

IEEC^R

Institut d'Estudis
Espacials de Catalunya

An aerial satellite-style photograph of a coastal region. The image shows a rugged, mountainous terrain in shades of brown and green, leading down to a coastal town and a bay. The water in the bay is a vibrant turquoise color. The overall scene is captured from a high angle, showing the intricate patterns of the landscape and the urban layout of the town.

Annual report 2025

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Cover Image: In 2022, the United Nations chose Terres de l'Ebre as the first territory in the world to analyse global challenges related to climate resilience.

Credits: Image "Earth from Space: The Ebro Delta" contains encoded data from Copernicus Sentinel (2024), and has been processed by ESA and licensed under the standard ESA license.

FOREWORD

I am very pleased to share with you the latest IEEC annual report, reflecting on a highly productive 2025 that was marked by several notable events and significant scientific achievements. It is a privilege to highlight here some of the Institute's most remarkable activities and to thank our teams for the dedication that continues to make the IEEC a leading research centre in space science and technology. I also want to take this chance to acknowledge the work of Ignasi Ribas, who after eight years of dedicated service since July 2017, ended his tenure as director. I thank him for his legacy and I look forward to continuing working closely with him to ensure the continued success of the institute.

This year we have celebrated a major milestone with the "first light" of the Vera C. Rubin Observatory, which is now set to map the southern sky and deepen our understanding of dark matter and dark energy. At a local level, the installation of the Wide Field Fast Telescope (TRAC) at the Montsec Observatory has already begun to enhance our capabilities in asteroid tracking and space debris monitoring. Furthermore, the successful launch of ESA's HydroGNSS mission represents a significant advance in our ability to monitor Earth's hydrological cycle and the impacts of climate change using innovative reflectometry techniques. These achievements are complemented by the completion of operations for the Gaia satellite (but not of the mission, the data processing will still continue for some years!), where IEEC researchers at the Institute of Cosmos Sciences (ICCUB) play an instrumental role in a decade of observations that transformed our understanding of the Milky Way.

The excellence of our research community has been further validated by prestigious awards and grants. Two ERC Synergy Grants were awarded to projects involving IEEC researchers at the Institute of Space Sciences (ICE-CSIC) and ICCUB, focusing on critical questions in solar physics and the "Hubble tension". We also celebrate the renewal of the Maria de Maeztu Excellence Distinction for ICCUB, a testament to the sustained quality of our scientific output.

Beyond pure research, the IEEC has strengthened its commitment to social and environmental impact. In collaboration with the Government of Catalonia, we published the first global map of light pollution in Catalonia developed using advanced modelling, providing a key tool for the sustainable management of outdoor lighting. Our institutional influence also grew through the coordination of the Catalonia Space 2030 pavilion at the Space Tech Expo Europe in Bremen and our participation in the International Astronautical Congress in Sydney, showcasing the industrial and innovation capa-

bilities of the Catalan space ecosystem. It is also worth highlighting the successful celebration of the 'Satellite-based Services for Disaster Risk Management' workshop, co-organised by the IEEC alongside the European Union Agency for the Space Programme, Eurisy, the Spanish Space Agency and the Government of Catalonia. The event established us as a benchmark for both public authorities and the private sector.

Looking ahead, we have already begun contributing scientific and technical expertise to the newly created Interdepartmental Commission tasked with preparing Catalonia for the landmark total solar eclipse on 12 August 2026.

We now look forward to expanding our work in 2026 and continuing to push the boundaries of space exploration together.



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Presentation



The Institute of Space Studies of Catalonia (IEEC - Institut d'Estudis Espacials de Catalunya) is a centre that promotes the development of activities related to space in Catalonia in its aspects of research, innovation, and training.

The IEEC collaborates and participates in the planning, execution, dissemination and transfer of knowledge of all kinds of initiatives, studies and projects related to space scientific research and technology.

The IEEC is a non-profit foundation from the Catalan public sector that was established in February 1996. It has a Board of Trustees composed of the Generalitat de Catalunya, the Universitat de Barcelona (UB), the Universitat Autònoma de Barcelona (UAB), the Universitat Politècnica de Catalunya - BarcelonaTech (UPC), and the Spanish Research Council (CSIC).

The IEEC is also a research centre within the CERCA system (Research Centres of Catalonia). In the 2024 evaluation of the IEEC conducted by the CERCA Institution—a process carried out every four years—our institute achieved the highest possible rating with an outstanding “A” grade.

The research structure is in the form of four units, each belonging to one of the Trustee academic institutions, which constitute the core of the R&D activity. The Research Units are:

- Institute of Cosmos Sciences of the University of Barcelona - ICCUB
- Centre for Space Studies and Research - CERES (UAB)
- Research Group in Space Sciences and Technologies - CTE (UPC)
- Institute of Space Sciences - ICE-CSIC

Scientists and technicians from the Research Units can simultaneously act as members of their institutions and as members of the IEEC.

The organisation chart of the IEEC is shown in Figure 1. The Board of Trustees is the highest governing body of the IEEC. Its members appoint a Director, who is assisted by a Management Team. The organisation of each Research Unit is independent and the four directors are members of the Board of Directors. Furthermore, an external Scientific Advisory Board (SAB) is nominated by the Board of Trustees with the mandate to evaluate the quality of the scientific and technical outputs and advise on the strategic planning of the IEEC, as well as on the overall organisation. The research and management structure of the IEEC is organised through 3 general areas and 13 offices with clearly defined roles and responsibilities.

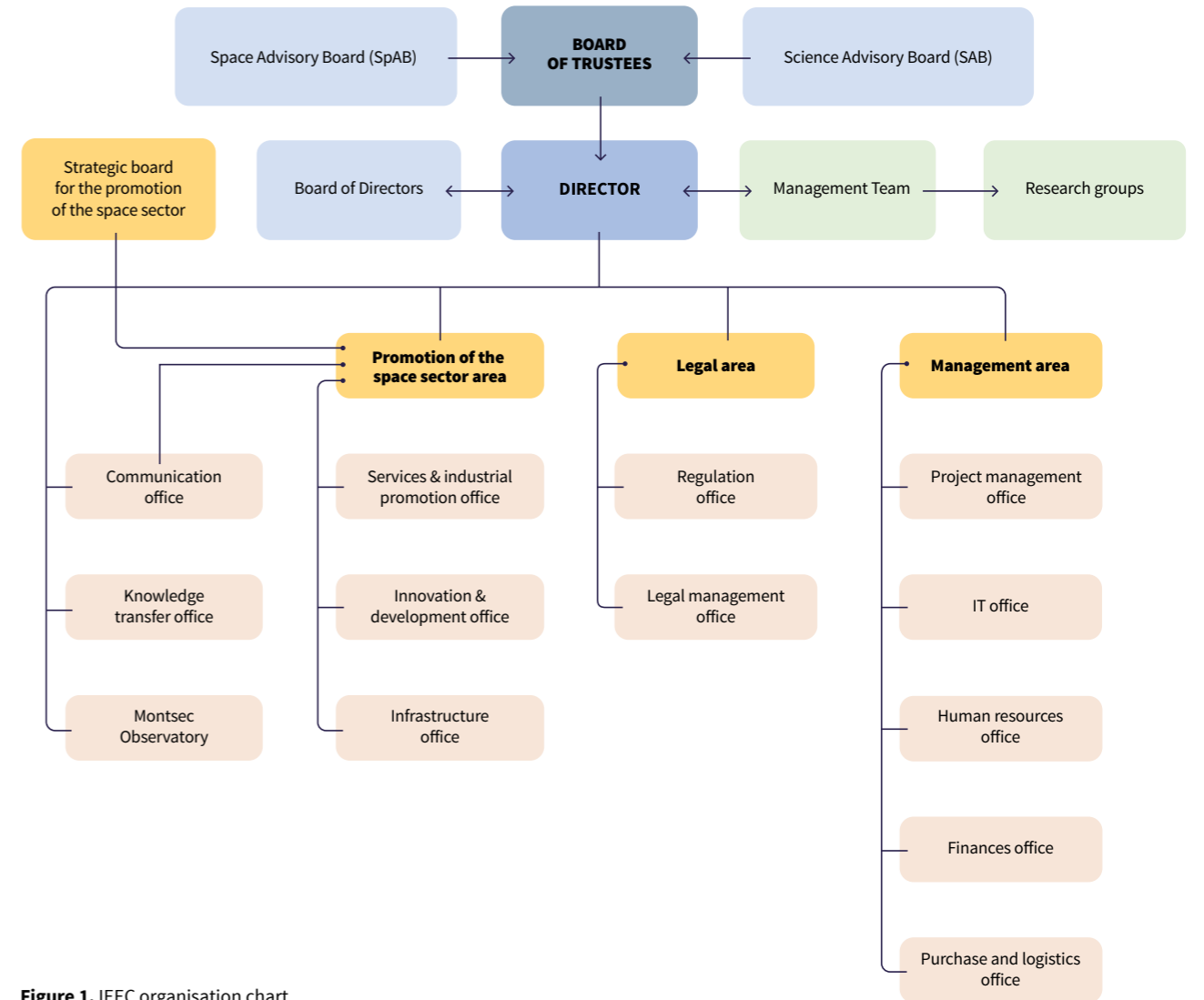


Figure 1. IEEC organisation chart.

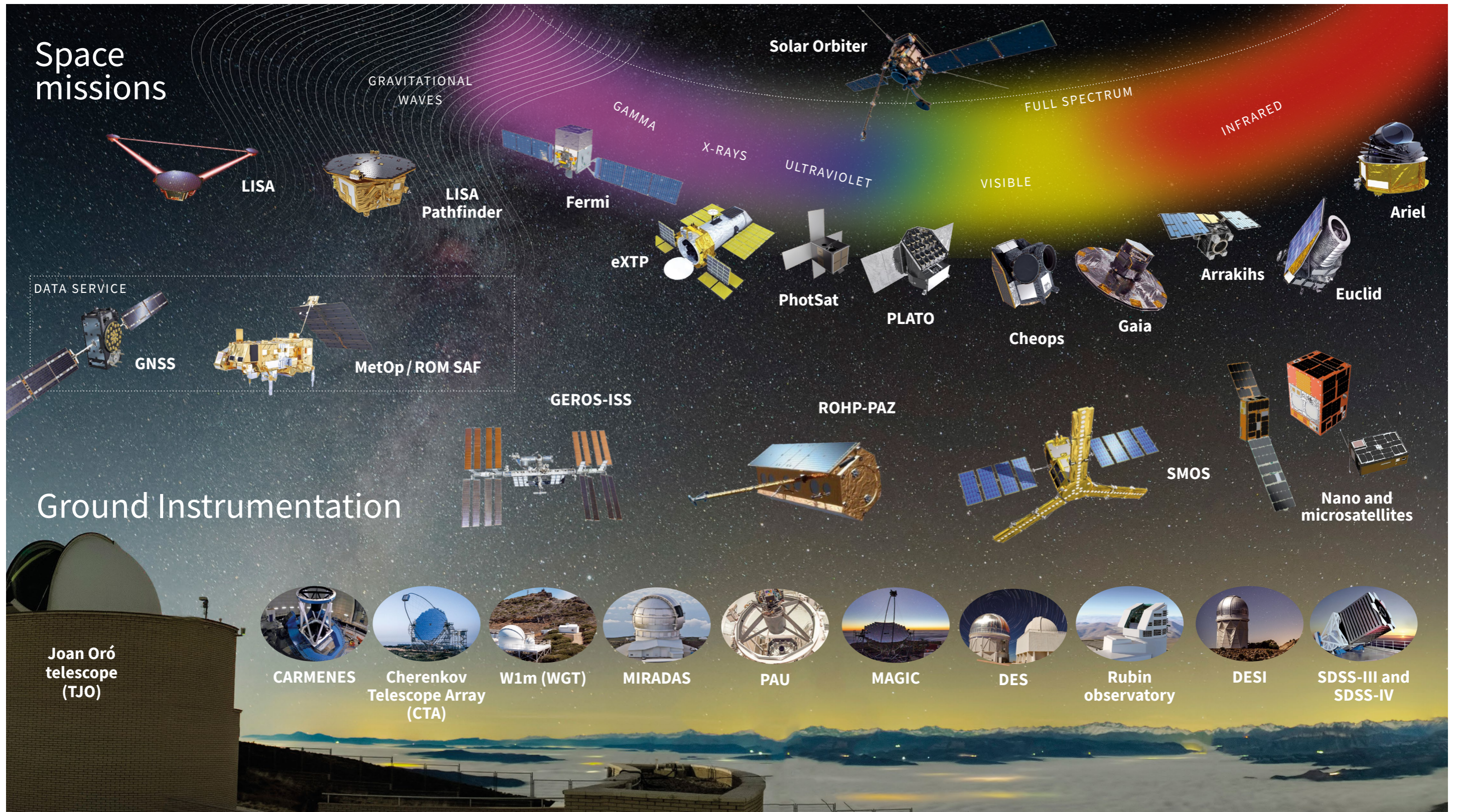


Image 1. Main space missions and ground-based instruments with the IEEC participation.

The IEEC manages the Montsec Observatory (Odm), a scientific and technological infrastructure located in Sant Esteve de la Sarga, in the Catalan pre-Pyrenees. The mission of the Odm is to provide the tools to carry out cutting-edge research in astronomy and earth sciences, as well as the necessary support for the operation of satellite telecommunications equipment. The astronomical equipment includes three robotic telescopes: the Joan Oró Telescope (TJO), the Wide-Field Fast Telescope (TRAC) and the Fabra-ROA Montsec Telescope (TFRM). In addition, the Odm has an all-sky camera for the detection of bolides and meteors. The Odm also hosts the Sant Esteve Teleport (TSE), which provides services to ground communication stations and has been promoted as part of the space strategy of the Government of Catalonia, in collaboration with the IEEC.

Precisely, the IEEC serves as the primary driver and international representative of Catalonia's space sector under the framework of this Catalan Government's space strategy. Through its Area for the Promotion of the Space Sector (APEC), the entity strengthens the regional ecosystem by managing satellite missions, developing ground infrastructure, and fostering R&D, downstream applications and services and talent retention. In this regard, the IEEC aims to expand industrial capabilities and international collaboration while providing high-value space services and maintaining a strong commitment to social responsibility.

The IEEC focuses its efforts on the study of the Cosmos and the Earth as a planet, through a powerful programme for research, development and technological innovation in the framework of scientific missions and projects. The Institute participates and has high-level responsibilities in multiple space missions and ground-based instrumentation facilities, as can be seen in Image 1. The research lines developed by the IEEC belong to the three following fields.

Astrophysics and Cosmology

The IEEC conducts cutting-edge research in the fields of Astrophysics and Cosmology through the use and development of advanced technologies such as instrumentation for ground-based telescopes and space missions, as well as tools for analysing large volumes of data. It also establishes strong multidisciplinary connections with various areas that include

particle physics, geology, biology and mathematics. The main areas are: the determination of the large-scale structure of the Universe; the detection and measurement of gravitational waves; the analysis of the most energetic astrophysical phenomena; the understanding of how stars form, evolve, and die, as well as the resulting compact objects; the study of the physics of the Sun and its relationship with the Earth; the characterisation of the formation, evolution, and architecture of our galaxy and other galaxies; the search for new exoplanets with potentially habitable conditions; Mars exploration; the interpretation of the role played by the interplanetary environment; and the tracking and study of the asteroids, comets, and meteorites that surround us.

Earth Observation and Navigation

The IEEC develops new concepts of remote sensing for Earth Observation and optimization of Global Navigation Satellite Systems (GNSS). The main areas of activity are: Earth Observation instrumentation; measurement of Earth's surface and atmosphere and monitoring of natural hazards through reflectometry, radio occultations with sources of opportunity, and GNSS data; combination of GNSS and wireless communications (including 5G) for smart cities and intelligent vehicles; advanced radiometric and hyperspectral data acquisition and processing technologies; and the synergy and fusion with other Earth Observation products and technologies, through the optimal exploitation of aerospace infrastructures.

Space Technology

The IEEC is a leading centre in the construction of space instrumentation in different areas of scientific and technological research of national and international programs. The Institute leads technological development projects for ground- and space-based instrumentation in technologies for telecommunications sensors and subsystems, electronic systems and control and processing software, platforms for nanosatellites, robotics and artificial intelligence, or Big Data tools for data management, analysis and exploitation, among others. In addition, the IEEC participates in the European and international networks that define the roadmaps of the agencies and organisations for future missions.

Personnel



PERSONNEL

The statistics, tables and graphs illustrate the distribution of IEEC's personnel according to their work situation, gender, research unit and role.

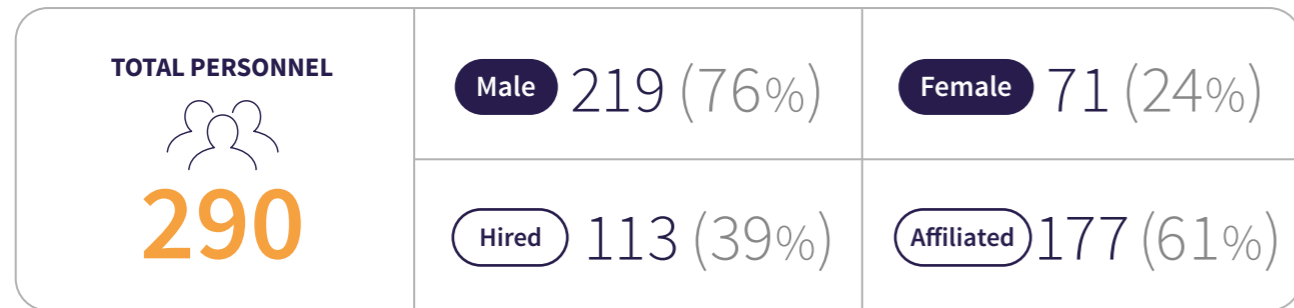


Figure 2

IEEC Contracts

Administration / Services	21
Management area (+ IT)	12
Legal area	3
Communication office	4
Knowledge transfer office	2
Academic	68
Faculty	5
Researchers & engineers	49
Postdoctoral researchers	17
Research engineers	32
Research support personnel	9
PhD Students	5
Montsec Observatory	5
Area for the Promotion of the Space Sector of Catalonia	19

Table 1

Affiliated members	ICCUB	CERES (UAB)	CTE (UPC)	ICE-CSIC	TOTAL
Faculty	29	11	28	24	92
Researchers & engineers	16	1	2	25	44
Postdoctoral Researchers	9	1	1	14	25
Research Engineers	7	0	1	11	19
PhD Students	15	6	0	20	41
TOTAL	60	18	30	69	177

Table 2

Personnel by hiring entity

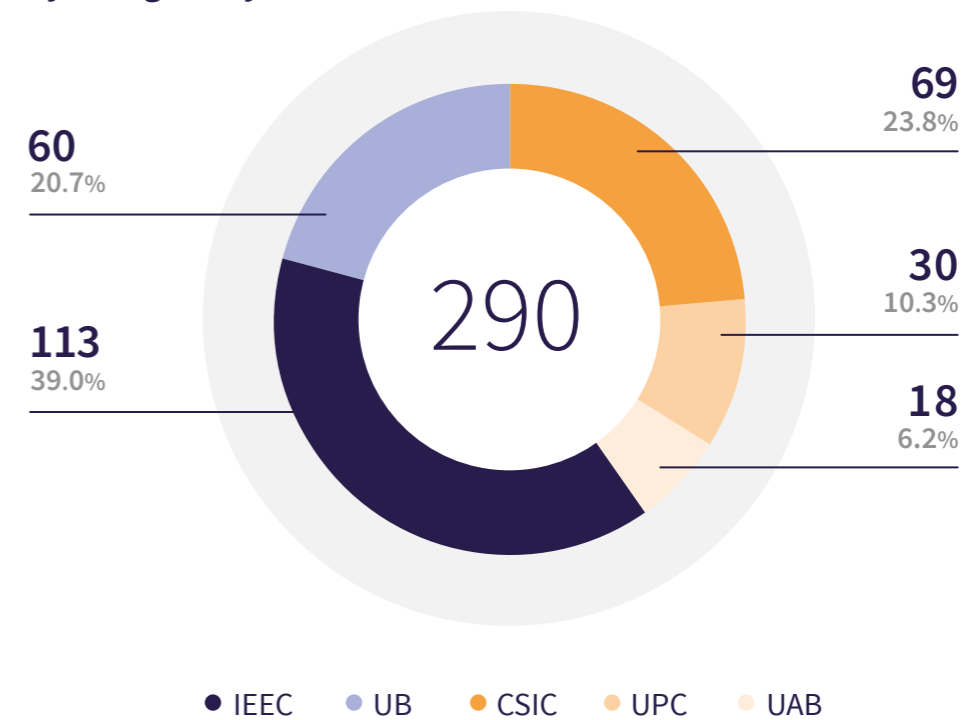


Figure 3

Personnel according to workplace

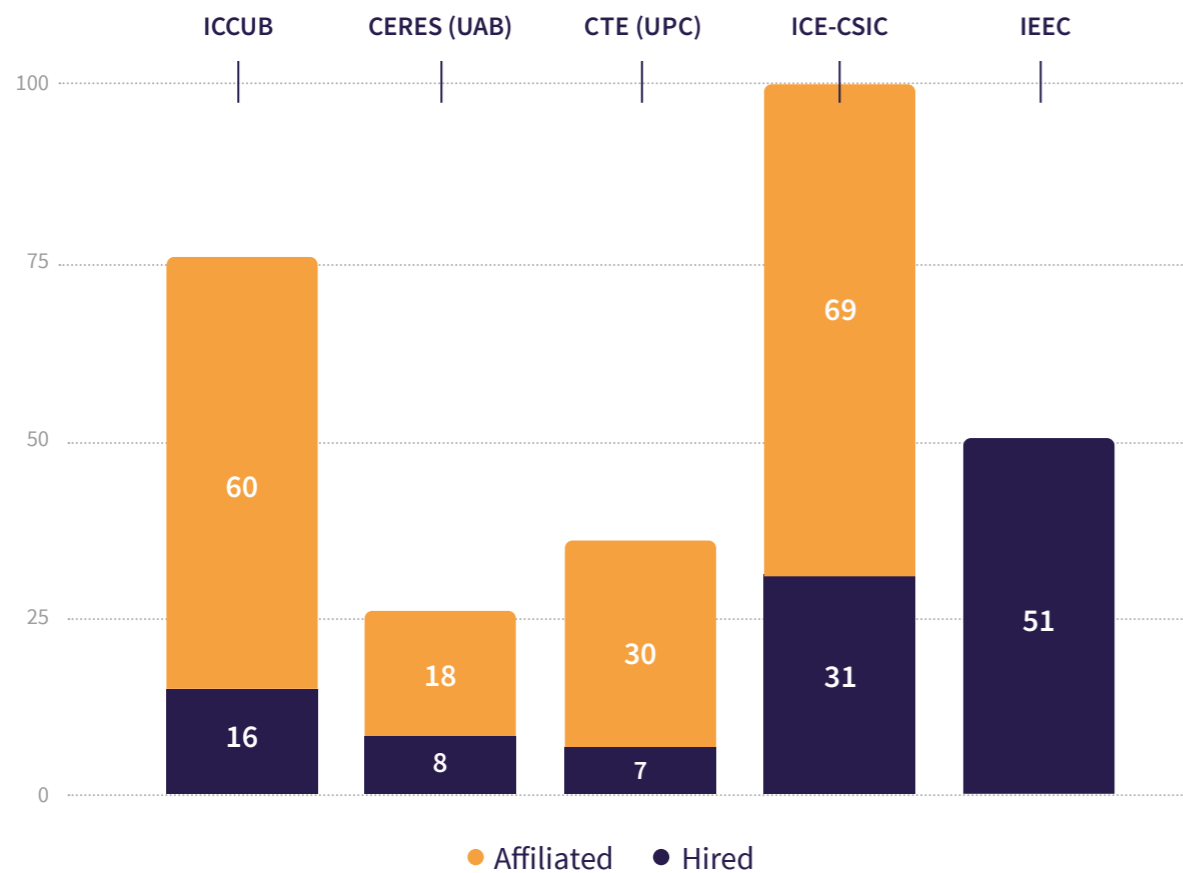


Figure 4

Personnel according to work situation and gender

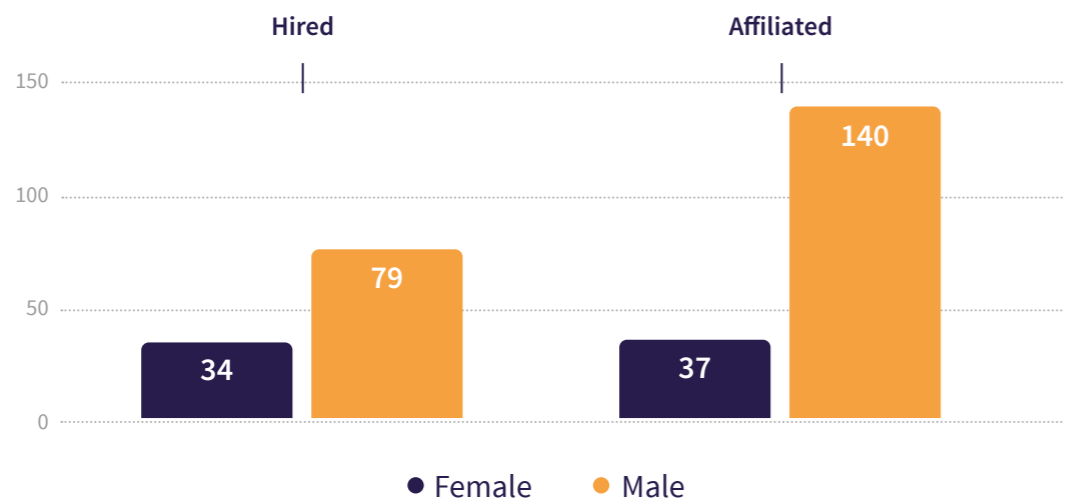


Figure 5

Personnel by role and gender

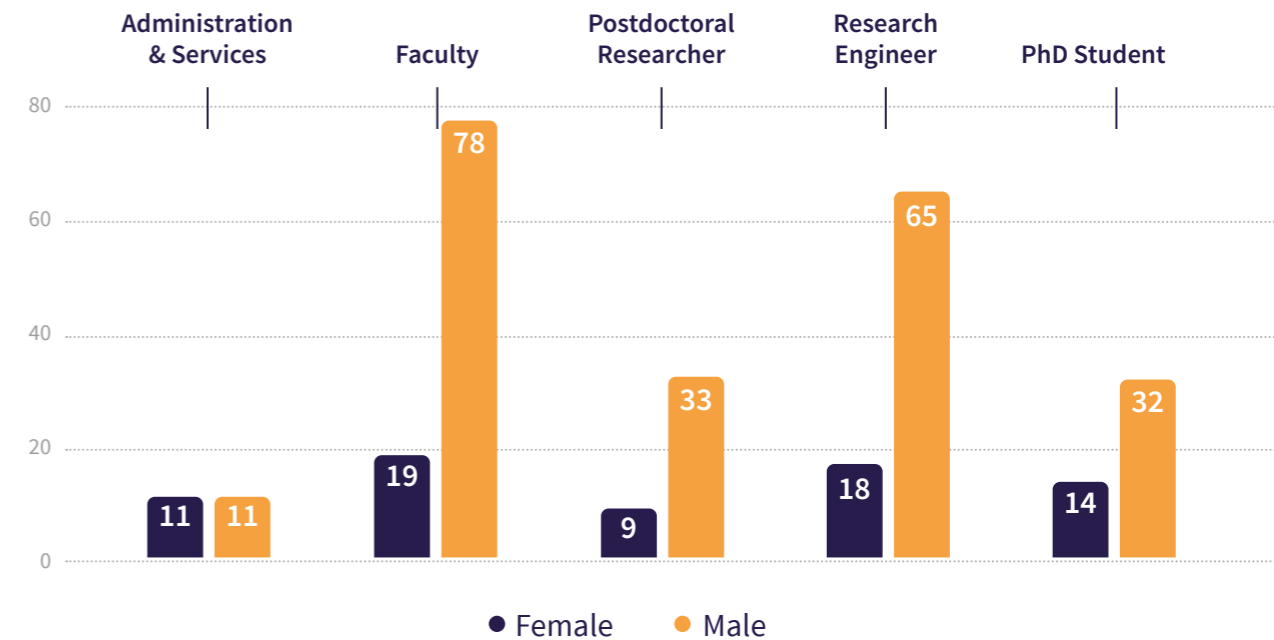


Figure 6

Research personnel by role and hiring entity

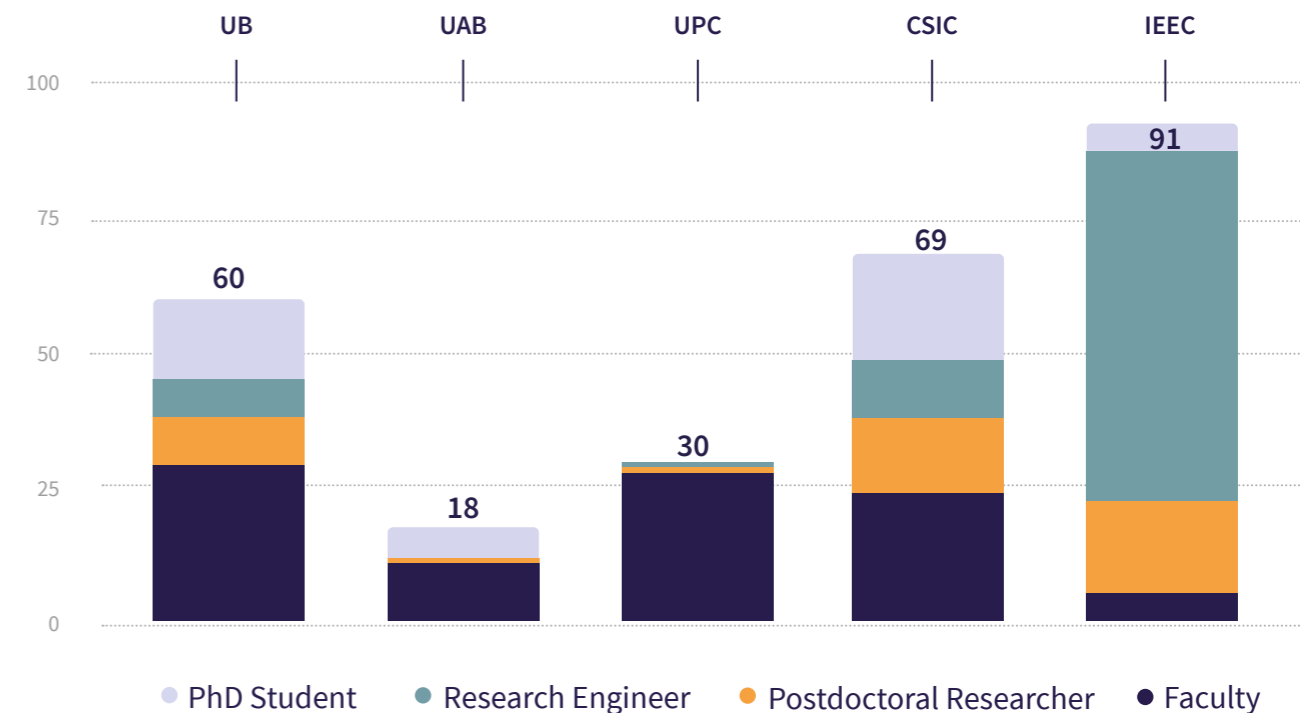


Figure 7

Montsec Observatory



A leading infrastructure for astronomical research, technological services, and environment monitoring.

The Montsec Observatory (OdM, montsec.ieec.cat) is a scientific infrastructure that is managed by the IEEC by virtue of an agreement with the Direcció General de Recerca of the Generalitat de Catalunya. It is located at an altitude of 1,570 metres in the Montsec mountain range, 50 km north of the city of Lleida, in the municipality of Sant Esteve de la Sarga (near Àger), in the Catalan pre-Pyrenees. This area is recognised as one of the most suitable on the European continent for astronomical observation, thanks to the combination of weather conditions and the low level of light pollution.

The main goals of the Observatory are to provide tools to carry out cutting-edge research in astronomy and the necessary support to exploit the OdM facilities, to serve as a testbed for the development of new astronomical instrumentation, and to provide space-related services to public institutions and industry. In this context, the largest telescope (the Joan Oró Telescope, TJO), the new wide field telescope (TRAC) and the AllSky Camera are directly managed by the IEEC. The main feature of the TJO is its robotic operation, so that observations and the decision-making process in the event of incidents are carried out automatically and without human intervention.

The OdM astronomical facilities have yielded important findings in the fields of exoplanets, supernovae and solar system research. Moreover, they have contributed to the tracking of satellites and the monitoring of atmospheric quality in the Montsec area. During 2025 the IEEC achieved various milestones at the OdM. Below, we provide a summary of these.

OdM infrastructures

In 2025, several major upgrades were implemented at the OdM, including the installation of new scientific equipment. Among the most significant additions is the new wide-field, fast-response 40-cm telescope, the *Telescopi Ràpid d'Ample Camp* (TRAC), which was installed at the OdM and is currently undergoing commissioning.

The TRAC is designed to support astrophysical research areas such as planetary defence and low surface brightness astronomy, as well as activities related to the surveillance and tracking of LEO satellites. The system is based on an ASA H400 telescope with a DDM mount and is initially equipped with a QHY411M CMOS camera, providing a large field of view

(3.5 degrees) together with very fast pointing and tracking capabilities. The telescope is located near the TJO building, housed in a new AstroHaven clamshell dome. The TRAC is expected to start fully robotic operations by mid-2026, under the control of the DRACOS framework, a new modular observatory control system currently in the final stages of development at the IEEC.

Significant improvements were also carried out in 2025 in the operations of the Joan Oró Telescope (TJO). These included multiple upgrades to both the Observatory Control System (OCS) and the ICAT data reduction software. A completely new data reduction pipeline was developed for the ARES spectrograph, leading to a substantial improvement in instrument performance and in the quality of the associated scientific programmes. In addition, the OCS has been enhanced to allow more intelligent management of the automatic acquisition of calibration images, both for the MEIA2/LAIA camera and for the ARES spectrograph.

Regarding the general OdM infrastructure, a major upgrade of the network equipment was completed. This upgrade provides improved connectivity across all facilities and includes the extension of network services to the new ground stations expected to begin operations at the Sant Esteve Teleport in 2026. Such an upgrade is critical for supporting wide-band connections (up to 10 Gbps) to the different installations and for significantly enhancing the overall cybersecurity of the observatory.

Finally, the first phase of funding for a new 2.5-m telescope at the OdM was approved by the Generalitat de Catalunya. The project, with an expected total budget of approximately 20 M€, will be implemented in two phases, the first focusing on the telescope itself, the associated building, and key infrastructure upgrades. An initial allocation of 2 M€ is being dedicated to preparatory actions, including site testing and sky-quality monitoring, a major upgrade of the OdM computational and data storage resources, and the installation of solar energy generation and storage systems, among others. All these activities are expected to be completed during the first semester of 2026.

Science with the TJO

The TJO is a fully-robotic 0.8 m telescope used for different applications, including multiple astrophysics fields, and also Space Surveillance and Tracking (SST) activities. This telescope can observe with two different instruments, including an imaging camera (LAIA) and a spectrograph (ARES). During 2025 LAIA suffered a series of repairs and for most of the year the previous MEIA2 camera was used.

The TJO provides useful data that is distributed through the OdM web portal and also through the node of the Spanish Virtual Observatory (SVO). Also, in 2025, all the historical TJO reduced astrometric and photometric data were included in the CORA data repository (CSUC). Since 2013, the TJO has produced over 500,000 science images during more than 3,600 different nights. The TJO offered around 70% of its available time in 2025 to the international astronomical community, with a fraction of requested over available telescope time of 1.3. At the end of 2025, the OdM had 240 registered users on the Management for Users in ROCS (MUR, mur.ieec.cat), which represents approximately a 18% increase in the number of registered users compared to 2024.



Image 2. General view of the TJO (left) and TRAC (right) telescopes in May 2025. Credits: IEEC/OdM.

During 2025, the telescope participated in different scientific projects, including the study of Solar System objects, monitoring of exoplanet transits, characterisation of M dwarf stellar activity, study of eclipsing binaries, monitoring of novae, detailed studies of white dwarfs or newly discovered black hole X-ray binaries, light curves of type Ia and type Ic super-

novae, Gaia transients such as the ones producing microlensing events, and monitoring of gamma-ray emitting blazars.

The amount of requested and delivered science time with the TJO has been significantly increasing since 2016 (Figure 8-bottom), and it is now equivalent to the total night time available with good weather. Also, the number of refereed publications has notably increased in the past four years (Figure 8-top) thanks to the new observation programmes started. Since the beginning of its operations in 2010, the TJO has already contributed to over 100 refereed publications.

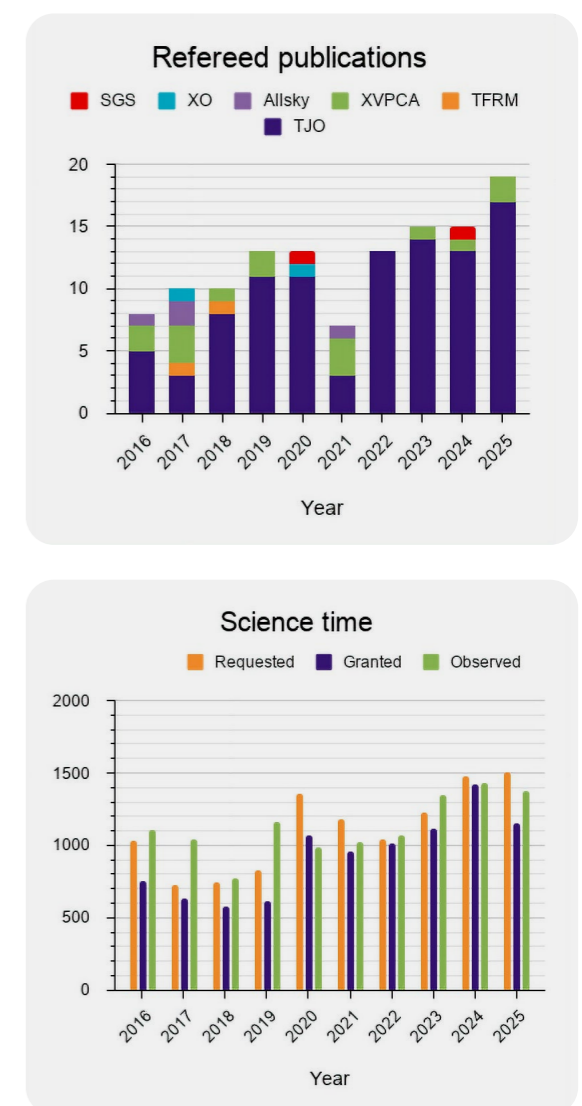


Figure 8. Number of refereed publications per year from the facilities at OdM during the last 10 years (top). Total amount of science time requested, granted and observed with the TJO (bottom).

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Key Projects



AgroSpace

Space technologies, a boost to innovation in rural territories.

AgroSpace is a project co-funded by the European Union's Interreg SUDOE programme, through the European Regional Development Fund (ERDF), which has the participation of organisations from France, Portugal and Spain in a transnational cooperation scheme. It aims to connect the agricultural and space sectors, promoting the use of space technologies in rural areas as an enabler of innovation and resilience in the face of climate change and agroecological transition.

The agricultural sector and, particularly, the regions in south-west Europe, face major climate challenges, such as droughts, wildfires and extreme heatwaves, as well as the need for more efficient resource management and the implementation of sustainable farming practices.

Space technologies, particularly those related to Earth Observation and Global Navigation Satellite Systems (GNSS), have the potential to become a key tool in transforming agriculture, which is increasingly moving towards digitalisation and the collection and processing of data to support informed decision-making.

The AgroSpace project proposes innovative solutions in this direction, based on good practices, cutting-edge research and transnational actions using Earth-observation images and tools, precision agriculture and space telecommunications.

To highlight the advantages of adopting these solutions, the project will implement three demonstrators: one from a Chamber of Agriculture to improve the assessment of climate-related damage and thus provide better compensation for farmers; another from a large wine company for the efficient management of agricultural resources; and a third to validate a methodology based on open calls that identify agricultural challenges and space-based solutions.

The implementation of an intersectoral marketplace will foster communication and collaboration between agricultural stakeholders, who will be able to put forward challenges from their sector, and providers of solutions from the space sector to help address them.

The project, launched in June 2025 and expected to continue until May 2028, has a budget of €2.5 million, of which €1.9 million comes from the European Union's ERDF funds.



Image 3. Family photograph of the AgroSpace project members during the Kick-off Meeting held at the IEEC headquarters. Credits: IEEC.

The organisations forming the consortium (coordinated by the IEEC) responsible for delivering the AgroSpace project, which includes research centres, chambers of commerce and agriculture, clusters, companies from the agricultural and space sectors, as well as end-users, will jointly develop an intersectoral innovation strategy with an action plan based on three pillars: research, market and policy instruments, which will include training and awareness-raising actions. The ultimate goal is to generate effective and transformative solutions that can be transferred to wider territories.

Coinciding with the New Space Economy Congress (NSEC 2025) celebration, on 3 and 4 July in Barcelona, representatives from the different entities of the AgroSpace's consortium met at the IEEC headquarters in Castelldefels. Besides the first consortium meeting, AgroSpace was also presented during the NSEC 2025. Alberto García-Rigo, head of IEEC's Knowledge Transfer Office, and Anne-Lise Stephan, European Project Manager at Aerospace Valley, presented AgroSpace during the first day of the congress, to promote awareness of the project as well as the future call for space solutions in 2026.



Image 4. AgroSpace was presented at the New Space Economy Congress in Barcelona. Credits: IEEC.

Several relevant milestones have been achieved on the project. First, the Cooperation Committee was successfully defined, establishing the governance framework that supports coordination across the project. In parallel, the first work package has been fully completed, along with all of its associated deliverables. These include the stakeholders mapping across the participating regions, which provided a clear overview of the key actors involved; the identification of regional Use Cases and Success Cases, offering valuable insights into existing practices and opportunities; the definition of the

Global Strategy, Action Plan, and Communication Strategy, which together set the overall direction of the project; the specification of the Platform Requirements, laying the technical foundation for the platform implementation, and the Technology Transfer Guide for the agricultural sector, intended to facilitate the adoption of innovative solutions across the value chain. In addition to these achievements, work has also begun on the definition of the platform tender, marking the start of the next stage of the project, work package 2.

The IEEC coordinates the 12 partners developing AgroSpace, which are: Asociación de empresas aeroespaciales Andalucía Aerospace (Andalusia); Agri Sud-Ouest Innovation cluster (Occitanie and Nouvelle-Aquitaine); Aerospace Valley cluster (Occitanie); Official Chamber of Commerce, Industry, Services and Navigation of Barcelona (Catalonia); Centro Operativo e de Tecnologia de Regadio (Alentejo); Hidromod-Modelação em Engenharia Lda (Lisbon); Universidade de Vigo – Faculdade de Ciências, Departamento de Química Analítica e Alimentaria (Galicia); Chambre interdépartementale d'agriculture de la Charente-Maritime et des Deux-Sèvres (Nouvelle-Aquitaine); Institut national d'enseignement supérieur pour l'agriculture, l'alimentation et l'environnement (Occitanie); Symington Family Estates – Vinhos S.A. (North Portugal) and Elliot Cloud (La Rioja).

Among AgroSpace's notable associated partners are the Government of Catalonia, the Spanish Space Agency (AEE), the Portuguese Space Agency, the French National Centre for Space Studies (CNES) and the Region of Occitanie.

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Institut d'Estudis
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ESA Phi-Lab Spain

Driving innovation for the commercialisation of space technologies to enhance climate resilience.

In 2025, the IEEC-led ESA Phi-Lab Spain consolidated its role as a key competence centre for space innovation in the country. Established in 2024, ESA Phi-Lab Spain is part of ESA Phi-LabNET initiative, a network of 11 innovation centres across ESA member states designed to accelerate the commercialisation of space technologies. Located in Castelldefels, Barcelona, the centre brings together universities, research institutes, and industry partners to promote collaboration and innovation, with a key focus on projects that contribute to climate resilience. ESA Phi-Lab Spain was created under the framework of ESA's ScaleUp Programme integrated into the ESA Commercialisation Gateway, which supports the development of technologies with strong market potential.

The consortium also includes the i2CAT Foundation, Cartographic and Geological Institute of Catalonia (ICGC), Fundació General CSIC, KIMbcn, ARRIBES Enlightenment, University of Valencia (UVEG), Universitat Politècnica de Catalunya – BarcelonaTech (UPC), Barcelona Supercomputing Center (BSC-CNS), Ricardo Valle Institute of Innovation (IRV), ESA MELiSSA Pilot Plant at Universitat Autònoma de Barcelona (UAB), and the Institute of Photonic Sciences (ICFO). By combining scientific excellence with technological expertise and industry knowledge, ESA Phi-Lab Spain has created a unique ecosystem that supports innovation across multiple market sectors with climate resilience challenges.

During its first full year of activity, the centre focused on project initiation, support, and increasing visibility. The first cut-off of the ESA Phi-Lab Spain Open Call took place in January 2025. Proposals covering areas such as data analysis, satellites and sensors, propulsion, and software were evaluated, and four projects were selected for funding. These projects leverage Earth Observation (EO) data, artificial intelligence, and advanced monitoring techniques to deliver actionable insights for decision-makers, researchers, and local stakeholders. The projects are: WAVESS, which integrates EO data with unmanned surface vehicles to produce precise bathymetric and environmental maps; RESCAT, a platform for monitoring climate impacts in the Ebro Delta and other vulnerable regions; SKOP, which combines satellite observations with AI-enhanced climate models to improve long-term forecasts;

and RISKCHAIN, a tool simulating risks in agriculture-based supply chains by integrating EO and socioeconomic data.

The second EO Use Case Ideas Competition was also integrated into ESA Phi-Lab Spain's Local Funds, supporting innovative projects that bring satellite data applications to the Catalan private sector. Selected projects include REMOT, which optimises vineyard irrigation using satellite imagery and predictive models; TIAFA, which detects water leaks in irrigation canals through AI and satellite data to improve efficiency and safety; and SAPIC, which delivers fire-risk indicators for critical infrastructure by integrating satellite and climate information.

Additionally, ESA Phi-Lab Spain launched a call for the development of payloads for small EO satellites. The initiative invited private companies, in collaboration with research and public institutions, to propose engineering projects advancing payloads, with the potential to evolve toward in-orbit demonstrations and commercial deployment.



Image 5. Group picture taken at the presentation of ESA Phi-Lab Spain in Sevilla, at the headquarters of the Spanish Space Agency. Credits: IEEC.

To raise visibility and foster partnerships, ESA Phi-Lab Spain actively participated in national and international events such as the Mobile World Congress, New Space Economy Congress, Living Planet Symposium, and created its own ESA Phi-Lab Spain tour through Barcelona, Madrid, Seville, Valencia and Bilbao. These engagements support programme visibility, encourage connection between consortium partners, and helped to promote the profile of ESA Phi-Lab Spain within the global space community.

Strategic guidance was strengthened through the establishment of the Advisory Board, which held its first meeting in September 2025. The Board provided advice on project selection, programme priorities, and the integration of climate resilience goals, ensuring alignment with ESA objectives. Members include high-profile representatives from ESA,

the Spanish Space Agency, the Government of Catalonia, the European Centre for Medium-Range Weather Forecasts (ECMWF), the European Association of Remote Sensing Companies (EARSC), and leading research institutions such as the Basque Centre for Climate Change (BC3).

Throughout 2025, ESA Phi-Lab Spain also enhanced its project support services, providing technical mentoring, business and IP guidance, and facilitating connections with ESA Technology Broker Spain and ESA Business Incubation Centres (ESA BICs) to redirect projects when needed. The year concluded with strong interest from applicants, laying the groundwork for the next Open Call cut-off date in early 2026 and confirming ESA Phi-Lab Spain's role as a hub for innovation in space technologies.



Image 6. ESA Phi-Lab Spain's Advisory Board held its first meeting at the IEEC headquarters. Credits: IEEC.

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PhotSat

The first astrophysical satellite entirely developed by the IEEC and its academic and industrial ecosystem to monitor the visible and ultraviolet sky with unprecedented precision.

PhotSat is a mission coordinated by the IEEC that involves the development and construction of a satellite to track the 40 million brightest stars in the sky for at least two years. Through a system of rotating mirrors, the satellite's two telescopes will take measurements of almost the entire sky every two days. These telescopes are optimised for observations from ultraviolet to visible light. The measurements, particularly accurate for bright stars, will support a wide range of scientific programmes, including exoplanet searches, stellar characterisation, and the study of transient phenomena.

PhotSat will have a CubeSat format of 16 units (each unit being a 10 cm cube) and a total mass between 10 and 20 kg. The satellite will operate in a Sun-synchronous low Earth orbit (LEO) at approximately 500 km altitude. Data downlink and communications will be performed via the Sant Esteve de la Sarga Teleport at the Montsec Observatory (Catalonia) and the Svalbard Satellite Station (Norway).

Following NewSpace standards, the PhotSat satellite is being developed using efficient and agile design procedures, relying on commercial components whenever possible. The platform design, implementation, integration, and launch of the satellite will be carried out by the Catalan company Open Cosmos. The payload, including the instrument, electronics, and associated software, is being designed and developed by the IEEC through an internal engineering team, with support from research groups from the four academic institutions of

the IEEC board (UB, UPC, UAB and CSIC). The optical subsystem (lens and filter assembly) is developed by the Catalan company ASENSE Optics. The full mission lifecycle, including all phases from 0 to D (launch), is expected to last between three and four years.

During 2023, the PhotSat team focused on the initial design of the scientific payload subsystems, performing analyses and developing a prototype of the optomechanical subsystem, as well as simulators for testing and validation. In 2024, the Critical Design Review (CDR) phase of the payload was completed, achieving the final design of the astronomy instrument, except for the optical subsystem.

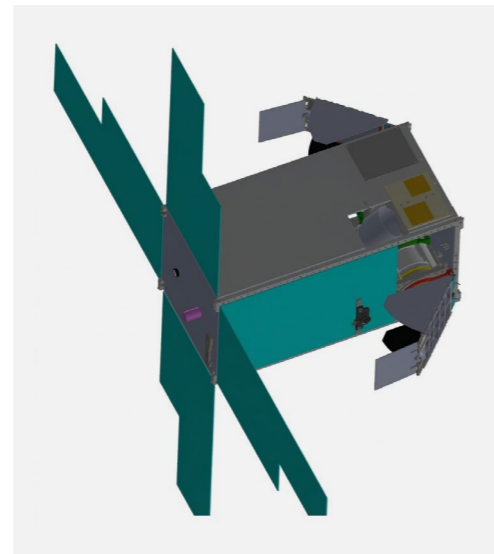


Image 7. Render of the current design of the PhotSat satellite. Credits: IEEC.

Throughout 2025, a qualification model of the astrophysical payload was tested, verified, and qualified, concluding with the integration of the flight models of the two telescopes with the siderostats. In the first half of 2026, the integration of the Instrument Control Unit (ICU) flight model is planned. Throughout the year, the development of the platform will be carried out, together with the integration of the final satellite flight model. The launch is scheduled for late 2026.

Beyond its scientific impact, an additional objective of the PhotSat mission is to act as a driving project for the space sector industry in Catalonia. PhotSat will be the first scientific satellite developed entirely (from the design phase to operations) by the IEEC and its academic and industrial ecosystem. Catalan companies will gain experience around NewSpace technologies and will thus become more competitive at international level thanks to the industrial contracts established by the mission, which will also enhance public-private collaboration.

To finance the project, 3.6 million euros have been allocated to the IEEC from the Astrophysics and High-Energy Physics Complementary Plan of the Spanish Government. These plans are state collaborations with the autonomous regions in R&D&I actions to channel European funds from the Recovery and Resilience Mechanism, a key part of the NextGenerationEU programme.

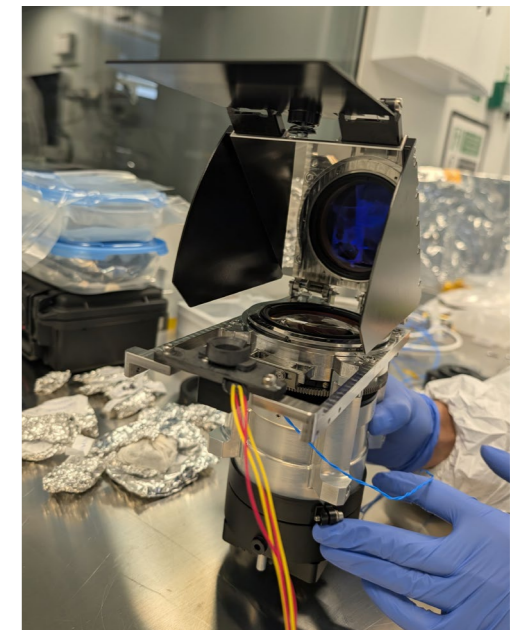


Image 8. Optical subsystem and siderostat engineering model. Credits: IEEC.

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Ariel

The mission will analyse the atmospheres of a large sample of transiting exoplanets using transmission spectroscopy.

Ariel (Atmospheric Remote-sensing Exoplanet Large-survey) is the fourth medium-class (“M-class”) mission of the European Space Agency (ESA). The mission was adopted in 2020, and its launch is currently planned for 2031. Ariel consists of a 1-metre class space telescope equipped with low-resolution spectrographs covering a broad wavelength range from 1.1 to 7.8 μm . This spectral coverage is optimised to study the atmospheres of exoplanets through transmission and emission spectroscopy.

Ariel will observe a statistically significant and homogeneous sample of transiting exoplanets. By monitoring planetary transits in front of their host stars, as well as secondary eclipses when the planet passes behind the star, Ariel will measure wavelength-dependent variations in the observed stellar flux. These measurements provide direct access to the spectral signatures of planetary atmospheres. From them, a wide range of physical and chemical properties can be inferred, including atmospheric composition, vertical pressure-temperature profiles, day-night temperature contrasts, atmospheric circulation patterns, and the presence and properties of clouds and hazes. Over its nominal four-year lifetime, Ariel will characterise the atmospheres of several hundred to about one thousand exoplanets, spanning a wide range of planetary masses, radii, temperatures, and host-star types. In doing so, Ariel will directly address one of the core questions of ESA’s Cosmic Vision programme: What are the conditions for planet formation and the emergence of life?

The Ariel mission is developed by an international consortium comprising more than 70 institutes from 17 ESA member states. The IEEC plays a central role within the consortium as one of the co-Principal Investigator (co-PI) institutes (co-PI: I. Ribas) and leads the Spanish contribution to the mission (Spanish PI: I. Ribas; National Project Manager: L. Martí). This national contribution also involves the Instituto de Astrofísica de Canarias (IAC) and the Universidad Politécnica de Madrid (UPM). In addition, research groups at CSIC and the Universitat de Barcelona (UB), coordinated through the IEEC, participate in several scientific and technical aspects of the mission.

One of the main technical responsibilities of the IEEC-coordinated team is the design, implementation, assembly, and

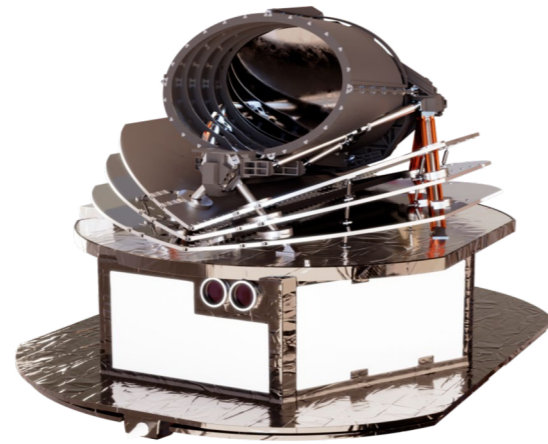


Image 9. Render of the Ariel telescope. Credits: ESA.

verification of the Telescope Control Unit (TCU). The TCU is a key subsystem of the payload and is responsible for the thermal monitoring and control of the telescope and payload module, as well as for commanding the refocusing mechanism of the secondary mirror (M2 Mechanism, M2M). The group is also contributing to the development of the mission planning and scheduling software, which constitutes a critical element of Ariel’s ground segment.

Over the past years, the TCU team has reached several major milestones. In 2023, the unit successfully passed the Instrument Preliminary Design Review, and preparations are underway for the Critical Design Review scheduled for 2026. During 2025, a major achievement was the testing and delivery of the TCU avionics model to Airbus, enabling the validation of payload operational concepts. In parallel, the detailed design of the main TCU subsystems was completed; including the Power Supply Unit (PSU), the Control and Thermal Sensing (CTS) electronics, and the Secondary Mirror Driver (M2MD). First hardware prototypes of these units are currently being tested, with a strong focus on interface verification between the TCU and the other payload subsystems developed by different teams within the consortium.

On the ground segment side, the IEEC research team is leading the development of the Ariel Long-Term Planning Tool (LTPT). This automated scheduling system is a critical component of the Ariel Ground Segment and is designed to generate efficient long-term observation plans for transits, occultations, and phase curves of a target sample of approximately 1,000 exoplanets. During 2025, development of the

LTPT continued based on the high-level ground segment requirements, with particular emphasis on the implementation of dedicated optimisation algorithms tailored to Ariel’s specific constraints. This work formed part of the PhD thesis of N. Nakhjiri, successfully defended in November 2025. New functionalities were added to the tool, including a calibration figure of merit to explicitly account for the mission’s calibration strategy. In addition, the STARS graphical user interface was

upgraded to support LTPT execution and result visualisation. By the end of 2025, a new software release (version 0.8.0) was delivered to ESA after extensive debugging and vulnerability revision. Beyond its operational role, the LTPT has proven to be a valuable asset for mission design studies, allowing us to quantify the scientific impact of including demanding observations such as phase curves alongside standard transit and eclipse measurements.

On the scientific front, IEEC’s main contribution focuses on understanding and mitigating the effects of stellar intrinsic variability, commonly referred to as stellar activity. Within the framework of the SPOTLESS ERC Advanced Grant, we are developing correction methodologies to remove stellar activity signals from Ariel-like observations using the StarSim tool. Building on earlier work that proposed the use of complementary observations (Rosich et al. 2020), these techniques are now being implemented and tested on real data from the James Webb Space Telescope (de Wit et al. 2024). In 2025, several pilot observational campaigns were conducted, exploring both classical approaches and machine-learning-based methods. The initial results are highly encouraging, and first publications are currently in preparation. These efforts rely on coordinated photometric and spectroscopic observations from multiple facilities, including Telescopi Joan Oró (TJO), Gran Telescopio Canarias (GTC), Very Large Telescope (VLT), and CARMENES, and are being carried out in the context of three ongoing PhD theses.



Image 10. Top: Integration and testing of the Avionics Model (AVM) of the Ariel Telescope Control Unit (TCU). Bottom: Avionics Model (AVM) of the Ariel Telescope Control Unit (TCU) delivered in August 2025. Credits: IEEC.

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Arrakihs

Observing haloes down to ultra-low surface brightness to better understand galactic-scale structures.

The Arrakihs (Analysis of Resolved Remnants of Accreted galaxies as a Key Instrument for Halo Surveys) mission is a European Space Agency (ESA) initiative designed to test the predictions of the Lambda Cold Dark Matter (Λ CDM) theory. While Λ CDM successfully explains the large-scale structure of the universe, it struggles to replicate certain features of galaxies on smaller scales, such as their abundance, structure, and dynamics. Arrakihs aims to address these discrepancies by studying the faint stellar components of nearby galaxy halos, providing unprecedented insights into the distribution of satellite galaxies and the presence of stellar streams. During 2025, the Arrakihs mission made solid progress in its

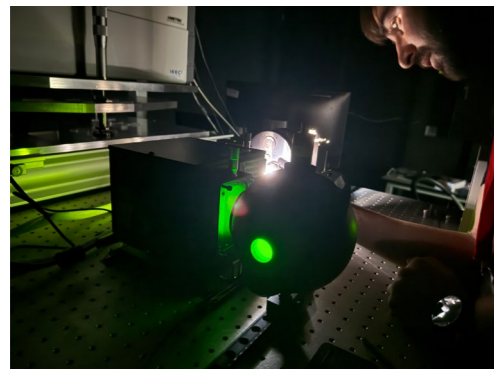


Image 11. Optical lab preparation at ICE-CSIC/IEEC for calibration of the Visible detectors. Credits: Santiago Serrano.

scientific, technical, and organisational activities. The mission moved closer to adoption through coordinated work on science definition, instrument development, and the growth of the consortium. Researchers and engineers at the IEEC provided strong support to these efforts and played an active role in several key areas of the mission.

On the scientific side, the Arrakihs Science Team continued to strengthen its structure and activities throughout the year. The Science Committee was fully established and met regularly, producing a large number of technical notes in support of ESA's Science Study Team. These documents covered core elements of the mission, including science objectives, observing strategy, performance assessment, and survey definition. In parallel, work started on the preparation of the Arrakihs Mission Red Book. This document brings together the scientific goals, instrument concept, mission architecture, and performance estimates in a single reference that supports the mission's path towards adoption.

A major technical milestone in 2025 was the installation and commissioning of the On-Ground Demonstrator (OGD) at the Javalambre Astrophysical Observatory. The OGD is a key facility for the mission, allowing end-to-end testing of observing strategies, calibration approaches, and data processing pipelines under realistic conditions. During the commissioning phase, the first images were successfully acquired using the iSIM-170 camera, which reproduces the core elements of the Arrakihs scientific instrument. This marked an important step from simulation-based studies to hardware-based validation and provided valuable input for the ongoing development of the science instrument.

At consortium level, the Arrakihs collaboration continued to expand during 2025. The annual Arrakihs Consortium Meeting was held in Vienna and brought together a large part of the scientific and technical community involved in the mission. Over the year, the consortium grew to more than 150 members across several countries, reflecting the increasing interest of the European astrophysics community. This expansion was accompanied by a wider distribution of responsibilities, particularly in science preparation, calibration planning, and instrument development.

On the instrument side, 2025 marked an important phase of consolidation. The System Requirements Review (SRR) was successfully completed early in the year, resulting in a stable and agreed set of top-level instrument requirements. This was followed by an internal Intermediate Analysis and Design

Review, aimed at consolidating the instrument architecture and identifying open points ahead of the Preliminary Design Review (PDR). In parallel, several subsystem breadboards were initiated, and qualification and verification activities started for key technologies. By the end of the year, a significant fraction of the PDR documentation had been completed, increasing the overall technical maturity of the mission. Researchers and engineers from the IEEC contributed extensively to these activities. IEEC personnel played an active role in the Arrakihs Science Team, with a strong focus on cosmology studies, end-to-end simulations, and the analysis of realistic mock observations. In particular, they worked on the modelling and analysis of simulated images of Milky-Way-like galaxies, representative of the low-surface-brightness targets that Arrakihs aims to observe. These studies were important to assess the scientific feasibility of the mission and to refine requirements on image quality, depth, and calibration accuracy. The results were included in the Mission Red Book and in several supporting technical notes.

Beyond the scientific work, the IEEC team was also involved in the technical and organisational aspects of the mission. They participated in the Science Study Team, contributed to the commissioning and operation of the OGD, and were involved in instrument coordination and calibration planning. During 2025, work also started on the design and setup of a dedicated calibration test bench for the visible sensors at the Institute of Space Sciences (ICE-CSIC) optical laboratory. This facility will support detector characterisation, performance verification, and the development of calibration pipelines to be applied later to flight data.

Overall, the work carried out in 2025 represents a clear step forward in the development of the Arrakihs mission. The involvement of the IEEC in science, instrumentation, calibration, and coordination has been an important contribution to this progress and will continue to be relevant in the next phases of the mission.

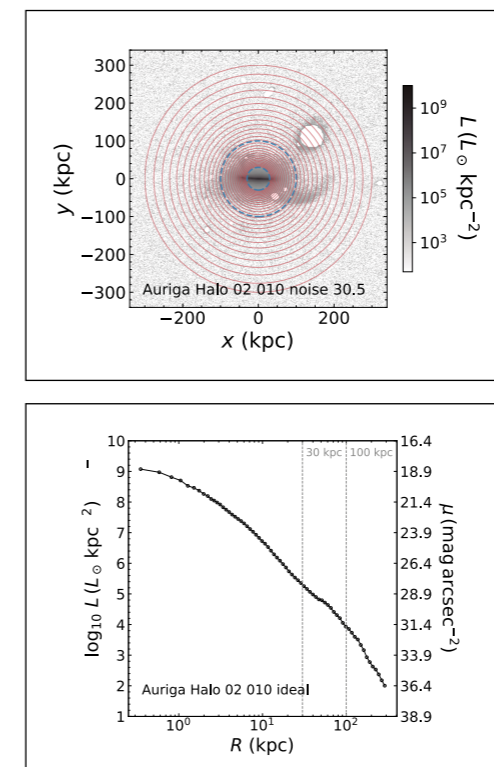


Figure 9. Top: simulation of an Arrakihs-like target galaxy in one of the visible bands (VIS2) of the telescope. Bottom: the corresponding surface brightness profile showing that Arrakihs will be able to detect their outer/fainter regions, which is critical to understand their formation history and the nature of the dark-matter contained in those galaxies. Credits: Li-Wen Liao.

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FUNDED BY:



CTAO

Studying the Universe in very high-energy gamma rays using Cherenkov radiation.

The Cherenkov Telescope Array Observatory (CTAO) is a state-of-the-art ground-based observatory designed to detect high-energy gamma rays. With up to 100 telescopes located in the northern and southern hemispheres, CTAO will be the world's largest and most sensitive very-high-energy gamma-ray observatory when completed.

While the northern hemisphere array will have more limited dimensions and focus on the low and medium energy ranges from 20 GeV to 20 TeV, the southern hemisphere array will cover the entire energy range of CTAO, with gamma-ray energies from 20 GeV to 300 TeV. The northern site is located at the Roque de los Muchachos Observatory on La Palma in the Canary Islands and will be devoted primarily to extragalactic science. The southern array site, located at the European Southern Observatory (ESO), Chile, will also carry out observations in the galactic plane.

Three classes of telescopes will be distributed in the northern and southern hemisphere according to their sensitivity: the Small-Sized Telescope (SST), the Medium-Sized Telescope (MST), and the Large-Sized Telescope (LST). Designed to be the most sensitive to detect very-high-energy gamma rays, the SSTs are best suited to the southern site, while the MSTs and LSTs will be installed at both sites.

On 7 January 2025, the European Commission established the CTAO as a European Research Infrastructure Consortium (ERIC), furthering its mission to become the world's largest and most powerful observatory for gamma-ray astronomy.

The CTAO ERIC was established with the international support of 11 countries and one intergovernmental organisation that contribute to the technological development, construction and operation of the Observatory. The ERIC not only provides the Central Organisation with a formal framework to accept and operate the current telescope prototypes, but

also allows for the immediate start of construction for the full array of more than 60 telescopes across both telescope sites in Spain and Chile. On the CTAO-North site, where the LST prototype (LST-1) is under commissioning, three additional LSTs, one MST and a Raman LIDAR for atmospheric monitoring are expected to be built in the next 1-2 years.

The IEEC team at the Institute of Space Sciences (ICE-CSIC) has helped to install, operate, and observe with the LST-1 of CTAO in La Palma throughout the year. Among other early scientific results, they collaborated on the detection of the Geminga pulsar at energies down to 20 GeV, filling in the gap between Fermi-LAT and IACT measurements (see the paper in *Astronomy and Astrophysics*: K. Abe et al. 2025).



Image 12. A close-up image of the LIDAR is shown with the LST-1 in the background, taken during its test campaign at the Roque de los Muchachos Observatory. Credits: Paolo Calisse (CTAO).

The IEEC team at the Universitat Autònoma de Barcelona (UAB) has completed the performance evaluation of the Raman LIDAR prototype and has entered the construction phase of the final instrument. The Raman LIDAR has therefore successfully concluded its pathfinder phase with the publication of two articles in the journal *Remote Sensing* (O. Ballester et al. 2025, and P.J. Bauzá-Ruiz et al. 2025). These articles provide a detailed technical description of the prototype and a scientific performance evaluation based on data acquired at the UAB Campus and during a one-year test period at the Roque de los Muchachos Observatory, close to its final installation site.

The IEEC team at the Institute of Cosmos Sciences (ICCUB) has contributed to observations with LST-1 and to the scientific exploitation of data obtained with it. They have led the study of the nova RS Oph with LST-1 and the modelling of its high and very high energy emission (K. Abe et al. 2025, *Astronomy and Astrophysics*), and the study of the LST-1 observation of the Brightest Of All Times (BOAT) Gamma-Ray Burst GRB 221009A (K. Abe et al. 2025, *The Astrophysical Journal Letters*). They have also contributed to constrain the TeV gamma-ray emission of SN 2024bch with LST-1 observations and conducted preparatory studies of novae and other transient galactic sources for CTAO. In addition, Arnau Aguasca-Cabot has been Coordinator of the Fast Offline Analysis and Pol Bordas is Physics Coordinator of the LST Collaboration.

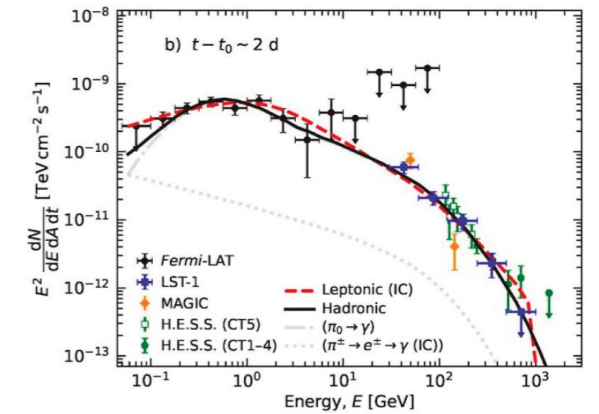


Figure 10. RS Oph spectral energy distribution from high energy to very high energy gamma rays including data from CTAO LST-1 and other facilities, together with best-fitted leptonic and hadronic models (K. Abe et al. 2025, *Astronomy and Astrophysics*).

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FUNDED BY: **CTAO**

Euclid

Understanding dark energy and dark matter by studying the expansion rate of the Universe and the growth of structure.

Euclid is a cosmology mission of the European Space Agency designed to investigate the accelerated expansion of the Universe, also known as dark energy. The IEEC holds prominent leadership roles within the mission: we serve on the Euclid Consortium Board, lead the simulation effort, develop core software, and have contributed to the mission's hardware.

Euclid contains two instruments: a visible imager and a near-infrared spectrophotometer. The mission, successfully launched on 1 July 2023, has been designed to study the expansion rate of the Universe and the growth of structure using weak lensing and galaxy clustering as main cosmological probes. Currently, it is carrying out a survey covering 14,000 deg², one third of the sky, taking high resolution images and slitless spectroscopy of millions of galaxies.

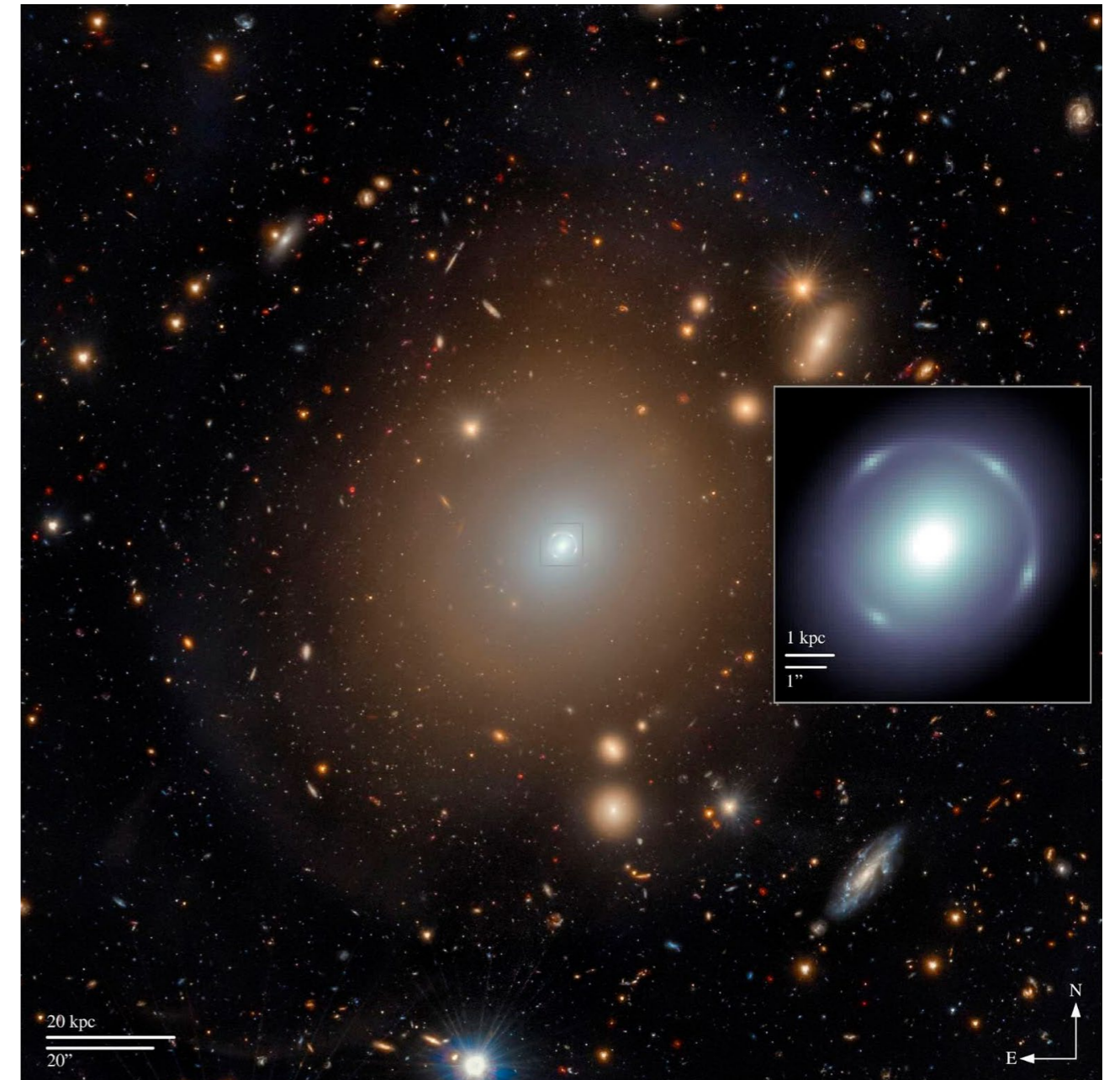
This year was marked by the passing of Yannick Mellier, the Euclid Consortium Lead, on 19 December 2025. His death deeply affected the entire collaboration, which now has to adapt to this new situation. Yannick had guided the Consortium since its inception and was instrumental in shaping its scientific vision.

In March 2025, ESA and the Euclid Consortium made available the first Quick Release (Q1). This release included one-pass observations of the Euclid Deep Fields and data from the "Dark Cloud" field, covering around 63 deg². The public release was accompanied by 34 scientific and technical papers submitted to *Astronomy & Astrophysics* (A&A). A second wave of seven papers, based on early Data Release 1 (DR1) data, followed in November, presenting many exciting new results. Notably, galaxy morphology studies and strong-lensing analyses made significant advances thanks to the new Euclid observations.

During 2025, the content of DR1 was defined, covering roughly 2000 deg². The processing of the DR1 data took place during the summer and autumn and was released internally to the collaboration at the end of the year. DR1 includes a special region of 500 deg² where the blinding strategy is relaxed to enable data-quality validation and analysis pipeline testing. The dataset selected for the Quick Release 2 (Q2) corresponds to the Euclid Galactic Bulge Survey.

In September, six members of the Euclid Science Team were replaced by new-appointed members. There was also a renewal of some Euclid Consortium Science Working Group Coordinators and the coordinators of the DR1 Key Projects were selected through open calls. The Euclid Consortium Annual Meeting took place in Leiden in March jointly with the ESA ESLAB meeting. In March-April, the mission underwent its Mission Key Point Review, with only a few items deferred for resolution in a subsequent delta review. Overall, the survey progressed nominally, despite episodic periods of high solar activity that resulted in some data loss.

At our institute, we continued to lead both the Cosmological Simulations working Group and the Simulations Organisation Unit of the Science Ground Segment. The Flagship simulation paper was published in a Euclid Special Issue of the A&A journal. In September, we made the simulations publicly available and announced it in conjunction with a press release. We are now working on preparing for the simulations needed for the scientific analysis of the DR1. We were selected by the Barcelona Supercomputing Center (BSC) as a strategic project for developing new Euclid simulations and performing cosmological inference. We remain actively involved in coordinating the DR1 Key project focused on deriving cosmological constraints from the joint analysis of weak lensing and galaxy clustering. We have selected the World Trade Center Barcelona as the venue for the Euclid Consortium meeting in 2026 and have been working in its organisation.



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Image 13. One of the highlight discoveries of the year: Euclid image of a bright Einstein ring around galaxy NGC 6505. Credits: Euclid Collaboration: O’Riordan et al., 2025, A&A, 694, A145.

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Gaia

Europe's most productive scientific space mission continues mapping the Milky Way.

Launched in December 2013, the European Space Agency's Gaia satellite has far surpassed its objective of creating the most accurate and comprehensive map of the Milky Way to date. The year 2025 has been intensely dedicated to the processing and validation of the upcoming data release (DR4), expected in December 2026 and that will be the data release for the nominal mission (the initially planned length of the mission, extended in later years). The Gaia Data Processing and Analysis Consortium (DPAC) is carrying on intense work for the data processing of this full release: we are currently processing and validating the first 5.5 years of Gaia observations that constitute the length of the nominal mission and that will lead to even more refined astrometric, photometric and spectroscopic data, and epoch data for all data products and sources. This new release will break all the previous records on data volume (approaching 500 TB) and precision. You can find full information about the published and planned Gaia data releases at: <https://www.cosmos.esa.int/web/gaia/release>

But 2025 was also a special year for the Gaia mission since the satellite depleted its cold gas propellant at the beginning of the year. After more than eleven years of flawless operations, Gaia was passivated and put into a retirement orbit around the Sun on 27 March 2025 (Fig. 11). However, the mission is not over, the data processing will extend until 2030, with the final DR5 release; we still have a lot of work to do: our Gaia team is already processing 10.5 years of extended mission data (towards DR5) with new developments and integration of complex algorithms, such as the inclusion and modelling of resolved binary stars.

On the scientific side, Gaia has also continued breaking records in publications based on its data. It has been the most productive scientific mission of ESA, accounting for about half of the refereed papers of its scientific programme. Up to the date of the writing of this report, there are more than 15,500 refereed publications based on Gaia data. Over 2000 papers per year since 2021 (and counting!). Moreover, there are more than 8,400 registered users of the Gaia archive, that is the highest number of registered users of all the archives of ESA. For the sake of comparison, the European Astronomical Society only has 5,300 members and the full International Astronomical Union has 12,000 members, so 70% of the astronomers of the world are registered users of Gaia. The number of users increases steadily by 100 users per month.

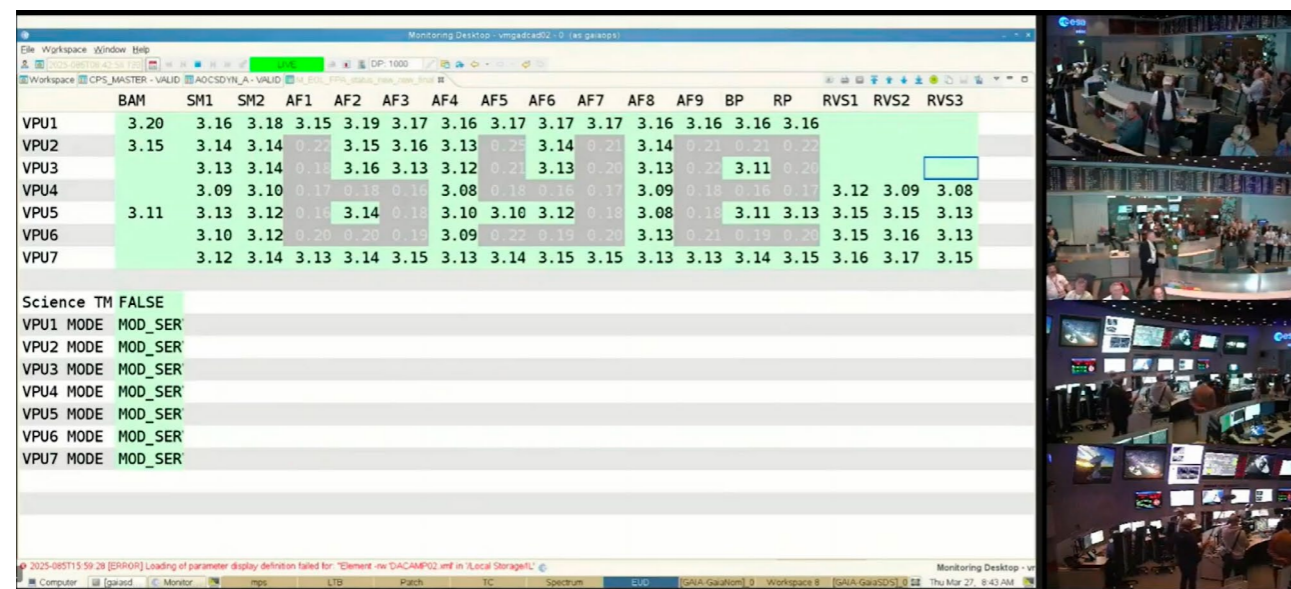


Figure 11. The final commands were sent to Gaia from ESA's European Space Operations Centre on 27 March 2025. Credits: ESA/Gaia.

Our team, and the Spanish community in general, have strongly contributed to this science; 20% of the papers have a Spanish co-author, a fraction significantly higher than the Spanish financial contribution to the mission. To this respect, the Spanish Gaia Network that we lead has certainly contributed to fostering Spanish participation in Gaia. As the Gaia mission advances, the tasks of the group working on

At a more local level, the Gaia team in Barcelona is leading the SPACIOUS project, started in January 2024. This Horizon Europe project (<https://spacious.ub.edu/>) focuses on the development of technologies for managing massive data in space science, enhancing the capabilities for data processing and analysis in missions like Gaia. The project has already opened a competitive call for the participation of as-

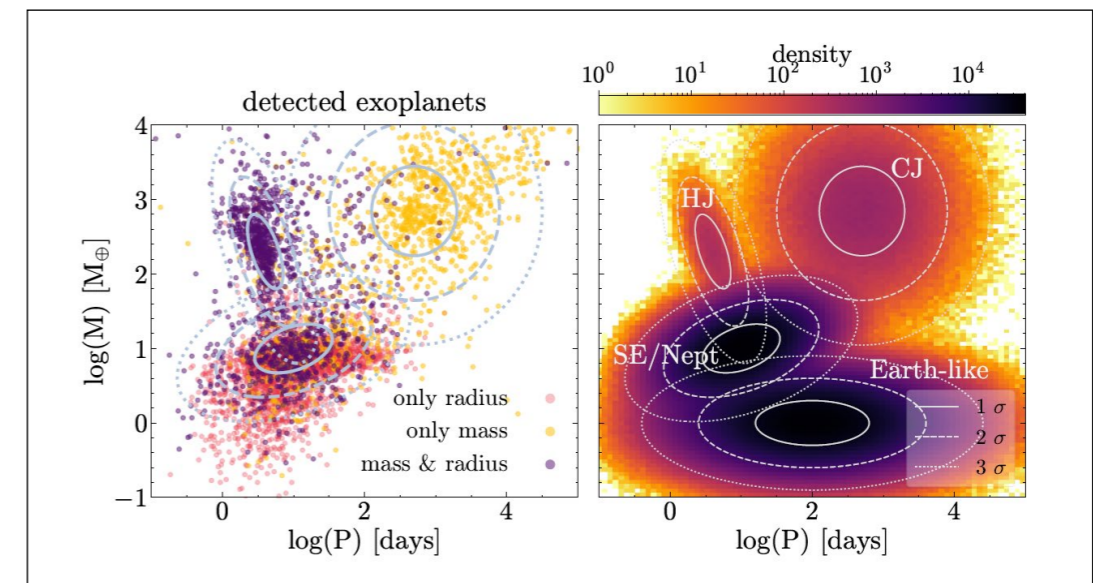


Figure 12. Distribution of detected vs. simulated exoplanets (Padois et al. 2025, "Modelling the Milky Way's exoplanet population based on cosmological galaxy simulations"). This work was carried out within the framework of the MWGaiaDN PhD supervised by F. Anders and D. del Ser.

the development of advanced scientific exploitation tools increases. The big size and the accuracy on the upcoming releases boost, on one side, the necessity to develop new applications for Data Mining / Big Data treatment and, on the other, the development of more complex chemo-dynamical modelling of our Galactic system.

tronomers to use the SPACIOUS platform in those projects involving large and complex datasets that can benefit from SPACIOUS scalability and modern cloud-native architectures. We are also part of two Marie Curie EU Doctoral networks (MWGaiaDN and EDUCADO) that have brought new PhD students to our team, in close collaboration with a variety of European institutions (see Fig. 12).

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LISA

The first observatory of gravitational waves in space.

The Laser Interferometer Space Antenna (LISA) will be the first space-based gravitational-wave observatory that will survey the entire observable Universe in the low-frequency band (around the millihertz). In January 2024, LISA successfully passed the Mission Adoption Review (MAR), which marks the conclusion of the preliminary design phase and the formal start of the industrial implementation phase. With this milestone, LISA officially became a Large-class (L-class) mission within the ESA Science Programme.

The IEEC team at the Institute of Space Sciences (ICE-CSIC) leads the Spanish contribution to the mission, which contains both instrumental and ground-segment components. The project also benefits from the participation of IEEC researchers at the Institute of Cosmos Sciences (ICCUB) and at the Universitat Politècnica de Catalunya - BarcelonaTech (UPC).

On the one hand, the instrumental contribution consists of the Science Diagnostics Subsystem (SDS; Miquel Nofrarias is the PI leading this effort), responsible for monitoring and characterising environmental disturbances (e.g., temperature, magnetic field, radiation) that could affect the interferometric measurements.

On the other hand, the ground segment contribution (Carlos F. Sopena is the PI leading this effort) is part of the LISA Distributed Data Processing Centre (DDPC). This contribution consists of a Data Computing Centre (DCC) and the development of a global-fit data analysis pipeline aimed at producing a comprehensive catalogue of gravitational-wave sources from the LISA data stream. In addition, the IEEC has a major contribution to waveform modelling within the DDPC framework (led by PI Sascha Husa), that is, to the production of accurate waveform models that are essential for the global-fit pipelines.

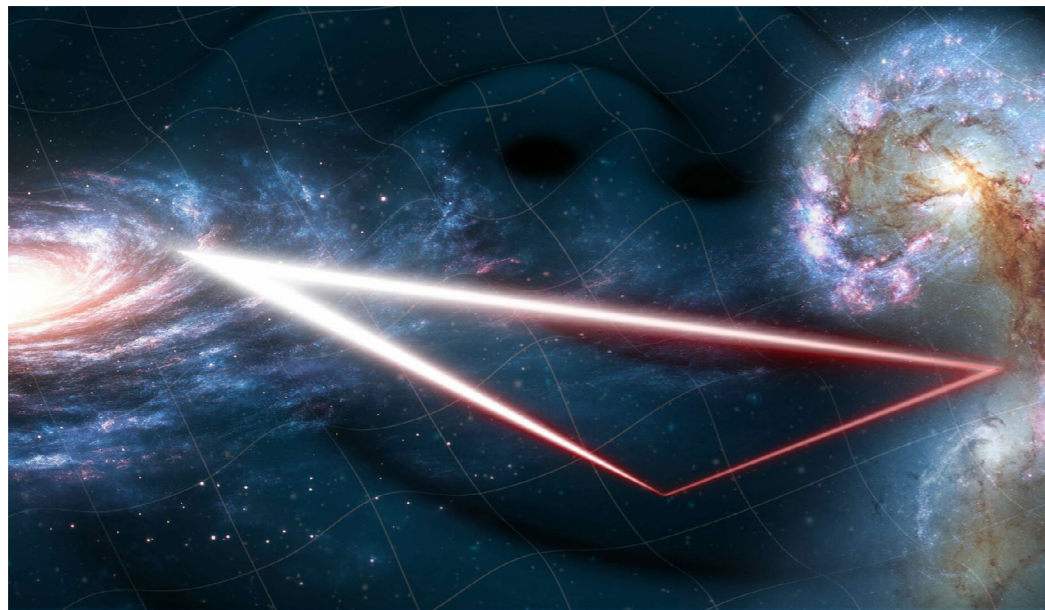


Image 14. Artwork inspired by the LISA mission. Credits: ESA.

During 2025, the LISA prime contractor (a consortium led by OHB) fully started activities and conducted a co-engineering phase with the different subsystems, including the SDS. This process consolidated the technical requirements and baseline design of this subsystem. The SDS now enters an industrial implementation phase where Elegant BreadBoard Models (EBBMs) will be manufactured by industrial partners and subsequently validated through dedicated test campaigns.

In parallel, the group has developed and manufactured Qualification and Flight Models (QMs and FMs) of the In-Orbit LISA Diagnostics Demonstrator (ILIADA), an in-orbit demonstrator carrying prototypes of the main diagnostics on-board LISA (temperature sensors, magnetometers, and a radiation monitor). ILIADA will fly on the forthcoming GENE0-02 mission within the framework of the Catalonia Space 2030 Strategy of the Government of Catalonia. The FM is now fully qualified for flight after passing thermal-vacuum (TVAC) and vibration tests. The launch of GENE0-02 is expected in 2026.

On the ground segment front, we have been working on the development of a prototype for the Spanish Data Computing Centre (DCC). We have also developed, in the context of the Deep Analysis coordination unit (CUL2D) of the DDPC, new data analysis algorithms for the detection and characterisation of galactic binaries (GBs) and massive black hole binaries (MBHBs), using both classical Bayesian sampling techniques and simulation-based inference methods based on advanced machine learning techniques. On the other hand, Sascha Husa has served as one of the co-chairs of the waveforms coordination unit (CUWAV) of the LISA DDPC, being responsible for the development of quality control procedures for the waveform code infrastructure that will be developed for the LISA ground segment. Together with Juan de la Cierva fellow Héctor Estellés, he has also



Image 15. ESA Director of Science, Carole Mundell, and OHB System AG CEO, Chiara Pedersoli, shook hands after signing their agreement to build LISA at the International Paris Air Show, in France. Credits: ESA, M. Polo.

been contributing to the sub-project devoted to develop waveforms for the coalescence of MBHBs, in particular in preparing the first data challenge of the DDPC, where their IMRPhenomT waveform model will be used to test LISA global fit algorithms.

Finally, the IEEC team has been leading the consolidation of the Spanish community interested in the science of LISA, first by creating the LISA Spain meetings (2024 and 2025) and more recently by structuring the community. Most members of the IEEC group are core members of the new LISA consortium, launched in June 2025, and organised within the LISA-IEEC group, represented on the consortium council by Sascha Husa.

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Plato

The ESA space mission to search Earth analogue planets is almost ready for launch.

Plato (PLANetary Transits and Oscillations of stars) is the next medium-class mission of the European Space Agency (ESA), and it is currently being tested and getting ready for launch in early 2027. The payload of this mission is composed of 26 cameras that will be staring continuously to the stars from the L2 Lagrangian point with the goal of detecting the tiny light drop caused by exoplanets transiting in front of them. The first Plato field, LOPS2, is centered on the Pictor constellation in the Southern celestial hemisphere. The stars in this field will be monitored for at least 2 years and Plato is expected to uncover thousands of planetary systems around them. The mission is particularly designed to search for Sun-Earth twin systems, that is, rocky planets in the habitable zone of solar-type stars, where liquid water can be sustained on the surface of the planet. Finding and characterising such planets is the first step towards the long quest objective of finding life beyond the Earth. Furthermore, Plato is also expected to provide a wealth of information about the host star itself through the analysis of their seismology from high-frequency photometric variability, from which fundamental parameters such as the mass and the age of stars can be inferred.

The exoplanets detected by Plato using the transit method will have to be confirmed with additional observations in order to rule out false positive scenarios and to measure the mass of the exoplanets, which, in combination with the radius determined from the transit, reveals the bulk properties such as its density. The Ground-based Observations Program (GOP) will oversee and coordinate the acquisition of all the observations. These include the photometric follow-up of the stars to confirm the transit detection, high-contrast imaging to search for background contaminant stars, and high-precision spectroscopic monitoring from which the radial velocity of the stars is measured. Building on our expertise in scheduling systems within the framework of the STARS project, the IECC team coordinates the task of organising and planning

all follow-up observations for thousands of planetary candidates from many ground-based facilities on different locations and with different capabilities.



Image 16. Plato payload testing campaign. Credits: ESA.

At the IECC we are leading different work packages. In particular, those devoted to data handling and communications between subsystems and databases (at the Institute of Cosmos Sciences, ICCUB), and observation scheduling (at the Institute of Space Sciences, ICE-CSIC). During 2025, we have implemented the first version of the user interface of the GOP Operational Centre (GOPOC), which oversees the communication between the Plato Data Centre (PDC), requesting the confirmation of the exoplanet candidates, and the GOP components. The database used as interface is in operation and is continuously updated following the requirements. We have also been working on the implementation of the Plato-GOP scheduler based on the requirements and design reviewed in 2024, and new functionalities and parameterisations into the STARS scheduling functions to handle the different observation types and strategies have been added. We have integrated the software modules from our colleagues at Warwick (UK) to determine the observation type and control the quality of

Finding Chart

Candidate ID	1
Priority	1
Status Photometry	For OTD
Status Imaging	To be scheduled
Status Spectroscopy	Pending completion check
RA	110.51285596446814
DEC	-57.38508799905727
Stellar Mass	1.20335081624414
Stellar Radius	1.73034163163799
Period	52.97818
Transit Time	2458376.052
T14	8.1226
Transit Depth	0.00684
Update Time	2025-10-13T08:53:05.637093
GOP Disposition Data	RVI
GOP Disposition Interpretation ?	RV: <input checked="" type="checkbox"/> SB1 <input type="checkbox"/> SB2 <input type="checkbox"/> BD <input type="checkbox"/> GVP <input type="checkbox"/> SFP Photometry: <input type="checkbox"/> NEB <input type="checkbox"/> VALID_TRA <input type="checkbox"/> NEB <input type="checkbox"/> NONEB Imaging: <input type="checkbox"/> NC <input type="checkbox"/> NVC <input type="checkbox"/> NBKG <input type="checkbox"/> NNC

[Save](#)

[Show more parameters](#)

Observations

Select All Download 0 selected observation(s)

Select	Obs ID	Type	Instrument	Observer	Start Time	End Time	Format flag	Observation flag	Science flag	Data disposition	In PFU
<input type="checkbox"/>	1	Low precision RV	4	1	13/10/2025, 00:00:00	13/10/2025, 00:00:00	0	0	0	RVI	false

Figure 13. Example of a Ground-based Observations Program Operations Centre (GOPOC) user interface view to monitor the progress of the observations. Credits: IECC.

the observations. Independent tests of the scheduling tool have been performed, as well as global tests in coordination with all the other subsystems of the GOP structure, successfully passing the ground segment implementation review. Finally, the STARS graphical user interface (STARS GUI) has been adapted and integrated into the observers interface (OBI) developed by our Swiss colleagues at the Observatory of Geneva. The main goal of this subsystem is to transfer the observation plans computed by the GOP scheduler to the observers gathering the data.

In addition to the GOP, the IECC is helping to better define the science case of the mission and prepare the data analysis tools. We have been contributing to the work packages on Stellar Activity and Rotation and Spot Models and contributing to the Work Package responsible for the production of the libraries of stellar models that will be used by Plato to determine the fundamental properties of stars in its core programme.

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FUNDED BY:



Area for the Promotion of the Space Sector of Catalonia



AREA FOR THE PROMOTION OF THE SPACE SECTOR OF CATALONIA

The IEEC carries out activities to promote Catalonia's space sector, acting as the entity that drives and represents the sector nationally and internationally. This activity is developed within the framework of the Catalonia Space 2030 Strategy, promoted by the Government of Catalonia.

The Catalonia Space 2030 Strategy strengthens the space ecosystem through the launch of satellite missions, the development of ground infrastructures, research and innovation programmes, talent promotion, industrial boost programmes, and high-value-added services based on space technologies. The IEEC participates in the deployment of this Strategy in collaboration with the i2CAT Research Centre and the Cartographic and Geological Institute of Catalonia (ICGC).

The space sector promotion functions carried out by the IEEC are developed within the Area for the Promotion of the Space Sector of Catalonia (APEC). The APEC contributes to the various pillars of the Government of Catalonia's space strategy and executes activities for the promotion of R&D&I, talent promotion and retention, the construction of key space and ground infrastructures, and the development of services and applications for the administration and industrial sectors. Its goal is to grow the ecosystem by strengthening national capabilities in the medium and long term and promoting international collaboration, while maintaining the entity's commitment to social responsibility criteria.

The APEC encompasses activities carried out through three offices dedicated to: the promotion of infrastructures; the promotion of industry and services linked to the space sector; the promotion of research and innovation. At the same time, it develops functions for talent promotion, the positioning of space technology and data, and the dissemination of the benefits they provide in solving societal challenges. The APEC also works closely with other IEEC teams to achieve its objectives and maintains active coordination with the Secretariat for Digital Policy of the Government of Catalonia for the deployment of various programmes and activities within the Catalonia Space 2030 strategy, as well as with other stakeholders linked to the strategy. Beyond the programmes themselves, the APEC also meets its objectives by participating in international congresses, collaborating on projects with the Spanish Space Agency and other space entities worldwide, and contributing to working groups and consortia.

Activities developed at the APEC

The APEC's functions are carried out through a set of activities in different areas, all of which are intended to achieve the expected impact on the growth of the public and private Catalan space ecosystem.

The objectives achieved during 2025 show a great progression in relation to those of previous years. In general terms, progress has been made in consolidating collaboration with the productive sector and in different areas of the public sector (administration, academia, research) at national level, in the positioning in the Spanish and international arenas and in the long-term positioning.

Regulatory scope and representativeness

With the aim of defining and promoting satellite policy and representing and promoting the sector in Catalonia, the APEC works on the national and international cooperation strategy and advises the Generalitat Administration in policies to stimulate the sector. Within this framework, meetings were held in 2025 with representatives of state and regional bodies that have made it possible to identify opportunities and promote the capabilities of the ecosystem. In particular, initiatives such as BASS and other programmes subscribed by Spain in the last ESA Ministerial have been followed up with the Spanish Space Agency, which has improved the promotion and impact on the ecosystem. Similarly, the interaction with the European Commission, the European Union Agency for the Space Programme (EUSPA) and the European Space Agency (ESA) has also been maintained for issues related with programmes such as IRIS2, Copernicus (e.g., Contributing Missions), CASSINI (e.g., hackathons), scale-up (e.g., ESA-BIC, PhiLabNET), Zero Debris Charter, BASS, etc.

Services and Industrial Promotion: ecosystem, international cooperation

The APEC carries out a series of services intended to support the growth of the space sector in Catalonia. The space ecosystem in Catalonia is well mapped through the Space community of the Digital Catalonia Alliance (DCA), an entity managed by i2CAT, and made up of more than 100 members. The IEEC and the DCA coordinate efforts to maximise the impact of initiatives in the digital and space sectors, with the benefit that this entails for the growth of the Catalan space sector.

The APEC provides specialised support to companies and entities in the sector on several topics: technical, legislative

and market areas. At the same time, it identifies and manages participation in national and international associations to carry out cooperation and promotion tasks that allow the ecosystem to be positioned, take advantage of funding opportunities and attract relevant actors at an international level. In addition, it carries out promotion actions, such as attendance at fairs and congresses of the space sector, and the organisation of events. Finally, the APEC also collaborates to encourage the use of applications and services provided by space technologies like the implementation of pre-commercial solutions based on Earth Observation and navigation technologies.

During 2025, the APEC has successfully achieved different actions: the direct support to more than 20 companies and entities in the ecosystem; the identification, promotion and participation in 6 European projects and consortia; the collaboration with key agents of the ecosystem such as the ESA-BIC, ACCIÓ, different departments of the Government of Catalonia and research entities such as IRTA, ICFO, CIMNE,

IFAE, etc.; the collaboration with the organisation and participation in conferences in Catalonia such as the New Space Economy Congress (see Image 17) and the annual conference of the NewSpace community of the DCA; the dissemination of events, e.g. European Parliament, webinars of NEREUS (Network of European Regions Using Space Technologies), Andalusian Government, etc. This year has also consolidated the APEC arena for interacting more efficiently with end users and their sectors, such as the agricultural, power and water management sectors. An online portal in the IEEC's website gathering funding opportunities for the space ecosystem has also been published.

It is important to highlight the effort dedicated to the activities for the internationalisation of the space ecosystem. In this area, we have participated in more than 30 international fairs and congresses, and we have successfully coordinated for the second time the Space pavilion with 21 companies representing the Catalan ecosystem at the Space Tech Expo Europe held in Bremen (Germany) from 18 to 20 November 2025, achieving great participation (see Image 18). In addition, we have collaborated with the Government of Catalonia in the Disruptive and Emerging Technology Alliance (DETA) initiative with its NewSpace working group.

Involvement in international organisations has also increased with Josep Colomé, director of the APEC, continuing in the Management Board of NEREUS, in which the IEEC acts as a representative of Catalonia as a European region, and as a member of the Council of the Eurisy association. At the same time, the APEC has continued to actively participate in the Earth Observation working group of the same NEREUS association and has continued to collaborate with the Eurisy association and the European Centre for Space Economy and Commerce (ECSECO) driven by ESA. Moreover, the IEEC continued as a representative member of the Catalan space ecosystem at SME4SPACE and as a member at the European Association of Remote Sensing Companies (EARSC), and continued its membership at Plataforma Tecnológica Aeroespacial Española (PAE). Finally, the IEEC became a new signatory of the Space for Climate Observatory (SCO) Charter in December 2025. Since 2019, the SCO has brought together organisations related to Earth observation involved in using space and satellite technologies to act against climate change. The IEEC is the first Spain-based organisation to sign the Charter and thus is the organisation's focal point in the country. This connects the IEEC with a network of globally relevant entities in the use of space technologies for climate action.

In the area of ecosystem services, the NewSpace Lab changed its name to Catalonia Space Labs and has also continued to be promoted by completing the mapping of public and pri-



Image 17. The New Space Economy Congress 2025 was held at Llotja de Mar (Barcelona) on 3 and 4 July. Credits: IEEC.



Image 18. Group picture with the companies that participated in the 'Catalonia Space 2030' pavilion, promoted by the Government of Catalonia and coordinated by the IEEC, during the Space Tech Expo Europe at Bremen (Germany). Credits: IEEC.

vate infrastructures that generate impact in the space sector. This mapping, with more than 30 infrastructures from 10 companies and public entities, has been disseminated at events such as the IAC, the New Space Economy Congress and finally with the updating of an online interactive platform integrated into the IEEC's website. Moreover, the procurement of a Thermal Vacuum Chamber (TVAC) has been finalised as a result of a CERCAGINYS grant, the collaboration with the Institut de Física d'Altes Energies (IFAE) and partial funding from the Catalonia Space 2030 Strategy. The inauguration of this new facility is expected by Q2 2026, and it will support electric propulsion development and enable thermal vacuum testing as well as the qualification of satellites and a diversity of space systems.

Finally, the APEC keeps carrying out actions to encourage the use of services based on space technologies, drawing on public procurement tools that allow the private sector to develop applications and pre-commercial solutions. The IEEC has completed three industrial contracts with companies that develop applications for private users in the agricultural, power and water management sectors:

- **REMOT Project (Agriculture):** Uses satellite data and predictive models to automatically detect plant water stress, allowing vineyards to optimize and automate their irrigation.

- **SAPIC Project (Safety):** Combines satellite and climate data into a digital viewer that monitors fire risks around power lines to prevent electrical grid incidents from sparking wildfires.
- **TIAFA Project (Utilities):** Uses satellite imagery and AI to automatically spot early signs of water leaks (such as abnormal soil moisture or vegetation changes) along major utility and energy canals.

Talent

Within the framework of the activities for the creation and attraction of talent, the APEC develops actions to achieve the growth of the space sector in the medium and long term, and it does so collaborating with bodies of the Government of Catalonia, the academic field, civil society, etc. Actions are carried out based on specific programmes or reinforcing existing programmes at the different training stages, taking advantage of the inspiring potential for future generations of space technologies and research.

In 2025, the APEC collaborated on various initiatives for secondary school students, including the CanSat competition, promoted by the European Space Agency (ESA) and driven in Catalonia by the Universitat Politècnica de Catalunya · BarcelonaTech (UPC) and the Government of Catalonia. Additionally, the APEC supported scientific stays and the Youth and Science programme of the Fundació Catalunya La Pedrera and the Edusat Challenge, an initiative of the Geographic Information Systems and Remote-Sensing Service (SIGTE) of the University of Girona (see Image 19).



Image 19. Group picture at the closing ceremony of the Edusat Challenge. Credits: Government of Catalonia.

At the higher education level, the APEC collaborated in the NASA International Space Apps Challenge hackathon in Barcelona (see Image 20), and facilitated internships in companies for university students pursuing degrees related to space technologies. The APEC kept supporting the Bachelor's degree in Satellite Engineering at the 'Escola Superior d'Enginyeries Industrial, Aeroespacial i Audiovisual de Terrassa' (ESEIAAT) of the UPC.

Finally, grants to promote industrial doctorates in the space sector were launched and grants were awarded for participation in the Space Studies Program (SSP) of the International Space University (ISU), as part of a collaboration agreement aimed at fostering new professionals in the space sector.



Image 20. Group picture of the NASA International Space Apps Challenge on the final day of the hackathon, 5 October 2025. Credits: Space Apps Spain.

Development and innovation

Innovation is a key element in strengthening any sector, particularly in the space sector, where technology plays a central role. Therefore, one of the APEC's core pillars is the promotion of research, development, and innovation. To achieve this, collaboration among the different stakeholders in the ecosystem is encouraged, fostering joint participation in R&I initiatives.

One of them is the ESA Phi-Lab Spain programme led by the IEEC, where innovative projects in the field of climate resilience are supported through funding and other support mechanisms. This programme is part of the ESA Commercialisation Network, with the support of the Spanish Space Agency and the Government of Catalonia, through the Catalonia Space 2030 strategy.

The APEC also promotes R&I lines, within the framework of this strategy, that have a potential impact on the industrial sector and a short time to get to the market, with the aim of facilitating the transfer of key technologies to the productive

sector. They are grouped into three main areas and cover Earth Observation (EO), upstream and downstream, and Positioning, Navigation and Timing technologies.

At the beginning of 2025, an internal call for projects took place. As a result of this call, six new projects were selected for funding. In total, the following ten projects were active during the year (four of them, selected in the 2024 internal call):

- **SmartC3 Rise:** On-board computer project focused on executing advanced data-processing algorithms in orbit, reducing downlink volume, and integrating GPU/RISC-V computing for AI applications. Key 2025 achievements include TRL 6 progress, radiation campaigns in Seville, a non-exclusive license agreement with Open Cosmos, contracts for the STRATOSENS project for AIRBUS and Power Innotech, and preparation for multiple space missions including PhotSat and GENE0-2.
- **MEDHUSA (GNSS-R):** Project aimed at estimating soil moisture at different depths using GNSS-R, with flight campaigns over agricultural areas to validate the system and compare results with in situ measurements. In 2025, the team started drone measurement campaigns and participated in the Agrobiotech Innovation Forum in Lleida.
- **Data Compression:** Research on onboard satellite compression to increase the amount of transmitted data, using COTS software and machine learning techniques. Main achievements include TRL 9 compressor integration, new AI-based techniques at TRL 3, agreement activity with Open Cosmos, CNES, and DAPCOM, and development of end-to-end compression architectures for panchromatic and multispectral data.
- **Data Fusion:** Work on fusing constellation and nano-satellite data to produce high-resolution soil moisture information, using 'Menu' data as a proof of concept. In 2025, the project supported funded initiatives with BETA and IRTA, expanded validation through real agricultural use cases.

- **LEOPNT:** Development of positioning algorithms and tools for GNSS receivers and commercial navigation platforms for ultra-low-power, secure, and resilient IoT applications. Key achievements include 13 conference papers, 2 journal papers, a software platform and hardware testbed for LEO signal experimentation, and active industry interest from companies such as Indra, GMV, Sateliot, and Airbus.
- **MinATOX:** Sensors for in-situ monitoring of atomic oxygen degradation in protective materials for LEO/VLEO satellites. The project reached TRL 3, started public-private collaboration discussions with Sateliot, filed a European patent, and was supported by the ESA Discovery Programme testing and planned Proof of Concept projects for 2026.
- **CMG (finished):** Development of a compact, accurate, and affordable control moment gyroscope, with a first commercial prototype under design and qualification. In 2025, the project progressed from TRL 2 to TRL 4, presented at multiple aerospace events, collaboration with Colombian Air network opportunities with the Colombian aerospace ecosystem, and advanced towards potential flight opportunities. The CMG team has applied to ESA BIC Barcelona to become one of their incubated startups.
- **INTREPID (finished):** Study of ionospheric scintillation impacts on LEO-PNT performance for terrestrial and airborne receivers, including mitigation strategies. The main 2025 achievement was the development of IonoSciNN, a web application that simulates how ionospheric scintillation affects satellite signals and positioning accuracy.
- **AI4EO (finished):** Identification of use cases and development of AI-based prototypes in areas such as soils, vegetation, water, urban sustainability, forests, and health. The project advanced to TRL 3/4, presented results at major conferences and events, produced a patent for estimating forest biophysical parameters, and supported broader initiatives such as AgriXel.
- **LIMAG (finished):** design, fabrication and testing of the first prototype of a compact and ultra-precise magnetometer. In 2025, the project progressed to

TRL 6, completed market analysis, advanced QM manufacturing and vibration testing, ran TVAC tests, and prepared for future use in GENE0-2 and possible relevance to ESA's LISA mission.

Infrastructures and data

The APEC leads diverse initiatives to develop in-flight and on-ground space systems (generically called infrastructures). In particular, the APEC promotes the implementation and exploitation of Earth Observation satellites, on-ground test facilities and flight-ground stations (antennas, in-flight object trackers, etc.). These assets contribute to the growth and consolidation of the space sector in Catalonia.

The Earth Observation (EO) missions fostered by the APEC are intended to collect complementary data to those provided by larger, existing programmes, such as ESA Copernicus satellites. These new data enable innovative imagery services addressing different types of use cases focused in Catalonia. The APEC is responsible for the missions' definition and the industrial providers selection. Likewise, the APEC follows up the missions' implementation and the operational exploitation phase. It also establishes data services contracts with the satellite owners to task and retrieve new imagery data: the APEC releases new observation needs retrieved from R&D centres, institutional departments and entities of the Government of Catalonia and centralises the effort to get and disseminate the requested data. These activities are carried out in collaboration with the i2CAT Foundation and the Cartographic and Geological Institute of Catalonia (ICGC).

In 2025, the first EO mission promoted by the IEEC, 'Menut' (GENEO-01), has completed its second year of in-flight operations and the service is expected to continue until July 2026, at least. Most of its acquisitions are available online on ICGC's 'Menut Viewer' (<https://visors.icgc.cat/menut/>). The C3SatP in-orbit demonstrator (IOD), a secondary payload of the mission, continues operating nominally, adding flight heritage and collecting data for future evolutions of the concept. On the other hand, the IEEC's second EO mission, GENE0-02, passed the Critical Design Review (CDR) in 2025 and is heading to the Flight Readiness Review (FRR), a milestone that would mark the qualification of the satellite for flight and which is occurring mid-2026. GENE0-02 is also hosting an IOD payload, the In-orbit LISA Diagnostics Demonstrator (ILIADA), which has undergone its qualification in late 2025.

The ILIADA consortium is led by researchers and members of the IEEC at the Institute of Space Sciences (ICE-CSIC), in collaboration with IEEC researchers at the Institute of Cosmos Sciences of the University of Barcelona (ICCUB) and the Universitat Politècnica de Catalunya - BarcelonaTech (UPC). The GENE0-02 mission comprises one primary microsatellite and several complementary ones, and is designed to provide enhanced data and performance (spectral bands, spatial resolution, a higher revisiting frequency, a yearly coverage of the Catalan territory, etc.) compared to GENE0-01. GENE0-02 is scheduled to be launched in October 2026

As for the on-ground test facilities, during 2025 the contract for the construction of the phase 1 equipment of the Alguaire Rocket Engine Test Centre (CPMC) has been finished and is currently being operated by the company Pangea Propulsion. Current plans include the further development of the infrastructure to increase testing capabilities for higher power rockets (up to one meganewton), which will be designed during 2026. The APEC collaborates with Aeroports de Catalunya in this infrastructure setup. On the other hand, in 2025, a thermal vacuum chamber (TVAC) procured by the IEEC and built under the IEEC's supervision has been installed in IFAE's premises (see Image 21), where it is planned to be operated thanks to an agreement between both entities. This equip-



Figure 13. Render of the primary microsatellite of the GENE0-02 mission. Credits: 3D model by Open Cosmos, render by the IEEC.

ment simulates space environment conditions in terms of temperature and pressure. The TVAC is intended to provide key test capabilities to companies and space research centres developing future in-orbit devices and satellites. It will be operated in a cooperative way, where any firm or public entity can book it and use it to conduct their tests under IFAE's and IEEC's supervision and maintenance. This usage logic and its proximity to Catalan space entities yields competitive conditions for users, which helps to foster the space economy in the region. The TVAC is planned to host the first operational activities early in 2026.

With regards to the Sant Esteve Teleport at the Montsec Observatory, the S/X/Ka band satellite communications ground station by Leaf Space Spain SL, granted in 2024, started its final construction stage as of the end of 2025, for a nominal operation phase kick-off planned end of Q1 2026. The agreement between the IEEC and Leaf Space foresees better-than-market use prices for the IEEC and the Catalan ecosystem. It also represents a very important step forward in the deployment of this teleport, a key on-ground infrastructure for the innovation and the industrial space capacities in Catalonia. Late 2025, it was agreed to make a first extension



Figure 14. Rocket Engine Test Center (CPMC) in the airport of Lleida-Alguaire. Credits: Aeroports de Catalunya.

of the teleport with three new infrastructures: two additional communication stations (one again in S/X/Ka band and another one operating in the optical spectrum), plus an in-flight object tracking facility. These assets have been awarded after a public selection process opened in September 2025. Last but not least, a public contest for the development of new Earth observation payloads was opened in November-December. It is done in the frame of the ESA Phi-Lab Spain programme and with direct funding by the Government of Catalonia. The awarded projects will be announced in February 2026.

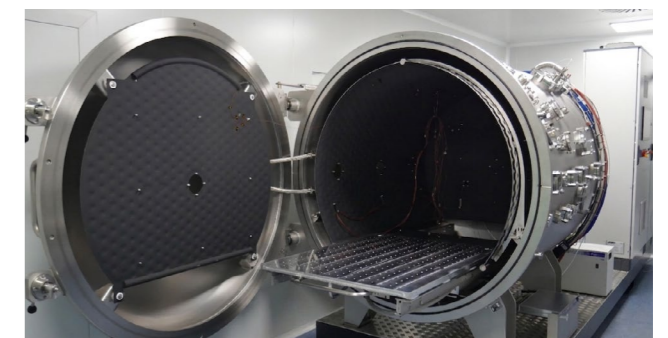
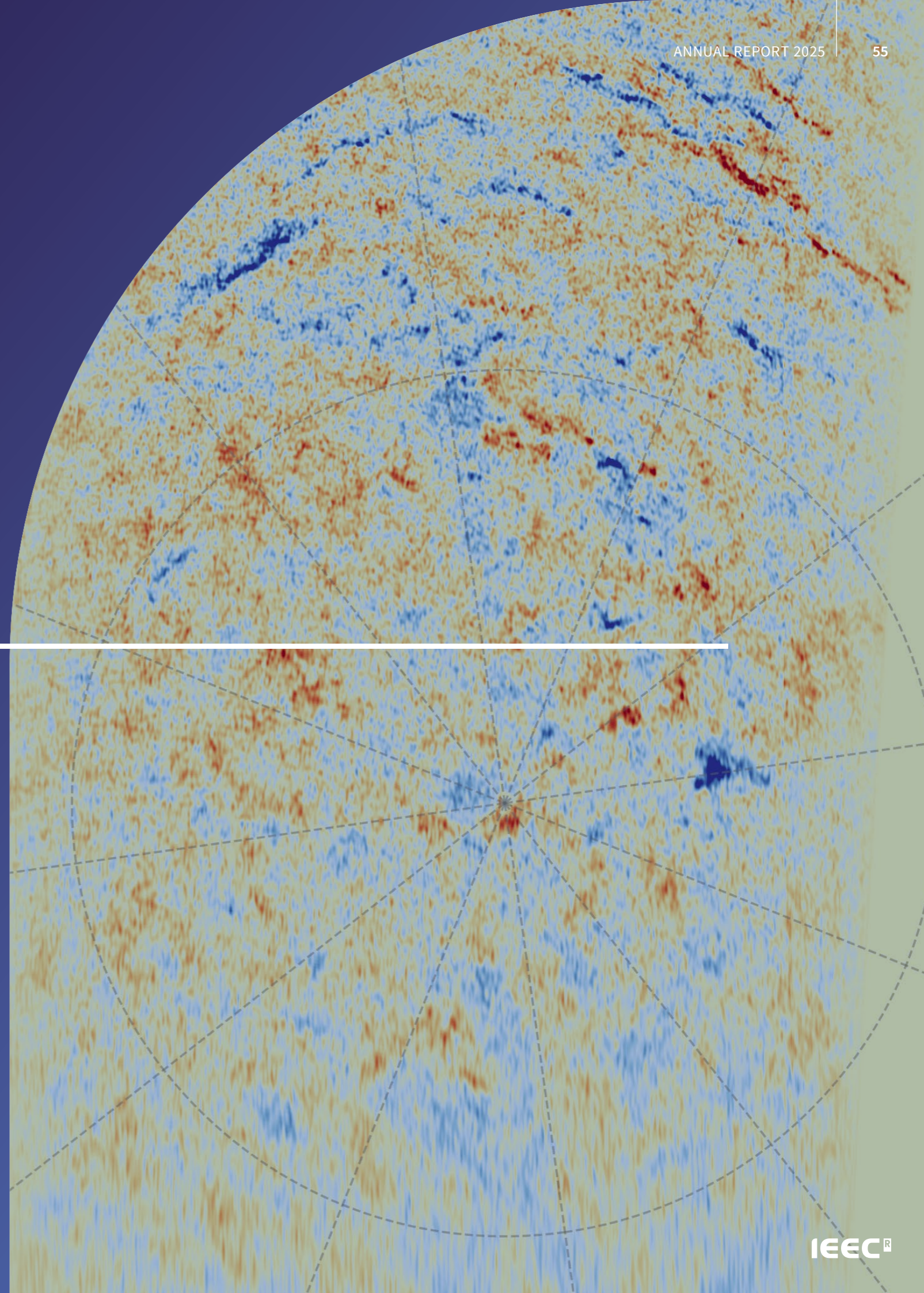
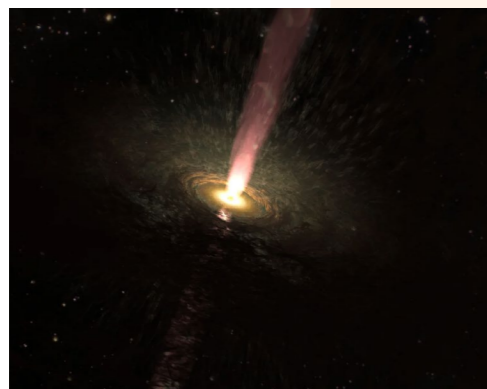


Image 21. IEEC's TVAC chamber installed in IFAE. Credits: IEEC.

Scientific Highlights

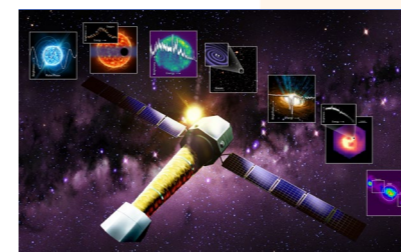




A new study points to a universal mechanism for jet collimation

The study led by the Institute of Theoretical and Experimental Astronomy, in which the IEEC participates, reveals the presence of a helical magnetic field within a protostellar jet. The team used new observations with the telescope Karl G. Jansky Very Large Array (NSF VLA) from the National Science Foundation National Radio Astronomy Observatory (NSF NRAO). [Read more](#)

The NewAthena mission plans an ambitious multi-messenger X-ray observatory



The mission was presented as a new X-ray observatory that promises to revolutionise the observation of the cosmos. The observatory will combine data from light, gravitational waves and neutrinos to explore extreme phenomena in the Universe. The observatory is being developed by the European Space Agency (ESA) and has the participation of the Institute of Physics of Cantabria (IFCA) and the Institute of Space Sciences (ICE-CSIC), with several members from the IEEC. The mission is expected to be adopted in 2027. [Read more](#)

A new UPC NanoSat Lab space mission for Earth observation was successfully launched

On 14 January, the RITA³Cat-6 payload, developed by doctoral students at the UPC NanoSat Lab and integrated into the Arab nanosatellite ALainSat-1, was launched into orbit. The UPC space payload carried instruments to obtain data on sea salinity and soil moisture and measure the state of vegetation. [Read more](#)



Einstein Probe detected a puzzling cosmic explosion

On 15 March 2024, the probe's Wide-field X-ray Telescope (WXT) detected a burst of low-energy X-rays that could change the way gamma-ray bursts are explained. The burst lasted more than 17 minutes and fluctuated in brightness before fading away again. Its study has been published with the participation of the IEEC researcher Nanda Rea at the Institute of Space Sciences (ICE-CSIC). [Read more](#)



Last starlight for the ground-breaking Gaia mission

The Gaia satellite, the European Space Agency's (ESA) project to map the Milky Way, completed the sky-scanning phase. The mission gathered over three trillion observations of around two billion stars and other objects over the last decade, which has transformed our understanding of the galaxy and our cosmic environment. Since the mission's beginning, it has included a team of IEEC astronomers and engineers from the Institute of Cosmos Sciences (ICCUB). [Read more](#)



Hypatia II mission concluded to study the effect of a Martian mission on the female body

The Hypatia II mission is part of an initiative to advocate for women in science as well as to study the effect that Mars conditions can have on the female body. The mission was at the Mars Desert Research Station (MDRS), located in the Utah desert, and lasted two weeks. Estel Blay, IEEC program manager, was part of the all-female crew of 7 and had the role of Scientist & Health and Safety Officer. During the mission, Blay conducted three experiments, which included studying the solar panel efficiency for dusty Mars environments, developing optimal growth mechanisms for space and Earth-born tomatoes, and designing a 24-hour space menu for astronaut health and performance. [Read more](#)





A sample of over 3600 Ia supernovae could change how we measure the Universe's expansion history

On 14 February, the most complete and advanced dataset of Type Ia supernovae, which play a key role in the study of dark energy, was published. This was done through the Zwicky Transient Facility survey, which included a sample of 3,628 of them, collected by a single instrument between March 2018 and December 2020. The team, which includes the participation of IEEC researchers at the Institute of Space Sciences (ICE-CSIC), discovered a new effect that could change how the expansion history of the Universe is measured. [Read more](#)

2500 new active black holes in dwarf galaxies are uncovered

The Dark Energy Spectroscopic Instrument's (DESI) early data uncover the largest samples ever of intermediate-mass black holes and dwarf galaxies hosting an active black hole, more than tripling the existing census of both. IEEC researchers at the Institute of Space Sciences (ICE-CSIC) participate in the discovery with the study of the interplay between these black holes and the dwarf galaxies where they reside. DESI is a state-of-the-art instrument that can capture light from 5,000 galaxies simultaneously. [Read more](#)



Euclid opens data treasure trove to study the Dark Universe

The European Space Agency's mission released its first batch of survey data, including a preview of its deep fields. Using Artificial Intelligence algorithms in combination with citizen science campaigns, the scientific results include, among many others, the discovery of strong gravitational lensing systems and the exploration of galaxy clusters and the cosmic web. [Read more](#)

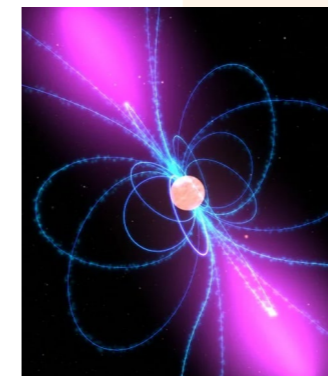
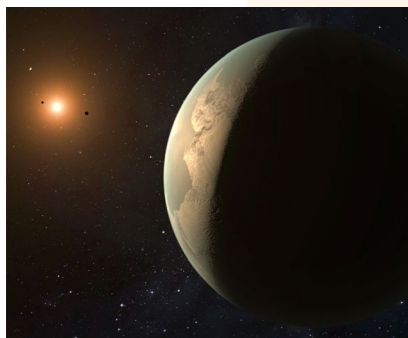
New DESI results strengthen hints that dark energy may evolve

The Dark Energy Spectroscopic Instrument (DESI) collaboration published a new analysis of dark energy using their first three years of collected data, which spans nearly 15 million galaxies and quasars. Researchers, including members of the IEEC at the Institute of Cosmos Sciences (ICCUB) and Institute of Space Sciences (ICE-CSIC), see hints that dark energy, once thought to be a "cosmological constant," might be evolving over time in unexpected ways. [Read more](#)



A super-Earth was discovered in the habitable zone of a nearby red dwarf

GJ 3998 d is the third planet found in the habitable zone of a star located 59 light-years away from Earth. The proximity of this system to the Sun makes GJ 3998 d an attractive candidate for atmosphere characterisation. This newly discovered planet is a super-Earth with a mass around six times that of the Earth, orbiting within the habitable zone and receiving slightly more stellar insolation than Earth, which makes it particularly interesting for further atmospheric studies. IEEC researchers at the Institute of Space Sciences (ICE-CSIC) participated in this discovery published in the journal *Astronomy & Astrophysics*. [Read more](#)



New method found to compare gamma-ray light curves of around 300 pulsars observed with NASA's Fermi telescope

IEEC researchers at the Institute of Space Sciences (ICE-CSIC) applied, for the first time, an innovative method from fields like medicine and finance to compare nearly 300 gamma-ray pulsars observed by NASA's Fermi Telescope, using the data compiled in the Third Fermi Large Area Telescope Pulsar Catalogue published in 2023. By analysing the full set of gamma-ray light curves with this approach, the study revealed unexpected and significant similarities across very different pulsars, including objects with very distinct ages, magnetic fields and rotational properties, opening new perspectives for understanding pulsar emission mechanisms. [Read more](#)

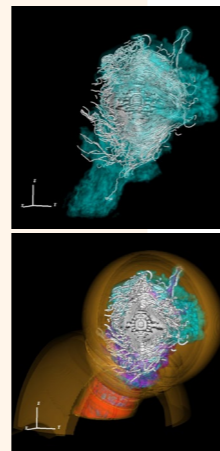


A team of astronomers resolve the mystery of massive star formation with the Very Large Array telescope

After 25 years of debate, a new study confirms the presence of an accretion disk around protostar HW2, a key element in massive star formation, located in the Cepheus A region, 2,300 light-years from Earth. Using interstellar ammonia gas as a tracer, the team observed infalling and rotating material, matching theoretical models, revealing extreme mass transfer rates and confirming that accretion disks can sustain the rapid growth of massive stars. [Read more](#)

New simulations hint pulsar nebulae are influenced by the evolution of their progenitor stars

A new study with the participation of IEEC members at the Institute of Space Sciences (ICE-CSIC) shows that the shape and emission of pulsar wind nebulae depend on the life history of their progenitor star. Using 3D simulations, the team reveals that pre-supernova environments crucially shape nebula structure, modelling the nebula produced by a runaway pulsar from a massive star that evolved and died as a red supergiant. The simulations were carried out using high-performance computing facilities such as the MareNostrum supercomputer at the Barcelona Supercomputing Center. [Read more](#)



The first images of the most complete 'movie' of the night sky ever made are published

With the largest digital camera ever built for astronomy, the Rubin Observatory will scan the sky to create an ultra-HD time-lapse of the Universe. Over the course of a decade, this unprecedented survey will repeatedly map the southern sky, producing the most complete 'movie' of the night sky ever made. Its goals include understanding dark energy and dark matter, cataloguing millions of asteroids and comets, and mapping the Milky Way. IEEC researchers at the Institute of Space Sciences (ICE-CSIC) contribute to key scientific and technical developments. [Read more](#)



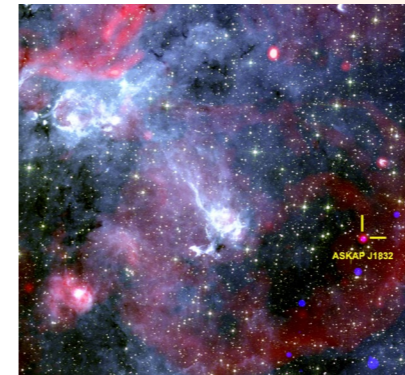
ARRAKIHS starts its research at the Javalambre Astrophysical Observatory

This mission led by the European Space Agency (ESA), and coordinated from Spain, has begun scientific preparations with a demonstrator now successfully operating at the Javalambre Observatory. This milestone represents a fundamental step towards the launch of the mission, scheduled for 2030. The camera installed in Javalambre will devote more than one hundred hours of observation to each of the galaxies under study, similar to the Milky Way, enabling the validation of the instrument's performance. The mission will explore dark matter and galaxy formation, with IEEC researchers at the Institute of Space Sciences (ICE-CSIC) contributing to both science and instrumentation. [Read more](#)



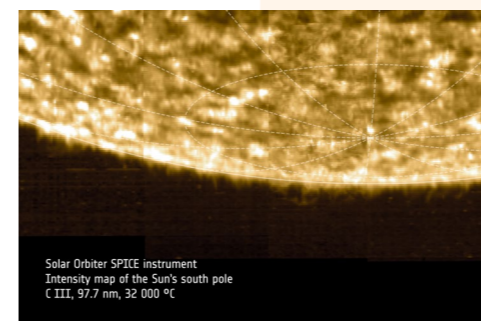
Detected a transient object emitting pulses in both radio waves and X-rays

For the first time, astronomers have observed X-rays from a long-period transient object: ASKAP J1832-0911, located 15,000 light-years away. The object emitted bursts every 44 minutes and showed unusual behaviour. It was detected through combined observations from the ASKAP radio telescope and NASA's Chandra X-ray Observatory. IEEC researchers at the Institute of Space Sciences (ICE-CSIC) contributed to interpreting this rare cosmic discovery, published in Nature. [Read more](#)



Solar Orbiter captures first-ever images of the Sun's south pole

Scientists have obtained the first detailed images of the Sun's south pole, thanks to the European Space Agency (ESA) and NASA's Solar Orbiter mission. With participation from IEEC researchers at the Institute of Cosmos Science (ICCUB), the mission sheds new light on magnetic field reversals, during which the Sun's magnetic north pole becomes south and vice versa, and improves predictions of the solar cycle and space weather, especially during peak activity phases. [Read more](#)





The Montsec Observatory expanded its capabilities with the installation of a new telescope

The new Wide Field Fast Telescope (TRAC), coordinated by the IEEC with the participation of the Institute for High Energy Physics and i2CAT, will enhance asteroid tracking, space debris monitoring, and astrophysical research. With a 40 cm diameter and a wide field of view, the telescope will complement the existing facilities at the Montsec Observatory. The project was framed in the CERCAGINYS III call and was designed as a cooperative scientific facility to be offered to the research community. [Read more](#)

First global map of light pollution in Catalonia developed using advanced modelling



A predictive model based on supercomputing assesses the brightness of the night sky across the entire territory and paves the way for improved planning and environmental and energy management of outdoor lighting. The IEEC has led this initiative with researchers at the Institute of Cosmos Sciences (ICCUB) using data from the Department of Territory, Housing and Ecological Transition of the Government of Catalonia. To calculate the zenith night sky brightness at over 32,000 points across Catalonia, three supercomputers were used, one of them belonging to the Consortium of University Services of Catalonia (CSUC), amounting to more than 600,000 computing hours. [Read more](#)

NASA's IXPE imager reveals mysteries of uncommon pulsar

The pulsar J1023 provided the first evidence of synchronised polarised emission across optical and X-ray wavelengths, revealing that the pulsar's wind dominates the emitted radiation. The research challenges traditional models of neutron star behaviour in binary systems, which had suggested that X-rays originated from the accretion disk. IEEC researchers at the Institute of Space Sciences (ICE-CSIC) co-led this international study published in The Astrophysical Journal Letters, based on observations from NASA's IXPE and other telescopes. [Read more](#)



The avionics model of Ariel's TCU, delivered to Airbus

The Telescope Control Unit (TCU) is a key subsystem of Ariel, the European Space Agency's (ESA's) mission that will study the atmospheres of over 1,000 exoplanets. The IEEC team, including researchers at the Institute of Cosmos Sciences (ICCUB) and the Institute of Space Sciences (ICE-CSIC), completed this important milestone by delivering its avionics model to Airbus Defence and Space, enabling its integration with the rest of the telescope units for initial functional tests and contributing to the validation of the system prior to the development of the flight model. [Read more](#)

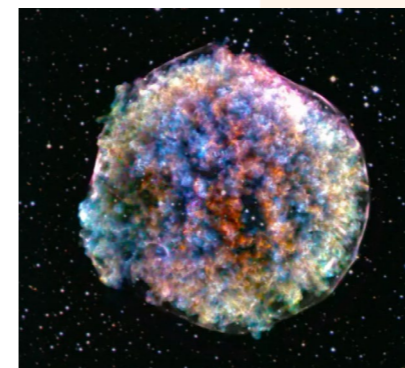


Record-breaking gamma-ray burst provides new clues on cosmic jets

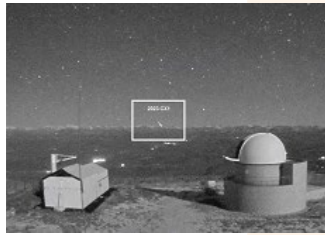


The Cherenkov Telescope Array Observatory (CTAO) found the strongest evidence for the existence of complex structured jets in long duration gamma-ray bursts, based on the observation of the record-breaking event GRB 221009A. IEEC researchers at the Institute of Cosmos Sciences (ICCUB) participated in this study, which opened a new window into cosmic jet physics and highlighted the power of CTAO's next-generation telescopes to explore the high-energy Universe and advance our understanding of the most extreme cosmic phenomena. [Read more](#)

A team of astronomers present a new method to detect supernovae hours after the explosion



The method combines wide-field sky surveys with immediate telescope follow-up. The study, led by IEEC researchers at the Institute of Space Sciences (ICE-CSIC), shows that observing the first light of supernovae preserves information about their type, origin, and environment. By capturing early spectra within the first hours and days after the explosion, the work established targeted protocols for rapid detection and follow-up, paving the way for new strategies to study the earliest phases of these stellar events. [Read more](#)

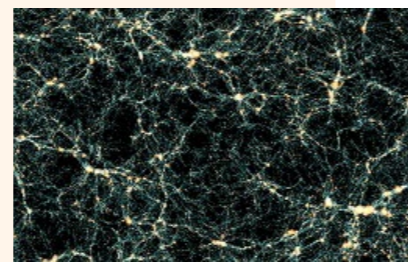


A comprehensive study of an asteroid disintegrated over France in 2023 opens new horizons for planetary defense

An international team, including IEEC researchers at the Institute of Space Sciences (ICE-CSIC) and the Montsec Observatory, analysed the origin and properties of the asteroid 2023 CX1, detected on 12 February 2023, seven hours before it entered Earth's atmosphere and impacted the French region of Normandy. As only the seventh asteroid ever detected prior to impact, and with its trajectory predicted with unprecedented accuracy, the study highlighted the importance of characterising asteroids before atmospheric entry, providing key insights for planetary defence strategies and the assessment of potential risks to populated areas. [Read more](#)

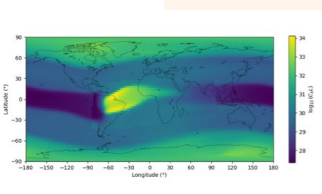
A virtual Universe for Euclid: the largest cosmological simulations catalogue becomes publicly available

The synthetic galaxy catalogue includes 3.4 billion galaxies with over 400 modelled properties and precedes the largest 3D map of the Universe, helping to develop strategies for the scientific exploitation of future galaxy surveys. Developed by a team of 11 institutions within the Euclid Consortium, and led by IEEC researchers at the Institute of Space Sciences (ICE-CSIC) and the Port d'Informació Científica (PIC), this synthetic catalogue aims to reproduce what the Euclid telescope observes, mimicking the actual Universe and enabling the study of very distant galaxies emitted more than 10 billion years ago. [Read more](#)



A key tool for simulating ionospheric scintillation in low-Earth-orbit positioning satellites is released

Named IonoSciNN, this tool allows the simulation of how the ionosphere affects satellite signals, offering a crucial resource for future Positioning, Navigation, and Timing (PNT) systems in low Earth orbit (LEO). LEO-PNT satellites will improve the Global Navigation Satellite System (GNSS) coverage in environments such as cities with skyscrapers or inside buildings. The work was carried out by a team from the IEEC, in collaboration with researchers from the Universitat Politècnica de Catalunya - BarcelonaTech (UPC). [Read more](#)



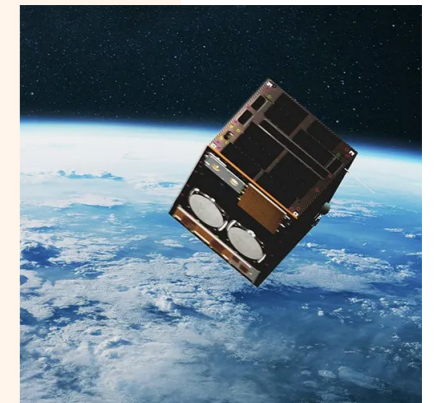
The first light of the 4MOST telescope marks the beginning of the observation of 77,000 binary stars

A team from the Universitat Politècnica de Catalunya - BarcelonaTech (UPC) that includes IEEC members will lead a research project with this telescope, installed on the VISTA telescope (Visible and Infrared Survey Telescope for Astronomy) of the European Southern Observatory, in Cerro Paranal, Chile. 4MOST will study the origin of chemical elements and the first stars, the growth of the Milky Way, the formation and evolution of galaxies and black holes, the composition of dark matter, and the nature of dark energy. [Read more](#)



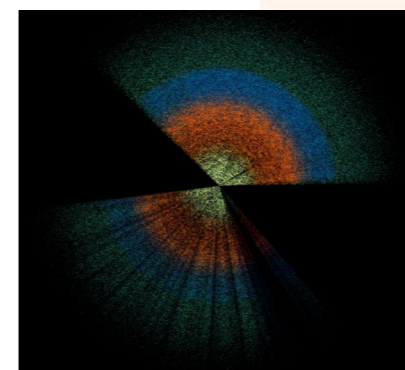
The IEEC takes part in the Atlantic Constellation, a project for Earth observation from space

This innovative programme brings together institutions and companies from Portugal and Spain to improve environmental management, climate resilience, and coastal monitoring. Several IEEC research units, including groups from the Institute of Space Sciences (ICE-CSIC), UPC, and UAB, are contributing to the mission. The company Open Cosmos has been selected by the Spanish Space Agency (AEE) and the European Space Agency (ESA) to lead the development of the Spanish component of this constellation. [Read more](#)

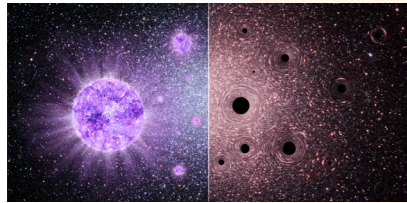


A team of astronomers use cosmological data to test if dark matter behaves like ordinary matter

The study suggests that dark matter may behave similarly to ordinary matter, while leaving open the possibility of an as-yet-unknown interaction. This breakthrough sheds a little more light on the properties of dark matter, which is five times more abundant than ordinary matter. The research was carried out by the University of Geneva (UNIGE), with the participation of IEEC researchers at the Institute of Space Sciences (ICE-CSIC). [Read more](#)



Extremely massive stars forged the oldest star clusters in the universe



A new groundbreaking model reveals how extremely massive stars (EMS)—with more than 1,000 times the mass of the Sun—have governed the birth and early evolution of the oldest star clusters in the universe. The study, led by an IEEC researcher at the Institute of Cosmos Sciences (ICCUB), reveals how these short-lived stellar giants profoundly influenced the chemistry of globular clusters, which are dense, spherical groups of hundreds of thousands or millions of stars found in almost all galaxies. [Read more](#)

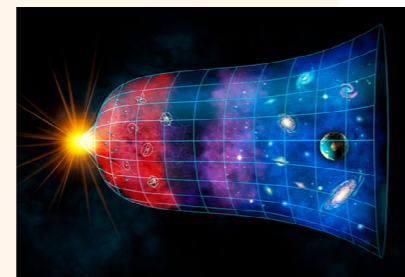
Successful launch of the European Space Agency’s mission that will study Earth’s hydrological properties from space



HydroGNSS uses an innovative technique called Global Navigation Satellite System (GNSS) reflectometry to advance the global understanding of water availability and the impacts of climate change on Earth’s hydrological cycle. This is the first ESA’s Scout mission—a modality to test new technologies in an agile and low-cost manner. The project includes the participation of IEEC researchers at the Institute of Space Sciences (ICE-CSIC), providing algorithms that will help in the detection of surface waters. [Read more](#)

Two ERC Synergy Grants to clarify the nuclear physics of the solar model and resolve the Hubble tension

The projects, involving several researchers from the IEEC at the Institute of Space Sciences (ICE-CSIC) and the Institute of Cosmos Sciences of the University of Barcelona (ICCUB), respectively, will benefit from these prestigious grants from the European Research Council. The first project, LUNANOVA, seeks to revolutionise the current understanding of the Sun by eliminating the uncertainty present in the nuclear physics of the solar model. The second one, RedHOT, aims at resolving one of the outstanding challenges in modern cosmology, and a source of disagreement when quantifying the expansion of the universe. [Read more](#)

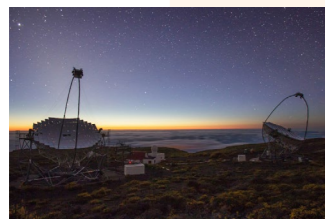


New data confirm “cosmological tension” in the measurement of Hubble constant

An international collaboration, including IEEC researchers at the Institute of Cosmos Sciences of the University of Barcelona (ICCUB), presented new results on the expansion rate of the Universe based on the study of extremely luminous active galactic nuclei known as quasars. The study revealed a statistically significant discrepancy in the value of a fundamental parameter of the Universe—the Hubble constant—depending on the method used to determine it. If the differing values are not caused by yet-to-be-found systematic uncertainties in the measurements, this calls for a profound rethinking of our understanding of the Universe. [Read more](#)



Physicists demonstrate with unprecedented accuracy the constancy of the speed of light

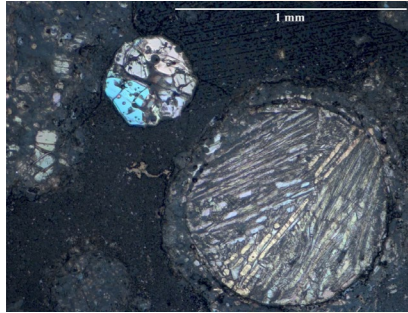


A study testing Lorentz invariance shows that the speed of light remains a universal constant, even though several quantum gravity theories predict that this parameter depends on photon energy. The team, formed by IEEC researchers at UAB’s Centre for Space Studies and Research (CERES), in collaboration with the University of Aveiro and the University of Algarve, searched for this dependence from astrophysical observations. The research increased the precision limit in measuring the constancy of the speed of light tenfold. [Read more](#)

New study sheds light on the Milky Way’s mysterious chemical history



The study, led by experts from the IEEC at the Institute of Cosmos Sciences of the University of Barcelona (ICCUB) and the Centre national de la recherche scientifique (CNRS), explores the origins of a puzzling feature in the Milky Way: the presence of two distinct groups of stars with different chemical compositions, known as the “chemical bimodality.” The research reveals that galaxies like the Milky Way can develop two distinct chemical sequences through various mechanisms, providing new clues about the formation and evolution of galaxies like our own. [Read more](#)

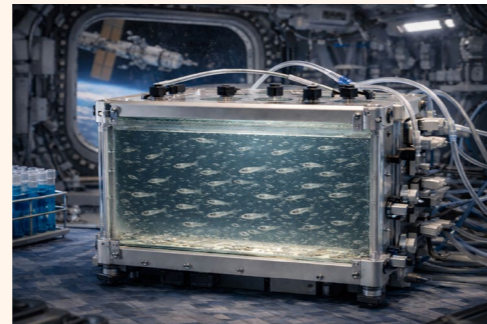


A pioneering study assesses the feasibility of asteroid mining

A team analysed meteorites from historical falls and NASA's Antarctic meteorite collection. Samples of C-type asteroids, carbon-rich minor bodies of the Solar System, were studied, revealing that they can serve as crucial material sources and support the development of new technologies for resource exploitation. They also provide valuable information on the chemical composition and evolutionary history of the bodies from which they originate. These findings were obtained by a team led by IEEC researchers at the Institute of Space Sciences (ICE-CSIC). [Read more](#)

SpaceGenFish will study aquaculture in space to obtain fresh food for long-duration missions

The project, led by the Institut de Ciències del Mar (ICM-CSIC), will focus on the biological and epigenetic adaptation of fish to space conditions—such as microgravity and radiation—to advance towards sustainable food systems in orbit. The IEEC collaborates in the project with researchers at the Universitat Politècnica de Catalunya - BarcelonaTech (UPC). The company Radian and the French research institute Ifremer also participate in this project funded by the Spanish Space Agency within a European Space Agency programme. [Read more](#)



Publications

The total number of publications authored by the IEEC members is 640*. Hereby there is a graphical summary of the total scientific and technical publications according to the Research Unit, journal quartile, journal, number of authors, and scientific subject. 96.1% of publications authored by the IEEC is distinguished as Open Access (OA) content.

Number of publications by Research Unit

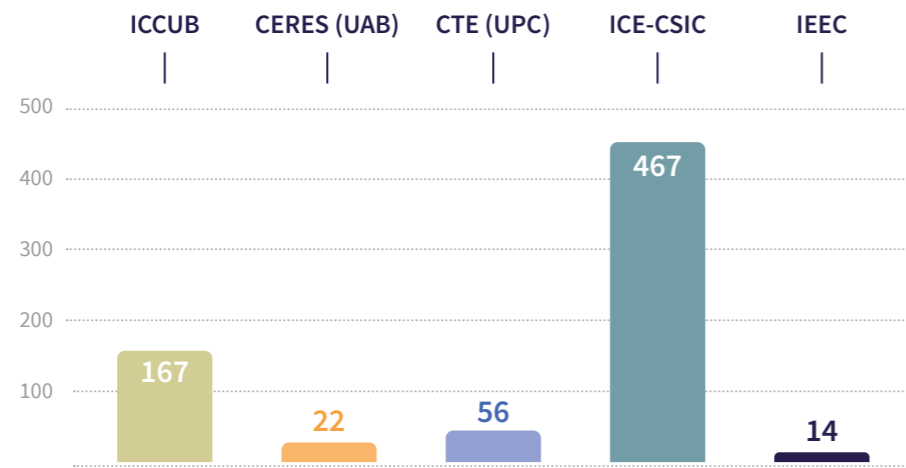


Figure 15

Number of publications by journal quartile

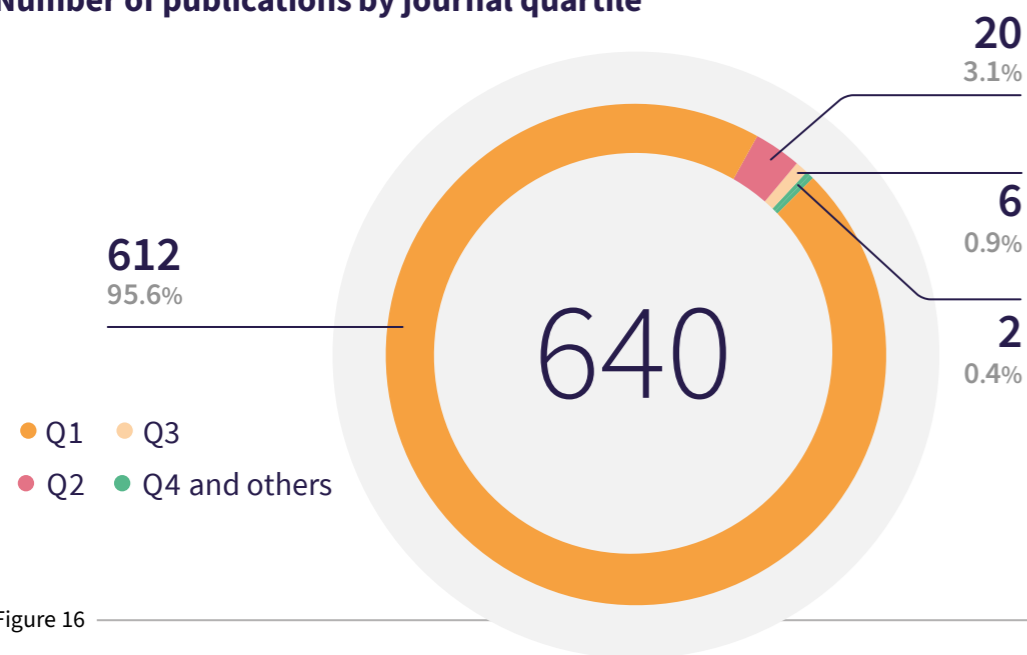


Figure 16

Number of publications by journal

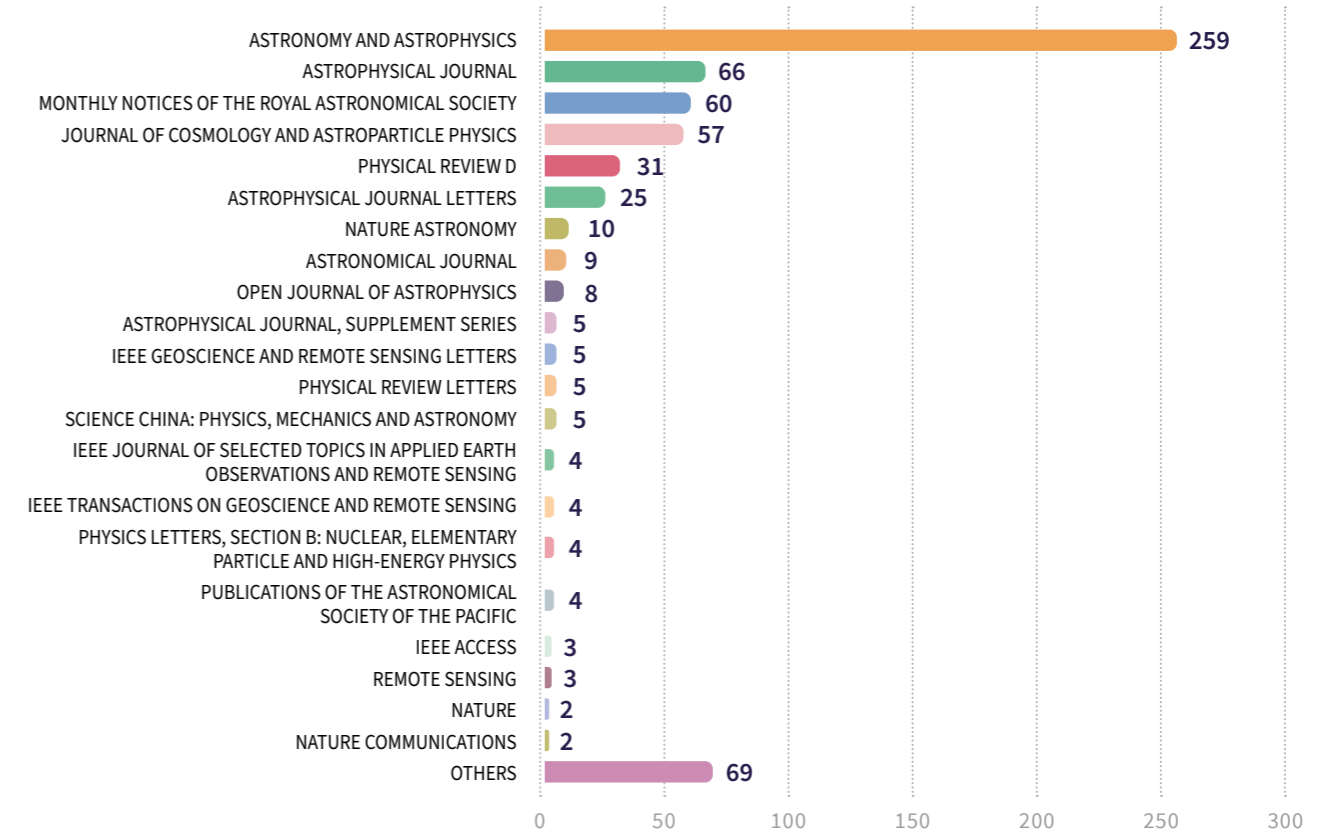


Figure 17

Number of publications according to number of authors

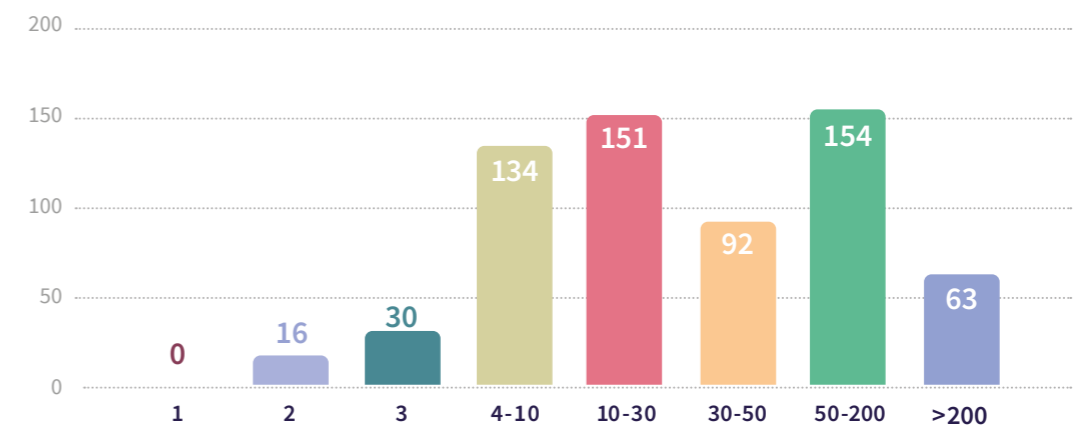


Figure 18

* The total number of publications includes the 16 publications done by authors at the Institute of Applied Computing with Community Code (IAC3) of the University of the Balearic Islands (UIB).

Institutional News and Highlighted Events

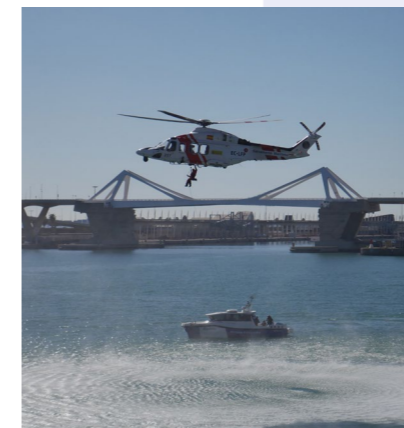


INSTITUTIONAL NEWS AND HIGHLIGHTED EVENTS



The IEEC attends the 17th European Space Conference in Brussels

During the 'EU Space Programme Services for Disaster Risk Management' session, innovative solutions to enhance our preparedness and response to disasters were explored, highlighting how these services leverage space technology to provide critical data and insights during emergencies. Additionally, the workshop 'Satellite-based Services for Disaster Risk Management', co-organised by the IEEC and held on 26 February in Barcelona, was discussed. [Read more](#)



A successful 'Satellite-based Services for Disaster Risk Management' workshop is held in Barcelona

On 26 February, the IEEC and the Government of Catalonia organised this conference about the use of space technologies in disaster risk management. The initiative was held at the World Trade Center Barcelona and was promoted by the European Agency for the Space Programme (EUSPA) and the Eurisy network, in collaboration with the Spanish Space Agency (AEE). The workshop highlighted the potential of EU satellite applications in enhancing Member-state response and risk reduction capacities amid rising risks from floods, wildfires, and earthquakes. The workshop also included two live demonstrations: a Search and Rescue (SAR) exercise and the upcoming Galileo Emergency Warning Satellite Service. [Read more](#)

The images from 'Menut' are now publicly available for everyone

The 'Menut Viewer' is an interactive tool for viewing and downloading images from the first Earth Observation satellite mission promoted by the Government of Catalonia and managed by the IEEC, as part of the NewSpace Strategy of Catalonia. The tool was developed by the Cartographic and Geological Institute of Catalonia (ICGC) in close collaboration with the IEEC and Open Cosmos. The aim of this viewer is to facilitate the development of innovative applications based on satellite images to address challenges across various sectors and contribute to the competitiveness of businesses, land management, and climate resilience in Catalonia. [Read more](#)



The IEEC showcases its work at the Science and Industry event in Alcalá de Henares

A sample of the work carried out in missions such as PhotSat, LISA or Ariel was presented by IEEC researchers in the science and industry event organised by the Spanish Space Agency (AEE) and the University of Alcalá, together with other research centres and universities such as the Institute of Cosmos Sciences (ICCUB), the Universitat Autònoma de Barcelona (UAB), the Universitat Politècnica de Catalunya (UPC) and the Institute of Space Sciences (ICE-CSIC). [Read more](#)



The IEEC at the Mobile World Congress 2025: Driving Space Technologies in Society and the Economy

Between 3 and 6 March, businesses, institutions, and professionals from various sectors gathered in Barcelona to showcase the latest technological advancements, exchange knowledge, and explore new collaboration opportunities. The IEEC participated to highlight the strategic value of space technologies in innovation and economic development, showcasing how space data provides practical solutions in areas such as natural resource management, infrastructure optimisation, and risk forecasting; and reinforcing its role in bringing these capabilities closer to society while promoting their adoption across sectors. [Read more](#)



The project PCP WISE, present at the Advanced Factories Open Innovation Challenge 2025

PCP WISE, an initiative of the European Commission's Horizon Europe Programme focused on water management for climate resilience, was present at the Advanced Factories exhibition (Hospitalet de Llobregat, Barcelona), one of the most relevant events related to industrial technology. The project, which has the participation of the IEEC, defined and presented one of the corporate challenges included in the Open Innovation Challenge 2025, held within the framework of the show. [Read more](#)

REMOT, SAPIC and TIAFA, selected projects in the second Earth Observation Use Case Ideas Competition for the Private Sector

The initiative, coordinated by the IEEC within the NewSpace Strategy of Catalonia, is aimed to obtain innovative Earth observation use cases to improve the competitiveness of private-sector companies through the use of satellite data. The selected projects, presented by the companies Spascat, Lobelia and MOAI, respectively, address challenges such as precision agriculture, wildfire prevention and water management, combining Earth Observation data and AI algorithms to deliver practical and scalable solutions. [Read more](#)



The IEEC participates in "The Space Industry," an event focused on collaboration and trends in Catalonia's space sector

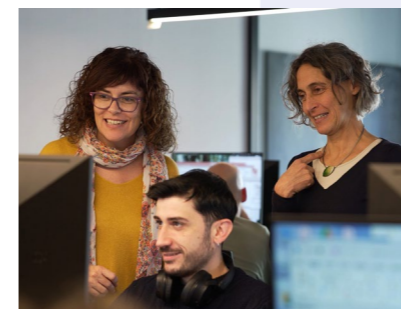
Organised by AeroS Ecosystem, the session showcased the sector's momentum, with a highlight on the roundtable "Space as a strategic sector and industrial lever," moderated by Josep Colomé, Director of the Area for the Promotion of the Space Sector in Catalonia (APEC), within the IEEC. The event provided a forum to explore emerging trends



and opportunities in Catalonia's space ecosystem, highlighting technological innovation, new business models, and strategies to strengthen collaboration between companies and research institutions. [Read more](#)

MARE: A project to optimize water management using satellite technology

This project, developed by the Catalan company isardSAT, delivers weekly maps of soil moisture and the drought index to optimize agricultural irrigation through the advanced analysis of satellite data obtained from NASA's SMAP and Landsat satellites. A key element of this project has been the use of data from the 'Menut' mission combined with Sentinel-3. With this integration, isardSAT has successfully opened the door to generating soil moisture maps at resolution of 5 meters, providing a detailed view at the plot scale. MARE exemplifies how space technology can revolutionize agriculture amid a rapidly changing climate, offering precise, scalable, and sustainable water management solutions. [Read more](#)



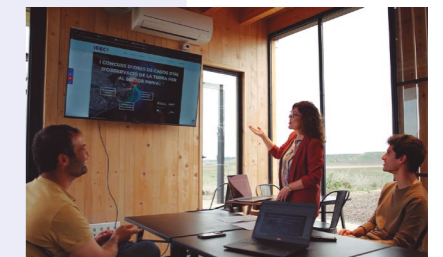
The IEEC and ESA Phi-Lab Spain host Luxembourg Space Agency to advance European space initiatives

The Luxembourg Space Agency visited the IEEC and ESA Phi-Lab Spain facilities as part of an official trade mission organised by Luxembourg Trade & Invest. The delegation, composed of representatives from public institutions and private companies in the space sector, explored key ongoing projects, shared experiences, and discussed new collaboration opportunities, contributing to stronger ties across European space ecosystems and supporting the NewSpace Strategy of Catalonia. [Read more](#)



MOT: Optimising vineyard management with satellite technology

Developed by the Catalan company Spascat, the MOT project ('Earth Observation Module for PixelSuite') has focused on plots at the Raimat estate (owned by the company Codorníu) in order to validate its functionalities on the ground and enhance the sustainability and quality of the crops. One of the project's highlights has been the integration of data from the 'Menut' mission, which has been integrated with that of Sentinel-2, that enables the calculation of various vegetation indices. The combination of the two satellites increased the amount of available information thanks to a higher data frequency. [Read more](#)





The IEEC strengthens ties with the South Korean Consulate to support space talent

Our Institute visited the South Korean Consulate in Barcelona to strengthen institutional collaboration and support talent in the space sector, in the frame of the Talent and Society programme within the NewSpace Strategy of Catalonia. The meeting also offered the three students who were awarded the NewSpace Catalonia scholarships the opportunity to learn more about this asiatic country, where the Space Studies Program (SSP25) was held from 30 June to 22 August. [Read more](#)

The New Space Economy Congress gathers more than 900 people to discuss space and green transition

On 3 and 4 July, the Llotja de Mar in Barcelona hosted the fourth edition of the congress, a key event in the space sector organised by the Barcelona Chamber of Commerce and the Government of Catalonia, with the support of the IEEC. The event featured more than 70 renowned local and international speakers who explored industry trends and discussed how space technologies can contribute to the green transition. In addition to conferences and roundtables, the congress included exhibition areas, networking spaces, and B2B meetings, where over 300 interactions took place between participating entrepreneurs and organisations. [Read more](#)



The 7th IEEC Forum brings together its members for a day of science and technology at Casa Convalescència (UAB)

On 18 June, our annual event gathered nearly 170 participants for a full day of talks, roundtables, and updates on space science and technology. The event featured guest speakers like European Southern Observatory's Director Xavier Barcons and Francisco Doblado from the Barcelona Supercomputing Center, and included panels and presentations on major international astronomical missions such as Euclid, LSST, PhotSat, and Gaia, as well as updates on new infrastructure at Montsec Observatory, including the Wide-Field Fast Telescope (TRAC). The Forum also highlighted the growing NewSpace sector in Catalonia and the opportunities it offers. [Read more](#)



AgroSpace kicks off to promote the use of space technologies in rural areas as a tool for innovation and climate change resilience

Co-funded by the European Union through the Interreg SUDOE programme, AgroSpace aims to connect the agriculture and the space sectors. The IEEC coordinates the 12 partners developing the project, which focuses on promoting the use of space technologies in rural areas as a tool for innovation and climate change resilience. AgroSpace also aligns with Interreg SUDOE's priorities of preserving natural capital, adapting to climate change, and enhancing social cohesion in South-West Europe. [Read more](#)



ESA Phi-Lab Spain announces results of its first call for research project funding

The initiative supports innovative and disruptive projects focused on improving climate resilience. Coordinated by the IEEC and supported by the Spanish Space Agency (AEE) and the Generalitat de Catalunya, Phi-Lab Spain selected four projects, led by Spascat Technologies, isardSAT, Geoskop, and EarthPulse. They address challenges such as waterbody monitoring, environmental resilience, climate forecasting, and agricultural supply chain risks, combining advanced data analytics and Earth Observation to deliver practical and scalable solutions. [Read more](#)



Pilot test of Civil Protection alert delivery via satellite to mobile phones in the municipality of Osor (La Selva)

The aim of the test, developed by the Government of Catalonia's Civil Protection together with the IEEC, was to validate the capabilities of the future European alert delivery service to mobile phones via Galileo satellites, in order to warn the population in case of an emergency. The pilot highlighted the potential of satellite-based communication to deliver alerts and safety instructions even in areas without mobile coverage, remaining operational during disasters affecting ground infrastructure and significantly enhancing emergency notification capabilities across Europe. [Read more](#)

New call for the installation of four space technology infrastructures at the Sant Esteve Teleport

The IEEC opened a public call for the selection of new projects involving the design, installation and management of ground-based space technology infrastructures at the Sant Esteve Teleport, located at the Montsec Observatory (OdM). The initiative aimed to offer companies, entities and research centres the opportunity to contribute to the installation of infrastructures that complement the current capabilities of the Teleport and help to boost the Catalan space ecosystem. The call was part of the NewSpace Strategy of Catalonia, promoted by the Government of Catalonia. [Read more](#)



The International Communications Satellite Systems Conference, held in Barcelona

This conference is one of the leading events in the field of satellite communications. Held on 23-25 September and co-organised by the IEEC, the event gathered researchers, engineers and experts from around the world to discuss the latest trends in the sector. The programme included talks by top international speakers and panel sessions on standards, security, quantum technologies and artificial intelligence applied to space, with the participation of leading companies such as Sener, Hispasat, Thales and Xairos, fostering collaboration between academia, industry and space agencies. [Read more](#)



ESA Phi-Lab Spain's Advisory Board holds its first meeting at the IEEC headquarters

The event gathered key representatives from European and national space institutions, research centres, industry, and public administrations to discuss the progress of the programme and its future directions. The meeting concluded with a strategic discussion on lessons learned and the way forward, addressing challenges, ecosystem engagement, emerging trends, and partnership opportunities. This first meeting marked an important milestone in the consolidation of the Phi-Lab Spain within the ESA Φ -lab Network, reinforcing its mission to promote space-driven innovation for climate resilience. [Read more](#)



Xavier Luri, new director of the IEEC

Since 1 September 2025, Xavier Luri is the new director of the IEEC, taking over from Ignasi Ribas, who led the Institute from 2017 until August 2025. A professor at the University of Barcelona and researcher at the Institute of Cosmos Sciences of the University of Barcelona (ICCUB), Luri has a solid scientific career closely linked to the Gaia mission of the European Space Agency. In this new stage, he leads the IEEC's strategy to continue strengthening its role as a hub for space research, technological development and innovation, while contributing to the promotion of the space sector in Catalonia within the framework of the NewSpace Strategy of Catalonia. [Read more](#)



The IEEC co-organises the EURASIP Seasonal SATNEX School Barcelona 2025

This international meeting for young researchers and professionals interested in space communications and security was organised by the Quantum Communication and Secure Information research group (UAB). The initiative, funded by the European Space Agency (ESA) and the European Association of Signal Processing (EURASIP), featured keynote talks by leading figures such as Holly Ridings (NASA) and Oana-Alexandra Graur (ESA). [Read more](#)



Disaster risk management at the International Astronautical Congress (IAC) in Sydney

The 32nd Workshop of the International Astronautical Federation was held in Sydney within the framework of the IAC, with the support of the United Nations Office for Outer Space Affairs (UNOOSA). The IEEC presented its work in disaster risk management, highlighting its role in advancing space-based solutions to mitigate natural hazards, as part of the NewSpace Strategy of Catalonia. This participation also contributed to strengthening international collaboration and boosting the presence of the Catalan space sector at one of the world's leading space events. [Read more](#)



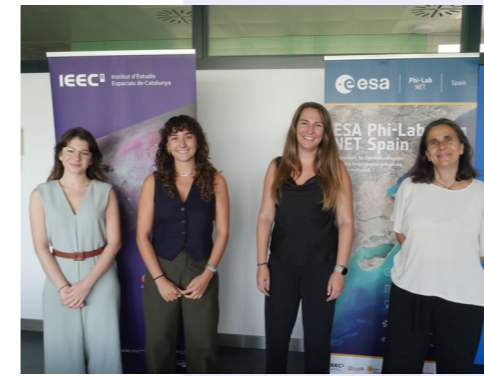
The IEEC participates in the NEREUS European Symposium

The event brought together discussions on how NewSpace technologies contribute to resilience and sustainability in critical areas such as civil protection and the blue economy. The IEEC contributed to the discussions, showcasing how satellite-based solutions support the protection of essential systems and the improvement of disaster risk management. This included the moderation of the “Critical Infrastructures” panel by Josep Colomé, Director of the Area for the Promotion of the Space Sector of Catalonia within the IEEC, and the participation of Estefania Blanch Llosa, Earth Observation Project Manager, in the “Natural Hazards” panel, sharing Catalonia’s experience in the use of NewSpace technologies. [Read more](#)



ESA Phi-Lab Spain launches second cut-off date for open call

Following the success of the first process, the programme announced the second cut-off date for its open call, aimed at fostering innovative and disruptive projects in space technologies that enhance climate resilience. Coordinated by the IEEC with the support of the Spanish Space Agency and the Government of Catalonia, the initiative is part of ESA’s ScaleUp initiative, promoting solutions across upstream and downstream space domains. The consortium behind ESA Phi-Lab Spain comprises twelve entities, including universities, research centres, and companies. [Read more](#)



The IEEC Supports Internships in Companies and Research Centres in NewSpace Projects

The IEEC and the Government of Catalonia launched a call for grants to companies, start-ups, and research centres in Catalonia to support internships in NewSpace-related projects. The initiative, framed in the Talent and Society programme within the NewSpace Strategy of Catalonia, aims to promote the space ecosystem, strengthen the connection between universities and industry, and assist small entities facing challenges in hiring interns. Each grant provides funding to enable university students to gain practical experience in the field of space solutions and technologies. [Read more](#)



PCP WISE Matchmaking Event Spain

Spanish companies: Build Your Consortium for €12M EU Tender!

WEDNESDAY 8 OCTOBER
11:00 - 12:30 CET

PCP WISE presents its tender call and Matchmaking

The PCP WISE project, an initiative aimed at promoting innovative solutions based on Earth Observation for smarter water management, presented its tender call in an online session jointly organised by the IEEC and the Cartographic and Geological Institute of Catalonia (ICGC). The session introduced the scope of the call and guided participants on how to get involved, while also including a Q&A and matchmaking meetings to connect startups, SMEs and innovators with potential partners and public buyers. [Read more](#)



The Government of Catalonia announced the Catalonia Space 2030 Strategy to further boost the space industry

Presented by the Minister of Business and Labour, Miquel Sàmpel, the new strategy aims to strengthen Catalonia’s space industry and contribute to Europe’s

technological sovereignty. It foresees eight satellite missions by 2030, focused on Earth observation and communications, and includes an initial investment of €40 million. The IEEC will continue to play a central role in its implementation, supporting research, technological development, and the growth of the Catalan space ecosystem. [Read more](#)

ESA Phi-Lab Spain showcases innovative space projects and new opportunities at its Barcelona event

The dedicated session held on 30 October at Palau Macaya gathered public institutions, research centres, and companies to present the latest opportunities for space-driven projects focused on climate resilience. The event offered a comprehensive overview of the programme and its initiatives, showcasing innovative projects, fostering dialogue, and strengthening connections across the space community. The gathering provided an opportunity to highlight how the ESA Phi-Lab Spain supports through a high-quality consortium and a range of tailored services, with a focus on networking to maximize project success. [Read more](#)





The IEEC, present in the world's biggest event on urban innovation

Our Institute participated in the Smart City Expo World Congress 2025 in Barcelona, taking part in sessions focused on data-driven urban planning, climate resilience, and the use of space technology for environmental management. In particular, the IEEC presented the session “Menut Mission Potentials”, held as part of the European Association of Remote Sensing Companies (EARSC) Open Networking programme in collaboration with Eurisy and ICLEI Europe, focusing on how this mission can generate valuable data for urban management and sustainability. [Read more](#)

The PCP WISE project, at an ACCIÓ and Enterprise Europe Network session

During the training “Innovate With Government: Unlocking Public Procurement Opportunities”, organised by ACCIÓ and the Enterprise Europe Network, the IEEC presented this European project. PCP WISE aims to co-develop cutting-edge Earth Observation solutions to monitor the Soil-Water-Vegetation system and address challenges such as droughts, floods, and other water-related crises through the Pre-Commercial Procurement mechanism. The session brought together participants to share knowledge and promote public innovation through collaboration between companies, research centres and public administrations. [Read more](#)



New call for the development of payloads for Earth Observation satellites

The Government of Catalonia and the IEEC, within the framework of the Catalonia Space 2030 Strategy, launched a call to select two engineering project proposals for the development of payloads, to be integrated into small Earth Observation satellites (SmallSats). The call, addressed to private companies, allows collaboration with research centres or other organisations and aims to strengthen the Catalan space ecosystem by promoting innovation and competitiveness in payload development. As part of the ESA Phi-Lab Spain programme, it facilitates the creation of deployable space technologies capable of evolving towards in-orbit demonstration and future market applications. [Read more](#)



Catalonia's space ecosystem goes global at Space Tech Expo Europe (Bremen)

The IEEC coordinated the Government of Catalonia's pavilion at the Space Tech Expo Europe 2025, held in Bremen (Germany), showcasing the industrial, innovation, and talent-generation capabilities of the Catalan space ecosystem while promoting the Catalonia Space 2030 Strategy internationally. During the event, the ESA Zero Debris Charter was signed, joining a global network committed to making future missions debris-neutral by 2030. The pavilion also hosted the presentation of ESA Phi-Lab Spain, showcasing projects such as WAVESS



(see above), that apply space technologies to climate resilience. Numerous delegations from European and international space agencies visited the pavilion, strengthening collaborations and opening new opportunities for business, technology transfer, and private investment in the Catalan space sector. [Read more](#)

ESA BIC Barcelona launched a call to select four new companies bringing innovation to the space sector

The business incubation centre of the European Space Agency in Barcelona, ESA BIC Barcelona, launched a call to select four new companies to join its incubation programme, aimed at fostering innovative start-ups developing products, services, or solutions using space technologies or data. The programme offers mentoring, technical and business support, legal advice on intellectual and industrial property, participation in industry events, and access to the UPC's RDIT building and the wider innovation ecosystem. [Read more](#)



Outreach and educational activities at the Montsec Observatory

During 2025, different events were organised at the Montsec Observatory (OdM) as a continuation to the successful outreach programme from the previous years, commemorating the centenary of Joan Oró's birth.

The usual monthly visits to the OdM were celebrated between May and August with great success. More than 120 people attended these open-door sessions, which represent a unique opportunity to see the astronomical telescopes first hand, learn about the infrastructures for satellite communications, the calibration systems for Earth observation satel-

lites and the atmospheric measurement services installed at the Observatory. Also, a public talk about the OdM's scientific highlights was organised on 5 August at the village of La Clua in Sant Esteve de la Sarga. The Observatory also took part in the public participation process of the Department of Territory, Housing and Ecological Transition (Government of Catalonia) to develop the Action Plan for the preservation and promotion of the Montsec night sky, with participation meetings in Tremp (Pallars Jussà), and Balaguer and Àger (Noguera).

The OdM also hosted a student for 2 weeks during July, as part of the internship student's programme 'Youth and Science' promoted by Fundació Catalunya la Pedrera.

[Read more](#)



Image 22

Winners of the Barcelona Zero-G Challenge 2024 successfully fly their microgravity experiment

10 January

The team 'GRABE', a group of Filipino students who won this international student competition coordinated by Antoni Pérez-Poch, a professor and researcher at the Universitat Politècnica de Catalunya – BarcelonaTech (UPC) in the School of Engineering of Barcelona East (EEBE) and IECC member, successfully conducted their experiment in a parabolic flight at Sabadell Airport. The challenge's goal is to promote aerospace research among young people, fostering new careers in this field and sparking interest in STEAM studies. GRABE's experiment investigated the behaviour in microgravity of shear-thickening fluids, a type of non-Newtonian fluid that increases its viscosity upon impact.

[Read more](#)



Final goodbye to the Gaia satellite as the Montsec Observatory captures its image

1 February

After 11 years of operation, ESA's Gaia mission carried out technological tests involving changing orientation, making it more visible in the sky. Some images of this European Space Agency satellite were captured by the Joan Oró Telescope at the Montsec Observatory, at the request of an IECC research group at the Institute of Cosmos Sciences (ICCUB).

[Read more](#)



The IEEC celebrates the International Day of Women and Girls in Science

11 February

Our Institute advocates for inclusive science and joins in raising the visibility of female role models for girls and boys. Once again, IEEC women researchers gave talks at schools in Catalonia as part of the #científiques initiative, promoted by the Fundació Catalana per a la Recerca i la Innovació and the Barcelona Institute of Science and Technology (BIST). On this occasion, the IEEC also highlighted Genis ('Genius'), a project to spread awareness of past and present women scientists of Catalonia. As part of this effort, the institute showcased figures such as Estefania Blanch, IEEC Earth Observation project manager, to inspire new generations. [Read more](#)



'NewSpace Catalonia' scholarships to attend the International Space University's SSP 2025 summer programme

12 March

The Government of Catalonia and the IEEC launched a call for 3 scholarships to attend the Space Studies Program (SSP): an intensive 8-week course organised by the International Space University (ISU). The programme offers training in a wide range of space disciplines through theoretical courses, workshops and professional visits. The 37th edition took place in Seoul, South Korea, from 30 June to 22 August 2025. The winners of the scholarships were: Víctor Muñoz Morales, Maria Castells Valero, and Arnau Dolz Puig. [Read more](#)



The fifth Catalan final of the ESA's CanSat competition broke participation records

27 March

Over 150 students from 68 Catalan schools took part in the fifth Catalan CanSat final at Lleida-Alguaire Airport, where 18 teams launched their satellites in the ESA-backed competition. Promoted across Europe by ESA's ESERO and organised in Catalonia by The School of Industrial, Aerospace and Audiovisual Engineering of Terrassa of the Universitat Politècnica de Catalunya – BarcelonaTech with the support of the Government of Catalonia and the collaboration of the IEEC and other partners, the initiative fostered interest in space, technology, and STEM disciplines, while setting a participation record with 135 registered teams from across Catalonia. [Read more](#)



More than 300 students and 23 teachers from across Catalonia successfully complete the Edusat Challenge, aimed to encourage scientific and technological vocations

16 May

Driven by the Government of Catalonia within the framework of the NewSpace Strategy and the STEAMcat programme, the programme originated from an initiative of the University of Girona and counted on the collaboration of the IEEC. Conceived as a pilot programme, the Edusat Challenge provided training and support to teachers to introduce Earth observation into classrooms, actively engaging students and teachers in the analysis of ESA satellite data to foster interest in STEM disciplines, enhance scientific vocations, and strengthen key competences related to climate change and environmental monitoring. [Read more](#)



The IEEC brings space science to the public at Festa de la Ciència in Barcelona

31 May

In the 2025 edition, once again an IEEC team engaged audiences of all ages visiting this event, celebrated in El Born Centre de Cultura i Memòria, through hands-on activities such as learning how GPS works with the Institute of Space Sciences (ICE-CSIC), building full-scale CubeSat nanosatellites, and launching rockets that reached over 15 metres. The initiative brought space science and technology closer to the people, fostering curiosity and public engagement with these fields of knowledge. [Read more](#)



The IEEC and the 'Youth and Science' programme bring the world of space to young students

24 June - 6 July

The project 'Small satellites to change the world' immersed 10 students from 4th ESO in the world of space, as part of this programme promoted by Catalunya La Pedrera Foundation to foster scientific vocations. Through workshops, talks, and activities, participants explored NewSpace and Earth Observation, as well as applications such as space communications, IoT and satellite navigation systems. The project also included the design, building and launching of an analogue nanosatellite mission using a High Altitude Balloon, followed by the analysis of the flight data and presentation of results. [Read more](#)



Young students dive into space engineering at NewSpace Scientific Stay in the Pyrenees

7-12 July

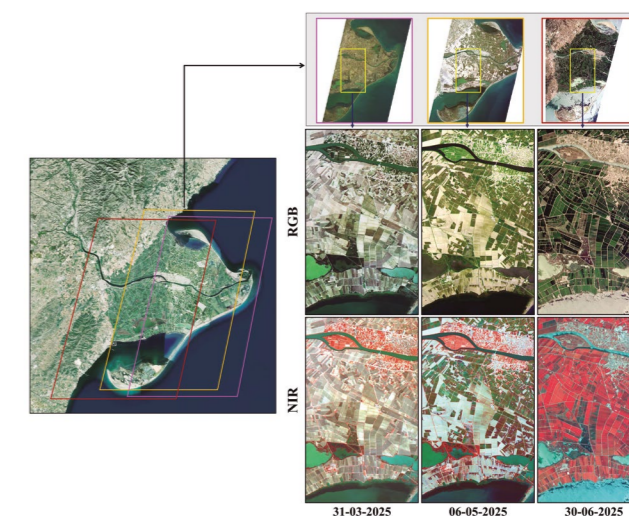
35 students from 4th year of ESO, high school, and vocational training became familiar with the world of space and its applications in many areas of society. Organised by the Government of Catalonia and the IEEC, with the collaboration of the GoSTEM association, as part of the 'Scientific Stays' programme of the Catalunya La Pedrera Foundation, the activity took place at the MónNatura Pirineus centre. During one week, participants explored NewSpace technologies focused on Earth Observation, navigation and communications, and took part in a hackathon to develop applications addressing current challenges. [Read more](#)



The 'Menut' satellite allows us to closely monitor the evolution of rice cultivation in the Ebre Delta

1 August

From barren fields to sowing and active plant growth, Menut's data helps us track changes in soil and water, and precisely identify the different phases of crop development, using high-resolution imagery captured during the early stages of the 2025 agricultural season. Natural color (RGB) composites and near-infrared (NIR) band combinations are used to better analyse surface change and improve the interpretation of field conditions, particularly in distinguishing between water-covered fields, moist soils, and vegetation. [Read more](#)



Families and women in science travel to Mars thanks to Hypatia and the IEEC

3 and 5 September

Two events taking place in September brought science and space exploration closer to the public and connected female talent with leading women in the science and technology fields. Organised by Hypatia Mars in collaboration with the IEEC, the activities included 'Families Go to Mars', an outreach event with workshops and hands-on activities for children, focused on encouraging scientific vocations, and the 'Women in Technology Day', which featured talks, round tables and networking spaces with researchers and industry professionals to inspire young women in scientific and technological fields. [Read more](#)



The IEEC hosts high school students during the summer as part of the 'Youth and Science' programme

From July to September

Five students gained a close insight into the daily work of several research teams (IEEC, OdM, ICE-CSIC, UPC), as part of the 'Youth and Science' programme of the Fundació Catalunya La Pedrera. The placements provided practical technical learning through day-to-day work of researchers, including tasks related to satellite development, exoplanet photometry and Earth Observation using satellite data. The students could also develop key skills such as communication, decision-making and collaboration. [Read more](#)



Two projects focused on artificial intelligence and shark identification, winners of the NASA International Space Apps Challenge in Barcelona

4 - 5 October

The NASA Space Apps Challenge is a global initiative where participants use open NASA data to develop solutions for Earth and space. Held at Campus 42 Barcelona Fundació Telefónica (in Barcelona), over 20 teams tackled 19 challenges. The winning teams were Sharkitects, with a satellite method to identify sharks and predict feeding behaviour, and AI i Oli, with an AI tool to explore astronomical images via natural language. The event was organised by SpaceApps Spain and supported by Fundació Telefónica, the Government of Catalonia, and the IEEC, within the framework of Catalonia's NewSpace Strategy. [Read more](#)



The CatMart programme reaches 50 schools across Catalonia

13 October

CatMart offered an exciting scientific experience through the analysis of "Martian" sand samples collected by the Hypatia I and II crews during their analogue missions at the Mars Desert Research Station (Utah, USA), the largest Mars-surface research facility on Earth. This programme is an educational initiative developed by the Hypatia Mars association with the support of the IEEC, bringing the exploration of the Red Planet to pupils in years 3 to 6 of primary school. [Read more](#)

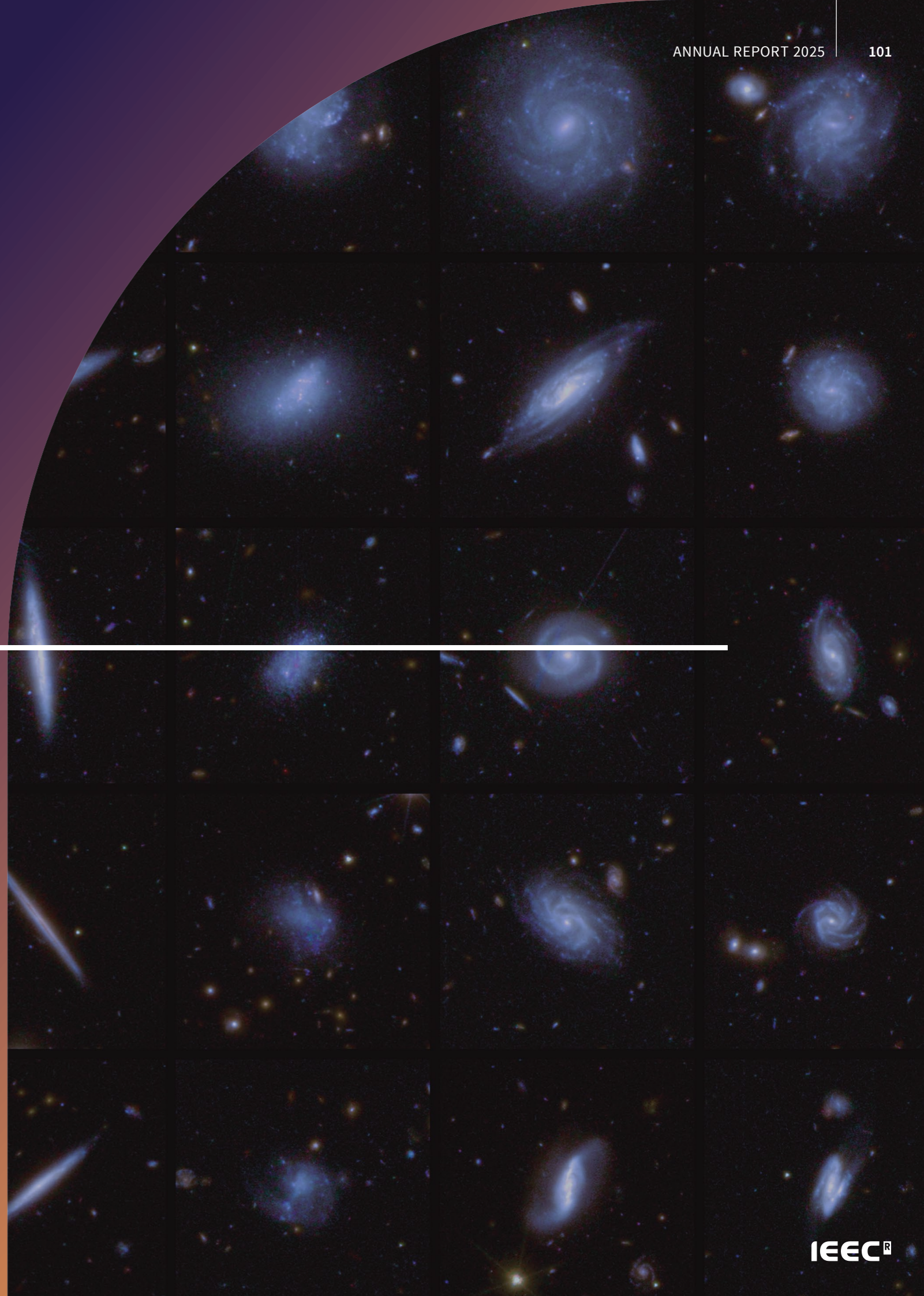
Subscribe to the new IEEC newsletter!

20 October

The IEEC launched in Autumn its new public newsletter to bring space sciences and technologies closer to everyone. This quarterly publication will feature the most relevant content on astrophysics and cosmology, scientific and technological space missions, astronomical observatories, and applications of Earth Observation and navigation. Anyone interested can subscribe at any time and receive the latest updates from the IEEC community. [Read more](#)



Awards

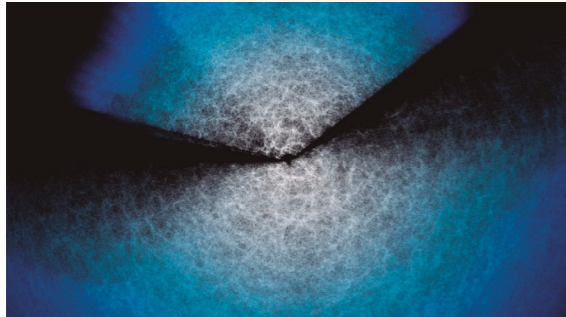


DonaTIC Awards celebrate once again women leading digital innovation

The 11th edition of the DonaTIC Awards, held at the Palau de la Música Catalana, highlighted the talent and leadership of women driving innovation and digital transformation across multiple fields. Within the framework of Catalonia's NewSpace Strategy, the IEEC contributed once again with the Special Aerospace Mention, awarded this year to Clàudia Mateo Segura, Business Innovation Manager for the space sector at i2CAT Research Centre. [Read more](#)



DESI Collaboration to receive 2026 Berkeley Prize awarded by the American Astronomical Society



The Dark Energy Spectroscopic Instrument (DESI) collaboration received this prestigious prize awarded by the American Astronomical Society (AAS) for its work creating the largest 3D map of the Universe and enabling the study of dark energy over cosmic time. With participation from IEEC researchers at the Institute of Space Sciences (ICE-CSIC) and the Institute of Cosmos Sciences of the University of Barcelona (ICCUB), the collaboration achieved precise measurements of baryon acoustic oscillations using data from millions of galaxies and quasars, providing new insights into the evolution of the Universe and strong hints that dark energy evolves over time. [Read more](#)

Francisco Castander, named scientific member for Cosmology by Spanish National Astronomy Committee

This recognition highlights Francisco Castander's solid scientific career and his role as a leading figure in the study of the structure and evolution of the Universe. Research professor at the Institute of Space Sciences (ICE-CSIC) and the IEEC, Castander has been appointed scientific representative in the cosmology area at the Spanish National Astronomy Committee, a body that coordinates astronomical activities in Spain and advises the government, composed of leading institutes and experts in the field. [Read more](#)



Researcher Estel Cardellach Galí receives the Muncunill Award of Honour for Innovation in recognition of her contributions to the study of our planet



This ICE-CSIC/IEEC researcher has received Terrassa's prestigious Muncunill Innovation Award for her innovative satellite-based techniques that advance global climate and weather monitoring worldwide. Cardellach leads the PRO experiment on board the PAZ satellite, providing vertical atmospheric profiles of thermodynamic variables and precipitation particles. She has also pioneered GNSS reflectometry, with applications in wind, ice, and surface water monitoring, and was appointed in 2024 to the Spanish Space Agency's Science and Technology Support Committee. [Read more](#)



The Fermi Gamma-ray Space Telescope collaboration, awarded the Giuseppe and Vanna Cocconi Prize

The Fermi-LAT and Fermi-GBM teams, with the involvement of IEEC researchers at the Institute of Space Sciences (ICE-CSIC), have been recognised with the 2025 Giuseppe and Vanna Cocconi Prize by the European Physical Society for their groundbreaking work in gamma-ray and multimessenger astrophysics. Their work has revolutionised the understanding of the high-energy Universe, enabling fundamental discoveries such as the identification of thousands of gamma-ray sources and the detection of electromagnetic counterparts to high-energy neutrinos. [Read more](#)



The ICCUB is awarded the Maria de Maeztu Excellence Distinction

The Institute of Cosmos Sciences of the University of Barcelona (ICCUB) has been awarded this distinction for its top-level research in cosmology and fundamental physics, its international impact, and its forward-looking strategic vision in addressing key scientific challenges. The recognition provides funding for four years, supporting international impact and leadership, knowledge transfer, collaboration with the business sector, open access policies, outreach, and communication initiatives, and allowing ICCUB to realise its strategic Research Plan and attract scientific talent.

[Read more](#)

Research and Innovation Projects and Contracts



RESEARCH AND INNOVATION PROJECTS AND CONTRACTS

The IEEC's Knowledge and Technology Transfer Office (KTO), together with APEC offices, acts as a connection point between a wide variety of actors, facilitating interactions, collaboration activities, the generation of spin-offs and transfer agreements between them. IEEC KTO contributes to a dynamic and diverse network that promotes the transfer of knowledge and technology from the space field to society. For this purpose, supporting IEEC members in funding programmes and initiatives is of key relevance, as well as contributing to IEEC strategic lines, actively contributing and promoting events dedicated to transfer and innovation, and facilitating knowledge transfer activities towards the market in coordination with APEC offices (see Image 23).

In turn, the IEEC's Project Management Office (PMO) acts as a centralised and strategic pillar, ensuring that projects are delivered efficiently and in full alignment with the institution's objectives. By providing essential governance, oversight, and professional support, the PMO promotes consistency, transparency, and methodological rigour across all project executions. For this purpose, its proactive approach focuses on optimising resource utilisation, mitigating operational and delivery risks, and guaranteeing that projects are executed within agreed budgets, timelines, and scopes, thereby fostering a culture of excellence and accountability throughout the institution.

Overall, KTO, APEC offices and PMO contribute to maximising the value of IEEC research and development efforts and reinforcing that the knowledge and technology from its members have access to more opportunities and can make a greater impact on society.

As an important final remark, there is also a close collaboration with the equivalent offices belonging to the different trustee institutions for valorization, transfer and promotion of funding initiatives at all levels.



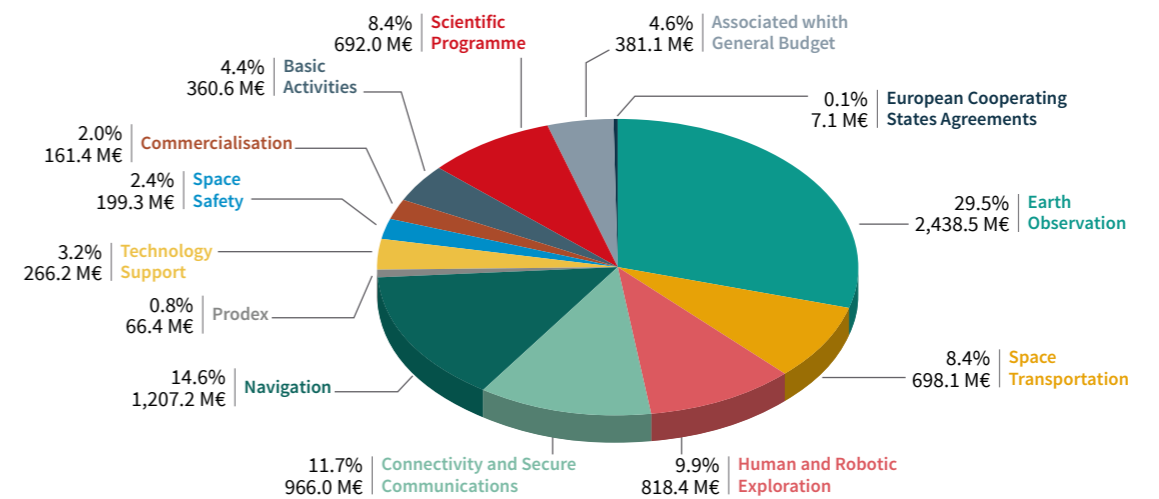
Image 23. Funding institutions offering programmes and initiatives.

Successful innovation cases

Below is an extract of the research, innovation and transfer projects with an IEEC member as Principal Investigator and where the IEEC or one of its scientific units is in charge of its management, which started in 2025. The activities are

grouped by topic, similarly to ESA domains, as shown in Figure 20 for year 2026. For projects launched in previous years, please kindly refer to earlier editions of the IEEC Annual Report.

ADOPTED BUDGET BY DOMAIN FOR 2026: 8.26 B€*



*Includes activities implemented for other institutional partners.

Figure 20

EARTH OBSERVATION AND POSITIONING, NAVIGATION & TIMING

Fixed-quality data compression with reduced-complexity neural networks



Usage of neural networks for fixed-quality compression of remote sensing data. Full characterisation of the compression noise introduced by the fixed-quality compression method, its relation to the data's signal intensity, and relation with the instrumental noise present in the data. Denoising of compressed noisy data.

- Contact persons: *Sebastià Mijares i Verdú; Joan Serra-Sagrístà*
- IEEC unit: *CERES (UAB)*
- Funding Institution: *Centre National d'Études Spatiales (CNES)*
- Partners: *UAB, Centre National d'Études Spatiales (CNES)*
- Reference / Contract N°: *Action R&T N°R-S25/OT-0001-179-01*
- Duration: *11/2025–11/2026*

Efficient compression systems for next-generation scientific datasets (ECS4NSD)

The project seeks to improve encoding techniques for scientific data such as those generated by synchrotrons, DNA sequencing and space, optimising their performance, scalability and efficiency. The Project is aligned with the Spanish Strategy for Science, Technology and Innovation (EECTI) 2021-2027 and Horizon Europe 2021-2027, promoting scientific leadership, competitiveness and technology transfer. This project introduces the study of new compression methodologies (classical and learned-based) and compact data structures, optimising both the speed and efficiency of data storage and information extraction.



- **Contact persons:** Joan Serra Sagristà; Joan Bartrina Rapesta
- **IEEC unit:** CERES (UAB)
- **Funding Institution:** Ministerio de Ciencia, Innovación y Universidades; FEDER
- **Partners:** ALBA Synchrotron (Catalonia)
- **Reference / Contract N°:** PID2024-156292OB-I00
- **Duration:** 09/2025–09/2028

New Generation of Disruptive Technologies in Payloads for HAPS (StratoSens)

STRATOSENS project develops sensor payloads for high-altitude platforms and Earth observation, integrating instrumentation with operational requirements for Airbus missions. These include prototypes designed to operate with precision and high performance, enabling continuous 24/7 observation. With intelligent imaging algorithms and scalable, eco-friendly architectures, the project envisages HAPS as transformative tools capable of providing flexible, high-resolution coverage while maintaining an operational footprint.



- **Contact persons:** Joan Serra-Sagristà, Juan José Ramos Bosch, José M. Gómez Cama
- **IEEC units:** CERES (UAB), CTE (UPC), ICCUB
- **Funding Institutions:** Airbus Defence and Space GEO, GPA Innova
- **Reference / Contract N°:** PTEG-20241004
- **Duration:** 02/2025–12/2026

MEDHUSA - Soil Moisture Measurements for Precision Agriculture

This internal initiative explores the MEDHUSA project for NewSpace applications, focusing on innovative payloads and observation strategies. It emphasises agile development cycles and testing in collaboration with research units at the IEEC.



- **Contact persons:** Serni Ribó, Estel Cardellach
- **IEEC unit:** ICE-CSIC
- **Funding Institution:** Generalitat de Catalunya – Institut d'Estudis Espacials de Catalunya (IEEC) internal project
- **Reference / Contract N°:** Estratègia Espai 2030 Generalitat de Catalunya
- **Duration:** 01/06/2025–30/06/2026

The Provision of Global Navigation Satellite System Reflectometry (GNSS-R) datasets services To ECMWF

The project provides GNSS-R dataset services to ECMWF, enabling improved weather forecasting and environmental monitoring. It covers data acquisition, processing, and validation to ensure high-quality GNSS reflectometry datasets for medium-range weather models.



- **Contact persons:** Estel Cardellach
- **IEEC unit:** ICE-CSIC
- **Funding Institution:** European Centre for Medium-Range Weather Forecasts (ECMWF)
- **Reference / Contract N°:** EFP/2025/394
- **Duration:** 01/10/2025–31/08/2027

Data Fusion for High-Resolution Soil Moisture Estimation

This project explores fusion of multi-source satellite data in NewSpace initiatives, enhancing information extraction and Earth observation applications. Its goal is to develop a reliable and reproducible workflow capable of delivering a near-real-time, high-resolution Soil Moisture product suitable for practical applications in water resource management, environmental monitoring, and climate adaptation strategies, among others.



- **Contact persons:** Mercè Vall-Ilossera
- **IEEC unit:** CTE (UPC)
- **Funding Institution:** Generalitat de Catalunya – Institut d'Estudis Espacials de Catalunya (IEEC) internal project
- **Reference / Contract N°:** Estratègia Espai 2030 Generalitat de Catalunya
- **Duration:** 01/06/2025–30/06/2026



AURORA

AURORA develops modelling of the ionosphere at VHF frequencies and analyses its impact on distributed radar sounders, improving the understanding of atmospheric effects on Earth observation and radar-based remote sensing.

- **Contact persons:** Adriano Camps Carmona
- **IEEC unit:** CTE (UPC)
- **Funding Institution:** RDA – Research and Development in Aerospace GmbH
- **Reference / Contract N°:** AURORA 3-18847-2025
- **Duration:** 01/05/2025–30/11/2026

ESA STUDY Phase 0/A System Studies of the CryoRad Mission

Phase 0/A system studies for the CryoRad mission, evaluating design, feasibility, and technical requirements for a future ESA cryospheric observation satellite.



- **Contact persons:** Adriano José Camps Carmona
- **IEEC units:** CTE (UPC), ICE-CSIC
- **Funding Institution:** Airbus Defence and Space
- **Duration:** 10/03/2025–31/07/2026

GNSS-R Firmware payload for satellites of the Spanish component of the Atlantic Constellation

Development of GNSS-R payload firmware for satellites in the Spanish component of the Atlantic Constellation, enabling advanced remote sensing capabilities. ICE-CSIC is responsible for the GNSS-R payload and developing the Level 2 algorithms to extract the geophysical information from the low level data. The UPC is providing the firmware of the sensor and developing the Level 1 algorithms that will transform the raw data into observables from which geophysical parameters are derived.



- **Contact persons:** Adriano José Camps Carmona, Estel Cardellach
- **IEEC units:** ICE-CSIC, CTE (UPC)
- **Funding Institution:** Open Cosmos
- **Duration:** 26/08/2025–31/03/2027

INTREPID

An internal IEEC project supporting instrumentation and technology development for INTREPID, focusing on payload testing, validation, and methodological support for observational and scientific experiments. The objective of the study is to analyse in a systematic way the impact of the ionospheric scintillation on the performance of MEO GNSS constellations for LEO (i.e. high dynamics) and a ground-based/airborne receiver (low dynamics).



- *Contact persons: Adriano Camps Carmona*
- *IEEC unit: CTE (UPC)*
- *Funding Institution: Generalitat de Catalunya – Institut d'Estudis Espacials de Catalunya (IEEC) internal project*
- *Reference / Contract N°: Estratègia Espai 2030 Generalitat de Catalunya*
- *Duration: 01/01/2025–31/12/2025*

LEOPNT3 - User Algorithms and Assistance Service

Internal NewSpace project developing the third generation of LEO-PNT technologies, combining sensor fusion, hybrid navigation algorithms, and mission demonstrations for precise positioning.



- *Contact persons: José Antonio López Salcedo, Gonzalo Seco-Granados*
- *IEEC unit: CERES (UAB)*
- *Funding Institution: Generalitat de Catalunya – Institut d'Estudis Espacials de Catalunya (IEEC) internal project*
- *Reference / Contract N°: Estratègia Espai 2030 Generalitat de Catalunya*
- *Duration: 01/06/2025–30/06/2026*

SCIENCE & TECHNOLOGY ASSOCIATED TO MISSIONS & GROUND-BASED INSTRUMENTS

Collaboration Agreement between CTAO gGmbH and Institut d'Estudis Espacials de Catalunya (IEEC)

This project formalises the collaboration agreement between CTAO gGmbH and the IEEC, covering joint research, instrumentation support, and operational coordination for CTAO observatory activities.



- *Contact persons: Markus Gaug*
- *IEEC units: CERES (UAB), IEEC*
- *Funding Institution: CTAO gGmbH*
- *Duration: 01/01/2025–31/12/2025*

Compression Technologies for Commercial Satellites

The project develops neural network-based fixed-quality compression techniques for NewSpace Earth observation data, optimising storage and data fidelity.



- *Contact persons: Joan Serra-Sagristà, Ian Blanes*
- *IEEC unit: CERES (UAB)*
- *Funding Institution: Generalitat de Catalunya – Institut d'Estudis Espacials de Catalunya (IEEC) internal project*
- *Reference / Contract N°: Estratègia Espai 2030 Generalitat de Catalunya*
- *Duration: 01/06/2025–30/06/2026*

SMARC3-RISE

SMARC3-RISE advances NewSpace research initiatives, focusing on satellite payload development, sensor testing, and demonstration of innovative space technologies.



- *Contact persons: Juan José Ramos Bosch*
- *IEEC unit: CTE (UPC)*
- *Funding Institution: Generalitat de Catalunya – Institut d'Estudis Espacials de Catalunya (IEEC) internal project*
- *Reference / Contract N°: Estratègia Espai 2030 Generalitat de Catalunya*
- *Duration: 01/06/2025–30/06/2026*

PID - Science and technology for the Ariel mission

PID 2024 ARIEL continues the scientific and technological contributions to the ARIEL mission, supporting instrument development, testing, and mission science exploitation over the extended project period.



- *Contact persons: Ignasi Ribas Canudas; Josep Maria Gómez Cama*
- *IEEC units: ICE-CSIC, ICCUB*
- *Funding Institution: Ministerio de Ciencia, Innovación y Universidades*
- *Reference / Contract N°: – PID2024-158486OB-C31*
- *Duration: 01/09/2025–01/09/2028*

Miniaturized sensor for real-time monitoring erosion processes due to ATOX in LEO and VLEO missions (MinATOX)

The objective of this project is to increase the TRL (from TRL3 to TRL5) of a sensor technology, entirely developed by the IEEC, for the long term in-situ monitoring of atomic oxygen degradation processes of protective materials and coatings in VLEO. The project is a continuation of an ESA project within the Discovery Programme (contract number 4000144432). The pathway to mature the sensor is based: firstly, on designing an inverse algorithm allowing to obtain an estimation of the accumulated material erosion from the raw sensor signals; and secondly, on adapting the sensor technology to a control ASIC that is being designed.



- Contact persons: Manuel Dominguez-Pumar
- IEEC unit: CTE (UPC)
- Funding Institution: Generalitat de Catalunya – Institut d'Estudis Espacials de Catalunya (IEEC) internal project
- Reference / Contract N°: Estratègia Espai 2030 Generalitat de Catalunya
- Duration: 07/2025–06/2026

PROGRAMMES FOR SPACE RESEARCH AND INNOVATION PROMOTION

AgroSpace - Space technologies, the driver of innovation in rural areas

The AgroSpace project, part of the Interreg SUDOE programme, aims to strengthen the resilience of the agricultural sector in southwest Europe in the face of climate change and to drive its digital transformation through the use of space technologies. AgroSpace seeks to act as a bridge between the agricultural and space sectors, promoting sustainability and territorial cohesion.



- Contact persons: Alberto Garcia-Rigo, Marc Herrera Giménez
- IEEC units: IEEC, CTE (UPC)
- Funding Institution: Interreg SUDOE programme, co-funded by the European Union
- Partners: IEEC, Cambra de Comerç de Barcelona (CCB), Andalucía Aerospace Cluster (AAERO), ELLIOT Cloud, Universidad de Vigo (UVIGO), Agri Sud-Ouest Innovation (ASOI), Aerospace Valley (AV), Chambre interdépartementale d'agriculture de la Charente-Maritime et des Deux-Sèvres (CMDS), Institut national d'enseignement supérieur pour l'agriculture, l'alimentation et l'environnement Institut Agro Montpellier (ITAP), Hidromod-Modelação em Engenharia, Lda (Hidromod), Symington Family States (SYM), Centro Operativo e de Tecnologia de Regadio (COTR)
- Reference / Contract N°: S2/1.1/E0260
- Duration: 01/06/2025–31/05/2028

SPACE SAFETY & SPACE WEATHER

EU-SST: Provision of optical sensor data for the space surveillance service

The EU Space Surveillance and Tracking is part of the Space Situational Awareness (SSA) component of the EU Space Programme, adopted by the European Union. CDTI represents the Spanish participation and coordinates the Spanish network of optical sensors for the provision of surveillance and tracking data of space debris.



- Contact persons: Kike Herrero Casas, Pere Gil, Francesc Domene, David Baroch, Gemma Domènech
- IEEC unit: IEEC
- Funding Institution: Agencia Espacial Española (AEE)
- Contract N°: 2024/0000034 NEG Lote 1
- Duration: 04/2025–6/2026

SWESNET - Space Weather Service Network extension

The Space Weather Service (SWE) Network, within the ESA Space Safety programme, consists of five expert service centres that provide crucial information on the space weather situation, including Ionospheric Weather. UPC-IonSAT group participates in real-time services on GNSS-based solar flares monitoring and triggering alerts, as well as on providing high resolution Global Ionospheric Maps (UQRG GIMs).



- Contact persons: Alberto Garcia-Rigo, Manuel Hernández-Pajares
- IEEC unit: CTE (UPC)
- Funding Institution: European Space Agency
- Partners: BIRA-IASB (Belgium; coordinator); 52 Europe-wide groups from 45 legal entities across 17 countries.
- Contract N°: 68747/54.61/SWESNET-22-UPC-IonSAT
- Duration: 03/2025–02/2026

PRODEX - MICROGRAVITY EXPERIMENTS

MIMOCYCS - Miniaturized and Monitored growth chambers for Cyanobacteria Culture in Space.

The MIMOCYCS project (Miniaturized and Monitored growth chambers for Cyanobacteria Culture in Space) aims to demonstrate the growth of the cyanobacterium “Limnospira indica” in culture chambers on the International Space Station (ISS). This species is key for regenerative life support systems (carbon dioxide capture, oxygen generation) on space stations.



- Contact person: Francesc Gòdia
- IEEC units: IEEC, CERES (UAB)
- Funding Institution: European Space Agency (ESA) Prodex Office
- Partners: Institut d'Estudis Espacials de Catalunya (IEEC), Universitat Autònoma de Barcelona (UAB), SENER Aeroespacial, IMB-CNM - CSIC
- Reference / Contract N°: 4000150142
- Duration: 01/06/2025–31/12/2026

SPACEGENFISH - Aquaculture in SPACe: deciphering EpiGENetics in FISH

The SpaceGenFish project will develop the first space aquaculture system, capable of autonomously raising fish on the International Space Station (ISS) with the potential to be deployed on future missions to the Moon or Mars. Autonomous hardware (Space Aquaculture Cube, SAC) will be designed to maintain and observe fish embryos and to evaluate how microgravity and space radiation affect their biology, especially their epigenetics.



- *Contact persons:* Juan José Ramos Bosch
- *IEEC units:* IEEC, CTE (UPC)
- *Funding Institution:* European Space Agency (ESA)
- *Partners:* Institut de Ciències del Mar (ICM-CSIC), IEEC, Radian Systems
- *Reference / Contract N°:* 4000148975
- *Duration:* 22/05/2025–31/12/2027

TALENT & EDUCATION

HYPATIA-TIC

HYPATIA-TIC is a collaborative initiative between the Hypatia Mars Association and the Institute of Space Studies of Catalonia (IEEC), funded by the Next Generation EU programme to reduce the gender gap in Information and Communication Technologies (ICT). The project promotes female talent and digital inclusion in ICT and space sciences through educational and outreach activities that integrate scientific research, storytelling, and participatory learning.



- *Contact persons:* Estel Blay
- *IEEC unit:* IEEC
- *Funding Institution:* Next Generation EU, Generalitat de Catalunya
- *Partners:* Hypatia Mars Association, IEEC
- *Duration:* 15/01/2025–15/09/2025

IEEC actions for the solar eclipse of 12 August, 2026.

Project that covers scientific advisory tasks to the Generalitat de Catalunya for the management and communication of events related to the total solar eclipse of August 12, 2026, including the development and acquisition of educational materials, the holding of public outreach talks and training workshops and the generation of communication content about the eclipse.



- *Contact persons:* Xavier Luri, Ignasi Ribas, Ana Montaner, Eduard Masana, Kike Herrero
- *IEEC units:* IEEC, ICE-CSIC, ICCUB
- *Funding Institution:* Generalitat de Catalunya
- *Duration:* 09/07/2025–31/10/2026

Funding



FUNDING

The plots and graphs below show the funding secured and managed by the IEEC, including base funding from the competitive projects, non-competitive projects and contracts/agreements with industry*.

Total budget by year and type of project

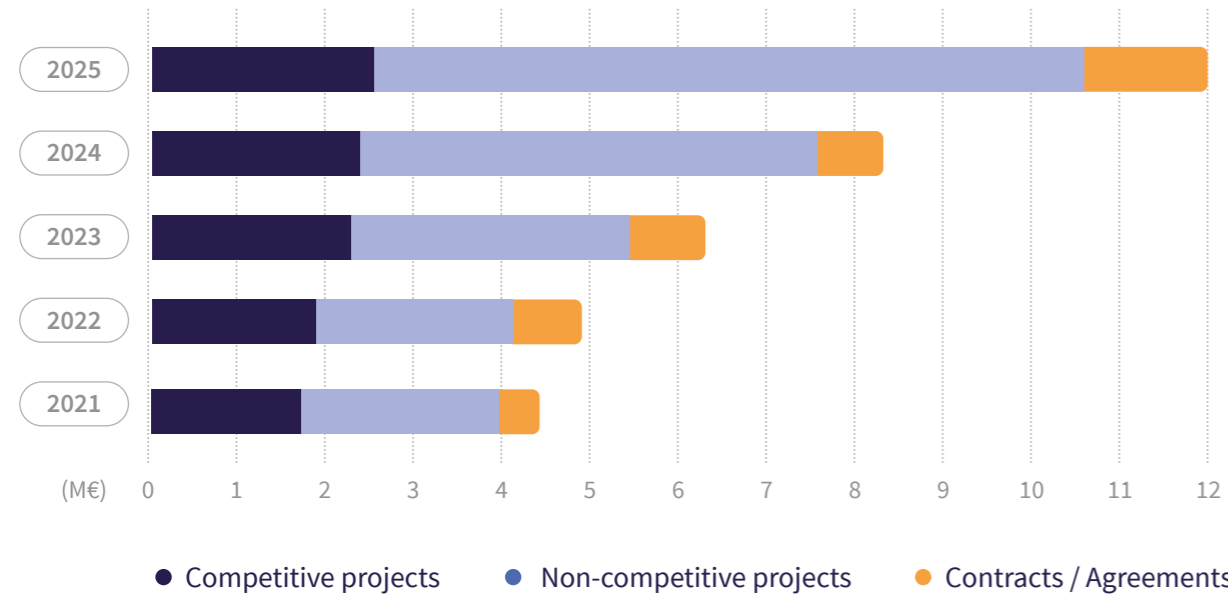


Figure 21

Source of funding

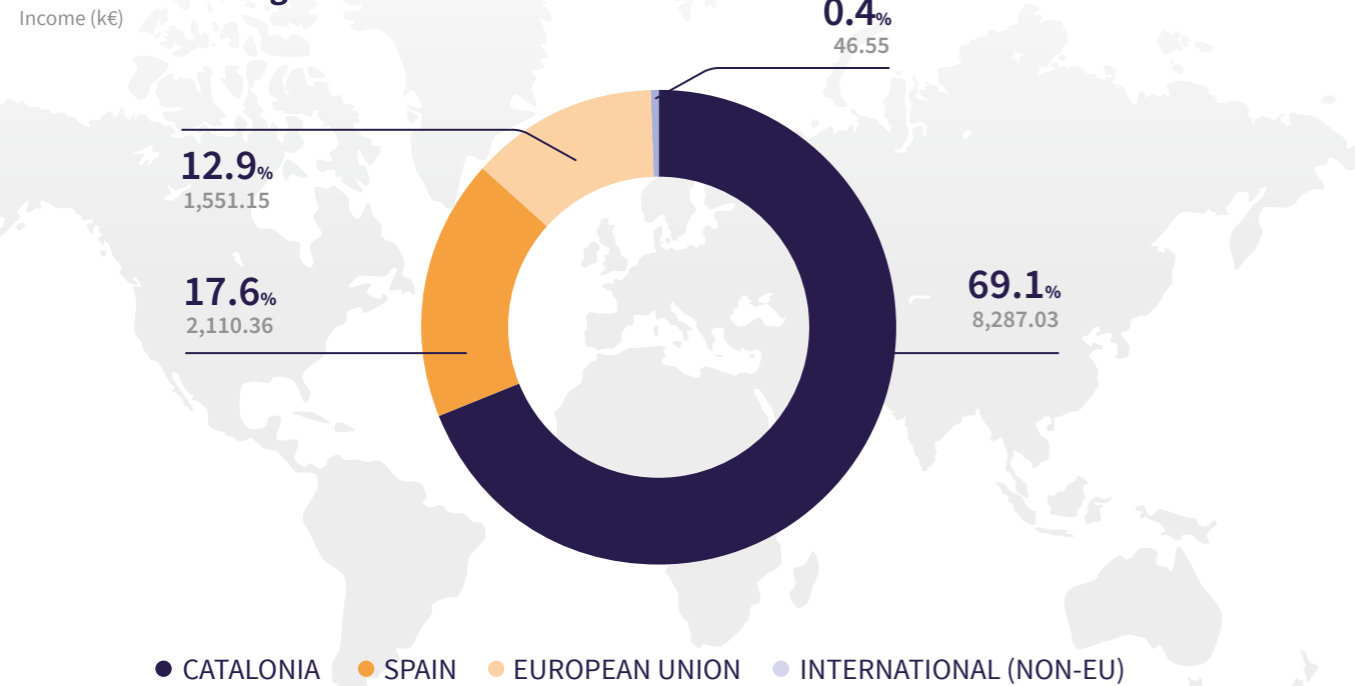


Figure 22

* Provisional economical data pending closure of the 2025 financial year.

Contracts / Agreements Income (k€)

European public sector	760.5
National public sector	158.4
European private sector	259.4
National private sector	183.3
International (non-European)	46.5
TOTAL	1,408.1

Income from contracts/agreements

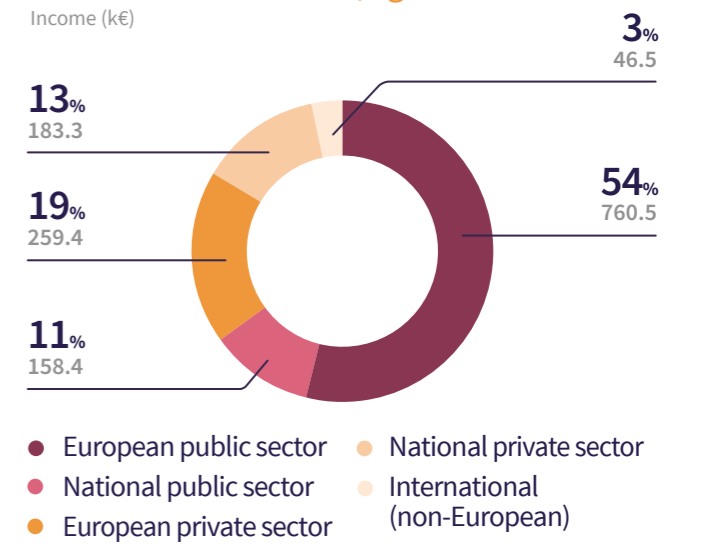


Figure 23

Subsidies Income (k€)

COMPETITIVE PROJECTS	
AGAUR	214.0
MICIU	1,768.7
EU	531.3
TOTAL	2,514.0

Income from competitive projects

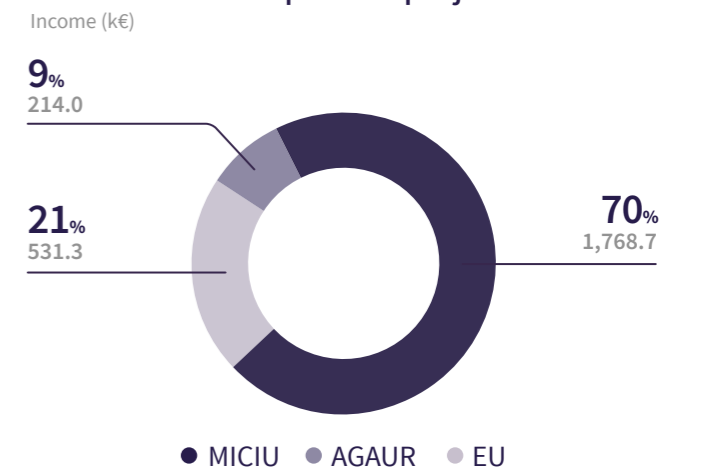


Figure 24

Subsidies Income (k€)

NON-COMPETITIVE PROJECTS	
NewSpace Strategy	4,055.6
Programme contract	1,276.1
Others	2,741.4
TOTAL	8,073.0

Income from non-competitive projects

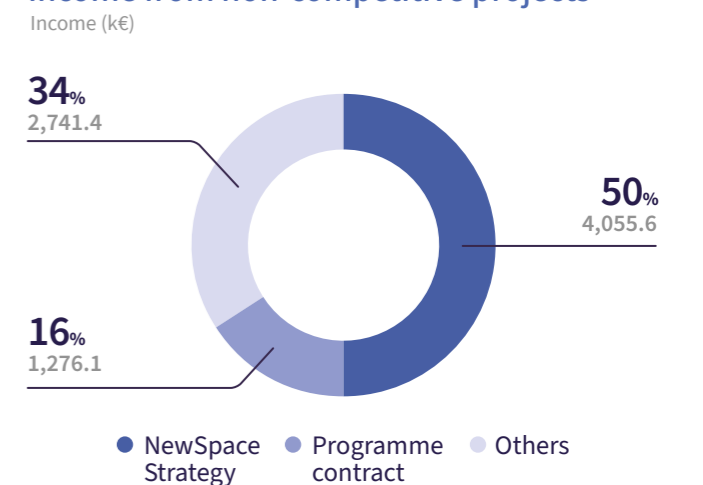


Figure 25

PhD Theses

Author — Cristian Nery Viglione Muñoz

Department/Institute — Universitat Autònoma de Barcelona. Department of Physics

Title — Probing gravity with weak lensing and clustering from mock galaxy surveys

Date — 11 February 2025

Director — Pablo Fosalba Vela

Author — Òscar Maireles González

Department/Institute — Universitat Autònoma de Barcelona. Department of Information and Communications Engineering

Title — Astronomical Data Compression

Date — 20 February 2025

Directors — Joan Serra-Sagrístà and Miguel Hernández-Cabronero

Author — Ivan Martín Vílchez

Department/Institute — Universitat Autònoma de Barcelona. Department of Physics

Title — Development of data analysis algorithms and waveform models for the LISA mission

Date — 27 March 2025

Director — Carlos F. Sopena

Author — Bo Huang

Department/Institute — Universitat Autònoma de Barcelona. Department of Physics

Title — Magnetized Clustered Star Formation in Orion

Date — 11 April 2025

Director — Josep Miquel Girart Medina

Author — Santiago Ubach Ramírez

Department/Institute — Universitat Autònoma de Barcelona. Department of Physics

Title — X-ray studies of accreting black hole X-ray binaries

Date — 9 May 2025

Directors — Lluís Font Guiteras, Markus Gaug and James Francis Steiner

Author — Adrián Pérez Portero

Department/Institute — Universitat Politècnica de Catalunya - BarcelonaTech. Department of Signal Theory and Communications

Title — Contributions to RFI detection, mitigation, and excision for GNSS receivers and spaceborne microwave radiometers

Date — 9 May 2025

Directors — Hyuk Park and Adriano J. Camps Carmona

Author — Raúl Díez García

Department/Institute — Universitat Politècnica de Catalunya - BarcelonaTech. Department of Signal Theory and Communications

Title — New methods for radio frequency interference mitigation in microwave radiometry

Date — 20 June 2025

Director — Adriano J. Camps Carmona

Author — Pedro Víctor Gabriel Cerna

Department/Institute — Universitat Politècnica de Catalunya - BarcelonaTech. Institut de Ciències de l'Educació

Title — Sistema Adaptativo de Aprendizaje Utilizando Motores de Machine Learning Aplicado a la Enseñanza de la Ingeniería Gráfica

Date — 4 July 2025

Directors — Antoni Pérez i Poch and Jordi Torner Ribé

Author — **Sergi Novell Masot**

Department/Institute — Universitat de Barcelona. Department of Quantum Physics and Astrophysics

Title — The bispectrum statistic in the era of precision cosmology

Date — 1 September 2025

Directors — Licia Verde and Héctor Gil Marín

Author — **Carlos Rodríguez García**

Department/Institute — Universitat Autònoma de Barcelona. Department of Physics

Title — Application and development of advanced mathematical tools for population and time series analysis in pulsar astrophysics

Date — 4 September 2025

Directors — Diego F. Torres Ozemo and Alessandro Patruno

Author — **Wei Zhang**

Department/Institute — Universitat Autònoma de Barcelona. Department of Physics

Title — Gamma-ray Analysis of Pulsar Environments and Their Theoretical Explanation

Date — 5 September 2025

Director — Diego F. Torres Ozemo

Author — **David Llavèria Godoy**

Department/Institute — Universitat Politècnica de Catalunya - BarcelonaTech. Department of Signal Theory and Communications

Title — Neural network-based data processing for satellite imagery in small satellite earth observation missions

Date — 9 September 2025

Director — Adriano J. Camps Carmona

Author — **Albert Elias Lopez**

Department/Institute — Universitat Autònoma de Barcelona. Department of Physics.

Title — Numerical simulations of astrophysical dynamos and applications to giant planets

Date — 15 September 2025

Directors — Daniele Viganò and Fabio del Sordo

Author — **Daniel Marín Pina**

Department/Institute — Universitat de Barcelona. Department of Quantum Physics and Astrophysics

Title — Black hole dynamics in star clusters: Eccentric mergers and star-black hole binaries

Date — 19 September 2025

Director — Mark Gieles

Author — **Arnau Agasca Cabot**

Department/Institute — Universitat de Barcelona. Department of Quantum Physics and Astrophysics

Title — Transient sources with LST-1: study of novae, supernovae, and gamma-ray bursts

Date — 23 September 2025

Directors — Pol Bordas Coma and Marc Ribó Gomis

Author — **Diana Zaida Felgueiras Luís**

Department/Institute — Universitat Politècnica de Catalunya - BarcelonaTech. Department of Signal Theory and Communications

Title — Magnetohydrodynamics enhanced radio blackout mitigation system for spacecraft during planetary entries

Date — 23 September 2025

Directors — Adriano J. Camps Carmona and Olivier Chazot

Author — **Mar Carretero Castrillo**

Department/Institute — Universitat de Barcelona. Department of Quantum Physics and Astrophysics

Title — Search and study of massive runaway stars in the Milky Way and impact on high-energy binaries

Date — 3 October 2025

Directors — Marc Ribó Gomis and Josep Maria Paredes Poy

Author — **Joanna Kuzma**

Department/Institute — Universitat Autònoma de Barcelona; Department of Chemical, Biological and Environmental Engineering, Université Clermont Auvergne; Génie des Procédés, Énergétique et Biosystèmes

Title — Improvement and validation of a mechanistic physical model for the prediction of heat and mass transfer in higher plant growth in reduced gravity

Date — 23 October 2025

Directors — Francesc Gòdia Casablanças, Claude-Gilles Dussap and Jean-Pierre Fontaine

Author — **Marcel Bernet Martí**

Department/Institute — Universitat de Barcelona. Department of Quantum Physics and Astrophysics

Title — Data-driven diagnosis of the Milky Way disk dynamics

Date — 29 October 2025

Director — Teresa Antoja Castelltort and Pau Ramos Ramírez

Author — **Jilun Peng**

Department/Institute — Universitat Politècnica de Catalunya - BarcelonaTech. Department of Signal Theory and Communications

Title — Development of innovative land applications for ESA's HydroGNSS mission

Date — 31 October 2025

Director — Estel Cardellach Galí

Author — **Badr Eddine Boudriki Smlali**

Department/Institute — Universitat Politècnica de Catalunya - BarcelonaTech. Department of Signal Theory and Communications

Title — Analysis of helio-geo-ionospheric proxies for short-term earthquake forecasting

Date — 12 November 2025

Directors — Hyuk Park and Adriano J. Camps Carmona

Author — **Nariman Nakhjiri**

Department/Institute — Universitat de Barcelona. Department of Mathematics and Computer Science

Title — Astronomical observation scheduling problem: a comprehensive study and novel metaheuristics solutions

Date — 12 November 2025

Directors — Maria Salamó Llorente and Miquel Sànchez i Marrè

Author — **Julen Untzaga San Vicente**

Department/Institute — Universitat Autònoma de Barcelona. Department of Physics

Title — A search for wandering black holes in the Milky Way

Date — 17 November 2025

Directors — Mar Mezcu Pallerola and Silvia Bonoli

Author — **Clàudia Soriano Guerrero**

Department/Institute — Universitat Autònoma de Barcelona. Department of Physics

Title — Atmospheric MHD simulations of Hot Jupiters to study winding, non-ideal effects and turbulence

Date — 17 November 2025

Directors — Daniele Viganò and Rosalba Perna

Author — **Dileep Kumar**

Department/Institute — Universitat Politècnica de Catalunya - BarcelonaTech. Electronic Engineering Department

Title — Deep Learning for Improving Resilience of the Sensors in Mars Exploration Missions


Date — 24 November 2025

Directors — Manuel M. Domínguez Pumar and Joan Pons Nin


Vera C. Rubin Observatory's first light images of the Trifid and Lagoon nebulas were published in June 2025. This image combines 678 separate images taken in just over seven hours of observing time. Combining many images in this way reveals otherwise faint or invisible details, such as the clouds of gas and dust that comprise the Trifid nebula (top left) and the Lagoon nebula, which are several thousand light-years away from Earth.

Credits: NSF-DOE Vera C. Rubin Observatory.

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