JWG 2.1.1: Development of the International Terrestrial Gravity Reference Frame

Meeting at GGHS, 05.09.2024, Thessaloniki, Greece, and online

Chair: Hartmut Wziontek, BKG (Germany)

Vice-chair: Sylvain Bonvalot, BGI (France)

Agenda

1. Status of the AGrav database
2. ITGRF Infrastructure
   a) Reference and comparison sites
   b) Regional coordination of ITGRF sites
3. Site requirements, Best practices, Wiki
4. ITGRF Workshop 2025

International Terrestrial Gravity Reference System and Frame (ITGRS / ITGRF)

Reference System:

The fundamental principles

Stable definition of gravity

- Measurand: **Instantaneous acceleration of free-fall**, expressed in the International System of Units (SI)
- **Constant components** of conventional models to correct for time dependent gravity effects:
  - Zero-tide system for the tidal correction
  - Standard atmosphere ISO 2533:1975 (DIN 5450) for the correction for atmospheric gravity effects
  - Reference pole of the International Earth Rotation and Reference Systems Service (IERS) for the correction for polar motion.

→ **Conventional quantity „acceleration of gravity"**

Reference Frame:

The realization of the system

Compatibility of gravity measurements

The realization of the ITGRS represented by

- **Absolute gravity measurements** traceable to the International System of Units (SI) (time and frequency)
- **Common reference level**: Absolute Gravimeters have to be checked at comparisons / by calibration
- Models / Recommendations for gravity corrections: **ITGRS 2020 Conventions**
- **Global set of reference stations** with reliable absolute gravity values (relative accuracy of $\leq 10^{-8}$) and monitoring capabilities for temporal changes

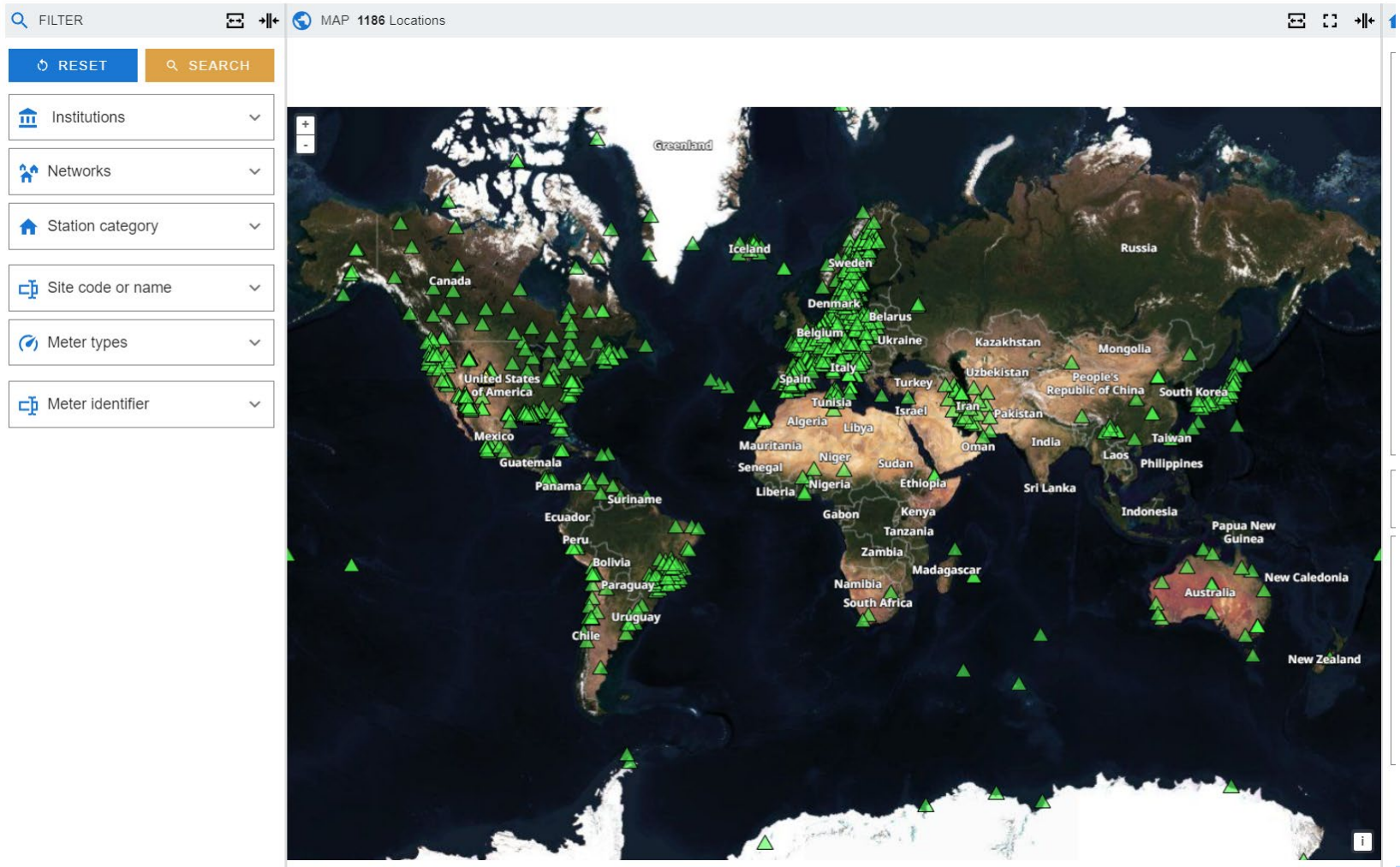
→ **Gravity reference function**

Absolute Gravity database AGrav

- offline at BKG since March 2022 because of IT security concerns
- Re-establishment on spring 2024 now at BGI, with support of BKG
  - https://bgi.obs-mip.fr/data-products/gravity-databases/absolute-gravity-data
  - https://agrav.bkg.bund.de/
- Dataset complete as of March 2022
- Completely new web application, based onJavascript
- New interface & features
  - Search criteria: (by institutions, networks, stations, meters…)
  - Data upload from project files (MGL instruments)
  - DOI: meters, networks

AGrav database demonstration

Made in joint collaboration BGI-BKG-SEDOO



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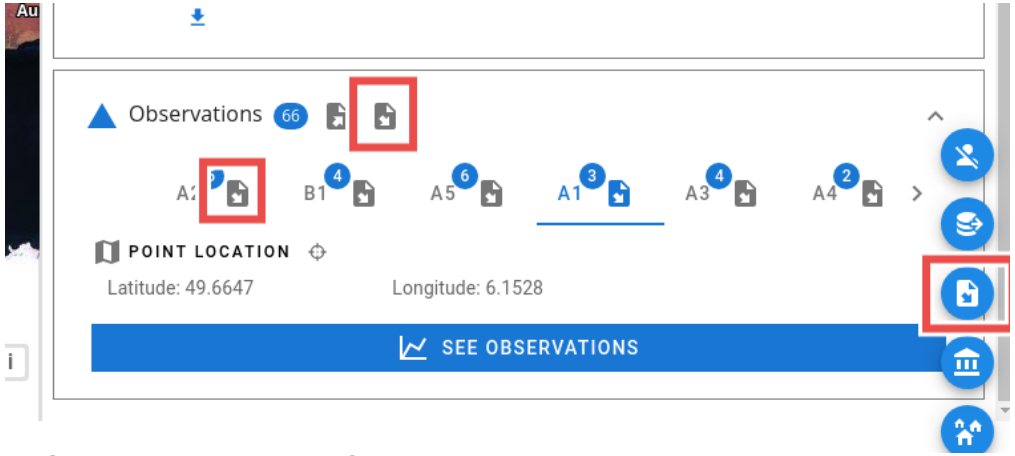
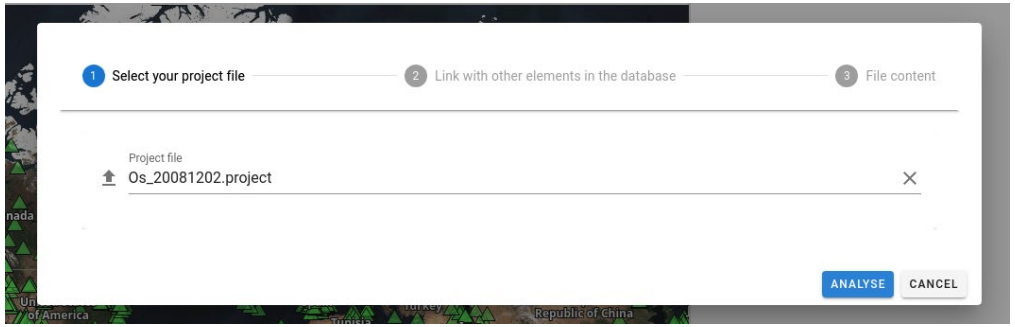
AGrav: Upload of project-files

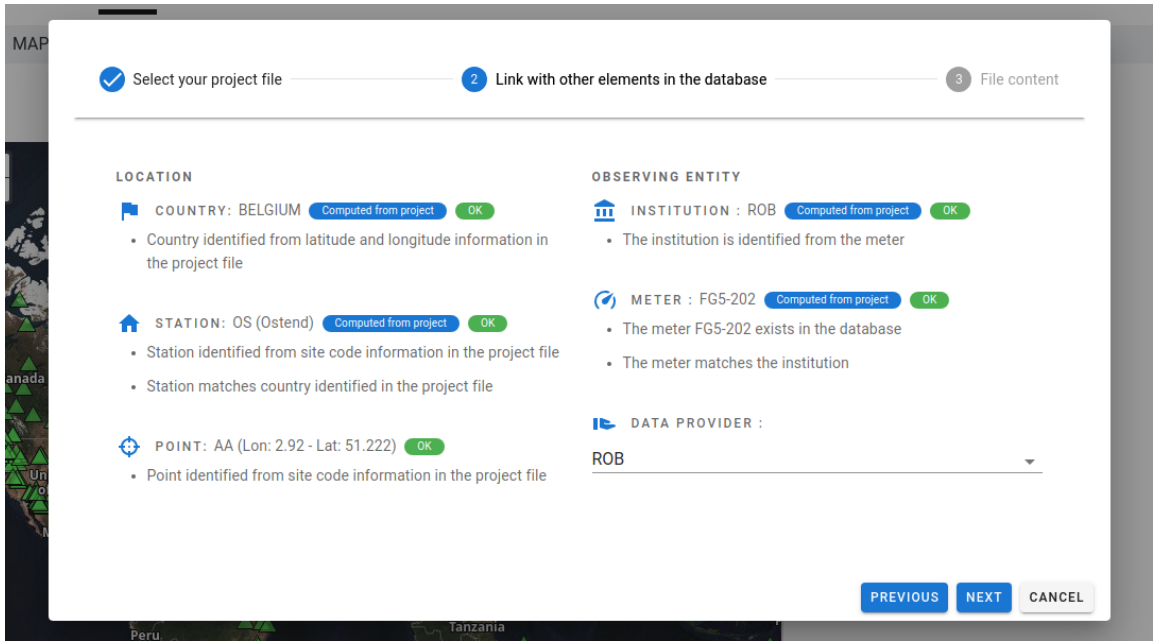
1 Select station / point (alt: main menu)



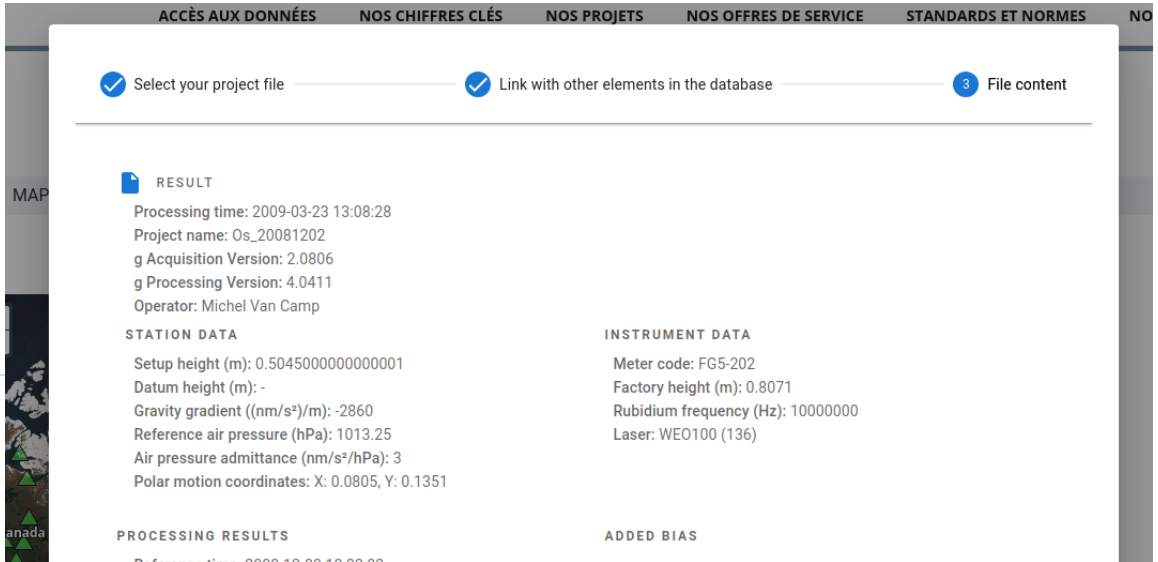
2 Select project files



3 Consistency checks



4 Report new record



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Reference Site Selection: Link to the International Geodynamics and Earth Tides Service (IGETS)

Continuous monitoring of temporal gravity variations with Superconducting and other stationary gravimeters

Potential stations:

Europe (12+1):
BG, BH, ~~MC~~, ~~MB~~, ME, MO, NY, OS, PE, ST, WE, YS, [BF]

North America: [BO], CA?

Australia: CB

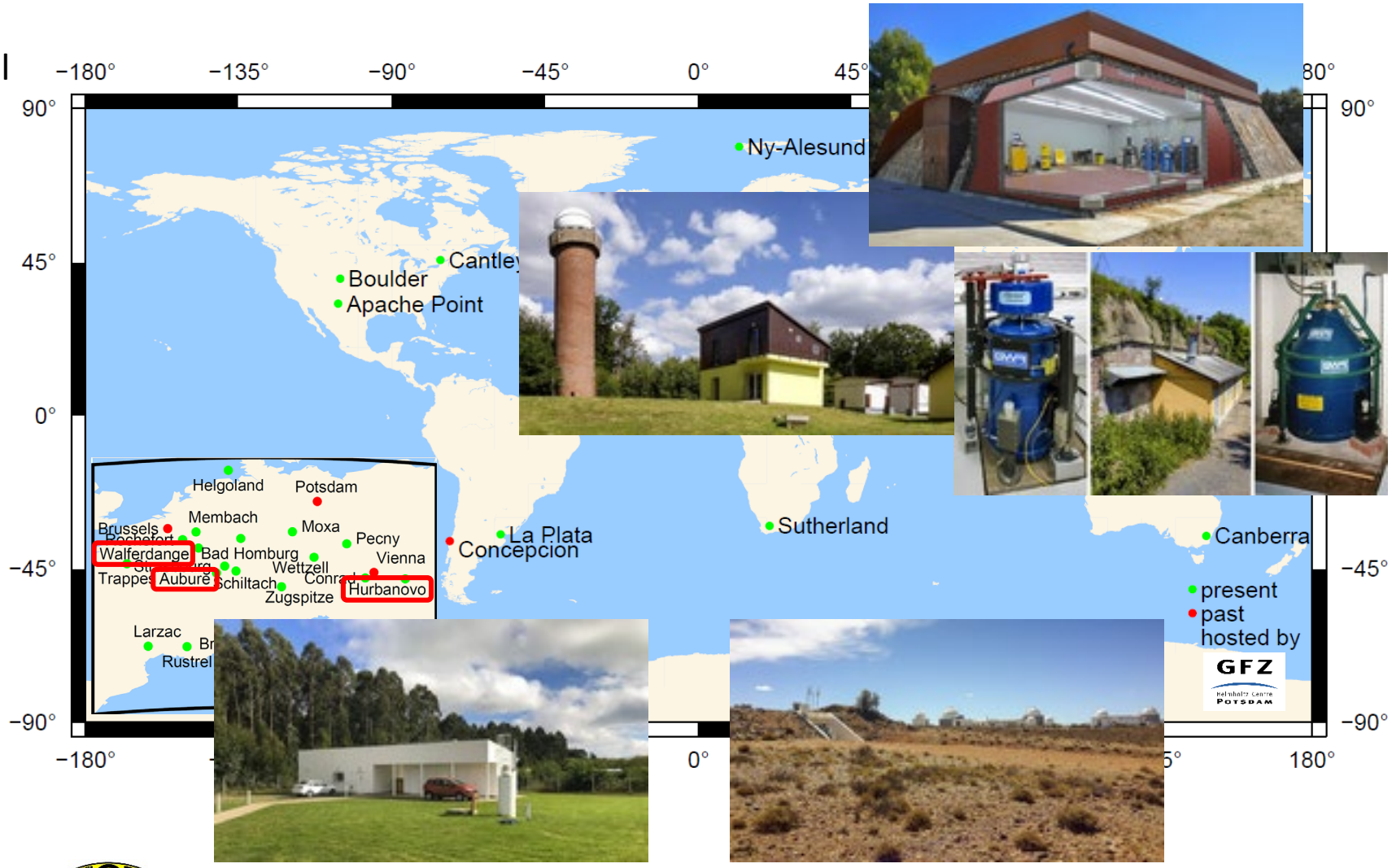
South America: LP

Asia: China (3): LH, LI, WU

Japan (1+2): MA, [MI, IS]

Africa (1): ~~SU~~

Antarctica (1): SY



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IGRF Workshop 2022

Leipzig, Germany, April 11-13 2022

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Schedule

Time from	Time to	Monday, April 11, 2022	Tuesday, April 12, 2022	Wednesday, April 13, 2022
09:00	10:30		City Tour	Session 2: Standards
10:30	11:00	Arrival	Coffee Break	Coffee Break
11:00	12:00		Session 5: Time variable	Final Discussion / Closing
12:00	13:00			
13:00	13:30	Welcome	Lunch	
13:30	14:00	Session 1a: Infrastructure		
14:00	15:00		Session 3: Monitoring	
15:00	15:30	Coffee Break		
15:30	16:00	Session 1b: Infrastructure		
16:00	16:20		Coffee Break	
16:20	17:00		Session 4: Best Practices	
17:00	17:20	Coffee Break		
18:00	19:00	Session 1c: Infrastructure		

Proposals for reference and comparison sites

Survey!

- Europe
- Asia
- Africa
- North America
- South America

Discussion on Infrastructure

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.

IGRF Site selection

- Collection of site proposals in regional coordination within IAG JWG 2.1.1

Coordinators for proposed for

- Europe, Latin America, North America

Coordinators to be nominated for

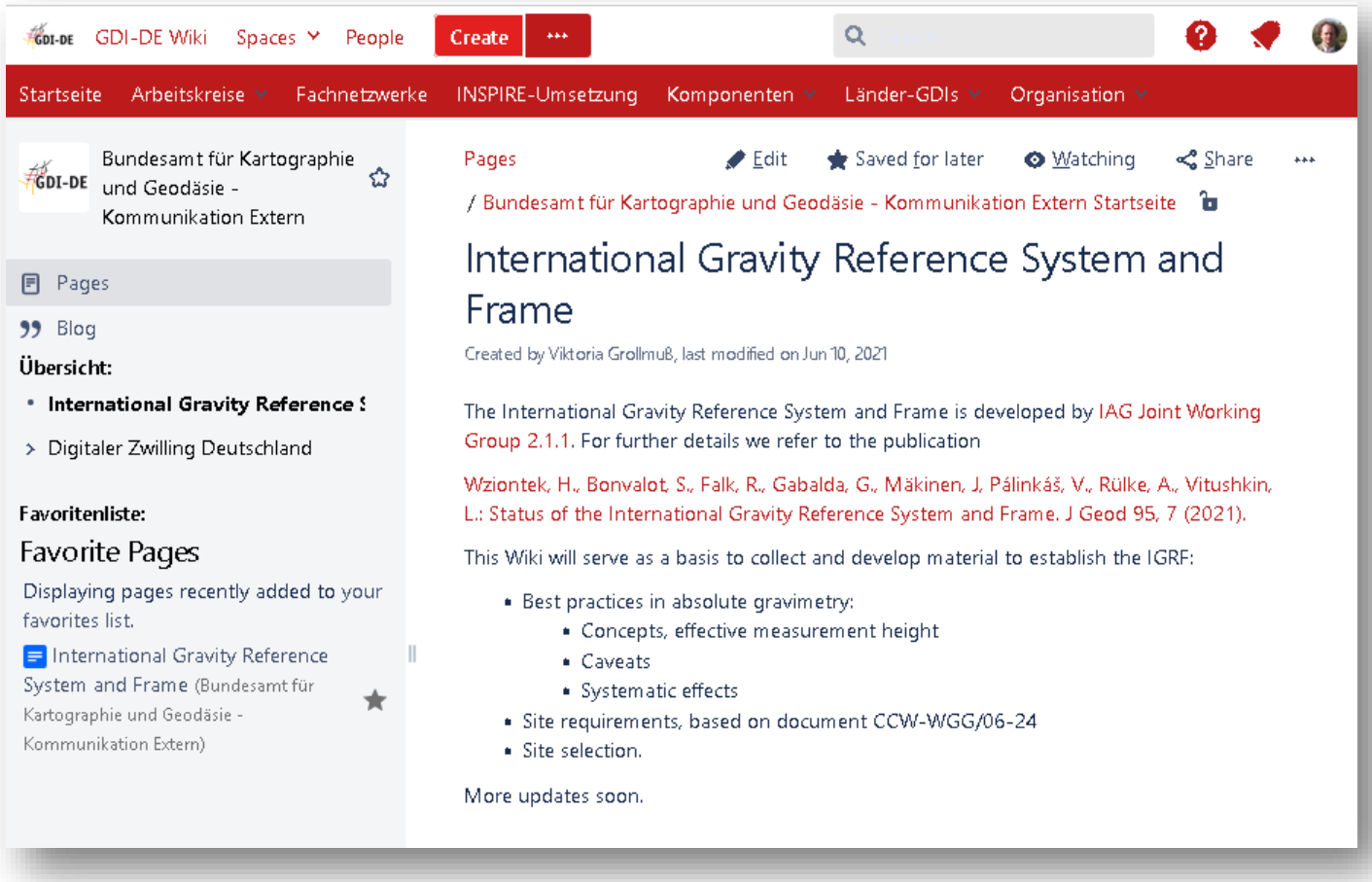
- Asia: China / India / Japan / Pacific region
- Middle East
- Australia
- Africa

→ Please contact JWG 2.1.1

Best practices in Absolute Gravimetry/ IGRF Wiki

- Wiki (based on commercial platform) operated by BKG
- Open access (but limited write access)
- Floating development:
  - Summary about IGRS/IGRF
  - Site requirements / Site selection (linked to AGrav)
  - Guides on absolute gravimetry, including links

https://wiki.gdi-de.org/x/hADLMg



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