



# GEO Work Plan Tasks

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## Group on Earth Observation (GEO) Work Plan 2009-2011 (Version 20090113)

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### GEO Sub-Task DA-09-02c: Task Sheet and Auxiliary Material

#### Updated Task Sheet:

- Task definition
- Motivation
- Outputs
- Planned Activities
- Progress of Activities
- Resources
- Architecture
- User Engagement
- Science and Technology needs
- Capacity Building
- Participation

<b>Sub-task Number:</b>	DA-09-02c
<b>Sub-task Title:</b>	Global Geodetic Reference Frames
<b>Overarching Task:</b>	Data Integration and Analysis
<b>Area:</b>	DATA MANAGEMENT
<b>Relevant Committee:</b>	ADC
<b>Related Targets:</b>	Availability of a sufficiently accurate and stable global reference frames is a mandatory prerequisite for most Earth observations and directly required for achieving the Strategic Goals 2, 3, 11, and 13.

#### Sub-task Definition (as given in the 2009-2011 Work Plan):

Ensure the availability of accurate, homogeneous, long-term, stable, global geodetic reference frames as a mandatory framework and the metrological basis for Earth observation. Identify steps towards such consistent high-accuracy global geodetic reference frames for Earth observation and the observing systems contributing to GEOSS.

#### Leads:

LAG, Point of Contact: Hans-Peter Plag ([hpplag@unr.edu](mailto:hpplag@unr.edu))

#### Individual contributions:

- LAG/GGOS: See report ...
- CEOS
- UN ECA: See report ...
- Mailing list
- Task AR-07-03

Last edited 16 June 2009

In case of problems, mail to [Web Administrator](#).

# Task sheet information and additional work documentation available at: <http://www.geo-tasks.org/da0902c>

*Recalling:*

## **Task DA-09-02c: Global Geodetic Reference Frames**

“Ensure the availability of accurate, consistent, homogeneous, long-term stable, global geodetic reference frames as a mandatory framework and the metrological basis for Earth observation.”

*Goals:*

- - **User requirement coordination:** Establish a comprehensive GEOSS database of user requirements concerning georeferencing and geodetic reference frames by identifying, describing and establishing links to relevant user communities in the nine societal benefit areas and conducting appropriate surveys.
- - **Georeferencing:** Ensure the availability of appropriate global geodetic reference frames for GEOSS.

# Membership and Contributors:

POC: IAG/GGOS (Hans-Peter Plag)

Lead organization: IAG/GGOS

Current contributions:

- Germany
- CEOS
- IAG/GGOS
- Korea
- Italy
- United Nations Economic Commission for Africa (ECA)
- Portugal (since 2009)
- USA (since 2009)

Additional contributions:

- Through GGOS 2020: more than 40 Experts  
(including IGOS-P, GLOSS, GOOS, GCOS)

*Deliverable related to the first goal (User requirement coordination):*

**Community report:** “The Global Geodetic Observing System: Meeting the Requirements of a Global Society on a Changing Planet in 2020”

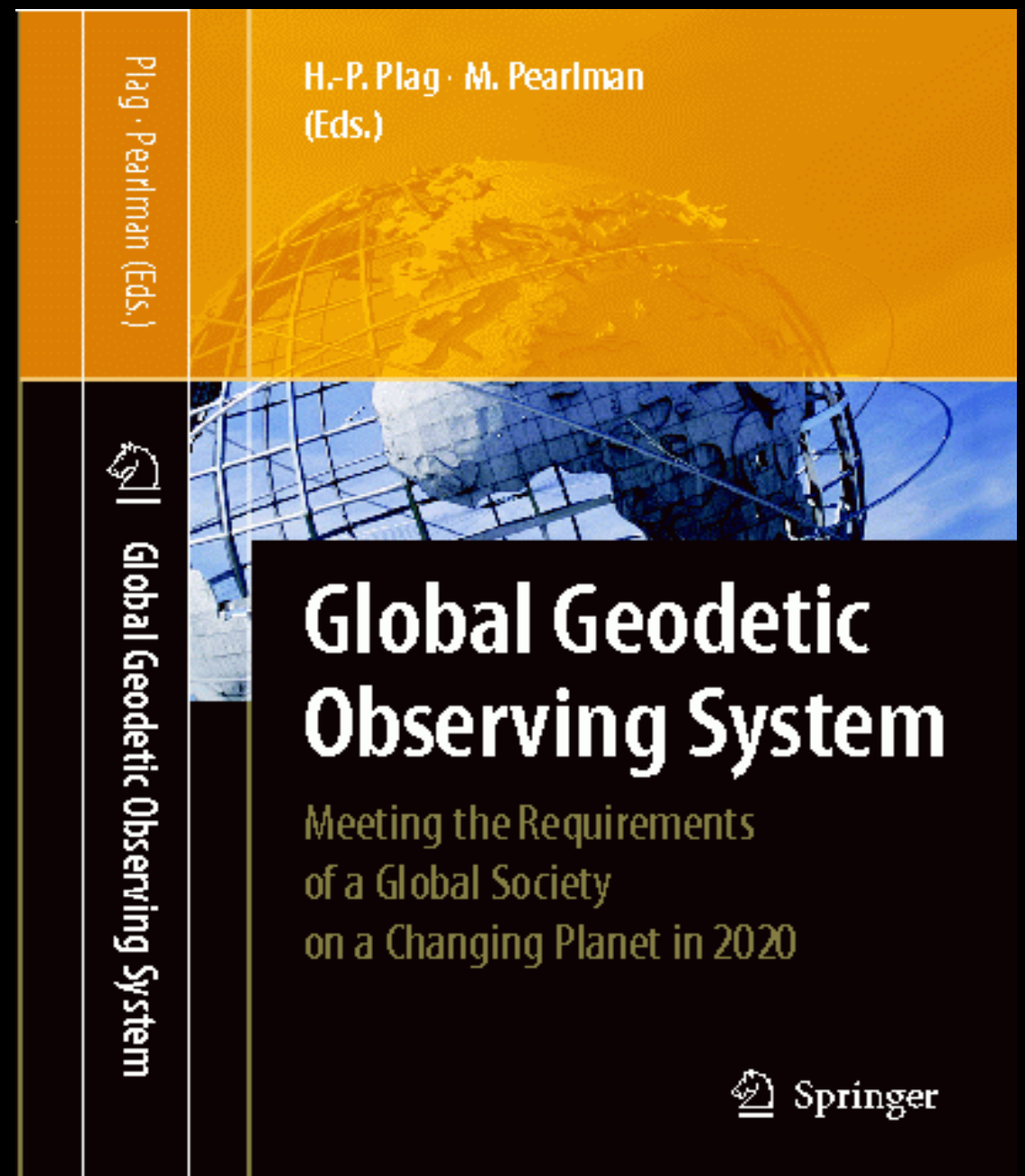
**Deliverable in 2009:**

GGOS 2020 Book, published by Springer

Chapter 2-7: User needs and requirements

Chapter 5: Requirements of the nine GEO SBAs

Chapter 9:  
System design and infrastructure



# GGOS 2020 Recommendations:

(<http://www.geo-tasks.org/da0902c> or <http://www.iag-ggos.org/ggos2020/>)

# GGOS 2020 Recommendations:

(<http://www.geo-tasks.org/da0902c> or <http://www.iag-ggos.org/ggos2020/>)

## Recommendation 4.1 (Promotion of ITRS and maintenance of ITRF):

*Recognizing that*

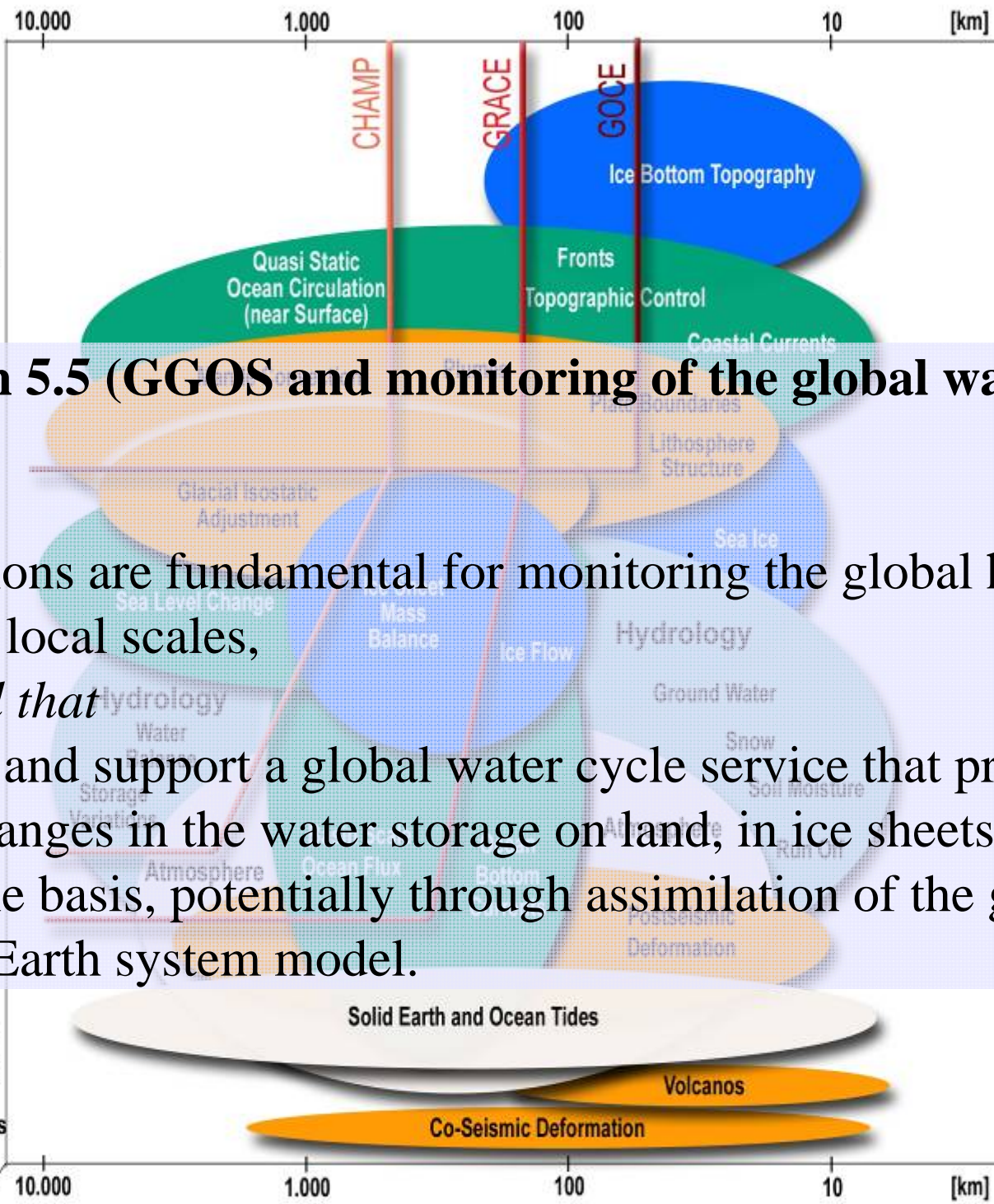
a stable and accurate geodetic reference frame must underpin Spatial Data Infrastructures (SDI), to ensure that all geo-referenced data used by a wide range of community groups and government agencies is unambiguously linked to the geodetic foundation,

*it is recommended that*

ITRS be employed as the global geodetic reference system for SDI, and that the ITRF be maintained and made accessible with an operational core ensuring ITRF with the accuracy, long-term stability, and the level of accessibility required by SDI applications.

**Recommendation 5.5 (GGOS and monitoring of the global water cycle):**

*Recognizing that geodetic observations are fundamental for monitoring the global hydrological cycle on global to local scales, it is recommended that GGOS encourage and support a global water cycle service that provides information on changes in the water storage on land, in ice sheets and in the oceans on a routine basis, potentially through assimilation of the geodetic observations in a Earth system model.*

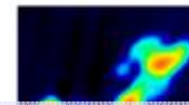
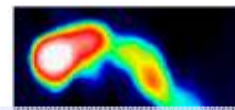
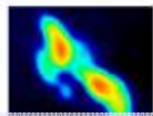


Area of closed region runoff 30,000 km<sup>3</sup>

Ocean area 361,000 km<sup>3</sup>

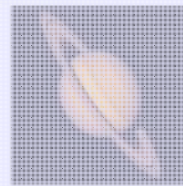
Level 5:

Quasars

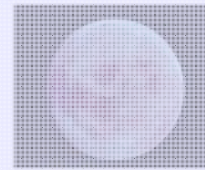


## Recommendation 9.1 (Augmentation of the current global geodetic infrastructure):

Level 4:  
Moon, Planets  
*Recognizing that*



Planets



Moon

the currently implemented global geodetic infrastructure is not sufficient to provide a monitoring of Earth's shape, gravity field and rotation meeting most of the users' needs, and to sustain the global geodetic reference frames required for many scientific and societal applications,

*it is recommended that*

the global geodetic infrastructure not only be maintained at the current level but also be augmented, in order to close major spatial and technological gaps, with: ..., *and that*

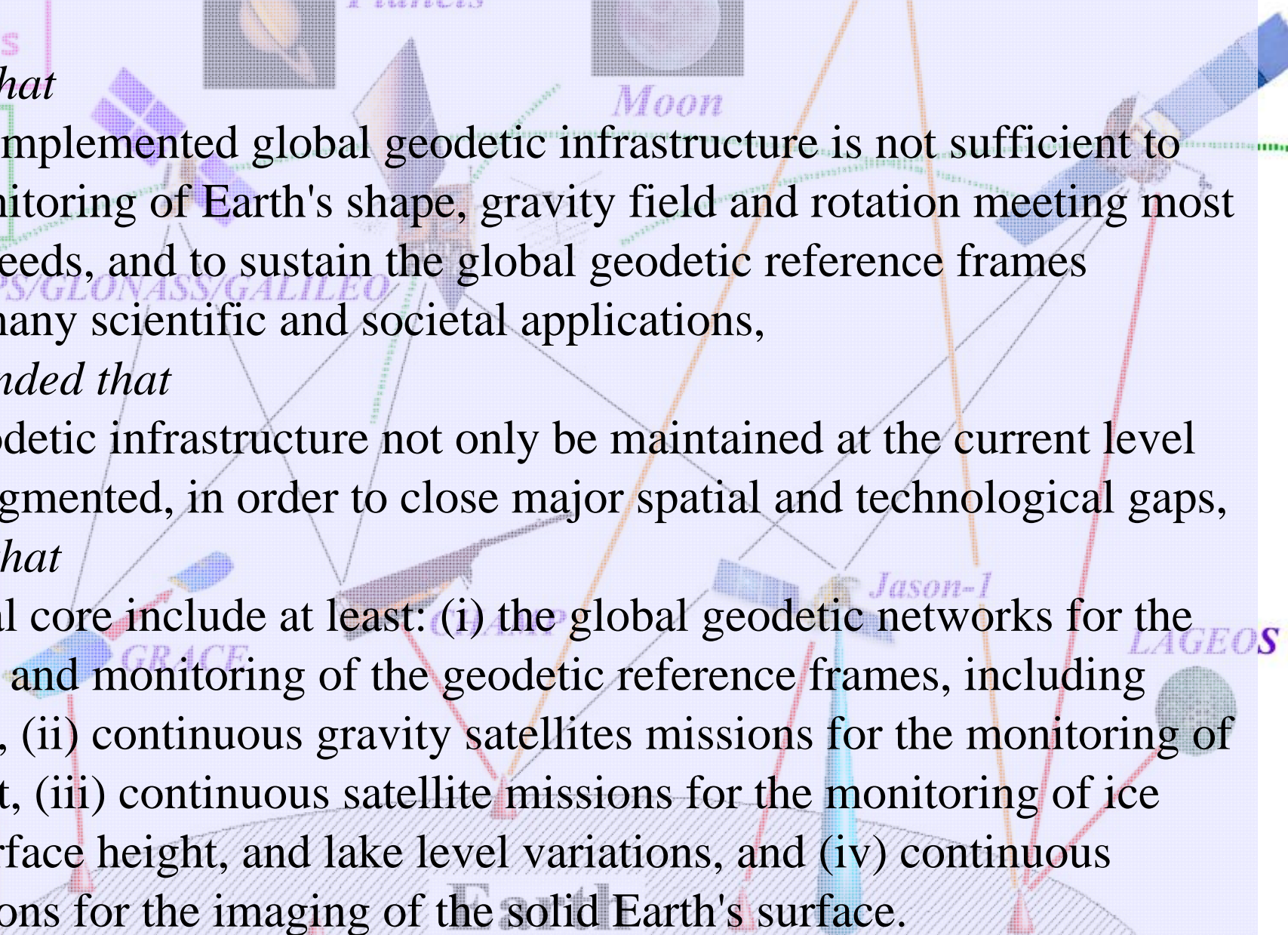
the operational core include at least: (i) the global geodetic networks for the determination and monitoring of the geodetic reference frames, including Earth rotation, (ii) continuous gravity satellites missions for the monitoring of mass transport, (iii) continuous satellite missions for the monitoring of ice sheets, sea surface height, and lake level variations, and (iv) continuous satellite missions for the imaging of the solid Earth's surface.

Level 2:

LEO

Level 1:

Earth



## **Task Activities in 2009/2010:**

- GGOS Stakeholder Events (preferably co-located with relevant GEO and/or CEOS meetings)
- Development of intergovernmental framework
- Discussion of GGOS 2020 Recommendations with GEO Members and Participating Organizations
- Specific steps towards implementation of the GGOS 2020 Recommendations

## Task Activities in 2009/2010 (continued):

- Develop two issues identified by ADC members:
  - > Unified global height system (*IAG InterCommission Project ICP 1.2 Vertical Reference Frames*)
  - > Transformation global to regional/national (*IAG Commission 1 together with regional subcommissions*)
  - > *Coordination with relevant GEO Tasks*

*Progress towards a ISO Standard for ITRS*

## Relevant GGOS Activities in 2009/2010:

### ITRS/ITRF standardization:

- Should there be an international standard for THE geodetic (coordinate) reference system?
- Should ITRS/ITRF be the basis for that?

GGOS Steering Committee: Yes

France is taking the lead and providing funds

# Next Step Towards Implementation of GGOS 2020 Recommendations

Applications Places System hpplag@challenge:~ The Global Geodetic O... Mon Sep 14, 9:12 PM

The Global Geodetic Observing System (GGOS) - SeaMonkey



International Association of Geodesy  
Global Geodetic Observing System

Empowering the advancement of society through geodesy ...

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**Supporting Documents:**

- [2007 Workshop Report \(local copy\)](#)
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**Towards a Roadmap for Future Satellite Gravity Missions**  
September 30 - October 2, 2009,  
Graz, Austria



**Rationale:** The CHAMP and GRACE satellite missions, in orbit since 2000 and 2002, respectively, have significantly improved the spatial resolution and precision of our gravity field models, pushing our knowledge of the static gravity field to centimeter level accuracy in geoid determination. The recently launched European GOCE mission will provide further improvements in accuracy and spatial resolution of the static part of the gravity field. The integration of various satellite missions with geometric techniques such as GPS, SLR and DORIS (monitoring, a.o., changes in the rotation and figure of the Earth), have created new opportunities for the study of mass transport in the Earth system in a globally consistent way. The GRACE mission monitors changes in Earth's gravity field and provides unprecedented insight in water storage changes at sub-continental scales in land water storage, ice sheets and oceans. Oceanographic applications illustrate the unique way in which the combined geodetic observations provide accurate and quantitative constraints on the ocean mass budget, tidal dissipation, near-surface ocean flow and its variability, and large-scale ocean mass variations. The observations are invaluable for understanding the causes of sea level rise and the dynamics of ocean mass redistribution.

Despite the importance of the gravity missions as part of the global geodetic observing system and, in particular, the global water cycle observing system, we are facing a serious challenge in maintaining the observations at current level or increasing spatial and temporal resolution to a level required by many geoscientific applications. GRACE is estimated to cease operation about 2012. If at that time no follow-on mission is launched, the gap in gravity observation would significantly hamper exploitation of the gravity observations for climate studies and the detection of climate change impacts on the global water cycle. It is therefore of paramount importance to come to a global agreement on how sufficient semi-operational satellite gravity missions can be ensured and necessary developments towards increase accuracy, spatial and temporal resolution, and lower latency of products can be facilitated. In parallel, a medium to long-term perspective has to be developed to ensure a continuous and sustainable monitoring of mass transport in the Earth system by means of future gravity satellite missions.



# Work Plan Revision: IAG/GGOS Input

Continuation of DA-09-02c: “Global Geodetic Reference Frame”

New Sub-Task: AR-09-03 “Advocating for Sustained Observing Systems”  
Sub-Task “Global Geodetic Observing System”

This sub-task is led by USA, ESA, and IAG ([mpearlman@cfa.harvard.edu](mailto:mpearlman@cfa.harvard.edu)).

GGOS provides observations of variations in Earth shape, gravity field and rotation which are fundamental for monitoring of climate and global change. The observations provided by GGOS contribute to at least seven of the SBAs. Moreover, with the global geodetic reference frames, ITRF and ICRF, GGOS provide the foundation for most Earth observations. Among other components, GGOS crucially depends on globally sustained geodetic ground networks. The task will promote the further development of the fundamental geodetic network of co-located instruments (i.e., the Global Geodetic Core Network) and sustained support of infrastructure needed to satisfy the long-term (10 - 20 years) requirements for the reference frames and the monitoring of global change signals. The task will encourage and facilitate the upgrade of existing stations where appropriate and the establishment of new stations and cooperating partnerships where necessary for proper global distribution.”

# Work Plan Revision: IAG/GGOS Input

Continuation of DA-09-02c: “Global Geodetic Reference Frame”

New Sub-Task: AR-09-03 “Advocating for Sustained Observing Systems”  
Sub-Task “Global Geodetic Observing System”

GEO Secretariat: Join DA-09-02c with the new sub task to form AR-09-03e

GGOS-Steering Committee: Does not fit together,

- one is focusing on a crucial data set involving more than just GGOS,
- the other on an observing system far broader than the one data set