

IAG Resolution (No. 1) for the definition and realization of an International Height Reference System (IHRS)

The International Association of Geodesy,

recognizing that

- to determine and to investigate the global changes of the Earth, the geodetic reference systems with long-term stability and worldwide homogeneity are required;
- to detect sea level change of a few millimeters per year can only be possible when a stable spatial reference with globally high accuracy over a long period of time is realized; for this purpose, an integrated global geodetic reference frame with millimeter accuracy must be implemented; to reach this goal, the inconsistencies existing between analysis strategies, models, and products related to the Earth's geometry and gravity field must be solved;
- to accomplish both definition and realization of a height reference system (HRS) standards and conventions that allow a consistent definition and a reliable realization are required;

noting

- the results of the GGOS Theme 1 investigations for the definition and realization of an International Height Reference System in particular the conventions and the computations of the height reference level as the potential value W_0 at the geoid based on the newest global gravity field and sea surface models;
- the necessity of ensuring the reproducibility and interpretability of the reference value, the procedure applied for the determination of W_0 must be well documented including conventions and guidelines;

resolves

- the following conventions for the definition of an International Height Reference System (see note 1):
 1. the vertical reference level is an equipotential surface of the Earth gravity field with the geopotential value W_0 (at the geoid);
 2. parameters, observations, and data shall be related to the mean tidal system/mean crust;
 3. the unit of length is the meter and the unit of time is the second (SI);
 4. the vertical coordinates are the differences $-\Delta W_P$ between the potential W_P of the Earth gravity field at the considered points P, and the geoidal potential value W_0 ; the potential difference $-\Delta W_P$ is also designated as geopotential number C_P : $-\Delta W_P = C_P = W_0 - W_P$;
 5. the spatial reference of the position P for the potential $W_P = W(\mathbf{X})$ is related as coordinates \mathbf{X} of the International Terrestrial Reference System;
- $W_0 = 62\,636\,853.4 \text{ m}^2\text{s}^{-2}$ as realization of the potential value of the vertical reference level for the IHRS (see note 2).

Note 1: Ihde J., Barzaghi R., Marti U., Sánchez L., Sideris M., Drewes H., Foerste Ch., Gruber T., Liebsch G., Pail R.: Report of the Ad-hoc Group on an International Height Reference System (IHRS); In: IAG Reports 2011-2015 (Travaux de l'AIG Vol. 39), <http://iag.dgfi.tum.de/index.php?id=329>.

Note 2: Report of Joint Working Group 0.1.1: Vertical Datum Standardization (JWG 0.1.1); In: IAG Reports 2011-2015 (Travaux de l'AIG Vol. 39), <http://iag.dgfi.tum.de/index.php?id=329>.

IAG Resolution (No. 2) for the establishment of a global absolute gravity reference system

The International Association of Geodesy,

considering that

- the time variable gravity field is one of the keys to understanding the changing Earth,
- the accuracy of modern absolute gravimeters has significantly improved,
- absolute gravity observation has become a valuable tool for monitoring crustal deformations and mass transports,
- new observation principles and instruments like cold atom interferometers and ultra-precise clocks are in preparation and testing,
- modern gravity observations need to be based upon the International Metre Convention and the relevant measurement standards,
- international comparisons of absolute gravimeters under the auspices of International Committee for Weights and Measures (CIPM) define the best metrological realization,
- absolute gravity observations are archived and distributed at global scale according to international standards by the International Gravimetric Bureau (BGI) jointly with the Federal Agency for Cartography and Geodesy (BKG) under the auspices of International Association of Geodesy (IAG);

acknowledging

- that the Strategy Paper between Metrology and Geodesy (see note 1) has been accepted by the IAG Executive Committee;

and noting

- that the International Gravity Standardization Net 1971 (IGSN71) no longer fulfills the requirements and accuracy of a modern gravity reference thus requiring replacement by a new global gravity reference system,
- that measurement accuracies have improved from the “100 μGal ” to the “few μGal ” level,
- that only with an improved gravity reference system time-dependent gravity variations can be determined with high reliability,
- that the use of consistent standards and conventions is necessary for the comparison of geometric and gravimetric observations in the framework of the Global Geodetic Observing System (GGOS);

resolves

- to adopt the Strategy Paper as the metrological basis for absolute gravimetry,
- to initiate a working group to compile standards for the definition of a geodetic gravity reference system based upon the international comparisons of absolute gravimeters,
- 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,
- to link the reference stations to the International Terrestrial Reference System by co-location with space-geodetic techniques,
- to initiate the replacement of the International Gravity Standardization Net 1971 (IGSN71) and the latest International Absolute Gravity Base Station Network by the new Global Absolute Gravity Reference System.

Note 1: Report of Commission 2: CCM – IAG Strategy for Metrology in Absolute Gravimetry, Role of CCM and IAG. In Travaux of the IAG 2011-2015.