GGOS Working Group Conventions, Models, Analysis Status Report 2006

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Status of WG CMA

Members of the Working Group (Chair: H. Drewes)
(Analysis Coordinators of IAG Services and Commissions)

- IERS:	G. Petit	- IGFS:	R. Forsberg
- IGS:	G. Gendt	- BGI:	R. Biancale ?
- ILRS:	E. Pavlis	- IGeS:	R. Barzaghi
- IVS:	A. Nothnagel	- ICET/GGP:	J. Hinderer ?
- IDS:	F. Lemoine	- ICGEM:	F. Flechtner
- Comm. 1:	M. Gerstl	- Comm. 2:	D. Blitzkow
- ICP1.1:	W. Bosch	- ICP1.2:	J. Ihde

Meetings 2006 (informal) at

- EGU General Assembly, Vienna, Austria, 6 April 2006
- IAG ICP1.2 Workshop, Prague, Czech Republic, 10 April 2006
- SIRGAS Workshop, Rio de Janeiro, Brazil, 17 August 2006
- IGFS Symposium, Istanbul, Turkey, 30 August 2006
- GRF2006 Symposium, Munich, Germany, 10/11 October 2006

GGOS

Activities 2006

Activities concentrate on checking the identity (or at least consistency) in **geometric & gravimetric** analysis and parameter representation:

Review of the definition and the current use of
- Fundamental geodetic constants,
- Conventions,
- Models for reductions and parameterisation,
- Parameters for analysis and products.

Discussion on the need of a new Geodetic Reference System (GRS)
- Review of the previous IAG discussion 2001 (Budapest)
  (Result there: no new GRS needed because GRS80 is sufficient)
- Compilation of new arguments and requirements

1. Fundamental constants and their use

Five fundamental constants are defined by IAG resolutions (GRS80) and by IERS conventions (2003):

- Geocentric gravitational constant (GM)
- Speed of light (c)
- Earth rotation velocity (ω)
- Semi-major axis / potential of level ellipsoid (a, U_0)
- Geometric / dynamic flattening (f, J_2)

The present **definition** in GRS80 and IERS2003 is **controversial**, e.g.:

GM [10^8 m^3s^{-2}]	3 986 005	$\leftrightarrow$	3 986 004.418
Semi-major axis [m]	6378137.0	$\leftrightarrow$	6378136.6
Reciprocal flattening	298.25722	$\leftrightarrow$	298.25642
Normal potential [m^2s^{-2}]	62636860.85	$\leftrightarrow$	62636856.0

The **geodetic use** is even different from both (e.g., EGM96, EIGEN, ..)

2. Geodetic Conventions

Conventions are defined by IERS (latest 2003) but also by the gravity community (**no** official IGFS conventions) and IAG resolutions. There are controversial definitions and applications, e.g.:

- Time system: defined to be geocentric (TCG) but in use is TT
- Tide system: zero tide (IAG1981) in IGFS, tide free in IERS

Conventions are different for reducing or not the environmental effects

- Ocean loading
- Atmosphere loading
- Hydrosphere loading
- Second (& third) order ionosphere effects
- Troposphere refraction (troposphere gradients)
- Gravity variations (short period, seasonal, secular)
- Geo-centre / coordinate origin / centre of network variations
- Relativity effects

3. Geophysical Models

Geophysical models are used for reducing effects on the observations **and/or** on the estimated parameters. We concentrate on:

- Solid Earth tide models
- Ocean tide models
- Pole tide models
- Ocean loading models
- Ionosphere models
- Troposphere models and mapping functions
- Relativity models
- Nutation models
- (Sub-daily) ERP models
- Gravity field models
- Earth mass (density) models
- (Digital) Terrain (Earth surface) models

There are other models required for specific techniques (instrumental)

4. Geodetic Parameterisation

Parameters must be set up consistently for all estimation procedures. If different representations are used, they have to be compatible.

- Station coordinates and their time evolution
  (reference epoch, linear and non-linear velocities, accelerations, ...)
- Satellite orbits (Kepler, gravitational & non-gravitational forces)
- Quasar coordinates and their time evolution
- Nutation, UT1, polar motion and its time evolution
- Gravity values and its time evolution
  (reference epoch, linear and non-linear gravity change, ...)
- Gravity field parameters and its time evolution
  (spherical harmonics, grid values, wavelets, splines, grid values, ...)
- Reference surfaces and its time evolution
  (ellipsoid, geoid/quasi-geoid, sea surface, height reference surface ...)
- Troposphere parameters (dry & wet, mapping functions gradients)
- Ionosphere parameters

WG CMA Procedure

1. To check in the corresponding Analysis Centres and processing groups (Services, Commissions, Projects) the complete set of applied constants, conventions, models and parameterisations in the frequently (and officially) used **software packages**.
2. To study and analyse the **effects** of differing constants, conventions, models and parameterisations realized in the individual software packages on the parameter estimation results (**sensitivity analysis**).
3. To prepare **recommendations** for eventual changes in the current software packages and in the IAG resolutions and conventions.
4. To prepare common document(s) for conventions of the **geometric** and **gravimetric** community.
5. Do we need a new GRS ?

Thank you !