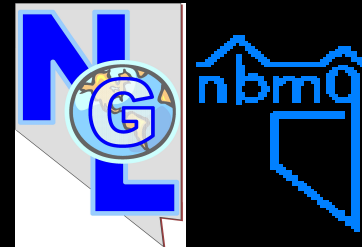


# The Global Geodetic Observing System (GGOS): A Key Component in the Global Earth Observation System of Systems

Hans-Peter Plag  
Nevada Bureau of Mines and Geology, and  
Seismological Laboratory  
University of Nevada, Reno



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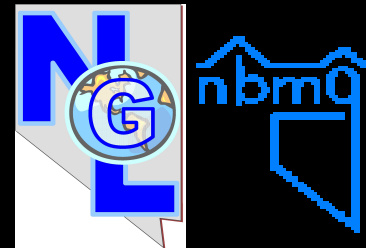
# The Global Geodetic Observing System (GGOS): A Key Component in the Global Earth Observation System of Systems

Please, note:

All statements made during this presentation reflect solely my personal opinion. None of my statements is approved or endorsed by the IAG Executive Committee or can be taken as IAG's official position.



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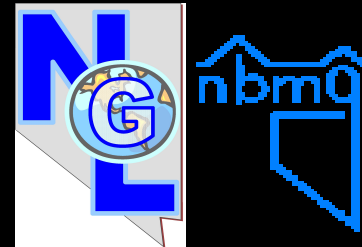


# The Global Geodetic Observing System (GGOS): A Key Component in the Global Earth Observation System of Systems

- GEO and GEOSS: A Brief Introduction
- GGOS: A Brief Introduction
  - GGOS the observing system
  - GGOS: the organization
- GGOS and GEO
- GGOS and GEOSS
- Mutual Benefits IAG/GGOS and GEO/GEOSS



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# GEO and GEOSS: A Brief Introduction

**2002: World Summit on Sustainable Development in Johannesburg, South Africa:**

*Urgent need for coordinated observations of the state of the Earth*

**June 2003: G8 Meeting in Evian:**

*re-emphasizes the importance of Earth Observations*

**July 2003: GGOS is established by IAG and IUGG**

**July 2003: First Earth Observation Summit (EOS-I) in**

**Washington, DC with 33 Countries+EC and 21 international Organisations:**

- Establishes the ad hoc Intergovern. Group on Earth Observation (ad hoc GEO)*
- Task of ad hoc GEO: initial 10 year Implementation Plan by February 2005*

**April 2004: EOS-II in Tokyo, 43 Countries + EC plus 25 international organisations:**

- Adopts the 'Framework Document', which defines nine societal benefit areas for Earth observations*

**IAG joins GEO as Participating Organisation**

**February 2005: EOS-III in Brussels:**

- Adopts the 10 Year Implementation Plan for a Global Earth Observation System of Systems (GEOSS)*
- Establishes the Group on Earth Observation (GEO) with the task to implement GEOSS*

# **GEO and GEOS: A Brief Introduction**

*Vision for GEOS is to realize a future wherein decisions and actions for the benefit of humankind are informed by coordinated, comprehensive, and sustained Earth observations and information*

# GEO and GEOS: A Brief Introduction



UN Millennium  
Development Goals

Keep the promise  
Millennium Development Goals

2015

## THE Global Earth Observation System of Systems



## Millennium Development Goals for 2015:

- Eradicate Extreme Poverty and Hunger
- Achieve Universal Primary Education
- Promote Gender Equality and Empower Women
- Reduce Child Mortality
- Improve Maternal Health
- Combat HIV/AIDS, Malaria and other Diseases
- Ensure Environmental Sustainability
- Develop a Global Partnership for Development

# GEO and GEOSS: A Brief Introduction

Assessment function of GEO:



GEO: Assessment of current state of the Earth observation system and future needs



IPCC



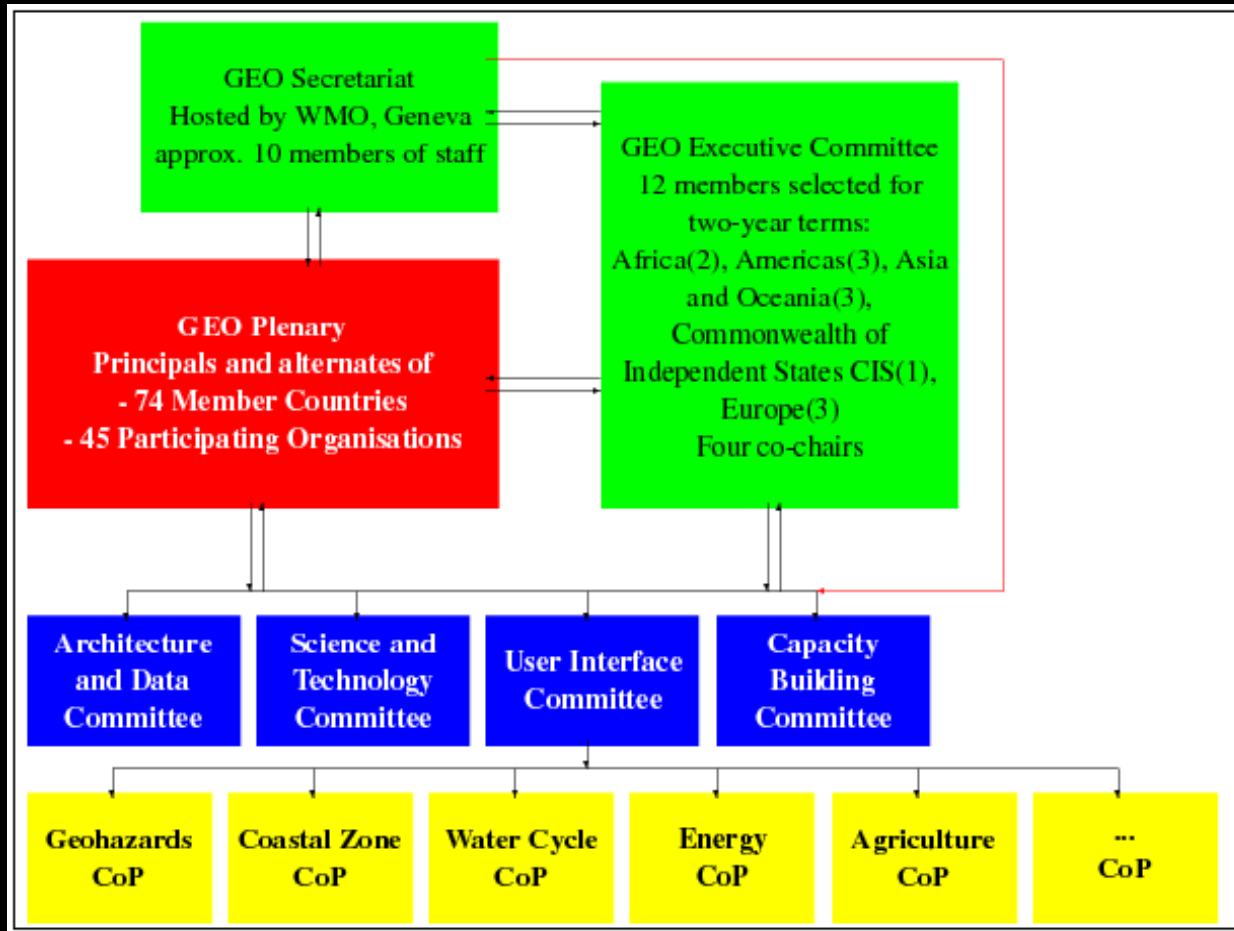
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



IPCC: Assessment of current state of knowledge with respect to climate change

# GEO and GEOSS: A Brief Introduction

## Structure and approach of GEO:



## GEO Work Plan:

- Currently: 2007-2009;
- 73 Tasks and Task Teams;
- linked with the Committees;
- Frequent update of Task Sheets

## Activities:

- Earth Observation Summits
- Annual Plenary Meetings
- ~ three EC meetings per year
- ~ three meetings of each committee
- Workshops, conferences, symposiums
- Task team activities
- CoPs activities

## Implementation of GEOSS:

- GEOSS Common Infrastructure (web-based portal; clearinghouse, information and services; registries, standards and best practices);
- GCI one year evaluation phase just started;
- Architecture Implementation Pilots (AIP): CfP in preparation



# GGOS: A Brief Introduction

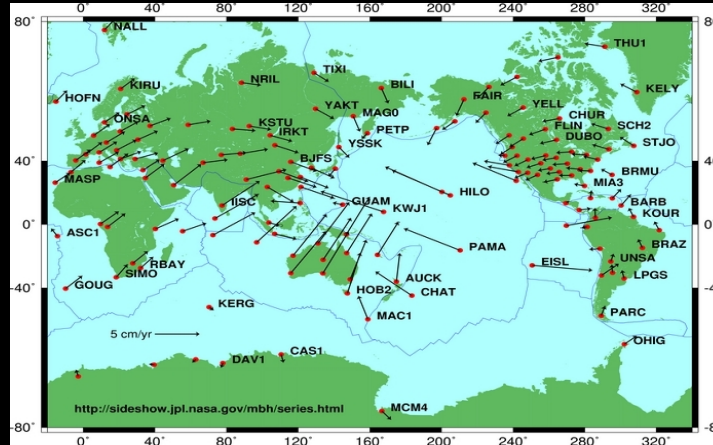
IUGG 2007:

**GGOS is the Observing System of the International Association of Geodesy (IAG): *The Global Geodetic Observing System (GGOS) works with the IAG components to provide the geodetic infrastructure necessary for monitoring the Earth system and for global change research.***

“GGOS” has two meanings:

- (1) The Observing System
- (2) The Organization

# GGOS: The Observing System



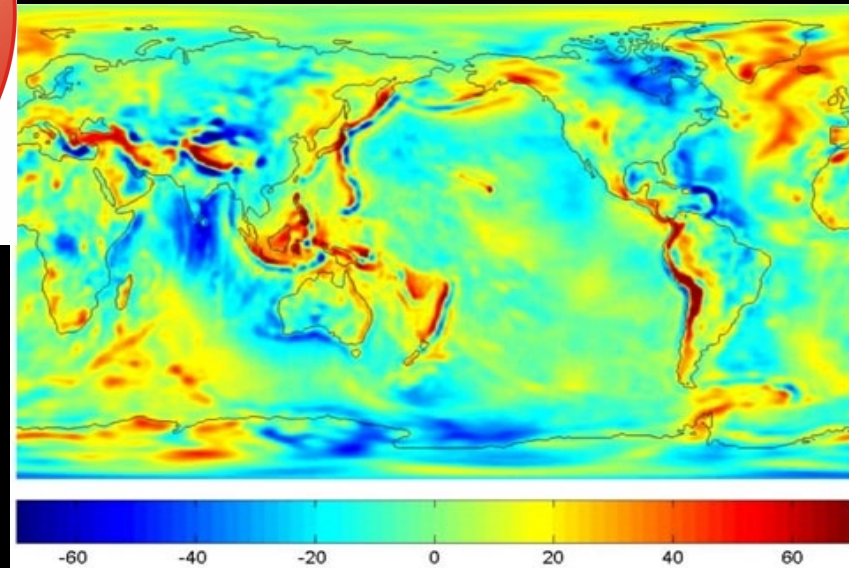
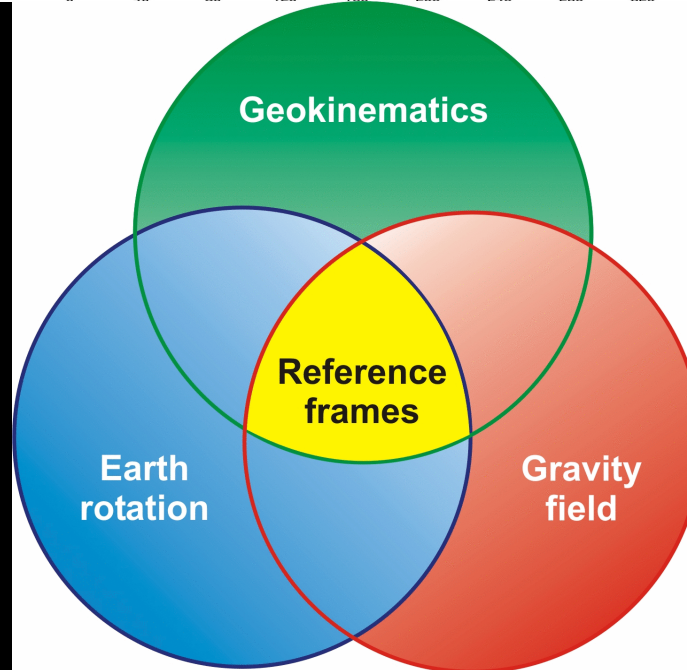
## The 'three pillars of geodesy':

- Earth's Shape (Geokinematics)
- Earth's Gravity Field
- Earth Rotation

## Output:

- Reference Frame
- Observations of the Shape,
- Gravitational Field and Rotation of the Earth

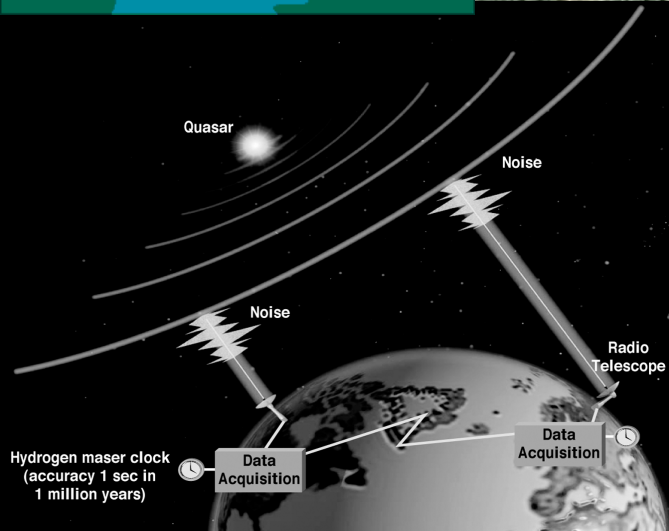
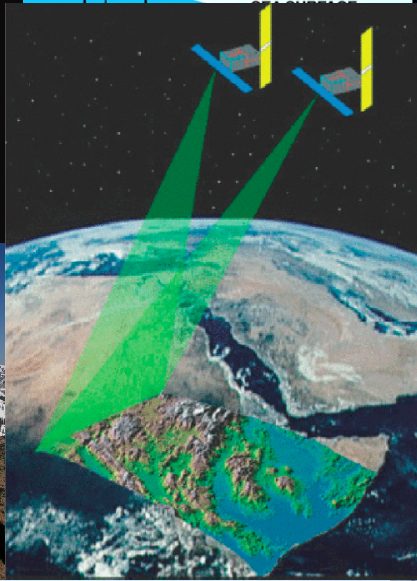
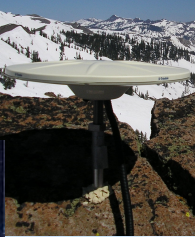
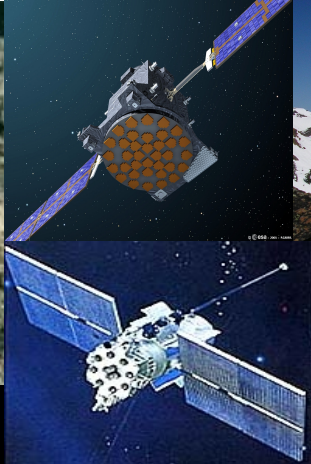
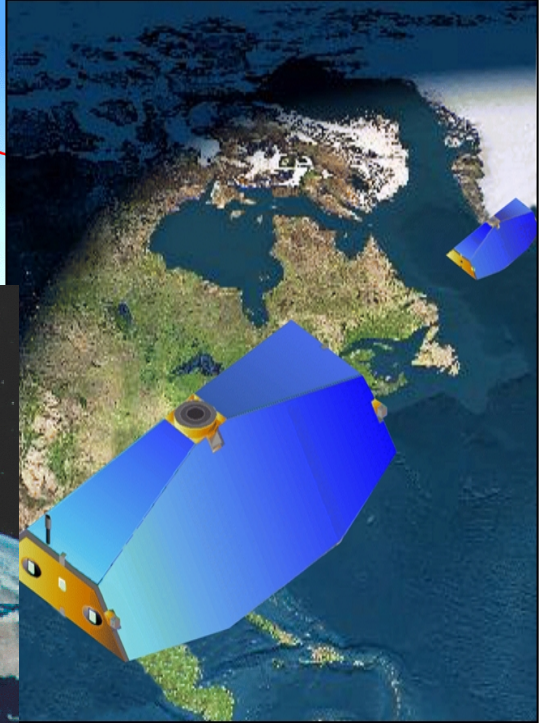
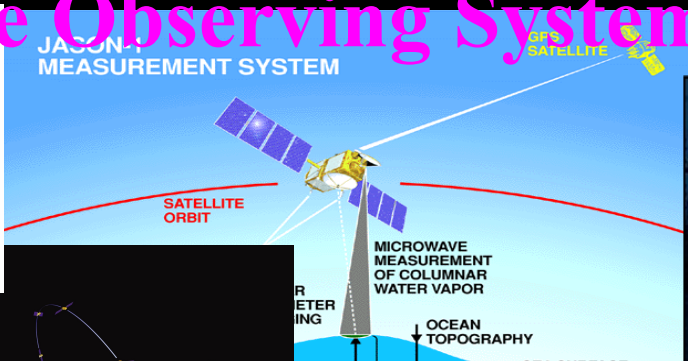
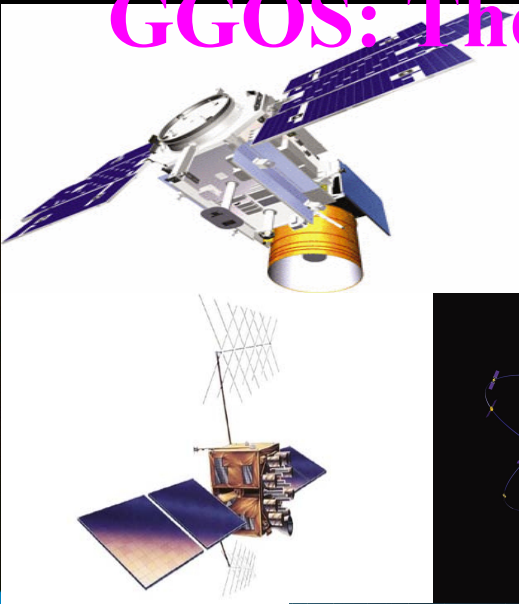
GGOS observes important characteristics of the Earth System



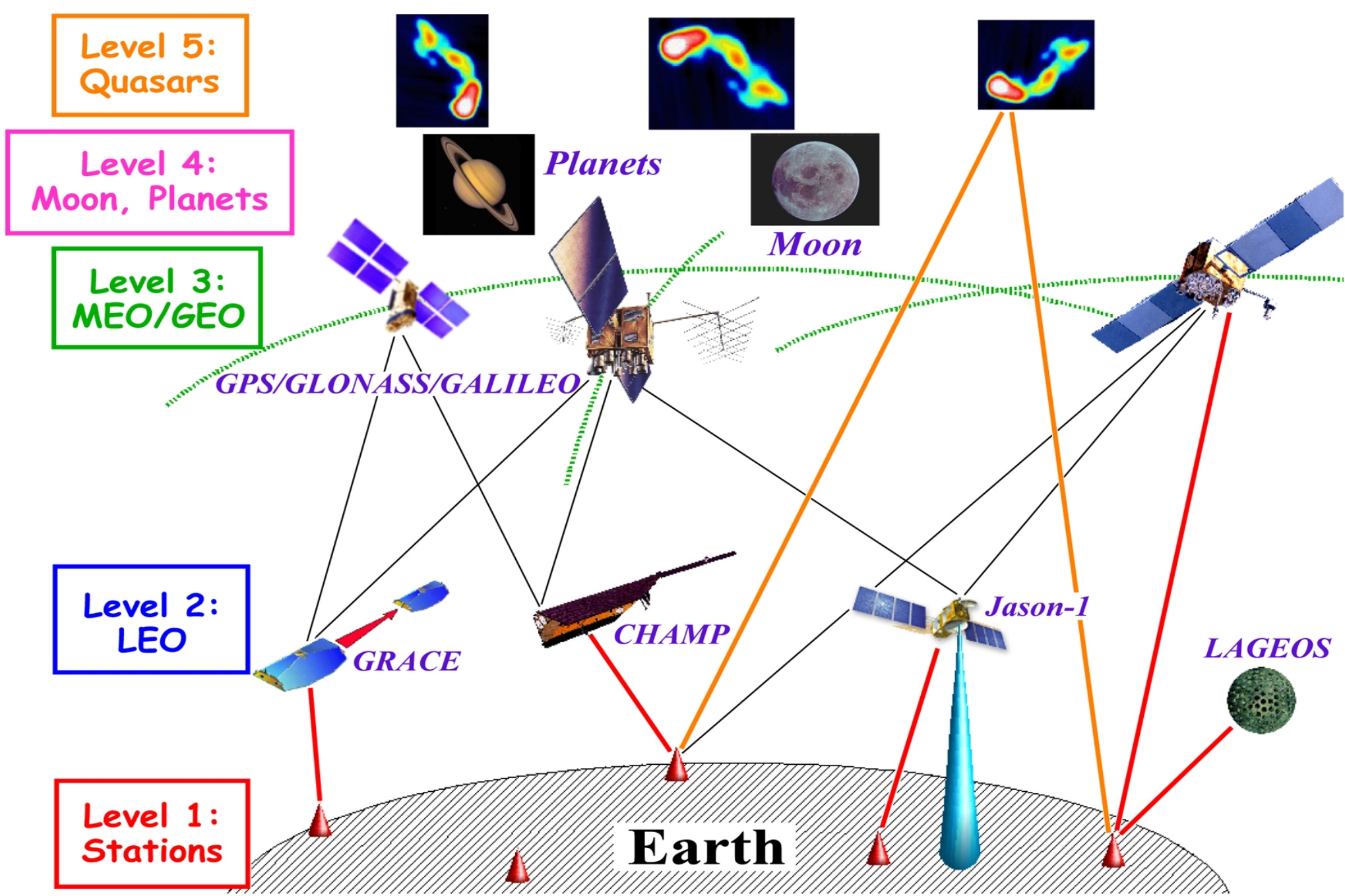
GGOS observes the temporal variation of the Earth shape, gravity field, and rotation.



# GGOS: The Observing System



# GGOS: The Observing System



# GGOS: The Organization

## GGOS Shareholders

Geometry

**IERS:** International Earth Rotation and Reference Systems Service

**IGS:** International GNSS Service

**IVS:** International VLBI Service

**ILRS:** International Laser Ranging Service

**IDS:** International DORIS Service

Gravimetry

**IGFS:** International Gravity Field Service

**BGI:** Bureau Gravimetrique International

**IGeS:** International Geoid Service

**ICET:** International Center for Earth Tides

**ICGEM:** International Center for Global Earth Models

Ocean

**PSMSL:** Permanent Service for Mean Sea Level

**IAS:** International Altimetry Service (in preparation)

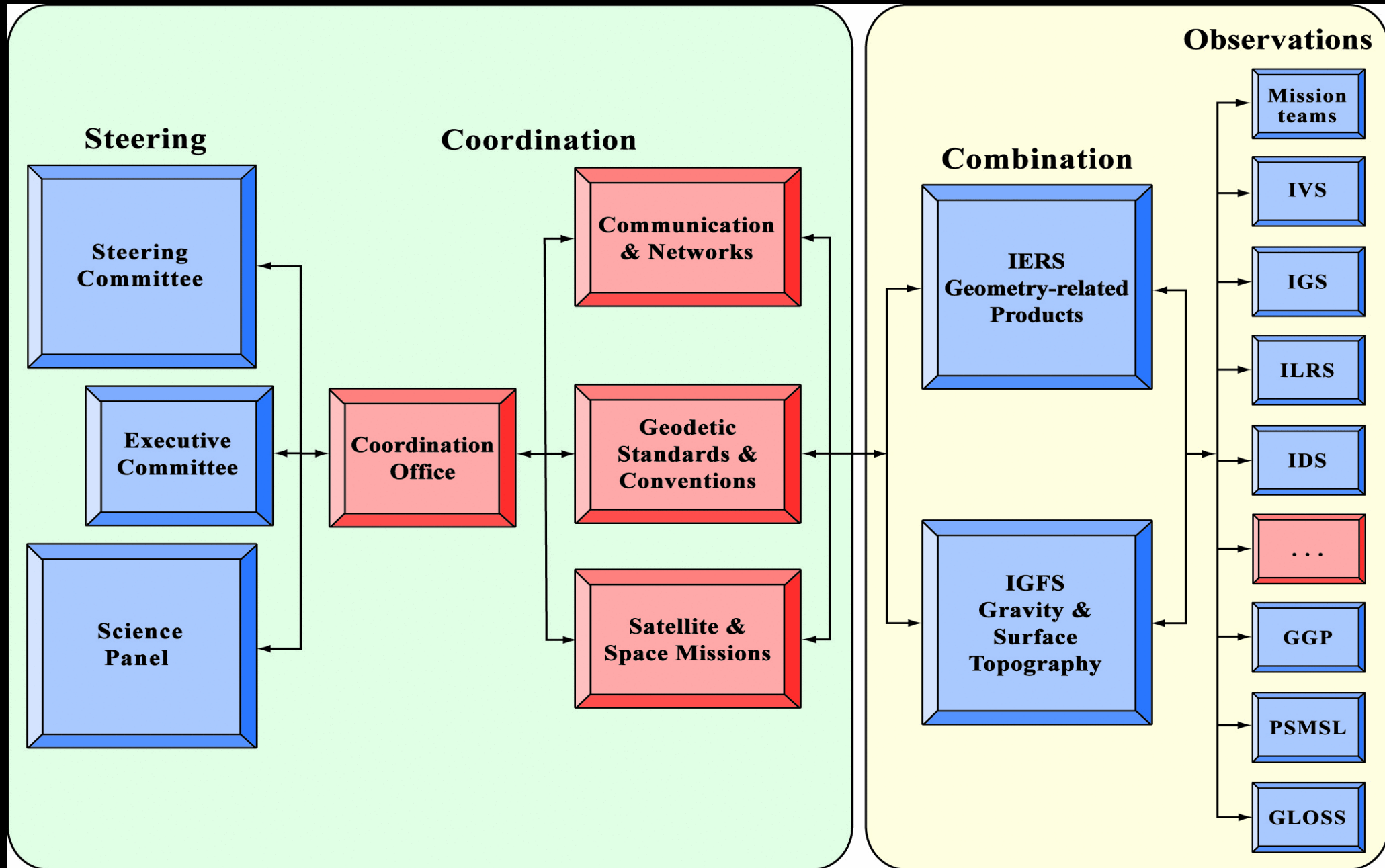
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**BIPM:** Bureau International des Poids et Mesures

**IBS:** IAG Bibliographic Service

# GGOS: The Organization

## Structure of GGOS



# GGOS: A Brief Introduction

GGOS observes with many techniques different parameters of one unique Earth system.

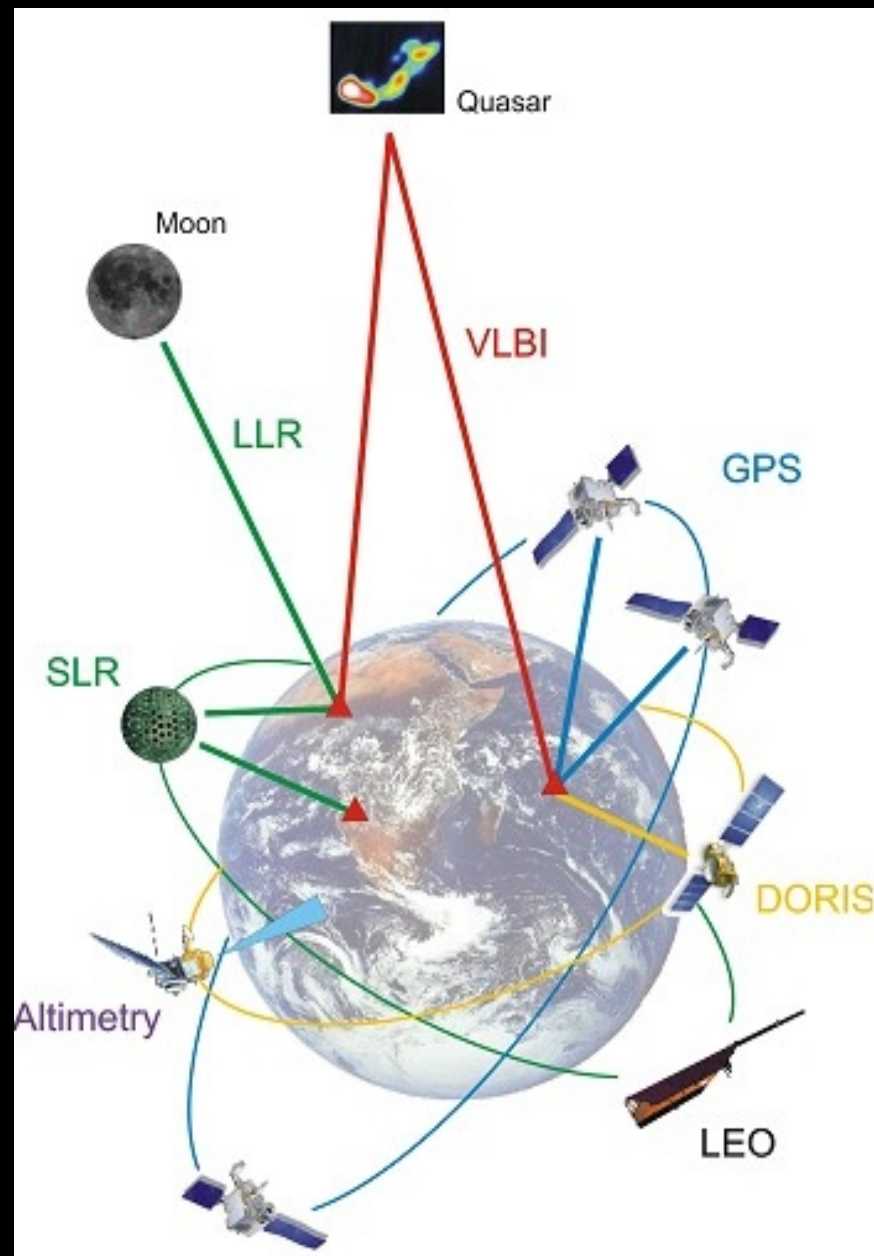
GGOS aims to extract (small) signals of global change and Earth system processes signals from the observations: **accuracy of  $< 1$  ppb.**

Challenges:

- Consistency of the three pillars;
- Global change and geohazards-related effects are small;
- Reference frame needs to be available anywhere, any time.

Solution: Integration of

- Systems,
- Observations,
- Analysis, and
- Geodetic and physical models (conventions)



# GGOS and GEO

## Link between IAG/GGOS and GEO

IAG Participating Organization in GEO

IAG Lead Organization for one GEO Task

IAG delegated representation in GEO to GGOS

GGOS Working Group on GEO Relations (*Chair: H.-P. Plag*)

- Members: Delegates to GEO Committees (two or more per Committee)

Mission:

- promote the work of GGOS and IAG in GEO
- foster the contribution of GGOS to GEOSS
- ensure adequate representation of GGOS and IAG in all GEO Committees and the relevant Teams of GEO Work Plan Tasks
- facilitate informed decision by GEO with respect to geodetic issues,
- ensure effective information flow between GGOS/IAG and GEO;
- emphasise interoperability of GGOS with GEOSS as a prerequisite for utilizing the full benefit of GGOS for Earth observation.



# GGOS and GEO

## Contribution to GEO Work Plan

### **GEO: Task AR-07-03: Global Geodetic Reference Frames**

- (1) Understand the user requirements of the nine SBAs in terms of access to a global reference frame (accurate positions) AND geodetic observations;*
- (2) Improve the framework conditions for the maintenance of the geodetic infrastructure, support for transition research to operational.*

(Point of Contact: H.-P. Plag)

### **Main Deliverable of the Task:**

- The Global Geodetic Observing System: Meeting the Requirements of a Global Society on a Changing Planet in 2020 (**GGOS 2020**)
  - Deliverable of Task AR-07-03
  - Community study aimed at (1); five chapters on observational requirements;
  - Scientific rationale for the future development and implementation of GGOS

-

# GGOS and GEO

## Contribution to Communities of Practice (CoP)

Geohazards CoP: GEO/GGOS Workshop: *The GGOS Contribution to GEOSS and an Observing System for Geohazards and Disaster Prevention*, November 5-6, 2007, Frascati, Italy.

Coastal Zone CoP (CZCP): GEO Workshop Series: *GEOSS Support for Decision-Making in the Coastal Zone: Managing and Mitigating the Impacts of Human Activities and Natural Hazards in the Coastal Zone*  
First Workshop: *Observing System Requirements for Managing and Mitigating the Impacts of Human Activities and Coastal Inundation in the Mediterranean Region*, June 9-13, 2008, Athens, Greece.

Water Cycle CoP: GEO/GGOS sponsored IGCP 565 Project: *Developing the Global Geodetic Observing System into a Monitoring System for the Global Water Cycle*, First Workshop: December 11, 2008, San Francisco.

# GGOS and GEOSS

## GEO/GGOS Workshop Conclusions:

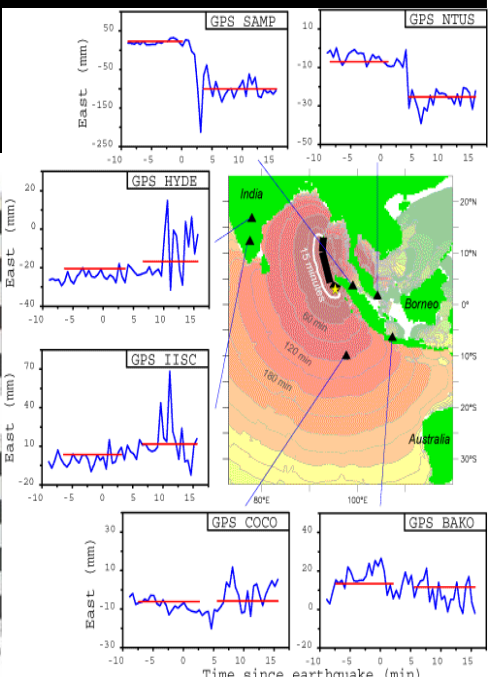
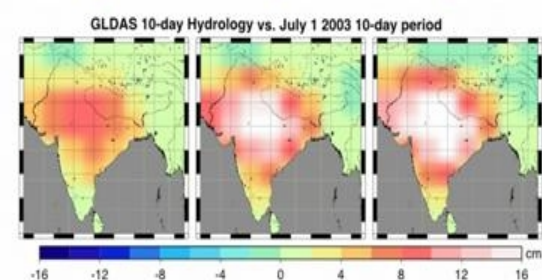
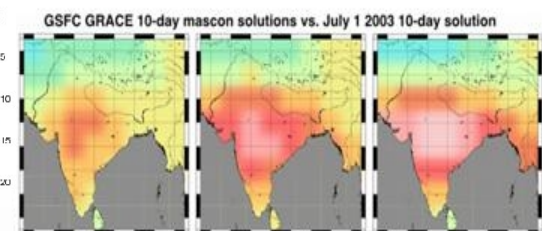
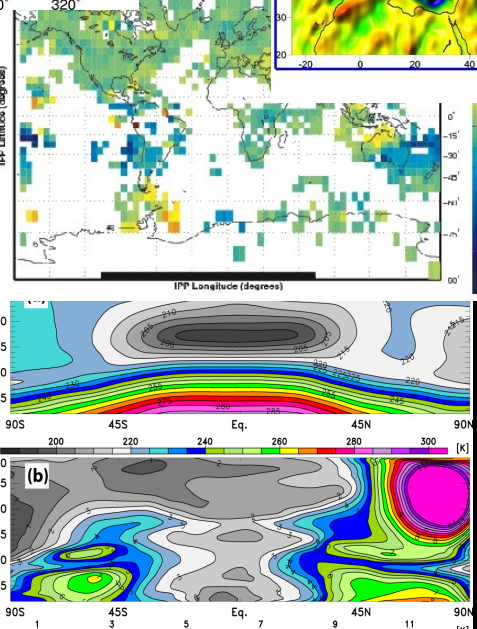
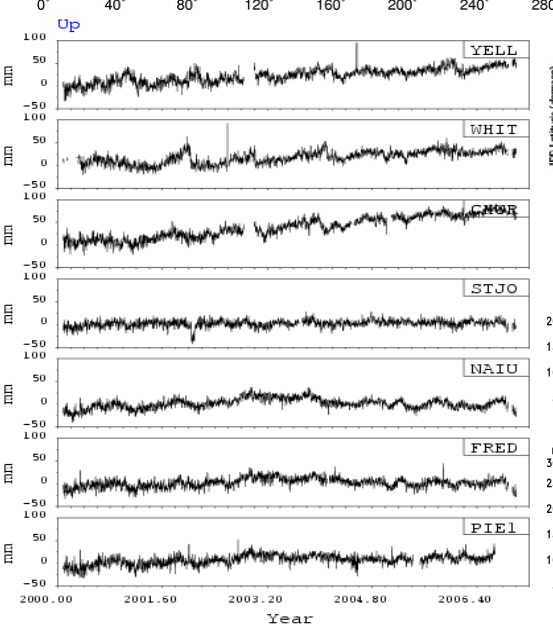
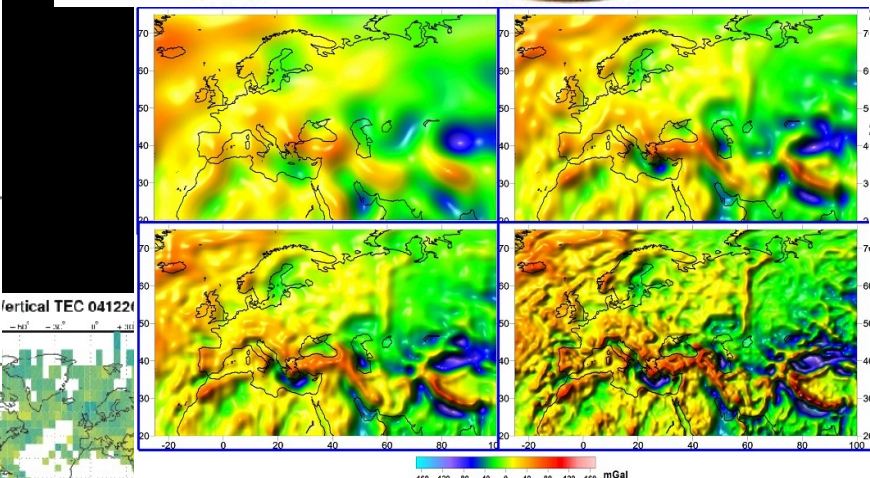
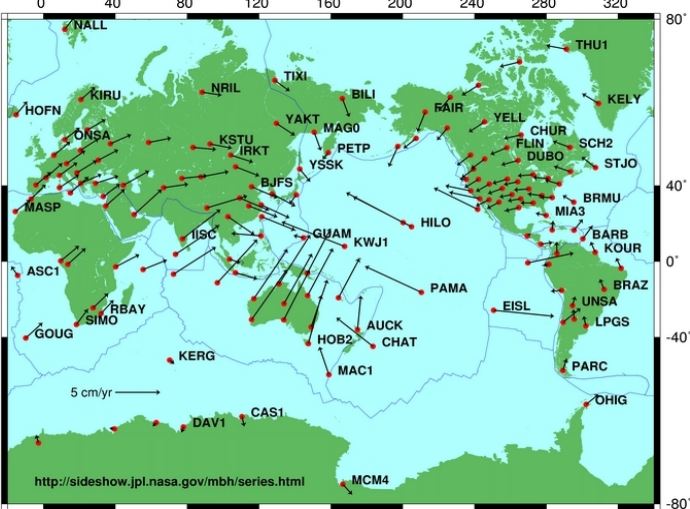
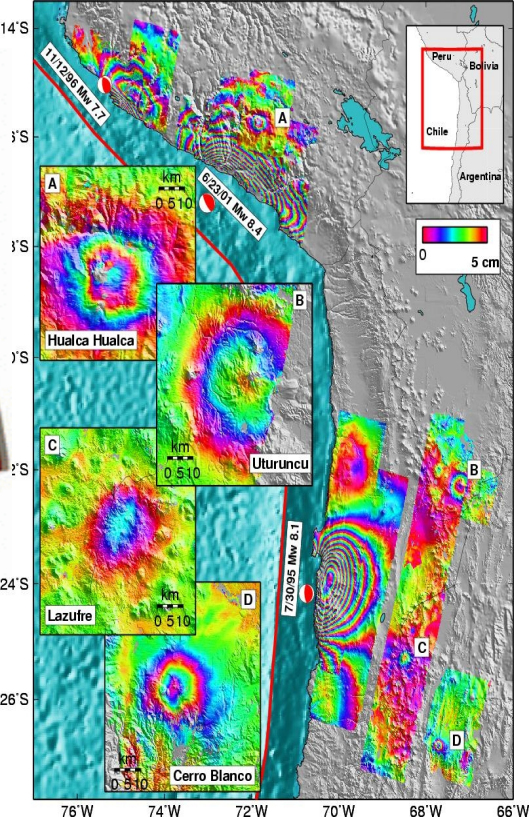
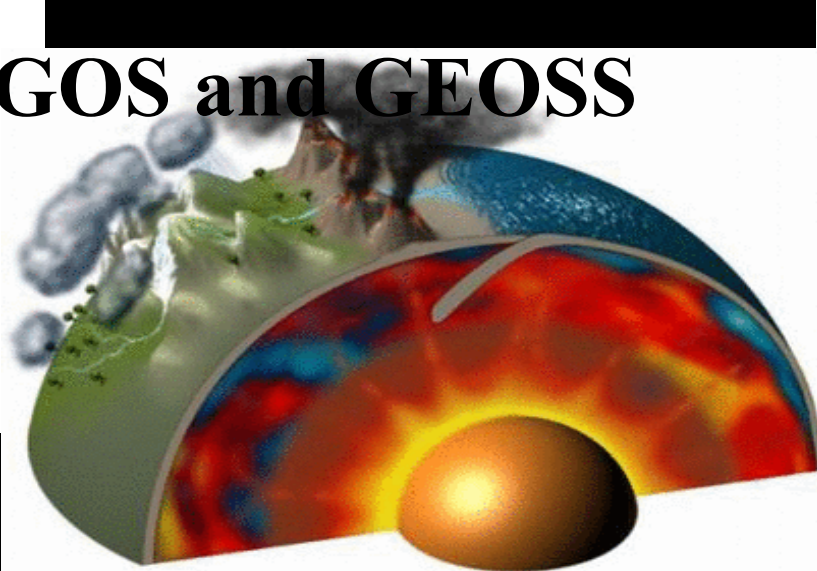
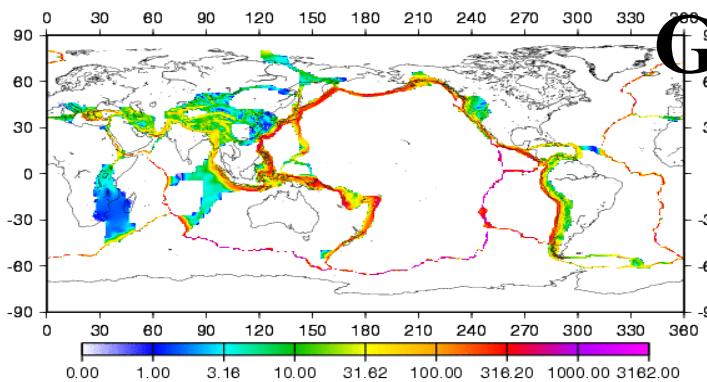
The global geodetic reference frames, ITRF and ICRF, and Earth rotation parameters are indispensable for Earth observations and their accuracy is a key limiting factor.

Global geodetic infrastructure, in particular GGOS, is a core element in the global Earth observation system of systems

### With respect to Geohazards:

- **Geodetic observations and products play a crucial role** in all aspects of disaster prevention and mitigation, including risk assessment and the monitoring of hazardous situations for early warning systems.
- **Geodetic Observations** have:
  - already transformed our **understanding of geohazards,**
  - started to **contribute to early warning,**
  - opened up **new scientific frontiers.**

# GGOS and GEOSS



# Mutual Benefits IAG/GGOS and GEO/GEOSS

## **IAG/GGOS provide:**

- crucial expertise;
- the metrological basis for GEOSS;
- observations pivotal for many GEOSS services and applications.

## **GEO provides:**

- a link to experts in other fields relevant for GGOS;
- a unique link to users on all levels, in particular global;
- an intergovernmental frame for promotion of GGOS/IAG and links to important providers.

## **GEOSS provides:**

- an opportunity to disseminate GGOS products;
- incentive to improve interoperability of IAG Services;
- a technological framework for the GGOS implementation.