WEBSITE RAEGE (2018 em diante)
PROPOSTA DE NOVA ESTRUTURA E CONTEÚDOS

ESTRUTURA

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ABOUT US	SCIENTIFIC SCOPE	COMMERCIAL SCOPE	PORTFOLIO	EVENTS	PHOTOS	USEFUL LINKS	CONTACT US	→ Público
•The Stations •The Project •The Partners •Management Structure •Human Resources •Infrastructures & Equipment •Technology •Financing	• VLBI - Very Long Baseline Interferometry • Astronomic VLBI • GNSS (Global Navigation Satellite Systems) • SLR - Satellite Laser Ranging • LLR • GPS • DORIS • LEO • Altimetry • Gravimetry • Seismography		• Publications • Projects • Services					

CONTEÚDOS

ABOUT US

HOME / The Stations

RAEGE – Rede Atlântica de Estações Geodinâmicas e Espaciais (Atlantic Network of Geodynamic and Spatial Stations) consists of 4 Fundamental Geodetic Stations located at:

Yebes (Spain)
link para página com informação, fotos da EGF de Yebes e respetivas coordenadas geográficas

Gran Canaria (Canary Islands, Spain)
link para página com informação e fotos do local onde ficará a EGF de Gran Canaria

Santa Maria (Azores, Portugal)
link para página com informação, fotos da EGF de Santa Maria e respetivas coordenadas geográficas

Flores (Azores, Portugal)
link para página com informação e fotos do local onde ficará a EGF das Flores

Such geographical distribution of the network’s Fundamental Geodetic Stations ensures that the relative position of 3 tectonic plates – North America, Eurasian and African – is monitored permanently.

Mapa com a localização das estações

Yebes

Yebes Observatory is currently the most important technological development center (CDT) in IGN, classified as a Spanish Large Scale Scientific Facility (ICTS).

Located about 70 km from Madrid, in the town of Yebes (Guadalajara), at an altitude of 980 meters above sea level, it has good conditions for radio astronomical observations, since the average precipitable water vapor is 6 mm (down to 2 mm reached in winter). The wind speed is less than 5 m/s for 90% of the time and the number of days with snowfall is less than one week per year.

In addition to the domes that house the instruments of observation, Yebes CDT has advanced receiver laboratories on site (low noise amplifiers, quasi-optics etc) that allows the dedicated team of more than 20 engineers and astronomers present to develop and optimize new and existing receivers. The R&D undertaken in the Yebes CDT under the mandate of IGN permits it to share information and resources with other important radio observatory in Spain, like the IRAM radio telescope at Pico Veleta in Granada. This collaboration also permits the free exchange of ideas and personnel with IRAM´s facilities in France and Spain and facilitates technology exchanges between sister institutes in other European countries which participate in the EVN.

The development of instruments for astronomical applications at Yebes CDT began in the late 1970s, after the installation of a 14-meter diameter radio telescope for millimeter wave which was fitted with receivers, a computer control system, and spectrometers for signal analysis.

In 2008 the construction of a 40-meter diameter radio telescope was finished, dedicated to millimeter and centimeter-wave Very Long Baseline Interferometry (VLBI) and single-dish observations. It currently has installed receivers working in S-

Very Long Baseline Interferometry (VLBI) and single dish observations. It currently has installed receivers working in S-band (2.2 – 2.37 GHz), CH-band (3.22 – 3.39 GHz), C-band (which is split in two sub-bands, 4.56 – 5.06 GHz and 5.9 – 6.9 GHz) , X-band (8.15 -9GHz), K-band (21.77 – 24.45 GHz), and W-band (85-110 GHz). A new Q-band (40-49 GHz) receiver is also in operation.

In Yebes CDT there are also located a GPS geodetic station, a pavilion of gravimetry, two optical telescopes (one double astrograph of 40 cm aperture and a solar telescope 15 cm aperture), a pavilion of scientific and facilities for residence and dining, and a visitors' center.

The RAEGE 13.2m "Jorge Juan" radio telescope at Yebes is finished and operational; the station, equipped with the new broadband receiver, has participated in the first intercontinental VGOS observation in june 2016 (see the Aug2016 IVS Newsletter).

The activities for the construction of the 13.2 meter radio telescope is being cofinancied by ERDF/FEDER 2007-2013 under the project: "VGOSYEBES: Radiotelescopio de VLBI Geodesico y Astrometrico para su integracion en la red VGOS" with a budget of 4.250.000 €.

Link to Spanish "Boletín Oficial del Estado":https://www.boe.es/boe/dias/2015/06/17/pdfs/BOE-B-2015-19495.pdf

The Yebes station, equipped with the new broadband receiver, has participated in the first intercontinental VGOS observation in june 2016 (see http://ivscc.gsfc.nasa.gov/publications/newsletter/issue45.pdf).

Gran Canaria

…

Santa Maria

Located in the Azores archipelago's most stable island, sitting on the African tectonic plate, the Geodetic Fundamental Station of Santa Maria is the first of its kind in Portugal.

A new technological potential was open in Portugal in 2015 with the inauguration of this 13.2m radiotelescope, dedicated to geodetic Very Long Baseline Interferometry (VLBI) - the RAEGE "Colombo" radiotelescope at Santa Maria that is part of the International VLBI Service for Geodesy and Astrometry (IVS) network (RAEGSMAR).

This station currently hosts:

- ✓ Tri-band receiver operating in S-band (2.2 – 2.37 GHz), X-band (8.15 -9GHz), and Ka-band (21.77 – 24.45 GHz), and a new broadband receiver (2 – 14 GHz) planned for the end of 2018.
- ✓ Two permanent GNSS geodetic stations - one belonging to RAEGE, integrated in the International GNSS Service (IGS) and EUREF networks, and another one belonging to the regional network of permanent stations (AZSM - REPRAA]
- ✓ Gravimetry pavilion, comprising one gravimeter and one seismograph
- ✓ Maser clock
- ✓ Meteorological station
- ✓ Data centre
- ✓ Control room to operate the radiotelescope and monitor observations
- ✓ Office and residential facilities for staff and visitors.

Flores

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The Project

Project RAEGE results from a Memorandum of Understanding between the Spanish Nacional Geographic Institute (IGN, Ministerio de Fomento, Gobierno de España) and the Government of the Portuguese Autonomous Region of Azores (Secretaria Regional da Ciência, Tecnologia e Equipamentos, Governo dos Açores), signed in 2011, to meet the international developments needed to set up a VLBI (Very Long Baseline Interferometry) Geodetic Observing System - VGOS.

The project consists of a network of four fully equiped Geodetic Fundamental Stations in Spain (Yebes – Guadalajara and Gran Canaria – Canary Islands), and Azores, Portugal (Santa Maria and Flores) and two Base Centres (Yebes/Spain and Lagoa-São Miguel/Azores), dedicated to astronomy, geodesy and geophisics studies.

The Partners

National Geographical Institute of Spain (IGN)

The National Geographical Institute of Spain (IGN) has experience in VLBI, being member of the European VLBI Network since 1993 and founder institute of the Joint Institute for VLBI in Europe (JIVE), and it is participating in geodetic VLBI campaigns since 1995.

Azores Regional Government

At the time of the signature of the Memorandum of Understanding, the Secretary for Science, Technology and Insfrastructures was representing the Azores Government. Due to subsequent administrative reorganizations, RAEGE now integrates the responsibilities of the **Azores Mission Structure for Space**, recently created within the Secretariat for the Sea, Science and Technology. Furthermore, **Associação RAEGE Açores** (a nonprofit private association between the Government of Azores and SATA, the regional air transport company) has been set up to manage the scientific and technical activity of the Azores RAEGE infrastructures.

Management Structure

The network is scientifically and technically managed jointly by both administrations (via the Executive Committee) as one operational unit for the development of geodinamic and spatial projects.

Members of the Executive Committee are mandated by the Spanish and Azores Administrations for 3 year periods, which then choose one Director, one Assistant Director and the Scientific-Technical Advisory Committee composed of eight reputable scientists in relevant fields of expertise.

Organigrama

Executive Committee

2018-2020

Jose Antonio Lopez Fernandez (IGN, Spain) - Chair
Carmen López Moreno (IGN, Spain)
Javier González Matesanz (IGN, Spain)
Bruno Pacheco (Azores Government) – Vice Chair
Francisco Wallenstein Macedo (Azores Government)
Sara Pavão (Azores Government)

2015-2017

Jesús Gómez González (IGN, Spain) | Jose Antonio Lopez Fernandez (IGN, Spain) – Vice Chair
Carmen López Moreno (IGN, Spain)
Javier González Matesanz (IGN, Spain)
Nelson Simões (Azores Government) | Bruno Pacheco (Azores Government) - Chair
José Azevedo (Azores Government) | Francisco Wallenstein Macedo (Azores Government)
Marlene Assis (Azores Government)| Sara Pavão (Azores Government)

2012-2014

Jesús Gómez González (IGN, Spain) –Chair
Carmen López Moreno (IGN, Spain)
Javier González Matesanz (IGN, Spain)
Bruno Pacheco (Azores Government) | Nelson Simões (Azores Government) – Vice Chair
José Azevedo (Azores Government)
Marlene Assis (Azores Government)

Director

José Antonio López Fernández (IGN, Spain) - 2012-2014; 2015-2017
Pablo de Vicente (IGN, Spain) - 2017; 2018-2020

Assistant Director

Luis R. Santos (Azores Government) - 2012-2014; 2015-2017; 2018-2020

Scientific-Technical Advisory Committee

2018-2020

Francisco Colomer Sanmartín (IGN, Spain; Chair)
María José Blanco Sánchez (IGN, Spain)
???? (Spain)
Rui Fernandes (Universidade da Beira Interior, Portugal)
Nuno Baltazar Fogaça Barros e Sá (Universidade dos Açores, Portugal; Vice Chair)
Machiel Bos (Universidade da Beira Interior, Portugal)Hayo Hase (Bundesamt für Kartographie und Geodäsie, Germany)
Arthur Niell (MIT Haystack Observatory, U.S.A.)

2015-2017

Francisco Colomer Sanmartín (IGN, Spain; Chair)
Pablo de Vicente Abad (IGN, Spain)
María José Blanco Sánchez (IGN, Spain)
Joäo Luis Gaspar (CIVISAçores, Portugal)
Nuno Baltazar Fogaça Barros e Sá (Universidade dos Açores, Portugal; Vice Chair)
Teresa J. Ferreira (CVARG Açores, Portugal)

Hayo Hase (Bundesamt für Kartographie und Geodäsie, Germany)
Arthur Niell (MIT Haystack Observatory, U.S.A.)

2012-2014
Francisco Colomer Sanmartín (Instituto Geográfico Nacional, Spain; Chair)
Pablo de Vicente Abad (Instituto Geográfico Nacional, Spain)
María José Blanco Sánchez (Instituto Geográfico Nacional, Spain)
João Luis Gaspar (IVISA – Centro de Informação e Vigilância Sismovulcânica dos Açores, Portugal)
Nuno Baltazar Fogaça Barros e Sá (DCTD, Universidade dos Açores, Portugal; vicechair)
Teresa J. Ferreira (CVARG – Centro Vulcanologia Avaliação Riscos Geológicos, Portugal)
Hayo Hase (Bundesamt für Kartographie und Geodäsie, Germany)
Arthur Niell (MIT Haystack Observatory, U.S.A.)

Human Resources

Yebes…

Gran Canaria…

Santa Maria

Susana
Ruben
António
…

Flores…

Infrastructures | Equipment

Basic equipment of all RAEGE's Geodetic Fundamental Stations:

- 1 radio telescope of VLBI2010 (13.2-m diameter; operation up to 90 GHz; Fast slewing speed)
- 1 gravimeter
- 1 permanent GNSS station
- Maser clock
- Seismograph

Yebes infrastructure/equipment specificities

Laboratories at Yebes Observatory have modern instrumentation for the design, construction and testing of receivers and microwave components up to a frequency of 50 GHz. Available are scalar and vector analyzers, power and noise figure meters, etc. Also available is equipment for performing refrigerated (cryogenic) receptor tests at temperatures down to 15 Kelvin (-258 ° C). A machine shop equipped with machine tools complements the electronics laboratory…

Gran Canaria infrastructure/equipment specificities…

Santa Maria infrastructure/equipment specificities…

Flores infrastructure/equipment specificities…

Technology

Radioastronomers usually try to detect very weak signals emitted by objects very far from Earth. Instruments used in land - based radio astronomy are large antennas or antenna networks equipped with the most sensitive receivers available, i.e., the noise they produce should be minimal to avoid its overlap to the signals received. Usually radio astronomy receivers are cooled to very low temperatures since some of the electronic devices used to amplify or mix radio signals add less noise if they are cooled.

In the frequency range of 500 MHz to 50 GHz, the components most often used at the entrance of these receptors are amplifiers with high electron mobility transistors (High Electron Mobility Transistors - HEMTs). These devices can be cooled to cryogenic temperatures (~ 15 Kelvin = -258° Celsius) for minimal noise. Once the weak radio astronomy signal is amplified, it is relatively immune to noise added in later processes.

For higher frequencies, the input signal is first converted to a lower frequency by a mixer and subsequently amplified by a cryogenic HEMT. In modern heterodyne receivers for millimeter and submillimeter wavelengths (up to several hundred GHz) the mixer is typically a SIS junction (Superconductor - Insulator - Superconductor) cooled to the temperature of liquid helium (4 Kelvin = -269° Celsius), while at the THz range the so-called hot electron bolometers (Hot electron bolometers - HEB) used are cooled to even lower temperatures.

The VLBI2010 RAEGE radio telescope

The construction work began on the new VLBI2010-type radio telescopes, part of the Spanish/Portuguese RAEGE project, initiated at the end of 2010 when the contract for the design, construction, and commissioning of the first three radio telescopes was awarded to MT Mechatronics (Germany). The design of the radio telescopes was completed in the summer of 2011. During 2011 and 2012 the backstructures of the three radio telescopes were built by Asturfeito in Cantabria, Spain. Other parts, such as the reflector panels, were fabricated by COSPAL Composites in Italy.

The RAEGE radio telescopes are Azimuth/Elevation turning head telescopes, reaching azimuth and elevation slew speeds of 12°/s and 6°/s, respectively. The optical design is based on a 13.2-m ring focus reflector. In its basic configuration, the observation frequency is in the range of 2–40 GHz. It can be enhanced up to 100 GHz by using additional options. For geodetic telescopes it is essential to be able to accurately measure the position of the intersection of the azimuth and elevation axes. Therefore a concrete pillar is installed at the center of the telescope tower, allowing the installation of a measurement system to be located at the intersection of axes and visible from the outside through openings. Another important requirement in geodetic VLBI is path length stability. In order to handle path length errors, an active deformation measurement and "flexible body compensation" (FBC) method is foreseen, similar to established methods used for surface and focus/pointing error corrections.

Receivers

The VLBI2010 RAEGE tri-band receiver

The tri-band receiver at S/X and Ka bands, developed at Yebes Labs, constructed for the first RF and VLBI tests. More information in:
http://www.oan.es/raege/cact/publicdocs/lopezperez-IVSGM2014.pdf

RAEGE Broadband receivers

A new broadband receiver of VGOS specifications has been developed for RAEGE. More information on the spiral broadband antenna is available at http://www.oan.es/raege/cact/publicdocs/lopezfernandez-IVSGM2014.pdf.

Financing

Yebes

Government of Spain - MINECO grant FIS2012-38160

European Commission - (ERDF / FEDER) plan 2007-2013 - project: "VGOSYEBES: Radiotelescopio de VLBI Geodesico y Astrometrico para su integracion en la red VGOS"

Gran Canaria

Government of Spain -

European Commission -

Santa Maria

Government of Spain -

Government of Azores -

Flores

Government of Spain -

Government of Azores -

SCIENTIFIC SCOPE

VLBI - Very Long Baseline Interferometry

The technique of VLBI is based on the observation of a celestial object simultaneously with a set of widely distributed radio telescopes, measuring the delay in the reception of the radiation from the selected object at each telescope to assess very precise variation in the relative position of the different telescopes. The resulting interference pattern (called fringes) allows this network of telescopes to behave like a single instrument, which equivalent size (and thus resolving power) is related to the distances between the telescopes participating in one observation.

In the field of space geodesy, precise observation of quasars allows to extract the positions on Earth of the radio telescopes involved in the observation. Observing plans organized globally enable tracking of variations of these positions, and therefore are a unique tool in the study of ground movements at small and large scales.

The celestial reference frame is defined by VLBI. The International Astronomical Union has adopted the 500 extragalactic radio sources (mostly quasars) used by VLBI as the defining objects of the celestial reference frame. Extragalactic objects form a true inertial reference frame because they are at such great distances that their motions across the sky are undetectable. Positions of stars in our galaxy are now tied to this reference frame, and this is the same reference frame used for measuring Earth orientation. VLBI is unique in its ability to make rapid, accurate measurements of the orientation of the terrestrial reference frame with respect to the celestial reference frame.

VLBI observations are sponsored by over 40 organizations located in 17 countries. VLBI determines with unequaled accuracy the terrestrial reference frame (antenna locations on the Earth), the celestial reference frame (quasar positions on the sky), and Earth's orientation in space.

Astronomic VLBI

VGOS – VLBI Global Observing System - VGOS is part of the Global Geodetic Observing System

(GGOS) of the International Association of Geodesy (IAG), which integrates different geodetic techniques to provide the geodetic infrastructure necessary for monitoring the Earth system and for Global Change research. It provides observations of the three fundamental geodetic observables and their variations:

- Earth's shape
- Earth's gravity field
- Earth's rotational motion.

GGOS (and within it, VGOS) provides the observational basis to maintain a stable, accurate and global reference frame and in this function is crucial for all Earth observation and many practical applications.

To improve VLBI data to meet increasingly demanding requirements, an end-to-end redesign called the VLBI Global Observing System (VGOS, formerly VLBI2010) is in progress. The key concepts are a broadband signal acquisition chain (2-14 GHz) with digital electronics and fast, small antennas. By placing up to four carefully chosen RF bands in the 2–14 GHz range, Radio Frequency Interference (RFI) should be ameliorated and the requisite observation precision achieved. Fast antennas will provide many more observations. More observations support higher temporal and spatial resolution in estimating the effect of the troposphere at each station. Simulations show tropospheric effects as the largest noise source. High recording bandwidths are required to achieve the necessary sensitivity.

VGOS is being developed to be minimally staffed, remotely controllable, broadband, RFI avoiding, fully digital, fast slewing, and capable of producing VLBI delays with precision of 4 picoseconds (in 4 picoseconds light travels 1 millimeter.) The system is designed to observe continuously.

The International VLBI Service for Geodesy and Astrometry (IVS) has been gradually introducing the VGOS systems into the new broadband network as they become available. The initial provisional roll-out plan included broadband test observations in 2015, mainly on the GGAO-Westford baseline. The goal for 2016 was to have one 24-hr VGOS session every week and in 2017 to have several 1-hr sessions for Earth Orientation Parameters (EOP) each day. The pilot project for 2018 is the combination of the 2016 and 2017 observing scenarios using more than ten VGOS stations.

Some of the scientific results derived from VLBI include:

- Motion of the Earth's tectonic plates
- Regional deformation and local uplift or subsidence.
- Definition of the celestial reference frame
- Variations in the Earth's orientation and length of day
- Maintenance of the terrestrial reference frame
- Measurement of gravitational forces of the Sun and Moon on the Earth and the deep structure of the Earth
- Improvement of atmospheric models

GNSS (Global Navigation Satellite Systems)

GNSS receivers detect, decode, and process signals from the GNSS satellites (e.g., currently GPS and GLONASS and, in the future, Galileo). The satellites transmit the ranging codes on two radio-frequency carriers, allowing the locations of GNSS receivers to be determined with varying degrees of accuracy, depending on the receiver and post-processing of the data.

The current GPS constellation includes 24 satellites, each traveling in a 12-hour, circular orbit, 20,200 kilometers above the Earth. The satellites are positioned so that six are observable nearly 100% of the time from any point on Earth. The current GLONASS constellation includes less than 20 satellites, each traveling in a circular orbit, 19,140 kilometers above the Earth. The satellites are positioned so that four are observable nearly 100% of the time from any point on Earth.

The current global IGS network consists of several hundred permanent GNSS (GPS and GPS+GLONASS) receivers. High-accuracy measurements of the change in receiver locations over time allow researchers to study the motions of tectonic plates, displacements associated with earthquakes, and Earth orientation.

The **International GNSS Service** (IGS) has developed a global system of tracking stations, data centers, and analysis centers to put high-quality GPS (and GPS+GLONASS) data on-line within one day and data products on line with two to ten days of observations. The purpose of this international service is to provide GPS data products and highly accurate ephemerides to the global science community to further understanding in geophysical research. The IGS has demonstrated the near real-time capability of the global GPS community to retrieve data and produce products (e.g., satellite ephemerides and Earth rotation parameters) that are of use to a broader community.

Some of the scientific uses of GNSS data include:

- Maintenance of global accessibility to, and the improvement of, the International Terrestrial Reference Frame (ITRF)
- Monitoring deformations of the solid Earth

- Monitoring deformations of the solid Earth
- Monitoring Earth rotation
- Monitoring variations in the liquid Earth (sea level, ice sheets, etc.)
- Precise GPS satellite orbit and clock determinations for analysis of regional GPS campaigns
- Monitoring of the ionosphere and troposphere
- Precise time transfer

SLR - Satellite Laser Ranging

SLR targets are satellites equipped with corner cubes or retroreflectors. Currently, the global SLR network tracks over 40 such satellites. The observable is the round-trip pulse time-of-flight to the satellite.

SLR systems are equipped with short-pulse laser transmitters that can range to orbiting satellites. Lunar Laser Ranging (LLR) systems can range to retroreflectors located on the moon.

The **International Laser Ranging Service (ILRS)** was formed to provide a service to support, through Satellite and Lunar Laser Ranging data and related products, geodetic and geophysical research activities as well as IERS products important to the maintenance of an accurate International Terrestrial Reference Frame (ITRF). The service also develops the necessary standards/specifications and encourages international adherence to its conventions. The ILRS collects, merges, archives and distributes Satellite Laser Ranging (SLR) and Lunar Laser Ranging (LLR) observation datasets of sufficient accuracy to satisfy the objectives of a wide range of scientific, engineering, and operational applications and experimentation.

Some of the scientific results derived from SLR include:

- Detection and monitoring of tectonic plate motion, crustal deformation, Earth rotation, and polar motion
- Modeling of the spatial and temporal variations of the Earth's gravitational field
- Determination of basin-scale ocean tides
- Monitoring of millimeter-level variations in the location of the center of mass of the total Earth system (solid Earth-atmosphere-oceans)
- Establishment and maintenance of the International Terrestrial Reference System (ITRS)
- Detection and monitoring of post-glacial rebound and subsidence

In addition, SLR provides precise orbit determination for spaceborne radar altimeter missions mapping the ocean surface (which are used to model global ocean circulation), for mapping volumetric changes in continental ice masses, and for land topography. It provides a means for subnanosecond global time transfer, and a basis for special tests of the Theory of General Relativity.

LLR…

GPS…

DORIS…

LEO…

Altimetry…

Gravimetry…

Seismography…

COMMERCIAL SCOPE

Necessário definir

PORTFOLIO

Publications

…

Projects

…

Services

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EVENTS

Listagem de eventos passados e futuros

22nd EVGA Meeting

Inauguração da EGF de Santa Maria
EVGA do próximo ano nas Canárias
Visita do PR
Visita da ANACOM: "Visita das delegações das ARN de Cabo Verde e São Tomé e Príncipe" a 1 de junho de 2017 (tenho fotos)
Eles também receberam a visita de uma das equipas vencedoras do CANSAT 2017, a equipa da escola profissional de Almada que ficou em 2.º lugar na competição e ganhou um estágio na estação da ESA em Santa maria, no dia 12 de junho, a Susana deve ter fotos
Participação da Semana Europeia da Prevenção de Resíduos 2017, a atividade consistia em fazer sacos reciclados. Temos fotos dos sacos que a Susana e o Ruben fizeram.

PHOTO GALLERIES

Para além de fotografias das estações, incluir fotografias de visitas oficiais e outros eventos

USEFULL LINKS

Institutional

Azores Government Official Web Site
Estrutura de Missão dos Açores para o Espaço
Ministerio de Fomento
Instituto Geográfico Nacional

Services

- The International GNSS Service (IGS)
- International Gravity Field Service (IGFS)
- International Laser Ranging Service (ILRS)

Networks

- European VLBI Network (EVN)
- Global Geodetic Observing System (GGOS)
- International Association of Geodesy (IAG)
- International Astronomical Union (IAU)
- International VLBI Service for Geodesy and Astrometry (IVS)
- EUREF Permanent GNSS Network (EUREF)
- Rede de Estações Permanentes da Região Autónoma dos Açores (REPRAA)

Outros?

CONTACT US

SPAIN

RAEGE project
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AZORES-PORTUGAL

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Email: luis.r.santos@azores.gov.pt

FORUM

PLATAFORMA DE EDIÇÃO DE CONTEÚDOS