The GGOS Bureau of Products and Standards

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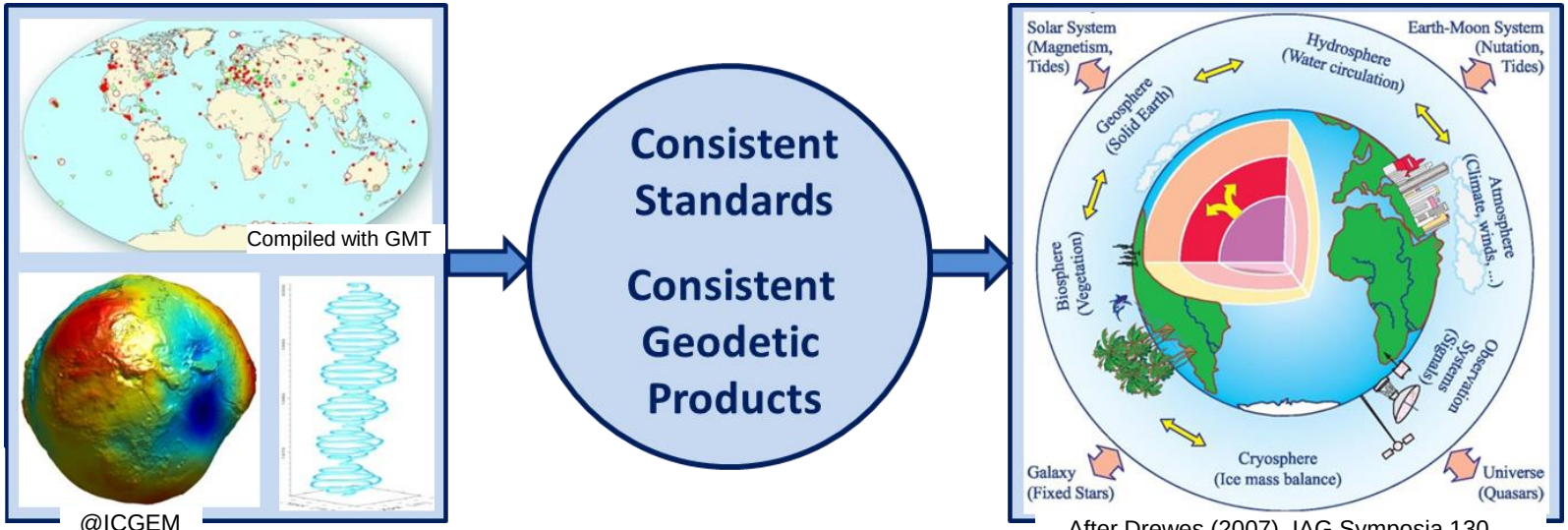
GGOS Bureau of Products and Standards (BPS)

The BPS supports GGOS in its key goal to obtain consistent products describing the geometry, rotation and gravity field of the Earth.

Mission and objectives

- contact & coordinating point for homogenization of IAG standards and products
- keep track of the adopted geodetic standards and conventions across all IAG components, and initiate steps to close gaps and deficienicies
- integrate geometric and gravimetric parameters
- develop new geodetic products, needed for Earth sciences and society



After Drewes (2007), IAG Symposia 130

BPS Organizational Structure

- The BPS is hosted at DGFI-TUM and IAPG of Technical University of Munich
- BPS staff:
  - D. Angermann (Director), T. Gruber (Deputy Director), M. Gerstl, R. Heinkelmann, U. Hugentobler, L. Sánchez, P. Steigenberger
- Entities associated to the BPS
  - Committee "**Earth System Modelling**" (Chair: M. Thomas)
  - Committee "**Essential Geodetic Variables (EGVs)**" (Chair: R. Gross)
  - Working Group **"Towards a consistent parameters for the definition of a new GRS**" (Chair: U. Marti)
- Associated members of the BPS:
  - ~ 25 representatives designated by the IAG Services and other relevant entities involved in standards and geodetic products

Representatives of IAG Services and other entities

Position (IAG Service, other entity)	Representatives	Affiliation, Country
IERS Conventions Center	Gérard Petit (until 2016)	BIPM (France)
	Nick Stamatakos (since 2017)	USNO (USA)
IERS Analysis Coordinator	Thomas Herring	MIT (USA)
	R. Heinkelmann (since 2019, BPS)	GFZ (Germany)
IGS Representative	Urs Hugentobler (BPS staff)	TUM (Germany)
ILRS Analysis Coordinator	Erricos Pavlis	UMBC/NASA (USA)
IVS Analysis Coordinator	John Gipson	GSFC/NASA (USA)
IDS Representatives	Frank Lemoine, John Ries,	GSFC/CSR (USA)
	Jean-M. Lemoine, H. Capdeville	CNES/GRGS (France)
IGFS Chair	Riccardo Barzaghi	Politec. Milano (Italy)
BGI Chair	Sylvain Bonvalot	IRD (France)
ISG President	Mirko Reguzzoni	Politec. Milano (Italy)
ICGEM Chair	Franz Barthelmes (until 2017)	GFZ (Germany)
	E. Sinem Ince (since 2018)	GFZ (Germany)
IDEMS Director	Kevin M. Kelly	ESRI (USA)
IGETS Chair	Hartmut Wziontek	BKG (Germany)
Gravity Comm. (corresp. Member)	Jürgen Kusche	Univ. Bonn (Germany)
IAG Representative to ISO	Johannes Ihde (until 2017)	BKG, GFZ (Germany)
	Detlef Angermann (since 2018)	TUM (Germany)
IAG Communication and Outreach	Josef Ádám	Univ. Budapest (Hungary)
IAU Commission A3 Representative	Catherine Hohenkerk (until 2018)	United Kingdom
	James L. Hilton (since 2018)	USNO (USA)
IAU Representative	Robert Heinkelmann (BPS staff)	GFZ (Germany)
Control Body for ISO Geodetic Registry	Michael Craymer (Chair)	NRCan (Canada)
	Larry Hothem (Vice Chair)	USA

BPS inventory on standards and conventions

- Inventory of standards and conventions used for the generation of IAG products (published in **The Geodesists Handbook 2016**, see below)
  - Assessment of the present status
  - Identification of gaps and deficiencies
  - Provision of recommendations (interaction with IAG Components)
- An updated 2nd version has been compiled and submitted for publication in **The Geodesists Handbook 2020**
- 2nd version under review by IAG

Angermann D., Gruber T., Gerstl M., Heinkelmann R., Hugentobler U., Sánchez L., Steigenberger P.: **GGOS Bureau of Products and Standards: Inventory of standards and conventions used for the generation of IAG products**. In: Drewes H., Kuglitsch F., Adám J. (Eds.) **The Geodesists Handbook 2016**. Journal of Geodesy 90(10), 1095-1156, 10.1007/s00190-016-0948-z, 2016

Numerical standards used within IAG

	semi-major axis a [m]	Geocentric Grav. Constant GM $[10^{12}\mathrm{m}^3\mathrm{s}^{-2}]$	Dyn. form factor J_2 $[10^{-6}]$	Earth's rotation ω $[\mathrm{rad\ s}^{-1}]$	Normal potential U_0 or W_0 $[\mathrm{m}^2\mathrm{s}^{-2}]$
GRS80 (1979)	6 378 137	398.600 5	1 082.63	7.292 115	62 636 860.850
EGM2008	6 378 136.3	398.600 4415(1)	1 082.635 9	7.292 115	62 636 856.0 (1998)
IERS Conv. (2010)	6 378 136.6(2)	398.600 4418(3)	1 082.635 9	7.292 115	62 636 856.0 (1998)
IERS Conv. (update 2017)	6 378 136.6(2)	398.600 4418(3)	1 082.635 9	7.292 115	62 636 853.4 (2015)
IAG Resol. No. 1 (2015)					62 636 853.4 (2015)

(1) TT-compatible value; (2) value given in zero-tide system; (3) TCG-compatible value

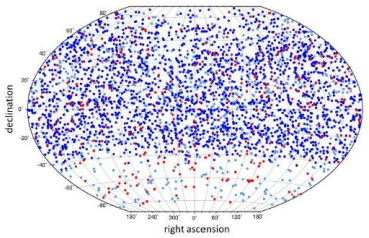
- GRS80 (still) provides the conventional values (IUGG 1979 / IAG 1980)
- The geodetic work is based on different numerical standards (e.g., IERS Conventions, standards used for gravity and altimetry)
- Thus, a unique and consistent set of numerical standards **does not exist** within IAG, moreover different time and tide systems are in use within geodesy

BPS recommendations on numerical standards

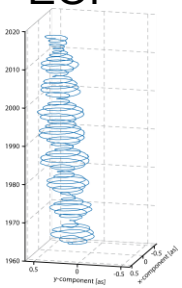
- **REC 1**: The used numerical standards including time and tide systems must be clearly documented for all geodetic products.
- **REC 2**: The inconsistency concerning the treatment of the permanent tide must be resolved within IAG to support the GGRF requirements and user needs.
- **REC 3**: Astronomical, geodetic or geophysical standards including or requiring a W_0 ref. value should adopt the IAG conventional W_0 value issued by IAG Res. No. 1 (2015).
- **REC 4:** A new Geodetic Reference System GRS20XX based on a consistent estimation of the major parameters of a geocentric level ellipsoid should be developed.

Review of IERS products

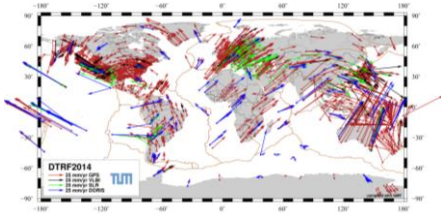
ICRF



EOP



TRF



IUGG

IAG GGOS Global Geodetic Observing System

IGS INTERNATIONAL GNSS SERVICE

ILRS

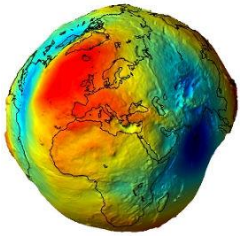
IVS

International DORIS Service IDS

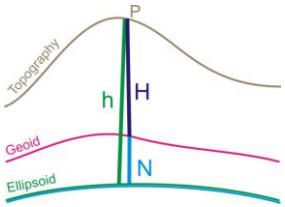
- BPS inventory provides several recommendations for each product;
- Three general recommendations for IERS products:
  - Consistency of CRF, TRF and EOP (IUGG Res, 2011, IAG Res. 2019)
  - Processing standards should be consistently applied by all AC's
  - Core networks and co-locations need to be further improved
- Ongoing activities of the technique-specific IAG Services and the IERS
- GGOS/IERS Unified Analysis Workshop (…, Pasadena 2014, Paris 2017 and 2019)
- IAU is involved concerning the celestial reference system and frame

Gravity-related products

Geoid



Heights



International Association of Geodesy
IAG
I G F S

BGI

iDEMS

IGETS

I C G E M

- The IGFS Central Bureau (igfs.topo.auth.gr) provides a new updated IGFS webpage, including a dedicated products portal and metadata information (e.g., geoid, GGMs, DEM, SG, tide data)
- Many static and temporal gravity field models are available at the ICGEM website, open access of data products, DOI for data sets
- A conventional GGM (as official IAG product) may be useful, this issue is under discussion within the IGFS
- New Component: International Service for Time-variable Gravity Field Solutions (COST-G)
- Developments on the unification of height systems (GGOS Focus Area “Unified Height System”)

Ongoing activities and planned actions

- to continue the work regarding **standards and conventions,** interaction with IAG Services, IAU, ISO, …
- to contribute to the re-writing/revising of the IERS Conventions
- to focus on the **integration of geometric and gravimetric observations** and to support **the development of integrated products** (e.g., GGRF, IHRF, atmosphere products)
- to **interact with external stakeholders** (e.g., ISO, IAU, UN-GGIM, …)
- to contribute to the UN GGIM Subcommittee on Geodesy (SCoG), IAG representation in **GGRF Working Group „*Data Sharing and Development of Geodetic Standards***“)
- to contribute to the **Committee on Essential Geodetic Variables (EGVs)**
- to compile a new **Implementation Plan** for the next 4 years