

# Briefing on the Importance of Geospatial Information Technologies



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## GEODESY - A GLOBAL SCIENCE ON A RESTLESS PLANET



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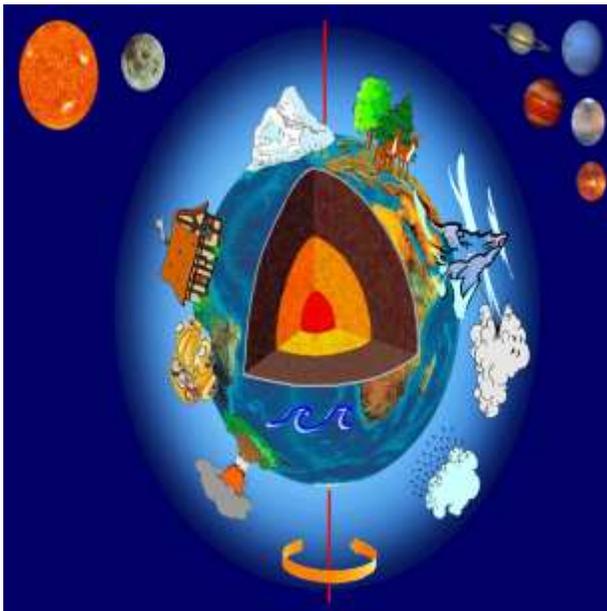
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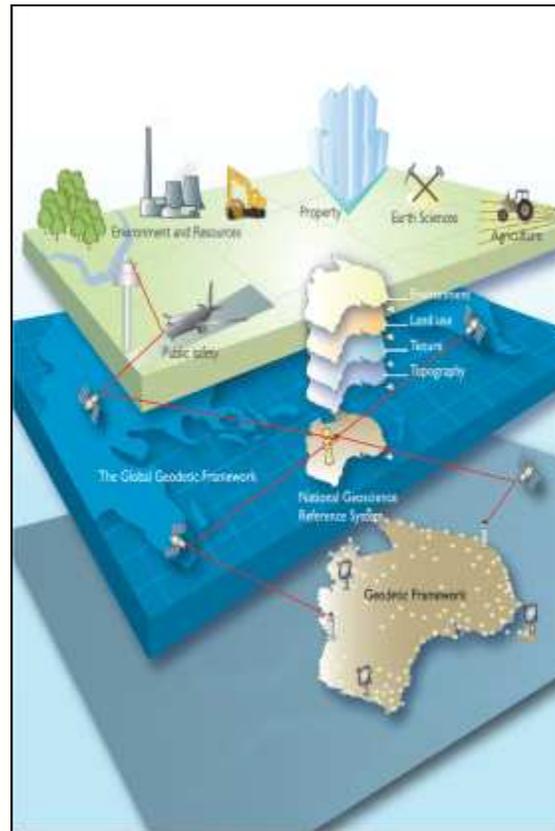
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# Global Geodetic Reference Frame

## Earth System Science



## Geospatial Information



## Societal Applications



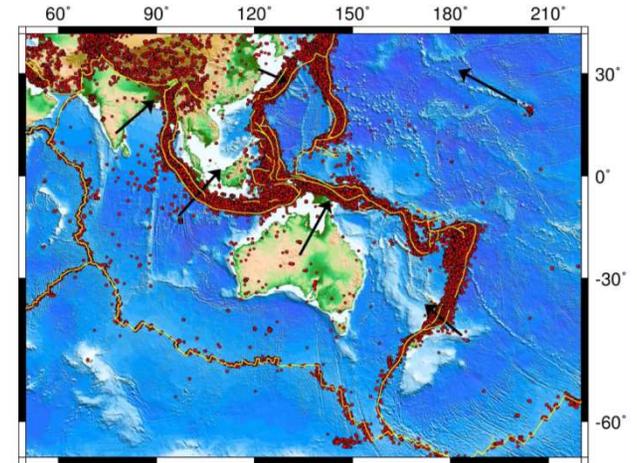
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# Natural hazard and disaster management

Measuring the changing Earth gives us insight into the processes that cause Natural Hazards



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- International Federation of Surveyors (FIG) Pacific Small Island Developing States Symposium, September 2013
- Theme: Policies and Practice for Responsible Governance
- Focused on Climate Change Adaptation for Resilience and Sustainability
- “Confirm the importance of and the need for strengthening and modernising the Geodetic Reference Framework”



Tuvalu meteorological Office Staff affected by tidal inundation.  
A graphic warning about the impacts of sea level rise



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# The basis for geospatial information



PHOTO: MORTEN BRUN



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# UN resolution - Global Geodetic Reference frame

- The UN Committee of Experts on Global Geospatial Information management (UN-GGIM) decided in July 2013 to formulate and facilitate a resolution for a global geodetic reference frame
- UN-GGIM recognises the growing demand for more precise positioning services, the economic importance of a global geodetic reference frame and the need to improve the global cooperation within geodesy



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# Global Geodetic Reference Frame

Presented by  
Milton Saunders  
Manager, Mapping Services  
National Land Agency, Jamaica



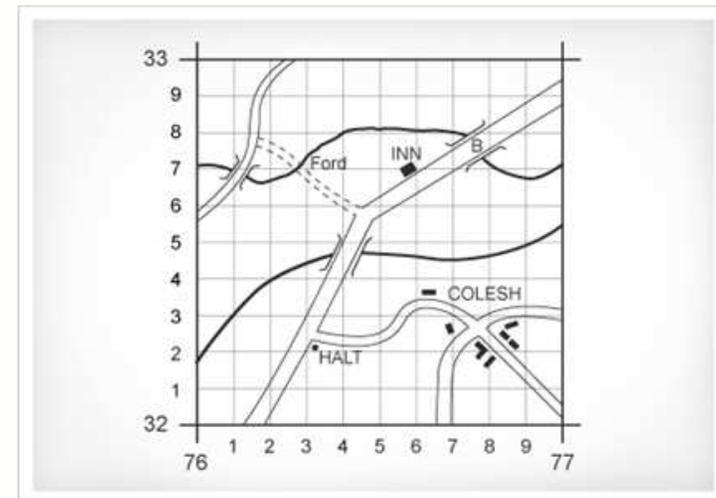
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# GGRF - What is it?

- A global coordinate system
- Allows us to know where we and things on the Earth are.



## Why is it important ?

- Enables a better understanding of the world we live in
- Facilitates better decision making
- Enables much more sustainable management and development of earth resources
- Allows for safer air land and sea navigation
- Enables spatial data interoperability



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# Questions

- Where am I?
- How do I get to where I want to go safely?
- How can I ensure more efficient development of infrastructure within my country?
- How does the earth move and what are the effects on human existence?
- What of sea level rise. Why should I be concerned about this?
- What impact will climate change have on present and future inhabitants of the world.
- How can we mitigate against the negative impacts on the environment.
- How can I ensure more sustainable development of the physical resources in my country?



# The GGRF

- No single country can establish and maintain the global geodetic reference frame alone
- A coordinated global effort is required
- The challenge is even greater in small developing countries
- Globally distributed benefits are the results



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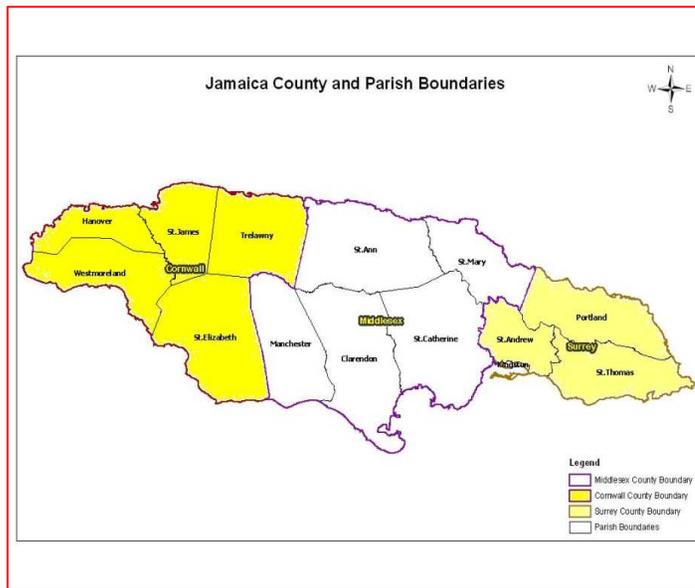
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# GGRF and Jamaica

Jamaica is the largest of the English Speaking Caribbean islands



- Geographical location: Latitude 18° N and Longitude 77° W
- Highest point on the island: 2256 metres (7402 ft.)
- Size: 11,424 km<sup>2</sup> (4,411 square miles)
- Population: Approximately 2.5 million
- East-West/North-South extent: 243 kilometres (146 miles) from east to west and its greatest width from north to south is 80 kilometres (51 miles)



## Beach Resort in Jamaica



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2012 Hurricane Sandy, Jamaica



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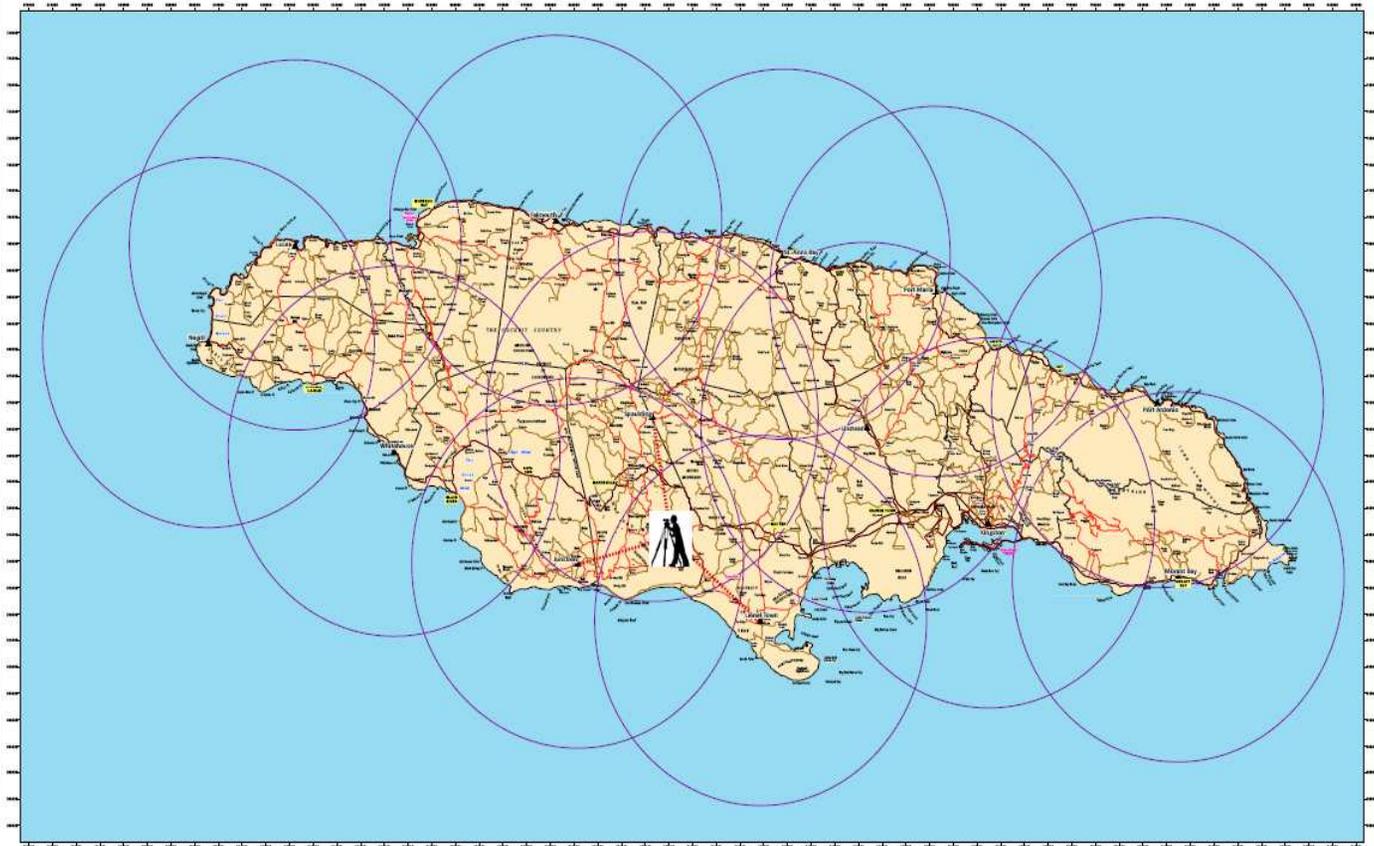
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# GGRF and Jamaica – Where are we?

## Establishment of a Local Virtual Reference System (VRS)

- With the necessity is recognized Jamaica has established a Virtual Reference System.
- Thirteen continuously operating reference sites (CORS) In use since 2013



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# GGRF and Developing Countries - Benefits

Understanding GGRF can help to promote local economic development in developing countries in many ways

- ✦ Associated technology enabling the fast tracking of the registration of land
- ✦ Placing governments in a position to make land available for the landless
- ✦ Elevate the credit value and standard of living of the poor
- ✦ Serving as a catalyst for land development
- ✦ More sustainable use of the physical environment



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## Other Benefits

- Capturing spatial data on assets
- Crustal movement monitoring.
- Positioning
- Tracking
- Navigation

It forms the base for the building a modern National Spatial Data Infrastructure (NSDI) for the country.



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# We must support it

Must be utilized to inform Government policy making (locally and globally) on

- Environment
- Planning
- Land Use
- Economic development
- Data sharing

A coordinated global effort is required



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# The Arctic challenge

*Anne Joergensen, Norwegian Mapping Authority*



PHOTO: BJØRN-OWE HOLMBERG



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# The northernmost geodetic Earth observatory: Ny-Ålesund



PHOTO: BJORN-OWE HOLMBERG



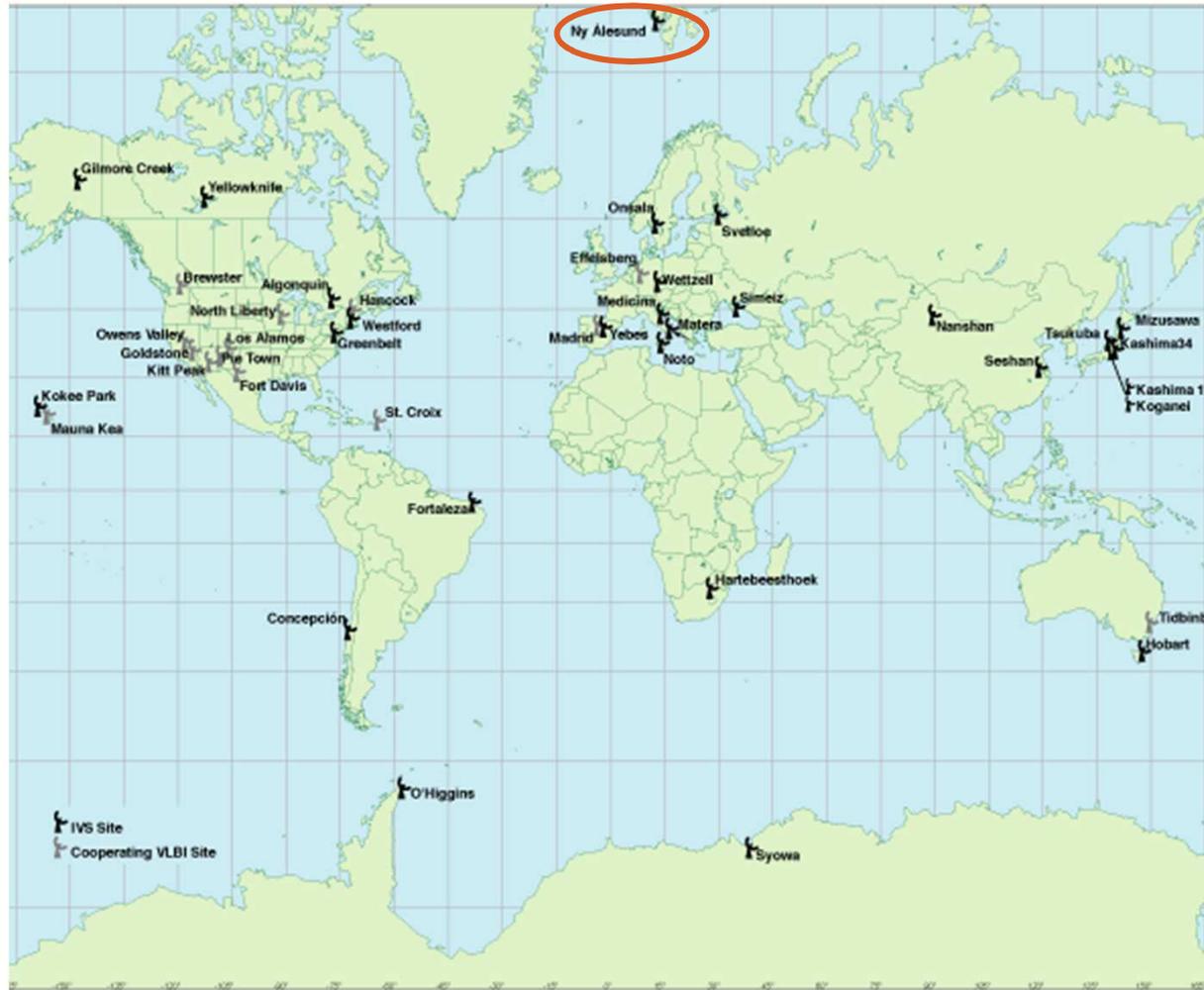
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# Key role in a global collaboration



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# Growing demand for geospatial information and navigation



PHOTO: KONGSBERG MARITIME



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# Precise positioning in engineering constructions



PHOTO: MORTEN BRUN



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# Climate change demands effective decision making



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# Norway's contribution - a new generation of geodetic observatory



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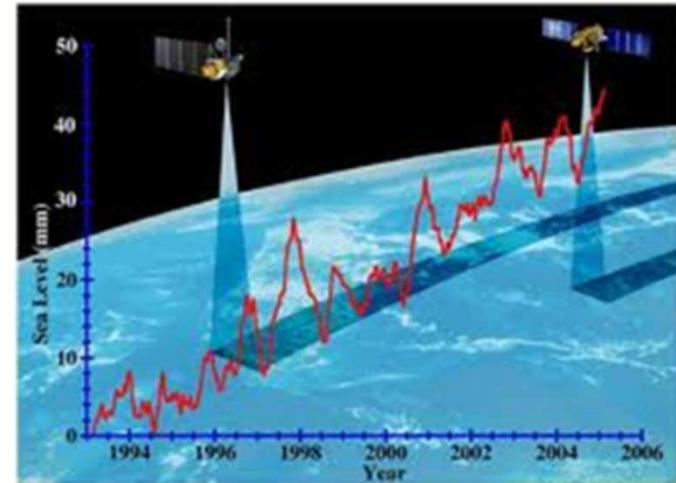
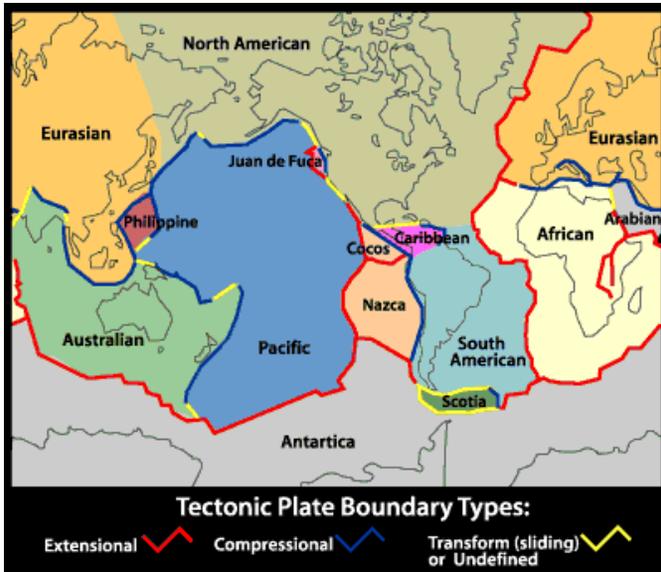
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# Geodesy: Quantification of Earth changes in space and time

## Sea Level Rise

## Plate Motion



## Earthquakes



**Zuheir Altamimi**

IGN, France

Head, International Terrestrial  
Reference Frame Center



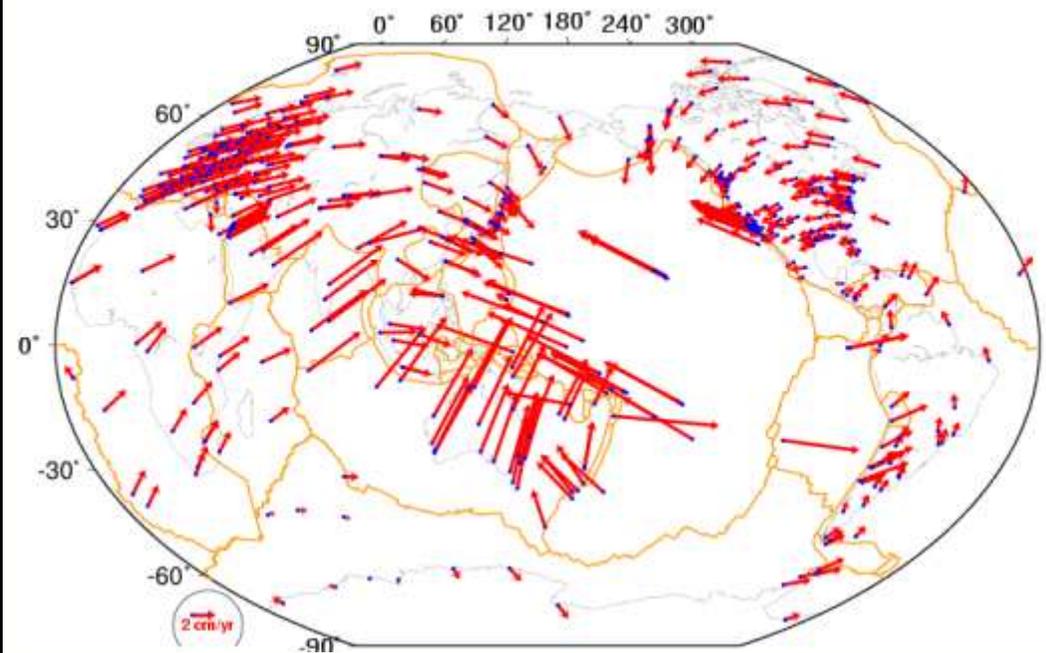
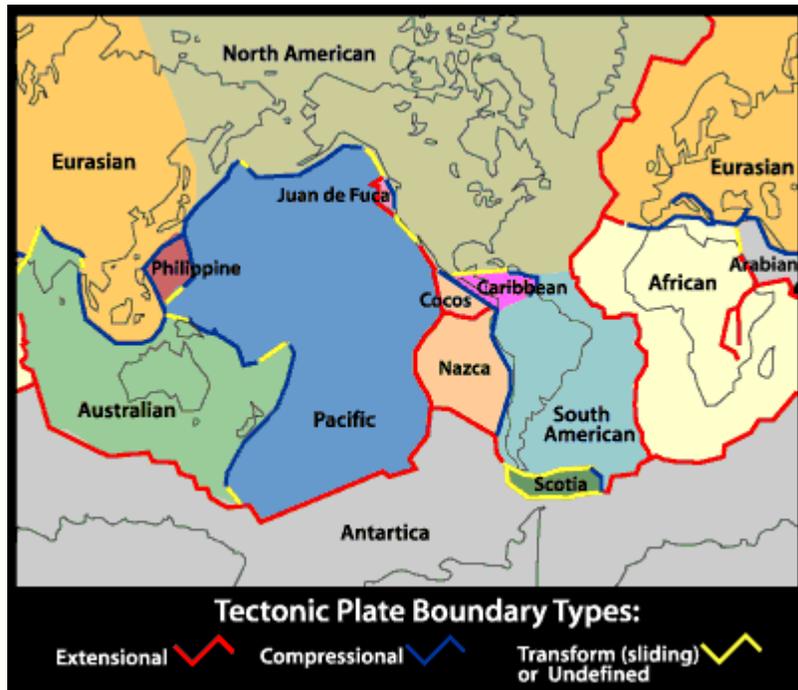
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# Describing & quantifying Tectonic Plate Motion in the Global Geodetic Reference Frame



Source: ITRF Center, hosted by IGN, France



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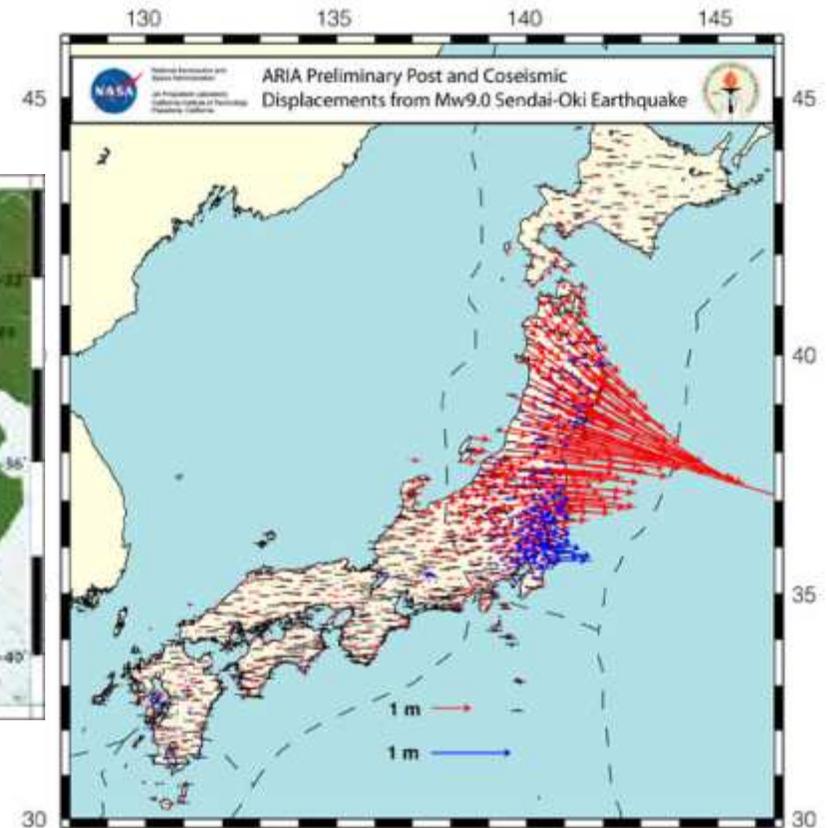
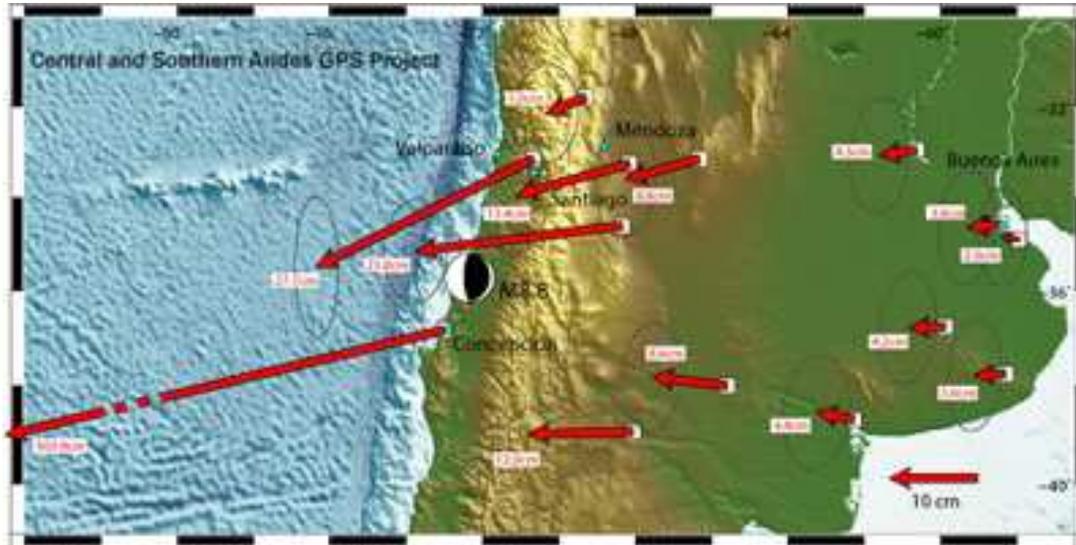
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# Examples of more than 3 meter Earthquake displacements expressed in the GGRF

## 2011 Mw 9.1 Honshu, Japan Earthquake

## 2010 8.8 Chile Earthquake



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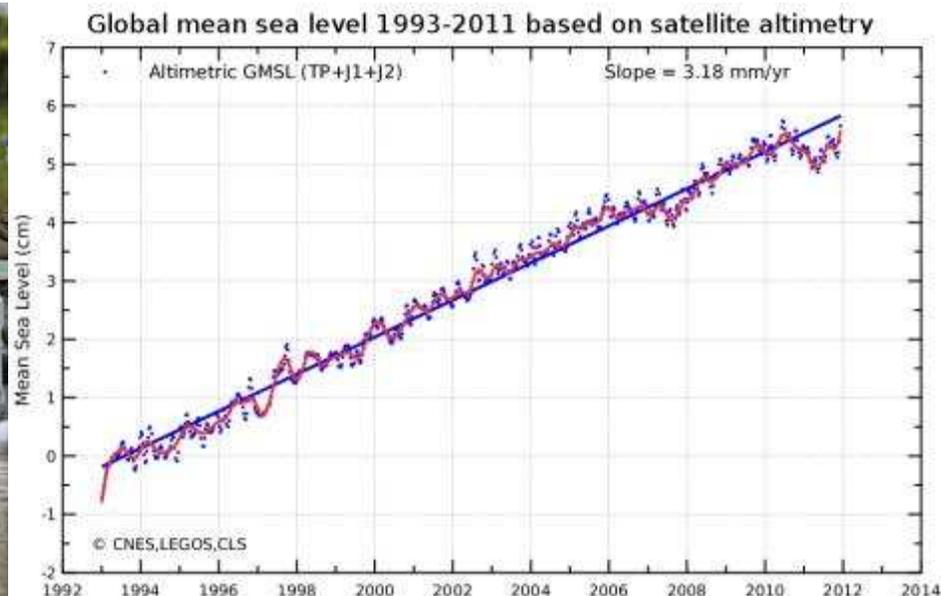
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# Global Mean Sea Level Rise

## Thousands of coastal cities are at risk



**An accurate GGRF is needed to accurately measure sea level rise**

**An error of 1 mm/yr in the GGRF creates Wrong variation in sea-level rise by 1 mm/yr at high latitudes**



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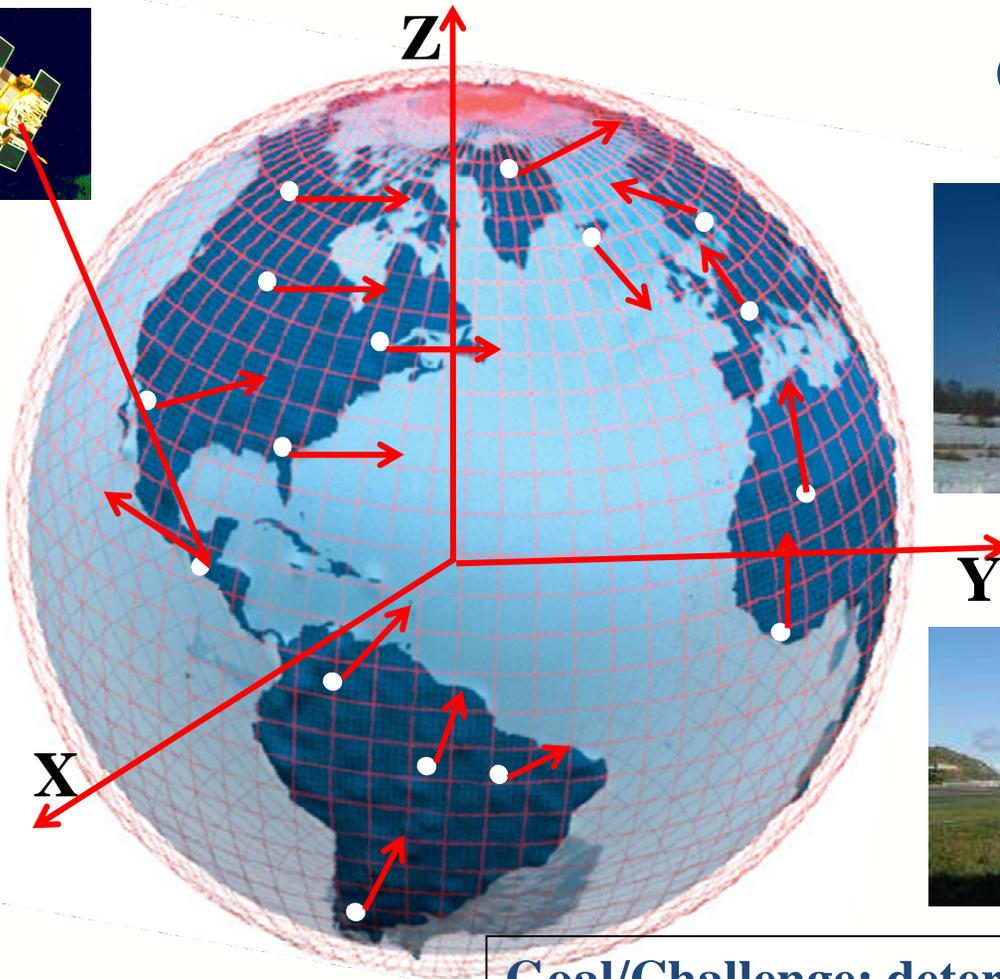
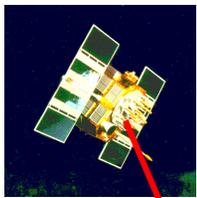
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# The Global Geodetic Reference Frame

## Observing instruments



**Goal/Challenge: determine locations & deformations with an improved precision, Everywhere & Anytime on Earth, to satisfy societal and science requirements**



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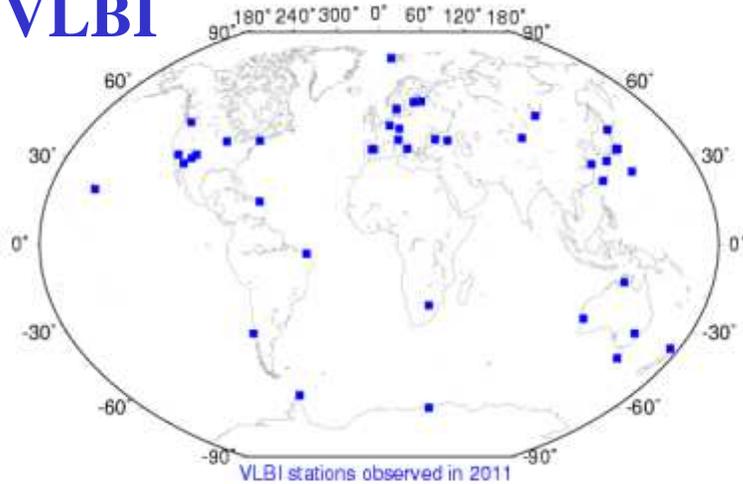
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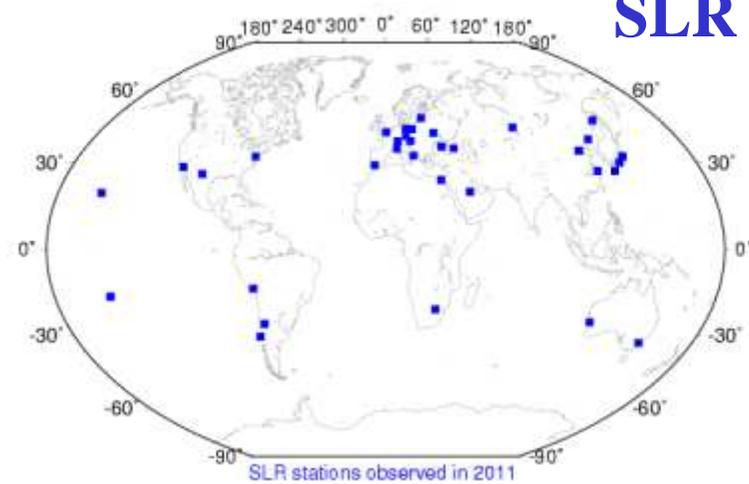
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# Current networks of Geodetic Observatories

**VLBI**

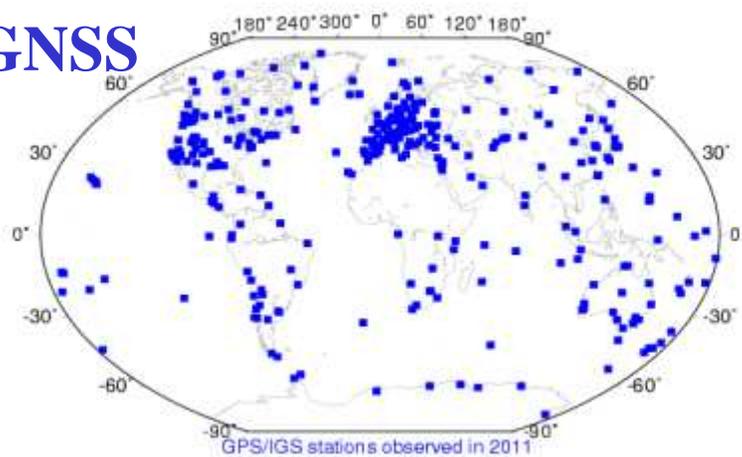


**SLR**

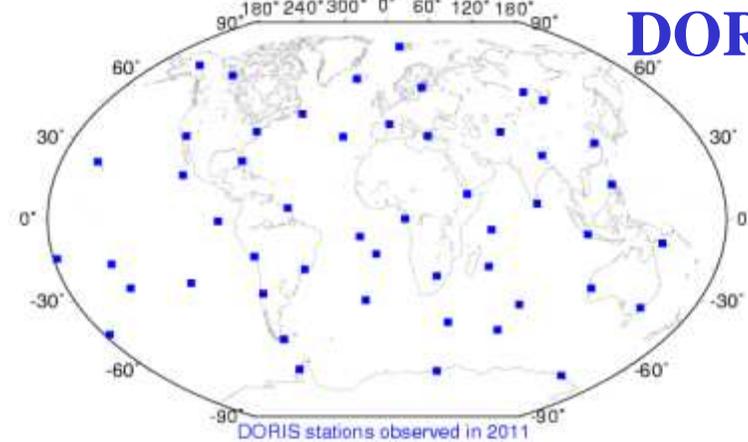


Source: ITRF Center, hosted by IGN, France

**GNSS**



**DORIS**



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# Questionnaire Background

- The concept of a global geodetic questionnaire arose from the Second Session of the United Nations Committee of Experts on Global Information Management in New York in August, 2012
- Questionnaire format and content discussed after the UNRCC forum in Bangkok, October 2012
- Questionnaire distributed globally in December 2012 by the UN
- 100+ responses received (as of August 2013)



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# Key Findings

- 88% of responses indicated that the data, products and services of the international global geodetic community (e.g. ITRF, IGS orbits,...) were either critical or had high importance in their country
- Only 61% of responding countries are willing/able to freely share GNSS data to the global community



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# International Cooperation is key

- Develop a global geodetic roadmap for the GGRF
- Global cooperation in providing technical assistance in geodesy for those countries in need to ensure the development, sustainability and advancement of a GGRF
- Implement open geodetic data sharing
- Improve and maintain national geodetic infrastructure
- Enhanced multilateral cooperation that addresses infrastructure gaps and duplications globally
- Improved Outreach to make the GGRF more visible and understandable to society



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# Conclusion

- Global geodesy is dependent on contributions from nations all around the globe
- No single country can maintain a global geodetic reference frame alone
- We aim to change from the current system where contributions to the development of a global geodetic reference frame are undertaken on a "best efforts" basis to one where they are made through a multilateral collaboration under a UN mandate



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