

Task AR-07-03: 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.

Task proposed by International Association of Geodesy (IAG)/Global Geodetic Observing System (GGOS)

Task Sheet:

- Work is described correctly
- POC: IAG/GGOS (Hans-Peter Plag)
- Lead organization: IAG/GGOS and ?
- Current contributions:
 - Germany
 - CEOS
 - IAG/GGOS
- Additional contributions:
 - Through GAGOS
 - Through GGOS 2020

Deliverables in 2007:

- **GGOS 2020 Reports**
- **GGOS 2007 Workshop**
- Also mentioned: GAGOS (*Assessing and forward planning of the Geodetic and Geohazards Observing Systems for GMES applications*)



GGOS 2020

GGOS 2020

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

- **Goal: Develop the strategy for the future GGOS which**
 - maintains the International Terrestrial and Celestial Reference Frames, ITRF and ICRF, respectively.
 - monitors mass movements in the Earth system (water cycle, ice sheets, sea level, geohazards)
- **Aims at two documents:**
 - **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



Time Schedule

GGOS 2020

- Request for Strategy paper of the GGOS Steering Committee in April 2006
- First draft Reference document available on October 5, 2006 for GGOS Workshop 2006
- January/February 2007: reviewer team established
- February 2/17, 2007: Versions 0.15/0.16, respectively
- GGOS Retreat and GGOS 2020 Writing Team Meeting, February 19-22, 2007, Oxnard, California
- **Strategy and Reference documents available in March 2007**
- **Hearing phase, including GEO, IGOS-P, IUGG, national authorities, space agencies, IAG components**
- **Final documents available for IUGG, July 2-13, 2007, Perugia, Italy**

The Reference Document

- Four main parts:
 - (1) Introductory chapters,
 - (2) User requirements,
 - (3) GGOS: System specification, design and organization,
 - (4) Recommendations
- Recommendations for
 - infrastructure
 - the organizational background
 - steps towards implementation



Contents

GGOS 2020

1. Introduction
2. The ways, means, and achievements of geodesy
3. Observing a dynamic planet: Geodesy's contribution to science
4. Geodesy's contribution to the functioning of a modern society
5. Earth observation: Serving the needs of an increasingly global 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

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- Chapter 11: All lead authors



5. Earth observation: GGOS 2020

Serving the needs of an increasingly global society

Chapter Goal: Understanding the requirements of nine Societal Benefit Areas (SBA) of GEO



5. Earth observation:

GGOS 2020

Serving the needs of an increasingly global society

- The current and future framework of global Earth observations
- **Disasters:** 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 change:** 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



5. Earth observation: GGOS 2020

Serving the needs of an increasingly global society

- **Disasters:** earthquakes, volcanoes, landslides, tsunamis, storms, subsidence, floods
- **Energy resources:** wind, subsidence, geothermal
- **Climate change:** ocean and atmospheric circulation
- **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:** Carbon cycle, land cover (forests, desertification), wetlands
- **Agriculture:** land use, irrigation, deforestation, desertification, erosion/deposition, urbanization



11. Recommendations

GGOS 2020

Preliminary Recommendations:

- Framework conditions
- Infrastructure
- Products
- Organizational aspects
- Specific actions

Relevant for

- GEO
- CEOS
- IGOS-P
- IAG/IUGG



11. Recommendations

GGOS 2020

Framework conditions:

- transition from research to operational
- sufficient infrastructure and human resources
- international agreement on reference frame (including GEO)



11. Recommendations

GGOS 2020

Infrastructure:

- Operational mass transport monitoring through gravity missions (GRACE-type, others?)
- Satellite altimetry
- More satellite laser ranging (both ground stations and LAGEOS-type satellites)
- absolute gravity at a global network of reference sites
- Integration InSAR and GNSS
- filling of spatial gaps in the ground networks
- operational core: to build up and maintain the minimally necessary infrastructure as an operational core of an Earth system service (ice sheet and sea level, hazards and disasters, water cycle, climate, and resource management).



11. Recommendations

GGOS 2020

Products:

- improved reference frame definition and monitoring
- real-time access to the reference frame
- Earth system service (mass fluxes - hydrology, surface deformations, rotation in terms of related dynamics)
- GNSS seismology
- ...



11. Recommendations

GGOS 2020

Organizational:

- GGOS under a joint IAG/UNESCO body or a joint Steering Committee
- Intergovernmental body for geodesy (International Geodetic Commission).

Specific actions:

- consider a resolution recommending to the GEO member countries to maintain, and if necessary, increase their support of the operational maintenance of the necessary infrastructure in the light of the importance of the geodetic reference frame for Earth observation.
- ...



After GGOS 2020:

The Global Geodetic Observing System (GGOS)

Workshop 2007

*The GGOS Contribution to GEOSS and an
Observing System for Geohazards and
Disaster Prevention*

November 5-6, 2007

Frascati, Italy





After GGOS 2020:

- Workshop is part of the International Geohazards Week
- Workshop is outreach activity to space agencies and geohazards community
- Workshop is intended as a GEO workshop

- major contributions to ice sheets and sea level monitoring
- major progress with respect to geohazards/early warning

Actions for the ADC

- Discuss procedure for endorsing the GGOS 2020 documents:
==> *GEO documents*
- Confirm GGOS 2007 Workshop as part of AR-07-03:
==> *GEO Workshop*
- How to describe/store/catalogue the User requirements?
==> *GEO User requirement utility*

