Towards a Roadmap for Future Satellite Gravity Missions

Breakout Session B1: Mission Requirements

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1120 - 1540	**Breakout Session B1: Mission requirements** ***PROGRAMME***
1120 - 1130	*Bert Vermeersen, Radboud Koop:* Introduction by session co-chairs and rapporteur
1130 - 1200	*Matt Rodell:* Hydrology Mission Requirements for a GRACE Follow-On
1200 - 1230	*Henryk Dobslaw, Robert Dill, Maik Thomas:* Gravity Field Signatures of Ocean Dynamics
1230 - 1245	*All:* General discussion on hydrology and ocean dynamics
1245 - 1400	*Lunch*
1400 - 1430	*Holger Steffen, Riccardo Riva, Wouter van der Wal, Bert Vermeersen:* GIA Requirements for Future Gravity Satellite Missions: Implications After More Than 7 Years of GRACE Data
1430 - 1500	*Jakob Flury, Reiner Rummel, Nico Sneeuw:* Time Periods, Spatial Resolution, and Accuracy: From Geophysical Requirements to Mission Scenarios
1500 - 1540	*All:* General discussion on Mission Requirements, followed by Formulation of Recommendations

B1 Session Description

Principle aim of this session is the **development/update of the matrix of user requirements for static and temporal gravity information**, including requirements for accuracy and spatial and temporal coverage. Basis for this will be Chapter 3, particularly **Tables 3-1 and 3-2, of the 2007 Report on the Future of Satellite Gravimetry from the April 12 - 13 2007 ESTEC Workshop**. Since then, progress has been made and problems have been recognized or identified in assessing the role played by long-term hydrological trends in GRACE data, joint studies on global mass transport (closing the global mass budget, coupling of geophysical models), on apparent deviations from long-term temporal trends in low-degree gravity components, separating glacial isostatic adjustment from ongoing climatic variations, post-seismic and tectonic trends, and others. These **recent experiences and insights need to be translated into measurement requirements and incorporated in the updated matrix for future satellite gravity missions**.

The Future of Satellite Gravimetry

Report from the

Workshop on The Future of Satellite Gravimetry

12-13 April 2007, ESTEC, Noordwijk, The Netherlands

Radboud Koop and Reiner Rummel (Eds.)

IAS TUM Institute for Advanced Study

Table 3-1, from Rummel (2005) summarizes the GOCE requirements, which are still the most useful targets for the time-averaged gravity field retrieval.

Table 3-1: Static gravity field, scientific requirements in preparation for GOCE, from: Rummel (2005).

Static gravity field, scientific requirements in reparation for GOCE					
Application			Accuracy		Spatial resolution
			Geoid [cm]	Gravity [mGal]	Half wavelength D [km]
Solid Earth	Lithosphere/upper mantle density			1-2	100
	Continental lithosphere	Sedimentary		1-2	50-100
		Basins rifts		1-2	20-100
		Tectonic motions		1-2	100-500
	Seismic hazards			1	100
	Ocean lithosphere/asthenosphere			0.5	100-200
Oceanography	Short scale		1-2		100
			0.2		200
	Basin scale		~0.1		1000
Ice sheets	Rock basement			1-5	50-100
	Ice vertical movements		2		100-1000
Geodesy	Levelling by GPS		1		100-1000
	Unified height system		1		100-20000
	INS			~1-5	100-1000
	Orbits			~1-3	100-1000
Sea level change	Many of the above applications, with their specific requirements, are relevant to studies of sea level change.				

Table 3-2: Accuracy requirements.

Application	**mm$_{H2O}$/mon**	**mm$_{H2O}$/yr**	**smoothing radius (km) ≥ 300**	**Timescales and Notes**
Hydrologic basin total water change	10	20 (10)	400	days to decades
Glacier mass loss		2 (1)	300	seasonal, interannual
Ice sheet mass loss		20 (5)	1,000	
Oceanic gyres spinup or down		4 (1)	700	interannual
Global Sea level rise: thermosteric / eustatic		1 (0.3)	5,000	seasonal, interannual
Glacial Isostatic Adjustment		0.5 (0.1)	1,000	5-10 years