



Establishment of the International Gravity Reference Frame

Meeting of IAG JWG 2.1.1, 14.07.2023 at IUGG GA, Berlin

Chair: Hartmut Wziontek, BKG (Germany)

Vice-chair: Sylvain Bonvalot, BGI (France)

Agenda

1. Obituary: Jim Faller
2. IAG Resolution on ITGRS
3. AGrav database
4. Realization of ITGRF
5. Status Report South America

IAG resolution for the International Terrestrial Gravity Reference System (ITGRS)

The International Association of Geodesy,

Noting,

- The importance of an International Terrestrial Gravity Reference System (ITGRS) for geodesy and geosciences,
- That with state-of-the-art absolute gravimeters a relative accuracy of 10^{-8} and better is achievable ;

Acknowledging,

- The IAG resolution No. 9.2 and 16.3 adopted at the 18th IUGG General Assembly in Hamburg in August 1983, recommending the use of a common standard atmosphere and the zero-tide concept;
- The IAG Resolution No. 2 for the establishment of a global absolute gravity reference system adopted at the 26th IUGG General Assembly in Prague in July 2015,
- The IAG Resolution No. 4 on the establishment of the Infrastructure for the International Terrestrial Gravity Reference Frame, adopted at the 27th IUGG General Assembly in Montreal in July 2019,

Resolves,

- That the definition of the ITGRS be based on the instantaneous acceleration of free-fall expressed in **SI** and related to the zero-tide concept, a standard atmosphere, and Earth orientation in the ITRS (International Terrestrial Reference System) ,

Recommends,

- That the ITGRS be adopted as the standard reference system for gravity acceleration in geosciences and metrology;

Requests,

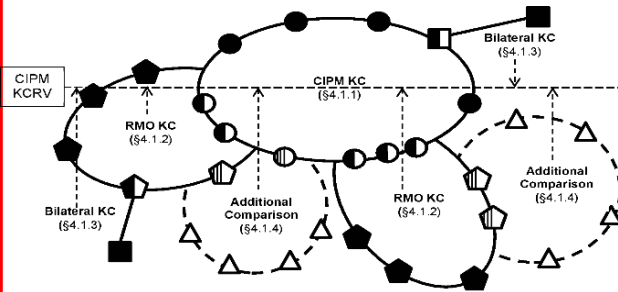
- That Commission 2 together with IGFS, BGI and IGETS prepare and disseminate guidelines and conventions for the establishment of the International Terrestrial Gravity Reference Frame (ITGRF) as the realization of the ITGRS.

Concept for the Gravity Reference Frame

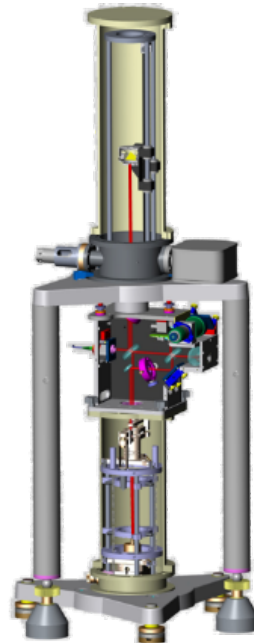
IAG Resolution No. 2 (2015)

- to establish a gravity reference frame by globally distributed reference stations linked to the international comparisons of absolute gravimeters where precise gravity reference is available at any time,

Intercomparison of Absolute Gravimeters

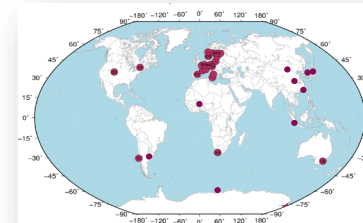


Absolute Gravimeters



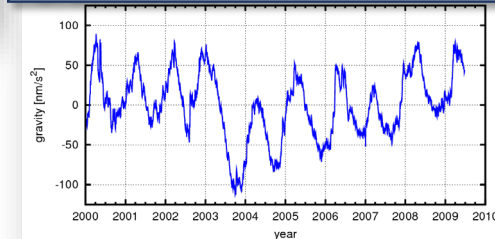
Gravity reference stations

with continuous comparison reference function



Continuous monitoring by

- Superconducting
- Repeated Absolute
- Continuous Quantum Gravimeters



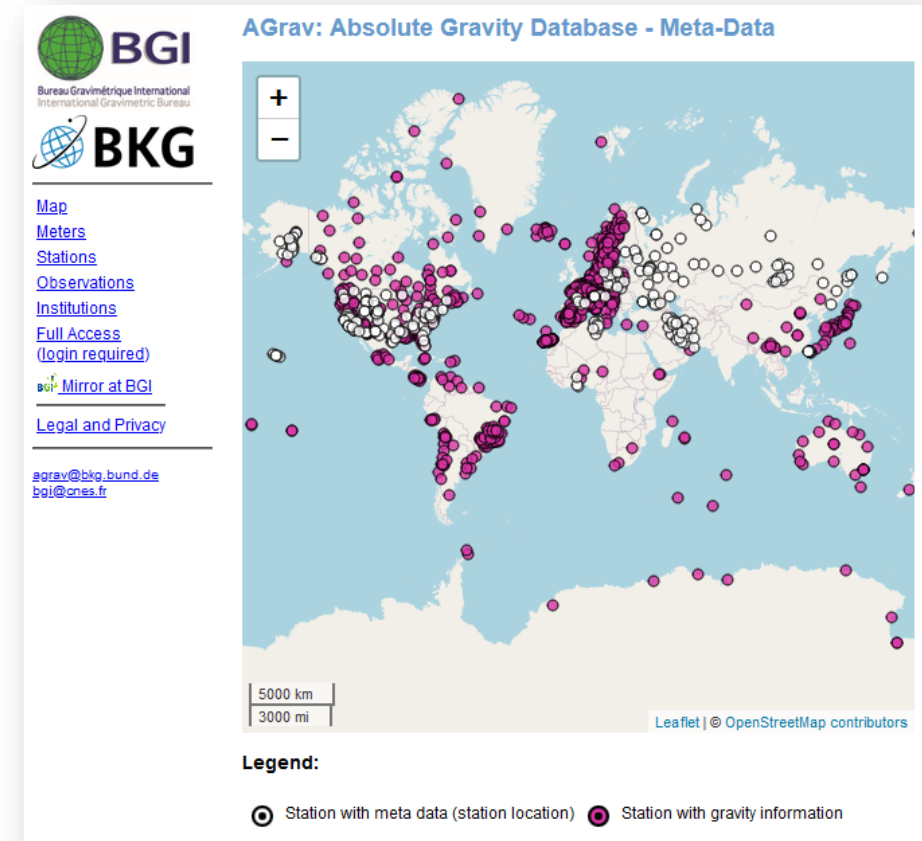
Conventional models for temporal gravity changes:
Tides, Atmosphere, Polar Motion

AGrav since Feb 2022 offline
solutions under discussion

AGrav: Intl. Absolute Gravity Database – Version 1

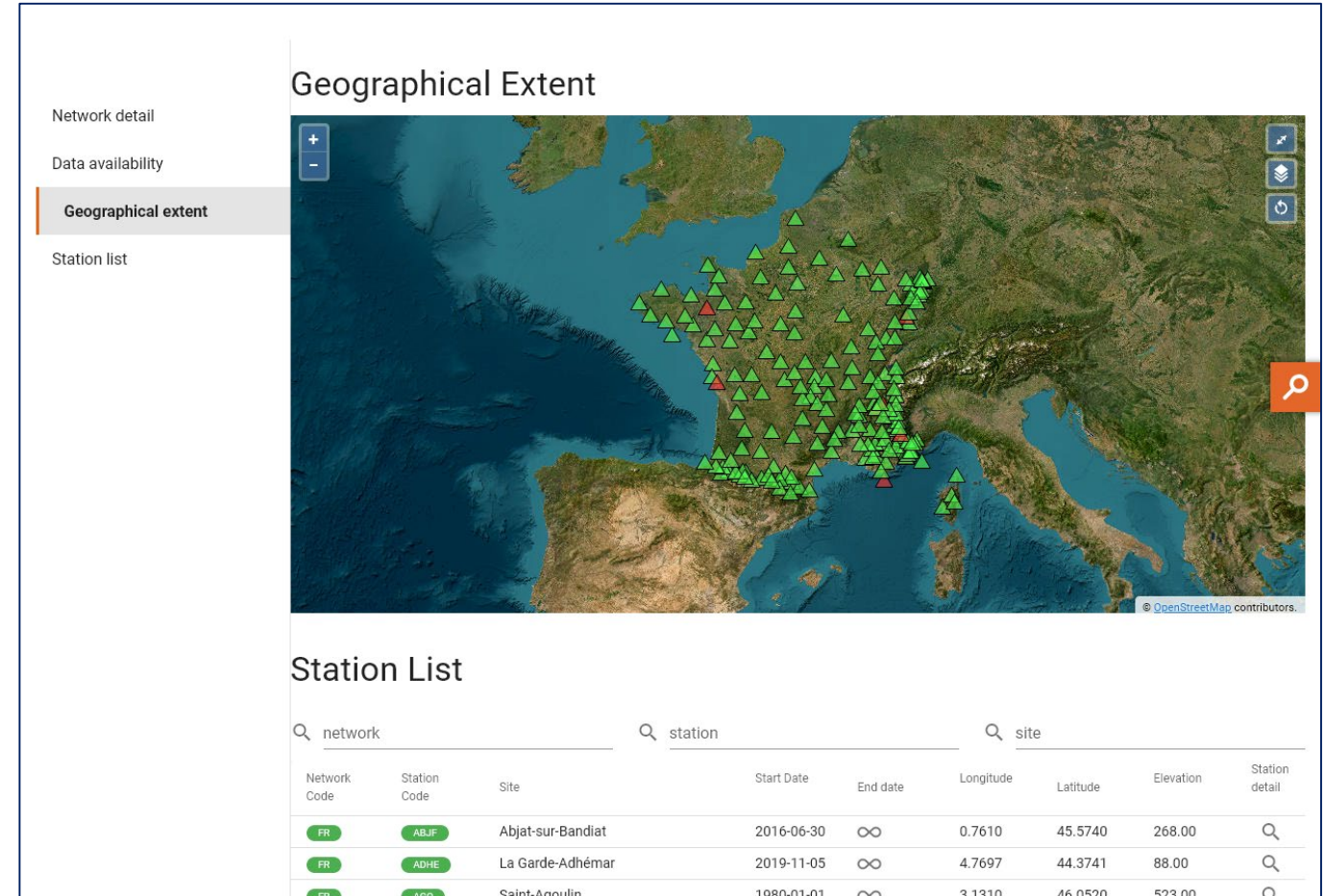
Operational since 2007

- Development of database scheme (MySQL) at BKG
- Basic php framework
- Mirror-Server at BGI until 2015
- Offline since Feb 2022 due to security issues
- Status March 2022:
 - 65 institutions from 33 countries
 - 1390 stations
 - 5237 observations, >98% with gravity values
 - 78 Absolute gravimeters: 39 FG5, 13 A10, 4 FG5X...



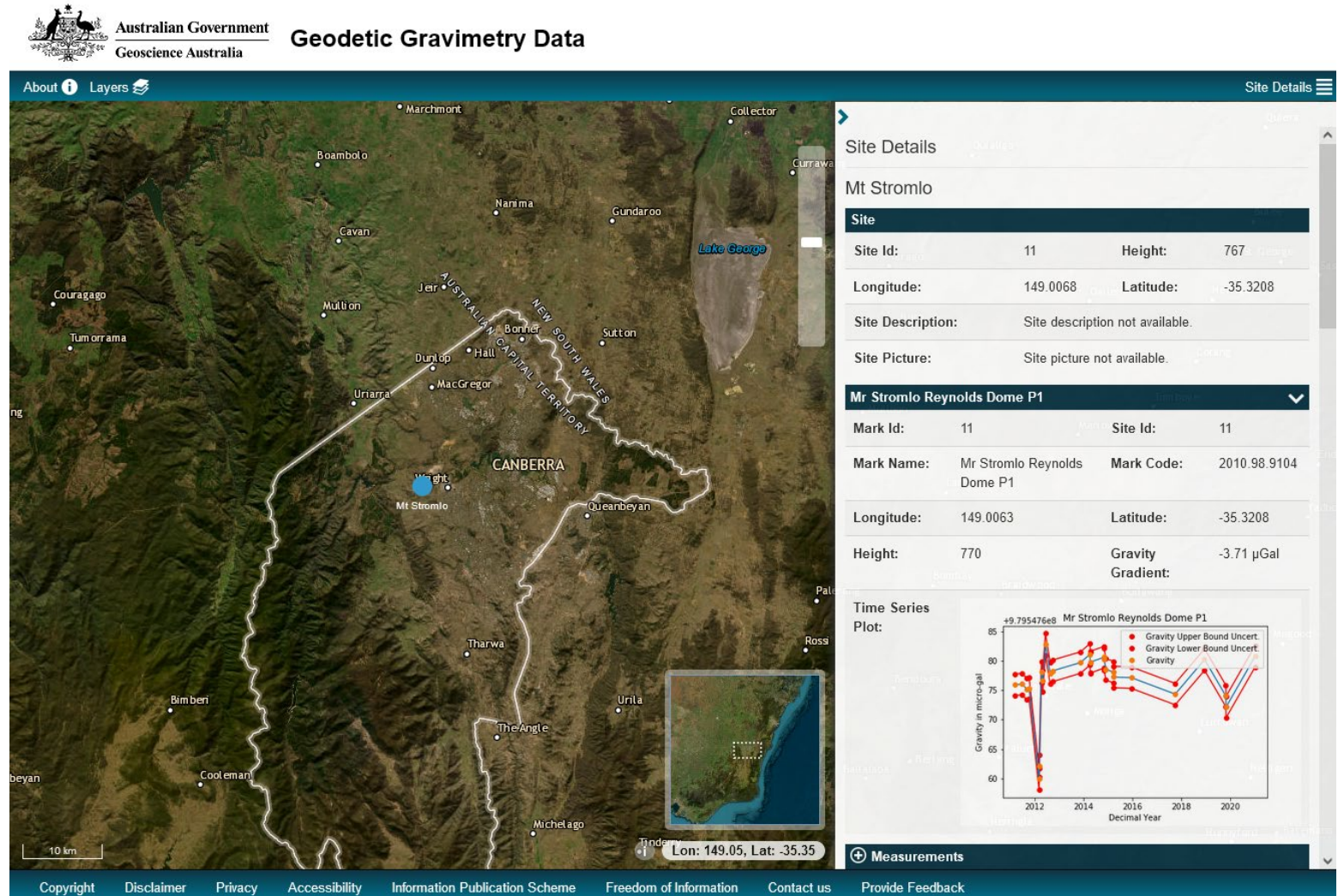
AGrav: Planned Implementation at OMP/SEDOO

- BKG currently not capable to provide the service due to strict IT security regulations
- BGI: Integration of AGrav dataset into service SEDOO at OMP to provide the basic information → planned in September 2023
- New Web application planned
- Assignment of DOI



Example from Seismological Network RESIF

Absolute Gravity Data at Geoscience Australia



<https://geodeticgravity.ga.gov.au/>

Realization of ITGRF

IGRF Site requirements / recommendations

- Document needs to be developed
- First order stations: More stringent requirements
- Majority of stations: More relaxed specifications to promote the establishment of new stations and avoid to exclude existing ones.
- Connection to GNSS should be considered.

Best practices in Absolute Gravimetry

- Guides contributed by experienced operators
- Wiki?



IGRF Workshop 2022

Leipzig, Germany, April 11-13 2022



IGRF Site selection

- Follow up Leipzig Workshop 2022
Presentations collected at ZENODO
<https://zenodo.org/communities/itgrf/>

zenodo Search Upload Communities hartmut.wziontek@bkg.bund.de

International Terrestrial Gravity Reference System and Frame

Recent uploads

Search International Terrestrial Gravity Reference System and Frame

February 22, 2023 (v1) Presentation Open Access View

Gravity reference function at Borowa Gora Observatory, Poland

Dykowski, Przemysław; Krynski, Jan; Sękowski, Marcin; Olszak, Tomasz

Repeated monthly absolute gravity measurements are conducted with the A10-020 absolute gravimeter on three stations (two indoor, one outdoor) at the Borowa Gora Geodetic-Geophysical Observatory since 2008. In 2016 next to one of the indoor stations (BG-G2) the IGrav-027 superconducting gravimeter was installed.

Uploaded on February 22, 2023

February 22, 2023 (v1) Presentation Open Access View

Modernization and current status of the Polish gravity control

Dykowski, Przemysław; Krynski, Jan; Olszak, Tomasz

Gravity control in Poland had been modernized in the years 2011 - 2015. The goal for the modernization was to renew/remeasure the POGK99 gravity network established in mid 1990s and propose the most efficient way to proceed with the use of the state of the art gravity instruments and methods. The re

Uploaded on February 22, 2023

February 22, 2023 (v1) Presentation Open Access View

Establishment of a modern gravity control in Ireland

Dykowski, Przemysław; Krynski, Jan; Sękowski, Marcin; Kane, Paul; Fitzpatrick, Katy; Aiken, Michael

The project for the establishment of a modern gravity control for Ireland, entitled Absolute Gravity Network Ireland, had been initiated by Ordnance Survey Ireland (Republic of Ireland) and Land and Property Services (Northern Ireland) with the support of the Institute of Geodesy and Cartography (Po

New upload

Community

IUGG IAG IAGG

International Terrestrial Gravity Reference System and Frame

Over the last decade, the Joint Working Group 2.1.1 of the International Association of Geodesy (IAG) has developed a system to achieve accurate, homogeneous, long-term global recording of Earth's gravity, while taking advantage of the potential of today's absolute gravity measurements.

Here, we provide material and presentations collected by this JWIG.

Curated by: hwziontek

Curation policy:

Discussion on Infrastructure



IGRF Workshop 2022

Leipzig, Germany, April 11-13 2022



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IGRF Site selection

- Follow up Leipzig Workshop 2022
Presentations collected at ZENODO
<https://zenodo.org/communities/itgrf/>
- Collection of site proposals in regional coordination
- Coordinators proposed / to be nominated
- Documentation of ITGRF sites in a central database (AGrav)

Unified Evaluation of AG Comparisons

- Evaluation of comparisons, following a strategy, e.g. Palinkas et al. 2021
- Independent verification of result