

IAC3

Institute of Applied Computing
& Community Code.

Astrophysics

NASA Science Visualization Studio

Computer Applications

Dynamical Systems

Image Processing

cnes
CENTRE NATIONAL
D'ÉTUDES SPATIALES

Relativity



Universitat
de les Illes Balears

IAC3

Institute of Applied Computing
& Community Code.

2018 Annual Report

iac3.uib.es

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1. DIRECTOR LETTER

Throughout last year 2018, the lines of research that make up the Institute of Applied Computing and Community Code (IAC3) have continued to develop their research activities with the aim of achieving maximum excellence and international visibility. In this sense, scientific production has increased with the publication of 40 articles in top-level international journals with referees, with important scientific results in various fields, including, for example, those related to the detection and analysis of gravitational waves; review articles on oscillations of prominences and partially ionized plasmas, development of computational platforms, methods for denoising in videos and dynamics of nonlinear systems. Likewise, the members of the Institute have organized and contributed to numerous National and International Meetings. On the other hand, through the Institute, the University of the Balearic Islands has signed Memoranda of Understanding with the University of Long Island (USA), Hasselt (Belgium) and Bretagne-Sud (France) through which researchers from these Universities will contribute to the scientific tasks of the Institute. Through research excellence, we try to better serve our society by training new generations of scientists while, at the same time, we try to contribute to disseminate the values of science in general. For this reason, members of the Institute have participated in scientific outreach tasks through scientific fairs, teaching at local, national or international conferences, presence in the media, etc. Finally, it should be noted that one of the members of the Institute, Dr. Alicia Sintes, has received numerous awards for her participation, together with the Relativity and Gravitation group, in the detection and analysis of gravitational waves. I would not like to finish this introduction to the Report without mentioning the most urgent needs of the Institute which are: Physical space to develop its activities and an improvement of the budget allocated by the University to the Research Institutes in general. For some time now, we have been waiting for the allocation of premises in the research complex built in the Parc Bit, whose implementation, hopefully immediate, would provide us with new physical space that would help our research tasks.



José Luis Ballester Mortes

Director IAC3

2. ABOUT THE INSTITUTE OF APPLIED COMPUTING AND COMMUNITY CODE

The Institute of Applied Computing with Community Code (IAC3) was created by the University of the Balearic Islands (UIB) in July 2008, and officially recognized by the Government of the Balearic Islands by March 2015. The focus of the Institute is based on the synergies created by the integration of different research groups, with expertise in Astrophysics, Relativity, and Image Processing. The common ground, beyond the quest for excellence, is the need to develop numerical codes for simulating systems of differential equations.

In some scientific communities, the development of complex numerical codes is used as an advantage regarding competing groups. That requires resources focused on computing techniques, which are taken away from the main research objectives. The IAC3 vision is, in contrast, the cooperation between groups towards the common goal of shared codes. This synergy is seen as a competitive advantage for the community as a whole, which frees resources for their specific fields of research.

The necessary polyvalence of the resulting code opens the door to the application in other contexts, both scientific and technological, ranging from satellite image processing to applications in computational physiology.

Some aspects that further define the Institute's profile are:

- **Research excellence**, as shown for instance by its participation (as the only Spanish institution) in the LIGO project on gravitational waves detection.
- **Knowledge transfer**, as shown by the collaboration with Spanish (Atos, Deimos Space, Telefonica) and French (DxO, Thales) companies in different research projects, or the registration of patents.

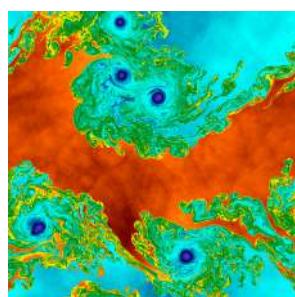
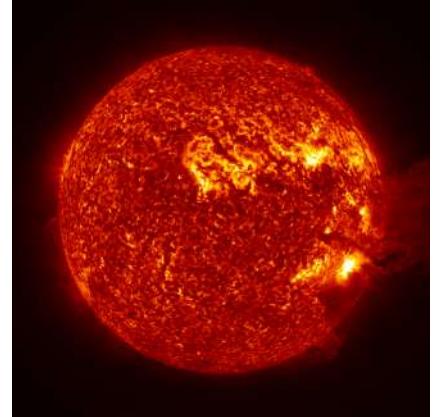
The Balearic Islands University has been awarded with the International Excellence Campus mention. The research lines of this national project include one about 'Physics, Computation and Applications' in which the IAC3 plays a significant role. We also participate in the teaching of the Advanced Physics and Applied Mathematics Master Degree.

The Institute is currently structured along five lines of research: Astrophysics, Computational Applications, Dynamical Systems, Image Processing, Relativity and Gravitation.

The research activities of the Solar Physics Group are related with the Solar Atmosphere. In particular, the group performs research on the Seismology of coronal magnetic structures (loops, prominences, etc.); on the behaviour of solar activity (Asymmetries, periodicities, chaos, etc.), on MHD waves and instabilities in the solar corona and coronal rain dynamics.

Research lines:

- **Seismology of the Solar Corona:** MHD seismology is a method of remote diagnostics of plasma structures combining observations of oscillatory motions with an interpretation in terms of MHD waves.
- **Behaviour of Solar Activity:** Solar activity is produced by the emergence of magnetic flux through the photosphere forming active regions which include sunspots. Apart from sunspots, other manifestations of solar activity are solar flares, prominences, CME's, etc. The behaviour of solar activity shows some particular features such as periodicities, asymmetries, lack of memory, etc which are worth to be investigated.
- **Waves and Instabilities in prominences:** Prominence oscillations are commonly interpreted in terms of MHD waves, and this interpretation allows to perform prominence seismology. Furthermore, MHD instabilities are also observed in prominences and its interpretation would allow to understand the complex dynamics displayed by prominences
- **Coronal rain:** Active region loops usually have temperatures of the order of 1 million K. But sometimes dense and cold (10.000 K) plasma blobs form high in these loops and start to fall under the action of the Sun's gravity. The measured downward acceleration is considerably smaller than that of free-fall motion: at present we are interested in explaining this behaviour. In the future we plan to study other coronal rain features, e.g., its multi-thermal character or the conditions that lead to the formation of the cold condensations.



The Computer Applications Group is the main contributor of the IAC3 to the development of open source scientific software for computational simulation with a sound basis in computer science. Our goals are to construct and optimize scientific computational codes by developing new numerical schemes and implementing them efficiently, making use of advanced parallelization techniques, different AMR strategies and open source computational infrastructures. These goals converge in Simflowny, a cloud-based open environment for scientific dynamical models, such as multiphysics models, with a user-friendly Integrated Development Environment, which automatically generates parallel code for simulation frameworks. Simflowny has been fully developed by *this* group, and it currently supports scientific model based on Partial Differential Equations of arbitrary order in space, Balance Law PDE that allow us to use schemes based on Finite Volume Methods to deal with shocks and discontinuities, and Agent-Based Models. Simflowny can be downloaded and used as a [docker container](#). Its source code is available from [Bitbucket](#).

The group of Dynamical Systems started its formal activity in 2002. Since then, we have developed our scientific activity in various fields including organization of international congresses, winter schools, research seminars, seminars for the dissemination of our scientific activities, attendance and participation in conferences, plenary lectures, conferences on math disclosure, etc. The seminars for the scientific training for our members, that are open to any interested person, are regularly conducted. The first one dates from March 12, 2003.



At the present time we develop our scientific research jointly with members of the Universidad de Extremadura ([UNEX](#), Spain), sharing a common research project ([MTM201454275-P](#) Spanish Government Grant) entitled "Estudio cualitativo de sistemas dinámicos y de sus aplicaciones. Comportamientos periódicos y bifurcaciones".

We also participated in the network [DANCE](#) that aims at being the meeting point of the Spanish researchers in Dynamical Systems and nonlinear dynamics with a flexible, open, integrating and interdisciplinary approach.

The three main research lines are:

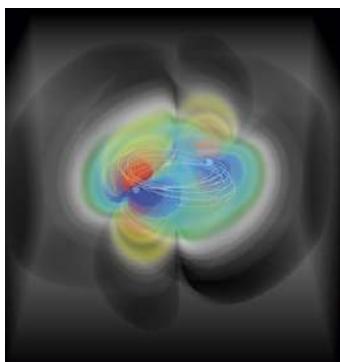
1. Qualitative theory of smooth ODE's.
2. Qualitative theory of ODE's systems piecewise linear.
3. Qualitative theory of discrete dynamical systems.

The Image Processing group has more than 20 years experience on applied mathematics for image analysis and processing. It also has long-term collaboration with industry and applied projects. On this level, TAMI has had a permanent technology transfer contract, renewed every year since 2006 with the company DxO Labs, one of the world leaders in image processing, whose image processing chains equips currently more than 300 millions cameraphones. TAMI has also a longstanding cooperation with CNES (the French Space Agency) for over one decade, where the team contributed to the image restoration chain of the Earth observation satellites SPOT5 and the recently launched Pléiades.



Main research lines of our group are:

- Filtering and restoration of digital images.
- PDE's based image processing.
- Study of color perception and segmentation.
- Applications of Gestal theory to feature detection in image and video.
- Satellite Imaging, 3D reconstruction.
- Medical Imaging.
- Filtering and restoration of digital images and video.



UIB Relativity and Gravitation Group is one of the pioneering groups in Spain in the study of gravitational waves, with a long track-record of participation in large international collaborations, playing an important role in the study of gravitational wave sources and the development of gravitational wave data analysis algorithms. The group is a member of LIGO and GEO, two major international projects dedicated to the detection of gravitational waves. We are also involved in the e-LISA, the European space-borne gravitational wave detector project, and the design study for the Einstein Telescope, a third generation gravitational wave detector.

We participate in two national leading scientific projects, CPAN (National Center for Particle, Astroparticle and Nuclear Physics) and Multidark (Multimessenger Approach for Dark Matter Detection). The UIB Group is a foundational member of the Institute of Applied Computing with Community Code (IAC3), which focuses on the development of open source scientific software for computational simulation with a sound basis in computer science. The group is also a member of the Institute of Space Studies of Catalonia (IEEC).

The UIB Relativity group is supported by research grants from the Spanish Ministry of Science and Technology and the local Government of the Balearic Islands. It also benefits from the support of the Barcelona Supercomputing Center (BSC-CNS) at Barcelona.

3. PERSONNEL

IAC3 Management Board

- Director: José Luis Ballester Mortes
- Deputy Director: Bartomeu Coll Vicens
- Secretary: Alicia Magdalena Sintes Olives

Research Staff

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|---------------------------------|----------------------------|-----------------------------|--|
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| Lisani Roca, José Luis | Image Processing | joseluis.lisani(a)uib.es | Titular Universidad |
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Scientific Collaborators

| Name | Line of Research | Mail | Position |
|----------------------|-----------------------|-------------------------|----------------------|
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Visiting Scientists

| Name | Main research subject | Mail | Building : Office |
|-----------------------|-----------------------|-----------------------------------|--|
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| | | | |
|------------------|-----------------------------------|-------------------------------|---|
| Froment, Jacques | Image Processing | Jacques.Froment(a)univ-ubs.fr | Université Bretagne-Sud, Campus Vannes, France |
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Postdoctoral Researchers

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| Colleoni, Marta | Relativity and Gravitation | marta.colleoni(a)uib.es | Investigador postdoctoral Marie Curie |
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PhD Students

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|---------------------------|-----------------------------------|------------------------------|--|
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Scientific/Techincal Supports

| Name | Line of Research | Mail | Position |
|--------------------------|-----------------------------------|--------------------------------|------------------------|
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| Jaume Amengual, Rafel | Relativity and Gravitation | rafel.jaume(a)uib.es | Técnico |
| Miñano Maldonado, Borja | Computer Applications | borja.minano(a)uib.es | Ingeniero de Sofware |
| Soubrié, Elie | Astrophysics | elie.soubrie(a)ias.u-psud.fr | Colaborador Científico |
| Tenorío Márquez, Rodrigo | Relativity and Gravitation | r.tenoriomarquez(a)hotmail.com | Técnico |

4. AWARDS AND MENTIONS

- Dra. Sintes has been awarded with "[Premi Bartomeu Oliver 2018](#)" of the prizes 31 de Desembre from the Obra Cultural Balear for her "contribution to the research from the UIB that has opened a window to the cosmos" (December 2018).
- Dra. Sintes take part in the "[Selección Española de Ciencia 2018](#)" from QUO and CNIC like one of the best spanish contemporary scientist (November 2018).



Image 1. Alicia Sintes take part in the discovery of gravitational waves.

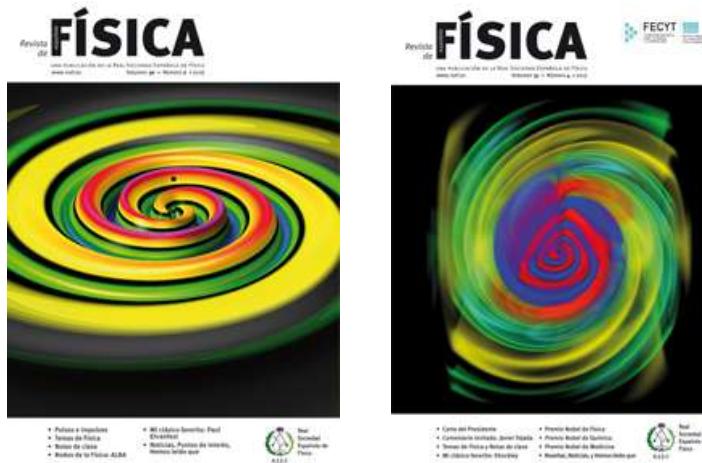
- Dra. Sintes has been awarded with "[Premio Sincronizados](#)" from Agencia SINC for her involvement in science communication and outreach activities (November 2018).
- Dra. Sintes has been named "[Filla Predilecta de Sant Lluís](#)" (July 2018).
- Dra. Sintes has been awarded with the [Rotary Ramón Llull award](#) from The Rotary Club (2018).
- The Socialists of Mallorca deliver the [Maria Plaza 2018 award to the 11FBaleares platform](#) to highlight the work and involvement of people and organisations in the struggle for gender equality.
- Dra. C. Vich. **First prize for best poster** at the "Analysis and Modeling of Complex Oscillatory Systems (AMCOS)" congress. "Phasic dopamine influences on action value estimation".
- Dr. Carles Bona is Outstanding Referee in the [American Physical Society](#) (10 January 2018)

5. HIGHLIGHTS

01.02.2018. Cover of the "Revista Española de Física"

The Spanish Journal of Physics, published by the Spanish Royal Society of Physics, is devoted to academic, pedagogical and social aspects of physics. It aims to serve as a communication bridge between its different sectors in Spain, offering a channel of information, discussion and debate about its specific problems and its situation in the world.

The cover of the last two editions contains images whose autor is Rafel Jaume and Sascha Husa of the Relativity and Gravitation group of the UIB. The two images correspond to gravitational waves produced by the fusion of two black holes. The images represent the component of the curvature ψ_4 in the XY plane at the time of the collapse of the two black holes from a numerical simulation with the parameters corresponding to GW150914.



01.03.2018. "La física al descobert" at the UOM.

The Diplomas of specialization of the UOM suppose, on the one hand, a deepening of the knowledge acquired by the students in the Senior Diploma of the UOM, as well as an update and knowledge of the current reality and, on the other, a rationalization of the educational offer existing for the 50-year-old group and more.

This year, Carles Bona, Josep Lluís Ballester, Alícia Sintes and Joan J. Cerdà have given lectures about physics to senior people.



22.06.2018. Nobel Prize in Physics Prof. Barry Barish will visit the UIB

Full and maximum expectation, this Thursday in the Auditorium of Palma, for listening the conference of the Nobel Prize in Physics Barry Barish, "Gravitational waves: from Einstein to the new science". A very complete representation of the Balearic society, from the simple amateur scientist to the highest academic authorities, went to the Palma Auditorium to listen Barish's explanations about the detection of gravitational waves, which could revolutionize the understanding of the universe. Before Barish, the interventions of Javier Santaolalla and Alícia Sintes were the perfect preamble for a conference at the height of the 125th anniversary of Ultima Hora and the 40th anniversary of the UIB.



30.07.2018. Rodrigo Tenorio is at the Summer Student Program at GSI and FAIR

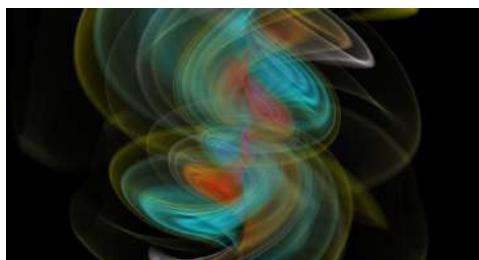


36 students from 24 countries take part in this year's Summer Student Program at GSI and FAIR. During their eight-week stay on the campus they participate actively in GSI and FAIR science projects, get to know the experiments and the research areas and get involved in the everyday working life at an accelerator institute.

The main focuses are developments and tests of technical and experimental components for the accelerator facility FAIR, which is being built at GSI, and its future experiments. Apart from the scientific program there are also social events planned like a barbecue party, a football match or trips to the region for networking and international exchange. In public lectures, which are part of the program, the summer students learn about GSI and FAIR research and scientific results.

Rodrigo will be learning about distributed computing through OpenStack with the department of I.T. of the GSI, and with collaborators of the University of Frankfurt.

26.10.2018. Future detections of gravitational waves are prepared from Mallorca



The UIB Relativity and Gravitation Group organize the Ligo-Virgo Collaboration Waveform face-to-face Meeting 2018, an international meeting in order to prepare the new observation periods of the LIGO and Virgo Advanced detectors.

Twenty-five members of the LIGO and Virgo collaborations, who work in six different countries, meet in Mallorca from 30th October to 1st November to participate in the Ligo-Virgo Collaboration Waveform face-to-face Meeting 2018. For three days, members of the international scientific collaborations dedicated to the detection of gravitational waves will meet to discuss and coordinate the gravitational wave signal models that will be used in the next observation period of the Advanced LIGO and Virgo detectors.

The meeting is organized by the UIB Relativity and Gravitation Group, one of the pioneering groups in the field of modelling the gravitational wave signal from the fusion of black holes.

05.11.2018. SINC Agency honored Alicia Sintes for her implication in science communication.

In 2008, FECYT launched SINC, the first scientific news agency in our country, aiming to increase the presence of quality scientific information in the media - especially those that have Spanish researchers and centers as their leaders - so that their achievements can reach the citizens.

On November 8th at 6:30pm, in La Casa Encendida (Madrid), due to the 10th anniversary of the SINC Agency, there will be the award ceremony to reward those scientists and institutions that work on public awareness of science. One of those prizes, that have been called #Sincronizados, is for Dr Alicia Sintes. It acknowledges her accessibility, her availability to answer journalists' questions, and her capacity to make divulgation seem easy. Lately, information about LIGO and gravitational waves has been very relevant in the news, and Alicia has been a first class source.

Congratulations to the award-winners.



19.09.2018. Science in Parliament



On Monday in the plenary hall of the Parliament of the Balearic Islands, the first day 'Science in Parliament' has been hosted. This event has the objective of create an open channel of communication among those responsible for taking political decisions and scientists.

On behalf of IAC3, Alicia M. Sintes, Carles Bona and Pep Lluis Ballester have attended.

18.10.2018. Scientists ranking in Spain



This week the ranking of Spanish researchers or researchers working in Spanish institutions according to the data of their public Google Scholar profiles has been published.

The list consists of the Top 65 000 profiles ranked first by h-index in decreasing order and then by the total number of citations.

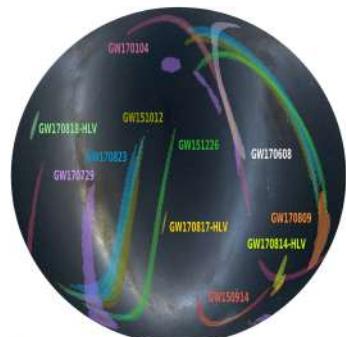
We highlight the positions of Alicia M. Sintes who is in 87th position, with an H-index of 90 and a total of 33,454 citations. She is the best located of the University of the Balearic Islands and the fifth scientific woman of Spain. In addition, Sascha Husa, appears at position 143 with an H-index of 77 and 29,446 total citations. Just below Alicia, the second best positioned scientist of the UIB.

03.12.2018. LIGO and Virgo announce four new detections of gravitational waves

The team of researchers of the UIB has made important contributions to the observation and analysis of the signals detected. The observatories publish the first catalog of gravitational wave events.

The Scientific Collaboration LIGO and VIRGO, its European counterpart, have announced four new detections of gravitational waves resulting from the fusion of stellar mass black holes. These results, coming from LIGO gravitational wave detectors, operated by the National Science Foundation of the United States (NSF) and Virgo, were announced on Saturday, December 1, within the framework of the Congress of Gravitational Wave Physics and Astronomy, which has taken place in the city of College Park (Maryland, United States).

So far, the Scientific Collaboration LIGO and Virgo have detected a total of ten mergers of stellar mass black holes and a merger of neutron stars, which are the dense and spherical remains of the collapse of stars. Of these ten mergers of black holes, there are four that correspond to the new round of detections, while the remaining six, had already been presented other times.



The four new detections, labeled as GW170729, GW170809, GW170818 and GW170823 occurred in the second observation period, between November 30, 2016 and August 25, 2017.

Alícia Sintes is excited by the growing Spanish participation in the field of gravitational waves: "The Spanish community of gravitational waves increases very fast. We have gone from being the only ones in this field, three years ago, to having two groups in the Scientific Collaboration of LIGO and three in the scientific collaboration of Virgo. We are proud to have paved the way".

10.12.2018. ESTALMAT at UIB

ESTALMAT is a project of the Real Academia de Ciencias Exactas, Físicas y Naturales. In the Balearic Islands is jointly organized by the University of the Balearic Islands and the Balearic Society of Mathematics SBM-XEIX. It seeks to detect, guide and stimulate in a continuous way, at the end of two courses, the exceptional mathematical talent of 12-13 year old students.

Bartomeu Coll and Maria Jesús Alvarez from Dynamical Systems have given the talks "Poden infinitos números sumar 1?" and "Les matemàtiques i el món que ens envolta: camins aleatoris".



6. RESEARCH PROJECTS

Spanish Agencia Estatal de Investigación

Computational Applications

- Estudio mediante simulaciones numéricas multiescala del comportamiento del glicocálix
Refs: DPI2017-86610-P. [Ministerio de Economía y Competitividad](#)
PI: Joan Josep Cerdà, Carles Bona-Casas
Amount: 175.450 €
Date: 01/01/2018-01/01/2020

Amount: 114000 €
Date: 30/12/2016 - 29/12/2019

- Red Temática de Relatividad y Gravitación
Ministerio de Economía y Competitividad
Refs: FIS2016-81770-REDT
PI: Gonzalo Olmo
Amount: 18.500€
Date: 01/2017-12/2018.

Astrophysics

- Dinámica de los plasmas de la atmósfera solar.
Ref: AYA2017-85465-P. Ministerio de Economía, Industria y Competitividad
IPs: Ramón Oliver, Roberto Soler
Amount: 132.000 €
Date: 01/01/2018-31/12/2020
- Dinámica de los plasmas de la atmósfera solar.
Ref: MICINN AYA2014-54485P.
IPs: J. L. Ballester/J. Terradas.
Amount: 132.000 €
Date: 2015-2018

- Precursores electromagnéticos de eventos de ondas gravitacionales.
Refs: AYA2017-82089-ERC. [Ministerio de Economía y Competitividad](#).
PI: Carlos Palenzuela.
Amount: 68.181€
Date: 01/01/2018- 30/12/2018

- RED CONSOLIDER CPAN
Refs: FPA2017-90687-REDC. [Ministerio de Economía, Industria y Competitividad](#)
Coordinator: Antonio Pich, PI: Carles Bona
Amount: 30.000€
Date: 2018-2020

Relativity and Gravitation

- Red nacional de astropartículas, (RENATA).
REF: FPA2015-68783-REDT. Ministerio de Economía y Competitividad.
IP: Sergio Pastor. IP UIB: Alicia Sintes
Amount: 35000 €
Date: 01/12/2015 - 30/11/2018
- Gravitational waves: from first detections to full design sensitivity with Advanced LIGO (IGraWaveEra)
REF: FPA2016-76821-P. Ministerio de Economía y Competitividad
PI: Alicia Sintes, Sascha Husa
Amount: 312000 €
Date: 30/12/2016 - 29/12/2019
- Jets, kilonovas y ondas gravitacionales: astronomía de multi-mensajeros en colisiones de estrellas de neutrones
REF: AYA2016-80289-P. Ministerio de Economía y Competitividad
PI: Carlos Palenzuela, Joan Massó

- RED CONSOLIDER MULTIDARK: Multimessenger Approach for Dark Matter Detection.
Refs: FPA2017-90566-REDC. [Ministerio Economía, Industria y Competitividad](#).
Coordinator: Carlos Muñoz, PI: Alicia M. Sintes.
Amount: 30.000€
Date: 01/07/2018-30/06/2020

Dynamical Systems

- Qualitative study of dynamic systems and their applications, with emphasis in neuroscience.
Refs: MTM2017-83568-P. Ministry of Economy, Industria y Competitividad.
PI: Rafel J. Prohens
Amount: 37.268,00€
Date: 01/01/2018-31/12/2021
- Qualitative study of dynamical systems and their applications. Periodic behavior and bifurcations.
Refs: MTM2014-54275-P. Ministry of Science and

Innovation. Spanish Government.
PI: Rafel J. Prohens
Amount: 48.279,00€
Date: 01/01/2015-31/12/2018

China, Israel y Estados Unidos. R. Oliver, J. L. Ballester (responsables UIB).
IP: Teimuraz Zaqareshvili (Austria)
Team: 389
Fundraising agency: ISSI
Amount: 50.000€

Image processing

- Procesamiento de imágenes digitales y aplicaciones. TIN2014-53772, Ministerio de economía y competitividad. Amount: 43.100€ Date: 2015-2018
- Cadena completa de procesamiento multi-imagen y video. TIN2017-85572-P, Ministerio de economía y competitividad. PI: Antoni Buades Amount: 55.176€ Date: 2018-2020

International Grants

Astrophysics

- Rieger-type periodicity in solar activity and seismology of solar interior
Ref: 217146. Shota Rustaveli National Science Foundation (Georgia)
IPs: T. V. Zaqareshvili (Space Research Institute, Austrian Academy of Sciences, Graz, Austria)
Amount: 78.000 €
- Instabilities in partially ionized plasmas.
Ref: IN-2014-016. The Leverhulme Trust International Networks.
IP: R. Oliver (responsable UIB).
Date: 2014-2018
- International Space Science Institute Team on Large Amplitude oscillations as a probe of quiescent and erupting solar prominences (2017-2019). Composición: 14 investigadores de China, Inglaterra, España, Croacia y Estados Unidos. J. Terradas, J. L. Ballester (responsables UIB).
IP: Manuel Luna (Spain).
Fundraising agency: ISSI
Amount: 50.000€
Date: 2017-2019
- International Space Science Institute Team on Observed Multi-scale variability of Coronal Loops as a probe of Coronal Heating.
Ref: Team No. 401 (International Space Science Institute, Berna, Suiza)
IP: C. Froment & P. Antolin. R. Oliver (responsable UIB).
Composición: 14 investigadores de Francia, Inglaterra, Noruega, Japón, España, Bélgica y Estados Unidos.
Amount: 50.000 €
Date: 2017-2019
- International Space Science Institute Team on Towards Dynamic Solar Atmospheric Magneto-Seismology with New Generation Instruments (2016-2018). Composición: 14 investigadores de India, Inglaterra, España, Bélgica y Estados Unidos. R. Soler, J. Terradas (responsables UIB).
IP: R. Morton; G. Verth.
Amount: 50.000€
- International Space Science Institute Team on Rossby waves in Astrophysics (2016-2018). Composición: 12 investigadores de Austria, Inglaterra, Suiza, España, Italia,

Relativity and Gravitation

- Quantum gravity phenomenology in the multi-messenger approach.
Refs: [COST Action CA18108](#), EU Framework Programme Horizon 2020 Management
PI: Sergio Palomares
Date: 13/11/2018-12/11/2022
- A network for Gravitational Waves, Geophysics and Machine Learning.
[CA COST Action CA17137](#), EU Framework Programme Horizon 2020
PI: Dra. Elena Cuoco (chair), Alicia M. Sintes (UIB)
Date: 13/04/2018-12/04/2022
- The multi-messenger physics and astrophysics of neutron stars.
Refs: [CA COST Action CA16214 PHAROS](#), EU Framework Programme Horizon 2020 Management
PI: Dr Nanda REA (chair), Alicia M. Sintes (UIB).
Date: 22/11/2017-21/11/2021
- Gravitational waves, black holes and fundamental physics.
[CA COST Action CA16104](#), EU Framework Programme Horizon 2020
Management Committee: Victor Cardoso (chair), Alicia Sintes (UIB)
Date: 07/04/2017 - 06/04/2021
- Gravitational waves from extreme mass-ratio inspirals (GWsFromEMRIs).
[Marie Skłodowska-Curie Individual Fellowships. Research Executive Agency \(REA\)](#)
PI: Marta Colleoni, Sascha Husa.
H2020-MSCA-IF-2016. Proposal number: 751492.
Date: 01/02/2018- 01/02/2020

Observational grants

Astrophysics

- Spectropolarimetric observations of prominences
PI: Ramon Oliver. Colnvestigators: D. Kuridze, T. V. Zaqareshvili, J. Koza, A. Hanslmeier
Organisation: "Comité de Asignación de Tiempo" (CAT) Solar para los Telescopios de los Observatorios de Canarias
No. of observing days granted: 10
Dates: 10.04.2018 - 19.04.2018
- Title: High resolution observations of type II spicules
PI: Ramon Oliver. Colnvestigators: D. Kuridze, T. V. Zaqareshvili, J. Koza, A. Hanslmeier
Organisation: "Comité de Asignación de Tiempo" (CAT) Solar para los Telescopios de los Observatorios de Canarias
No. of observing days granted: 10
Dates: 21.06.2018 - 30.06.2018

Relativity and Gravitation

- GTC follow-up of gravitational radiation sources in the Multi-messenger Era
Refs: GTCMULTIPLE4B-18B. Gran Telescopio Canarias
PI: Alberto Javier Castro Tirado. Coinvestigators: María Dolores Caballero García, José Antonio Font Roda
Yudong Hu, Soomin Jeong, Elena Pian, A. Sintes, Juan Carlos Tello Salas, Binbin Zhang
Amount: 36 hours
Date: 01/09/2018 - 28/02/2019
- Monitoring electromagnetic counterparts of gravitational wave events with NOEMA.
Refs: P343431 IRAM. Institut de Radioastronomie Millimétrique
IP: I. Agudo and A. J. Castro-Tirado. Coinvestigators: M. Bremer, A. Ritacco, C. Kramer, A. Sintes and J. A. Font.
Date: 01/12/2018 - 31/05/2019
- Improving the accuracy of gravitational wave models for non-precessing black hole mergers
Refs: AECT-2018-2-0022. RES-BSC Marenostrum.
PI: Sascha Husa.
Amount: 3 million hours
Date: 20/06/2018-20/10/2018
- Development of a refined phenomenological gravitational wave model for parameterised tests of General Relativity.
Refs: AECT-2018-1-0024. RES-BSC Altamira.
PI: Leila Haegel
Amount: 100.00 Kh.
Date: 01/03/2018-30/06/2018
- Tuning finite difference algorithms for binary black hole evolutions in general relativity.
Refs: AECT-2018-1-0023. RES-BSC Marenostrum.
PI: Sascha Husa.
Amount: 2500 Kh.
Date: 03/01/2018-03/07/2018

Computational Grants

Computational Applications

- Divergence-conforming splines in microvascular fluid-structure interaction
Refs: FI-2018-1-0026. RES-BSC Marenostrum.
PI: Carles Bona-Casas.
Amount: 700 Kh.
Date: 01/03/2018-07/07/2018
- Divergence-conforming splines in microvascular fluid-structure interaction. Codimension one solids
Refs: FI-2018-3-0020. RES-BSC Marenostrum.
PI: Carles Bona-Casas.
Amount: 2500 Kh.
Date: 01/11/2018-07/03/2019
- RES-BSC Marenostrum: Modelling gravitational wave signals from eccentric binaries.
Refs: AECT-2017-3-0013
IP: Sascha Husa.
Amount: 3400 Kh
Date: 01/11/2017 - 28/02/2018
- PRACE: Modeling gravitational wave signals from black hole binaries.
14th Call
ID: 2015133131
Resource awarded: 8.4 million core-hours awarded for year 1; 12 million core-hour pre-booked for year 2 on MareNostrum III.
IP: Sascha Husa
Date: 15/03/2016-15/03/2018

Relativity and Gravitation

- 17th Call for PRACE: Gravitational and electromagnetic emission from binary neutron star mergers: from coalescence to jet formation.
Refs: Tier-0 GEEFBNSM
IP: Carlos Palenzuela

7. RESEARCH CONTRACTS

Image processing

- Project title: Méthodes locale et globale rapides pour la stéréorestitution
Reference: R & T MSMW R-S16/OT-0004-084.
Funding institution: Centre National d'Études Spatiales (CNES), France
Principal researcher: Antoni Buades
Funded amount: 60.000 €
Date: 2016 - 2018

8. PATENTS

Image processing

- L. Rudin, J. L. Lisani, P. Monasse, J. M. Morel. "Object recognition based on 2D images and 3D models", Núm. de Solicitud: 7587082 País de prioridad: Estados Unidos de América. Fecha de prioridad: 2009. En explotación por Cognitech.
- A. Buades, B. Coll, J.M Morel and B. Rougé, "Procedimiento de establecimiento de correspondencia entre una primera imagen digital y una segunda imagen digital de una misma escena para la obtención de disparidades", Spanish patent, Ref. P25155ES00, UIB, 2009. Extensión PCT conjunta UIB-CNRS, solicitada también para EE. UU.
- F. Cao, F. Guichard, N. Azzabou, A. Buades, B. Coll, J.M. Morel, "Procédé de traitement d'objet numérique et système associé", French patent, Ref. PA080163EC, 2008. En explotación per DxO.
- A. Buades, B. Coll and J. M. Morel. "Image data process by image noise reduction and camera integrating the means for implementing this process". Patente europea UIB - CNRS - ENS Cachan, 2004. Extensión a EE. UU: US 8,253,825 B2 (Aug. 28, 2012).
- L. Rudin, J.L. Lisani, J.M. Morel, P. Yu. "Video demultiplexing based on meaningful modes extraction", Núm. de Solicitud: 7328198. País de prioridad: Estados Unidos de América. Fecha de prioridad: 2008. En explotación por Cognitech.
- L. I. Rudin, J. L. Lisani, J. M. Morel." Registration and comparison of three dimensional objects in facial imaging", Núm de Registre: 8,605,989. Estats Units d'Amèrica (2013).

9. ACADEMIC ACHIEVEMENTS

7.1. Doctoral Theses



- Title: High-frequency waves and instabilities in multi-fluid partially ionized solar plasmas
Student: David Martínez (Universitat de les Illes Balears)
Directors: Dr. J. Terradas, Dr. R. Soler
Presented: 17/01/2018

Abstract:

The solar atmosphere is a highly dynamic environment in which a huge diversity of waves and instabilities has been detected. The matter in that region is in plasma state, and thus is affected by the presence of electromagnetic fields. To understand its dynamics, a theory that combines the equations describing the properties and evolution of fluids with those for electric and magnetic fields is required. Among the several available alternatives that fulfill the mentioned conditions, ideal magnetohydrodynamics (MHD) is a useful description when the phenomena of interest are associated with low frequencies. For long temporal scales, all the species that compose a plasma are strongly coupled and they can be treated as a single fluid. However, when the temporal scales are shorter, the coupling is weaker and collisions between the different species produce a deviation on the properties of waves from those predicted by ideal MHD. Consequently, a more complex and accurate theory is needed. In this Thesis, a multi-fluid theory that takes into account the effects of ion-neutral collisions, Coulomb collisions and magnetic diffusivity, and makes use of a generalized Ohm's law that includes Hall's term is presented. Then, it is applied to the investigation of waves and instabilities in several layers and structures of the solar atmosphere, such as the fully ionized solar corona and solar wind, and the partially ionized chromosphere and quiescent prominences or filaments. By means of numerical simulations and the analysis of the dispersion relation for small-amplitude transverse perturbations, the impact of collisions on the properties of the low-frequency Alfvén waves and the high-frequency ion-cyclotron and whistler modes is studied. It is shown that the damping caused by collisional friction is dominated by the ion-neutral interaction at low frequencies and by Coulomb collisions and magnetic diffusivity at high frequencies. Moreover, the cut-off regions and resonances that the ion-cyclotron waves have in collisionless fluids are removed when collisions are taken into account. It is also demonstrated that the consideration of Hall's term in the induction equation is fundamental for the proper description of high-frequency waves in weakly ionized plasmas. Non-linear effects, such as heating, and perturbations of large-amplitude are also studied. On the one hand, it is shown that the ponderomotive force generated by non-linear Alfvén waves, which induces variations of density and pressure of the plasma, is greatly affected by the interaction of ions with neutrals. On the other hand, friction due to collisions causes dissipation of the energy of the perturbations. A fraction of that energy is transformed into heat and rises the temperature of the fluid. In this way, the plasma in quiescent prominences or in the chromosphere may be heated by ion-neutral collisions. Finally, the effect of shear flows at the interface between two partially ionized media are also investigated. The presence of a shear flow velocity leads to the development of the Kelvin-Helmholtz instability. Here, the onset of such instability is studied for partially ionized magnetic flux tubes and an application to cylindrical filament threads is given. It is found that the collisional coupling between ions and neutrals reduces the growth rates of the instability for sub-Alfvénic shear flows but cannot completely suppress it, which means that partially ionized plasmas are unstable for any value of the shear flow. The comparison of the analytical results with observations performed by other authors show that, for a range of parameters of the perturbations, the computed growth rates are compatible with the typical lifetimes of threads.

7.2. Ongoing Doctoral Theses

Astrophysics

- Title: 3D studies of MHD waves in coronal arcades
Student: Samuel Rial (Universitat de les Illes Balears)
Directors: Dr. Iñigo Arregui, Dr. R. Oliver
- Title: The excitation and damping of large amplitude prominence oscillations from 3D MHD simulations
Student: Andreu Adrover (Universitat de les Illes Balears)
Director: Dr. J. Terradas
- Title: Waveform modelling of Binary Black Holes in the Advaced LIGO era.
Student: Cecilio García Quirós (Universitat de les Illes Balears)
Director: Dra. Alicia Sintes
- Title: Jets, Kilonovas and Gravitational Waves: Multimessenger astronomy in mergers of binary neutron stars
Student: Ricard Aguilera Miret (Universitat de les Illes Balears)
Director: Dr. Carlos Palenzuela Luque

Relativity and Gravitation

- Title: Gravitational wave data analysis for the advanced detector era.
Student: Miquel Oliver (Universitat de les Illes Balears)
Directors: Dra. Alicia Sintes, Dr. Sascha Husa
- Title: Coalescence of Exotic Compact Objects in the new era of gravitational wave astronomy.
Student: Miguel Bezares Figueroa (Universitat de les Illes Balears)
Director: Dr. Carlos Palenzuela
- Title: Modelling the dynamics of black hole coalescence with Numerical Relativity.
Student: Antoni Ramos Buades (Universitat de les Illes Balears)
Director: Dr. Sascha Husa
- Title: Searching for continuous gravitational waves with Advanced LIGO.
Student: Josep Blai Covas Vidal (Universitat de les Illes Balears)
Director: Dra. Alicia Sintes
- Title: Accurate models of gravitational wave signals from precessing black holes.
Student: Héctor Estellés Estrella (Universitat de les Illes Balears)
Director: Dr. Sascha Husa

Image processing

- Title: Multi-source image processing from the observation of the environment.
Student: Jamila Mifdal
Director: Bartomeu Coll i Jacques Froment (UIB and UBS (Université Bretagne-Sud)
- Title: Disparity adapted weighted aggregation for local stereo matching.
Student: Júlia Navarro Oliver (Universitat de les Illes Balears)
Director: Dr. Antoni Buades
- Title: "Complete chain in multi image and video processing".
Student: Onofre Martorell (Universitat de les Illes Balears)
Director: Dr. Antoni Buades

7.3. Master Theses

Dynamical Systems

- Title: Takens' Theorem: Proof and Applications
Student: Jordi Penalva Vadell (Universitat de les Illes Balears)
Directors: María Jesús Álvarez, Antonio E Teruel
Presented: 9/10/2018

10. PUBLICATIONS

Computational Applications

- Hugo Casquero, Yongjie Jessica Zhang, Carles Bona-Casas, Lisandro Dalcin, Hector Gomez
Non-body-fitted fluid-structure interaction: Divergence-conforming B-splines, fully-implicit dynamics, and variational formulation
Journal of Computational Physics, Volume 374, Pages 625-653 (14 September 2018)
[DOI: 10.1016/j.jcp.2018.07.020](https://doi.org/10.1016/j.jcp.2018.07.020)
- A. Arbona, B. Miñano, A. Rigo, C. Bona, C. Palenzuela, A. Artigues, C. Bona-Casas, J. Massó
Simflowny 2: An upgraded platform for scientific modeling and simulation.
Computer Physics Communications (2018), (3 April 2018)

[DOI: 10.1016/j.cpc.2018.03.015](https://doi.org/10.1016/j.cpc.2018.03.015)

- D. A. Rozhkov, E. S. Pyanzina, E. V. Novak, J. J. Cerdà, T. Sintes, M. Roneti, P. A. Sánchez & S. S. Kantorovich
Self-assembly of polymer-like structures of magnetic colloids: Langevin dynamics study of basic topologies
Molecular Simulation, 44(6), 507-515
DOI: 10.1080/08927022.2017.1378815
- E. V. Novak; E. S. Pyanzina; D. A. Rozhkov; M. Roneti; P. A.; J. J. Cerdà; T. Sintes; Sánchez; S. S. Kantorovich
Suspension of supracolloidal magnetic polymers: self-assembly properties from computer simulations
Journal of Molecular Liquids, 271, 631-638
DOI: [10.1016/j.molliq.2018.08.145](https://doi.org/10.1016/j.molliq.2018.08.145)

- Carlos Palenzuela, Borja Miñano, Daniele Viganò, Antoni Arbona, Carles Bona-Casas, Andreu Rigo, Miguel Bezires, Carles Bona, Joan Massó
A Simflowny-based finite-difference code for high-performance computing in numerical relativity
Classical and Quantum Gravity 35 (18), 185007, 2018
DOI: [10.1088/1361-6382/aad7f6](https://doi.org/10.1088/1361-6382/aad7f6)

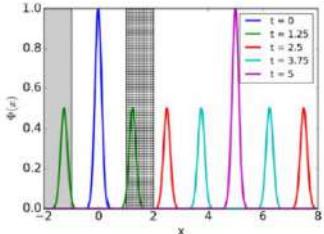


Image 2. Wave equation with FMR. Scalar field at different times of the evolution.

Astrophysics

- [Roberto Soler, Jaume Terradas, Ramon Oliver, Jose Luis Ballester](#)
Energy transport and heating by torsional Alfvén waves propagating from the photosphere to the corona in the quiet Sun.
Accepted for publication in *The Astrophysical Journal* (4 December 2018)

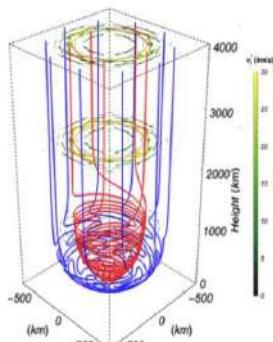


Image 3. Visualization in 3D of the magnetic field and velocity perturbations associated with the torsional Alfvén waves excited by a photospheric broadband driver.

- Terradas, Jaume; Arregui, Iñigo
Temporal and Spatial Scales for Coronal Heating by Alfvén Wave Dissipation in Transverse Loop Oscillations
Research Notes of the AAS, Volume 2, Number 4 (29 October 2018)
DOI: [10.3847/2515-5172/aaeb26](https://doi.org/10.3847/2515-5172/aaeb26)

- Manuel Luna, Judith Karpen, José Luís Ballester, Karin Muglach, Jaume Terradas, Therese Kucera, Holly Gilbert
GONG Catalog of Solar Filament Oscillations Near Solar Maximum
The Astrophysical Journal Supplement Series 236:35, (30 May 2018)
DOI: <https://doi.org/10.3847/1538-4365/aabde7>

- Iñigo Arregui, Ramón Oliver, José Luis Ballester
Prominence oscillations
Living Rev. Sol. Phys. (2018) 15:3, (23 April 2018)
DOI: <https://doi.org/10.1007/s41116-018-0012-6>

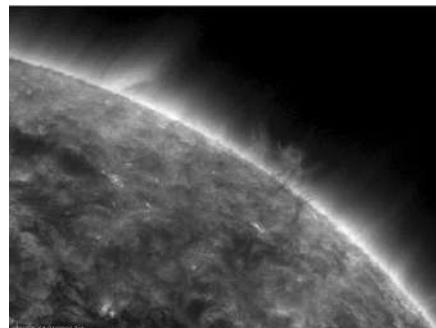


Image 4. The dynamics of solar prominences has been the subject of a large number of studies, and of particular interest is the study of prominence oscillations

- David Martínez-Gómez, Roberto Soler, Jaume Terradas
Multi-fluid approach to high-frequency waves in plasmas. III. Nonlinear regime and plasma heating
The Astrophysical Journal, Volume 856, Number 1, (21 March 2018)
DOI: <http://doi.org/10.3847/1538-4357/aab156>
- José Luis Ballester, Igor Alexeev, Manuel Collados, Turlough Downes, Robert F. Pfaff, Holly Gilbert, Maxim Khodachenko, Elena Khomenko, Ildar F. Shaikhislamov, Roberto Soler, Enrique Vázquez-Semadeni, Teimuraz Zaqarashvili.
[Review] Partially Ionized Plasmas in Astrophysics
Space Science Reviews, Volume 214, Number 2 (13 March 2018)
DOI: <https://doi.org/10.1007/s11214-018-0485-6>
- C. Froment, F. Auchère, Z. Mikić, G. Aulanier, K. Bocchialini, E. Buchlin, J. Solomon, and E. Soubrié
On the Occurrence of Thermal Nonequilibrium in Coronal Loops
The Astrophysical Journal, Volume 855, Number 1 (7 March 2018)
DOI: <https://doi.org/10.3847/1538-4357/aaaf1d>
- Terradas J., Magyar N. & Van Doorsselaere T.
Effect of Magnetic Twist on Nonlinear Transverse Kink Oscillations of Line-tied Magnetic Flux Tubes
The Astrophysical Journal, 853(1)(2018), 35. (19 February 2018)
DOI: <http://doi.org/10.3847/1538-4357/aa9d0f>

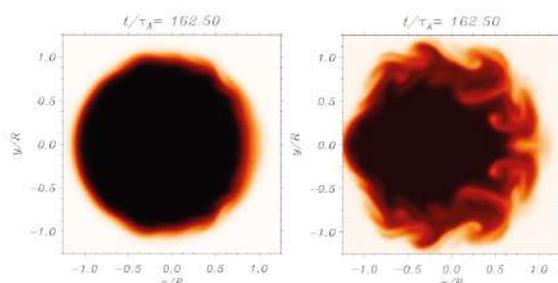


Image 5. Snapshot of the 2D density distribution at half the tube length ($z=L/2$) at a given time. In the right panel the amplitude of the initial excitation ($0/R=0.2$) is half the amplitude in the left panel ($0/R=0.4$).

- Auchère F, Froment C, Soubrié E, Antolin P, Oliver R, & Pelouze G.
The Coronal Monsoon: Thermal Nonequilibrium Revealed by Periodic Coronal Rain
The Astrophysical Journal, 853(2)(2018), 176. (1 February 2018)
[DOI: <http://doi.org/10.3847/1538-4357/aaa5a3>](http://doi.org/10.3847/1538-4357/aaa5a3)
- B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
GW170817: Measurements of neutron star radii and equation of state
Phys. Rev. Lett. 121, 161101, (15 October 2018)
[DOI: <https://doi.org/10.1103/PhysRevLett.121.161101>](https://doi.org/10.1103/PhysRevLett.121.161101)

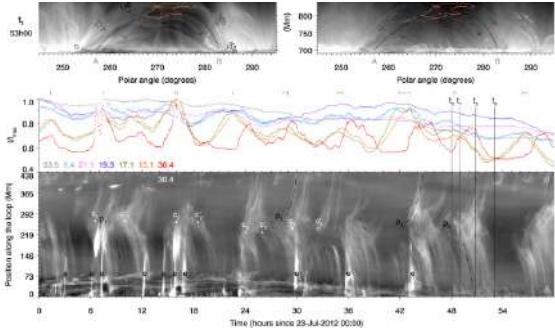


Image 6. Summary of the “rain bow” event.

- Ballester, J. L.; Carbonell, M.; Soler, R.; Terradas, J.
The temporal behaviour of MHD waves in a partially ionized prominence-like plasma: Effect of heating and cooling
Astronomy & Astrophysics 609, A6, (1 January 2018)
[DOI: <https://doi.org/10.1051/0004-6361/201731562>](https://doi.org/10.1051/0004-6361/201731562)

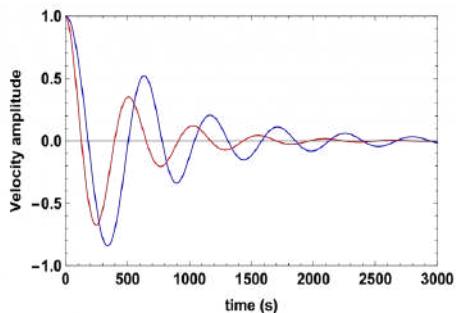


Image 7. Comparison of the slow-wave velocity amplitude vs. time for the cooling (red line) and heating (blue line) processes ($k_x = 10^{-6} \text{ m}^{-1}$). The velocity amplitude has been normalized.

Relativity and Gravitation

- Alessandro Nagar, Sebastiano Bernuzzi, Walter Del Pozzo, Gunnar Riemenschneider, Sarp Akcay, Gregorio Carullo, Philipp Fleig, Stanislav Babak, Ka Wa Tsang, Marta Colleoni, Francesco Messina, Geraint Pratten, David Radice, Piero Rettegno, Michalis Agathos, Edward Fauchon-Jones, Mark Hannam, Sascha Husa, Tim Dietrich, Pablo Cerdá-Durán, Jose A. Font, Francesco Pannarale, Patricia Schmidt, Thibault Damour
Time-domain effective-one-body gravitational waveforms for coalescing compact binaries with nonprecessing spins, tides and self-spin effects
Phys. Rev. D 98, 104052 (28 November 2018)
[DOI: <https://doi.org/10.1103/PhysRevD.98.104052>](https://doi.org/10.1103/PhysRevD.98.104052)
- Miguel Bezares, Carlos Palenzuela
Gravitational Waves from Dark Boson Star binary mergers
Classical and Quantum Gravity, Volume 35, Number 23 (7 November 2018)
[DOI: <https://doi.org/10.1088/1361-6382/aae87c>](https://doi.org/10.1088/1361-6382/aae87c)
- Federico Carrasco, Carlos Palenzuela, Oscar Reula
Pulsar magnetospheres in General Relativity
Phys. Rev. D 98, 023010 (9 July 2018)
[DOI: <https://doi.org/10.1103/PhysRevD.98.023010>](https://doi.org/10.1103/PhysRevD.98.023010)
- L. Herrera, A. Di Prisco, and J. Carot
Tilted shear-free axially symmetric fluids
Physical Review D, 97, 124003 (5 June 2018)
[DOI: <https://doi.org/10.1103/PhysRevD.97.124003>](https://doi.org/10.1103/PhysRevD.97.124003)
- B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
Search for Tensor, Vector, and Scalar Polarizations in the Stochastic Gravitational-Wave Background
Phys. Rev. Lett. 120, 201102, (16 May 2018)
[DOI: <https://doi.org/10.1103/PhysRevLett.120.201102>](https://doi.org/10.1103/PhysRevLett.120.201102)
- B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
Constraints on cosmic strings using data from the first Advanced LIGO observing run
Phys. Rev. D 97, 102002, (8 May 2018)
[DOI: <https://doi.org/10.1103/PhysRevD.97.102002>](https://doi.org/10.1103/PhysRevD.97.102002)
- B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
Prospects for observing and localizing gravitational-wave transients with Advanced LIGO, Advanced Virgo and KAGRA
Living Reviews in Relativity 218 (21:3), (26 April 2018)
[DOI: <https://doi.org/10.1007/s41114-018-0012-9>](https://doi.org/10.1007/s41114-018-0012-9)
- P. B. Covas et al.
Identification and mitigation of narrow spectral artifacts that degrade searches for persistent gravitational waves in the first two observing runs of Advanced LIGO
Phys. Rev. D 97, 082002, (23 April 2018)
[DOI: <https://doi.org/10.1103/PhysRevD.97.082002>](https://doi.org/10.1103/PhysRevD.97.082002)
- Lionel London, Sebastian Khan, Edward Fauchon-Jones, Cecilio García, Mark Hannam, Sascha Husa, Xisco Jiménez-Forteza, Chinmay Kalaghatgi, Frank Ohme, and Francesco Pannarale
First higher-multipole model of spinning binary-black-hole gravitational waveforms
Phys. Rev. Lett. 120, 161102, (19 April 2018)
[DOI: <https://doi.org/10.1103/PhysRevLett.120.161102>](https://doi.org/10.1103/PhysRevLett.120.161102)
- Eric W. Hirschmann, Luis Lehner, Steven L. Liebling, Carlos Palenzuela
Black Hole Dynamics in Einstein-Maxwell-Dilaton Theory
Phys. Rev. D 97, 064032, (26 March 2018)
[DOI: <https://doi.org/10.1103/PhysRevD.97.064032>](https://doi.org/10.1103/PhysRevD.97.064032)
- Laura Sagunski, Jun Zhang, Matthew C. Johnson, Luis Lehner, Mairi Sakellariadou, Steven L. Liebling, Carlos Palenzuela, David Neilsen

Neutron star mergers as a probe of modifications of general relativity with finite-range scalar forces

Phys. Rev. D 97, 064016, (16 March 2018)

DOI: <https://doi.org/10.1103/PhysRevD.97.064016>

- B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)

GW170817: Implications for the Stochastic Gravitational-Wave Background from Compact Binary Coalescences

Physical Review Letters, 120, 091101 (28 February 2018)

DOI: <https://doi.org/10.1103/PhysRevLett.120.091101>

- B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)

All-sky search for long-duration gravitational wave transients in the first Advanced LIGO observing run

Class. Quantum Grav. 35 065009, (14 February 2018)

DOI: [10.1088/1361-6382/aaab76](https://doi.org/10.1088/1361-6382/aaab76)

- B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)

Effects of Data Quality Vetoos on a Search for Compact Binary Coalescences in Advanced LIGO's First Observing Run

Class. Quantum Grav. 35 065010, (14 February 2018)

DOI: [10.1088/1361-6382/aaaafa](https://doi.org/10.1088/1361-6382/aaaafa)

- Alex Vañó-Viñuales, Sascha Husa
Spherical symmetry as a test case for unconstrained hyperboloidal evolution II: gauge conditions

Class. Quantum Grav 35 045014, (24 January 2018)

DOI: <https://doi.org/10.1088/1361-6382/aaa4e2>

- B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)

First search for nontensorial gravitational waves from known pulsars

Physical Review Letters 120,031104, (19 January 2018)

DOI: <https://doi.org/10.1103/PhysRevLett.120.031104>

Dynamical Systems

- Rafel Prohens, Joan Torregrosa
New lower bounds for the Hilbert numbers using reversible centers.

Nonlinearity, no.32 (2019), pp.331-355 (20 December 2018)

DOI: [10.1088/1361-6544/aae94d](https://doi.org/10.1088/1361-6544/aae94d)

- Mathieu Desroches, Soledad Fernández-García, Martín Krupa, Rafel Prohens, Antonio E. Teruel
Book chapter: **Piecewise-linear (PWL) canard dynamics Simplifying singular perturbation theory in the canard regime using piecewise-linear systems.**

Nonlinear Systems, Vol. 1 pp 67-86, Mathematical Theory and Computational Methods. Edit. Springer International Publishing, (16 September 2018)

DOI: [10.1007/978-3-319-66766-9_3](https://doi.org/10.1007/978-3-319-66766-9_3)

- Adrian C. Murza, Antonio E. Teruel, Arghir D. Zarnescu
Shear flow dynamics in the Beris-Edwards model of nematic liquid crystals
Proc. R. Soc. A 2018 474 20170673 (14 February 2018)
DOI: 10.1098/rspa.2017.0673

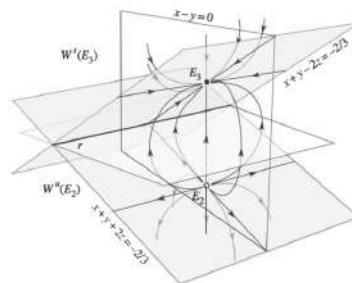


Image 8. We express these in terms of the physical variables and compare with the predictions of other models of liquid crystal dynamics.

Image processing

- A. Buades, J.L. Lisani

Patch-based methods for video denoising

Chapter in book Denoising of Photographic Images and Video, Advances in Computer Vision and Pattern Recognition, Springer, 2018

DOI: [10.1007/978-3-319-96029-6_7](https://doi.org/10.1007/978-3-319-96029-6_7)

- A. Buades, R. Grompone von Gioi, J. Navarro
Contours, Corners and T-Junctions Detection Algorithm

Image Processing On Line, Vol. 8, pp. 24-36, 2018. 27 February 2018

DOI: [10.5201/ipol.2018.218](https://doi.org/10.5201/ipol.2018.218)

- A. Buades, J.L. Lisani

Video Denoising with Optical Flow Estimation

Image Processing On Line, Vol. 8, pp. 142-166, 2018. 23 July 2018

DOI: [10.5201/ipol.2018.224](https://doi.org/10.5201/ipol.2018.224)

- J. Duran, A. Buades

Restoration of Pansharpened Images by Conditional Filtering in the PCA Domain

IEEE Geoscience and Remote Sensing Letters, in press, 08 November 2018

DOI: [10.1109/LGRS.2018.2873654](https://doi.org/10.1109/LGRS.2018.2873654)

- A. Buades, J. Navarro and R. Grompone

Joint contours, corner and T-junction detection. An approach inspired by the mammal visual system.

Journal of Mathematical Imaging and Vision, Vol. 60 (3), pp. 341-254, 2018.

DOI: [10.1007/s10851-017-0763-](https://doi.org/10.1007/s10851-017-0763-)

11. MEMORANDUM OF UNDERSTANDING AND COLLABORATION AGREEMENTS

- Academic, Scientific, and Cultural Collaboration Agreement between the **Leibniz University of Hannover** (Germany) and the **University of the Balearic Islands** (Spain).
- Memorandum of understanding for the national collaboration in Particle Physics, Astroparticles and Nuclear Physics fields between Spanish institutions dedicated to Science, Research and Technological Development. **National Center for Particle, Astroparticle and Nuclear Physics** (CPAN) (2016).
- Memorandum of Understanding (LIGO-M020265-00) between the Balearic Islands University Relativity and Gravitation Group and the **Laser Interferometer Gravitational Wave Observatory (LIGO)** since 2002.
- Memorandum of Understanding (GEO-E2009-01) with the Balearic Islands University, **Max Planck Institute for Gravitational** (Albert Einstein Institute), University of Glasgow, University of Hannover and Cardiff University (2009).
- Memorandum of Understanding with the Balearic Islands University and the **Laser Interferometer Space Antenna (LISA)**.
- The Relativity group collaborates with the ET (**Einstein Telescope**) project aims to the realization of a crucial research infrastructure in Europe: a third generation Gravitational Wave observatory.
- Memorandum of Understanding with the Balearic Islands University and VESF (**The Virgo-EGO Scientific Forum**).
- In 2014, the IEEC (**Institut d'Estudis Espacials de Catalunya**) has signed a specific agreement for scientific collaboration between IEEC and UIB for "gravitational waves detection" (2014).
- Memorandum of Understanding with the Balearic Islands University and **Institute d'Astrophysique Spatiale de Orsay** (France) (Dr. Elie Soubrié). 1/10/2018-30/09/2019
- Memorandum of Understanding with the Balearic Islands University and **Long Island University** (USA) (Dr. Steve Liebling). 1/09/2018-31/10/2020.
- Memorandum of Understanding with the Balearic Islands University and **Hasselt University** (Belgium) (Dr. Peter De Maesschalck). 1/09/2018-31/08/2020.
- Memorandum of Understanding with the Balearic Islands University and **Université Bretagne-Sud** (France) (Prof. Nicolas Courty and Prof. Jacques Froment). 01/01/2019-31/12/2020.
- Instrumental Agreement of grant with the Administration of the Balearic Islands and the Balearic Islands University for the research of gravitational waves. Govern de les Illes Balears.. Pl: Alicia M. Sintes. 175.000€. Date: 01/05/2016-10/2020.
- Collaboration between the **Astromallorca Association** (ref. 3760) and the Balearic Islands University (2019).
- Memorandum of Understanding with the Balearic Islands University and **Institut Mallorqui de Ciències de l'Espai (IMCE)** (Ref.3559).

12. SOCIETIES AND COLLABORATIONS MEMBERSHIP

- American Physical Society, APS (Carles Bona, Carlos Palenzuela, Pep Covas)
- European Astronomical Society, EAS (José Luis Ballester, Sascha Husa, Ramón Oliver, Carlos Palenzuela, Alicia M. Sintes, Roberto Soler, Jaume Terrades and Daniele Viganò)
- European Physical Society (Ramón Oliver)
- International Society on General Relativity and Gravitation, ISGRG (Jaume Carot, Sascha Husa and Alicia M. Sintes)
- Institut Menorquí d'Estudis (Alicia M. Sintes)
- International Astronomical Union (José Luis Ballester and Ramón Oliver)
- Institute of Physics (IOP) (José Luis Ballester)
- New York Academy of Sciences (Carles Bona)
- LIGO Scientific Collaboration (Marina Adrover, Alicia Calafat, Marta Colleoni, Pep Covas, Héctor Estellés, Cecilio García, Leila Haegel, Sascha Husa, Rafel Jaume, Maite Mateu, Miquel Oliver, Geraint Pratten, Antoni Ramos, Alicia M. Sintes, Rodrigo Tenorio)
- LISA Consortium (Marina Adrover, Marta Colleoni, Pep Covas, Héctor Estellés, Cecilio García, Leila Haegel, Sascha Husa, Rafel Jaume, Miquel Oliver, Geraint Pratten, Antoni Ramos, Alicia M. Sintes, Rodrigo Tenorio)
- Real Sociedad Española de Física, RSEF (José Luis Ballester, Carles Bona, Sascha Husa and Alicia M. Sintes)
- Red de Dinámica, Atractores, No linealidad, Caos y Estabilidad, DANCE (Maria Jesús Álvarez, Rafel Prohens, Antonio Teruel and Catalina Vich)
- Societat Balear de Matemàtiques (Maria Jesús Álvarez)
- Societat Catalana de Física (Jaume Carot).
- Sociedad Española de Astronomía, SEA (José Luis Ballester, Sascha Husa, Ramón Oliver, Carlos Palenzuela, Alicia M. Sintes, Roberto Soler, Jaume Terrades and Daniele Viganò)
- Sociedad Española de Gravitación y Relatividad, SEGRE (Carles Bona, Jaume Carot, Sascha Husa and Alicia M. Sintes)
- Sociedad Española de Matemática Aplicada (Bartomeu Coll)
- Sascha Husa. Visiting Professor IFT India.
- Alicia M. Sintes and Sascha Husa are Severo Ochoa Associate Researchers of IFT Madrid.

13. R&D MANAGEMENT AND PARTICIPATION IN SCIENTIFIC COMMITTEES

Organization of R&D activities

- José Luis Ballester
[BUKS 2018: Waves and instabilities in the solar atmosphere: Confronting the current state-of-the-art.](#)
Scientific Organising Committee
03-07/09/2018. La Laguna, Tenerife, Spain
- Alicia M. Sintes
[XIII Reunión Científica de la Sociedad Española de Astronomía](#)
Scientific Organising Committee
16-20/07/2018, Salamanca, Spain
<https://sea2018.usales.es>
- Alicia M. Sintes
Spanish-Portuguese Relativist Meeting (EREP) 2018
Scientific Organising Committee
4-7/09/2018, Palencia, Spain
<https://workshops.ift.um.csic.es/222>
- Sascha Husa
European Einstein Toolkit Meeting 2018
Scientific Organising Committee
10-13/09/2018, Instituto Superior Técnico, Lisbon
- Alicia M. Sintes, Sascha Husa
[8th Iberian Gravitational Waves Meeting](#)
Scientific Organising Committee
7-9/05/2018. Palma, Spain.
- Alicia M. Sintes, Sascha Husa
[LVC waveforms face-to-face Meeting](#)
Scientific Organising Committee
30/10/2018-1/11/2018. Palma, Spain.

Scientific, technical and/or assessment committees

- Alicia M. Sintes, member of the Ramón y Cajal commission 2018
- Alicia M. Sintes. ERC Advanced Grants Evaluator 2018.
- Alicia M. Sintes. Evaluator of Agencia Estatal de Investigación (AEI) of R&D projects.

- Alicia M. Sintes, expert for the evaluation of the International Max Planck Research School on Gravitational Waves Astronomy.
- José Luis Ballester, Carles Bona and Ramón Oliver, evaluators of PhD in Physics.
- Alicia M. Sintes and Sascha Husa, members of the LIGO Scientific Collaboration Council.
- Alicia M. Sintes, member of the GEO600 Executive Committee
- Alicia M. Sintes, member of the Max Planck Research School (IMPRS) on Gravitational Wave Astronomy Committee.
- Alicia M. Sintes, member of the ISGRG Nominating Committee.
- Jaume Carot, member of the executive committee of the R + D + i sector commission of the CRUE. He is part of the CRUE working group for the 'Iberian Agenda of Knowledge'.
- Jaume Carot, member of the RIS3 Expert Group of the EUA.
- Jaume Carot, member of the monitoring committee of the RIS3 strategy in the Balearic Islands.
- Ramón Oliver, member of the Board of the European Solar Physics Division of the European Physical Society.
- Bartomeu Coll member of the Math Accreditation Commission (ANECA)
- Bartomeu Coll, member of the Editorial Board of SIAM Imaging Journal.
- Alicia M. Sintes, member of the Editorial Board of Astroparticle Physics (2018).
- Alicia M. Sintes, member of the quality commission of PhD in Physics until October 2018.

R&D management

- Alicia M. Sintes, Secretary of Commission of PhD in Physics until October 2018.
- Alicia M. Sintes Secretary of the IAC3.
- Carles Bona, Director of the Physics Department.
- Carles Bona, member of the Development and Design Commission of the current curriculum of the Bachelor Degree in Physics of the UIB.
- Jaume Carot, UIB Vice-chancellor for Research and Internationalization.
- José Luis Ballester, Director of IAC3.
- Carlos Palenzuela, member of the academic commission of PhD in Physics.

14. ORGANIZATION I+D+I ACTIVITIES

IAC3 Meetings

- 7-9/05/2018. Iberian Gravitational Waves Meeting organized by Relativity and Gravitation group of the University of the Balearic Islands. <http://grguib.es/iberianGW18/>
- 10-14/09/2018. The Initiation to Research and Innovation Workshop held in Palma. Joint meeting between UIB (TAMI team) and ENPC (École Nationale des Ponts et Chaussée), <https://imi2018.enpc.fr/>
- 21-22/09/2018. "Jornades científiques sobre l'estudi qualitatiu dels sistemes dinàmics i les seves aplicacions". Palma de Mallorca, Spain.
- 30/10/2018-1/11/2018. The LVC Waveforms face-to-face Meeting was hosted by the Relativity and Gravitation group of the University of the Balearic Islands, Spain. <http://grguib.es/lvcwaveforms2018/>

IAC3 Seminars

- 15 January: R. Prohens
Seminario Matemática Aplicada UIB: "New lower bounds for the Hilbert numbers using reversible centers"
Edifici de Postgrau (Mossèn Antoni Maria Alcover Sureda),
UIB, Palma
- 18 January 2018: Yana Maneva
Seminar: "Hybrid modeling of local ion acceleration and relaxation in the solar corona and the solar wind"
Sala de Seminarios, Edifici Mateu Orfila UIB
- 18 January 2018: Cecilio García and Daniele Viganò
Journal Club: "Black hole kicks as new gravitational wave observables" and "The Binary Neutron Star event LIGO/VIRGO GW170817 a hundred days after merger: synchrotron emission across the electromagnetic spectrum"
14h, 10 Physics Laboratory, Antoni Maria Alcover Building,
UIB
- 19 January 2018: Adolfo F. Viñas
Seminar: "New Perspectives on a 70-Years Old Problem: Kinetic Simulation Study of Landau Damping Universitat"
Sala de Seminarios, Edifici Mateu Orfila UIB
- 1 February 2018: Pep Covas and Leila Haegel
Journal Club: "Identification and mitigation of narrow spectral artifacts that degrade searches for persistent gravitational waves in the first two observing runs of Advanced LIGO" and "The future of gravitational theories in the era of the gravitational wave astronomy".
14h, 10 Physics Laboratory, Antoni Maria Alcover Building,
UIB
- 6 February 2018: Sergio Toledo Redondo (European Space Agency (ESAC), Madrid, Spain)
Seminar: Solar wind-magnetosphere coupling via magnetic reconnection and the effects of cold plasma of ionospheric origin
Physics Department, UIB
- 22 February 2018: Héctor Estellés and Antoni Ramos
Journal Club "Reinterpreting Low Frequency LIGO/Virgo Events as Magnified Stellar-Mass Black Holes at Cosmological Distances" and "SENR/NRPY+: Numerical Relativity in Singular Curvilinear Coordinate Systems".
14h, Aula 4a, Antoni Maria Alcover Building, UIB
- 22 February: C. Vich
Seminario Matemática Aplicada UIB: ""Making decisions between two choices"
Edifici de Postgrau (Mossèn Antoni Maria Alcover Sureda),
UIB, Palma
- 9 March 2018: Dr. Jose D. Edelstein
"Como dos extraños: Mecánica Cuántica y Relatividad General"
12 h, Sala de Graus, Edifici Antoni Maria Alcover i Sureda,
UIB
<http://grg.uib.es/news/jose.php>
- 12 April 2018: Prof. Thibaut Damour
"Gravitational Waves and Binary Black Holes"
14:30 h, Sala de Graus, Edifici Antoni Maria Alcover i
Sureda, UIB
- 3 May 2018: Miguel Bezares
Extreme Gravity Tests with Gravitational Waves from Compact Binary Coalescences: (I) Inspiral-Merger"
14h, Aula 4a, Antoni Maria Alcover Building, UIB
- 6 May 2018: Andrés Adrover
Seminar: Numerical simulations of solar filament oscillations.
Sala de Seminarios, Edifici Mateu Orfila UIB
- 8 May 2018: Chris J. Nelson (Queen's University Belfast & University of Sheffield (UK))
Seminar: Signatures of localised magnetic reconnection in the photosphere and corona
Physics Department, UIB
- 22 May 2018: Samuel Rial (UIB)
Seminar: Normal modes of a coronal loop embedded in a potential arcade
Physics Department, UIB
- 24 May: A. E. Teruel
Seminario Matemática Aplicada UIB: "Saddle-node of limit cycles in PWL systems and applications"
Edifici de Postgrau (Mossèn Antoni Maria Alcover Sureda),
UIB, Palma
- 5 October 2018: Miquel Oliver Almiñana
"Neutron stars as gravitational wave emitters"
12h, Lab 10, Antoni Maria Alcover Building, UIB
- 15 October: Rodrigo Tenorio
"Applications of Universal Statistics to search for continuous GWs"
10:30h, 3a Room, Antoni Maria Alcover Building.
- 16 October: Pep Covas
"A new method to detect continuous gravitational waves from spinning neutron stars in binary systems"
11h, 2a Room, Antoni Maria Alcover Building, UIB.
- 2 November: Tom Broadhurst (Department of Theoretical Physics, University of the Basque Country; Ikerbasque, Basque Foundation for Science, Bilbao)
"Dark Waves in the Galaxy and the Axiverse"
11:30h, Lab 10, Antoni Maria Alcover building, UIB, Palma
- 6 November 2018: Gary Verth (University of Sheffield, UK)
Seminar: Sunspot waves
Physics Department, UIB
- J. Duran and Y. González
"Deep Learning. Last Trends and Applications
Ciclo de Conferencias Datos Masivos e Inteligencia Artificial", Cátedra Hotelbeds Group & Universitat de les Illes Balears
Palma, Spain.

15. CONTRIBUTION TO I+D+I ACTIVITIES

Seminars and colloquia

- 1 February: J. Duran (Image processing)
Collaborative Regularization Approaches in Multi-Channel Variational Imaging: Theory, Applications and Perspectives
School of Mathematics, The University of Manchester, Manchester, UK.
- 9 February 2018: Leila Haegel. (Relativity and Gravitation)
"Gravitational waves: a new probe of the cosmos". [Bucharest University, Romania](#)
- 23 March 2018: Leila Haegel (Relativity and Gravitation)
Colloquium: "Testing general relativity with gravitational waves".
University of Berkeley <https://dcc.ligo.org/LIGO-G1801424>

Contribution to conferences and workshops

INVITED TALK:

Computational Applications

- Joan Josep Cerdà
Invited talk: Magnetic fields, a new promising technological field
Graduated Students Meeting on Electronics Engineering 2018
28-29/06/2018, Universitat Rovira i Virgili
Tarragona

Astrophysics

- Soler, R., Terradas, J., Oliver, R., Ballester, J.
Invited talk: Energy transport and heating by torsional Alfvén
waves in the partially ionized chromosphere.
[BUKS 2018](#)
03-07/09/2018. La Laguna, Tenerife, Spain

Relativity and Gravitation

- Geraint Pratten
Invited Talk, Conference, " Four Challenges in Gravitational
Wave Astronomy with Neutron Stars", Talk
Title: Phenomenological Waveform Models
http://www.pr.infn.it/html_extra/gworkshop/gw180116/
INFN, Università degli Studi di Parma, Parma, Italy 16.01.2018-
17.01.2018
- Carlos Palenzuela
Invited speaker: "Binary compact objects in alternative theories of
gravity".
Congress: [Gravity@Malta 2018: "Gravitational Waves, Black
Holes and Fundamental Physics"](#). 22-25/01/2018, University of
Malta, Malta.
- Alicia Sintes.
Invited speaker: "Searches for signals from unknown or poorly
known sources"
16-20/04/2018. INT Workshop INT-18-71W: Astro-Solids,
Dense Matter, and Gravitational Waves. Seattle, United States
<https://dcc.ligo.org/LIGO-G1800775>
<http://www.int.washington.edu/PROGRAMS/18-71W/>
- Alicia Sintes.
Invited Talk: "CW Searches Overview" 19/03/2018. LVC
Meeting. Sonoma State University, California,
USA. <https://dcc.ligo.org/G1800487>, <http://ligo.sonoma.edu/>

- Sascha Husa
Invited speaker: Modelling the gravitational wave signal from
compact binary coalescence (DCC: G1801425-V2)
XIII Reunión Científica de la Sociedad Española de Astronomía
16-20/07/2018 Salamanca,
https://www.sea-astronomiae/sites/default/files/sea2018_plenarias_20180620.pdf
<https://sea2018.usales.es>
- Sascha Husa.
Invited talk: Modelling gravitational wave signals from coalescing
black holes.
12th RES Meeting 20-21/09/2018, Valencia, Spain
<https://www.reses/en/events/12th-res-users-meeting-7th-hpc-advisory-council-conference>
- Alicia Sintes.
Invited Talk: Ondas gravitacionales en LIGO.
Primer Congreso Nacional de Estudiantes de Física, Salamanca,
Spain 28/09/2018
<https://nusgrem.es/primer-congreso-nacional-de-estudiantes-de-fisica/>
- Sascha Husa.
Invited talk: "The phenomenological waveforms program - current
status and challenges ahead."
[3rd LISA Consortium Meeting](#)
5-7/11/2018. "Palais du PHARO", Marseille, France.
<https://indico.in2p3.fr/event/17866/overview>

Image processing

- A. Buades
Invited talk: "Restoration of RAW mobile video sequences"
Huawei Workshop in future technologies for ISP, Nice, France,
2018.
- A. Buades, J. L. Lisani
Invited talk: "Restoration of noisy and compressed video
sequences"
Siam Imaging Science, Bologna, Italy, 2018.
- J. Duran
Collaborative Regularization Models for Color Imaging Problems
SIAM Conf. Imaging Sciences, Bologna, Italy, 2018

CONTRIBUTED TALKS

Astrophysics

- Oliver, R., Soler, R., Terradas, J., Zaqrashvili, T. V., Khodachenko, M. L., Antolin, P., Boulharrak, A
Contributed talk: Dynamics of coronal rain blobs.
Observed multi-scale variability of coronal loops as a probe of coronal heating.
05/01/2018. International Space Science Institute, Bern, Switzerland
- J. L. Ballester, M. Carbonell, R. Soler, J. Terradas
Contributed Talk: The temporal behaviour of MHD waves in a partially ionized prominence-like plasma: Effect of heating and cooling with different radiative loss functions.
[The Dynamic Sun II](#)
12-16/02/2018. Siem Reap, Camboya
- J. L. Ballester, M. Carbonell, R. Soler, J. Terradas
Contributed Talk: Effect of heating and cooling on the temporal behaviour of MHD waves in a partially ionized prominence plasma using different radiative loss functions
ISSI Large Amplitude Oscillations as a probe of Quiescent and Erupting Prominences
01/04/2018. Berna, Suiza
- Oliver, R.
Contributed talk: Do signals dream of the Empirical Mode Decomposition? Rossby Waves in Astrophysics
05/07/2018. International Space Science Institute, Bern, Switzerland
- Auchère, F., Soubrié, E., Antolin, P., Froment, C., Oliver, R., Pelouze, G.
Contributed talk: The coronal monsoon: thermal nonequilibrium revealed by periodic coronal rain.
[COSPAR 2018](#)
14-22/07/2018. Caltech, Pasadena, California, USA
- Terradas, J., Ballester, J. L., Soler, R., Oliver, R., Luna, M.
Contributed talk: Dynamics and morphology of solar prominences from MHD simulations.
[COSPAR 2018](#)
14-22/07/2018. Caltech, Pasadena, California, USA
- Oliver, R., Soler, R., Terradas, J., Zaqrashvili, T. V., Khodachenko, M. L., Antolin, P., Boulharrak, A
Contributed talk: What brakes coronal rain?
[COSPAR 2018](#)
14-22/07/2018. Caltech, Pasadena, California, USA
- Andrés Adrover
Contributed talk: 3D numerical simulations of oscillations in prominences.
[XIII Reunión Científica de la SEA](#)
16-20/07/2018. Salamanca, Spain
- Soler, R., Terradas, J., Oliver, R., Ballester, J. L.
Contributed talk: Torsional Alfvén waves in the lower solar atmosphere: energy transport and dissipation.
[XIII Reunión Científica de la SEA](#)
16-20/07/2018. Salamanca, Spain
- J. L. Ballester, M. Carbonell, R. Soler, J. Terradas
Contributed talk: The temporal behaviour of MHD waves in a partially ionized prominence-like plasma: Effect of heating and cooling with different radiative loss functions.
[XIII Reunión Científica de la SEA](#)
16-20/07/2018. Salamanca, Spain
- Andrés Adrover
Contributed talk: Numerical study of a 3D prominence model: Transverse and longitudinal MHD oscillatory modes.
[BUKS 2018](#)
03-07/09/2018. La Laguna, Tenerife, Spain
- Auchère, F., Soubrié, E., Antolin, P., Froment, C., Oliver, R., Pelouze, G.
Contributed talk: The coronal monsoon: thermal nonequilibrium revealed by periodic coronal rain
[2018 SDO Science Workshop](#)
29/10/2018. Ghent, Belgium
- Soler, R., Terradas, J., Oliver, R., Ballester, J. L.
Contributed talk: Energy transport and heating by torsional Alfvén waves in the quiet-Sun atmosphere.
[2018 SDO Science Workshop](#)
29/10/2018. Ghent, Belgium

Computational Applications

- Joan J. Cerdà, Daniel Lusebrink, Pedro Sanchez, Sofia Kantorovich, Tomàs Sintes
Contributed talk: "Magnetic brushes in particle flows: towards tunable selective nanofilters"
[Flowing Matter 2018](#)
5-9/02/2018, Lisboa, Portugal
- Carles Bona-Casas
Contributed talk: "The divergence conforming immersed boundary method: application to microscale blood flow".
6th European Conference on Computational Mechanics (ECCM6) and 7th European Conference on Computational Fluid Dynamics (ECFD7)
11-15/06/2018, Glasgow, United Kingdom
- Carles Bona-Casas
Contributed talk: "The Divergence-Conforming Immersed Boundary Method with application to capsule and vesicle dynamics".
The Society of Engineering Science (SES) Technical Meeting 2018
10-12/10/2018, Universidad Carlos III de Madrid, Spain
- J.J. Cerdà, P. Sánchez, S. Kantorovich, T. Sintes
Contributed talk: Flow properties of particle mixtures in micro and nano-channels coated with responsive-polymer brushes
[FiSeS 2018, XXII Congreso de Física Estadística](#)
18-20/10/2018, Madrid

Relativity and Gravitation

- Miquel Oliver, Alicia M. Sintes
Contributed Talk: "Digitized Power Law Tracker Presentation (DPT)"
10/01/2018 <https://dcc.ligo.org/LIGO-G1800045>
- Alicia Sintes
Contributed talk: "Searching for continuous gravitational-waves from spinning neutron stars", Gravity@Malta 2018: "Gravitational Waves, Black Holes and Fundamental Physics". 22-25/01/2018, University of Malta, Malta.
<https://www.um.edu.mt/events/gravitymalta2018/home>
- Geraint Pratten, Ryan Magee, Marissa Walker
Contributed Talk: "Parameter Estimation Update for O2 Rota".
30/01/2018. PE Call. <https://dcc.ligo.org/LIGO-G1800160>

- C. García Quirós M. Colleoni, G. Pratten, S. Husa.
Contributed Talk: "Calibration of a multi-mode phenomenological waveform model to numerical data" 15/03/2018. CBC Waveform Call.
<https://dcc.ligo.org/LIGO-G1800411>
- A. Ramos, G. Pratten, S.Husa, X. Jiménez Forteza, C. García Quirós, H. Estellés, D. Keitel, R. Jaume, P. Covas, P. Schmidt.
Contributed Talk: "Update on BBH Simulation Efforts" . 15/03/2018. CBC Waveform Call. <https://dcc.ligo.org/LIGO-G1800412>
- Geraint Pratten, S Husa, M Colleoni, C García, A Ramos, R Jaume, X Jiménez Forteza, D Keitel, A Nagar, S Bernuzzi.
Contributed Talk: "IMRPhenomX: A Framework for Phenomenological Waveform Models" 15/03/2018. CBC Waveform Call. <https://dcc.ligo.org/LIGO-G1800406>
- Miquel Oliver, Alicia Sintes.
Contributed Talk: "Hough post-merger update" 19-22/03/2018. LVC Meeting. Sonoma State University, California, USA.
<https://dcc.ligo.org/cgi-bin/private/DocDB>ShowDocument?docid=G1800546&version=http://ligo.sonoma.edu/>
- C. García Quirós, M. Colleoni, G. Pratten, S. Husa.
Contributed Talk: "Calibration of a multi-mode phenomenological waveform model to Numerical Relativity" 19-22/03/2018. LVC Meeting. Sonoma State University, California, USA. <https://dcc.ligo.org/LIGO-G1800513>, <http://ligo.sonoma.edu/>
- Pep Covas, Alicia Sintes.
Contributed talk: "Setup for SkyHough all-sky analysis of O2 data" 19-22/03/2018. LVC Meeting. Sonoma State University, California, USA.
<https://dcc.ligo.org/LIGO-G1800479>, <http://ligo.sonoma.edu/>
- P. Covas, E. Goetz, A. Neunzert, B. Pearlstone.
Contributed talk: "Data characterization of cleaned C02 h(t)" 19-22/03/2018. LVC Meeting. Sonoma State University, California, USA.
<https://dcc.ligo.org/LIGO-G1800499>, <http://ligo.sonoma.edu/>
- Daniele Viganò
Contributed talk: [Signatures of fermion-boson star mergers](#)
8th Iberian Gravitational Waves Meeting
8/05/2018. UIB, Palma, Spain
- Antoni Ramos
Contributed talk: A simple procedure to reduce the eccentricity of binary black hole simulations. 8th Iberian Gravitational Waves Meeting. 07-09/05/2018, UIB, Palma, Spain
<http://grguib.es/IberianGW18/>
- Geraint Pratten
Contributed talk: IMRPhenomX: A Framework for Phenomenological Waveform Models
8th Iberian Gravitational Waves Meeting. 07-09/05/2018, UIB, Palma, Spain
<http://grguib.es/IberianGW18/>
- C. García Quirós
Contributed talk: Multi-mode frequency-domain gravitational waves model for non-precessing black-hole binaries. 8th Iberian Gravitational Waves Meeting. 07-09/05/2018, UIB, Palma, Spain <http://grguib.es/IberianGW18/>
- Marta Colleoni
Contributed talk: "Self-force input for binary black-hole inspirals: progress and challenges. 8th Iberian Gravitational Waves Meeting 07-09/05/2018, UIB, Palma, Spain
<http://grguib.es/IberianGW18/>
- Héctor Estellés
Contributed talk: Lensing effects in gravitational waves from astrophysical sources: signal morphology and impact on detection. 8th Iberian Gravitational Waves Meeting. 07-09/05/2018, UIB, Palma, Spain <http://grguib.es/IberianGW18/>
- P. Covas
Contributed talk: All-sky searches of continuous gravitational waves from isolated neutron stars. 8th Iberian Gravitational Waves Meeting 07-09/05/2018, UIB, Palma, Spain
<http://grguib.es/IberianGW18/>
- P. Covas
Contributed talk: All-sky searches of continuous gravitational waves from neutron stars [\(DCC: G1801413-v2\)](#), XIII Reunión Científica de la Sociedad Española de Astronomía 16/07/2018, Salamanca, Spain
<https://sea2018.usal.es>
https://www.sea-astronomia.es/sites/default/files/sea2018_programa_general_final_20180712.pdf
- Antoni Ramos, Geraint Pratten and Sascha Husa
Contributed talk: Calibration of Black Hole Binary Numerical Relativity simulations (DCC: G1801436-v1). XIII Reunión Científica de la Sociedad Española de Astronomía 16-20/07/2018, Salamanca
https://www.sea-astronomia.es/sites/default/files/sea2018_programa_general_final_20180712.pdf
<https://dcc.ligo.org/LIGO-G1801436>
- Daniele Viganò
Contributed talk: Turbulence in neutron star mergers
[XIII Reunión Científica de la SEA](#) <https://sea2018.usal.es>
Salamaca, Spain
16-20/07/2018
- Héctor Estellés, Pep Covas
Contributed talk: Lensed gravitational waves from spinning neutron stars by SgA* and globular clusters
XIII Reunión Científica de la Sociedad Española de Astronomía 16-20/07/2018, Salamanca,
https://www.sea-astronomia.es/sites/default/files/sea2018_programa_general_final_20180712.pdf
<https://sea2018.usal.es>
- Antoni Ramos, Sascha Husa, Geraint Pratten, Maria Haney
Presentation: "UIB Status update on eccentric modelling" (DCC: G1801615)
CW Call 23/08/2018
<https://dcc.ligo.org/LIGO-G1801615>
- Pep Covas, Alicia M. Sintes
Contributed talk: Update on all-sky analysis of O2 data. (DCC: G1801741)
LVC Meeting Maastricht 2018 4-7/09/2018, Maastricht, The Netherlands
<https://dcc.ligo.org/LIGO-G1801741/>
<https://www.lvcmeetingmaastricht2018.com/>
- Marta Colleoni, Hector Estelles, Edward Fauchon-Jones, Cecilio Garcia-Quiros, Leila Haegel, Eleanor Hamilton, Mark Hannam,

Sascha Husa, Rafel Jaume, Sebastian Khan, Lionel London, Frank Ohme, Francesco Pannarale, Geraint Pratten, Antoni Ramos-Buades
Contributed talk: Phenomenological waveform models: an update. (DCC: G1801758)
[LVC Meeting Maastricht 2018](#) 4-7/09/2018, Maastricht, The Netherlands
<https://dcc.ligo.org/LIGO-G1801758>
<https://www.lvcmeetingmaastricht2018.com/>

- Jaume Carot
Contributed talk: "Elasticity in General Relativity"
Spanish-Portuguese Relativity Meeting 2018
4-7/09/2018, Palencia (Spain)
- Geraint Pratten
Contributed talk: Numerical Relativity and Phenomenological Waveform Modelling.
European Einstein Toolkit Meeting 2018
10-13/09/2018 Instituto Superior Tecnico, Lisbon
<https://centra.tecnico.ulisboa.pt/network/grit/einsteintoolkit2018/>

- Sascha Husa
Contributed talk: Revisiting convergence tests of binary black hole simulations for waveform modelling. European Einstein Toolkit Meeting 2018
(Scientific Organising Committee) 10-13/09/2018, Instituto Superior Tecnico, Lisbon
<https://centra.tecnico.ulisboa.pt/network/grit/einsteintoolkit2018/>
- Antoni Ramos
Contributed talk: Simple method to reduce the eccentricity of Binary Black Hole simulations with the EinsteinToolkit. European Einstein Toolkit Meeting 2018
10-13/09/2018, Instituto Superior Tecnico, Lisbon
<https://centra.tecnico.ulisboa.pt/network/grit/einsteintoolkit2018/>

Dynamical Systems

- C. Vich. Co-authors: K. Dunovan, M. Clapp, J. Rubin, T. Verstynen
Contributed talk: "Dopaminergic changes in striatal pathway competition modify specific decision parameters"
Computational and Systems Neuroscience (Cosyne) 2018
01/03/2018. Denver (Colorado)
- C. Vich. Co-authors: K. Dunovan, M. Clapp, J. Rubin, T. Verstynen
Contributed talk: "Phasic dopamine influences on action value estimation"
Analysis and Modeling of Complex Oscillatory Systems (AMCOS)
21/03/2018. Barcelona (Spain)
- B. Coll, A. Gasull
Contributed talk: "Asymptotic dynamics of a difference equation with a parabolic equilibrium"
"International Conference in Nonlinear Analysis and Boundary Value Problems"
4-7/09/2018. Santiago de Compostela (Spain)
- C. Vich. Co-authors: K. Dunovan, M. Clapp, J. Rubin, T. Verstynen
Contributed talk: "Phasic dopamine influences on a two-alternative forced choice task"
International workshop on neurodynamics (NDy'18)
28/09/2018. Castro Urdiales (Spain)
- R. Prohens. Co-authors: A.E. Teruel, J. Torregrosa
Contributed talk: "Cyclicity of 2-saddle connection in a discontinuous piecewise linear differential systems"
Workshop: II Joint meeting Spain-Brazil in Mathematics (RSME-SEMA-SBM-SBMAC)

11-14/12/2018. Cádiz (Spain)

Image processing

- J. L. Lisani
"Adaptive Local Image Enhancement based on Logarithmic Mappings"
IEEE Int. Conference on Image Processing (ICIP), Athens, 2018.

POSTERS

Computational Applications

- J.J. Cerdà, P. Sánchez, S. Kantorovich, T. Sintes
Póster: Micro and nano-channels coated with tunable responsive-polymer brushes: towards a selective rheology of polydisperse particle flows
Jülich Soft Matter Days 2018
20-23/11/2018, Jülich, Alemania.

Astrophysics

- M. Carbonell, R. Soler, J. L. Ballester, J. Terradas
Panel: Alfvén waves in a partially ionized two-fluid plasma.
XIII Reunión Científica de la SEA
16-20/07/2018. Salamanca, Spain
- M. Carbonell, J. L. Ballester, R. Soler, J. Terradas
Panel: Effect of heating and cooling on the temporal behaviour of MHD waves in a partially ionized prominence plasma using different radiative loss functions.
BUKS 2018
03-07/09/2018. La Laguna, Tenerife, Spain

Relativity and Gravitation

- Cecilio García, Marta Colleoni, Geraint Pratten, Héctor Estellés Estrella, Sascha Husa, Leila Hägel, Antoni Ramos Buades, Rafel Jaume Amengual.
Poster: Modelling subdominant gravitational waves modes and its astrophysical implications.(DCC: G1801437-v1)
XIII Reunión Científica de la Sociedad Española de Astronomía
16-20/07/2018, Salamanca,
<https://sea2018.usales.es>
<https://dcc.ligo.org/LIGO-G1801437>

Image processing

- J. Navarro, J. Duran and A. Buades
Poster: Filtering and Interpolation of Inaccurate and Incomplete Depth Maps
Proc. of 25th IEEE Int. Conf. on Image Processing (ICIP), pp. 1533-1537,
Athens, Greece, 2018.
- A. Buades and J. Duran
Poster: Joint Denoising and Demosaicking of RAW Video Sequences
Proc. of 25th IEEE Int. Conf. on Image Processing (ICIP), pp. 2172-2176, Athens, Greece,
2018.
- J. Mifdal, B. Coll and J. Duran
Poster: A Variational Formulation for Hyperspectral and Multispectral Image Fusion
Proc. of 25th IEEE Int. Conf. on Image Processing (ICIP), pp. 3328-3332,

ATTENDANCE

Astrophysics

- R. Soler
Attendance: [XXX General Assembly of the IAU](#)
20-31/08/2018. Vienna, Austria

Relativity and Gravitation

- Marta Colleoni, Héctor Estellés, Cecilio García, Sascha Husa, Rafel Jaume, Geraint Pratten
Attendance: [LVC waveforms face-to-face Meeting](#)

Dynamical Systems

- M.J. Álvarez, R. Prohens, A.E. Teruel, C. Vich
Attendance Workshop: "Jornades científiques sobre l'estudi qualitatiu dels sistemes dinàmics i les seves aplicacions"
21-22/09/2018. Palma de Mallorca (Spain)

16. RESEARCH VISITS

| Visitor | Visiting Institute | Arrival-Departure | Line of Research |
|-----------------|---|-----------------------|----------------------------|
| Júlia Navarro | Technicolor R&I, Rennes, France. Project: "Deep learning for light fields". | 12/03/2018-13/07/2018 | Image Processing |
| Rodrigo Tenorio | HGS-HIRe Summer Student Program at GSI 2018 Project: Automated Setup of an OpenStack Cluster with HEP Applications | 23/07/2018-13/09/2018 | Relativity and Gravitation |
| Pep Covas | Sapienza Università di Roma, Roma | 10/09/2018-21/09/2018 | Relativity and Gravitation |
| Antoni Ramos | Universitat de Radboud, Nijmegen | 15/09/2018-01/12/2018 | Relativity and Gravitation |
| Pep Covas | Albert Einstein Institut, Hannover, Germany | 22/10/2018-16/11/2018 | Relativity and Gravitation |
| Miguel Bezares | Sapienza Università di Roma, Roma | 05/11/2018-23/11/2018 | Relativity and Gravitation |

17. VISITORS

| Visitor | Home Institute | Arrival-Departure | Line of Research |
|-------------------|--|-----------------------|----------------------------|
| Miguel Ibáñez | Universidad de los Andes (Mérida), Venezuela. | 15/10/2018-15/12/2018 | Astrophysics |
| Steve Liebling | Long Island University, New York, US | 02/07/2018-31/07/2018 | Relativity and Gravitation |
| Salma Essawab | Cadi Ayyad High School, Morocco | 25/06/2018-20/07/2018 | Relativity and Gravitation |
| Paolo Pani | Universidad de la Sapienza, Roma, Italy | 11/06/2018-02/07/2018 | Relativity and Gravitation |
| Thibaut Damour | Institut des Hautes Études Scientifiques, Bures sur Yvette, France | 12/04/2018 | Relativity and Gravitation |
| José D. Edelstein | Particle Physics department, Universidad de Santiago de Compostela | 09/03/2018 | Relativity and Gravitation |

| | | | |
|----------------------------------|-----------------------------------|------------------------|----------------------------|
| Alicia Di Prisco | Universidad Central de Venezuela | 01/03/2018-30/04/2018 | Relativity and Gravitation |
| Luis Herrera | Universidad Central de Venezuela | 01/03/2018-30/04/2018 | Relativity and Gravitation |
| José Pons | Universidad de Alicante | 24/01/2018- 26/01/2018 | Relativity and Gravitation |
| Jonathan Rubin | University of Pittsburgh | 01/10/2018 | Dynamical Systems |
| Joan Torregrosa | Universitat Autònoma de Barcelona | 19/03/2018-23/03/2018 | Dynamical Systems |
| José Luis Bravo | Universidad de Extremadura | 05/02/2018- 09/02/2018 | Dynamical Systems |
| Manuel Fernández García-Hierro | Universidad de Extremadura | 05/02/2018- 09/02/2018 | Dynamical Systems |
| Armengol Gasull | Universitat Autònoma de Barcelona | 23/01/2018-01/02/2018 | Dynamical Systems |
| Adrian C. Murza | University of Texas | 01/06/2018-06/06/2018 | Dynamical Systems |
| Geoffroy Dufay (tutor B.Coll) | Mines ParisTech | 01/05/2018-30/09/2018 | Image Processing |

18. OUTREACH

OUTREACH BOOKS AND ARTICLES

- "CIENCIA, y yo quiero ser científico!!!", book edited by Quintín Garrido Garrido, contribution by R. Oliver: "Físico Solar"
<https://cienciayquierosercientifico.blogspot.com.es/>
<https://yoquierosercientifico.blogspot.com/2018/01/yo-quiero-ser-fisico-solar-ramon-oliver.html>



Image 9. Ramón Oliver Herrero has written the chapter 83 of the outreach book: "CIENCIA, y yo quiero ser científico!!!"

- Alicia Sintes
Astronomía gravitacional. La nueva ventana al cosmos.
 Revista: [Astronomía](#) (N. 229-230 Julio-Agosto 2018)
<https://www.globalastronomia.com/astronomia-gravitacional/>



LECTURES

- November 2018: R. Oliver
 "Planetas, estrellas y galaxias. Un paseo por el Universo"
 CEIP Sta. María del Mar (Cala d'Or)
- 2-6 July 2018: 2nd Institute of Space Sciences Summer School - Gravitational Wave Astronomy. Alicia M. Sintes (3h)
 Gravitational Waves Data Analisys
<https://dccligo.org/LIGO-G1801395>
 Institute of Space Sciences, Campus UAB - Bellaterra, Spain
- 29 June 2018: Rafel Jaume, Héctor Estellés
 Public Lecture: IX Campus Científicòtècnic d'Estiu
 UIB Students 4ºESO a 1ºBatxillerat, 50 people for session
- 15-16 May 2018: J.L. Ballester
 Lecture: "La física al descobert"
 Universitat Oberta per a Majors, Palma de Mallorca, Balears, Spain
- 2 and 7 May 2018: Joan J. Cerdà
 Lecture: "La física al descobert"
 Universitat Oberta per a Majors, Palma de Mallorca, Balears, Spain
- 09 May 2018: Alicia M. Sintes
 Lecture: "La física al descobert"
 Universitat Oberta per a Majors, Palma de Mallorca, Balears, Spain
- 23, 25, 30 April 2018: Carles Bona
 Lecture: "La física al descobert"
 Universitat Oberta per a Majors, Palma de Mallorca, Balears, Spain

- 16 March 2018: High School Lectures: La Salle Rafael Jaume, Héctor Estellés
4t ESO, 40 students
- 23 Febrero 2018: High School Lectures . IES S'Arenal. Rafael Jaume y Héctor Estellés
Public Lecture: "Ondas gravitacionales"
Students 4ºESO - 2ºBatxillerat, 150 people aprox.
- January-February 2018: J.L. Ballester, R. Oliver
"Descobrir l'Univers (Discovering the Universe)", Course at the Universitat Oberta per a Majors (Senior University), UIB

Curs 2017/2018. Bartomeu Coll and Maria Jesús Alvarez.
"Poden infinitos números sumar 1?" and "Les matemàtiques i el món que ens envolta: camins aleatoris" at ESTALMAT.
- January 2018: José Luis Ballester, Ramón Olivier
Lecture: "Descobrir l'univers"
Universitat Oberta per a Majors, Palma de Mallorca, Balears, Spain



Image 10. Barry Barish, Physics Nobel Prize, visit UIB.

PUBLIC TALKS

- 15 November 2018: Sascha Husa
Public Talk: "Ondas gravitacionales de binarias de agujeros negros: descifrando sus enigmas con superordenadores"
[Universitat de Valencia, Valencia](#)
- 9 November 2018: Alicia M. Sintes
Public Talk: "El albor de la astronomía de ondas gravitacionales"
Sala Tornamira del Planetario de Pamplona, Navarra, Spain
<http://www.unavarra.es/astronomia-upna/secciones?contentId=236474>
- 26 October 2018: Alicia M. Sintes and Giovanni Losurdo
Conferencia Multimedia: "Onde gravitazionali, organizada por la "Società Dante Alighieri Comitato delle Isole Baleari".
CaixaForum, Plaça Weyler, 3, 07001 Palma Palma, Spain
<https://www.facebook.com/Societ%C3%A0-Dante-Alighieri-Comitato-delle-Isole-Baleari-355718721587660/>
- 19 October 2018: Alicia M. Sintes
Public talk: "Ondas Gravitacionales, así suena el universo"
Facultad de Ciencias de la Universidad Cadi Ayyad de Marrakech.
Instituto Cervantes de Marrakech.
- 11 October 2018: Alicia M. Sintes
Public talk: "El albor de la astronomía de ondas gravitacionales"
19h, CaixaForum Palma
<https://caixaforum.es/palma/fichaactividad?entryId=557484>
- 13-16 September 2018: Interview to Alicia Sintes in NAUKAS Bilbao
Palacio Euskalduna, Bilbao, Spain
<https://naukas.com/2018/04/20/ya-tenemos-cartel-y-fechas-definitivas-para-naukas-bilbao-2018/>
- 21 June 2018:
Public Lecture: "Descubriendo los enigmas del universo"
Javier Santaolalla - Superhéroes con bata
- 16 March 2018: Alicia M. Sintes - El Nobel de Física 2017 Y la participación de la UIB
Barry Barish - Gravitational Waves: From Einstein to a New Science
19h, Auditorium de Palma
<https://ultimahora.es/mallorca/ocio/conferencias/descubriendo-enigmas-del-universo.html>
https://www.youtube.com/watch?time_continue=7&v=k4Cfwh03fjs
- 1 June 2018: Alicia M. Sintes
Public talk: "Multimensajeros: la Física del Futuro"
<https://cienciadefuturo.io/>
Encuentro con la Gran Ciencia. [Sevilla, España](#)
- 29 May 2018: Alicia M. Sintes
Public talk: "El albor de la astronomía de ondas gravitacionales"
Club de Mar, Palma, España
- 22 May 2018: Alicia M. Sintes
Conference: "Gravitational waves: this is how the universe sounds!"
UCL & Instituto Cervantes de Londres,
<https://sruk.org.uk/events/gravitational-waves-london/>
- 16 May 2018: Alicia M. Sintes
Acto Central del Día Internacional de la Luz en España
<https://www.diadelaluz.es/29-Anunciado-el-programa-del-Acto-Central-del-DIL-en-Espa%C3%B1a1a>
Conference: "El albor de la astronomía de ondas gravitacionales"
[Universidad Complutense de Madrid, Madrid, España](#)
- 2 May 2018: Alicia M. Sintes
Public talk: "El albor de la astronomía de ondas gravitacionales"
[CosmoCaixa, Barcelona](#)
- 27 March 2018: Alicia M. Sintes
Public talk: "Ondas gravitacionales: así suena el universo... ¡por fin!"
[Instituto Cervantes de Moscú, Rusia](#)
<https://moscow.carpe-diem.events/calendar/6069007-gravitationnye-volny-vot-kak-zvuchit-vselennaya-at-instituto-cervantes-de-mosc-institut-servantesa-v-moskve/>
- 14 March 2018: Alicia M. Sintes
Public talk: "El Premio Nobel de Física 2017"
Sesión científica en la Real Academia de Ciencias, [Real Academia de Ciencias, Madrid](#)
http://www.rac.es/7/7_1_1.php?id=239
- 1 March 2018: Alicia M. Sintes
Public talk: "Las nuevas mensajeras del universo".

[Facultad de Física, Universidad de Sevilla](#)
<http://canalciencia.us.es/tag/alicia-sintes/>

- 24 January 2018: Alicia M. Sintes, Thomas Sotiriou, Vitor Cardoso, Valeria Ferrari, Leor Barack Gravity@Malta 2018 - Malta Café Scientifique.
 Public talk: "Gravitational Waves, Black Holes and Fundamental Physics"
 19 - 20:30h, Valletta Campus, University of Malta
<http://www.kreattivita.org/en/event/gravity-malta-cafe-scientifique/>

FAIRS AND FESTIVALS

- 13 February 2018: Alicia M. Sintes
 Interview. Pròxim estació: Ciència i tecnologia "De tu a tu amb Alicia M. Sintes"
[Salón de actos del edificio Son Lledó, Universitat Illes Balears](#)
International Day of Women
- 9 February 2018: Alicia M. Sintes
 Round table: "Día internacional de la Mujer y la Niña en la ciencia"
 18h, CaixaForum Palma
International Day of Women
- 28-29 October 2018: Fira de la Ciència i la Tecnologia (Inca)
 Grup de Relativitat i TAMI. Plaça de Mallorca. Inca



Image 11. Fira de la Ciència i la Tecnologia

- 16 May 2018: Marta Colleoni, Leila Haegel, Daniel Viganò
 Pint of Science Festival
 Public Lecture: "Estrellas: vidas brillantes, muertes pirotécnicas." y "Tenemos buena onda...¡gravitacional!"
 Palma 80's Café, Carrer Femenies, 2, Palma, Baleares, España



- 10, 11, 12 May 2018: Grupo de Relatividad
 "Ciència per a tothom 2018". Universitat de les Illes Balears, Palma



- 24 February 2018: Alicia M. Sintes
 "Clausura Fira de la Ciència i de la Tècnica"
 Fira de la Ciència i de la Tècnica, Centre Bit, Alaior, Menorca

TV OR RADIO PROGRAMMES

- 3 October 2018: Radio Canal 4: Biobalears.
 Rafel Jaume, Héctor Estellés
- 18 July 2018: Rafel Jaume.
 Radio Canal 4: Biobalears.
https://www.ivoox.com/biobalears-18-07-2018-audios-mp3_rf_27121079_1.html
- 17 July 2018: Radio USAL-Eureka:
 Segundo programa sobre el Encuentro de Astronomía en Salamanca.
 Alicia M. Sintes. <http://radio.usal.es/programa/eureka/>
- 22 June 2018:
 Nobel Prize in Physics Prof. Barry Barish
 Interview: Barry Barish, Jaume Carot, Javier Santaolalla, Alicia M. Sintes
 11h, Salón de Actos de Son Lledó, UIB, Palma
https://www.youtube.com/watch?time_continue=1&v=7p5XbfDrx3M
- 29 May 2018: Alicia M. Sintes
 TV interview from Moscú (28 minutes)
 Física española: "De alguna forma todos somos polvo de estrellas"
<https://actualidad.rt.com/programas/entrevista/273465-entrevista-alicia-sintes-fisica-espana>

- TV Movistar+: LA RESISTENCIA - interview to Alicia Sintes | #LaResistencia 24.04.2018
<https://www.youtube.com/watch?v=z-9hQvWISTw>
<https://www.elterrati.com/alicia-sintes-una-estrella-de-neutrones/>



- 4 April 2018: Radio Programme. Interview Alicia Sintes en Ciencia Clandestina (Radio de la Universidad de Sevilla)
<https://radio.us.es/episodio/ciencia-clandestina-episodio-03x01-viaje-al-espacio/>

- EL PAÍS Published el 5 feb. 2018
 "Alicia Sintes, una mirada al universo desde España" | Visionarios | El País Semanal
https://www.youtube.com/watch?time_continue=3&v=C4RU8Vq8XDA

19. MASTER IN ADVANCED PHYSICS AND APPLIED MATHEMATICS

The objective of the University Master in Advanced Physics and Applied Mathematics (FAMA) is to provide an advanced training, specially oriented to graduate students aiming to enter later in a Doctorate program.

It is then a Master basically oriented towards research. This requires a structure making possible the specialization in some research areas with a premium quality. The UIB is awarded with the mention of International Excellence Campus, including the line of Physics, Computing and Applications. In this line, there are some research groups that have been developing an international level first rank task during years. This is why five specialties are offered, directly related with those groups: Relativity and Astrophysics, Geophysical Fluids, Materials Physics, Quantum Systems , and Applied Mathematics.

Most of the socially relevant problems have many faces, and addressing them requires both general vision and the ability to connect ideas. In this context, the Master is not offering specialties as watertight compartments. The student can rather choose a reasonable number of complementary credits coming from other specialties, different from the selected one.

20. IN THE MEDIA

- [23/12/2018 – IB3: “Els nou premis 31 de desembre d’enguany de l’Obra Cultural Balear”](#)
- [22/12/2018 – Menorca.info: “La OCB entrega los Premis 31 de Desembre”](#)
- [22/12/2018 – Ultima Hora: “La OCB entrega los Premis 31 de Desembre”](#)
- [19/12/2018 – Diario de Mallorca: “Alicia Sintes, Laura Gost, Txarango y ‘Mai neva a Ciutat’, Premis 31 de Desembre”](#)
- [18/12/2018 – Ara Balears: “Laura Gost, Alicia Sintes, ‘Mai neva a Ciutat’ i Txarango, premis 31 de Desembre 2018”](#)
- [18/12/2018 – Ultima Hora: “Alicia Sintes, galardonada en los premios de la OCB”](#)
- [18/12/2018 – Europa Press: “Alicia Sintes, galardonada en los premios de la OCB y el Cuerpo de Bomberos de Mallorca recibe una ‘Mención de Honor’”](#)
- [18/12/2018 – mallorcadiario.com: “IB3 y Alicia Sintes, entre los galardonados con los premios de la Obra Cultural Balear”](#)
- [18/12/2018 – dBalears: “Txarango, Mai neva a Ciutat, Scrabble Eivissa, Alicia Sintes, Antoni Bibiloni, Pere Orpí, Laura Gost, Ca s’Artiller, i Bombers de Mallorca, Premis 31D d’enguany”](#)
- [13/12/2018 – Diario Vasco: “La investigadora del DIPC y de la UPV Vergnory, en la Selección estatal de Ciencia”](#)
- [12/12/2018 – Columna Cero: “La revista QUO premia a la llamada ‘Selección Española de la Ciencia’”](#)
- [12/12/2018 – QUO: “GRAN ÉXITO DE LA GALA DE LA CIENCIA 2018”](#)
- [11/12/2018 – La Vanguardia: “La ‘Selección Española de la Ciencia’ alaba la investigación que se hace en España pero critica su gestión”](#)
- [11/12/2018 – Europa Press: “La ‘Selección Española de la Ciencia’ alaba la investigación que se hace en España pero critica su gestión”](#)
- [11/12/2018 – Diario Vasco: “La V Selección de la Ciencia presenta el mayor número de mujeres hasta ahora”](#)
- [11/12/2018 – La Razón – Innovadores: “La ‘Selección Española de la Ciencia’ se queja más de la burocracia que de la falta de dinero”](#)
- [09/12/2018 – El País: “¿Cómo se sabe de dónde proceden las ondas gravitacionales?”](#)
- [04/12/2018 – El Espectador: “Detectan 4 nuevas ondas gravitacionales. ¿Qué significa este hallazgo?”](#)
- [04/12/2018 – ABC: “Detectan con ondas gravitacionales la mayor y más distante colisión de agujeros negros conocida”](#)
- [04/12/2018 – Menorca info: “Que el coche de Google Maps circule de nuevo...”](#)
- [03/12/2018 – Diario de Mallorca: “La UIB juega un papel “clave” en las detecciones de cuatro nuevas ondas gravitacionales”](#)
- [03/12/2018 – El Periódico: “Ondas gravitacionales: el eco de cuatro eventos cósmicos alcanza la Tierra”](#)
- [03/12/2018 – El Independiente: “La mayor colisión de agujeros negros jamás detectada”](#)
- [03/12/2018 – IB3: “La UIB col·labora en l'estudi de quatre noves onces gravitacionals”](#)
- [03/12/2018 – Europa Press: “Cuatro ondas gravitacionales más, entre ellas la más masiva y distante”](#)
- [03/12/2018 – Mallorca diario: “Detectadas cuatro nuevas ondas gravitaciones con la colaboración de la UIB”](#)
- [03/12/2018 – 20 minutos: “Detectan cuatro nuevas ondas gravitaciones con la colaboración de la UIB”](#)
- [03/12/2018 – Ultima Hora: “Detectan cuatro nuevas ondas gravitacionales, entre ellas la más distante jamás hallada”](#)
- [03/12/2018 – Agencia SINC: “Cuatro nuevas ondas gravitacionales, y ya van once”](#)
- [03/12/2018 – La Vanguardia: “Investigadores de ondas gravitacionales y la académica Carmen Iglesias, en la Selección Española de Ciencia 2018”](#)
- [03/12/2018 – Menorca al dia: “Investigadores de la UIB, a la Selección Española de Ciencia 2018”](#)
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- [01/12/2018 – Menorca al dia: “Alicia Sintes ya es “Hija Predilecta” de Sant Lluís”](#)
- [30/11/2018 – Menorca al dia: “Alicia Sintes, Hija Predilecta de Sant Lluís”](#)
- [26/11/2018 – QUO: “Presentamos a la selección española de ciencia 2018”](#)
- [26/11/2018 – QUO: “Alicia Sintes: “Llevo 20 años esperando ver un púlsar. Quizá ocurra mañana.””](#)
- [26/11/2018 – QUO: “José Antonio Font: “Todavía me emociono cuando recuerdo lo que vimos aquel día en el cosmos...””](#)
- [24/11/2018 – Menorca.info: “Que el Ayuntamiento de Es Castell viviera ayer...”](#)
- [17/11/2018 – IDEAL: “La nueva ‘Cosmos’ se rueda en Granada”](#)
- [09/11/2018 – Diario de Navarra: “Descubriremos fenómenos que no puedo ni imaginar”](#)

- 09/11/2018 – Navarra información: “9 de noviembre, en el Museo de Navarra, jornada sobre ondas gravitatorias”
- 08/11/2018 – Diari UIB: “L’agència SINC reconeix la implicació d’Alicia Sintes en la comunicació de la ciència”
- 07/11/2018 – Noticias de Navarra: “La UPNA organiza el viernes una jornada de ondas gravitatorias”
- 06/11/2018 – El Mundo: “Una nueva vía para conocer el cosmos”
- 05/11/2018 – El Diario de Mallorca: “Alicia Sintes, premiada por su divulgación de las ondas gravitacionales”
- 30/10/2018 – El Diario Norte: “Monólogos, teatro y exposiciones para acercar la ciencia a todos los públicos”
- 30/10/2018 – Diario de Navarra: “La UPNA abre el sábado en el Planetario las Semanas de la Ciencia con un espectáculo gratuito de monólogos científicos”
- 30/10/2018 – La Vanguardia: “La UPNA abre el sábado en el Planetario las Semanas de la Ciencia con un espectáculo gratuito de monólogos científicos”
- 08/10/2018 – L’Economiste.com: “Conférence à Marrakech sur les ondes gravitationnelles”
- 07/10/2018 – Diario de Mallorca: “Las matemáticas sirven para despertar la emoción”
- 28/09/2018 – Salamanca 24 horas: “La Universidad de Salamanca acoge el primer Congreso Nacional de Estudiantes de Física ‘La mujer en la Ciencia’”
- 17/09/2018 – Parlament de les Illes Balears: “La Sala de les Cariàtides acull la Jornada Ciència al Parlament”
- 17/09/2018 – Europa Press: “El Parlament acoge su primera jornada sobre ciencia tratando los polinizadores y la política científica”
- 14/09/2018 – DEIA: “Alicia Sintes: “La combinación entre ciencia y humor es muy práctica para divulgar””
- 14/09/2018 – eitb.eus: “El evento de divulgación científica Naukas, en directo en eitb.eus”
- 12/09/2018 – DEIA: “Bizkaia divulga de nuevo su faceta más científica”
- 12/09/2018 – Diario Vasco: “Naukas llega esta semana con un documental sobre la vida del fisico Etxenike.”
- 11/09/2018 – eitb.eus: “Presentan un documental sobre la vida y obra científica de Etxenike.”
- 07/09/2018 – Última Hora: “Ocho años después llega el Complex Científic.”
- 07/09/2018 – Menorca: “Armengol anuncia ante el rector una mayor financiación para la UIB en 2019.”
- 06/09/2018 – eitb.eus: “Bizkaia Zientzia Plaza contará con siete eventos y más de 100 ponentes”
- 06/09/2018 – Europa Press: “Bizkaia acogerá el 13 al 29 de septiembre la VIII edición de Zientzia Plaza, que ofrecerá siete eventos”
- 31/08/2018 – Ara Balears: “Un complex científic per acostar la ciència al món empresarial”
- 06/08/2018 – Diario de Mallorca: “Alicia Sintes: “Organizo un congreso en Valencia; aquí los precios son desorbitados””
- 24/07/2018 – El Mundo: “Medicina y Enfermería: las dos notas más altas para estudiar en la UIB.”
- 18/07/2018 – Diario de Mallorca: “Selectividad 2018: Medicina, Enfermería y Bioquímica, las notas de corte más altas de la UIB”
- 18/07/2018 – Diario de Ibiza: “Medicina, Enfermería y Bioquímica, las notas de corte más altas de la UIB”
- 18/07/2018 – Canal 4 Radio: BioBalears.
- 17/07/2018 – Radio USAL-Eureka: Segundo programa sobre el Encuentro de Astronomía en Salamanca.
- 02/07/2018 – Última Hora: El Premio Nobel Barry Barish, en el Club Ultima Hora.
- 30/06/2018 – Brisa: El Premio Nobel Barry Barish, en el Club Ultima Hora.
- 30/06/2018 – Diario de Mallorca: Unos Premis para sentirse como en casa.
- 28/06/2018 – Diario de Mallorca: La sociedad mallorquina se reúne en los Premis de Diario de Mallorca.
- 24/06/2018 – Última Hora: El Nobel de Física, Barry Barish, visita la ciudad y sus espacios culturales.
- 23/06/2018 – Última Hora: El Nobel de Física, Barry Barish, visita Sóller.
- 23/06/2018 – Menorca: Que la investigadora menorquina Alicia Sintes interviniere el jueves...
- 23/06/2018 – Última Hora: “Detectaremos las ondas del Big Bang en décadas o siglos”.
- 22/06/2018 – QUO: El vals de la colisión.
- 22/06/2018 – Última Hora: Conferencia integra de Barry Barish, Nobel de Física, en el Auditorium de Palma.
- 22/06/2018 – Última Hora Especial 125 años: Una velada de Nobel
- 22/06/2018 – Mallorca Daily Bulletin: Nobel Prize winner fascinates Palma audience.
- 22/06/2018 – Diario de Mallorca: Un Nobel de Física tras la comprobación de la teoría de la relatividad.
- 22/06/2018 – Última Hora: Barry Barish: «Detectaremos las ondas del Big Bang en décadas o siglos».
- 22/06/2018 – Diari UIB: La 2 de TVE emet microespais de divulgació científica amb participació d’investigadors de la UIB.
- 22/06/2018 – Última Hora: Barry Barish, Nobel de Física: «Hemos tardado cien años en medir las ondas».
- 22/06/2018 – Cadena SER: El premio Nobel de Física Barry Barish asegura que el equipo de la UIB ha sido fundamental en su proyecto.
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- 22/06/2018 – Ara Balears: Barry Barish: “Si tenim paciència sabrem què va passar al principi de l’Univers”.
- 22/06/2018 – Diario de Mallorca: Un Nobel de Física al campus de la UIB.
- 22/06/2018 – Europa Press Baleares: El Nobel de Física Barry Barish destaca la “contribución” de la UIB para “ayudar a entender” las ondas gravitacionales.
- 22/06/2018 – OK Diario: El Nobel de Física Barry Barish destaca la “contribución” de la UIB para “ayudar a entender” las ondas gravitacionales.
- 21/06/2018 – Última Hora: Barry Barish explica este jueves en Palma las ondas gravitacionales.
- 19/06/2018 – ABC: El Nobel de Física, Barry Barish, visita la UIB.
- 17/06/2018 – Ultima Hora: «La ciencia emociona tanto como se esperaba»
- 10/06/2018 – Última Hora: Javier Santaolalla, doctor en Física: «La divulgación divertida ayuda a despertar vocaciones para la ciencia»
- 30/05/2018 – Ultima Hora: Alicia Sintes, doctora en Física: «En España, la burocracia asfixia a los investigadores»
- 30/05/2018 – Menorca info: Alicia Sintes: «En España, la burocracia asfixia a los investigadores»
- 30/05/2018 – Sevilla Actualidad: Sevilla reúne a expertos internacionales en ondas gravitacionales en un encuentro con la ‘Gran ciencia’
- 29/05/2018 – RT: Física española: “De alguna forma todos somos polvo de estrellas”
- 29/05/2018 – Andalucía Información: El debate sobre las ondas gravitacionales llega a Sevilla.
- 28/05/2018 – El Correo de Andalucía: Seis ‘Sheldon Coopers’ abordarán en Sevilla los nuevos retos de la física
- 26/05/2018 – El Diario de Mallorca: Diario de Mallorca reconoce los mejores talentos de la isla
- 24/05/2018 – El Ibérico: Ondas Gravitacionales: así suena el universo
- 24/05/2018 – Última Hora: Jaume Carot, vicerrector de Investigación de la UIB: «Queda demostrado que en Baleares se hace buena ciencia»

- [21/05/2018 – Periódico de Ibiza: Ciudadanos Europeos celebra el Día de Europa](#)
- [13/05/2018 – Mallorca Diario: Llega ‘Pint of Science’, un encuentro entre científicos y público en bares](#)
- [13/05/2018 – Última Hora: Barry Barish, Nobel de Física 2017, impartirá en Palma una conferencia](#)
- [12/05/2018 – Majorca Daily Bulletin: Nobel Prize winner to present the enigmas of the universe](#)
- [11/05/2018 – Última Hora: Conferencia: Descubriendo los enigmas del universo](#)
- [11/05/2018 – 20 Minutos: Palma acogerá del 14 al 16 de mayo el festival ‘Pint of Science’, un encuentro entre investigadores y público en bares](#)
- [11/05/2018 – EuropaPress: Palma acogerá del 14 al 16 de mayo el festival ‘Pint of Science’, un encuentro entre investigadores y público en bares](#)
- [07/05/2018 – Diario de Mallorca: La UIB acoge un congreso internacional sobre ondas gravitacionales](#)
- [25/04/2018 – Diario de Mallorca: Alicia Sintes se apunta al humor de Broncano](#)
- [25/04/2018 – Diario de Menorca: Alicia Sintes, en la onda de Broncano.](#)
- [25/04/2018 – Canal 0 Movistar +: La Resistencia. Entrevista a Alicia M. Sintes.](#)
- [21/04/2018 – Cadena SER: “El ‘Nobel’ de la menorquina Alicia Sintes llena las plazas de Física de la UIB”.](#)
- [19/04/2018 – ЕвроПульс: “«Моя мечта – обнаружить сигнал от одиночной нейтронной звезды»: нобелевский лауреат Алисия Синтес о гравитационных волнах”.](#)
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- [11/04/2018 – Diario de Mallorca: “Las ondas gravitacionales atraen alumnos hacia la UIB”.](#)
- [10/04/2018 – Diario de Mallorca: “Baja un 20% los aprobados en Selectividad que se van fuera de la UIB”.](#)
- [04/04/2018 – RadioUS \(Ciencia Clandestina\): “Viaje al espacio” \(Episodio 03×01\).](#)
- [01/04/2018 – La Opinión A Coruña: “El “sueño” americano de un físico.](#)
- [28/03/2018 – Última Hora: “La doctora Alicia Sintes nombrada editora de la revista científica “Astroparticle Physics”.](#)
- [22/03/2018 – QUO: “Los grandes desafíos del siglo XXI están en manos de estas 12 científicas.](#)
- [17/03/2018 – IB3 Radio: “Balears fa Ciència” \[12:00 to 13:00\] \(38'\)](#)
- [15/03/2018 – Sinc: “El legado de un genio encerrado en un cuerpo enfermo”](#)
- [14/03/2018 – Real Academia de Ciencias Exactas: “El premio Nobel de Física 2017”](#)
- [11/03/2018 – Mallorca Diario: “Dirigir en femenino; el reto de llegar arriba”](#)
- [11/03/2018 – Burgos Noticias: “Dos alumnos del Diego Porcelos y uno del Pintor Luis Sáez participarán en la fase nacional de la Olimpiada de Física”](#)
- [01/03/2018 – Anuario Sinc: “La Ciencia es noticia” \(páginas 116-119\)](#)
- [24/02/2018 – Diari Menorca: “La Fundació Rubió assegura la repetició de la Fira de la Ciència i la Tècnica”](#)
- [20/02/2018 – Burgos Noticias: “La UBU rendirá homenaje a las mujeres de la Física en la Olimpiada Española de Física 2018”](#)
- [13/02/2018 – El Mundo: “Adiós a los estereotipos de género en la ciencia”](#)
- [12/02/2018 – El Periódico de Canarias: “Unid@s se puede propone medidas de conciliación en el Polo Científico y Tecnológico de Las Mantecas”](#)
- [11/02/2018 – Ara Balears: “La competència per continuar liderant projectes és brutal”](#)
- [10/02/2018 – Ara Balears: “Donar visibilitat a la dona i crear referents femenins en la ciència”](#)
- [06/02/2018 – El País Semanal: “Alicia Sintes, la física española que ganó parte del Nobel”](#)
- [03/02/2018 – Ara Balears: “La investigació a Balears també és cosa de dones”](#)
- [23/01/2018 – Times Malta: “Of gravity and black holes”](#)
- [10/01/2018 – Última Hora: “Festa de l’Estendard y entrega de medallas en Cort”](#)
- [06/01/2018 – Menorca.info: “Festa de l’Estendard y entrega de medallas en Cort”](#)
- [05/01/2018 – Tercera Información: “Quince hitos de la ciencia española que han sido noticia en 2017”](#)
- [02/01/2018 – Diario de Mallorca: “Medallas sin hijos ilustres”](#)
- [02/01/2018 – Palma.cat: “El Grup de Relativitat i Gravitació de la UIB, l’IES Ramon Llull, l’Associació Balear d’Alletament Matern, Josep Sanchís i Joan Barceló, medalles d’or de la ciutat”](#)
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