



Establishment of the International Absolute Gravity Reference System and Frame

Meeting of IAG JWG 2.1.1 at EGU 2019

Chair: Hartmut Wziontek, BKG (Germany)

Vice-chair: Sylvain Bonvalot, BGI (France)

Agenda

1. Presentation of NIM China
2. Update and definition of processing standards
3. Site requirements: Update of document CCW-WGG/06-24
4. Site classification, site selection
5. Publication



Update of IAGBN 1992 Processing Standards

Speed of light correction:

- Sign dependent on interferometer position
 - Rise and Fall
 - Application to Atom Interferometers?
- Light propagation delay correction
- Each individual time value should be corrected by

$$\delta t = (-/+) z(t)/c$$

where $z(t)$ is the coordinate corresponding to the time t and $c = 299\,792\,458 \text{ [ms}^{-1}\text{]}$ is the speed of light (IAG 1983 resolution no. 1). The correction has a negative sign if the interferometer is positioned above the test mass, and a positive sign if below (Nagorny et.al. 2011a,b).



Update of IAGBN 1992 Processing Standards

Earth Tides:

- TGP: min. Tamura, alt: Hartmann-Wenzel, Kudryavtsev
- Elastic response: DDW (Dehant et.al. (1999)), preferably observed tidal parameters

Ocean Tide loading:

- FES 2004
- Interpolation in complete tidal spectrum by admittance for each main constituent (only deg. 2 terms), e.g. SPOTL (Agnew), ttimm (Scherneck)

Update of IAGBN 1992 Processing Standards

Permanent Tide:

- Keeping the correction from Mean Tide to Zero Tide (Wahr 1982 pers. comm. as given in Rapp 1983) for compatibility with applied 'old' corrections?

- Proposal: Based on $C_{2,0}$ coefficients of TGP

$$g(M_0 S_0) = -\delta \left[\frac{2r}{a^2} \sqrt{\frac{5}{4}} (3 \cos^2 \theta - 1) (\sum C_0^{2,0} + \Delta t \sum C_1^{2,0}) \right]$$

- Approach in alignment with IERS conventions:
→ J. Mäkinen

In order to avoid this assumption we recommend that the direct part of the tidal attraction be included in $g_E(P)$ but that the indirect effect due to the permanent yielding of the earth not be removed due to the fact that we do not know the appropriate factors. This procedure will yield an external gravitational potential which is a harmonic function. The recommended correction would then be:

$$\bar{g}_E(P) = g_E(P) - \delta f_c \quad (11)$$

where

$$\delta f_c = -\frac{2}{r_0} H_2^0 \times 10^2 g_a Y_2^0 G_2^0 - \delta f_d \quad (12)$$

with δf_d (the constant effect for a rotating, elliptical, rigid earth) given by (Wahr, 1982, private communication)

$$\delta f_d = -\frac{2}{r_0} H_2^0 \times 10^2 g_a \frac{1}{2} [3 \cos^2 \theta - 1 + \epsilon (-9 \cos^4 \theta + 6 \cos^2 \theta + \frac{1}{3})] \quad (13)$$

with ϵ the flattening. Using the numerical coefficients from Wahr we have:

$$\delta f_c = -4.83 + 15.73 \sin^2 \psi - 1.59 \sin^4 \psi \text{ } \mu\text{gals} \quad (14)$$



Update of IAGBN 1992 Processing Standards

Polar Motion:

- Ellipsoidal approximation:
Replacing a by the radius of curvature in the prime vertical N

$$N = \frac{a}{\sqrt{1 - e^2 \sin^2 \varphi}}$$

Update of IAGBN 1992 Processing Standards

Vertical Gravity Gradients:

- Depending on application:
 - a) Equation of motion, at effective height, rather insensitive → presentation V. Pálinkás
Computation of the effective height automatically in processing software?
 - b) Transfer to datum height
- Non-linearity?
- Measurement scheme: 3 height levels independently (i.e. in the triangle A-B, B-C, A-C)
- Apply to all stations or just Reference and Comparison sites?

Open questions:

- Is the third or higher order polynomials necessary?
- Is it necessary to consider the different kinds/principle of instrument such as CG-6 or Burris to perform the VGG measurements ?

Site requirements

Update of document CCW-WGG/06-24 of CCM-WGG from 2006

Pier size: One large pillar for all instruments vs. individual pillars?

Reinforcement necessary / recommended?



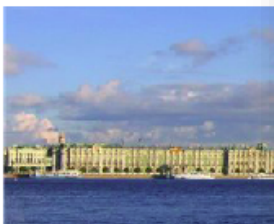


5th IAG Symposium on Terrestrial Gravimetry: Static and Mobile Measurements (TG-SMM 2019)

01-04 October 2019



GENERAL



IMPORTANT DATES

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15 May 2019

1 April 2019 – deadline for abstract submission.

10 June 2019

20 May 2019 – accepted papers listed on the Symposium website.

19 August 2019 – the Symposium preliminary program available on the website.

By 2 September 2019 – ONLINE registration of the Symposium participants.

2 September 2019 – deadline for submission of camera-ready papers for publication in the Proceedings.