

# 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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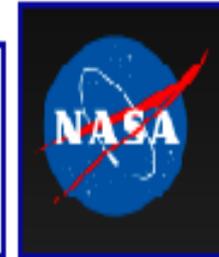
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# The Workshop



***Towards a Roadmap for Future  
Satellite Gravity Missions***  
**September 30 - October 2,  
2009, Graz, Austria**



**Objectives of the workshop:** The workshop aimed at bringing together stakeholders in satellite gravity missions in order to establish a roadmap for 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 main users of gravity data, and with the needs of key user groups (such as

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.

# The Workshop



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**Output:** The workshop will produce a roadmap document that could be submitted to the IUGS for endorsement and also to the CEOS Plenary and SIT for further consideration. The 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*.

# 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

# 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

## 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.

