Actions 2011 – 2015

- Numerical standards: Compilation of numerical and processing standards currently used.
- Inconsistencies: Removal of inconsistencies in the IAG/ IERS conventions.
- Metadata: Develop – together with the GGOS Portal – consistent metadata for all products describing underlying standards and conventions.
- Software routines: Make available a set of validated software routines for transformation between tide systems and time systems.
- Standards and Conventions: Development of homogeneous consistent models and standards for the integration of data to combine geometric positioning with physical heights and Earth gravity field parameters.
- IGSN: An extension of standardization activities to a new International Gravity Standardization Network (IGSN) shall be considered.
- Global Geophysical Fluids: Investigations regarding geophysical background models (e.g., loading, dealiasing) shall be carried out in cooperation with the GGFC.

New GRS: Development of a new Geodetic Reference System (GRS) based on a consistent system of best estimates of major parameters related to a geocentric equipotential ellipsoid.

Bureau of Networks and Communication

Chair: Mike Pearlman (USA)

The Bureau provides oversight, coordination, and guidance for the development, implementation and operation of the GGOS Network of Core Sites. Elements of this role are:

- Promote communication and integration among Services;
- Develop and maintain a ground network station information base and data product directory;
- Monitor the development of prototype ground systems to understand performance and availability;
- Monitor network performance and advocate for maximum participation to maintain reference frame and other data product quality;
- Advocate the continued support and maintenance of the current geodetic networks and the implementation of upgraded and new field systems;
- Define the network requirements and scope the size and geometry of gravimetry and tide gauge ground networks; advocate for continued support, upgrade and expansion;
- Interface with upcoming missions to advocate for the best satellite technology to support the reference frame tasks;
- Advocate for reference frame connections through GNSS to other geodetic instruments including tide gauges, gravimeters, etc.
- Promote the formation of key partnerships to establish stations in present network gaps,
- Exploit synergistic opportunities to better integrate or co-locate stations with the infrastructure and communications networks of the many other Earth Observation disciplines.

Actions 2011 – 2015

- Continue development by the Services (VLBI2010, NGSLR, new generation GNSS receivers, modern DORIS ground systems and new satellites; retro arrays on GPS, etc;
- Continue outreach
  - Give presentations; meet with potential participants;
  - Pursue the "American Networks Concept" in the first half of 2011 (1 year);
  - Need to do something about Africa;
- Complete the simulation to scope the GNSS network (1 year);
- Develop Site Specification Document (1 year);
  - Complicated by lack of configuration uniformity;
- Work on the technical and operational issues;
  - Work with IERS WG on Inter-system vectors (co-location);
  - Communications requirement;
  - Multi-instrument control systems;
- Issue the CFP in concert with the GIAC (1 year);
- Strengthen our connection with the non-geometry geodesy techniques
- Characterize performance and trade-offs as the network builds up
- Implement the network

Themes

Theme 1: Unified Height System

Chairs: M. G. Sideris (Canada) and J. Ihde (Germany)

The objective of Theme 1 is the unification of the existing vertical reference systems around the world. This will be achieved through the definition and realization of a global vertical reference system that

- will support geometrical (ellipsoidal) and physical (normal, orthometric, geoidal) heights world-wide with centimetre precision (10^{-9}) in a global frame;
- will enable the unification of all existing physical height systems (i.e., all geopotential differences shall be referred to one and the same reference equipotential surface with potential W_o); and

- will provide high-accuracy and long-term stability of the temporal height changes (dh/dt, dH/dt, dN/dt) with 10^{-9} precision.

A World Height System (WHS) shall be realized with a global combined network, which will integrates at set of terrestrial reference stations high-precision absolute and relative gravity, leveling with gravity reductions, and GNSS and tide gauge observations. For this purpose, it will use contributions from all IAG Commissions, and the available databases, standards and infrastructure of the IAG/GGOS Services.

Planned activities

Short-Term:
Establish a global vertical reference surface and its geopotential value W_o.

1. Refinement of standards and conventions for the definition and realization of a WHS, including unification of standards and conventions that are used by the "geometric" and "gravity" Services of the IAG.
2. Establishment of a global vertical reference level. The work will be carried out by analysis centres for determining and monitoring the relationship between a conventional W_o and the potential of the level surface closely approximating the mean sea surface.

Medium-Term:
Develop GGOS products for the realization of a WHS.

3. Recommendation for a global vertical reference frame.
4. Guidelines/procedures for height system unification.
5. Development of a registry (metadata) containing the existing local/regional height systems and their connections to the global one.

Long-Term:
Maintain and use in practice the WHS.

6. Determination and modeling of the temporal changes of the vertical reference frame.
7. Update the Unified Global Height System definition and realization as needed, based on future improvements in geodetic theory and observations.
8. Servicing the vertical datum needs of other geosciences such as, e.g., hydrography and oceanography.

Efforts are currently underway to establish working groups and processing centres that will focus on one or more of the action items above. One such group is the already established JWG 0.1.1, whose program of activities is outlined below.

Joint Working Group of Theme 1

JWG 0.1.1: Vertical Datum Standardization

(joint with Commissions 1 and 2, and IGFS)

Chair: L. Sánchez (Germany)

Terms of Reference

During the last decades, many initiatives related to vertical datum unification have been developed in IAG. They are oriented to define and realize a global reference level and to determine the connection (transformation) of the local height datums to the global one, i.e. all physical heights (or geo-potential numbers) worldwide shall be referred to only one reference surface that is realized globally.
The main objective in the present period is to provide a reliable W_0 value to be introduced as the conventional reference level for the realization of the Global Height System. Although any W_0 value can arbitrarily be chosen, it is expected that this value is consistent with other defining parameters of geometric and physical models of the Earth. Activities will be based on the state-of-the-art data and methodologies, especially on the available representations of the Earth's surface and gravity field. Computations carried out will be documented in detail in order to guarantee the repeatability and reliability of the results. This documentation shall support the adoption of the obtained W_0 value as official IAG/GGOS convention. Another objective is to provide guidance on the usage of W_0 in practice, in particular for vertical datum unification.

Program of activities

1. To coordinate all individual initiatives for a unified W_0 determination: Groups working on the estimation of a global W_0 value shall be brought together in order to elaborate an inventory describing the methodologies, conventions, standards, and models presently applied in W_0 computations.
2. To refine the W_0 estimation: Each group shall perform a new W_0 computation following its own methodologies, but applying recent models (e.g. GOCE/GRACE gravity models, sea surface models derived from calibrated and combined satellite altimetry observations, etc.). This analysis shall also include an investigation about the time-dependence of W_0.
3. To propose a IAG/GGOS convention on W_0: It is expected that results obtained after applying the different methodologies considered in the previous item are very similar. After a rigorous reliability evaluation, a best estimate of W_0 shall be recommended.
4. To provide a standard about the usage of W_0 in the vertical datum unification: Based on the interchange of experiences within the WG, it is expected to generate a document describing the most appropriate strategy to connect (unify, transform) any local height system with the global W_0 reference level.

Members

- L. Sánchez (Germany), Chair
- J. Agreen (Sweden)
- R. Čunderlík (Slovakia)
- N. Dayoub (Syria)
- Z. Faskova (Slovakia)
- J. Huang (Canada).
- K. Mikula (Slovakia)
- P. Moore (United Kingdom)
- D. Roman (USA)
- Z. Šima (Czech Republic)
- V. Vatrt (Czech Republic)
- M. Vojtiskova (Czech Republic)
- Y. Wang (USA)

Theme 2: Geohazards Monitoring

Mitigating the impact on human life and property of natural hazards such as earthquakes, volcanic eruptions, debris flows, landslides, land subsidence, tsunamis, floods, storm surges, hurricanes and extreme weather is an important scientific task to which GGOS can make fundamental contributions. GNSS and InSAR can be used to monitor the pre-eruptive deformation of volcanoes and the preseismic deformation of earthquake fault zones, aiding in the issuance of volcanic eruption and earthquake warnings. GNSS can also be used to rapidly estimate earthquake fault motion, aiding in the modeling of tsunami genesis and the issuance of tsunami warnings. Gravity measurements can be used to track mass motion within volcanic conduits; and gravity and altimetric measurements can be used to track floodwaters in river basins.

Geodetic observations are essential for understanding the processes causing the hazard, for assessing the risks of the hazard, for monitoring the development of the hazard, for deciding whether or not to issue an early warning, and to support rescue and damage assessment activities.

The objective of Theme 2 is to improve the effectiveness of the geodetic community in supporting natural hazard identification, assessment, prioritization, prediction, and early warning. As an international organization, GGOS can be very effective as an advocate for the role of geodesy in understanding and mitigating natural hazards. GGOS can be an effective advocate for improving the geodetic data needed for natural hazards research including better spatial coverage, higher sampling rate, lower latency, and wider data availability, particularly of SAR and GNSS data. Finally, improved public outreach is needed to better educate and inform the public about the benefits of geodesy for geohazards monitoring.

Joint Working Group of Theme 2

JWG 0.2.1: New technologies for disaster monitoring and management
(joint with Commission 4)

Chair: I.D. Doukas (Greece)

Terms of Reference

United Nations International Strategy for Disaster Reduction (UNISDR) offers the following definition: “Disaster: A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources”.

These facts demand actions and therefore they make indispensable the existence of dedicated methodologies and practices that serve for the prevention of environmental risks (in terms of protecting the citizens against the effects resulting from a disaster). So, these facts trigger off the launch of many initiatives throughout the world. Many related serious undertakings have targets such as: the assessment and reduction of urban vulnerability, the boost of information and knowledge exchange concerning the numerous topics and parameters involved into the extremely complicated domain of disasters.

Consequently, there is a very wide and dynamic field for investigation, studying and testing of available technologies, sensors, geosensors, methods, information systems, techniques etc., with a lot of potential.

Objectives

- To gather and register all kinds of disasters, either natural or man-made as a preparation to obtain a final reference base of study.
- To investigate, study and test any kind of available technologies, sensors, geosensors, methods, information systems (web-based or not), techniques etc. that could relate with Disaster Monitoring and risk management.
- To explore both the "Disaster Cycle" (Preparedness, Response, Recovery, Mitigation, Prevention) and the risk management domains, in order to detect where, how and what kind of the above mentioned new technologies could be infused to these domains.
- To dynamically record and register internationally existing disaster management systems, in order to have up-to-date information about the scene, the sophistication and the general advances in this field.
- To experiment with existing or new ideas, for ground based, water/marine based or airborne solutions, into