Minutes of the Web-Meeting of IAG JWG 2.1.1
Establishment of the International Gravity Reference Frame

Wednesday, 20 October 2021, 12:00 UTC

Chair: Hartmut Wziontek (Germany)
Vice-chair: Sylvain Bonvalot (France)

Agenda

1. IGRF Workshop 2022 in Leipzig/Germany: 11 – 13. April 2022
2. Best practices in Absolute Gravimetry / IGRF Wiki
3. Site requirements
4. Selection of References sites
5. Discussion:

1. IGRF Workshop 2022 in Leipzig/Germany: 11 – 13. April 2022

To support the implemention of the IGRF, a Workshop is planned for April 11-13 2022 in Leipzig/ Germany, the week after the EGU General Assembly 2022 in Vienna. Thanks to the support of BKG there is no registration fee. A hybrid meeting option is under consideration but a meeting in person is preferred, depending on the pandemic situation. As an IAG sponsored workshop, according to the IAG by-laws, travel support for young scientists is possible.

The objectives are different aspects of the IGRF implementation and all colleauges involved in absolute gravimetry and gravity networks as well as institutions, agencies and governmental bodies in charge of geodetic infrastructure are invited. The members of the JWG are kindly asked to forward this information to the respective authorities.

Main topics are the establishment first order gravity networks based on absolute gravity observations, site requirements and best practices in absolute gravimetry, including correction of temporal gravity effects, instrumental properties, vertical gravity gradients and the processing of AG observations. Invited lectures by specialists in gravimetry are planned. A web page with further information is under preparation.

2. Best practices in Absolute Gravimetry / IGRF Wiki

A wiki was initiated at a platform hosted permanently at BKG: https://wiki.gdi-de.org/x/hADLMg

A move to a separate instance is planned, so the link may change in the near future but all content will be preserved. The access is open, but write access is limited to registered users. Contributions are very welcome, please contact the JWG chair. Besides a summary about IGRS/IGRF, the objective is to develop a floating collection of documents about site requirements / selection and guides on absolute gravimetry.

3. Site requirements

The proposal to develop site requirements based on an update of document CCW-WGG/06-24 of the CCM-Working Group on Gravimetry was discussed. Since the document was intended for regional/international comparisons of absolute gravimeters it was found to be applicable only partially, mainly for reference and comparison sites. Another set of requirements for the majority of IGRF stations will be

necessary. Additionally, a connection to GNSS should be considered. A distinction between requirements and recommendations was proposed. Apart from first order stations, relaxed specifications would promote the establishment of new stations and avoid to exclude existing ones. By this, a rapid progress of the IGRF is ensured. Based on material collected in the Wiki, a final document with working group recommendations is needed.

4. Selection of References sites

The IGRF, will be realized by means of reference stations. Based on a set of mimum set of requirements, a first list of IGRF reference stations needs to be identified. Long-term stability was discussed and it was emphasized that seasonal variations have to be monitored at reference stations. Currently, at least six AG observations at different periods of the year are recommended [1]. This requirement could be relaxed if other information about the seasonal variability is available, e.g. by an uncertainty model or a harmonic function. However, institutions should be encouraged to establish gravity stations for that purpose.

In contrast, field stations must be compatible with the definition of the system (IGRS) but do not define the frame (IGRF). Consequently, the majority of existing absolute gravity stations should become part of the IGRF if the used absolute gravimeters are considered compatible with respect to the achieved measurement uncertainty. Field stations are essential to realize the IGRF but will not primarily provide information about temporal gravity changes. Therefore, gravity value and uncertainty only refer to the measurement epoch. Categories for different accuracy levels were proposed which allows to include most of the existing stations. It will be further necessary to discuss how existing national (absolute) gravity networks are related to the IGRF.

5. Discussion

The evaluation of comparisons of absolute gravimeters should be performed in a unique way, e.g. by following the procedure described in [2], and results from independent computations should be compared. Also, software to reprocess absolute gravity data based on raw data was developed during the past years, because standard software doesn't provide all possible and helpful information about the measurement. Both aspects motivate to establish AG analysis centers. The importance of a validation and independent software was agreed on. The discussion made clear that such activities should be aligned with existing services, mainly with the BGI, and that contributions and share of experiences are very welcome.

Participants

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References

[1] Wziontek, H., Bonvalot, S., Falk, R., Gabalda, G., Mäkinen, J., Pálinkáš, V., Rülke, A. and Vitushkin, L., (2021) Status of the International Gravity Reference System and Frame, Journal of Geodesy 95:7 https://doi.org/10.1007/s00190-020-01438-9

[2] Pálinkáš, V., Wziontek, H., Vaľko, M. Falk, R., (2021) Evaluation of comparisons of absolute gravimeters using correlated quantities: reprocessing and analyses of recent comparisons Journal of Geodesy 95:21. https://doi.org/10.1007/s00190-020-01435-y