GGOS Bureau for Standards and Conventions: Integrated Standards and Conventions for Geodesy

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Contents

- Challenges of GGOS
- Importance of consistent standards and conventions
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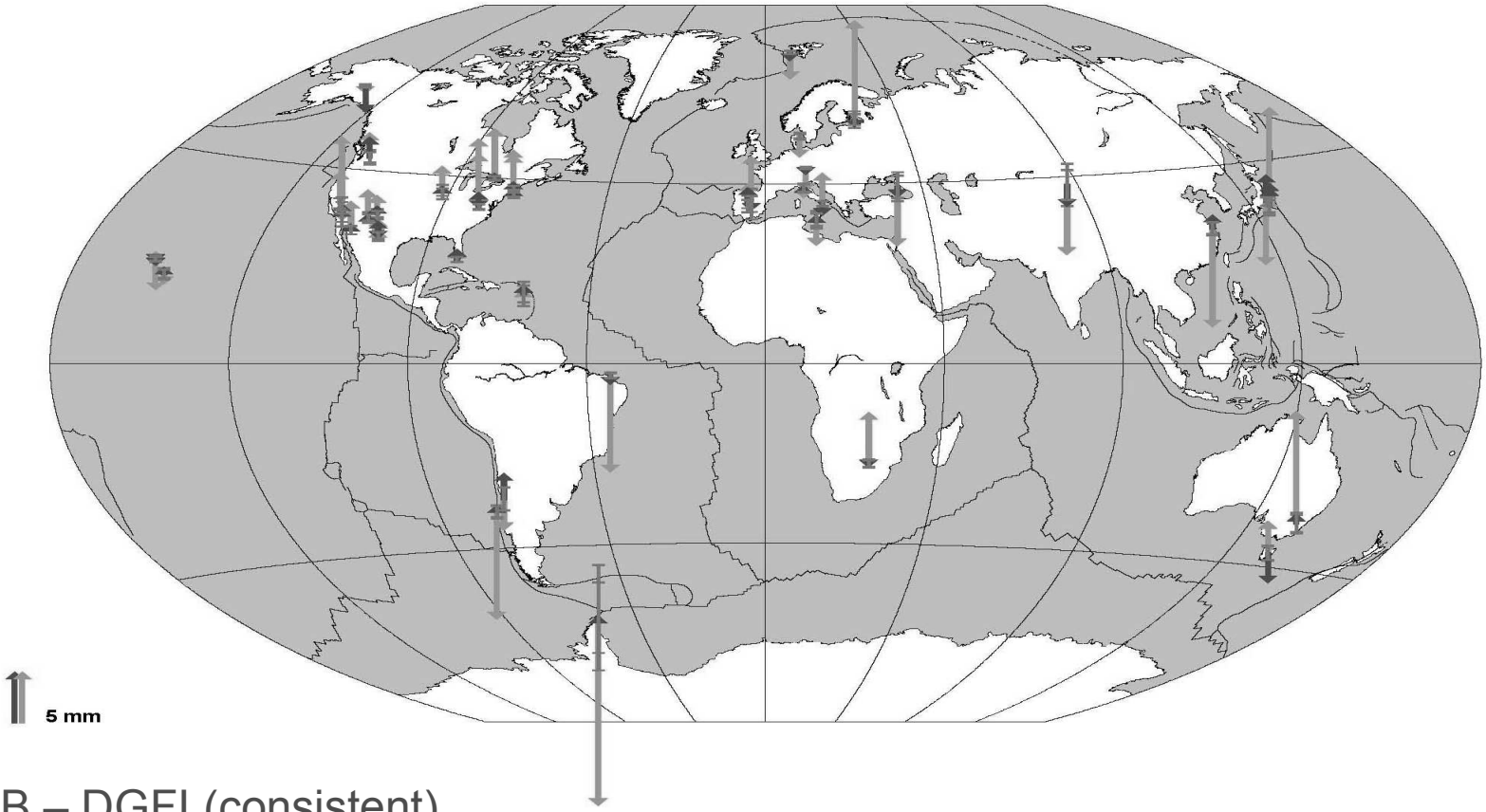
GGOS

- IAG's Global Geodetic Observing System (GGOS) provides the *metrological basis* for measuring and interpreting global deformation and mass exchange processes in the System Earth.
- It is built on the IAG Services and shall provide *integrated and consistent* products on an operational basis.
- Main product is a *long-term stable, accurate and global* terrestrial reference frame at the mm-level.
- That requires the integration of *geometry, gravimetry, Earth rotation.*
- Applying *common standards and conventions* is of crucial importance for the generation of geodetic and geophysical products.
- It is similarly important that users of GGOS products are aware of the standards and conventions these products are based on in order to fully exploit their accuracy and to allow for a *coherent interpretation*.

Examples from GGOS-D

- GGOS-D was a cooperative project supported by the German Federal Ministry of Education and Research (BMBF) in the Geotechnologien-Programme under the topic "Observations of System Earth from Space".
- The project was funded from 2005 to 2008 and involved four German institutions: GFZ Potsdam, BKG Frankfurt, IGG Bonn, DGFI.
- For the project VLBI, SLR and GPS observations were processed and rigorously combined using *unified standards* for modelling and parameterization to generate consistent high-quality time series of geodetic-geophysical parameters describing the Earth system.
- A number of examples show the impact of *inconsistencies* in the application of standards and conventions.

Handling of Mean Pole for Pole Tide

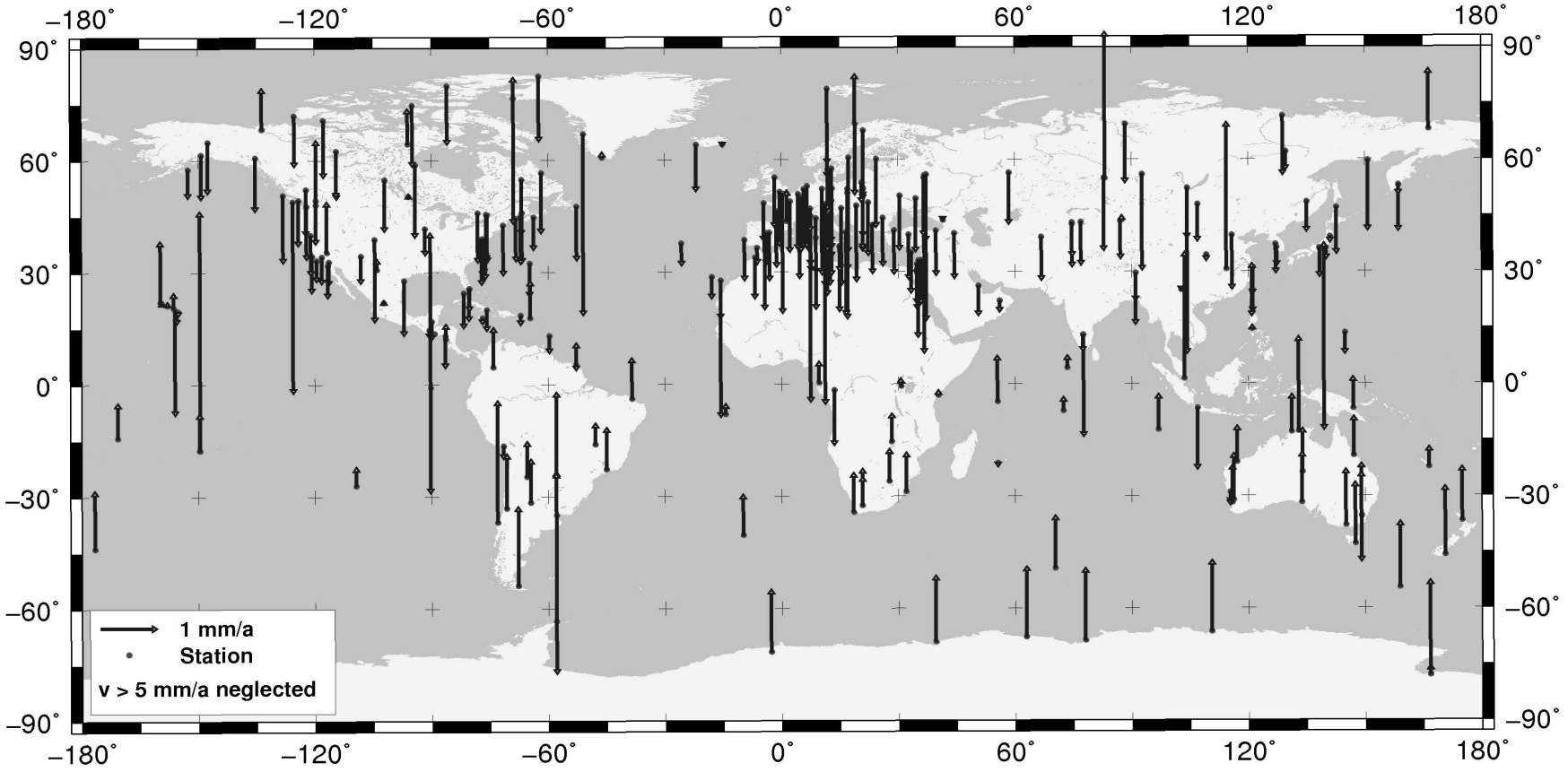


GIB – DGFI (consistent)
GSFC – DGFI (inconsistent)

GGOS-D

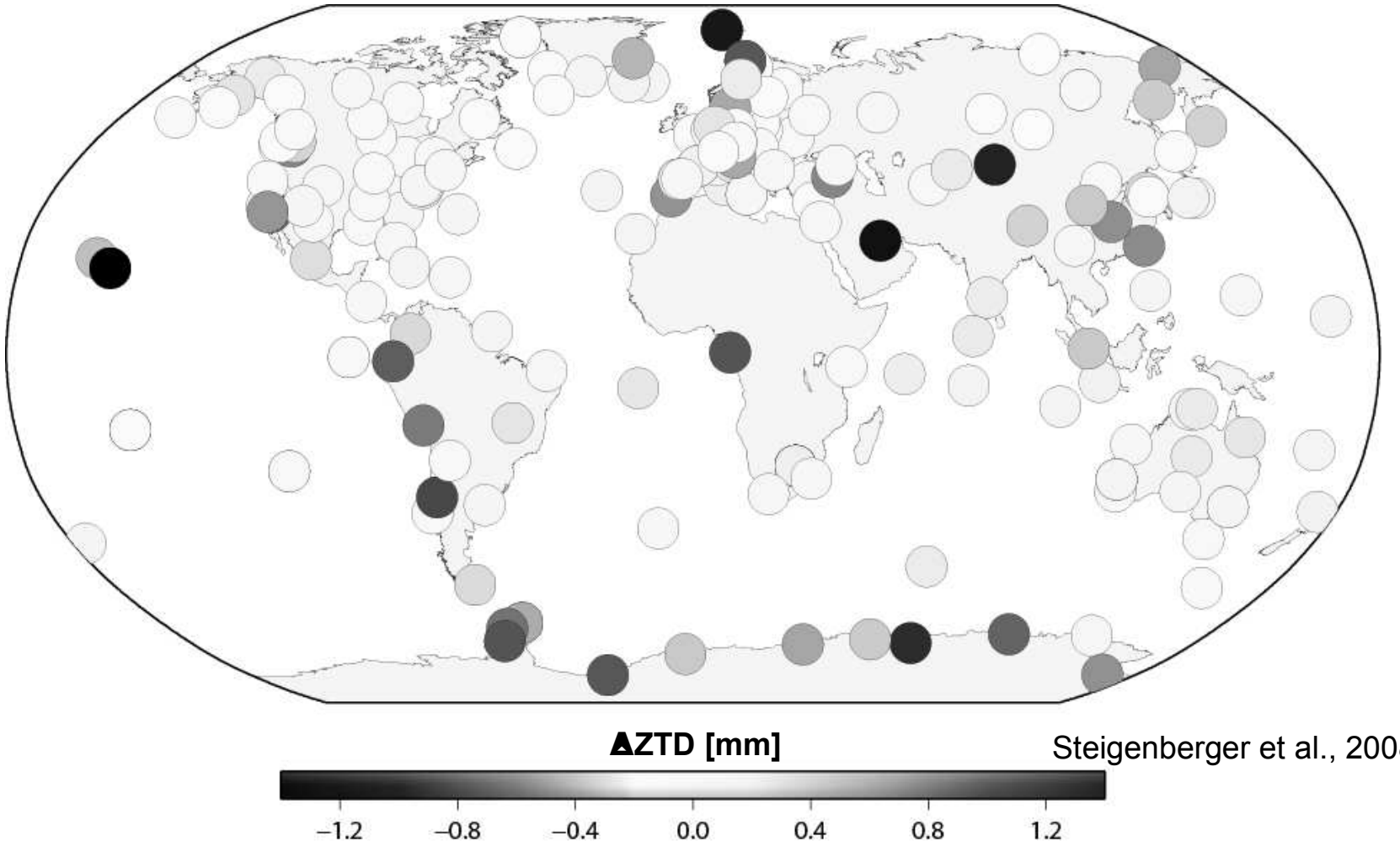
Datum and Combination

Vertical station velocities: ITRF2005 vs ITRF2005D



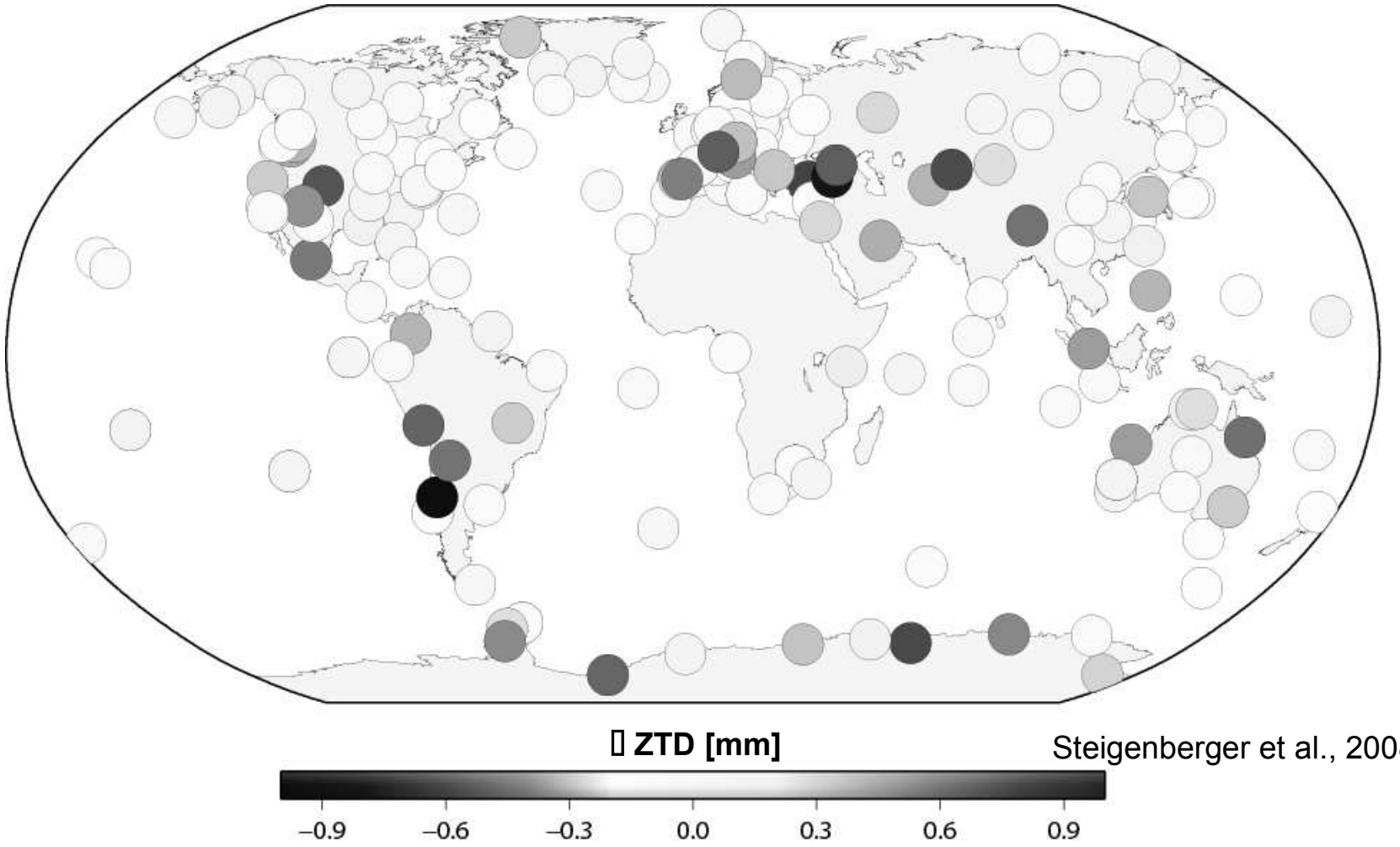
Blossfeld & Drewes, 2009

Hydrostatic Delay, ECMWF vs. GPT



Steigenberger et al., 2008

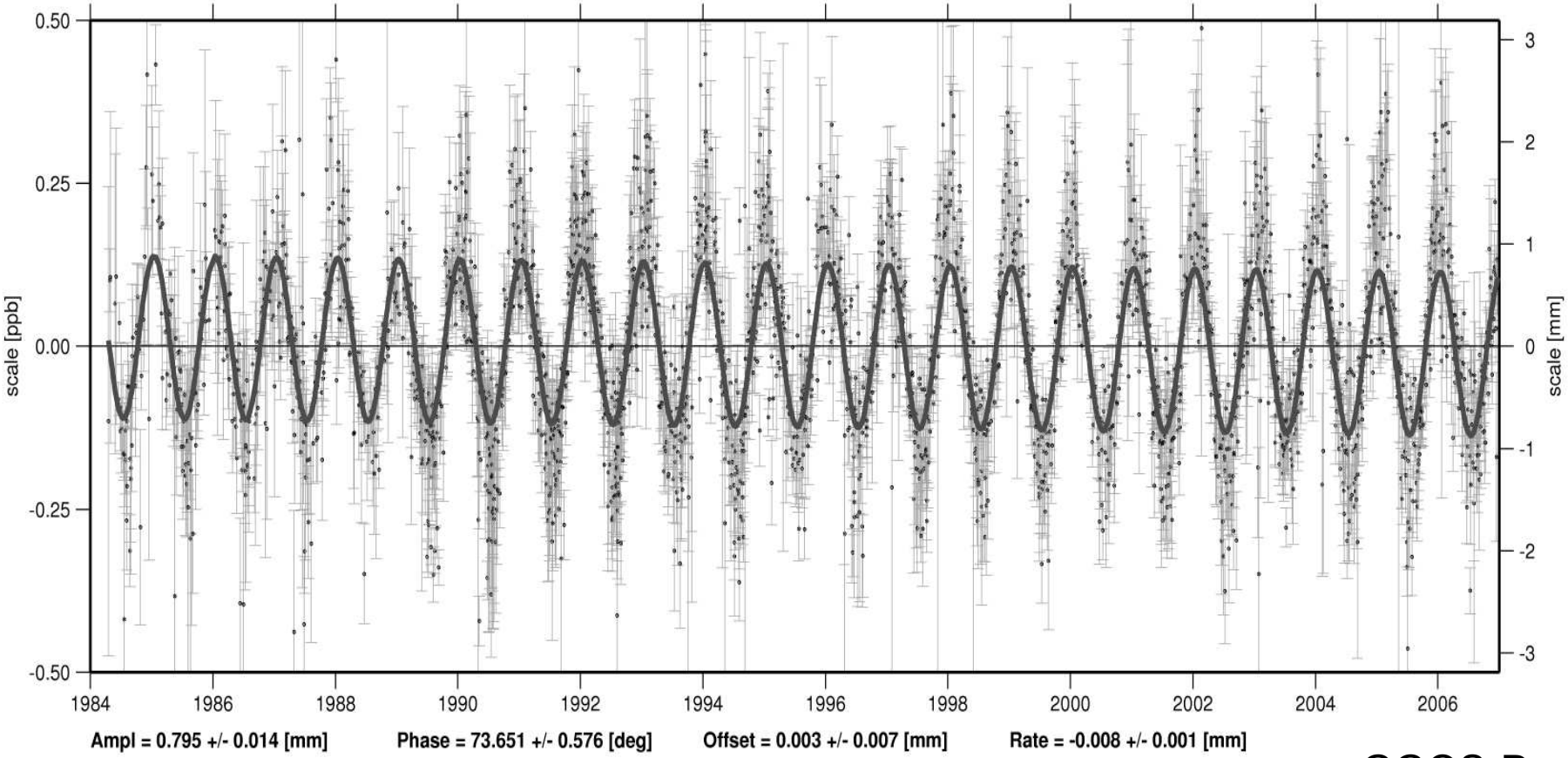
Mapping Functions, VMF1 vs. GMF



Steigenberger et al., 2008

Thermal Deformations for VLBI

- Scale variations



GGOS-D

Constants

Quantity	GRS80	IERS2003	
GM	$398.600\ 5 \cdot 10^{12}$	$398.600\ 441\ 8\ (8) \cdot 10^{12}$	$m^3 s^{-2}$
J2	$1082.63 \cdot 10^{-6}$	$1082.635\ 9\ (1) \cdot 10^{-6}$	
a_e	6 378 137	6378 136.6 (1)	m
1/f	298.25722	298.25642 (1)	
ω	$7.292\ 115 \cdot 10^{-5}$	$7.292\ 115 \cdot 10^{-5}$	rad s^{-1}
W_0	62 636 860.85	62 636 856.0 (5)	$m^2 s^{-2}$

Best estimates, consistent set of constants, uncertainties ?

Time and Tide Systems

- Time System TT (practice) vs TCG (IAU & IUGG Resolutions, 1991)

  GM = 398.600441**8** · 10^{12} m^3s^{-2} (TCG value, IERS 2003)

  398.600441**5** · 10^{12} m^3s^{-2} (TT value, EGM96, EIGEN, ...)

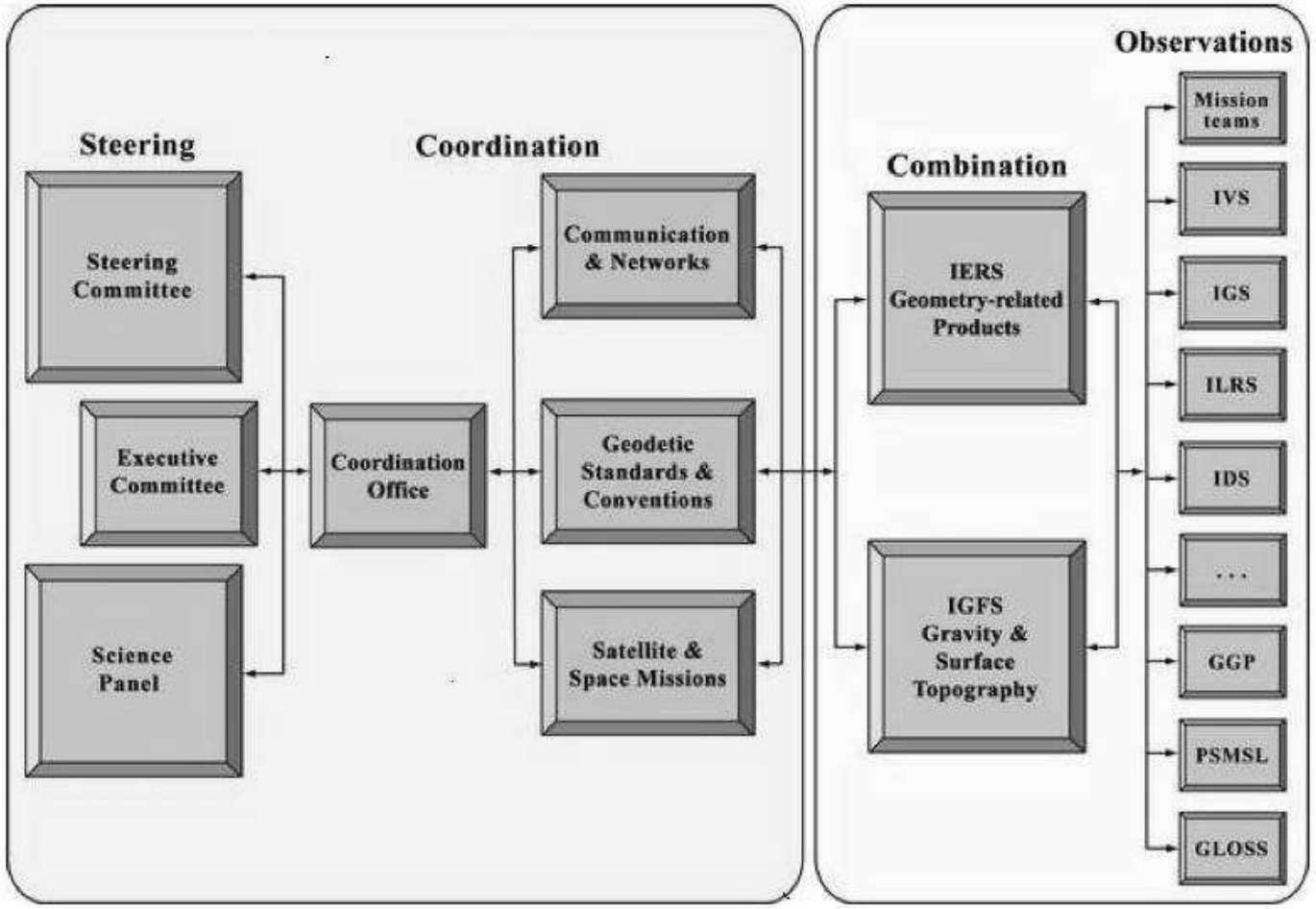
  Use of other constants consistently!

- Tide system, IAG Resolution 16 of 18th General Assembly (1983):
  - zero-tide for geopotential quantities
  - mean-tide for station displacement quantities

  In practice for geometrical quantities: tide-free (ITRF)

  → source for confusion when combining geometric and gravimetric quantities

GGOS Structure



GGOS, 2008

GGOS Bureau for Standards and Conventions

Objectives of the BSC are

- to *keep track of the strict observance* of adopted geodetic standards, standardized units, fundamental physical constants, resolutions and conventions in the generation of the products issued by the IAG Services;
- to *review, examine and evaluate* all standards, constants, resolutions and conventions adopted by IAG or its components and recommend their use or propose the necessary updates;
- to *identify gaps, inconsistencies, and deficiencies* in standards and conventions and to initiate steps to remove them;
- to *propose the adoption* of new standards and conventions where necessary;
- to *propagate standards and conventions* to the wider scientific community and promote their use.

GGOS Bureau for Standards and Conventions

The work of the BSC is thus directed at

- the *geodetic community* to assure that a consistent set of standards and conventions is used, and
- the *broader scientific community and society* in general by promoting the use of such consistent geodetic standards.

The BSC will not necessarily design new standards and conventions, but it will *take actions* when new standards and conventions emerge within the geodetic community.

To fulfill its mission, the BSC works closely together with experts in this field. Experts in standards and conventions are *welcome to participate*.

It maintains *regular contact* and establishes a strong interface with all the IAG Services and Commissions and international bodies involved in the adoption of standards, resolutions, and conventions (IERS, IAU, BIPM, CODATA, NIST, ISO/TC211).

Tasks and Goals of the GGOS BSC

- Sift the relevant *resolutions* concerned with geodetic standards and conventions.
- Draw up an *inventory* of used constants, standards, conventions.
- Evaluate the *impact* of inconsistent use of standards and conventions.
  - S/W packages for major techniques available to BSC
  - GNSS reprocessing capability available to BSC
  - Deep involvement of BSC in global gravity field recovery experiments
- Provide *Toolbox* for conversion between systems.
- Compile a consistent set of best estimates, evaluate uncertainty estimates; GRS2011 ?
- Initiate the documentation of conventions similar to those of IERS for *gravity* services and their products.
- All GGOS products shall be accompanied with a *standards sheet*.

You are invited to contribute!