



# **The Global Geodetic Observing System: Meeting the Requirements of a Global Society on a Changing Planet in 2020**

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Rizos, Jim Zumberge, Richard Gross, Tom Herring,  
Markus Rothacher, Gerhard Beutler  
(contributions from all leading authors and their co-authors)**



# Time Schedule

GGOS 2020

- Request for Strategy paper of the GGOS Steering Committee in April 2006
- Draft Structure and Initial Strategy Writing Team (SWT) in June 2006
- First Meeting August 21-22, 2006, Washington, DC: Two documents (Strategy and Reference Doc.)
- First draft Reference document available on October 5, 2006
- GGOS Workshop 2006, October 8-9, Munich
- GGOS Retreat and GGOS 2020 SWT Meeting, February 19-22, 2007, Oxnard, California
- Strategy and Reference documents available in March 2007
- Hearing phase, including GEO, IGOS-P, IUGG, national authorities and space agencies
- Final documents available for IUGG, July 2-13, 2007, Perugia, Italy



# Expected Output

GGOS 2020

- Two documents needed:
  - **Strategy document:** short document for politicians, decision makers, funding agencies
  - **Reference document:** long, comprehensive document with all the user requirements and details of GGOS in 2020 mainly for those actually doing the work
- First focus is on the Reference document
- Draft Reference document now available, about 130 pages, but not yet complete ...
- A lot of work still to be done: make it consistent, no repetitions, ...
- Intensive and extensive discussions needed concerning the future structure and characteristics of GGOS (meetings and telecons)



# Contents

GGOS 2020

1. Introduction
- 2. The ways, means, and achievements of geodesy**
3. Observing a dynamic planet: Geodesy's contribution to science
4. Earth observation: Serving the needs of an increasingly global society
5. Geodesy's contribution to the functioning of a modern society
6. Geodesy: foundation for exploring the planets, the solar system and beyond
7. Integrated user requirements and functional specifications for the GGOS
8. The future geodetic reference frame
9. The future Global Geodetic Observing System (GGOS)
10. Towards GGOS in 2020
11. Recommendations



# Writing Team

GGOS 2020

- Editors: Hans-Peter Plag, Markus Rothacher
- Chapter 1: Hans-Peter Plag, all other lead authors
- Chapter 2: *nn*
- Chapter 3: Reiner Rummel, G. Beutler, V. Dehant, R. Gross, K.H. Ilk, H.-P. Plag, P. Poli, M. Rothacher, S. Stein, R. Thomas, J. Wahr, P.L. Woodworth, S. Zerbini, V. Zlotnicki
- Chapter 4: Dork Sahagian, D. Alsdorf, P. Davis, P. Houser, C. Kreemer, J. Melack, H.-P. Plag, P. Poli, S. Reid, R. Thomas
- Chapter 5: Chris Rizos, D. Brzezinska, R. Forsberg, G. Johnston, D. Smith, S. Kenyon
- Chapter 6: Jim Zumberge, G. Beutler, V. Dehant, *a.o.*
- Chapter 7: Richard Gross, G. Beutler, A. Donnellan, R. Haagmans, H.-P. Plag, V. Zlotnicki, *H. Drewes, D. Green, S. Marsh, a.o.*
- Chapter 8: Tom Herring, Z. Altamimi, G. Blewitt, C. Ma, R. Neilan, R. Forsberg, J. Hinderer, D. Lavallee, D. Coulot, J. Ray
- Chapter 9: Markus Rothacher, G. Beutler, W. Bosch, A. Donnellan, C. Ma, M. Pearlman, D. Smith, *J. Hinderer, J. Ries, H. Schuh, F. Seitz, C.K. Shum, M. Thomas, I. Velicogna, J. Wahr, P. Willis*
- Chapter 10: Gerhard Beutler, M. Pearlman, H.-P. Plag., *R. Neilan, R. Rummel, M. Rothacher*
- Chapter 11: All lead authors



# 1. Introduction

GGOS 2020

- The Challenge: Achieving sustainable development for an increasing population on a changing planet
- The potential of geodesy
- The need for a long-term strategy



## 2. Ways and Means

GGOS 2020

- New chapter
- Introducing all techniques and methodology of geodesy
- Brief history
- Current status



### 3. Science URs

GGOS 2020

***A „the geodetic dimension“***

==> Internal user requirements

***B „the geo-scientific dimension“***

==> External user requirements



## 4. EOS URs

GGOS 2020

Understand the requirements of

- the nine societal benefit areas of Earth observation
- GEO
- IGOS-P Themes

### The nine benefit areas of Earth observations:

- **Disaster:** reducing loss of life and property from natural and human-made disasters
- **Health:** understanding environmental factors affecting human health and well being
- **Energy resources:** improving management of energy resources
- **Climate:** understanding, assessing, predicting, mitigating, and adopting to climate variability and change
- **Water:** improving water resource management through better understanding of the water cycle
- **Weather:** improving weather information, forecasting, and warning
- **Ecosystems:** improving the management and protection of terrestrial, coastal, and marine ecosystems
- **Agriculture:** supporting sustainable agriculture and combating desertification
- **Biodiversity:** understanding, monitoring and conserving biodiversity



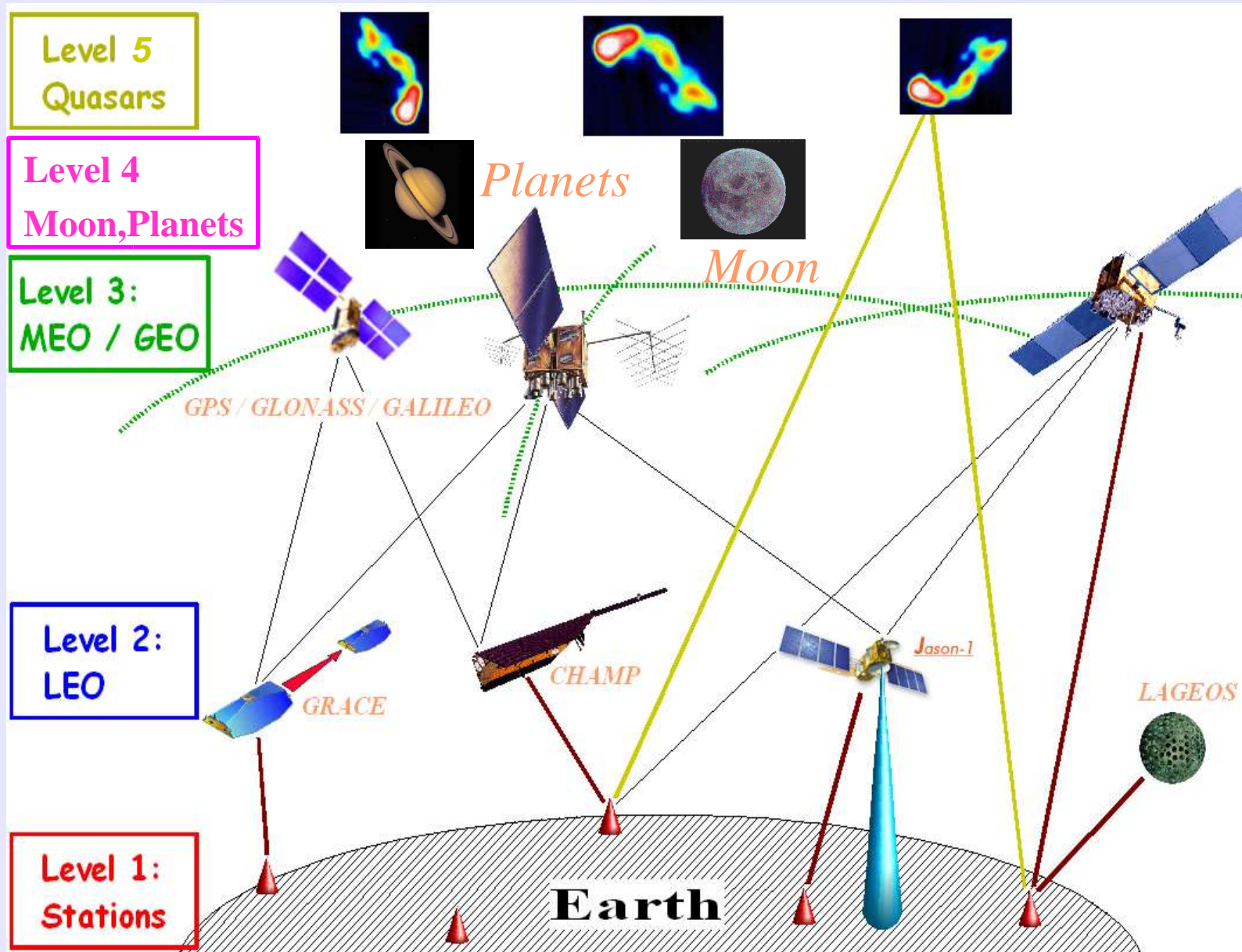
## 4. EOS URs

GGOS 2020

### Topics addressed in the Chapter:

- **Disasters:** tsunamis, EQs, volcanoes, storms, landslides, creep, subsidence, floods
- **Energy resources:** wind, Oil pumping-induced subsidence, geothermal
- **Climate change:** ocean, atm. circulation, health
- **Water:** sea level, fresh water resources, lakes, streams, ground water, ice, dams, water mass redistribution, soil moisture
- **Weather:** enhancing prediction tools, extreme events, space weather
- **Ecosystems and Carbon cycle:** Land cover (forests, desertification), wetlands
- **Land use:** agriculture & irrigation, deforestation, desertification, erosion/deposition, urbanization

## Integration of 5 Layers to a GGOS





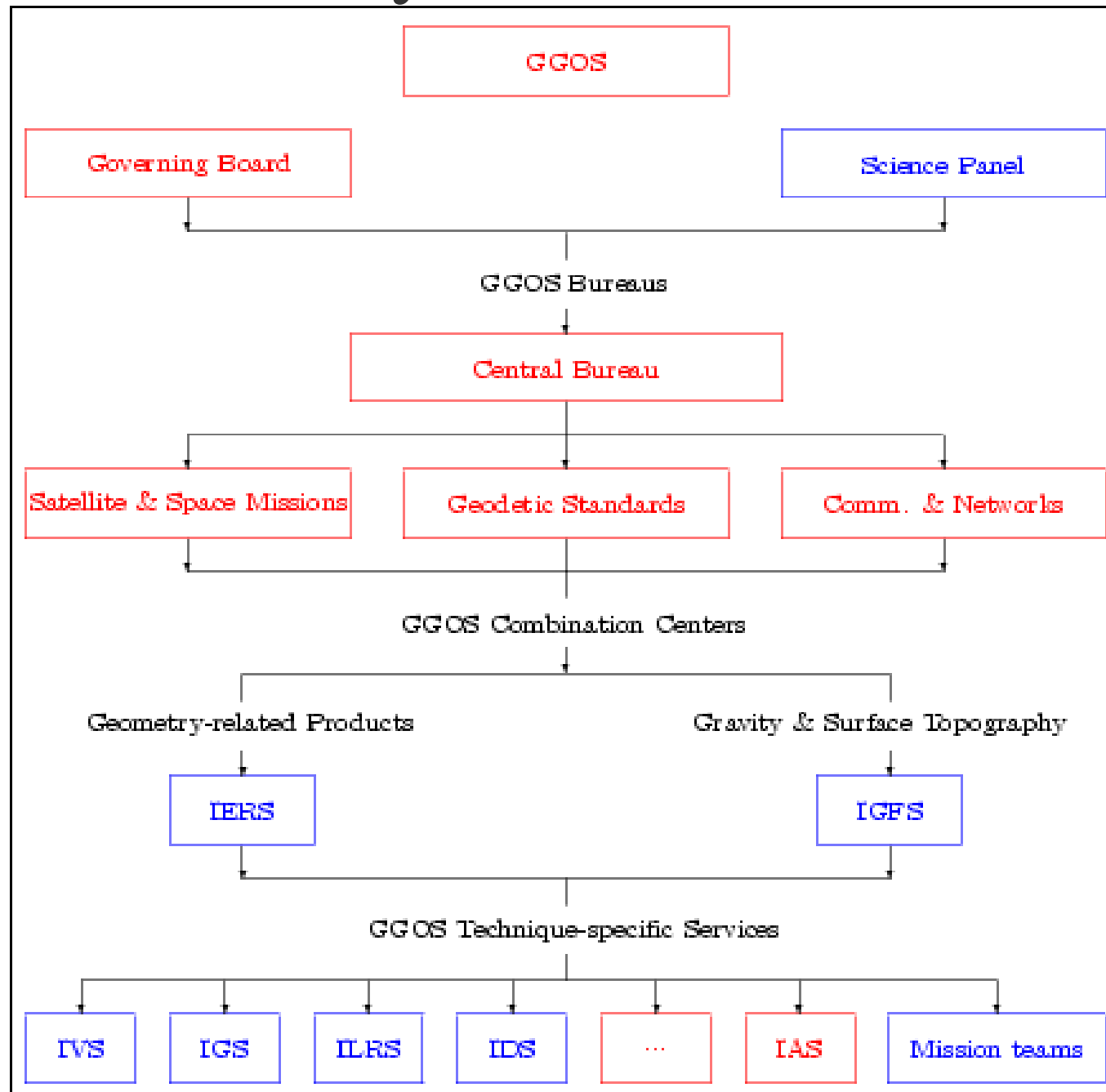
# 10. Way Forward

GGOS 2020

Chapter addresses:

- step for implementation;
- international and intergovernmental background;
- internal organization.

# 10. Way Forward





# 11. Recommendations

GGOS 2020

## Preliminary Recommendations:

- Operational gravity missions (GRACE-type)
- Satellite altimetry
- More satellite laser ranging (both ground stations and LAGEOS-type satellites)
- Integration InSAR and GNSS
- many more ...



- Presented the GGOS2020 Process in relation to the Theme Proposal at the IGOS-P-13b in Buenos Aires (13 November 2006).
- Well received, considered to be a good example even for the IGOS-P themes.
- Discussion of the future role of IGOS-P in GEO.
- CEOS suggested dissolving IGOS-P and suggested instead the concept of virtual constellations.
- Small team to write a strategy paper, to be discussed at IGOS-P-14.



## Theme Proposal

- “Earth System Dynamics” Theme proposal based partly on Chapters 3 and 4, but also 7, 9 and 11
- Should get some input from the other Themes (Theme leaders?)
- Proposal ready in March/April 2007
- Action Item: Proposal can be presented/discussed at IGOS-P 14

## **GGOS 2020 Work since SC6:**

### **More work around the document than actually on the document:**

- Task proposal accepted for the GEO Work Plan 2007 – 2009.
- Task AR-07-03: “Global geodetic Reference Frames” has GGOS 2020 documents as first deliverables.
- GGOS 2020 reports will be GEO reports.
- May be reported into the next Earth Observation Summit (November 2007 in Capetown, South Africa).

**Next main work phase: 27 December to 13 January**

**Report Plag (2006) available at <http://www.nbmng.unr.edu/dox/b112.pdf>.**



**UNIVERSITY OF NEVADA, RENO**  
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**NEVADA BUREAU OF MINES AND GEOLOGY**  
**BULLETIN 112**

**NATIONAL GEODETIC INFRASTRUCTURE**  
**Current Status and Future Requirements:**  
**The Example of Norway**

**Hans-Peter Plag**  
Nevada Bureau of Mines and Geology

**2006**

Based on a consolidated set of user requirements for geodetic infrastructure, the mutual dependence of national and global geodetic infrastructure and the societal benefit of geodetic observations and products are discussed in general terms and specifically applied to the example of Norway.

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# Time Schedule

GGOS 2020

- Revision/completion of the current document by 15 January
- One iteration prior to the Retreat with the whole team
- GGOS Retreat and GGOS 2020 SWT Meeting, February 19-22, 2007, Oxnard, California
- Strategy and Reference documents available on 15 March 2007
- Hearing phase, including GEO, IGOS-P, IUGG, UN agencies, national authorities and space agencies
- End of hearing phase 15 May
- Final revision 15 May to 15 June
- 15 June to 1 July: printing
- Final documents available for IUGG, July 2-13, 2007, Perugia, Italy