A Roadmap for Future Satellite Gravity Missions

- The “Graz Workshop”
(- The Roadmap)
- Why time-variable gravity?
- The Declaration
- Hope and Long-Term Perspective

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The Workshop

Towards a Roadmap for Future Satellite Gravity Missions

September 30 - October 2, 2009, Graz, Austria

GROUP ON EARTH OBSERVATIONS

Objectives of the workshop: The workshop aimed at bringing together stakeholders in satellite gravity missions in order to establish [illegible] future gravity satellite missions that would outline the sensor developments, mission concept developments, and mission implementation, and that would be consistent with anticipations of the major [illegible] with the needs of key user groups (such as [illegible]

In 2007, an international workshop on *The Future of Satellite Gravimetry* was held (see the Workshop Report) and attended by about 50 leading scientists representing relevant fields of science and technology. The participants agreed on a set of recommendations, which provided the starting point for the roadmap.

http://www.iag-ggos.org/workshops/Graz

The Workshop

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Output: [illegible] produce a roadmap document that could be submitted to the [illegible] endorsement and also to the CEOS Plenary and SIT for further [illegible] anticipated output of the Workshop included:

- Roadmap for future satellite gravity missions;
- Workshop report on the Workshop Web page;
- Summary report in *Episodes*;
- A thematic issue of *Physics and Chemistry of the Earth*.

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The Workshop

- 55 participants from eleven countries and three continents
- Outputs produced:
  - roadmap (*)
  - declaration (*)
  - draft recommendations
  - one-page stories (**)

(*) Input to GEO Plenary
(**) GGOS Booth

Experimental aspects of the Workshop:
- bring GEO and GEOSS to a science&technology community;
- create a forum for the discussion of user groups with data providers;
- produce output of value for GEO
- create channels for S&T communities to make their results better known to decision makers

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Roadmap: Towards Future Satellite Gravity Missions

Contents:

STRATEGIC TARGET
PREAMBLE: Why? For Whom?
ORIGIN OF THE ROADMAP
INTRODUCTION
- *Why gravity? A unique quantity related to mass redistribution in the Earth system*
- *Where we want to go: The goal*
- *Where do we stand?*
- *What is needed in order to get from here to there?*

THE WAY FORWARD: THE MAP
Activity 1: Science developments
Activity 2: Technological developments
Activity 3: Mission implementation
Activity 4: Processing, modeling and applications

Why time-variable gravity?

Satellite gravity missions are a unique observational system for monitoring mass redistribution in the complete Earth system – no other sensors could do the same.

Roadmap: Towards Future Satellite Gravity Missions

STRATEGIC TARGET

*A **multi-decade, continuous series of space-based observations of changes in the Earth's gravity field** begun with the GRACE mission, and leading, before **2020**, to satellite systems capable of global determination of changes in the Earth's gravity field from global down to regional spatial scales and on time scales of two weeks or shorter, as a **contribution to an integrated, sustained operational observing system for mass redistribution, global change, and natural hazards, and in support of global water management**, the understanding of climate variations, and the characterization and early detection of natural hazards.*

Roadmap: Towards Future Satellite Gravity Missions

THE WAY FORWARD: THE MAP

Activity 1: Science developments

1.1 Identifying the guiding science questions and application
1.2 Consolidating and reviewing user and mission requirements
1.3 Meeting the scientific challenges on the road to future gravity missions

Activity 2: Technological developments

2.1 Short-term developments
2.2 Medium-term developments
2.3 Long-term developments

Activity 3: Mission implementation

3.1 Facilitate the international co-ordination of science and technology activities
3.2 Develop a proposal for a virtual constellation for mass redistribution
3.3 Inter-agency coordination
3.4 Agency plans including operation

Activity 4: Processing, modeling and applications

4.1 Processing
4.2 Geophysical modeling
4.3 Supporting science and societal applications through a dedicated service

Declaration

Towards a Service for the Water Cycle

Noticing that

one billion people *are currently without sufficient access to clean* ***drinking water****; ...;*

and recognizing that

the ***GRACE*** *satellite gravity mission has* ***demonstrated the ability to measure mass redistribution in the water cycle****, ...*

the Participants of the Workshop on a Roadmap for Future Satellite Gravity Missions declare that

a ***long and uninterrupted series of satellite gravity missions*** *with accuracies and resolutions at least as good as GRACE's is a* ***crucial element*** *of an observation system to adequately monitor the global water cycle ...;*

such a ***series of satellite gravity missions*** *would provide the* ***basis for a global service to inform decision makers*** *in a timely manner about ongoing and forecasted changes in the water cycle ...;*

Furthermore, the Participants of the Workshop have ***agreed on a roadmap towards future satellite gravity missions*** *and, ...* ***initiate international action for the implementation of this roadmap****, ...*

After Workshop Actions and Longer-Term Perspective

Since the Workshop:

- Declaration and Roadmap has been brought to the attention of the GEO Plenary;
- Declaration and Roadmap has been presented at various meetings, including GEO STC and GEO UIC, and GRACE Science Team meeting.

Current and planned activities:

Workshop documentation:

- Workshop Report
- Recommendations
- Special Issue

A major international effort to implement the roadmap, i.e.

- facilitate the science and technology development;
- realize the missions.

Further outreach to

- other disciplines to increase usage/benefits (STC, UIC);
- CEOS and GEO Water and Climate Tasks to increase support for roadmap;
- UNFCCC: gravity/mass redistribution as a key climate variable.