

ASSOCIATION INTERNATIONALE
DE GEODESIE

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UNION GEODESIQUE ET GEOPHYSIQUE INTERNATIONALE

INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS

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Michel Jarraud
Secretary General
World Meteorological Organization (WMO)
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Dear Mr. Jarraud

with interest we have seen that WMO prepared a recommendation to adopt a particular terrestrial reference system and a geoid model that shall be used as primary reference for positioning and for reference level for the mean sea level. The International Association of Geodesy (IAG), which is defining the terrestrial reference system and the gravitational potential underlying the geoid, deploying and maintaining in time the Terrestrial Reference Frame (which is the realization of the reference systems) fully endorses this step.

We would, however, like to point out that, from our perspective, the WGS-84 and the EGM-96 are not suitable for this purpose. The terrestrial reference system of choice for all geometric purposes, in particular for all scientific studies asking for high accuracy (decimeter-type or better),

- is the ITRS, the International Terrestrial Reference System, defined by the International Earth Rotation and Reference Systems Service (IERS),
- its realization being the ITRF, the International Terrestrial Reference Frame, which is maintained through a permanent space-geodetic network consisting of about 40 VLBI telescopes (VLBI=Very Long Baseline Interferometry), 30 SLR observatories (SLR=Satellite Laser Ranging), about 50 DORIS terminals, and about 200 permanent sites equipped with GNSS receivers, most of them tracking the GPS satellites, i.e., the satellites of the well known Global Positioning System.

The maintenance of a reference frame of (sub-)cm accuracy, which includes the motion of all stations in the network with sub-mm/year accuracy in time, is a very ambitious task, which is performed on a routine basis by the IAG services

- IVS, the International VLBI Service for astrometry and geodesy,
- ILRS, International Laser Ranging Service,
- IGS, International GNSS Service,
- IDS, International Doris Service and

- IERS combining the products of IVS, ILRS, IGS, and IDS to define the unique terrestrial reference frame, which must be the basis for all scientific work related to geometric positioning and navigation on the planet and in the Earth-near space.

The WGS-84 is the US Department of Defence's reference system, which was adjusted to the ITRF to sub-m accuracy, and therefore is no longer an independent system. The WGS-84 is only accessible through the Standard Positioning Service of GPS, which has a nominal accuracy on the 1-2 m level. The primary reference, however, and the only valid reference for high-accuracy applications is the ITRF, based on the defining system ITRS. This has been acknowledged, for example, in the recent agreement between the U.S. Government and the European Commission to align the internal reference frames of GPS and Galileo to the ITRS (see the attached reference *European Commission, 2004*). Note that the GRF-80 (see Geodesist's handbook 2000) may be used as a reference ellipsoid.

We therefore strongly recommend that WMO, GEO, and CEOS do not use the term WGS-84, but to replace it by the term ITRF and/or ITRS in the resolution.

For the gravity field model, it should be pointed out that the EGM96 model is outdated, because it does not incorporate recent results from the gravity field missions CHAMP and GRACE. Several newer models exist and are available through IAG's International Center for Earth Models, see <http://icgem.gfz-potsdam.de/ICGEM/ICGEM.html> or www.igfs.net. A new global geopotential model EGM07 is currently being completed, and will be available by the end of 2007. This would serve as a new world geoid standard accurate at the 10 cm level in most regions.

Hoping to have served you with this information I remain with kind regards

Yours sincerely



Gerhard Beutler

Reference: *European Commission, 2004: Agreement on the Promotion, Provision and Use of Galileo GPS Satellite-Based Navigation Systems and Related Applications*. Available at http://europe.eu.int/comm/dgs/energy_transport/galileo/documents/doc/2004_06_21_summit_2004_en.pdf.

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