GGOS Working Group on Ground Networks and Communications

Status Update – April 2006

Goals and Objectives

The Ground Networks and Communications Working Group is working toward the implementation of properly designed and structured ground-based geodetic networks to materialize the reference systems to support sub-mm global change measurements over space, time and evolving technologies. The WG is working with the IAG measurement services (the IGS, ILRS, IVS, IDS and IGFS) to develop a strategy for building, integrating, and maintaining the fundamental network of instruments and supporting infrastructure in a sustainable way to satisfy the long-term (10-20 year) requirements identified by the GGOS Science Council. At the moment, the Working Group is examining options for 1 mm and 0.1 mm/yr reference frame stabilities.

Activities Planned and Underway

Activities of the Working Group include the investigation of the status quo and the development of a plan for full network integration to support improvements in terrestrial reference frame establishment and maintenance, Earth orientation and gravity field monitoring, precision orbit determination, local deformation monitoring, and other geodetic and gravimetric applications required for the long-term observation of global change. This integration process includes the development of a network of fundamental stations with as many colocated techniques as possible, with precisely determined intersystem vectors. This network would exploit the strengths of each technique and minimize the weaknesses where possible.

The final design of the GGOS network must take into consideration all of the applications including the geometric and gravimetric reference frames, EOP, POD, geophysics, oceanography, etc. We will first consider the TRF, since its accuracy influences all other GGOS products. Early steps in the process are:

1. Define the critical contributions that each technique provides to the TRF, POD, EOP, etc;
2. Characterize the improvements that could be anticipated over the next ten years with each technique;
3. Understand the present error sources for each technique (instrument and modeling) and how these errors sources propagate into the analysis products;
4. Using simulation techniques, quantify the improvement in the TRF, Earth orientation and other key products as stations are added and station capabilities (co-location, data quantity and quality) are improved;

The Working Group is assuming that the GNSS and the DORIS Networks will be at least as robust as they are presently and that planned upgrades in the ground systems and the satellites will come to fruition. Some augmentation is also assumed where the present networks would be significantly enhanced with additional stations.

SLR and VLBI are presently investigating the size and density of the networks that will be required to satisfy their individual requirements.

We are still in the process of integrating the role of gravity field measurements within the context of the integrated network.

In a next step, we will examine the current infrastructure in-place, for the analysis of the network-collected data, investigate their adequacy to meet the envisioned future network realizations and the product quality and latency vis-à-vis the GGOS goals, and suggest appropriate actions.

Related to the above, is the question of data and product communications. This needs to be examined once we have a firm idea of the networks of the next decade and the product availability requirements. Our detailed investigation will ensure that the data will reach the analysis centers with minimal delays, and the products will be expeditiously disseminated to the public and the users. In addition to these questions, we will examine the need and possible improvements of communication links between geodetic and other GEOSS-related networks, e.g. oceanographic, atmospheric, seismic, etc., to make sure that data and results from each of these can be made available to all users with minimal effort and delays.

A preliminary discussion of items 1 and 2 above is included in our Poster paper from the IAG Cairns meeting:

M. Pearlman, et al, “GGOS Working Group on Networks, Communication, and Infrastructure” (http://cddis.gsfc.nasa.gov/docs/GGOS_IAG_0508.pdf)

Meetings

During 2005, the Working Group met at EGU in April, IAG in August, and AGU in December.

The next meeting is scheduled for EGU on April 6, 2006. The progress of the SLR and VLBI simulations will be reviewed along with the long term plans for the GNSS and DORIS networks, and the role and scope of the gravity field and tide gauge measurements in the integrated network. The agenda for the meeting is attached.

Member List of the Working Group

- IGS: Angelyn Moore, Norman Beck

- ILRS: Mike Pearlman, Werner Gurtner
- IVS: Chopo Ma, Zinovy Malkin
- IDS: Pascal Willis
- IGFS: Rene Forsberg, Steve Kenyon
- ITRF and Local Survey: Zuheir Altamimi, Jinling Li
- IERS Technique Combination Research Centers: Marcus Rothacher
- IAS (future International Altimetry Service): Wolfgang Bosch
- Data Centers: Carey Noll
- Data Analysis: Erricos Pavlis, Frank Lemoine, Frank Webb, John Ries, Dirk Behrend

GGOS Working Group on
Ground Networks and Communications
Austria Center Vienna
Room SM3
April 6, 2006
17:30 – 20:00

Review of Working Group Charter

Status of Network

Satellite Laser Ranging

- What should the technology and infrastructure look like in 10 years?
- What TRF requirements does the technique satisfy?
- What network is required to satisfy the TRF requirements?

Very Long Baseline Interferometry

- What should the technology and infrastructure look like in 10 years?
- What TRF requirements does the technique satisfy?
- What network is required to satisfy the TRF requirements?

GNSS

- What should the technology and infrastructure look like in 10 years?
- What TRF requirements does the technique satisfy?
- What changes in the network are anticipated over the next 10 years?

DORIS

- What should the technology and infrastructure look like in 10 years?
- What TRF requirements does the technique satisfy?
- What changes in the network are anticipated the next 10 years?

Gravity Field

- What type of gravity data are available now, where and with what coverage (spatial+temporal)?
- Who controls the data archival and dissemination?
- Which data level is freely available, L0, L1, L2,... define what these levels of processing.
- Which gravity-measuring efforts are in-place and how and who runs them?
- What do the current permanent gravity networks look like now (describe all types)?
- How many absolute gravimeters are there, who owns them and controls them, what are the end-product, and what is the deployment plan?
- How many super-conducting gravimeters are there, who owns them and controls them, what are the end-product, and what is (if any) the enhancement/expansion plan?
- How best could we incorporate these gravity networks into our overall activity on a "Global Geodetic Observing System" network design?
- What are expected to be the future requirements and how did you arrive at these?
- Describe on-going or planned, global and regional programs for each type of gravity measurements: surface, airborne, shipborne, space missions.
- Should all fiducial reference geodetic observatories have a gravimeter or a program of gravimeter occupations at regular intervals?
- What is the mechanism (if any) that coordinates gravity measuring campaigns of any type, and how and who initiates them?

Tide Gauge Network

- What the network looks like?
- What does the data look like?
- Where are the data stored?
- How do people get access?
- What kinds of products are generated from the data?
- Is the technology changing?

Site Metadata Effort

Communications