



Governo dos Açores

# SPACE TECHNOLOGY IN AZORES REGION

NEREUS INTERNATIONAL CONFERENCE

"Space, a driver for competitiveness and growth"

Bari, 27-28 February 2014

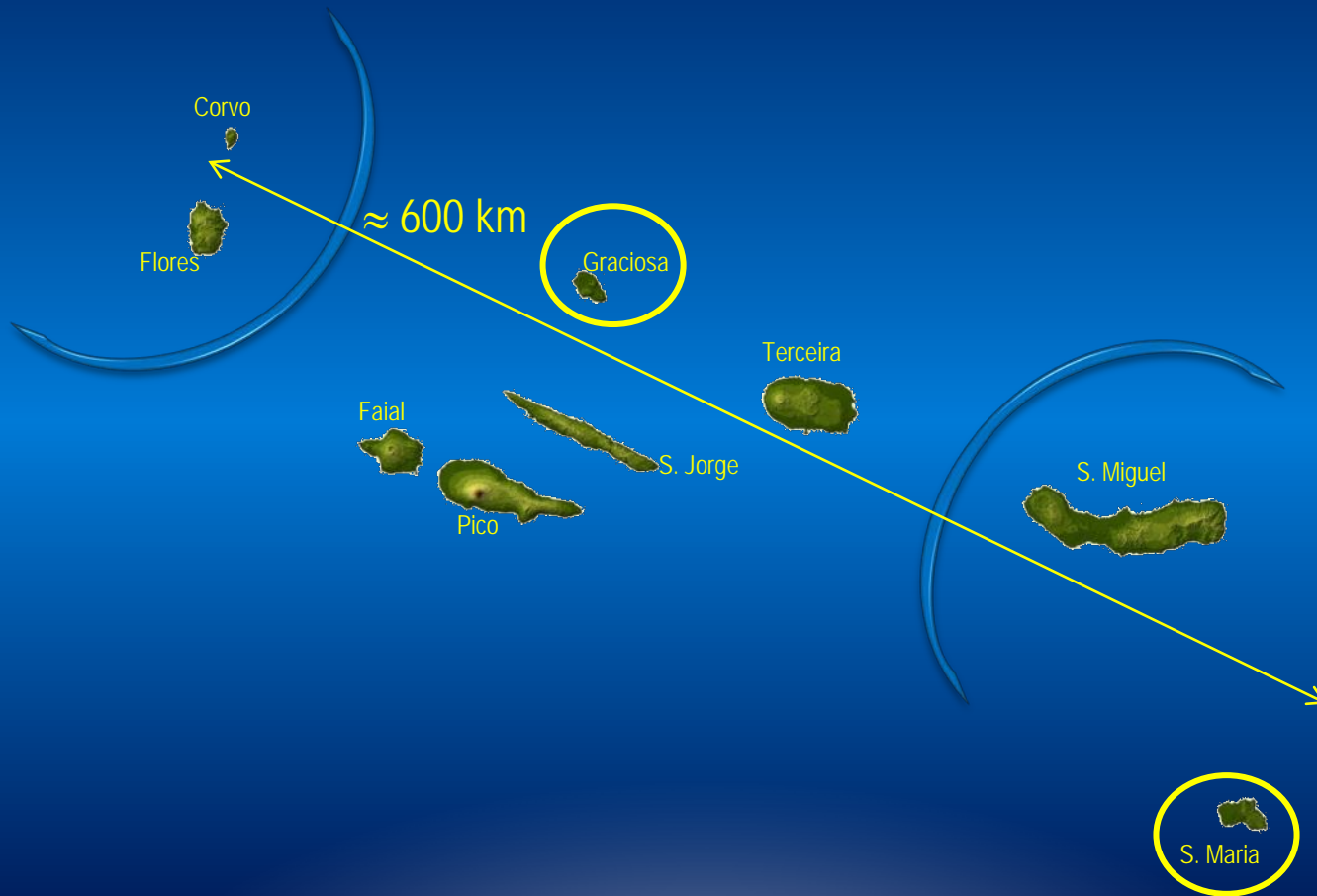


# SUMMARY

- Introducion
- REPRAA
- RAEGE
- SUPERDARN
- ARM
- GRA / ESA Collaboration
- Future



# INTRODUCTION





# REPRAA

- Main goals

Create a regional geodetic infrastructure

Ensure harmonization of reference systems

Field work autonomy

- Equipment

9 GNSS Reference Stations

1 GPS Reference Station





# REPRAA

- Data Access

## Pos Proc

- Request, selection and download of 5 sec data
- Data processing online
- Warning to users
- Access to all station coordinates

## RTK

- Free access to service
- Access to receiver configurations online
- Data format: Leica and RTCM (v2.3 and 3.0)
- Operation mode:
  - Single Base Station
  - Manual or automatic selection of reference station



# RAEGE



- In recent years VLBI techniques applied to geodesy and geophysics have had an extraordinary development, and have been obtained fundamental results to establish reference systems and Earth rotation parameters that are required for the operation of the navigation space systems and global positioning.
- Gathering efforts and ideas, Azorean Government and IGN (Spain) agreed to establish themselves a network designed for studies of astronomy, geodesy and geophysics:

## RAEGE

### Atlantic Network of Geodynamic and Spatial Stations



# RAEGE



- 4 Fundamental Geodetic Stations
  - Yebes, Spain
  - Santa Maria, Azores
  - Tenerife, Canarias
  - Flores, Azores
- Station Instruments
  - Radiotelescope VLBI2010+ GNSS station + Gravimeter
  - Sattelite Laser Ranging in Yebes
  - Hydrogen Maser





# RAEGE



## VLBI 2010

At this time, there are more than 250 institutions (representing more than 90 countries) sharing information.



### VLBI2010 very fast

- ☺ radio telescope
- ☺☺ twin radio telescope

### VLBI2010 fast

- ☹ radio telescope

### upgrade legacy

- ☹ radio telescope





# MSI – SUPERDARN (SUPER DUAL AURORAL RADAR )

- Promoted by National Science Fundation of USA with collaboration of the Azorean Government, Sta. Cruz da Graciosa Municipality, under the coordination of Dartmouth Univerity. Also involves partenerships with:
- Regional Secretariat of Tourism and Transports
- Center for Climate Studies, Meteorology and Global Change – Azores University
- Virginia Polytechnic Institute and State University
- Alaska University
- The Johns Hopkins University Applied Physics Laboratory





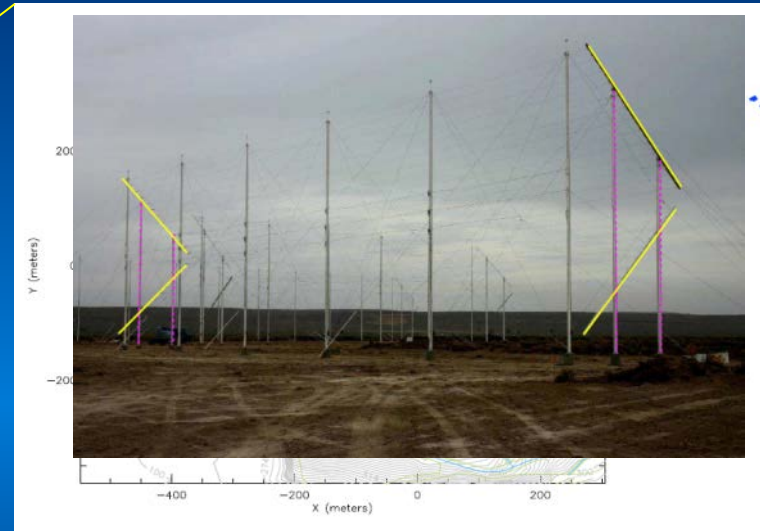
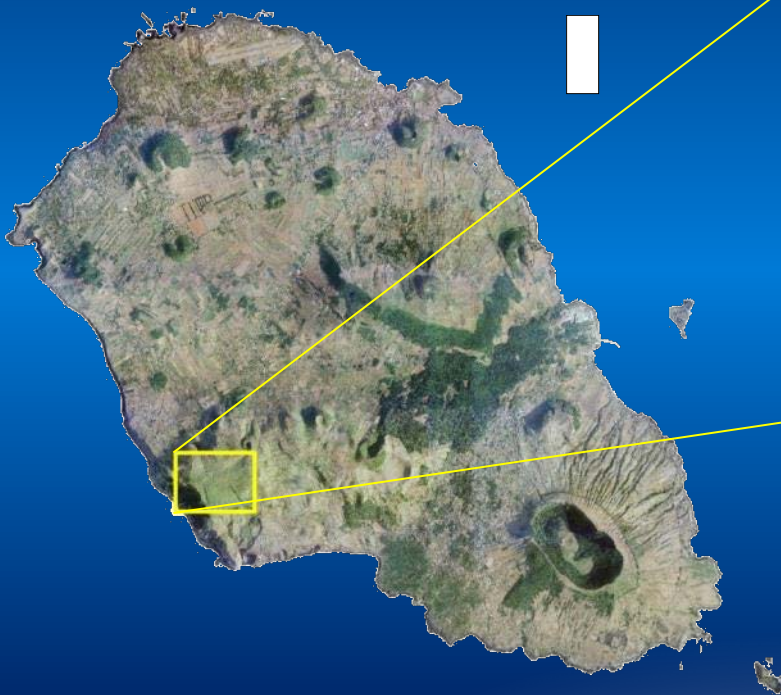
# MSI – SUPERDARN (SUPER DUAL AURORAL RADAR )

- The main goal of this project is to build a high-frequency backscatter radar network. By combining observations from all of the radars in the network, a comprehensive view of the plasma motion in the polar ionospheres can be measured and used in studies of the electromagnetic coupling between the solar wind the Earth's magnetosphere.
- Better knowledge of atmospheric region between 100 and 400 km will de allow to understand and minimize phenomena related with:
  - Climate change
  - GNSS signal and communication disruptions
  - Satellite malfunctions



# MSI – SUPERDARN (SUPER DUAL AURORAL RADAR )

- Graciosa's Island



These radars established in Graciosa island will be part of a larger network (SuperDARN), which includes 25 other radars installed in North and South hemisphere and involves 10 countries.

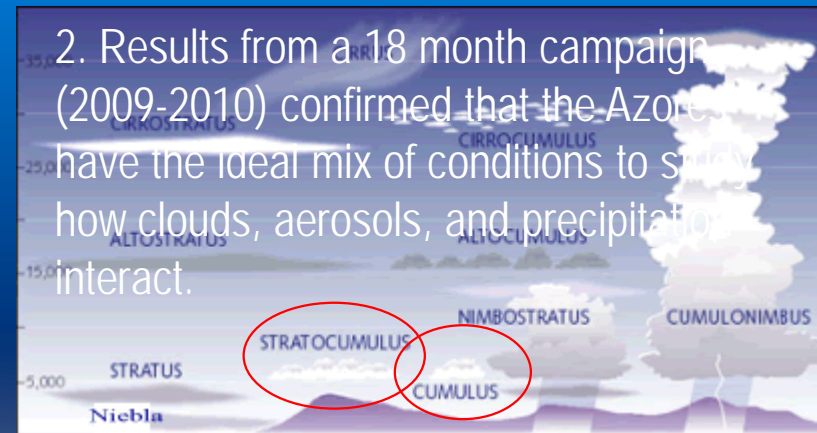


# ARM - CLIMATE RESEARCH FACILITY

- The Atmospheric Radiation Measurement (ARM) Program was created in 1989 with funding from the U.S. Department of Energy (DOE) to develop several highly instrumented ground stations to study cloud formation processes and their influence on radiative transfer. This scientific infrastructure now includes two mobile facilities, an aerial facility, and data archive available for use by scientists worldwide through the ARM Climate Research Facility—a scientific user facility.

- Why Azores?

1. The Azores are an island group located in the northeastern Atlantic Ocean, a region characterized by marine stratocumulus clouds. Response of these low clouds to changes in atmospheric greenhouse gases and aerosols is a major source of uncertainty in global climate models.

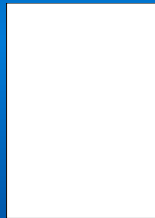




# ARM - CLIMATE RESEARCH FACILITY

- Why Graciosa?

Graciosa Island is small enough and low enough so that it does not influence measurements



It is located north of the other islands, not influenced by aerosol emissions



# ARM - CLIMATE RESEARCH FACILITY

- Site instrumentation include:

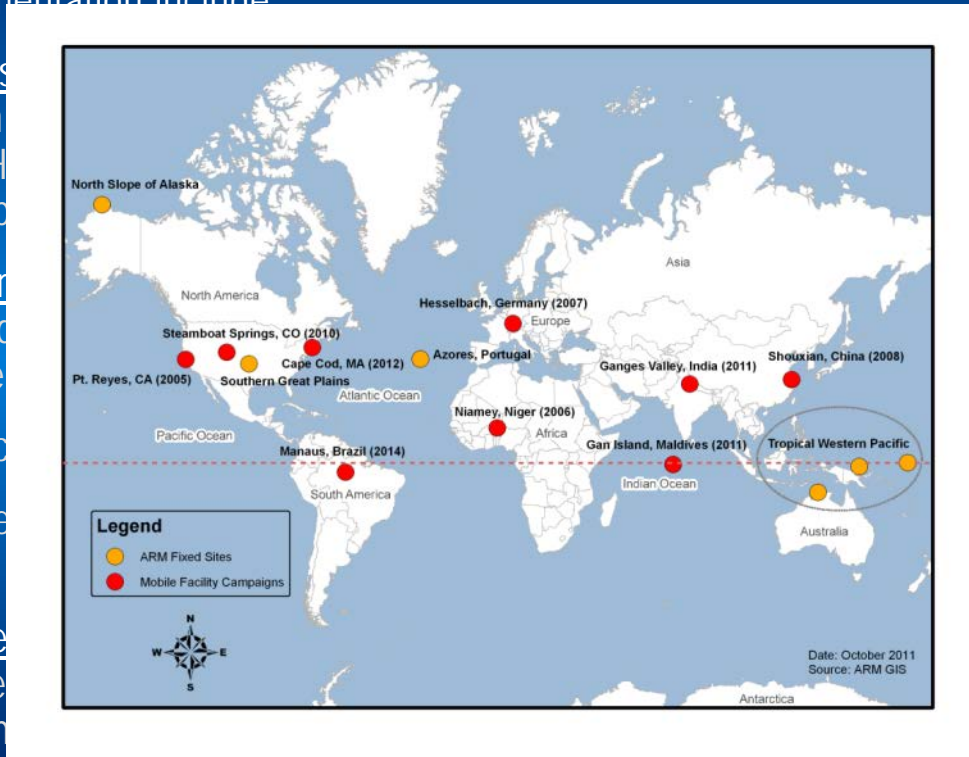
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# ARM - CLIMATE RESEARCH FACILITY

- Graciosa has:
  - The newest technology in service of climate and atmosphere sciences
  - Reliable structure for data calibration and validation
  - Excellence data for international scientific community





# GRA/ESA COLLABORATION

## ESA/SMA Tracking Station



- Missions
  - Tracking launchers from the European Space Port in the French Guyana: Ariane 5 Rocket; Soyuz2 and Vega2
  - Earth Observation (Edisoft Station): Oil spills detection and alert mechanisms; Vessel detection through satellite radar
- Operation
  - Edisoft, SEGMA, GlobalEDA





# GRA/ESA COLLABORATION

## ESA/SMA Tracking Station

- Is part of the ESTRACK network ESA Stations
- Integrates the Ariane Network stations



Located in the Santa Maria Azores Island





# GRA/ESA COLLABORATION

## Galileo Sensor Station In Santa Maria Island

- Life time at least for 20years
- Investment from industry
- Strong commitment of the regional Government of Azores
- Land concession from Regional Government of Azores





# FUTURE

- Support of new space related projects
- Maintenance of the existing projects
- New Partnerships





**Governo dos Açores**

# SPACE TECHNOLOGY IN AZORES REGION

Thank you for your attention!

Obrigada!