IAG Components Supporting ICG Goals

Chris Rizos

Vice President IAG

ICG Goals

- Forum for multi-lateral discussions
- ***…promote cooperation, as appropriate, on matters of mutual interest related to civilian satellite-based PNT and value-added services, as well as the compatibility and interoperability of GNSSs, while increasing their use to support sustainable development, particularly in developing countries***
- ICG Participants are system providers, international governmental organisations and international NGOs
- Opportunity for users to interact with system providers

Components of the IAG

- Commissions (& sub-commissions & WGs/SGs)
- Services … *the "operational geodesy" component*
- Global Geodetic Observing System (GGOS) … *the proposed integrating mechanism*
- Executive Committee
- Central Bureau & website *http://www.iag-aig.org/*

- ***Contributions to ICG: geodetic products and activities of IAG components***

Geodesy's Contribution

- Fundamental Spatial *Infrastructure*
  - Reference surfaces and reference frames for mapping, surveying, and the Spatial Data Infrastructure: "Digital Earth"
- National Reference Datums
  - 3D & 2D Cartesian coords: mapping & scientific
  - Heights above reference surface: height datum
  - Geoid-MSL geometry: height above geoid
- Global *Terrestrial* Reference Frames
  - 3D coords: International Terrestrial Reference Frame - ITRF2005
  - Sea Level height: sea level surface from satellite altimetry
  - Global Gravity Model: static & variable gravity field
- Global *Celestial* Reference Frames
  - International Celestial Reference Frame (ICRF)
  - Polar motion & earth spin rate EOPs

It's all about the Reference Frame

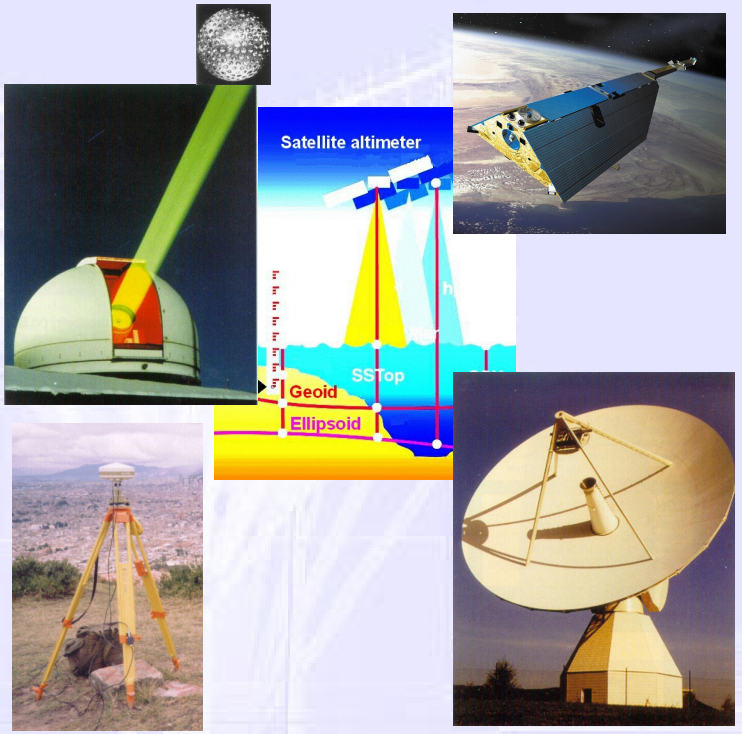
- Geoscience, surveying, mapping, navigation, all need the….

International Terrestrial Reference Frame

- The ITRF is at the heart of interoperability for GNSS providers and users…. *The global framework in which regional & national datums are embedded*

The Global Geodetic Observing System

- 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*.



- *Requires ultra-stable ITRF maintenance, to the benefits of all other communities as well…*

GGOS

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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)

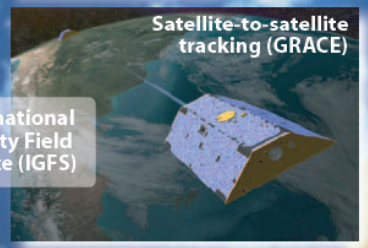
International VLBI Service (IVS)

International Earth Rotation and Reference Systems Service (IERS)

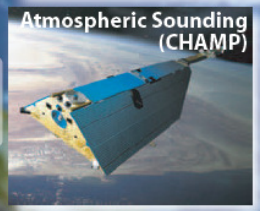
IAG services are based on more than 400 global observation stations.

Geodetic Space Techniques

Satellite Altimetry



Satellite-to-satellite tracking (GRACE)

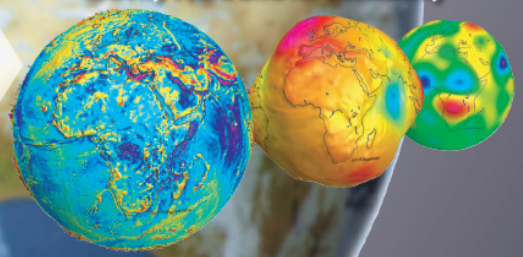


Atmospheric Sounding (CHAMP)

Products

Geometry and Kinematics

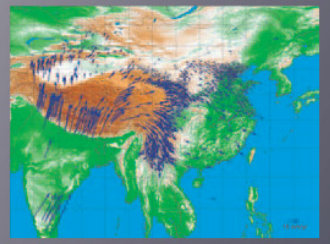
Gravity Field and its Variability



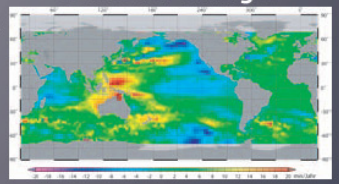
Earth Orientation and Rotation

Applications

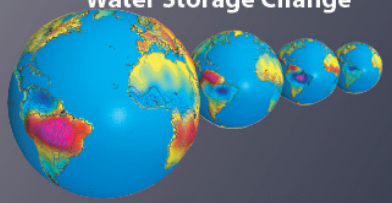
Positions and Velocities



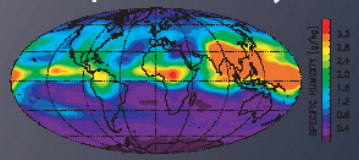
Sea Level Changes

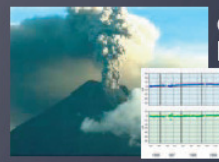


Water Storage Change



Specific Humidity





Geo-hazards

Ice Mass Balance

GGOS
http://www.ggos.org

http://www.ggos.org

IAG Commission 1: Reference Frames

President: Z. Altamimi (France), M. Craymer (Canada)

- SC1.1: Coordination of Space Techniques **M. Rothacher** (Germany)
- SC1.2: Global Reference Frames **C. Boucher** (France)
- SC1.3: Regional Reference Frames **J. Torres** (Portugal)
  - SC1.3 a: Europe **J. Ihde** (Germany)
  - SC1.3 b: South & Central America **C. Brunini** (Argentina)
  - SC1.3 c: North America **R. Snay** (USA), **M. Craymer** (Canada)
  - SC1.3 d: Africa **R. Wonnacott** (South Africa)
  - SC1.3 e: Asia-Pacific **S. Matsuzaka** (Japan)
  - SC1.3 f: Antarctica **R. Dietrich** (Germany)
- SC1.4: Interaction of Celestial & Terrestrial Reference Frames **H. Schuh** (Austria)

The Services of the IAG

- **Geometric Services:**
  - International Earth Rotation and Reference Systems Service (IERS) - 1866, 1960, 1988
  - International GNSS Service (IGS), *formerly International GPS Service* -1994
  - International Laser Ranging Service (ILRS) - 1998
  - International VLBI Service for Geodesy and Astrometry (IVS) - 1999
  - International DORIS Service (IDS) - 2003
- **Gravity Services:**
  - International Gravity Field Service (IGFS) - *to coordinate and integrate broad range of gravity field activities* - 2003:
    - International Gravimetric Bureau (BGI)
    - International Geoid Service (IGeS)
    - International Center for Earth Tides (ICET); etc
- **Cross Union Services:**
  - Permanent Service for Mean Sea Level (PSMSL) - 1933
  - Time Section of the International Bureau of Weights and Measures - 1875

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IAG's Contribution to ICG

- The International Terrestrial Reference Frame (ITRF), e.g. ITRF2005.
- Geodesy is the foundation of national surveying & mapping products.
- Geodesy is a geoscience that can mitigate (or at least help understand) many natural hazards.
- Geodetic science is international in scope, *crossing boundaries and spanning continents*.
- *However, it is through the IGS that the IAG makes its most obvious contribution to the ICG, and to the GNSS community in general.*

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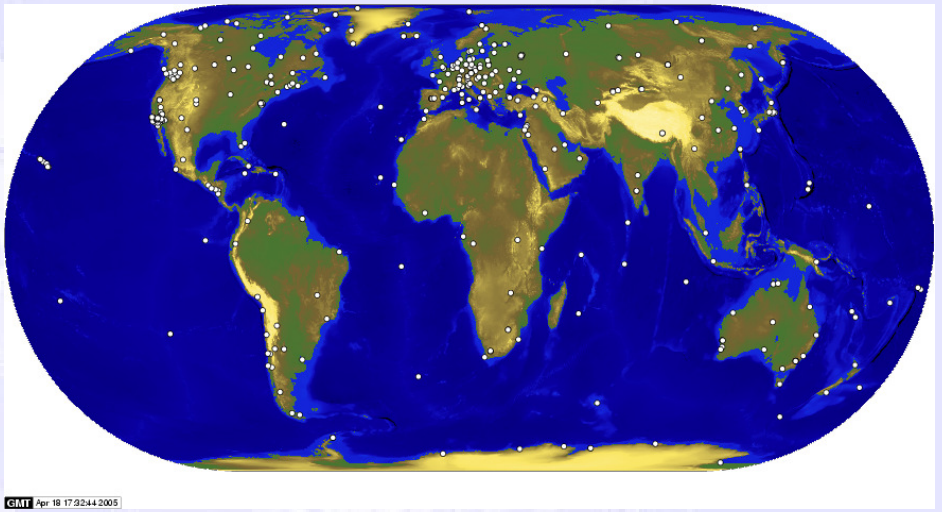
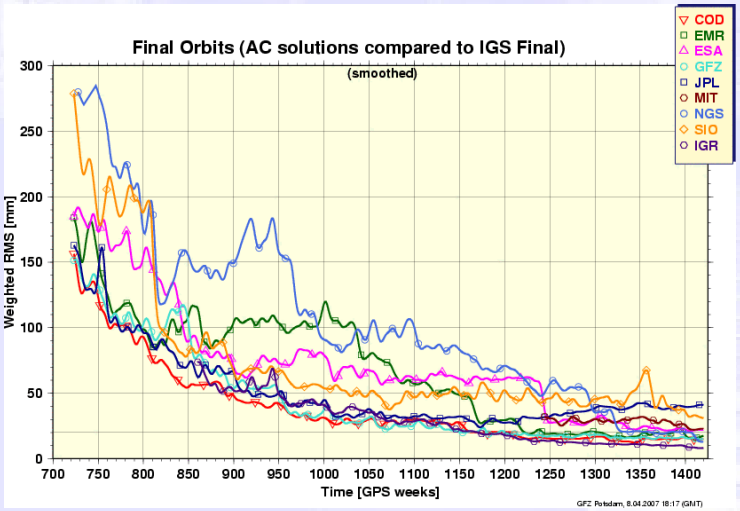
International GNSS Service

The IGS is a voluntary federation of more than 200 worldwide agencies in more than 90 countries that pool resources and permanent GPS station data to generate precise GPS products.



Over 350 permanent tracking stations operated by more than 100 worldwide agencies comprise the IGS network. Currently the IGS supports two GNSS: GPS and the Russian GLONASS.



IGS products are formed by combining independent results from each of several Analysis Centers. Improvements in signals and computations have brought the centers' consistency in the Final GPS satellite orbit calculation to ~ 2cm

Graph courtesy Analysis Coordinator

G. Gendt, GFZ Potsdam

GPS Applications in IGS Projects & Working Groups

IGS Reference Frame
Supporting AREF - African Reference Frames
Precise Time & Frequency Transfer
GLONASS Pilot Service Project, now routine within IGS processes
Low Earth Orbiters Project
Ionosphere WG
Atmosphere WG
Sea Level - TIGA Project
Real-Time Project
Data Center WG
GNSS WG

IGS's Value Proposition

- IGS is a federation of hundreds of organisations, *with international "reach"*.
- IGS has high credibility (& visibility) in the GNSS user community, *and with other int. organisations*.
- IGS generates valuable products, *freely available*.
- IGS has significant GNSS expertise, *and represents a "community of expert users"*.
- IGS contributes to many international & regional initiatives, esp. in developing countries, e.g. AFREF.

IGS's Contribution to ICG

- IGS disseminates information & products
- IGS provides a means of easily accessing the ITRF, *through its permanent "über" network*
- IGS supports the establishment of "positioning infrastructure", *to maximise benefits of GNSS*
- IGS is a scientific (& non-political) organisation
- IGS is not system, software or instrument-specific
- IGS provides independent GNSS orbits & time
- IGS is committed to GNSS interoperability & openness, *at all levels*

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Thank You!