Recent activities of the ICGEM Service and its contribution to the gravity field related products and their use

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GFZ Helmholtz Centre for Geosciences

SAMDAT

HELMHOLTZ

International Centre for Global Earth Models

- ICGEM actively contributes to Earth gravity field and related research since 2004
- Collects and archives all existing global Earth **gravity field models** (GGMs)
- Makes GGMs available in a **standardized format** (.gfc format) and provides **DOI** minting service
- Interactive **visualisation** of the models, their differences, and time variatio
- Web interface to **calculate** gravity field functionals
- **Evaluation** of the static gravity field models
- Operation of an online **discussion forum (outreach)**

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All these activities continue as usual.
What is new?

Latest updates

- **11. August 2025:** New Model GOCO2025s is available.
- **8. August 2025:** ITSG-Grace_op models for 04/2025 and 05/2025 are availabe.
- **21. July 2025:** LUH-GRACE-FO-2020 models from 08/2024 to 05/2025 are available.
- **14. July 2025:**

  Latest models of CSR Release 06.3 for 04/2025 and 05/2025 are available.
  Latest models of JPL Release 06.3 for 04/2025 and 05/2025 are available.
  Latest models of GFZ Release 06.3 for 04/2025 and 05/2025 are available.
  AIUB GRACE-FO rl02 gravity field models for 2025-04 and 2025-05 are now available.
  New COST-G model Grace/Grace-FO RL02.1 is available.

“Past” limitations

- Capacity and voluntary manpower did not allow to respond to the needs of:
  - ❑ Recent advancements in **high degree order GGMs** (e.g. XGM2019)
  - ❑ **Increasing amount** of gravity data, their evaluation and related products
  - ❑ **Data handling** (OPEN and FAIR), data format and standardisation, metadata
  - ❑ **Data portal**, architecture, interoperability and interlinks among services
  - ❑ User requirements, public **outreach**

“Past” limitations

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  - ❑ Rec
  - ❑ **Inc** …oducts
  - ❑ **Dat** met
  - ❑ **Data portal**, architecture, interoperability and interlinks among services
  - ❑ User requirements, public **outreach**

Future Work

SAMDAT Project

New gravity field related research data types

Global high-resolution models in different representations

Data reliability and quality-assurance tool

F Findable A Accessible I Interoperable R Reusable + OPEN

Online metadata Editor

Metadata enrichment and standardization

ICGEM

Sustainable data information centre

Online data upload tool

GFZ Data Services
Geosciences Data Publisher

ORCID

ROR

doi

International Association of Geodesy
IAG
IGFS

GGOS Global Geodetic Observing System

GraVIS Gravity Information Service

COST-G Combination Service for Time-variable Gravity Fields

NFDI4Earth

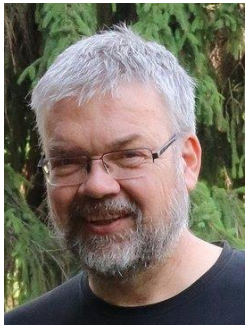
GFZ Helmholtz Centre for Geosciences

SAMDAT
Service and Archive for Mass Distribution And mass Transport data

HELMHOLTZ

Project Team

GFZ Section 1.2



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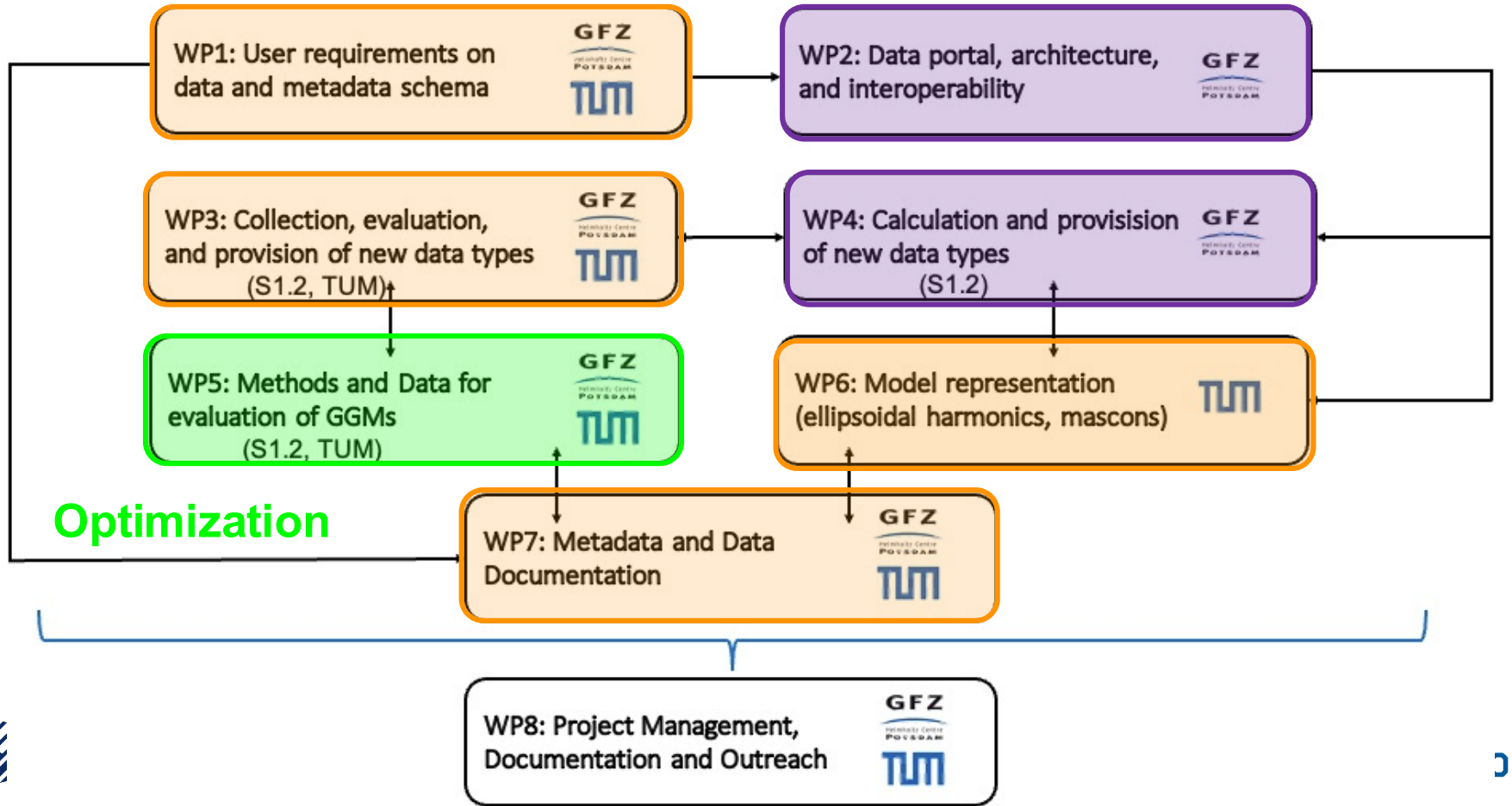
Work Packages



User Survey

Poster #76

Community survey via ICGEM and IGFS

- User background and interest
- Application area
- Data, Metadata, Science keywords
- Data format, Standardisation
- Output format ….

How can we make gravity data visible, accessible, understandable?

International effort is needed to bring standards and enrich metadata

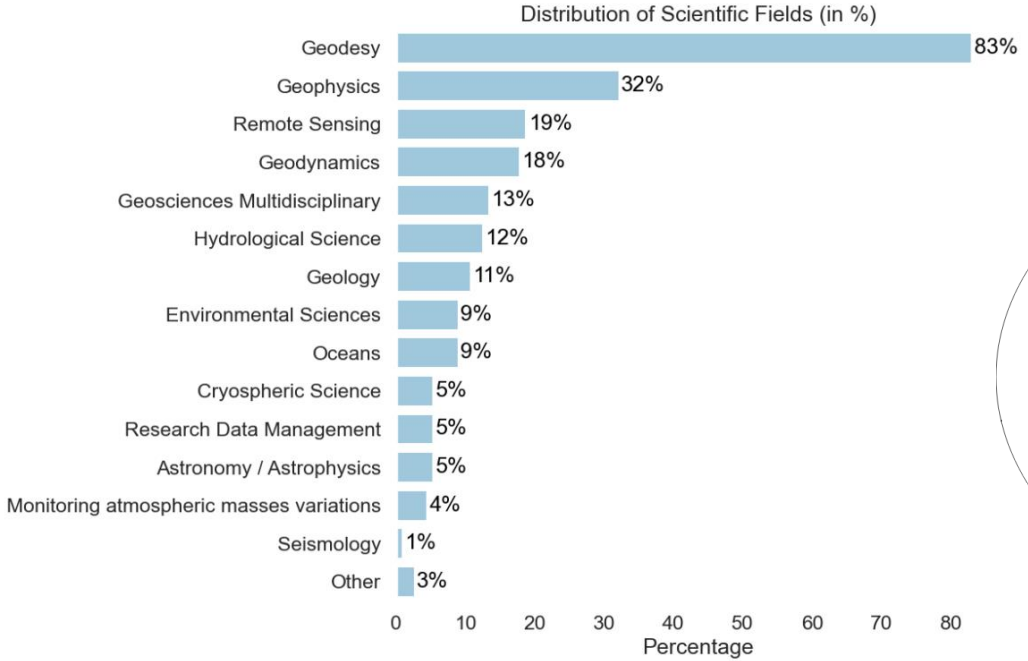
Online metadata Editor

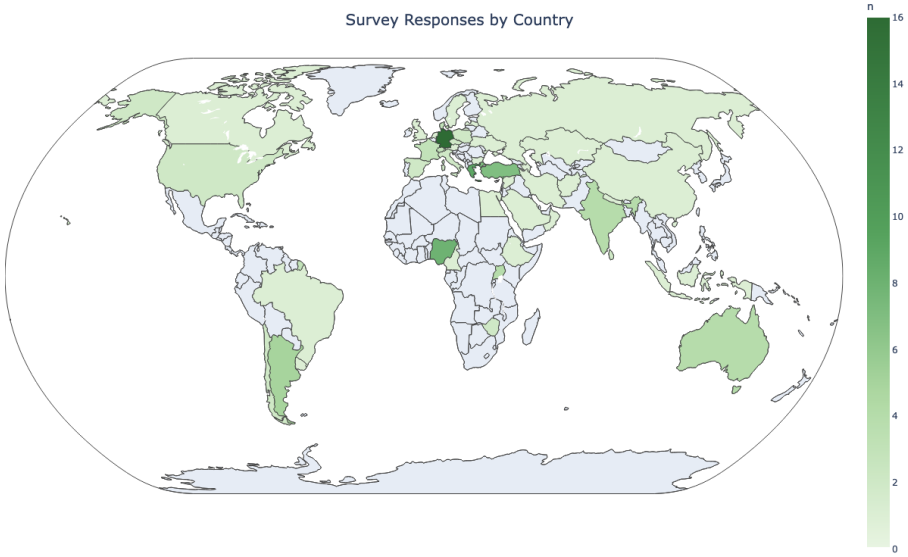
Translator between information provided by humans and machines

Metadata enrichment and standardization

➢ Improved findability of gravitational data by enriching international metadata standards.

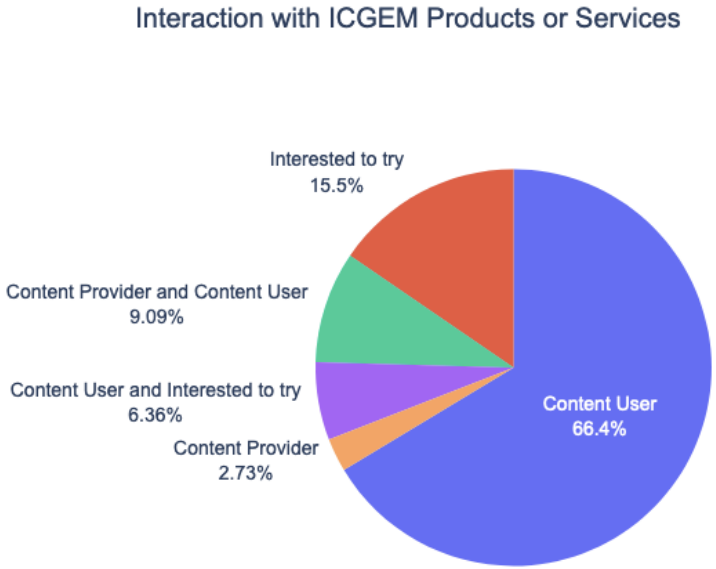
Survey results (1)

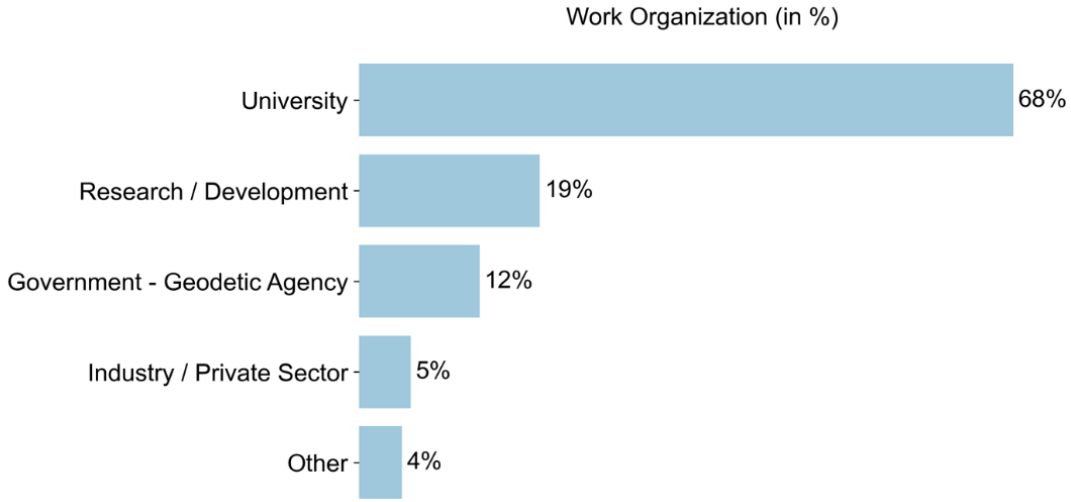




Torkhov et al. (2025)

Survey results (2)





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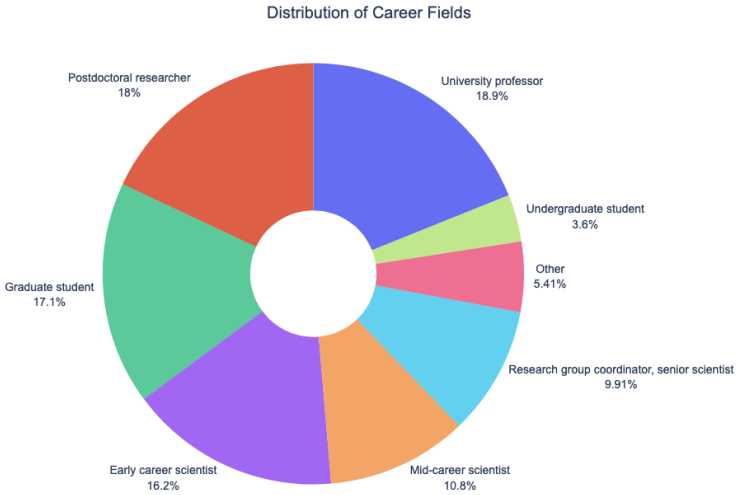
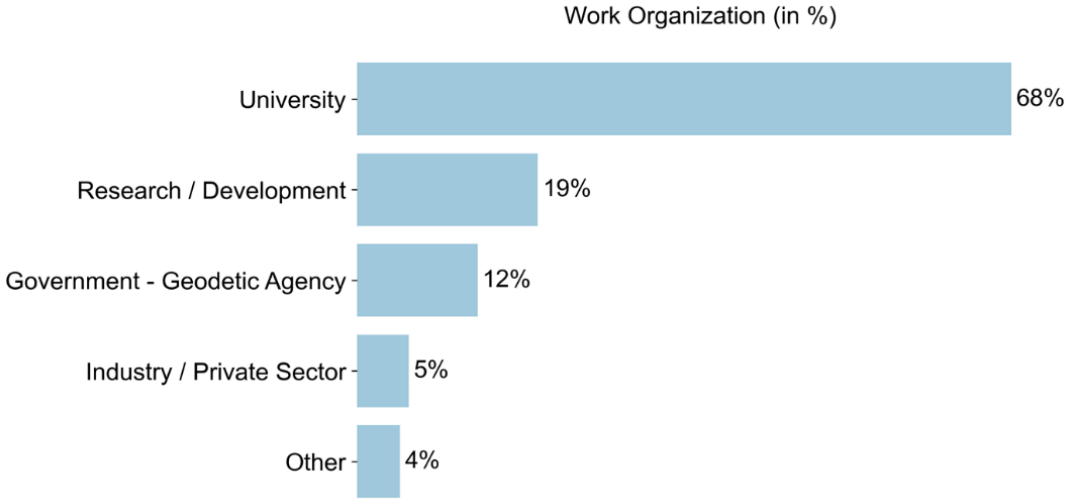
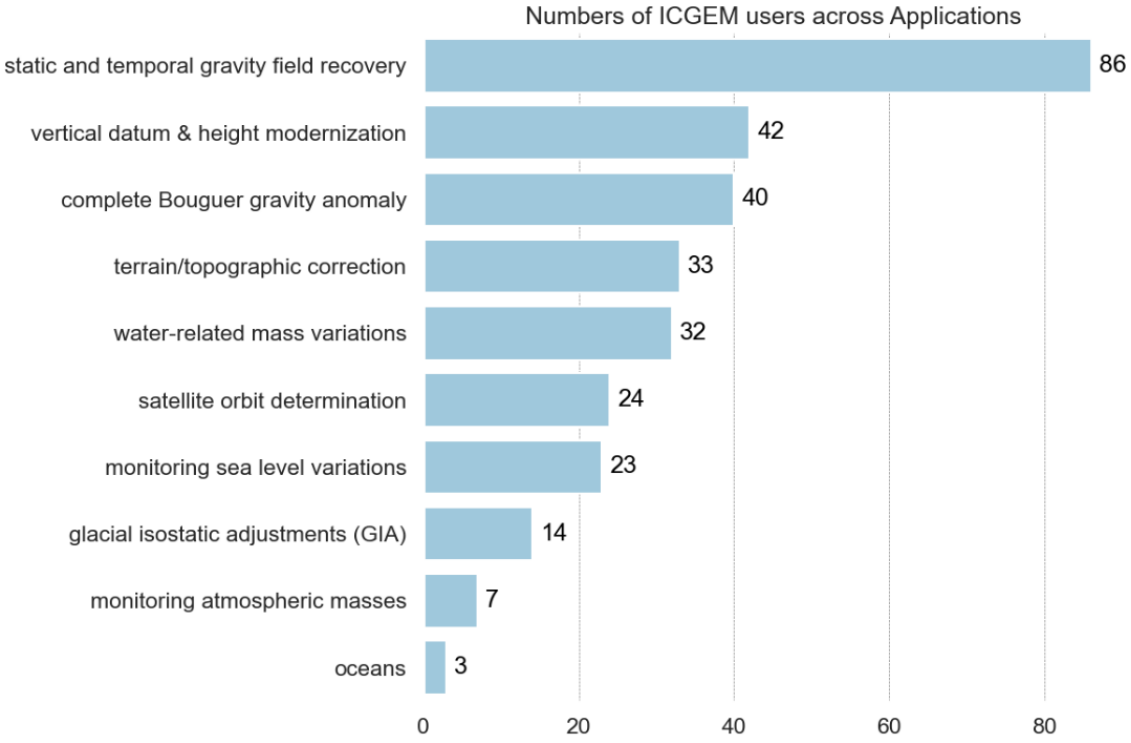




Torkhov et al. (2025)

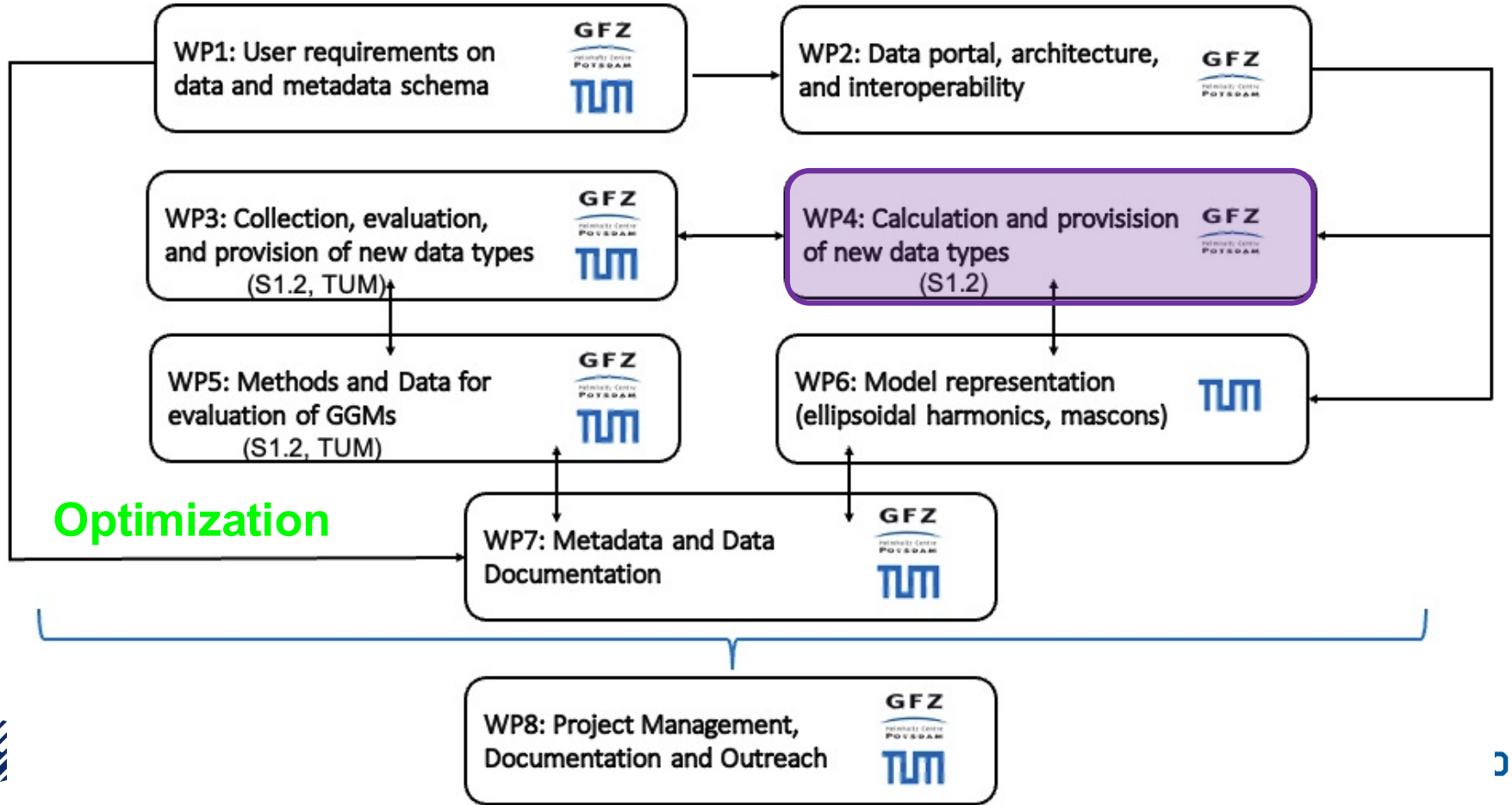
Survey results (3)

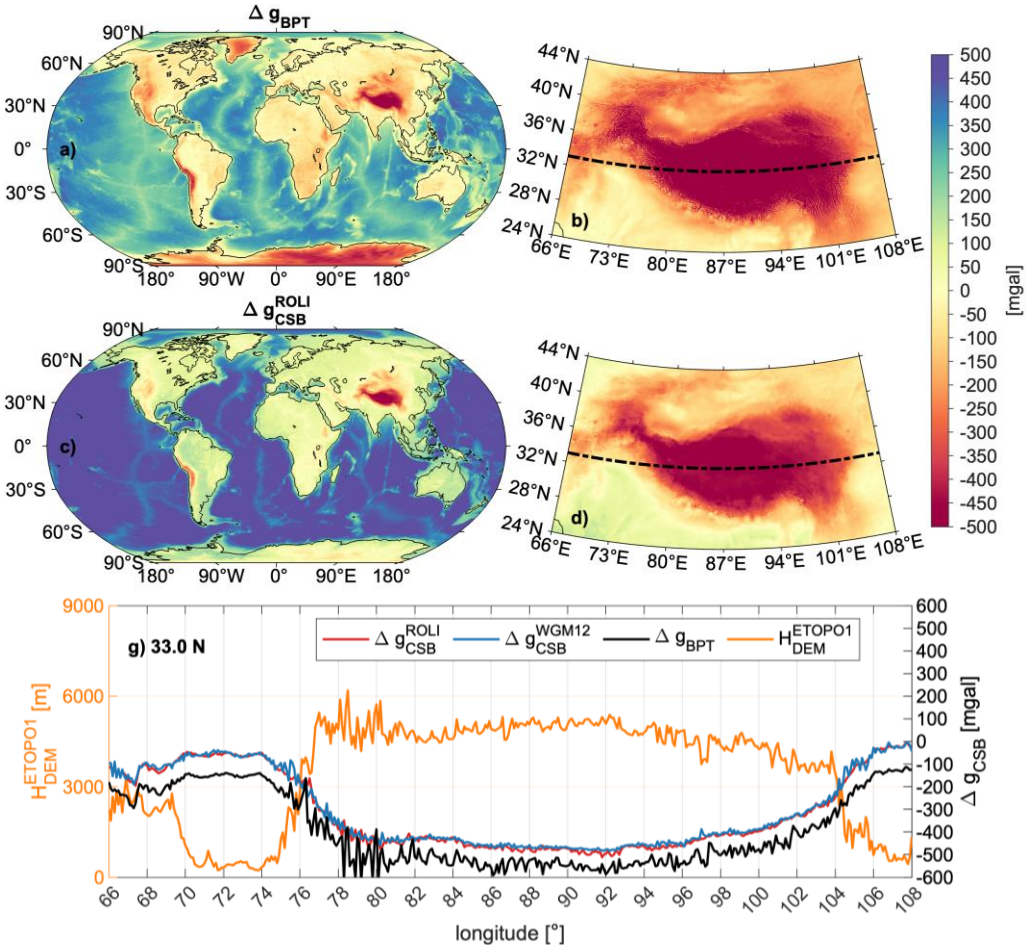


Work Packages

Standardization

Integration





Uz and Ince (submitted).

New functionals

Simple bouguer anomalies

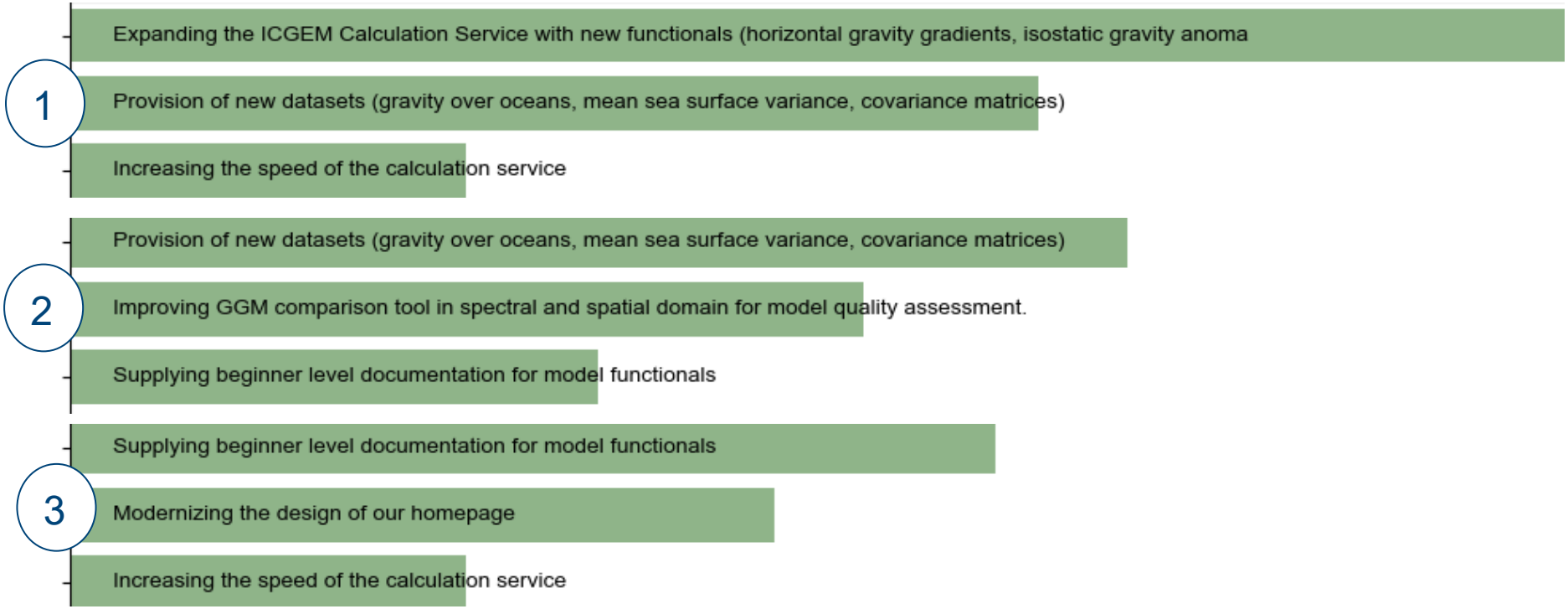
vs

Complete Bouguer anomalies

Outreach

(e.g., Non-geodesists)

Future plans based on user needs



SAMDAT

Service and Archive for Mass Distribution And mass Transport data

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Torkhov A. et al. (2025): Report on the ICGEM User Community Survey: Analysis and Future Plans with the SAMDAT Project, (Scientific Technical Report STR - Data; 25/01), GFZ Data Services, https://doi.org/10.48440/gfz.b103-25011

Uz M. et al. (2025): Responses to the ICGEM User Community Survey: Analysis and Future Plans with the SAMDAT Project. GFZ Data Services. https://doi.org/10.5880/GFZ.LIS.2025.001

Thank you for your attention!

Users: Students, experts, institutions, agencies, non-experts, public

Front end

- Submission & Import of data
- Continuous data flow-exchange
- Visualisation
- Calculation
- Documentation
- GFZ Data Services – Geosciences Data Publisher

Back end

- ICGEM Team
- New Database
- Review & Archive
- Requirements
- Quality Assurance
- Data Representation

International Association of Geodesy (IAG) · IGFS · GGOS Global Geodetic Observing System · GravIS Gravity Information Service · COST Combination Service for Time-variable Gravity Fields · NFDI4Earth

ORCID · ROR · doi · FAIR + OPEN