Meeting of the Working Group on Absolute Gravity

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Members of the Working Group

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,
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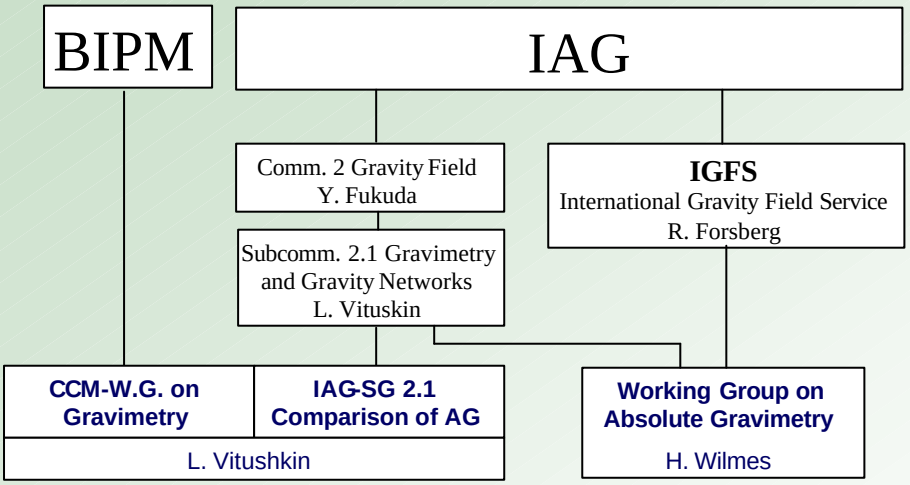
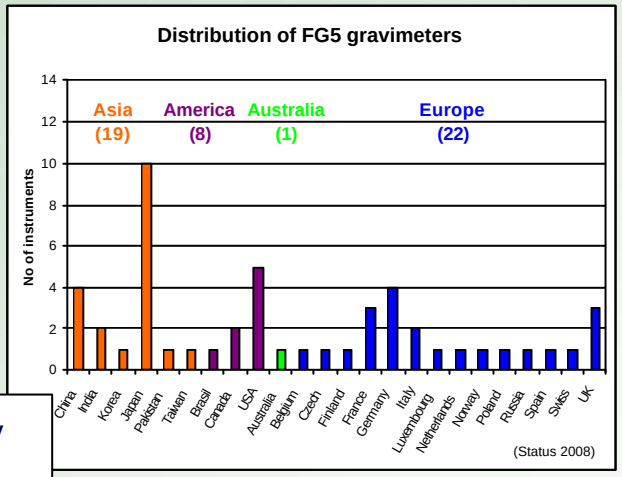
Motivation

- Importance of gravity for monitoring global change processes
  - Increasing number of worldwide AG observations
  - Growing importance of the gravity field for a better understanding of the complex system Earth
  - Use of gravity field products in other geosciences
- Development of the sensitivity of terrestrial gravimetric technology
  - Absolute gravity measurements (AG) (a few µGal-level)
  - High sensitivity in time-dependent observations (SG) (sub-µGal level)
- Global Geodetic Observing System (GGOS)

Structure of AG-related working groups



Growing number of absolute gravimeters



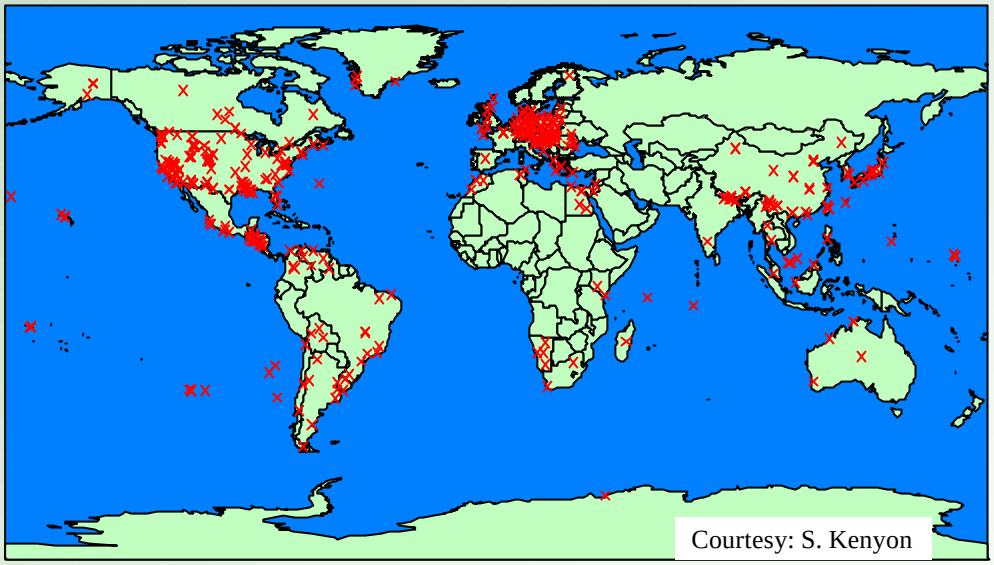
Complemented by other instrument types: e.g. JILA-G, A10, IMGC, GABL, Sakuma, Faller etc.

Owners:
- **Metrological,**
- **Geodetic,**
- **Geologic and**
- **Geophysical Institutions**

Value of the data grows!
Long-term availability of absolute gravity data ?

Absolute gravimetry network (NGA)

(National Geospatial Intelligence Agency, USA)



Need more co-located observatories (VLBI, Laser, GPS, abs.grav., …)
Many regional initiatives - ECGN/Europe, NGOS/Nordic ..) ..

Subjects of the WG (1):

Definition and Realisation of an International Gravity Reference System – IGRS

- Definition of the IGRS
  - Concepts (with reference to IERS conventions)
  - Metrological standards (together with BIPM)
  - Standards for realisation (models, parameters)

Subjects of the WG (2):

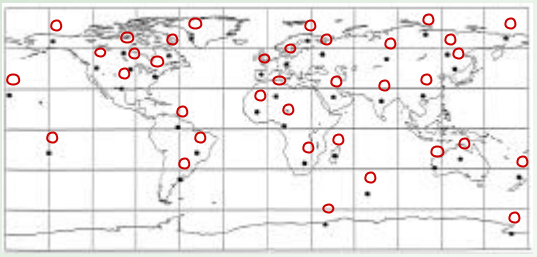
Definition and Realisation of an International Gravity Reference System – IGRS

- Realisation of the IGRS - International Gravity Reference Frame (IGRF) (An IGFS action)
  - AG Database
  - Pilot project: global gravity network
  - Combination with GGP
  - Combination with the GVRS (in cooperation with ICP1.2 Vertical Reference Frames

IAG Gravity Standard

- **IGSN71 is still the valid standard of IAG – station accuracies ±1 µm/s² (±100 µGal)**
- **Next step: proposal by Boedecker to establish the IAGBN**

IGSN71 reference network Ref. Morelli



1986 **IAGBN (A)** Ref: Boedecker

- **AG measurements with ±20 nm/s² (±2 µGal)**
- **AG Comparisons confirm the high reliability of observations**
- **Combination with other geodetic techniques requires consistent definition!**

Absolute Gravity Standard

Standard required

- for the measurements: station selection, auxiliary observations, repetition intervals etc. and
- for the data evaluation: based upon consistent and standardized corrections and models

Premises for the realisation:

- The present gravity standard still defined by IGSN71
- Processing standards within the CCM-W.G. on Gravimetry and CCM-W.G. on the Comparison of AG
- AG international and regional comparisons (BIPM and others)
- Efforts for standardisation within GGOS

Can the CCM-W.G. on Gravimetry *and* IAG-SG 2.1 on the Comparison of AG *contribute with recommendations for the definition of standards?*

Absolute Gravity Database

- Clear and quick overview about existing AG observations
- Storage of metadata or complete observation results
- Contact point and ownership information of the data provided

What is already available?

- Database operational and running at two mirror servers at BGI and BKG
- Standardised data upload to the database by “project files”

The owners of absolute gravimeters are asked to provide their AG observations at least as metadata to the international database operated at BGI and BKG to improve cooperation and visibility of the data for other disciplines.

Gravity network of IGRF

- Global, repeated, highest accuracy
- Co-located with other techniques (VLBI, SLR, GNSS, DORIS, levelling, tide gauge, SG)
- Compared absolute gravimeters (international / regional comparisons)

What is already available?

- Geodetic fundamental stations
- Gravimetric reference stations
- Regional comparison sites
- GGP network

As a starting initiative for a GGOS network it is proposed to chose a network of stations where absolute gravity measurements have been made for at least 5 epochs separated by at least one year or more apart.

Combination of AG and SG

- AG measurements at SG sites for SG drift determination and calibration
- Repeated combinations support AG comparisons and survey of AG long-term reference

Cooperation between AG and SG owners to be improved.

Connection between AG database and GGP database required.

Action Items (1):

Definition and Realisation of an International Gravity Reference System – IGRS

- Definition of the IGRS (jointly with CCM-W.G. on Gravimetry and IAG-SG 2.1 on the Comparison of AG)
  - Concepts (with reference to IERS conventions)
  - Metrological standards (together with BIPM)
  - Standards for realisation (models, parameters)

Action Items (2):

Definition and Realisation of an International Gravity Reference System – IGRS

- Realisation of the IGRS - International Gravity Reference Frame (IGRF) (An IGFS action)
  - AG Database
  - Pilot project: global gravity network
  - Combination with GGP
  - Combination with the GVRS (in cooperation with ICP1.2 Vertical Reference Frames)