish and German astronomers, the latest developments (visitor and test instruments, opening to the international community on a pay basis, and astrotourism) insure the continuity of the Spanish-German Astronomical Center in Calar Alto for the coming years.

Improving the automatic wavelength calibration of EMIR spectroscopic data

Nicolás Cardiel

EMIR, the near-infrared camera-spectrograph operating in the near-infrared wavelengths 0.9–2.5µm, is being commissioned at the Nasmyth focus of the Gran Telescopio CANARIAS. One of the most outstanding capabilities of EMIR will be its multi-object spectroscopic mode which, with the help of a robotic reconfigurable slit system, will allow to take around 53 spectra simultaneously. A data reduction pipeline, PyEmir, based on Python, is being developed in order to facilitate the automatic reduction of EMIR data taken in both imaging and spectroscopy mode.

Focusing on the reduction of spectroscopic data, some critical manipulations include the geometric distortion correction and the wavelength calibration. Although usually these reductions steps are carried out separately, it is important to realise that these kind of manipulations involve data rebinning and interpolation, which in addition unavoidably lead to the increase of error correlation and to resolution degradation. In order to minimise these effects, it is possible to incorporate those data manipulations as a single geometric transformation. This approach is being used in the development of PyEmir. For

this purpose, the geometric transformations available in the Python package Scikit-image are being used.

SIRENA: algorithms for energy reconstruction Athena X-IFU detector

M. T. Ceballos

The X-ray Observatory ATHENA was proposed in April 2014 as the mission to implement the science theme "The Hot and Energetic Universe" selected by ESA for L2 (the second Large-class mission in ESA's Cosmic Vision science programme). One of the two X-ray detectors designed to be on board ATHENA is X-IFU, a cryogenic microcalorimeter based on Transition Edge Sensor (TES) technology that will provide spatially resolved highresolution spectroscopy. X-IFU will be developed by an international consortium led by IRAP (PI), SRON (co-PI) and IAPS/INAF (co-PI) and involving ESA Member States, Japan and the United States. In Spain, IFCA (CSIC-UC) has an anticipated contribution to X-IFU through the Digital Readout Electronics (DRE) unit, in particular in the Event Processor Subsytem. We at IFCA are currently developing SIRENA, a set of on board processing algorithms aimed at recognizing, from a noisy signal, the intensity pulses generated by the absorption of the X-ray photons, to lately reconstruct their energy, position and arrival time. Here we will present a trade-off of the algorithms developed to date, comparing their performance in terms of energy resolution as well as resources consumption. This has been proven to be a fundamental study to design the on board processing hardware responsible to host the Event Processor.

Data mining and data analytics with the Gaia archive

Francesc Julbe Lopez

The Gaia Data Processing and Analysis Consortium (DPAC) Coordination Unit 9 is the last DPAC coordination unit, in charge of the design and implementation of the Gaia archive. We report on recent advances in the Data Mining Work Package of this Coordination Unit 9. The main goal of this work package is to make available to the community of Gaia archive users a platform that provides and enables the Knowledge Discovery and data analytics tools needed to fully exploit datasets of sizes intractable with traditional approaches. Initial developments have been funded by the GENIUS FP7 project and during its first two years of activity, we have undertaken a broad study and evaluation of Big Data technologies applicable Gaia scientific use cases. The simplest use cases have been implemented and tested as part of the platform validation. This so-called Gaia Data Analytics Framework (GDAF) deploys a set of Big Data services based on the Hadoop and Apache Spark framework for state-of-the-art distributed processing. GDAF should be in production for the third Gaia Data Release. As a more ambitious test case, we simulate large numbers of Gaia archive stellar entries and estimate the IMF (Initial Mass Function) and Star Formation Rate (SFR) using the GDAF prototype. The inference system is based on hierarchical Bayesian models and MCMC posterior probability samplers of both parametric and non-parametric (Gaussian Processes based) models. The simulations lack important details of the Gaia selection biases, but they serve to gauge the processing capabilities of the infrastructure.

Criogenia y vacío para la investigación astronómica

Javier Luzarraga

Criogenia y vacío son dos tecnologías imprescindibles en la investigación astronómica. Este poster expone algunas aplicaciones relacionadas con estos campos, aportando ejemplos de equipos fabricados por Cryovac S.L. que emplean estas tecnologías para la investigación de astronomía y ciencias del espacio.

WSO-UV Spectrographs' Simulations

Pablo Marcos-Arenal

The World Space Observatory - Ultraviolet (WSO-UV) is a space telescope, equipped with a high resolution spectrograph (WUVS - WSO UltraViolet Spectrograph) that provides high resolution spectroscopy (R55,000) in two channels VUVES and UVES. VUVES is a far UV echelle spectrograph designed to observe point sources in the range 1020-1800 °A. UVES is the near UV echelle spectrograph, working in the range 1740-3100 °A. These instruments can be evaluated, in terms of performance, from an appropriate overall instrument model through simulations of the expected observations. Since it is not feasible to build and test a prototype of a space-based instrument, numerical simulations performed by an end-to-end simulator are used to model the noise level expected to be present in the observations. The performance of the instrument can be evaluated in terms of noise source response, data quality, and fine-tuning of the instrument design for different types of configurations and observing strategies. The WUVS Simulator has been implemented as a further development of the PLATO Simulator, adapting it to an echelle spectrograph and the WUVS instrument specific characteristics. It has been designed to generate synthetic time series of CCD images by including models of the CCD and its electronics, the telescope optics, the jitter movements of the spacecraft and all important natural noise sources. We provide a detailed description of several noise sources and discuss their properties, in connection with the optical design, the quantum efficiency of the detectors, etc. The expected overall noise budget of the output spectra is evaluated as a function of different sets of input parameters describing the instrument properties.

The Athena Community Office (ACO)

Silvia Martínez-Núñez

The Athena Community Office (ACO) has been established by ESA's Athena Science Study Team (ASST) in order to obtain support in performing its tasks assigned by ESA, and most specially in the ASST role as "focal point for the interests of the broad scientific community". The ACO is led by the Instituto de Física de Cantabria (CSIC-UC), and its activities are funded by CSIC and UC. Further ACO contributors are the University of Geneva, MPE and IRAP. In this poster, we present ACO to the Spanish Astronomical Community, informing about its main responsibilities, which are: 1. Assist the ASST in organising and collecting support from the Athena Working Groups and Topical Panels. 2. Organise and maintain the documentation generated by the Athena Working Groups and Topical Panels. 3. Manage the Working Group and Topical Panel membership lists. 4. Assist the ASST in promoting Athena science capabilities in the research world, through Conferences & Workshops. 5. Keep a record of all (refereed and non-refereed) papers and presentations related to Athena, 6. Support the production of ASST documents. 7. Produce and distribute regularly an Athena Newsletter, informing the community about all mission and science developments. 8. Create and maintain the Athena Community web portal. 9. Maintain an active communication activity. 10. Promote, organise and support Athena science-related public outreach, in coordination with ESA and other agencies involved when appropriate. Design and produce materials and provide pointers to

available materials produced by other parties. In summary, ACO is meant to become a focal point to facilitate the scientific exchange between the Athena activities and the scientific community at large, and to disseminate the Athena science objectives to the general public.

UVESP: ULTRAVIOLET VISIBLE ECHELLÉ SPECTROPOLARIMETER FOR

STELLAR ASTROPHYSICS.

Gracia Belén Perea Abarca

UVESP is an efficient instrument designed for mid resolution (30,000) spectropolarimetric observations in the 119-888nm wavelength range. Spectropolarimetry introduces **challenging constraints in the image quality of the echellé design that are addressed via** the introduction of specific optical elements. UVESP design is significantly optimized with respect to previous similar instruments.

Correcting the non-linearity of the 2MASS Atlas Images photometry

Daniel Reverte Payá

The data products of the 2 Micron All Sky Survey (2MASS) consist of Point Source Catalogue (PSC), Extended Source Catalogue (XSC) and Atlas Images, covering the entire sky. Although the scientific output of the survey is tremendous, an important limitation exists that hampers the usage of the Atlas Images. Due to computational power limitations at the time of the final release, they are not corrected for non-linearity effects, arising in the Near-IR detectors at high flux levels. Here we present correction factors for the 2MASS Atlas Images photometry, based on aperture photometry of isolated bright stars and comparison with the magnitudes of these objects in the PSC (the PSC magnitudes were corrected for the non-linearity effects). Although newer NIR surveys exist, as a rule they are deeper that 2MASS and could not be used to study the bright NIR objects. This is the niche that is going to be filled by the current work, assuring the synergy of 2MASS and current surveys for the future.

Interfaz gráficas de usuario para software astrofísico

José Ramón Rodón Ortiz

El incremento de la necesidad de la utilización a gran escala de códigos orientados a la astrofísica, no solo por investigadores individuales sino por equipos de investigación o consorcios, ha planteado la necesidad facilitar el uso de estos códigos de manera que sean más accesible a la comunidad. Además, en los últimos años han aparecido nuevos instrumentos para el aprovechamiento científico de los códigos desarrollados como pueden ser nuevas infraestructuras de computación distribuidas o nuevos conceptos de uso de códigos tales como flujos de trabajo o bases de datos relacionales de metadatos. Así pues, teniendo en cuentas estas circunstancias hemos decido desarrollar unas serie de herramientas que no solo facilita el uso del software astrofísico mediante interfaces gráficas del usuario, sino que además permite la utilización de las nuevos paradigmas para la ejecución de los códigos de forma más eficiente y transparente al usuario científico. Estamos desarrollando un integrador de software llamado ATILA que permite el uso de infraestructuras distribuidas, base de datos relacionales, flujos de trabajos, etc. Además, al ser una herramienta de carácter modular permite añadir nuevas funcionalidades. Como ejemplo del uso del integrador ATILA, hemos utilizado códigos en el campo de la física estelar y la astrosismología consiguiendo de este modo la interconexión de códigos para modelados de estrellas como para el análisis de los datos obtenidos por distintos instrumentos. Consiguiendo de esta forma, facilitar la investigación en este campo.

SPEX (Plasma Code & Spectral Fitting Tool). Collisional ionization for atoms and ions of H to Zn

Igone Urdampilleta

Every observation of astrophysical objects involving a spectra requires some aspects of atomic data for the interpretation of line fluxes, ratios and ionization state of the emitting plasma. One of the thermal radiative process which determines it, partially, is the collisional ionization. In this study the direct ionization and excitation-autoionization processes has been taken into account, leaving the resonance excitation double autoionization and multi ionization for future work. The most recent assessments have been performed by Dere (2007, A&A 466, 771) for H to Zn isoelectronc sequences, Arnaud. & Raymond (1992 , ApJ. 398, 394) for Fe and Arnaud & Rothenflug (1985, A&AS, 60, 425). However, in the last years new laboratory measurements and theoretical calculations of ionization cross sections have become accessible. Our main goal is to provide a review, extension and update of these previous works and be able to obtain the cross sections for the different inner shells of all ions from H to Zn isoelectronic sequences. Once all dataset available are identified, they have been fitted using an extension of Younger's formula, suitable for integration over a Maxwellian velocity distribution to derive the ionization rate coefficients. For the elements with non available data, the cross section has been interpolated or extrapolated. The results of the present work will be included together with radiative recombination rates data (Mao et. al 2016, A&AS, 27568), a changeexchange model (Gu et al. 2016, arXiv:1601.05958) and another atomic data in SPEX (Kaastra et al. 1996, UV and X-ray Spectroscopy of Astrophysical and Laboratory Plasmas) SW, utilized for X-ray spectra modeling, fitting and analysis. SPEX will be extensively used for the analysis of the measurements obtained with the Astro-H (Hitomi) satellite.

EMCCD calibration for astronomical imaging

Sergio Velasco

The evident benefits of Electron Multiplying CCDs (EMCCDs) –speed, high sensitivity, low noise and their capability of detecting single photon events whilst maintaining high quantum efficiency- are bringing these kinds of detectors to many state-of-the-art astronomical instruments. The EMCCDs are the perfect answer to the need for great sensitivity levels as they are not limited by the readout noise of the output amplifier, while conventional CCDs are, even when operated at high readout frame rates. Here we present for the first time a quantitative on-sky method to calibrate EMCCD detectors dedicated to astronomical imaging to give answer to the problems detected with them. The possibility of having regular access to the Canarian telescopes has allowed us to develop this calibration method. The results so obtained will represent a referent to be taken into account for future **instruments hosting EMCCD detectors at the Instituto de Astrofísica de** Canarias and associated centres.

Snorkelling between the stars: submarine methods for astronomical observations.

Sergio Velasco

Trying to reach diffraction-limited astronomical observations from ground-based telescopes is very challenging due to the atmospheric effects contributing to a general blurring of the images. However, astronomy is not the only science facing turbulence problems, obtaining quality images of the undersea world is as ambitious as it is on the sky. One of the solutions contemplated to reach high-resolution images is the use of multiple frames of the same target, known as fusion super-resolution, which is the principle for Lucky Imaging. Here we present the successful result of join efforts between

the undersea and the astronomical research done at the Canary Islands. We have applied a selective filter for frames using the SSIM (Structural SIMilarity) objective metric developed for super-resolution underwater imaging to astronomical frames. By implementing SSIM selection algorithms into the Lucky Imaging procedure we have upgraded our method to obtain diffraction-limited astronomical images even under bad seeing conditions.

LA VÍA LÁCTEA Y SUS COMPONENTES

Se**sión V**L: lunes 18 julio - tarde

COSMIC DANCE: unravelling the origin of the IMF

(Conferencia Invitada) *Hervé* Bouy

Despite the tremendous progress achieved over the past decade, the study of stellar formation is far from complete. We have not yet measured the minimum mass for star formation, nor the shape of the IMF down to the least massive free-floating planets, or know how Universal this shape is. Although clusters are the building blocks of galaxies, little is known about their early dynamical evolution and dispersal into the field. The main culprit for this state of affairs is the high level of contamination and incompleteness in the sub-stellar regime, even for the best photometric and astrometric surveys. COSMIC-DANCE aims at overcoming these drawbacks and revealing the shape of the IMF with a precision and completeness surpassing current and foreseeable surveys of the next 15 years. We will measure proper motions with an accuracy comparable to Gaia but 4 to 5 magnitudes deeper, reaching the planetary mass domain, and, critically, piercing through the dust obscured young clusters inaccessible to Gaia's optical sensors. Feeding these proper motions and the multi-wavelength photometry to innovative hyper-dimensional data mining techniques, we will securely identify cluster members within the millions of sources of the COSMIC-DANCE database, complemented by Gaia at the bright end, to obtain the final census over the entire mass spectrum for 20 young nearby clusters, the end of a 60-year quest. By providing conclusive empirical constraints over a broad parameter space unaccessible to current state-of-the-art surveys on the much debated respective contributions of evolutionary effects (dynamics, feedback and competitive accretion) and initial conditions (core properties) to the shape and bottom of the IMF, the most fundamental and informative product of star formation, with essential bearings on many areas of general astrophysics.

The giga-CMD of the VVV survey

Javier Alonso-García

The Vista Variables in the Vía Láctea (VVV) survey has changed our picture of the inner Galaxy in the last years. The inner regions of our Galaxy are hidden behind a curtain of gas and dust, and their observations at visible wavelengths are severely hampered by this fact. Observations in the near-infrared are better suited due to the diminished effect of extinction at these wavelengths. VVV, one of the six ESO public surveys conducted with the 4m VISTA telescope in Paranal, has observed 562 square degrees of the Galactic bulge and an adjacent region of the southern disk in the Z, Y, J, H, and Ks near-infrared filters during the last 6 years. Using PSF photometry on the VVV images, we have produced a deep and highly complete color-magnitude diagram (CMD) with nearly one billion sources that gives us an unprecedented view of the Galactic bulge and inner disc. In our contribution I will present this CMD and the first results of its analysis. I will talk especially about its implications in terms of structure of the inner Galaxy, the stellar populations residing in it, and the information that can be extracted to determine such fundamental quantities as the weight of the Galactic bulge. I will also mention the possibilities it provides to better understand the reddening law towards the inner Galaxy and to provide high-definition extinction maps.

Validation of Gaia data

Claus Fabricius

In preparation of the first Gaia data release, Gaia-DR1, the data has undergone a large number of tests, in order to check the validity of positions, parallaxes, proper motions, and magnitudes. Tests carried out by the Gaia consortium - with participation of the University of Barcelona - include independent error estimations from the negative parallax tail, comparisons with existing catalogues, internal consistency of open clusters, distributions of the various quantities, etc. This validation has led to final conclusions on which Gaia solutions to accept for publication.

Gaia + (WEAVE, EMIR...): orbits and radial migration of kinematic tracers

Merce Romero-Gomez

Gaia-DR2 (summer 2017) and next data releases will provide excellent astrometric parameters – parallax, positions and proper motions - for sources up to G=20. This data combined with the upcoming EMIR survey at GTC (starting 2017) and the WEAVE Multiobject Spectroscopic Survey being designed and built for WHT at La Palma (Science operations starting 2018) is opening a new window to the orbital analysis of the stars placed on the galactic disc up to distances of 3-5 kpc. In this talk, we focus on the study of the radial migration of kinematic tracers, both young and old stellar populations. We quantify the propagation of Gaia errors (Gaia+EMIR+WEAVE) on the orbits of such tracers, nowadays in the extended solar neighbourhood. By considering different mechanisms causing radial migration, namely the bar and/or the spiral arms, we study the Gaia and ongoing large spectroscopic surveys capabilities to ascertain the star formation place of this objects and thus, the evolution of the galactic disc.

Galactic Cepheids as tracers of the Thin Disc Initial Mass Function

Roger Mor

CONTEXT. Classical Cepheids are known to be excellent tracers of the rotation, chemical distribution and spatial density of non-axisymmetric structures of the young Galactic Thin Disc. In the Gaia era, thousands of Classical Cepheids are going to be detected, so these objects will be in a privileged position to define the chemo-dynamical evolution of the Milky Way young Thin Disc population.

AIMS. To set up some key parameters that define the evolution of the Thin Disc. In this talk we will start with the constrain of the Initial Mass Function (IMF) at intermediate-masses.

METHODS. Strategies and tools are used to fit Besançon Galaxy Model simulations to Tycho-2 data and the at present most complete catalogues of Galactic Cepheids. Work is in progress to adapt these tools to coming Gaia data and future WEAVE data.

RESULTS. For the first time the Besançon Galaxy Model is able to simulate a population of Classical Cepheids with reliable mass and age distribution. Focusing on the IMF, preliminary results show that Salpeter IMF (alpha=2.35) is overestimating the number of observed Cepheids while at the same time is underestimating the star counts of Tycho-2 catalogue, that is at low masses. Kroupa-Haywood IMF (alpha=3.2) is the tested IMF that better explains the amount of observed Cepheids in the Milky Way.

El proyecto SONG: operación y primeros resultados científicos

Pere L. **Pallé**

La iniciativa SONG (Stellar Observations Network Group -http://song.au.dk/) es un proyecto de colaboración cuyo objetivo es desarrollar, implementar y operar una red de instalaciones telescópicas completamente robóticas de telescopios de 1 m y dotadas de capacidades espectroscópica y fotométrica. con el que se puedan llevar a cabo programas que requieran largos periodos de observación (de meses a años) con un mínimo de interrupciones (ciclo día-noche). En esta contribución se muestran los resultados obtenidos con el primero de los nodos de la red (telescopio "Hertzsprung SONG" en el Observatorio del Teide, operativo desde la primavera de 2014) ilustrando el alto grado de eficiencia alcanzado en las observaciones remotas y robóticas que han permitido desarrollar una amplia variedad de programas científicos dentro del área de la Astrofisica Estelar y Planetas Extrasolares para objetos brillantes (m_v 4 meses continuos) de velocidad radial de alta precisión para estrellas sug-gigantes y gigante rojas en distintos estados evolutivos, están permitiendo las primeras inferencias astrosismológicas a partir de la detección y caracterización de su espectro de modos propios. Asimismo, se ha constatado la posibilidad de poder llevar a cabo sismología en estrellas gigantes OB y la capacidad de mejorar sustancialmente la det erminación de los parámetros orbitales de sistemas binarios espectroscópicos. Observaciones coordinadas y simultaneas con SONG (velocidad radial) y los que se obtendrán con la misión espacial TESS (fotometría) a partir de 2017 permitirán mejorar la caracterización sísmica de un gran número de estrellas y con ello una mejor determinación de sus parámetros fundamentales (masa, radio y edad).

The use of the Tremaine-Weinberg method to derive the pattern speed of the Milky Way spiral arms and bar

Marta Reina Campos

The Tremaine-Weinberg method (Tremaine and Weinberg 1984), aims to determine the pattern speed of barred external galaxies. Debattista et al. (2002) modified this method so it can be used for the Milky Way. The importance of this method relies on its simplicity, as it only depends on the galactic positions, the distances and the radial velocities of the sample used. Here our goal is to study the applicability of this method on Gaia and new large spectroscopic surveys data to derive the pattern speed of the bar and the spiral arms of the Milky Way. We have applied the method to simulations including bars and spirals arms with different pattern speeds. We use both test particle and n-body simulations. We quantify the capability and requirements of this method to correctly recover the modelled pattern speed. We also study the dependence with the number of stars in the sample and the properties of the kinematic tracers to be used for such a study.

Sesión VL: martes 19 julio - mañana

Signs of planet formation in protoplanetary disks

(Conferencia Invitada) Mayra Osorio

I will present results for three protoplanetary disks, studied by our team, that show signs of planet formation. Our high angular resolution interferometric observations of these sources suggest that we are witnessing different stages of the planet formation process working at different scales.

MHD simulations of protostellar jets: formation and stability of shock diamonds

Sabina Ustamujic

The early stages of a star birth are characterised by a variety of mass ejection phenomena, including outflows and collimated jets, that are strongly related with the accretion process developed in the context of the star-disc interaction. After been ejected, jets move through the ambient medium, interacting and producing shocks and complex structures that are observed at different wavelength bands. In particular, X-ray observations show evidence of strong shocks heating the plasma up to temperatures of a few million degrees. In some cases, the shocked features appear to be stationary and have been interpreted as shock diamonds. We aim at investigating the physical properties of the shocked plasma and the role of the magnetic field on the collimation of the jet and the location, stability and detectability in X-rays of the stationary shock formed. We performed 2.5D MHD simulations, including the effects of the thermal conduction and the radiative losses. We modelled the propagation of a jet ramming with a supersonic speed into an initially isothermal and homogeneous magnetized medium. We studied the physics that guides the formation of a stationary shock (for instance a shock diamond) and compared the results with observations, via the emission measure distribution vs. temperature and the luminosity synthesized from the simulations.

Characterizing young brown dwarfs atmospheres with polarization data

Elena Manjavacas

Polarization of brown dwarfs has been linked to the scattering by dust grains known to cover their atmospheres, but it is not known if it is the consequence of rotationally induced flattening or large scale cloud patterns. Models predict a higher linear polarization for young brown dwarfs, but this polarization has not been systematically investigated yet. We used CAFOS in the 2.2 m telescope of CAHA (Spain), to measure polarization together with variability, to disentangle effects of flattening from asymmetric dust distribution. Our observations archived accuracies of 0.04 % in linear polarization. Through multiwavelength observations we have set constrains on the dust grains characteristics.

The stellar cusp around The Milky Way's central black hole

Rainer Schoedel

The existence of stellar cusps in dense clusters around massive black holes is a fundamental, decades-old prediction of theoretical stellar dynamics. Yet, observational evidence has been elusive so far. With a new, improved analysis of high-angular resolution images of the central parsecs of the Galactic Center, we are finally able to provide the first solid evidence for the existence of a stellar cusp around the Milky Way's massive black hole. The existence of stellar cusps is not only of theoretical importance, but has a significant impact on predicted event rates of phenomena like tidal disruptions of stars and extreme mass ratio inspiral events, which are expected to be strong sources of gravitational wave emission. Finally, we confirm the lack of giant stars in the central ~0.5 pc around the black hole, which implies that some kind of mechanisms, such as collisions, must have led to their depletion in this region.

Variable Stars within 5 pc of the Milky Way's Central Black Hole?

Hui Dong

In this talk, I will present a catalog of variable stars with 5 pc of the Milky Way's central black hole derived from the HST/WFC3 observations with a baseline of four years (2010-2014). We find not only long-term variable stars with periods of years, but also short-term ones with only one-day periods. The latter one has typical light curves of RR Lyrae stars, which are old metal-poor stars. From them, we can constrain old stellar population in the closest nuclear cluster. The former ones are associated with known massive stars, indicating that they are binary systems. This helps us to derive the binary fraction of massive stars in the nuclear cluster, which has an important impact on our understanding the initial massive function in this extreme environment.

Searching for Cataclysmic Variables in the J-PLUS Survey

Javier Abril Ibáñez

Cataclysmic Variables (CVs) are binary systems made of a white dwarf which is accreting mass from a less evolved companion. Depending on the physical properties of the system, the observational characteristics of CVs can be very diverse. Nevertheless, as we learned from projects like the Sloan Digital Sky Survey, CVs occupy the same locus of quasars in colour-colour diagrams, hence their discovery can be quite challenging. During this talk, I will expose how the filter set of the J-PLUS project can help to efficiently separate CVs from other objects (mostly quasars) and even get their type. Through simulations and real data, I will explain how accurate the method is and next steps to finally get the first magnitude-limited complete sample of Cataclysmic Variables to date, a fundamental data set to be able to study the evolution of this type of objects.

Sesión VL: miércoles 20 julio - mañana

Massive stars: evolution, mass loss and feedback

(Conferencia Invitada) *Miriam García García*

Massive stars are essential components to many astronomical events, ranging from local Galactic dynamics to the epoch of reionization. Because they are nearby, Milky Way massive stars allow for extensive studies, with sample sizes close to statistical significance. While we strive to produce realistic parameterizations so that feedback from massive stars can be accounted for throughout their lives, a number of outstanding open questions prevent accurate numbers. I will review the current state with emphasis on the two points that more strongly affect our interpretation of the unresolved Universe: mass loss and feedback.

How much can we trust high-resolution spectroscopic stellar atmospheric parameters and abundances?

Sergi Blanco-Cuaresma

The determination of atmospheric parameters and chemical abundances depends on the use of radiative transfer codes to compute synthetic spectra and/or derive abundances from equivalent widths (SPECTRUM, Gray & Corbally 1994; WIDTH, Kurucz 1993 & Sbordone et al. 2004; SME, Valenti & Piskunov 1996; Turbospectrum, Alvarez et al. 1998 & Plez 2012; MOOG, Sneden et al. 2012). However, to extract scientific conclusions about stellar aggregates or the Galaxy (for instance), it is common to mix results from different surveys/studies where different setups were used to derive parameters and abundances. These inhomogeneities can lead us to inaccurate conclusions. We studied one aspect of the problem: What differences originate from the use of different radiative transfer codes? Using exactly the same spectroscopic pipeline (based on iSpec, Blanco-Cuaresma et al. 2014), we executed a homogeneous analysis (based on iSpec, Blanco-Cuaresma et al. 2014) of the Gaia FGK Benchmark Stars and studied the level of agreement between the most popular radiative transfer codes.

Quantitative Spectroscopic Analysis of O stars in the IACOB+OWN project: Massive stars in the Galaxy with the imminent GAIA information.

Gonzalo Holgado Alijo

Massive stars are luminous beacons that help us to extract information about the star formation history and the chemodynamical evolution of galaxies in the Universe. They are also one of the agents suggested to trigger the re-ionization of the Universe. Our Galaxy is full of massive stars, which expend their short-lived existence within bright star-forming regions, depositing huge amounts of mechanical and radiative energy to the interstellar medium before they explode as energetic supernovae event. The IACOB and OWN projects have collected a large database of high-resolution multi-epoch spectra of Galactic O and B-type stars. This unique spectroscopic dataset, once analyzed and interpreted with state-of-the-art tools and techniques will provide a new, global overview of the physical and evolutionary properties of massive stars in their early phases. In this contribution, I will present the results from the quantitative spectroscopic analysis of ~280 likely single O stars targeted by the IACOB and OWN surveys (implying the largest sample of O Galactic O stars analyzed homogeneously, using modern automatized tools). I will put

special emphasis on the subsample of ~130 O stars included in the recently revised (by the GOSSS project) grid of standards for spectral classification. Finally I will also highlight the impact of the GAIA mission in the determination of physical parameters of massive stars, both in the IACOB project and in future Multi-Object Spectroscopy Surveys.

Clumpy Structure in a 4D Phase-Space Volume for the Cluster NGC 2548

Emilio J. Alfaro Navarro

Most stars form in clusters and most clusters survive, as coherent stellar systems, not longer than a few hundreds million years. One of the main scientific objectives of modern astronomy is to understand how stellar clusters born and dead. The number of works devoted to the analysis of some subspaces of phase space for young clusters is good enough as to get some general conclusions about the formation and early dynamical evolution of these stellar systems. However, the papers dedicated to the phase-space analysis of dissolving clusters are very sparse and always focussed on the spatial coordinates. In this work we present the first analysis of the proper motion distribution of an intermediate-age cluster, while suffers a strong interaction with the Galactic disk. Three blobs, previously detected in the spatial plane of NGC 2548, show to have kinematic counterparts in the subspace defined by the proper motions, detecting for the first time a clumpy structure in the 4D phase-space volume defined by these variables. The high quality of the proper motion data in the CdC-SF catalogue enabled us to unveil the clumpy structure of the Vector-Point Diagram for this interesting cluster.

Detection of second-generation asymptotic giant branch stars in metal-poor globular clusters

Domingo Aníbal García Hernández

Galactic globular clusters (GCs) are known to host multiple stellar populations: a first generation (FG) with a chemical pattern typical of halo field stars and a second generation (SG) enriched in Na and AI and depleted in O and Mg. Both stellar generations are found at different evolutionary stages (e.g., the main-sequence turnoff, the subgiant branch, and the red giant branch (RGB)). The non-detection of SG asymptotic giant branch (AGB) stars in several metal-poor ([Fe/H] < -1) GCs suggests that not all SG stars ascend the AGB phase, and that failed AGB stars may be very common in metal-poor GCs. This observation represents a serious problem for stellar evolution and GC formation/evolution theories. We have detected fourteen SG-AGB stars in four metal-poor GCs (M13, M5, M3, and M2) with different observational properties: horizontal branch (HB) morphology, metallicity, and age. By combining the H-band Al abundances obtained by the Apache Point Observat ory Galactic Evolution Experiment (APOGEE) survey with ground-based optical photometry, we identify SG AI-rich AGB stars in these four GCs and show that AI-rich RGB/AGB GC stars should be Na-rich. Our observations resolve the apparent problem for stellar evolution, supporting the existing horizontal branch star canonical models, and may help to discern the nature of the GC polluters.

Looking for phase-space structures in star-forming regions: An MSTbased methodology

Marta González García

We present a method for analysing the phase-space of star-forming regions. In particular we are searching for clumpy structures in the 3D subspace formed by two position coordinates and radial velocity (RV). The aim of the method is the detection of kinematic segregated radial velocity groups, that is, radial velocity intervals whose associated stars

are spatially concentrated. To this end we define a kinematic segregation index, (RV), based on the Minimum Spanning Tree (MST) graph algorithm, which is estimated for a set of RV intervals in the region. When (RV) is significantly greater than 1 we consider that this interval represents a grouping in the phase space. We split a star-forming region in radial velocity bins and calculate the kinematic segregation index for each bin, obtaining the spectrum of kinematic groupings, which enables a quick visualization of the kinematic behaviour of the region under study. We apply this method to a set of simulations in order to show its capabilities for the analysis of the phase space of stellar systems. We also show some results of the application of the method to real data, in particular to the NGC2264 region.

Sesión VL: miércoles 20 julio - tarde

What powers the high-energy emission in stellar-mass objects?

(Conferencia Invitada) Valentí Bosch-Ramon

Binary systems hosting a compact object are among the most powerful gamma-ray sources in the galaxy. There are two main scenarios to explain the high-energy emission detected in these types of system, one characterized by the presence of a jet, the other by the presence of a pulsar wind. Both types of outflows propagate in a complex environment characterized by the wind of the companion, generally a massive star, and orbital motion, which leads to shocks and other dissipative phenomena that can accelerate particles and produce high-energy emission. In this talk, I will review the main properties of the interaction between a relativistic jet, or a pulsar wind, with the wind of massive star, pointing out similarities and differences of these two contending frameworks, in particular in the context of high-energy radiation.

Revealing different properties between SFXTs and SGXBs: IGR J17544-2619 versus Vela X-1

José Miguel Torrejón Vázquez

Classical Supergiant X-ray Binaries and Supergiant Fast X-ray transients present similar donors but, at the same time, show very different behaviour in the X-rays. In this work, we perform a comparative analysis of the optical counterpart in two representative systems such as IGR J17544-2619 (SFXT) and Vela X-1 (SGXB). We analyse the spectra of each star in detail and derive their stellar and wind properties. Comparing its parameters we obtain some key differences between donors winds in these objects. We also use archival infrared, optical and ultraviolet observations and study them with the non-LTE Postdam Wolf-Rayet model atmosphere code. We derive the physical properties of the stars and its stellar winds, accounting for the influence of X-rays on the stellar winds. As a result of our study, IGR J17544-2619 and Vela X-1 show moderate differences in their stellar wind velocity and spin period of the neutron stars that have a strong impact on the X-ray luminosity of the sources. This specific combination of wind speed and pulsar spin favours an accretion regime with persistently high luminosity in Vela X-1, while it favours an inhibiting accretion mechanism in IGR J17544-2619. Our study demonstrates that the wind relative velocity is critical in the determination of the class of HMXBs hosting a supergiant donor, given that it may shift the accretion mechanism from direct accretion to propeller regimes when combined with other parameters.

Fast orbital decays of black hole X-ray binaries: the case of Nova Muscae 1991

Jonay I. González Hernández

Angular momentum loss (AML) is believed to drive the evolution of black hole X-ray binaries (BHXBs). In particular, magnetic braking is supposed to be the main AML mechanism responsible for the evolution of very compact binaries with short orbital periods of several hours. However, there are several models to explain the origin and evolution of BHXBs but none of them are able to explain all the observables. During the last years we have been using 10.4m-GTC telescope equipped with OSIRIS medium-resolution spectrograph to obtain many spectra of two BHXBs, XTE J1118+480 and A0620-00, at different epochs. These BHXBs are composed by a subsolar-mass late type

LA VÍA LÁCTEA Y SUS COMPONENTES Sesión VL: miércoles 20 julio - tarde

secondary star orbiting a 6-8 solar-mass black hole in very short orbital periods (4-8hr), and therefore are ideal sites to investigate AMLs. Using these spectroscopic 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 discover the orbital period **decays for the first time in BHXB systems (González Hernández et al. 2012, 2014). The** secondary star in both systems is approaching the black hole much faster than predicted by standard models of magnetic braking theory, and may suggest an evolutionary sequence in which the orbital period decay begins to speed up as the orbital period decreases. This scenario may have an impact on the evolution and lifetime of black hole X-ray binaries. We then decided to obtain X-Shooter@VLT spectroscopic observations of Nova Muscae 1991 which has a longer orbital period of 10.4 hr and surprisingly discovered an extremely faster orbital decay. In this talk, I will discuss the implications of these results for the origin and evolution of black hole binary systems.

Subluminous accreting black holes and neutron stars

Montserrat Armas Padilla

During the last decade a new population of X-ray binaries have been discovered. They show anomalously low peak luminosities (2-10 keV) of 1E34 to 1E36 ergs/sec. A large fraction of them is expected to harbour accreting neutron stars and black holes in binaries systems. These very faint X-ray binaries provide new regimes to study accretion onto compact objects, and therefore they could challenge our understanding of accretion physics and binary evolution models. I will review the state-of-the-art of the field and present our results in black hole and neutron star very faint X-ray binaries, including both transient and persistent sources. I will show the similitudes and differences on their main characteristics as compared to those of brighter sources (Lx > 1E36 ergs/sec), and therefore, the new insights they provide in the X-ray binary properties.

Swift J1357.2–0933: a massive black hole in the Galactic thick disc

Daniel Mata Sánchez

Swift J1357.2–0933 is one of the shortest orbital period black hole X-ray transients. It exhibited deep optical dips together with an extremely broad H-alpha line during outburst. We present 10.4-m Gran Telescopio Canarias (GTC) time-resolved spectroscopy during quiescence searching for donor star absorption features. The large contribution of the accretion flow to the total luminosity prevents the direct detection of the companion. Nevertheless, we constrain the non-stellar contribution to be larger than 80 per cent of the total optical light, which sets new lower limits to the distance (d > 2.29 kpc) and the height over the Galactic plane (z > 1.75 kpc). This places the system in the Galactic thick disc. We measure a modulation in the centroid of the H-alpha line consistent with the orbital period which, combined with the recently presented full width at half maximum - K2 correlation, results in a massive black hole (M1 > 9.3 M_sun) and an M2V compa nion star (M2 = 0.4 M_sun).

The most pristine dwarf star observed with OSIRIS at GTC

David Sánchez Aguado

The most metal poor stars in milky way witnessed the early phases of formation of the Galaxy, and have chemical compositions that are close to the pristine mixture from Big Bang nucleosynthesis, polluted by one or very few supernovae. Here we present a program we are carrying out to search for and characterize new ultra metal-poor stars

formed in the early Milky Way. Unfortunately, these stars are extremely rare, with only a few known with less than 1/100,000 of the solar iron abundance. We have selected iron poor candidates from SDSS and dozens of them have been observed with ISIS at the 4.2 m William Herschel Telescope. The most interesting objects have been confirmed with OSIRIS at 10.4m-GTC telescope and an extremely metal-poor dwarf star has been identified. We report the discovery of J0815+4729, the most metal poor dwarf star known with [Fe/H]=-5.7. We will discuss the implications of this discovery on our knowledge of the Early Galaxy, and the formation of the first stars and supernovae.

Primordial abundances of baryonic matter vs. stellar evolution: Detection of 3He+ in IC418

J. Ricardo Rizzo Caminos

The abundance of the 3He isotope is one of the open problems of current astrophysics. The abundance of 3He is the result of the Big Bang Nucleosynthesis and the stellar evolution. The only way to measure the presence of 3He is through the observation of a spectral line at 8.665, which correspond to a single ionized isotope, 3He+. This line is usually so weak and hard to be detected. In this work we report the detection and further analysis of the 3He+ line towards the planetary nebula IC418, by observations gathered with DSS-63, the 70m antenna at Madrid Deep Space Communication Complex. The simultaneous detection of several radio recombination lines are also presented and analyzed.

Sesión VL: jueves 21 julio - mañana

The atomic and molecular content of protoplanetary discs

(Conferencia Invitada) Gwendolyn Meeus

The discs around young stars are nurseries of planets in which gas slowly gets dispersed until planets no longer can form. As an important piece of the planet-formation puzzle, both the heating & cooling processes, and the chemical composition and its evolution, as well as gas dispersing mechanisms need to be understood. In this talk, we will mainly show Herschel results from two Key Programmes focussing on protoplanetary disc evolution, GASPS and DIGIT. Both programmes surveyed a large sample of young stars with the spectrograph PACS, tracing the far-IR region. Another part will focus on ALMA observations. With the aid of emission lines of [O I], [C II], OH, H2O, CH+ and CO we can trace the disc at different vertical depths and radial distances. We look for correlations between the observed line fluxes and stellar properties such as eective temperature and stellar luminosity, FUV and X-ray luminosities, accretion diagnostics, as well as with certain disc properties. Our spectra cover a wide range in pure rotational transitions of CO. We analyse the CO ladder with a small model grid, and show that the amount of flaring is important in determining the line flux, as it determines the amount of warm gas. We will look into the difference in water detections between solar-type and more massive stars. Finally we will present a few cases to illustrate how simultaneous modeling of the observed lines can constrain the gas properties, once the disc structure is derived, and how high spatial resolution observations with ALMA can indicate the presence of planets in the disc.

LkHa 262/263: the paradigm of multiplicity vs disk fraction in low-mass stellar systems.

Sergio Velasco

The study of multiple systems and their link with the presence of discs around their components is key to understanding the evolution of low-mass pre-main sequence stars. Although there are indications that high-multiplicity systems are much more frequent among very young stars, until now, only a few of these young low-mass stellar systems have been confirmed. Here, we present high spatial resolution i' band imaging of the system formed by LkH 262 and LkH 263, in the MBM12 cloud. It was obtained during the first commissioning period of the Adaptive Optics Lucky Imager (AOLI) at the 4.2 m William Herschel Telescope, using its Lucky Imaging mode. The multiple system LkH 262/263 is composed of four low-mass very young M-type stars and some discs, including a edge-on disc around LkHa 263C. The AOLI data combined with previously available and newly obtained optical and infrared imaging show that the three components of LkH 263 are co-moving, that there is orbital motion in the AB pair (0.41arcsec separation), and, remarkably, that LkH 262-263 is a common proper motion system with a less than 1 mas/yr relative motion. According to BT-settl models the mass of each of the five components is close to 0.4 M and the age is in the range 1-2 Myr. We also give marginal evidence of a cooler companion to LkHa 262, at less than 0.15 arcsec, turning LkH 262-263 into a five-component likely gravitationally bounded system. The presence of discs in some of the components offers an interesting opportunity to investigate the formation and evolution of discs in the early stages of multiple very low-mass systems. In particular, we provide tentative evidence that the disc in 263C could be coplanar with the orbit of 263AB.

Photoevaporation of the gas component in the young planetary disks. The role of disk winds and jets in the process.

Ana I. Gómez de Castro

UV and X ray radiation from young stars play a key role in photoevaporation of the gas component in young planetary disks. In particular, UV radiation is absorbed by the H2 molecule creating a PDR on the disk surface (Hollenbach & Gorti, 2009). About 80% of the far UV flux (115-175nm) radiated by T Tauri stars is in the Lyman alpha line (France et al. 2012). Lyman alpha photons are efficiently absorbed by the molecular Hydrogen on the disk surface leading eventually to the photo-evaporation of the gas component (Herczeg et al. 2004). Current theoretical models predict characteristic lifetimes for the gas component in young planetary disks of 1 Myr (Alexander et al. 2006, Hernandez et al., 2007) however, deep ultraviolet observations of the H2 bands show a significant gas component till time scales of 10 Myr (France et al. 2012, Ingleby et al. 2011, Salyk et al. 2009). In this talk, we will present the results of our calculation on the impact of disk winds opacity on the UV radiative budget reaching the disk surface (Gómez de Castro ϑ Ustamujik 2016). The lifetime, spatial distribution, and composition of gas and dust of young (age < 30 Myr) circumstellar (CS) disks are important properties for understanding the formation and evolution of extrasolar planetary systems. Disk gas regulates planetary migration (Armitage et al. 2002, Trilling et al. 2002) and the migration timescale is sensitive to the specifics of the disk surface density distribution and dissipation timescale (Armitage et al. 2007). Moreover, the time available for planetary embryos to coalesce cores and accrete gaseous envelopes is strictly limited by the 1-10 Myr lifetime of their parent disk (Alexander & Armitage, 2009, Hernandez et al., 2007).

¿Cuántas estrellas FGK de la vecindad solar tienen un cinturón de Kuiper?

Benjamín Montesinos Comino

En anteriores reuniones científicas de la SEA mostramos resultados preliminares del proyecto DUNES, realizado con datos del observatorio espacial Herschel de la Agencia Espacial Europea. El objetivo fundamental del proyecto era estudiar estrellas FGK de secuencia principal de la vecindad solar en el infrarrojo lejano (entre 70 y 500 micras) buscando estructuras similares al cinturón de Kuiper de nuestro Sistema Solar. Estas estructuras son el resultado de la evolución en la pre-secuencia principal de los discos protoplanetarios, formados por gas y polvo, que se transforman en discos pobres en gas, poco densos y dominados por polvo a medida que el gas se dispersa y el polvo se reprocesa a través de colisiones de planetesimales, formando los llamados "discos de debris". Estos discos son fundamentales para entender la formación de sistemas planetarios. Presentamos aquí los principales resultados que se derivan del análisis de la muestra completa de los objetos estudiados en DUNES. Alrededor del 22% de las estrellas FGK de secuencia principal situadas a distancias menores de 15 pc presentan discos de debris. Los valores más bajos de los límites superiores para la luminosidad fraccional del polvo, L_polvo/L*, son del orden de 4.0E-07, lo cual supone un orden de magnitud menor que el alcanzado con datos de Spitzer. Los resultados se ponen en contexto con propiedades de la muestra tales como edad, actividad y metalicidad.

Physical parameters of TGAS stars

Eduard Masana Fresno

Tycho-Gaia Astrometric Solution (TGAS) will be released on September 2016. This first Gaia product will deliver positions, parallaxes and annual proper motions for the 2.5 million Tycho-2 stars, with sub-milliarcsecond uncertainty, by using both Tycho-2 positions and the first year of Gaia observations. We have compiled observations in several photometric systems for the TGAS stars in order to compute their physical

parameters: effective temperature, surface gravityi and metallicity; and also, when possible, their interestellar absorption. For the effective temperatures we have used the Infrared Flux Method (IRFM) based on V-JHK photometry. The other physical parameters, **as well as the absorption, have been computed from Strömgren** uvby-beta photometry. The IRFM also gives the observed bolometric flux of the stars, which together the effective temperature and TGAS parallaxes will allow a good determination of the stellar radii. In this work we described the methods used to compute the physical parameters, we present the comparisons with independent values and give outlines on how they can be used to check theoretical stellar models when Gaia data is available.

Gaia science alerts follow-up from Montsec Observatory

Josep Manel Carrasco Martínez

The continuous and reiterative scan of the whole sky performed by Gaia ESA's mission during its (at least) 5 years of mission allows to detect new transient events (e.g., supernovae, microlensing events, cataclysmic variables, etc) almost in real time among the daily millions of observations. The pipeline in charge to discover these alerts have to do a quick look analysis of the daily data stream, identify those sources increasing their brightness with respect to previous Gaia observations and also analyse their spectrophotometry to decide if those sources are good candidates to be published as a Gaia Photometric Science Alerts. These events are announced to all scientific community in order to perform follow-up observations (both photometric and spectroscopic are needed) from many different observatories around the world in order to confirm, classify and study them in detail. Observations from all these observatories are put in common and analysed together in a common interface in order to get a single analysis as detailed and precise as possible joining all possible data. Our team in Barcelona is also contributing to this Gaia science alerts follow-up programme with the 0.8 m robotic telescope Joan Oró (TJO), at the Montsec Observatory (OAdM), located at Ager (Lleida, Spain) performing photometric observations to derive the lightcurves of the most interesting alerts accessible from the observatory. Until now we have contributed with about 3000 images in multicolour Johnson-Cousins passbands obtained with TJO for a total of about 30 Gaia science alerts, becoming the second most contributing observatory in the programme. In this talk we will summarise the procedure to select new targets to be observed by TJO, submit new follow-up observations and explain the analysis we did for some interesting lightcurve obtained.

Sesión VL: jueves 21 julio - tarde

On the chemical composition of the Milky Way outermost disk

Jose M. Vilchez

The metal content and physical properties of the ionized gas and ionizing stars in the virtually unexplored outer disk of the Galaxy have been determined to shed new light on its chemical evolution. Chemical abundances, gas density and temperature, massive ionizing stars properties and extinction are derived for the outer anticenter using data for an extended sample of HII regions at Galactocentric radii beyond eleven kpc. The sample includes new deep spectra covering from 3600 A to 1 micron, in addition to a selected compilation of highest quality spectroscopic data available for the Galactic anticentre. All the data have been analyzed in a self-consistent way and the chemical abundances derived directly using electron temperature measurements, and also from taylored physical photoionization models produced with the CLOUDY photocode. The abundance gradients of O/H, N/H, S/H, Ar/H and He/H as well as the radial profile of the N/O ratio –our 'chemical clock'- have been obtained for the outer Milky Way disk on a solid basis. A discussion of these results is presented in the light of the theoretical predictions of recent chemical evolution models and disk formation scenarios.

The OCCASO survey: second data release overview

Laia Casamiquela Floriach

The Open Clusters Chemical Abundances determination from Spanish Observatories survey (OCCASO) targets intermediate-age and old OCs visible from the Northern hemisphere. It is designed to reconstruct the disc evolution by analyzing chemical composition and ages as a function of position: i.e. radial and vertical gradients. Clusters are very suitable targets for these studies since dynamical evolution and radial mixing is less severe than for field stars. OCCASO provides homogeneous radial velocities, physical parameters, and individual abundances from high-resolution spectroscopy (R>62,000) of Red Clump stars and represents the Gaia-ESO survey (GES) counterpart in the North. It is important to recall that several key OCs such as the most metal-rich, NGC 6791, and the oldest, Berkeley 17, together with several systems towards the Galactic anticenter or those observed by the Kepler mission are only visible from the North. For the observations we mainly use the Nordic and Mercator telescopes at Roque de los Muchachos Observatory with time mainly granted through Large Programs.

Up to now, we have completed ~70% of the observations, which encompass

100 stars in 17 clusters (first data release of radial velocities in Casamiquela et al. 2016, MNRAS). External comparisons have shown our accuracies are at the level of 0.2 km/s in radial velocities. The analysis of dynamics of such clusters reveals that IC4756 and NGC6633, both in the Local arm, are located close together and have similar age and spatial non-circular velocity. Taken together, this may indicate some relationship in their formation. NGC 6819 is particularly remarkable because its large vertical velocity of 71.73+/-23.10 km/s.

The combination of our radial velocities and Gaia proper motions (releases 1 and 2), instead of current proper motions available, will allow the much improve this dynamical analysis and compute orbits.

The determination of physical parameters and chemical abundances is done using one equivalent width method (GALA; Mucciarelli et al. 2013) and one synthetic spectral fitting method (iSpec; Blanco-Cuaresma et al.

2014). We discuss the results and the detailed analysis of the comparison between methods. Three OCs in common with GES, NGC 2682, NGC

6705 and NGC 6633, allow us to study homogeneity between surveys.

Chemical abundances are put in context of the radial Galactocentric, height above the plane and age gradients. Our sample includes four OCs (NGC 1907, NGC 6939, NGC 6991, NGC 7762) never or poorly studied with high-resolution spectroscopy before.

VOSA (VO Sed Analyzer)

Carlos Rodrigo Blanco

VOSA (VO Sed Analyzer, http://svo2.cab.inta-csic.es/theory/vosa/) is a public web-tool developed by the Spanish Virtual Observatory (http://svo.cab.inta-csic.es) and designed to help users to (1) build Spectral Energy Distributions (SEDs) combining private photometric measurements with data available in VO services, (2) analyze them comparing observed photometry with synthetic photometry from different collections of theoretical models or observational templates, using different techniques (chi-square fit, Bayesian analysis) and thus (3) estimate physical parameters for the observed objects (effective temperature, gravity, luminosity, age, mass, etc). In particular, VOSA offers the advantage of deriving physical parameters using all the available photometric information instead of a restricted subset of colors. VOSA is in operation since 2008 (Bayo et al, 2008, A&A 492,277B). At the time of writing this proposal there are more than 600 active users who have published more than 60 refereed papers using the tool. In the framework of the GENIUS (https://gaia.am.ub.es/Twiki/bin/view/GENIUS) project we have upgraded VOSA to provide access to Gaia photometry and give a reliable estimation of the physical parameters (effective temperatures, gravities, metallicities, masses and ages) of thousands of objects at a time. This upgrade has required the implementation of a new distributed environment capable of submitting and processing jobs in an asynchronous way.

A search for new hot subdwarf stars by means of Virtual Observatory tools

Enrique Solano Márquez

Recent massive sky surveys in different bandwidths are providing new opportunities to modern astronomy. The Virtual Observatory (VO) represents the adequate framework to handle the huge amount of information available and filter out data according to specific requirements.

In this work, we applied a selection strategy to find new, uncatalogued hot subdwarfs making use of VO tools. We used large area catalogues (GALEX, SDSS, SuperCosmos, 2MASS) to retrieve photometric and astrometric information of stellar objects. To these objects, we applied colour and proper motion filters, together with an effective temperature cut-off, aimed at separating hot subdwarfs from other blue objects such as white dwarfs, cataclysmic variables or main sequence OB stars.

As a result, we obtained 437 new, uncatalogued hot subdwarf candidates, which represents an increase of 17% in the census of known hot subdwarfs. Based on previous results, we expect our procedure to have an overall efficiency of at least 80 per cent. Visual inspection of the 68 candidates with SDSS spectrum showed that 65 can be classified as hot subdwarfs: 5 sdOs, 25 sdOBs and 35 sdBs. This success rate above 95 per cent proves the robustness and efficiency of our methodology.

The spectral energy distribution of 45 per cent of the subdwarf candidates showed infrared excesses, a signature of their probable binary nature. The stellar companions of the binary systems so detected are expected to be late-type main sequence stars. A detailed determination of temperatures and spectral classification of the cool companions will be presented in a forthcoming work.

Nuevas perspectivas en Supergigantes rojas

Ricardo Dorda Laforet

La gran mayoría de estrellas de alta masa (M>8 Msol) pasan en un momento u otro de su evolución por el estado de supergigantes rojas. Más aún, se ha estimado que representan la abrumadora mayoría de precursores de supernovas tipo II-P. Pese a su gran interés astrofísico, tanto como trazadores de la formación estelar como por su rol protagonista en la evolución y muerte de las estrellas de alta masa, estas estrellas siguen guardando muchas incógnitas. Sus tamaños extremos y sus peculiares condiciones físicas siguen siendo un desafío para los modelos de atmósferas y evolutivos. Así se ha propuesto recientemente que todas las supergigantes rojas tienen aproximadamente la misma temperatura, mientras que el tipo espectral indicaría el estado evolutivo. Para poner a prueba estas propuestas, así como para ampliar la perspectiva sobre estos objetos, hemos realizado un extenso y detallado estudio espectroscópico sobre una de las mayores muestras de supergigantes rojas hasta la fecha (>500), observadas tanto en la SMC como en la LMC. Nuestros resultados presentan una nueva perspectiva global y estadísticamente significativa sobre las características físicas de las supergigantes rojas. Así, obtenemos fuertes indicios de que la temperatura no es constante en estos objetos, sino que está fuertemente correlacionada con el tipo espectral, y al mismo tiempo, más indirectamente con la luminosidad y la pérdida de masa. Del estudio de la variabilidad hemos concluido una dependencia significativa con la metalicidad típica de la galaxia. Finalmente, del estudio de la distribución de tipos espectrales en cada galaxia hemos hallado que a bajas metalicidades las supergigantes amarillas (G) forman parte del mismo camino evolutivo que las supergigantes rojas y, más inesperado aún, la existencia de una bimodalidad en la distribución de tipos espectrales que sugiere dos subfases evolutivas separadas dentro de las supergigantes rojas, con características físicas significativamente diferentes.

Clusterix 2.0 for Gaia

Lola Balaguer-**Núñez**

We present an advanced, VO-compliant version of Clusterix, a tool for the determination of membership probabilities in stellar clusters from proper motion data. Clusterix is a webbased, interactive application that allows the computation of membership probabilities from proper motions through a fully non-parametric method (Galadí-Enríquez et al. 1998). Version 1.0 (http://clusterix.cerit-sc.cz) was developed as a collaboration between the Masaryk University (Czech Republic) and the University of Barcelona, as a complement to WEBDA database of observational data on stars in open the clusters (http://webda.physics.muni.cz). Clusterix 2.0 is oriented towards the exploitation of Gaia data products. With the participation of the Spanish Virtual Observatory, Clusterix now features an improved user interface for a faster, easier and more accurate interactive definition of the cluster and field proper motion distributions. The system provides fast feedback between membership probability determinations and the distribution of the observables for the most probable members and field stars, with graphic tools to display, for instance, photometric diagrams on the fly. Furthermore, Clusterix 2.0 is fully VOcompatible, what opens interesting prospects for the astrophysical exploitation of the improved membership probabilities that it will be capable to provide for many open clusters observed by Gaia.

NGC 6067: el mejor laboratorio para el estudio de estrellas de masa intermedia

Javier Alonso Santiago

Con una edad ligeramente inferior a los 100 Ma NGC 6067 es el cúmulo abierto que, en su rango de edad, presenta la mayor cantidad de estrellas evolucionadas, haciéndolo único en la Galaxia para el estudio de estrellas de masa intermedia. Mediante el empleo combinado de espectroscopía de alta resolución y fotometría de archivo hemos llevado a cabo el estudio más completo hasta la fecha.NGC 6067 se encuentra situado a una distancia de 1,78 \pm 0.12 kpc, tiene un radio de 14,8+6,8-3,.2 arcmin y su edad es de 90 \pm 20 Ma. Se trata de un cúmulo muy masivo, con una masa inicial en torno a las 11000 Mo, cuya consecuencia es la existencia de un clump que contiene 12 (super)gigantes de 6 Mo cuvos tipos espectrales típicos están en el rango G8-K2 Ib/II. Presenta también dos cefeidas, dos (super)gigantes A y 14 gigantes B.Se han determinado también los parámetros atmosféricos (Teff, logg y [Fe/H]) para medio centenar de estrellas, obteniéndose una me talicidad media supersolar, [Fe/H]=0,19. Para las estrellas evolucionadas se han calculado también las abundancias de Li, O, Na, Mg, Si, Ca, Ti, Ni, Rb, Y y Ba. Se observa que el cúmulo es químicamente homogéneo y que su composición está dentro de lo esperado de acuerdo con su edad y su posicón en la Galaxia.En NGC 6067 la población de estrellas evolucionadas es suficientemente numerosa para constreñir los modelos evolutivos de estrellas de masa intermedia, tan sensibles al tratamiento de fenómenos complejos como el overshooting. En este sentido, la razón cefeidas/(super)gigantes rojas, la menor conocida en cúmulos similares y la posición en los diagramas HR de las estrellas evolucionadas son buenos indicadores de la bondad de los modelos. Observamos que éstos, muy dependientes de la metalicidad, no reproducen correctamente la posición de las cefeidas aunque sí la de las estrellas del clump.

Sesión VL: viernes 22 julio - mañana

Accretion/ejection coupling in stellar-mass black holes: the case of V404 Cyg

Teo Muñoz-Darias

X-ray observations performed by several missions during the last few decades have provided a rich data base on black hole and neutron star X-ray binaries. A strong coupling between the properties of the accretion flow and ejection processes (jets/winds) has been found to be a fundamental characteristic of these objects; a property which is probably shared by active galactic nuclei. I will review the state-of-the-art of the field and show the results of an intense GTC spectroscopic campaign (15 hours of ToO + DDT) that we have recently performed during the 2015 outburst of the prototypical black hole transient V404 Cyg. This event, the most interesting of its class in decades, has changed previous paradigms in this field of research.

Searching for binary central stars of planetary nebulae Alba Aller Egea

With the new binary central stars identified in the last years, binary interactions have become the main proposed mechanism to explain the complex morphologies seen in PNe. There are around 50 binary central stars detected so far. However, this number remains very small as compared to the more than 3000 known PNe in the Milky Way. In this context, we are leading a project to study how binary interaction processes influence the shape of PNe. For this purpose, the first step is to search for new binaries among the sample of known PNe, by means of multi-epoch photometric and spectroscopic surveys. We will use different techniques (radial velocity, light curves modulations) to detect and follow-up a large amount of binary systems in the nuclei of PNe. In this talk, we will summarize the goals of this project and show the ongoing work.

Revealing the Location of the Mixing Layer in a Hot Bubble

Martin A v

The fast stellar winds can blow bubbles in the circumstellar material ejected from previous phases of stellar evolution. These are found at different scales, from planetary nebulae (PNe) around stars evolving to the white dwarf stage, to Wolf-Rayed bubbles and up to large-scale bubbles around massive star clusters. In all cases, the fast stellar wind is shock-heated and a hot bubble is produced. At the mixing layer between the hot bubble and optical nebula, processes of mass evaporation and mixing of nebular material and heat conduction are key to determine the thermal structure of these bubbles and their evolution. In this talk I would review our current understanding of the X-ray observations of hot bubbles in PNe and I would present the first spatially-resolved study of a mixing layer in a PN.

Neutron-capture element abundances in the planetary nebula NGC 5315 from deep high-resolution optical and near-IR spectrophotometry.

Simone Madonna

Approximately half of the isotopes of elements with atomic number Z > 30 are created by slow neutron-capture process (s-process) in the stellar interior of low- and intermediatemass stars on the asymptotic giant branch (AGB), during the phase of thermal pulses. These elements are dredged up onto the surface of the star and later ejected into the interstellar medium by planetary nebulae ejection. In this work we study the chemical content of the planetary nebula NGC 5315 by joining deep, high-resolution spectrophotometric data taken with the echelle spectrograph UVES at 8.2m VLT and with the near-IR FIRE spectrometer at the 6.5m Magellan Baade telescope. We identify and measure more than 700 emission lines, some of which are faint lines of n-capture elements like Se, Kr, and Xe. The abundances of these elements are calculated with unprecedented accuracy, thus constraining the efficiency of the s-process and convective dredge-up in the progenitor star of NGC 5315.

Studies of circumstellar shells in AGB stars by multifrequency (sub)mm-VLBI observations of maser emission

Francisco Colomer

VLBI observations of maser emission are a basic tool to study the circumstellar envelopes (CSEs) around evolved stars, mainly around AGB and post-AGB stars. The maser lines of water and silicon monoxide are particularly intense. They provide us with high spatial resolution data on the very inner CSEs around AGB stars, including the pulsating layers previous to grain formation and outer regions where the fast expansion characteristic of such envelopes is already present. The analysis of the pumping mechanism of SiO masers and of the physical conditions in the emitting clumps requires accurate maps of the various lines, which show different excitation requirements. A large observational effort is being done to obtain (quasi-)simultaneous multiline data at the highest spatial resolution, using VLBI techniques, which makes possible to compare the relative distribution of the maser lines. The participati on of ALMA in these VLBI arrays will boost the study of these masers, at higher frequencies. We will present the state-of-the-art in the field, and discuss recent observations of SiO masers with the Global Millimeter VLBI Array (GMVA) which provide a new view into the physics of these AGB envelopes.

A pilot search for mm-wavelength recombination lines from emerging ionized winds in pre-Planetary Nebulae

Carmen Sánchez Contreras

The shaping of planetary nebulae (PNe) is probably the most exciting yet least understood problem in the late evolution of sun-like stars. We report preliminary results from a pilot search for radio recombination line (RRL) emission in a small sample of 8 pre-Planetary Nebulae (pPNe) and young PNe (yPNe) with emerging central ionized winds. Before this work, RRLs had only been searched for and detected in one pPN, CRL618 (Martin-Pintado et al., 1988). Observations of the H30alpha, H31alpha, H39alpha, H41alpha, H48beta, H49beta, H51beta, and H55gamma lines at 1 and 3 mm have been performed with the IRAM-30m radiotelescope in 2015. RRLs at mm-wavelengths are excellent probes of the dense inner regions of these objects, where the yet unknown agents for PN-shaping operate, and which are usually heavily obscured at shorter wavelengths by optically thick circumstellar dust shells. We detected mm-RRLs in three objects in our sample, namely, CRL 618, MWC922, and M2-9, consistent with high current mass-loss rates of >1e-7Msun/yr
and moderate velocities of ~20-50 km/s in their central ionized regions. For the pPN CRL618, the only pPN with previous published detections of H41alpha, H35alpha, and H30alpha line emission, we find significant changes in the lines' profiles indicating that current observations are now probing regions of the ionized envelope with expansion velocities and densities larger than 25 years ago, consistent with a varying stellar wind. We also report the second detection to date of maser H30alpha emission (in MWC922). In constrast to CRL618 and, possibly, M2-9, in MWC922, the RRLs are produced in the inner regions of a 'rotating disk + disk wind' system around a 5-7 Msun central object(s). We present the results from line + continuum radiative transfer models for CRL618, MWC922, and M2-9 using the code MORELI, which enables constraning the stucture, physical conditions (electron temperature and density) and kinematics of the current (post-AGB) mass-loss in these objects.

Multi-Conjugate Adaptive Optics images of the molecular hydrogen in the planetary nebula NGC 2346

Arturo Manchado

We present Multi-Conjugate Adaptive Optics (MCAO) images of the molecular hydrogen in the planetary nebula NGC2346. Images were obtained with Gemini Multi-Conjugate Adaptive Optics System (GeMS) + Gemini South Adaptive Optics Imager (GSAOI), at 8 m Gemini South Telescope. We achievied a spatial resolution of 80 milliarcseconds. At a distance of 700 pc this corresponds to a spatial resolution of 56 AU, which is slightly higher than an [N II] image of NGC-2346 obtained with **jError! Referencia de hipervínculo no válida.** For the first time it was possible to study in detail the structure of the H2, finding that it is composed of knots and filaments, which at lower resolution had appeared to be a uniform torus of material. The formation of clumps and filaments in this planetary nebula is consistent with a mechanism in which a central hot bubble of nebular gas surrounding the central star has been depressurized, and the thermal pressure of the photoionized region drives the fragmentation of the swept-up shell.

$Modeling\ nonthermal\ emission\ from\ stellar\ bow\ shocks$

Víctor Pereira Blanco

Runaway O- and early B-type stars passing through the interstellar medium at supersonic velocities and characterized by strong stellar winds may produce bow shocks that can serve as particle acceleration sites. Previous theoretical models predict the production of high-energy photons by nonthermal radiative processes, but their effciency is still debated. We aim to test and explain the possibility of emission from the bow shocks formed by runaway stars traveling through the interstellar medium by using previous theoretical models. We applied our model to AE Aurigae, the first reported star with an Xray detected bow shock, to BD+43 3654, in which the observations failed in detecting highenergy emission, and to the transition phase of a supergiant star in the late stages of its life. From our analysis, we confirm that the X-ray emission from the bow shock produced by AE Aurigae can be explained by inverse Compton processes involving the infrared photons of the heated dust. We also predict low high-energy flux emission from the bow shock produced by BD+43 3654, and the possibility of high-energy emission from the bow shock formed by a supergiant star during the transition phase from blue to red supergiant. We conclude that bow shocks formed by different types of runaway stars are revealed as a new possible source of high-energy photons in our neighbourhood.

Sesión VL: viernes 22 julio - tarde

Astroparticles and stellar evolution

Adrián Ayala Gómez

The nature of dark matter remains a puzzling problem today. A plausible solution is the existence of weakly interacting particles, like axions which, in some theoretical frames feature both, relic densities high enough to account for the missing mass of the Universe and small coupling constants to practically avoid interactions, out of gravitational, with common matter. The detection of these particles is the target of some ongoing experiments (like CAST or ADMX) and next upgrades, like IAXO. In our research we focus on the hints of the existence of axions (and other weakly interacting particles called hidden photons) which are related to some modifications of the observables of large star populations, respect to the standard stellar evolution. These corrections of the paradigm could even alleviate tensions between theory and observations, favouring the need of axions or hidden photons. Globular clusters are ensembles of around a million of stars, whose properties can be well reproduced by our simulations, within the systematical errors. We introduce, in the simulations of the evolution of a typical globular cluster star, the emission from the stellar core of weakly interacting particles and compare these simulations with accurate color magnitude diagrams and luminosity functions obtained from the observational survey of different GCs. In this way, and after regarding all the uncertainties, it is possible to reject models in disagreement with observations. Therefore constraints on the aforementioned dark matter candidates can be derived, especially on their mass and coupling constant to photons and other standard model particles.

Contribution due to clumpy winds to the gamma-ray emission in microquasar jets

Víctor Moreno de la Cita.

Powerful jets in high-mass microquasars are likely to be crossed by dense inhomogeneities (clumps) from the stellar winds, which may lead to particle acceleration and thus non-thermal emission in X-rays and gamma-rays. We characterise a typical clump-jet interaction scenario and compute the contribution to the high-energy emission of these systems. We use hydrodynamical simulations of a single clump-jet interaction and we use this result to compute its non-thermal (synchrotron and inverse Compton) radiation. We present several radiative calculations for a number of clump states, as the clump is disrupted over time, letting different parameters vary (viewing angle, magnetic field). We obtain significant amounts of non-thermal radiation from jet-clump interactions in high-mass microquasars.

Early-type massive stars in Carina Nebula within Gaia-ESO Survey

Sara Rodríguez Berlanas

The Gaia-**ESO Survey is obtaining high quality spectra of ~10 stars in our Galaxy, providing** an homogeneous and unique overview of all the main components of the Milky Way, its formation history and the evolution of young, mature and ancient Galactic populations. Our group is in charge of the early-type massive stars that define the youngest population in the survey. Using automatized tools for the determination of stellar parameters, we are able to obtain properties for these objects, which are key points to study the most recent epochs of formation and evolution of our Galaxy. In this contribution, we present the results of the quantitative spectroscopic analysis of O-type stars in the Carina Nebula within the Gaia-ESO Survey. For this aim, we have used FASTWIND and CMFGEN stellar atmosphere codes, providing stellar parameters as well as elemental abundances.

Pulsar with MAGIC

Jezabel R. Garcia

MAGIC is a stereoscopic system of two imaging atmospheric Cherenkov telescopes, located at the Roque de los Muchachos Observatory, in La Palma (Spain). Since 2008, MAGIC has palyed a big role in Pulsar physics due to the discovery of the first VHE (> 25 GeV) gamma-ray emission from the Crab pulsar. Such a discovery was possible thanks to a revolutionary trigger technique used in the initial MAGIC mono system, the Sum-Trigger, that provided a 25 GeV energy threshold. Due to its bright emission in comparison to other pulsars, the study of the Crab keeps providing numerous important results for the understanding of pulsar physics. The most recent ones are the bridge emission at VHE and the detection of the Crab pulsations at TeV energies. For several years, MAGIC has been searching for new pulsars, providing recently interesting results about the Geminga pulsar and nebula. This talk reviews the essential MAGIC results about VHE pulsars and their implications for pulsar physics. Also we discuss the development of a new stereo trigger system, the Sum-Trigger-II, and its performance as well as the importance of the observation windows that this system opens for the study of VHE pulsars.

The impact of prewhitening in the characterization of pulsating stars observed by space missions

Javier Pascual-Granado

Even when ultraprecise observations are performed by space missions for determining the frequency content of multiperiodic pulsating stars, gaps associated to wrong data acquisition are unavoidable. In these cases, the most extended method in asteroseismology for determining the frequency content consists of an iterative process called prewhitening. The usual assumption is that this method does not alter the original frequency content of the time series. Here we test this assumption by performing frequency analyses of a set of delta Scuti stars from the seismofield of CoRoT satellite. The frequency analyses performed on gapped data show that only the very first frequencies are preserved. It follows from these results that the standard techniques applied in asteroseismology to infer the internal structure of pulsating stars cannot be applied if a reliable filling of the gaps is not performed previously.

Gas molecular caliente en estrellas evolucionadas de tipo solar en el catalogo THROES

Jesús Ramos Medina

En nuestro proyecto THROES (A caTalogue of HeRschel Observations of Evolved Stars), estamos trabajando en la reduccion y analisis sistematicos de datos espectroscópicos obtenidos con PACS y SPIRE para una muestra de mas de 120 estrellas evolucionadas en distintas fases: AGB, post-AGB y PN. Aprovechando la ventana abierta por Herschel en el infrarrojo lejano, estamos realizando un estudio sistemático de las líneas de emisión del gas molecular, atomico e ionizado asi como de la componente solida (granos de polvo) que son abundantes en las envolturas de estos objetos. En este trabajo, presentare algunos de nuestros resultados preliminares encaminados a caracterizar las propiedades fisicas de la componente molcular caliente (>~200-1000K), que es trazada por lineas de alta excitacion de CO y vapor de agua, entre otras. Este estudio se está llevando a cabo en toda la muestra para obtener una visión global del contenido de estas y otras especies en las distintas fases evolutivas.

The Rb problem in massive AGB stars

Víctor Pérez-Mesa

The asymptotic giant branch (AGB) is formed by low- and intermediate-mass stars (M < 8 solar mass) in their last nuclear-burning phase, when they develop thermal pulses and suffer extreme mass loss. AGB stars are the main contributor to the enrichment of the interstellar medium and thus to the chemical evolution of galaxies. Particularly, the more massive AGB stars (M > 4 solar mass) are expected to produce light (e.g., Li, N) and heavy neutron-rich s-process elements (such as Rb, Zr, Ba, Y, etc.), which are not formed in lower mass AGB stars and Supernova explosions. Classical chemical analyses using hydrostatic atmospheres revealed strong Rb overabundances and high [Rb/Zr] ratios in massive AGB stars of our Galaxy and the Magellanic Clouds (MC), confirming for the first time that the 22Ne neutron source dominates the production of s-process elements in these stars. The extremely high Rb abundances and [Rb/Zr] ratios observed in the most massive stars (s pecially in the low metallicity MC stars) uncovered a Rb problem; such extreme Rb and [Rb/Zr] values are not predicted by the s-process AGB models, suggesting fundamental problems in our present understanding of their atmospheres. We present more realistic dynamical model atmospheres that consider a gaseous circumstellar envelope with a radial wind and we re-derive the Rb (and Zr) abundances in massive Galactic AGB stars. The new Rb abundances and [Rb/Zr] ratios derived with these dynamical models significantly resolve the problem of the mismatch between the observations and the theoretical predictions of the more massive AGB stars.

Pósteres

A new near infrared classification of pre main sequence stars

Miguel Alonso Martínez

We obtained mid-resolution JK spectra with WHT/LIRIS and NOT/NOTCam of ~ 110 T Tauri stars (SpT ~ K to M) in the Taurus region. Here we present equivalent width line measurements of common and strong spectral features. The spectra show lines that depend on the temperature (and gravity). Various methods of spectral classification already exist in the literature, but we now aim at providing a direct and fast method to derive effective temperatures for our sample stars. To overcome the effects of veiling, line ratios of strong absorption features relatively close in wavelength are used. Nal(2.208 μ m)/Mgl(2.281 μ m) and Cal(2.265 μ m)/Mgl(2.281 μ m) line ratios follow a tight relation as function of effective temperature. These particular line ratios are good proxies for stars cooler than 5000 K, as seen in a test with standard stars. Because dwarfs and giants can show different behaviors with temperature, clearly associated with their gravity (log g = 3– 5 compared to log g = 0–3), we need a proxy to discern between the two. The All (1.313 μ m) line helps to overcome this issue, as it is strongly gravity-dependent. Finally, we estimate accretion rates using the H-lines Paschen beta and Br gamma.

Unraveling the contribution of jets and discs to far-infrared line emission

Miguel Alonso Martínez

Protoplanetary discs are ubiquitously found around young stars and are the sites where planets form. As part of Herschels' key programme "Gas in Protoplanetary Systems" (GASPS), we have analyzed far-IR (60—190 μ m) spectra of protoplanetary discs around 76 T Tauri stars located in Taurus. These stars are in different evolutionary states from Class I to Class III sources, and 27 show jet/outflow activity. We derived fluxes of all detected atomic and molecular lines - [OI], [CII], CO, H2O and OH. Outflow sources are found to have the richest spectra and highest line fluxes, while non-outflow sources are rather poor in lines. We find that just from an observational perspective, the outflow rather than the disc dominate the emission at early evolutionary stages (Class I/II). We found correlations between several emission lines which suggests a common origin. To verify whether the line emission is associated with the protoplanetary disc or shocks, we compared the observed line fluxes and their ratios with disc and shock models. The atomic gas line ratios are compatible either with PDR (logG_{0}>3, n>10^4 cm^-3) and fast (V_shock 50 km/s) CJtype shock emission with densities ~ 10^3 cm-3. The molecular emission is more compact and better explained with slow (V_shock ~15-40 km/s) CJ-type shocks involving densities between 10^4 cm^-3 and 10^6 cm^-3, depending on the particular line. The disc models fail to reproduce the high line fluxes. We compare dust tracers with the line fluxes, to understand how much emission can be associated with the disc at different evolutionary stages. We conclude that models taking into account jets, disc and their mutual interaction are needed to precisely interpret observations of young T Tauri stars.

The evolution of the Milky Way's radial abundance gradients

Friedrich Anders

Using asteroseismic CoRoT observations of red giant stars together with APOGEE spectroscopy, we measure the age dependence of the radial metallicity distribution in the Milky Way's thin disc over a large radial range. While the gradient traced by the young

population (Age <2 Gyr) is compatible with measurements of Cepheids in the literature, stellar radial mixing and migration seem to wash out any present differences in the metallicity distributions after about 4 Gyr. Our results also suggest the presence of a metallicity floor in the disc's interstellar medium of about [Fe/H] = -0.8 which has remained constant for the past 8-10 Gyrs.

Binary Stars in the AB Doradus Moving Group

Rebecca Azulay Romero

We present a study of the radio emission and kinematics of a sample of stars belonging to the AB Doradus moving group through VLBI observations. The main aim of our study is to obtain precise estimates of the dynamical mass of young, low-mass stars, which in combination with photometric measurements provide precise benchmarks for calibrating pre-main-sequence (PMS) stellar evolutionary models. Previous studies show that model predictions are in disagreement with experimental results for masses below 1.2 MO Among the stars included in our study, we emphasize the results obtained in two of them: ABDorB and HD160934, from which we have measured both the relative and absolute orbital motion. Accordingly, we obtained precise estimates of the mass of the dynamical masses with the prediction of PMS evolutionary models show that the models underpredict the dynamical masses of the binary components by 10--40%.

Detailed studies of three open clusters from Gaia ESO Survey (GES)

Lola Balaguer-**Núñez**

We present results for the intermediate-age and old open clusters NGC6633, NGC6705 (M11) and NGC2682 (M67). We have used new Stromgren photometry, proper motions from ROA observations and spectral information from Gaia ESO and OCCASO Surveys among others, to study the physical parameters of the stars in the three cluster's areas. The astrometric studies cover an area of about 1deg^2 and down to r'~17 while our INT-WFC CCD intermediate-band uvby-Hbeta photometry cover an area of about 40'x40' down to V~19. The stars of those areas selected as cluster members from their proper motions, are classified into photometric regions and their physical parameters determined, using uvby-Hbeta photometry and standard relations among colour indices for each of the photometric regions of the HR diagram. That allows us to determine reddening, distances, absolute magnitudes, spectral types, effective temperatures, gravities and metallicities, thus providing an astrophysical characterization of the clusters. These results are compared with the physical parameters obtained from GES spectral data as well as radial velocities to confirm membership. All these data lead us to a (1) comparison of photometric and spectroscopic physical parameters, and (2) complete study of the structure, dynamics and mass segregation of these three open clusters.

Catalogue of UV sources in the Galaxy

Leire Beitia Antero

The Galactic Evolution Explorer (GALEX) has produced the largest photometric catalogue of ultraviolet (UV) sources. As such, it has defined the new standard bands for UV photometry: the near UV band (NUV) and the far UV band (FUV). However, due to brightness limits, the GALEX mission has avoided the Galactic plane which is crucial for astrophysical research and future space missions. The International Ultraviolet Explorer **(IUE) satellite obtained 63,755 spectra in the low dispersion mode (resolution 6 Å) with**

LA VÍA LÁCTEA Y SUS COMPONENTES Pósteres

good photometric quality during its 18 years lifetime. We have derived the photometry in the GALEX bands for all the stellar sources in the IUE Archive to extend the GALEX data base with observations including the Galactic plane. Good quality spectra have been selected for all IUE classes of stellar sources. The GALEX FUV and NUV magnitudes have been computed using the GALEX transmission curves, as well as the conversion equations between flux and magnitudes provided by the mission (galexgi.gsfc.nasa.gov).

Consistency between GALEX and IUE synthetic photometries has been tested using White Dwarfs (WD) contained in both samples. The saturation limit of GALEX photometry (NUV **lim 13mag, FUV lim < 12mag) is found to be in good agreement with previous works.** The photometric data base is made available to the community through the services of **the Centre de Données Stellaires at Strasbourg (CDS). The catalogue contains FUV** magnitudes for 1,795 sources, ranging from FUV= 1.8 to FUV=21.4 mag, based on 5,127 observations obtained with the IUE. In the NUV band, the catalogue includes observations for 1,156 stars ranging from NUV = 3.1 to NUV= 18.3 mag based on 10,195 observations.

Cepheids: Determination of atmospheric parameters as a function of phase with iSpec

Sergi Blanco-Cuaresma

Classical Cepheids are radially pulsating stars where the spectral type varies depending on their phase (F-type at maximum, G-K type at minimum). Several studies used the equivalent width method to determine the evolution of effective temperature, surface gravity and metallicity for classical cepheids with different pulsation periods (Luck and Andrievsky 2004; Kovtyukh et al. 2005; Andrievsky et al 2005; Luck et al 2008; Takeda et al. 2013). We evaluated iSpec (Blanco-Cuaresma et al. 2014), which has been extensively used with non-pulsating FGK stars, to derive atmospheric parameters as a function of phase for classical Cepheids. This tool allows us to completely automatise the analysis process and test different atmospheric models, atomic line list, radiative transfer codes and spectroscopic methods, such as the classical equivalent width method or the synthetic spectral fitting technique.

Carmencita, the CARMENES Cool dwarf Information and daTa Archive

Jose A. Caballero

CARMENES, the new ultra-stable high-resolution spectrograph at the 3.5 m Calar Alto telescope and the only one in its category that covers from 0.52 to 1.71 mum in one shot, started its Guaranteed Time Observations (GTO) in January 2016.

Under GTO, CARMENES is monitoring approximately 300 selected M dwarfs for at least three years with the aim of finding rocky planets, perhaps habitable, orbiting around them. Those 300 GTO stars are the brightest and latest single M dwarfs observable from Calar Alto, which are carefully picked up from the CARMENES input catalogue, dubbed "Carmencita": CARMENES Cool star Information and daTa Archive. For each of the over 2200 M dwarfs in Carmencita, a team of German and Spanish astronomers involving PhD, MSc and BSc students has collected a large amount of information, compiled from the literature or measured by us with new data: accurate astrometry, spectral typing, photometry in 20 bands from the ultraviolet to the mid-infrared, rotational and radial velocities, X-ray count rates and hardness ratios, close and wide multiplicity data, kinematics, derived stellar parameters... The private on-line catalogue, including preparatory science observations (i.e., high-resolution imaging, low-and high-resolution spectroscopy), will be eventually public as a CARMENES legacy.

Survey of Young Stellar Clusters in the North Hemisphere

M. Teresa Costado Dios

Five years ago, the Stellar Systems Group of the IAA began an observational programme of young stellar clusters containing massive stars, whose main objective is the characterization of their stellar population using optical (UBVRI+ H) and NIR (JHK) photometry. With these data, we can obtain the physical parameters of the clusters and determine the mass function of the cluster members, their spatial distribution by mass range, as well as a census of populations at different masses and evolutionary states for two distinct environments: a) isolated clusters, and b) clusters contained within a larger star-forming region. So far, we have observed around 20 clusters, which are at different stages of analysis. The optical data were secured from the 1.5m telescope at Sierra Nevada Observatory (OSN), while the NIR data were taken using the Nordic Optical Telescope (NOT) at Roque de los Muchachos Observatory. The last year, we began the optical observations of the survey with a larger field of view (13' size) at the 0.9m telescope (OSN). The analysis of the set of standard stars observed along the whole project enabled us to determine a reliable estimation of the atmospheric extinction as well as to analyze the stability of the photometric transformations at OSN to calibrate the data. In this poster, we present the results of the calibration analysis and the preliminary study for a subsample of the clusters.

Preliminary study of the kinematic structure in the association Cygnus OB1

M. Teresa Costado Dios

The main objective of this project is the characterization of the velocity field in the Cygnus OB1 association using the current available data in the literature. This association is part of a larger star-forming complex located in the direction of Cygnus, but whose main subsystems may be distributed at different distances from the sun. This project is a necessary study previous to the definition of a new scientific case to study Cygnus OB1 in a denser and deeper way with WEAVE. WEAVE is a future multi-object spectrograph to be attached at the William Herschel Telescope (WHT). The field of view is of two degrees in diameter, with almost 1000 fibres and two resolution modes. The first light is scheduled for 2018 and the survey will last 5 years with 236 guaranteed nights per year. The survey is divided in several scientific cases; one of them is named "Galactic Archaeology". The study of the open clusters and associations belongs to it. Our main scientific objective is the study of the kinematic properties of some star-forming regions in terms of age, metallicity, and position. We are interested in determining the spatial structure of the velocity field in the association Cygnus OB1, which includes several young stellar clusters. We found 5 previous catalogues of radial velocities and some studies of the clusters in the area. From current literature, we have collected more than 300 stars in the area of 5 x 5 squared degrees centred in the association. This area also covers part of the Cygnus OB3 and OB9 associations. In this talk, we want to make a description of the different stellar populations present in the area and to show a preliminary analysis of the phase-space groupings found in the region.

Fullerenes and fullerene-related molecules in the circumstellar environment of evolved stars

José Jairo Díaz-Luis

Fullerenes, highly resistant and stable tridimensional carbon molecules, have attracted much attention since their discovery at laboratory by Kroto and collaborators; e.g., fullerenes and fullerene-related molecules may explain several phenomena in

LA VÍA LÁCTEA Y SUS COMPONENTES Pósteres

Astrophysics such as the diffuse interstellar bands (DIBs) and the UV bump. The recent detection of the most common fullerenes (C60 and C70) in the circumstellar environment of evolved stars like planetary nebulae (PNe) has raised the idea that other forms of carbon such as hydrogenated fullerenes, buckyonions, and carbon nanotubes may be widespread in the Universe and it has permitted to study the DIBs towards fullerene-rich space environments for the first time. In particular, here we present: i) a study of DIBs in the optical spectra of fullerene-containing PNe and the first possible detection of two diffuse bands of circumstellar origin (diffuse circumstellar bands, DCBs) at 4428 and 5780 **Å around PN Tc 1; indeed these DCBs could be associated with very large fullerenes or** buckyonions; and ii) the non-detection of fullerene-related molecules such as hydrogenated fullerenes (fulleranes like C60H36 and C60H18) in the 3-**5 µm spectral range** in C60-rich PNe. Our non-detections together with the (tentative) fulleranes detection in a proto-PN suggests that fulleranes may be formed in the short transition phase between asymptotic giant branch (AGB) stars and PNe but they are quickly destroyed by the UV radiation field from the central star.

Determinación de períodos de rotación de estrellas M con técnicas fotométricas

Enrique Díez Alonso

Este trabajo se enmarca en el proyecto CARMENES que busca exoplanetas tipo terrestre en estrellas enanas de tipo espectral M. Nuestro objetivo es caracterizar los períodos de rotación de las estrellas enanas de tipo M del catálogo de entrada de CARMENES con el fin de poder distinguir las variaciones en velocidad radial producidas por la actividad magnética de las producidas por los posibles exoplanetas en estas estrellas. Estos datos permitirán además estudiar en detalle la dependencia de la actividad cromosférica con la rotación en este tipo de estrellas. Para ello se están analizando series fotométricas de las estrellas de la muestra realizadas por surveys como MEarth, ASAS o K2. También se están realizando observaciones en varios telescopios en colaboración con observatorios amateurs. Así mismo y con objeto de optimizar la sensibilidad fotométrica de los citados observatorios se están desarrollando y probando nuevas técnicas fotométricas y de modelización de la turbulencia atmosférica basadas en inteligencia artificial. Estas técnicas persiguen reducir los efectos perniciosos que la turbulencia atmósferica tiene sobre las curvas de rotación obtenidas.

The Spanish Network for Gaia Science Exploitation

Francesca Figueras

The "Red Española de Explotación Científica de Gaia" (REG) continues to intensify its activities facing the imminent publication of the first and second Gaia Data Releases (September, 2016 and summer 2017, respectively). The network, supported by the **MINECO under contract** "Acciones de dinamización, Redes de Excelencia (2016-2017)", has as major priority the task to coordinate and support the collective activities developed by its more than 150 members. At present, REG plays a prominent role in the preparation of the Spanish community for the use of the Gaia Data Archive (a task being leaded by the Spanish teams), in the work to exploit the Gaia-ESO survey collected during the last four years and in supporting the preparation of the Science Case and Survey Plan for WEAVE, the new multi-object spectrograph for the WHT at Canary Islands (commissioning, 2018). These activities will be described together with the schedule of future national and i nternational science meetings and the outreach activities being organized for the First and Second Data Release.

Reveal the population of ASCC20

Francisco J**osé** Galindo-Guil

We present a study of the open cluster ASCC-20. This young stellar association is 20 Myr old (based on the upper main sequence fitting) and is located at 450 pc. We have created a multi-wavelength photometric catalogue of cluster candidate members by using archival data and data-mining techniques. In addition, we have followed-up a fraction of our candidates by using astrometric --from different epochs-- and additional spectroscopic data -- with CAHA-TWIN and GTC-OSIRIS. We have derived spectral types, confirmed their membership and measured spectral features related with their youth down to the M7 spectral type.

The Luminous Red Nova M31N 2015-01a

Stefan Geier

The MASTER-Kislovodsk auto-detection system discovered a faint transient in the Andromeda galaxy on January 13th 2015. It was originally identified as a nova and received the designation M31N 2015-01a. Further observations showed some discrepancies with the spectra and light-curves typical for classical novae. The transient was re-identified as a Luminous Red Nova (LRN) and a possible stellar merger, similar to V838Mon. In this poster we will deliver a short overview of our current understanding of this class of objects and a summary of the current state of the ongoing observing campaign of the M31 LRN. Recent results will be discussed with a particular emphasis on the contributions made possible by GTC and other observing facilities at Observatorio Roque de los Muchachos. This is only the 8th object of this type observed in the Milky Way and other nearby galaxies, and one of the best studied in all spectral wavelengths, adding important details to our un derstanding of that (so far) rarely observed phenomenon.

Membership, lithium and chromospheric activity of the young open clusters IC 2391, IC 2602 and IC 4665 from GES (Gaia-ESO Survey) observations.

Miguel Gómez Garrido

We conduct a comparative study of the main properties of the of the young open clusters IC 2391, IC 2602 and IC 4665, focusing on their membership, lithium abundance and level of chromospheric activity and possible accretion. We use the fundamental parameters (effective temperature, surface gravity, and radial velocity) delivered by the Gaia-ESO survey (GES) consortium in the four internal data release (iDR4) to select the members of these clusters among the UVES and GIRAFFE spectroscopic observations. Chromospheric activity criterium, and iterative process between radial velocity distribution and lithium-temperature diagram are applied to determinate what objects are members or non members of the clusters. All this information allowed us to characterize the properties of the members of these clusters and identify some field contaminant lithium-rich giants.

Multi-wavelength Studies of Wolf-Rayet Bubbles

Martin A. Guerrero

Wolf-Rayet stars harbor the most powerful stellar winds, with terminal wind velocities above 1,000 km/s and mass-loss rates up to 10⁻⁴ Msun/yr. These stellar winds blow bubbles and produce notorious interactions with the circumstellar material. These can be

detected at different wavelengths, either in X-rays produce inside the hot bubble, or nebular optical emission lines at the swept-up material ionized by the central star, or by the infrared thermal emission of dust at the outer nebular edge.

Calibrating the lithium-age relation with open clusters observed with GES (Gaia-ESO Survey).

Marta Lúthien Gutiérrez Albarrán

Li depletion is strongly age-dependent but currently available data have shown a complex pattern of Li depletion on the pre- and main-sequence stars that is not yet understood. The lithium abundance observed in late-type stars depend not only of the age and the temperature but also on metallicity, mixing mechanisms, convection structure, rotation and magnetic activity. The large number of stars observed within the Gaia-ESO survey (GES) for many open clusters and associations can be used to calibrate the lithium-age relation and its dependence with other parameters that can be derived from the UVES and GIRAFFE spectroscopic observations. We present here the preliminary results of the analysis of membership and Li abundance of the young clusters and associations, as well as of the intermediate-age and old open clusters, observed until now in GES (iDR4) in order to conduct a comparative study. All this information allowed us to characterize the properties of the members of these clusters and identify a series of field contaminant lithium-rich giants.

GTC-10.4m/OSIRIS spectroscopy of Aquila X-1

Felipe Jiménez-Ibarra

Low-mass X-ray binaries (LMXBs) are binary systems harbouring an accreting compact object, either a neutron star or a black hole, and a companion star less massive than the Sun. These objects are among the brightest X-ray sources in the sky, allowing us to study in great detail both accretion processes and the fundamental properties (e.g. mass) of compact objects. We present GTC-10.4m/OSIRIS spectroscopy of the optical counterpart of the transient system Aquila X-1 obtained during two consecutive accretion episodes in 2011 and 2013. We have performed a detailed analysis of the evolution of the main optical spectral features, with emphasis on the Bowen blend at 4640 A. This high excitation emission line encodes information regarding both the accretion disc and the irradiated side of the companion, and can thereby be used to carry out dynamical studies. We also study the evolution of hydrogen (Balmer) and helium emission lines as a function of the both the X-ray luminosity and the ionization state of the disc.

The intermediate and old age Open Clusters science case for highresolution spectroscopy

Carme Jordi

Open Clusters (OCs) are key objects for studying the formation and evolution of the Galactic disk. OCs are targets in on-going large spectroscopic surveys like Gaia-ESO and **"Open Clusters Chemical Abundances determination from Spanish Observatories survey (OCCASO)" surveys. We will discuss the science case of the intermediate and old OCs for WEAVE, the target selection and the limitations. The extension to 4MOST and MOONS will be addressed. Additionally, the impact of the discovery of new clusters by the Gaia space mission will be discussed.**

Compact Binary Millisecond Pulsars: A Panchromatic View of a Growing Neutron Star Population

Manuel Linares

I will present a multi-wavelength overview of compact binary millisecond pulsars, as well as our latest results from the optical studies of this rapidly growing class of neutron stars. I will discuss a new method to measure neutron star masses from the radial velocities of companion stars, strongly irradiated by the pulsar wind and high-energy radiation.

The Galactic O-Star Spectroscopic Survey (GOSSS): current status

Jesús Maíz Apellániz

The Galactic O-Star Spectroscopic Survey (GOSSS) is a long-term project whose main objective is to obtain high-quality intermediate-resolution blue-violet spectroscopy of all optically accessible Galactic O stars. I will present our recent work on this survey, which includes the publication of the third large paper, the release of the associated data, updates on the software, and other additions to the Galactic O-Star catalog (GOSC). I will also discuss our plans for the future, including the use of different telescopes, the connection with WEAVE, and how the incoming Gaia data releases will affect the survey results.

Progress towards a universal family of UV-IR extinction laws

Jesús Maíz Apellániz

I will present the progress in generating a universal 0.1-100 micron family of extinction laws in the last two years. I have analyzed IR spectrophotometry, cross-calibrated different IR photometric systems, and obtained optical-UV HST and optical ground-based spectrophotometry of targets in the Milky Way and the LMC. I will also discuss how the first Gaia data release will complement the existing data.

The origin of the Fast Radio Bursts, a still open question

Benito Marcote

Fast Radio Bursts (FRBs) are transient sources characterized by exhibiting a strong a single short pulse (with a duration of milliseconds or submilliseconds). They were firstly discovered by Lorimer et al. (2007), and nowadays tens of these events have been observed. Its origin remains unknown. Both, Galactic and extragalactic origins, have been proposed. The observed pulses resembles the ones from pulsars, and thus preferring a Galactic origin. However, the large dispersion measure observed in the pulses indicates an extragalactic origin. Many scenarios have been proposed up to now to explain the FRBs, most of them based on cataclysmic events. However, the identification of the first repeating FRB (Spitler et al. 2016) indicates that could there be, at least, two different scenarios. Keane et al. (2016) reported for the first time the localization of an FRB. FRB 150418 was observed by the Parkes telescope and a transient source located in a galaxy was localized in the field of view with the Australian Telescope Compact Array (ATCA). This association would confirm the extragalactic origin of the FRBs. However, this association has been widely discussed during the last months. Here we present a monitoring of the associated galaxy, WISE J071634.59–190039.2, with the European VLBI Network (EVN). Our data show a compact radio emission persistent on day/week timescales one year after the observed FRB. This behavior perfectly fits to the expected emission of a regular active galactic nuclei (AGN), and thus not with the association of the FRB.

An AGN or a Be star as possible counterparts of 3FGL J0133.3+5930

Josep Martí Ribas

We present the current status of our program for cross-identification of unassociated gamma-ray sources at low galactic latitudes. The main motivation for this work is the search for new members of the scarce class of gamma-ray binaries and microquasars. While carrying out this hunt, other unexpected but no less interesting objects can also emerge. Here we report in detail our results in the case of 3FGL J0133.3+5930. A clear counterpart candidate has been identified inside the 95% confidence ellipse of this Fermi LAT source. Its spectral energy distribution, from radio to gamma-rays, is strongly suggestive of an AGN nature. A second counterpart candidate in the same field is the optically bright Be star TYC 3683-985-1, initially suspected to be a new gamma-ray binary. Follow-up optical and spectroscopic observations finally led us to discover that TYC 3683-985-1 is in fact a semi-detached eclipsing binary with two early-type components. Its orbital half-period is remarkably close to an integer number of days, thus rendering it a difficult target to show up as a variable source in automated optical surveys operating on a daily basis. The different possible physical scenarios are discussed.

A setup for Gaia-DR1: The star formation history of our thin disc environment

Nuria Miret

The first Gaia Data Release (Gaia-DR1, September 2016) primes the pump and paves the way for a new golden age of the galactic astronomy. We expect Gaia-DR1 will provide us new parallaxes and proper motions for about two million well-behaved Tycho-2 stars. This TGAS (Tycho-Gaia Astrometric Solution) catalogue is being obtained using the first year of Gaia data and Tycho positions as priors. Using both, the astrometric accuracy expected in **TGAS and the Besançon Galaxy Model, we quantify and characterize this new 5D** (statistically robust) snap-shot of the solar neighborhood. We plan to discuss how long standing issues such as the detection of young local associations, the Gould Belt or the galactic warp kinematics will be seen by TGAS. Furthermore, we will use test particle simulations in realistic galactic potentials to evaluate the present capabilities to trace back on time the star formation history of our thin disc environment.

Characterizing the CARMENES input catalogue of M dwarfs with lowresolution spectroscopy: spectral types, chromospheric activity and metallicity

David Montes Gutierrez

In this contribution we summarise our science preparation activities to complete the CARMENES input catalogue of M dwarfs using low-resolution spectroscopy to derive spectral indices sensible to spectral type, gravity and metallicity as well as the level of chromospheric activity. We provide here all this information for 230 stars in addition to the 753 stars already published in Alonso-Floriano et al. (2015). In addition, we have developed a calibration of the M-dwarfs metallicity (Alonso-Floriano et al. 2016) using physical binaries composed of an F-, G- or K-dwarf primary and an M-dwarf secondary that allow us to provide the metallicity for all these M dwarfs.

CARMENES input catalogue of M dwarfs: Looking for close and wide companions

David Montes Gutierrez

Aims: We aim to look for close low-mass companions of M dwarfs for a more appropriate selection of the CARMENES targets, as well as for wide common proper motion companions up to 10000 au for a better characterization of the multiplicity of M dwarfs in the solar neighborhood. Methods: On one hand, we obtained high-resolution images in the I band with the lucky imaging instrument FastCam at the 1.5m Telescopio Carlos Sánchez for 490 mid- to late-M dwarfs. For all the detected binaries we measured angular separations, estimated the masses of the components and calculated orbital periods. On the other hand, we used STILS, TOPCAT and Aladin Virtual Observatory tools together with proper motions and distances of the CARMENES input catalogue for an extensive search of similar proper motions in a 10000 au radius. Results: Of the observed stars with FastCam: 75% are single, 16% have confirmed or probable physical related companions in the range 0.15-17.70 arcsec (2-263 au) and the remaining 10% have background sources or artifacts. We provide new astrometric epochs for over 70 previously known pairs, and discover 28 new binary stars and 5 likely new bound systems. Of them, 16 systems have estimated periods shorter than 20 years. Of the more than 2000 input M dwarfs of the Virtual Observatory common proper motion search, we found around 730, of which 360 are already known WDS visual companions. A more restrictive cut off on the remaining 370 candidates gives 170 candidates that are still being analysed.

Un cúmulo joven masivo en el brazo de Perseo

Ignacio **Negueruela Díez**

Nuestra investigación del cúmulo enrojecido Berkeley 51 revela una importante colección de supergigantes amarillas y rojas. Espectroscopia multi-objeto con Osiris en gtc nos muestra una población de estrellas b, con una secuencia principal que se extiende hasta b3V. Combinando espectroscopia y fotometría derivamos una edad en torno a 35 Ma y una distancia compatible con el brazo de Perseo. La población de estrellas observada sugiere una masa total del orden de 10000 masas solares, un resultado que confirma que los cúmulos jóvenes masivos son bastante abundantes en la vía láctea, en contra de lo que se pensaba hace tan sólo unos años.

Stellar pulsation and rotation in NGC 6811

Sandra Ocando

We present the results of the frequency analysis for a selected sample of pulsating Delta Sct- and Gamma Dor-type stars, in the open cluster NGC 6811, which have been observed in short-cadence (SC) mode by the Kepler satellite. In all cases, the resulting frequency spectra are very complex, especially when the dominant pulsation is that of the Delta Sct type, that is, short-period pulsations corresponding to excited pressure (p) modes. In all these cases, the Delta Sct stars are shown to be essentially Delta Sct/ Gamma Dor hybrid pulsators. However, the opposite rule seem not to be true. Moreover, we find that the pulsations commonly are not stable in amplitude. We detect that an important number of the main excited modes significantly change their amplitudes over relatively short time scales. On the other hand, we have also detected the stellar rotation periods for a significant percentage of objects in our sample. This is an indication of stellar activi ty in the surfaces of these stars of spectral type A. Sometimes, activity dominates the luminosity variations of some stars in our sample.

Ground-based multicolour photometry of NGC 6811

Sandra Ocando

NGC 6811 is one of the four open clusters in the field of view of the Kepler space mission. Among its members there are several known pulsating A-F stars of the Delta Scuti, Gamma Doradus, and hybrid type, which makes this cluster a very interesting object to study its pulsational content. During the summers of 2013 and 2014 we performed an extensive observational campaign using the 1.5 m telescope at the Sierra Nevada Observatory and multicolour photometry. New pulsating variables candidates are detected in this work. We fulfilled a frequency analysis for the known variables, with very good agreement with previous results. By using Stromgren photometry we were able to obtain the main physical parameters of the stars such as temperature, surface gravity, metallicity and luminosity. We have also determined the corresponding frequency phase-shifts and amplitude ratios between different filters as a first step to identify the pulsational modes of the variables.

Determinación precisa de los parámetros orbitales del sistema binario espectroscópico etaBoo

Pere L. Pallé

Las observaciones realizadas con el espectrógrafo de alta resolución ubicado en el telescopio Hertzsprung SONG en el Observatorio del Teide han permitido obtener una serie temporal de casi 1000 días de medidas de la velocidad radial de la estrella etaBoo (Mufrid) de muy alta precisión. En esta contribución se presenta el análisis de estas observaciones con el que se ha caracterizado este sistema binario espectroscópico obteniendo sus parámetros orbitales con mucha más precisión que la existente hasta la fecha y permitiendo una mejor estimación de la masa del objeto

Detection and study of circumstellar envelopes in extremely young planetary nebulae

J. Ricardo Rizzo Caminos

Maser emission lines in intermediate-mass evolved objects are one of the best signposts of the energetic events which drive the evolution of the planetary nebulae. One of the most challenging aspects is the physical relationship between the occurence of water and OH masers, the precise evolutive stage of the stars, and their mass progenitors. We haved used the 30m radio telescope at Pico Veleta to observe the CO and 13CO line emission at 3 and 1 mm in a selected sample of five extremely young planetary nebulae, which display OH and/or water maser emission. The aim is to detect and characterize the cold envelopes associated to the planetary nebulae and look for some link between the progenitor stars and their corresponding maser emission. We detected the four lines observed in a total of three sources, and derived the most relevant physical parameters, such as sizes, densities, kinetic temperatures, opacities and masses.

GALACTICNUCLEUS - a high-angular resolution, near-infrared study of the Galactic centre

Rainer Schödel

Because of the unique observational challenges – extreme crowding and extinction – any existing large-scale near-infrared (NIR) imaging data on the Galactic Center (GC) are limited by either one, or a combination, of the following: saturation, lack of sensitivity, too low angular resolution, or lack of multi-wavelength coverage. To overcome this situation, we are currently carrying out a sensitive, 0.2" resolution JHK imaging survey of the Galactic

LA VÍA LÁCTEA Y SUS COMPONENTES Pósteres

Centre with HAWK-I/VLT. Thanks to holographic imaging, we achieve a similar resolution than with HST/WFC, but can cover also the long NIR, beyond 2 microns, which is essential to deal with extinction. Our survey is supported by an ESO Large Programme and will provide photometrically accurate (few percent uncertainty for H<18 stars), high-angular resolution, NIR data for an area of several 100 pc^2, a more than ten-fold increase compared to the current state of affairs. Here we present and overview and first results.

Estudio ultravioleta de la Nebulosa del Cangrejo

Antonio Talavera Iniesta

La Nebulosa del Cangrejo (Messier 1) es uno de los objetos más observado con el telescopio espacial XMM-Newton de la ESA. Se trata de una de las fuentes de calibración de sus instrumentos que observan en rayos X. En esas observaciones (unas 80 entre los años 2000 y 2015) también se ha utilizado el Monitor Óptico (OM). Presentamos aquí un estudio del Cangrejo con las imágenes obtenidas con el OM en el rango ultravioleta, a las longitudes de onda 291, 231 y 212 nm. También analizamos la fotometría ultravioleta del púlsar asociado (PSR0531+21), resto de la supernova que en el 1054 AD dió lugar a la nebulosa.

Variability in the Galactic globular cluster M15

Héctor Vázquez Ramió

In the framework of the Science Verification Phase of T80Cam of the 83cm Javalambre Auxiliary Survey Telescope (JAST80) located at the **Observatorio Astrofísico de Javalambre** (OAJ), Teruel, Spain, a program was proposed to study the variability of RR Lyrae stars, as well as other variable ones, belonging to the Galactic globular cluster, M15. The observations were carried out on ~10 different nights along a ~2 month period using the complete set of 12 filters that are being be devoted to the already started Javalambre Photometric Local Universe Survey (J-PLUS). The initial results are going to be presented in this poster.

REUNIONES DE GRUPO

Lunes 18 julio:	RG1 (Oteiza - mediodia)	RG2 (Mitxelena - tarde)
Martes 19 julio :	RG3 (Oteiza - mediodia) RG5 (Mitxelena - tarde)	RG4 (Arriaga - mediodía)
Miércoles 20 julio:	RG6 (Arriaga - mediodia) RG8 (Oteiza - mediodia)	RG7 (Elhuyar - mediodía) RG9 (Elhuyar - tarde)
Jueves 21 julio:	RG10 (Oteiza - mediodia)	RG11 (Arriaga - mediodia)

RG1: MIRADAS y CIRCE Fecha: lunes, 18 de julio de 13:30 a 15:30 Número estimado de participantes: 20-30 Tipo de reunión: abierta Contacto: Verónica Donoso Ubicación: sala Oteiza

RG3: H2020 ORISON

Fecha: martes, 19 de julio de 2016, 13:30 – 15:30 Número estimado de participantes: 30-40 Tipo de reunión: abierta Contacto: José Luis Ortiz Ubicación: sala Oteiza

RG5: Colaboración ProAm

Fecha: martes, 19 de julio de 19:45 a 20:45 Número estimado de participantes: 40-50 Tipo de reunión: abierta Contacto: Santiago Pérez-Hoyos Ubicación: sala Mitxelena

RG6: J-PLUS

Fecha: miércoles, 20 de julio de 2016, 13:30 – 15:30 Número estimado de participantes: 20-30 Tipo de reunión: abierta Contacto: Javier Cenarro Ubicación: sala Arriaga

RG8: **Astronomía UV (WSO**-UV) Fecha: miércoles, 20 de julio, 13:30–15:30 Número estimado de participantes: 10-20 Tipo de reunión: abierta Contacto: Ana Inés Gómez de Castro Ubicación: sala Oteiza

RG10: Almuerzo con astrónomas

Fecha: jueves, 21 de julio de 13:30 a 15:30 Número estimado de participantes: 40-50 Tipo de reunión: abierta Contacto: Mercedes Mollá Ubicación: sala Oteiza RG2: Astronomía, industria y empleabilidad

Fecha: lunes, 18 de julio de 19:45 a 20:45 Número estimado de participantes: 40-50 Tipo de reunión: abierta Contacto: Ricardo Hueso Ubicación: sala Mitxelena

RG4: IX Escuela del Observatorio Virtual **Español** Fecha: martes, 19 de julio, 13:30 – 15:30 **Número estimado de participantes: 30**-40 **Tipo de reunión: escuela abierta** Contacto: Enrique Solano **Ubicación: sala Arriaga**

RG7: Ciencias Planetarias Fecha: miércoles, 20 de julio, 13:30 – 15:30 Número estimados de participantes: 20 Tipo de reunión: abierta Contacto: Adriano Campo Ubicación: sala Elhuyar

RG9: OTELO y LOCKMAN

Fecha: miércoles, 20 de julio, a partir de las 16h Número estimado de participantes: 10-12 Tipo de reunión: cerrada Contacto: Jordi Cepa Ubicación: sala Arriaga

RG11: SHARDS y SHARDS Frontier Fields Fecha: jueves, 21 de julio, 13:30 – 15:30 Número estimado de participantes: 15-20 Tipo de reunión: abierta Contacto: Pablo Pérez-González Ubicación: sala Arriaga



Universidad del País Vasco Unibertsitatea





Grupo de Ciencias Planetarias Zientzia Planetarioen Taldea