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Welcome Address on behalf of the International Association of Geodesy IAG

G. Beutler

President, President

Astronomical Institute

University of Bern

IGS Analysis Center Workshop 2006

Perspectives and Visions for 2010

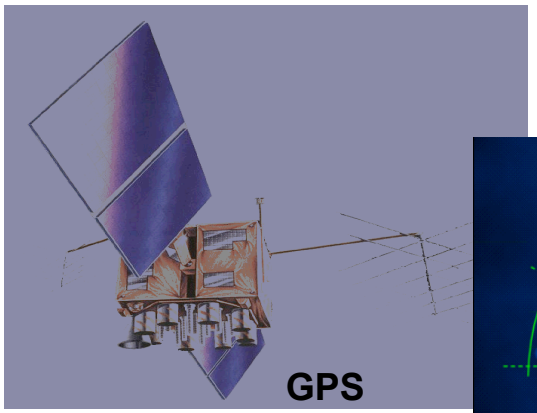
Monday, May 8, 2006

ESOC, Darmstadt

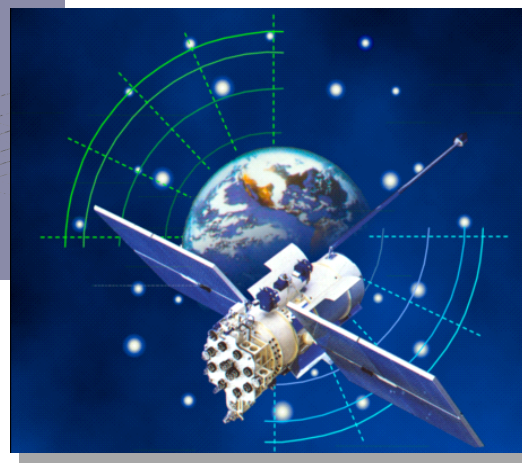
Global Navigation Satellite Systems

GPS: USA , about 30 satellites in 6 planes
GLONASS: about 12 satellites in 3 planes

GALILEO: today one test satellite in orbit



GPS



GLONASS

GALILEO

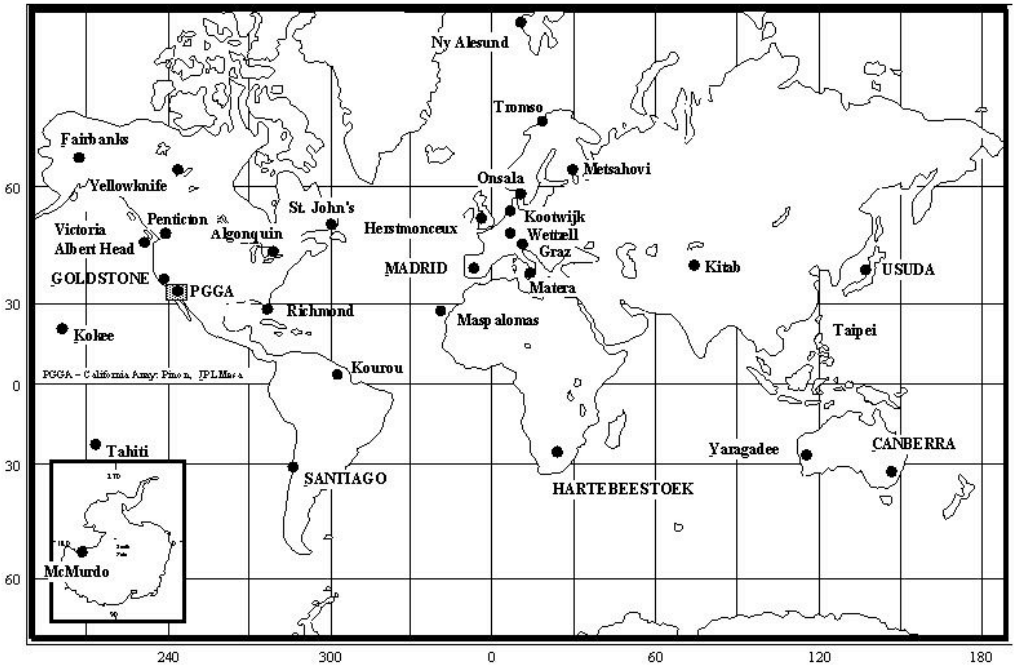
The International GNSS Service

- The primary motivation in planning the IGS was the recognition in 1989 that the most demanding users of the GPS satellites, the geophysical community, were purchasing receivers in exceedingly large numbers and using them as more or less black boxes, using software packages which they did not completely understand, mainly for relative positioning.
- The other motivation was the generation of precise ephemerides for the satellites together with by-products such as earth orientation parameters and GPS clock information.

IGS planning was initiated 1989 in Edinbugh and started with an insult!

The International GNSS Service

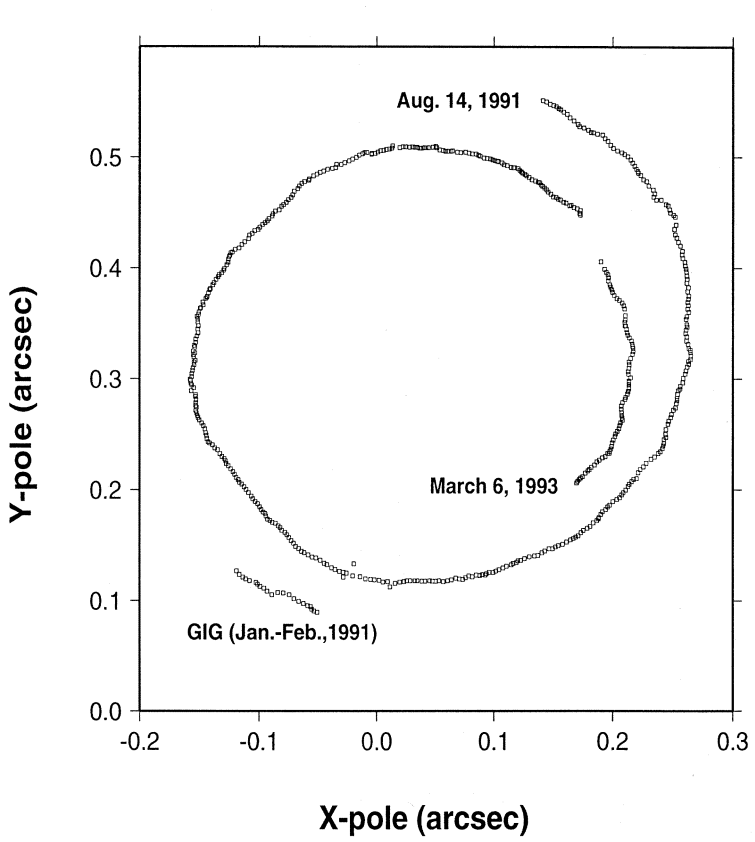
Station Locations for the IGS Pilot Campaign, 1992



In 1992 (IGS Test Campaign) the IGS network consisted of about 20 (!) „good“ receivers (mainly Rogues).

The coverage was „kind of global“ ...

The International GNSS Service



Typical early 1990s result (SIO) for polar motion. Accuracy about 1 mas per coordinate for daily esti-mates (Bern 1993 IGS work-shop).

It became clear that ERPs had to be estimated by the IGS Analysis Centers and could not be taken over from other sources (IERS) - mainly due to delays and data density issues.

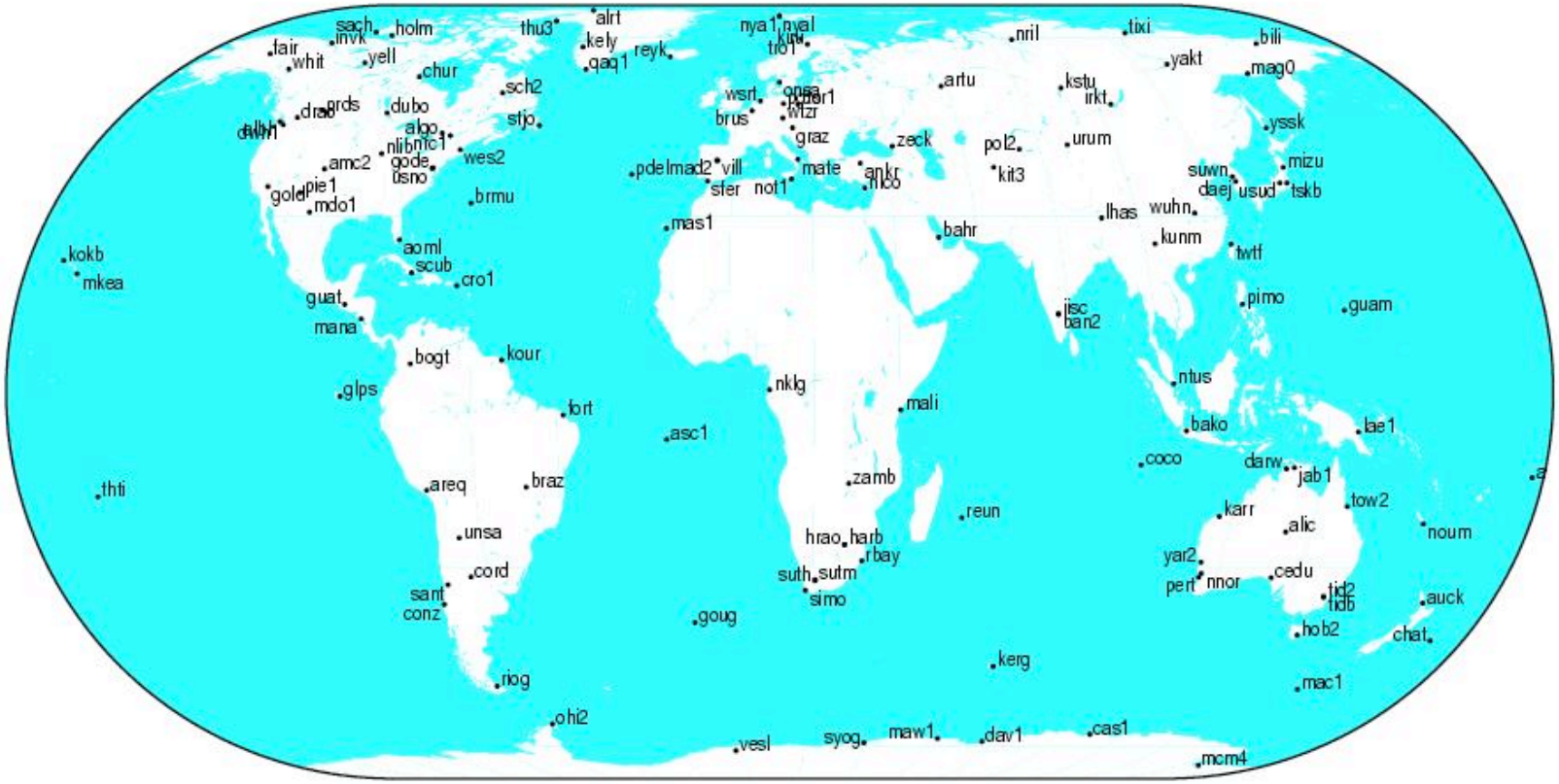
The International GNSS Service

Today, the IGS may access the data of 500+ receivers close to real time, but at least on a daily basis („real-time“, hourly, daily data transmission to data centers).

The IGS is today an interdisciplinary service making available, among other, the following products:

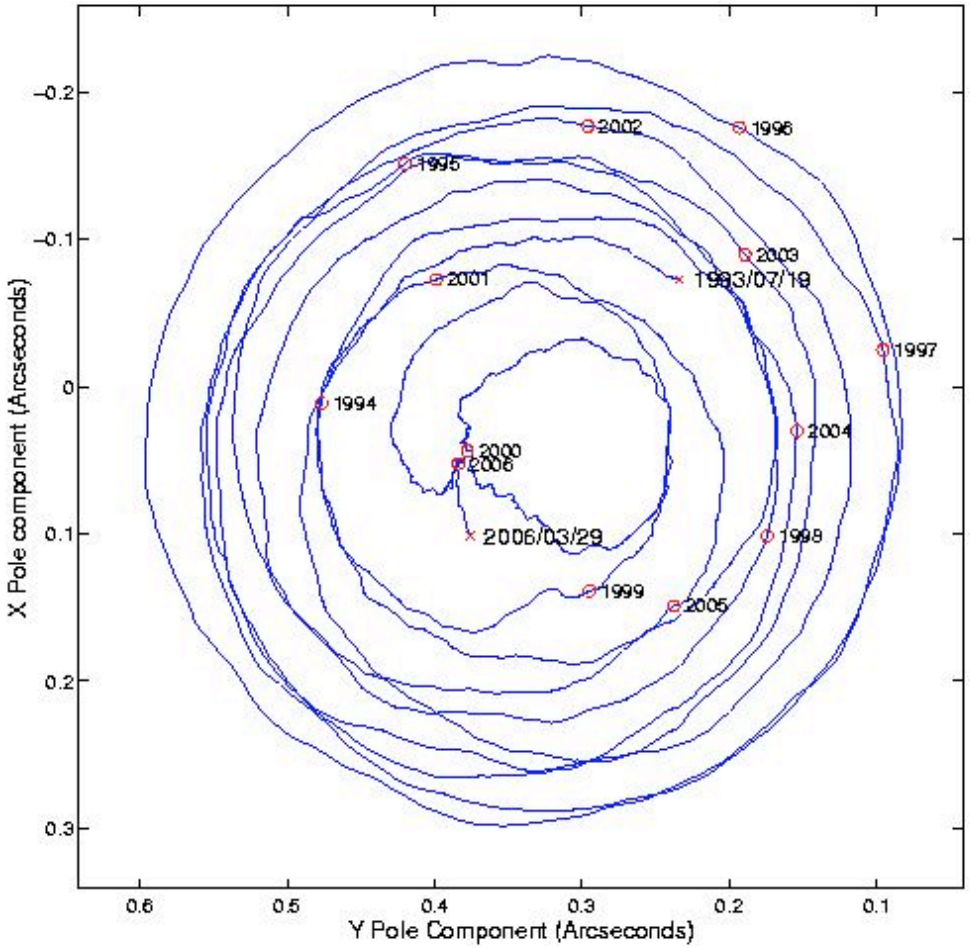
- ***GPS orbit data (2-5 cm consistency),***
- ***Clock corrections for satellites and receivers (sub 0.1 ns consistency),***
- ***ERPs (polar motion, length of day),***
- ***Coordinates of sites (weekly batches),***
- ***Ionosphere models***
- **Many special products and activities ...**

The International GNSS Service



The global IGS Network has 500+ receivers today!

The International GNSS Service

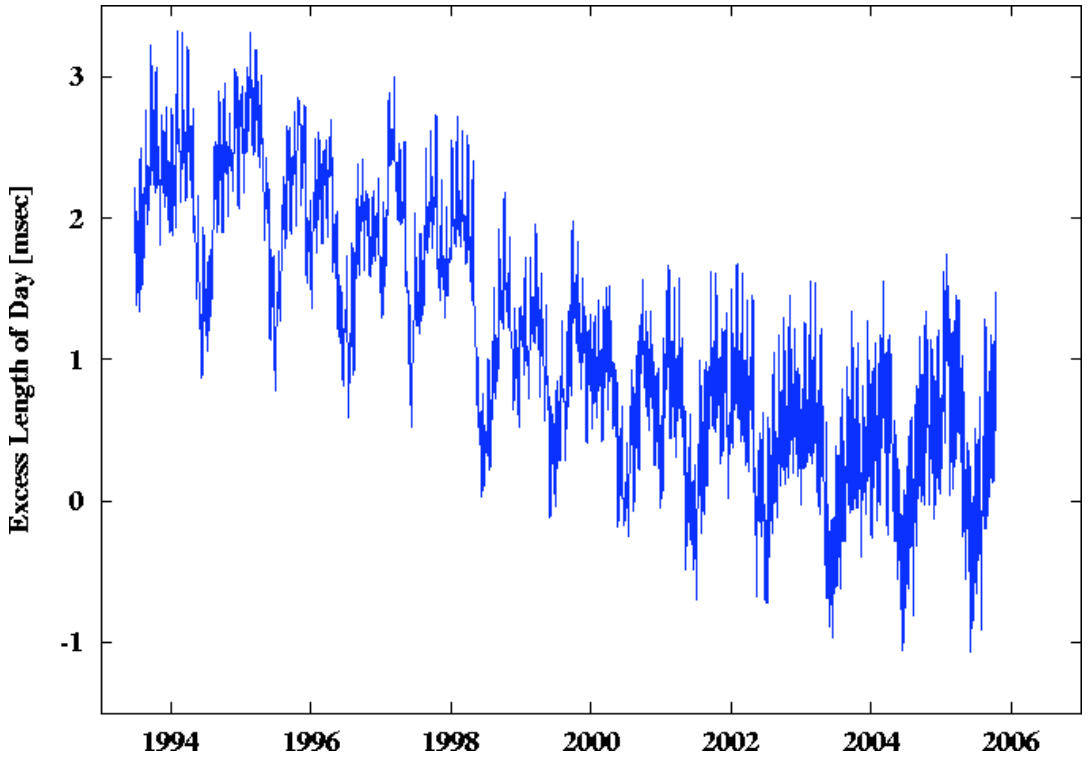


IGS polar motion 1993 – March 2006, daily resolution.

Accuracy today better than 0.1 mas.

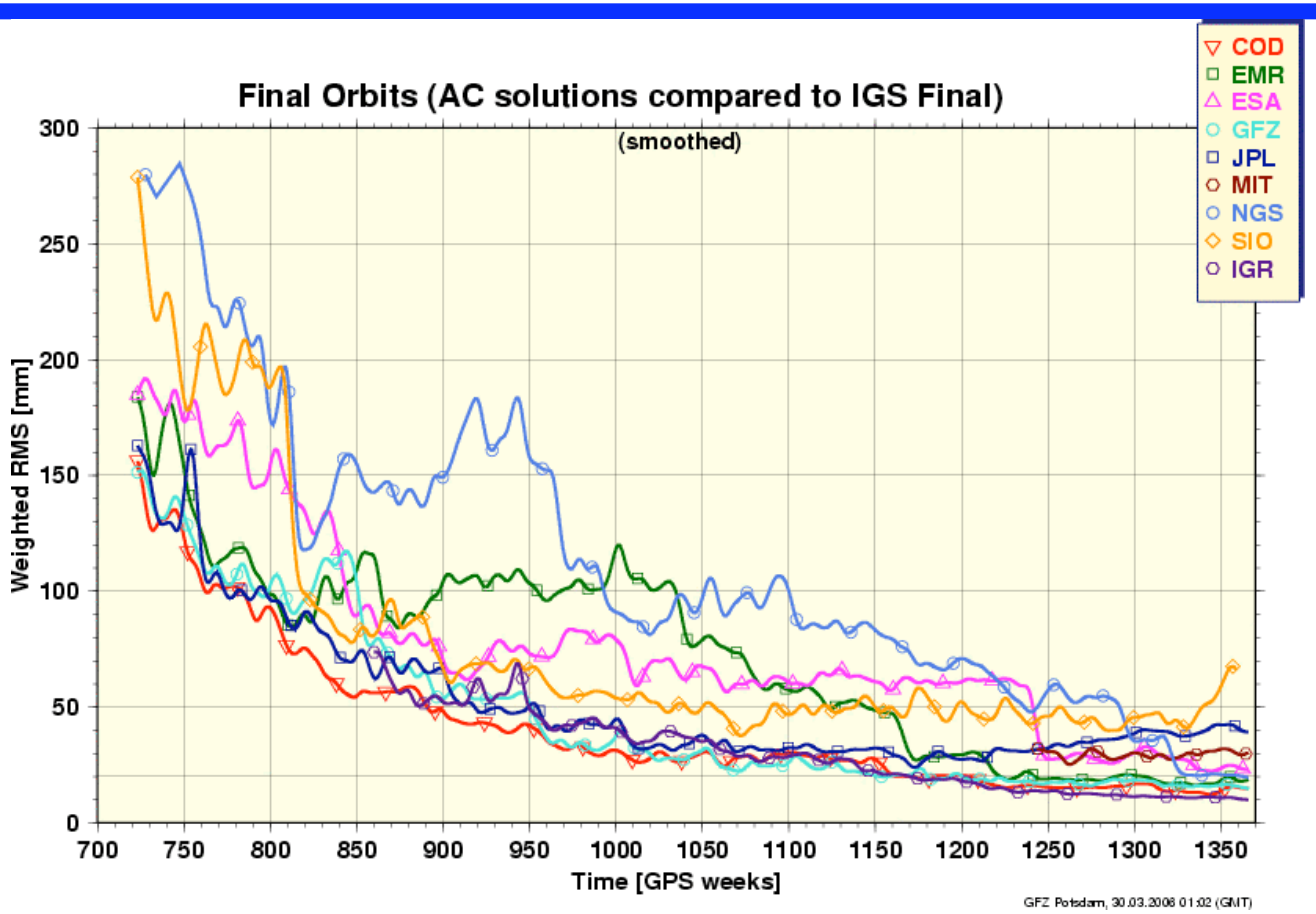
Twice, around New Year's Eve 1999 / 2000 (Y2K) and end of February 2006 the pole almost came to a standstill ...

The International GNSS Service



Length of day variations (tidal effects of short period, atmosphere-induced annual/semiannual effects, multi-annual variations).

The International GNSS Service



Weekly statistics concerning orbit quality by IGS ACC (Gerd Gendt, GFZ)

The Global Geodetic Observing System

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In space geodesy we derive parameters defining the

- the terrestrial reference system
- the celestial reference system
- the transformation between systems
- Earth models (rigid, elastic, multi-layer, atmosphere, oceans, etc.)
- satellite motion (gravity field, non-gravitational forces)

as a function of time.

All parameters are correlated.

→ We definitely need a system approach to tackle our very ambitious problem(s)!

The Global Geodetic Observing System

On the other hand, the IAG has had great success by setting up special tasks:

- **the IGS, ILRS, IVS uses GNSS satellites, satellites with Laser reflectors, and Quasars, respectively, to study the system Earth,**
- **the IERS derives the parameters of the system Earth by combining the results of the technique-specific services,**
- **the IGFS (International Gravity Field Service) studies the gravity field using terrestrial, airborne and satellite data.**

The two views, holistic and specialization, are not in contradiction, but complementary.

They are the two guiding principles of GGOS!

The Global Geodetic Observing System

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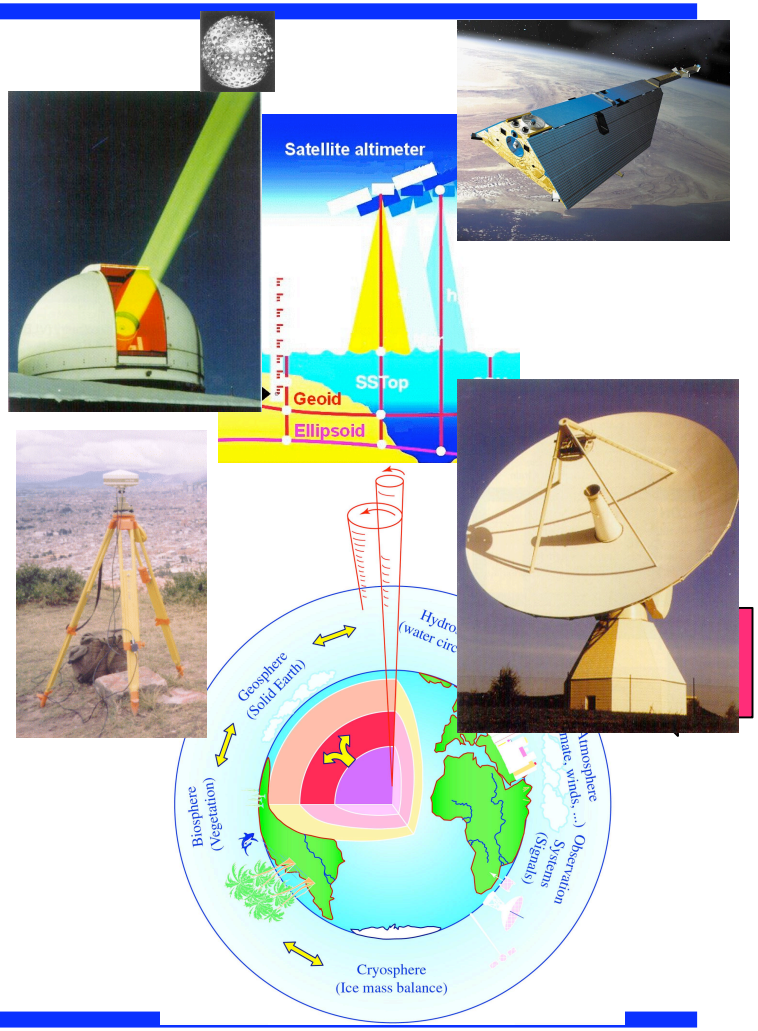
GGOS integrates different geodetic techniques, different models, different approaches in order to achieve the required long-term consistency, reliability and understanding of geodetic, geodynamic and global change processes.



- GGOS provides the scientific and infrastructural basis for all global change research in Earth sciences.

IAG's Global Geodetic Observing System (GGOS)

ICSU International Council for Science
IUGG Int. Union of Geodesy and Geophysics
IAG Int. Association of Geodesy
Commissions | Services
GGOS Global Geodetic Observing System

IAG Services | GGOS Board | Science Council

Working Groups

- Copyright, Data Access Policy, Publishing, Certification
- Data and Info Systems
- Infrastructure: Networks, Communication
- User Linkage: Science, Industry, Authorities, Outreach

International Laser Ranging Service (ILRS)

International GPS Service (IGS)

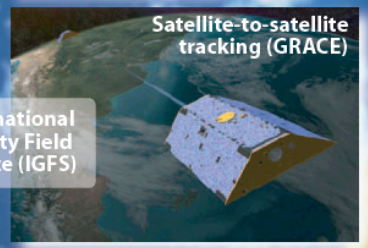
International VLBI Service (IVS)

International Earth Rotation and Reference Systems Service (IERS)

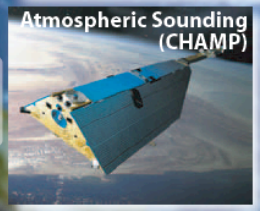
IAG services are based on more than 400 global observation stations.

Geodetic Space Techniques

Satellite Altimetry



Satellite-to-satellite tracking (GRACE)

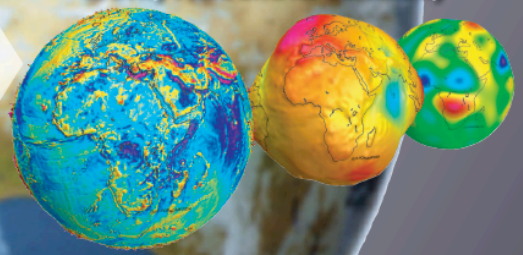


Atmospheric Sounding (CHAMP)

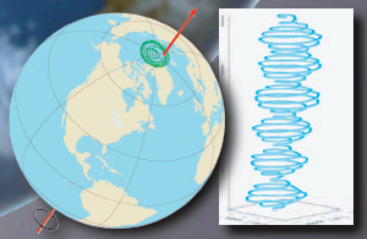
Products

Geometry and Kinematics

Gravity Field and its Variability

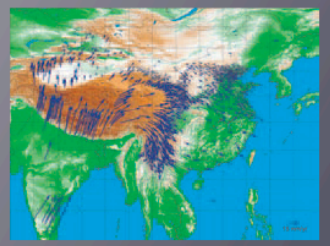


Earth Orientation and Rotation

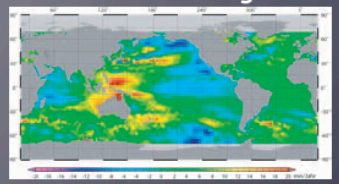


Applications

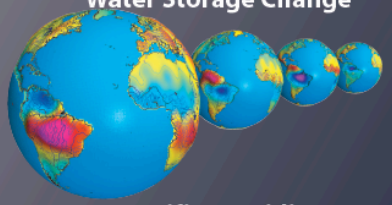
Positions and Velocities



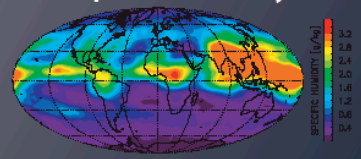
Sea Level Changes



Water Storage Change



Specific Humidity



Geo-hazards

Ice Mass Balance

GGOS
http://www.ggos.org

The IGS Workshop 2006 at ESOC

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IAG is proud of its scientific services, in particular of the IGS, which was the first of Space Geodesy's technique-specific services and served as an example to set up other IAG services of this type.

International scientific collaboration over decades can only be successful if the underlying concepts and methods are continuously analyzed, improved, and adapted to the most demanding requirements.

This insight is the driving element of IGS workshops.

On behalf of the IAG Bureau and Executive I wish all of you/us a very inspiring IGS Workshop 2006.

I would like to thank ESOC, in particular John Dow and his crew in advance for hosting the workshop!