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GGOS Focus Area Unified Height System (FA-UHS), and JWG 0.1.2: Strategy for the Realization of the International Height Reference System (IHR)

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Present Status and Progress

The objectives and planned activities of the FA-UHS are described in the Geodesist's Handbook 2016 (Drewes, H., et al., 2016, J Geod 90(10): 1091, doi:10.1007/s00190-016-0948-z). The main goal at present is the implementation of the International Height Reference System (IHR) defined by the IAG 2015 Resolution No. 1 (ibid. page 981); especially, the establishment of the International Height Reference Frame (IHRF). The corresponding activities are being coordinated by the joint working group (JWG) *Strategy for the Realization of the IHR*. It is supported by the International Gravity Field Service (IGFS), the IAG Commissions 1 and 2 (Reference Frames and Gravity field), the Inter-commission Committee on Theory (ICCT), the regional sub-commissions for reference frames and geoid modelling, and both GGOS Bureaus (Networks and Observations and Products and Standards). The progress is summarized as follows:

- Sep. 2016 (first meeting of the WG at GGHS2016, Thessaloniki): Brainstorming and definition of action items; criteria for the selection of IHRF stations.
- Oct. 2016 (GGOS Days 2016, Cambridge, MA): Preliminary station selection for the IHRF.
- Nov. 2016 – Mar. 2017: Interaction with regional/national experts about the preliminary station selection and proposal for further geodetic sites.
- Apr. 2017 (EGU2017, Vienna): First proposal for the IHRF reference network.
- Since May 2017: Numerical experiments for the computation of potential values at the IHRF stations.
- Since Aug. 2017 (IAG-IASPEI Assembly, Kobe): Discussion on standards and conventions for the IHR/IHRF.

Planned Actions and Milestones

During the IAG-IASPEI 2017 Assembly, J. Ågren (Chair of IAG SC 2.2: Methodology for geoid and physical height systems) and J. Huang (Chair of ICCT JSG 0.15: Regional geoid/quasi-geoid modelling - Theoretical framework for the sub-centimetre accuracy) proposed to establish a strong interaction with the JWG 2.2.2 (the 1 cm geoid experiment, chaired by Y.M. Wang). Aim of JWG 2.2.2 is the computation and comparison of geoid undulations using the same input data and the own methodologies/software of colleagues involved in the geoid computation. The comparison of the results should highlight the differences caused by disparities in the computation methodologies. In this frame, it was decided to extend the “geoid experiment” to the computation of station potential values as IHR coordinates. With this proposal, Y.M. Wang agreed to provide terrestrial gravity data, airborne gravity, and digital terrain model for an area of about 700 km² in Colorado, USA. With these data, the different groups working on the determination of IHRF coordinates should compute potential values for some virtual geodetic stations located in that region. Afterwards, the results individually obtained should be compared with the Geoid Slope Validation Survey 2017 (GSVS17). The Colorado data were distributed in Feb. 2018, together with a document summarising a minimum set of basic requirements (standards) for the computations. The first results of this experiment should be discussed during the Gravity, Geoid and Height Systems (GGHS2018) Symposium (in Sep. 2018, Copenhagen). Colleagues participating in this experiment are: A. Ellmann (EE), A.C. de Matos (BR), B. Erol (TR), C. Hwang (TW), D. Avalos-Naranjo (MX), D. Blitzkow (BR), D. Pangastuti (ID), D. Roman (US),

D. Smith (US), D. van Westrum (US), G. Vergos (GR), H. Abd-Elmotaal (EG), H. Denker (DE), H. Sarid (IL), I. Oshchepkov (RU), J. Ågren (SE), J. Huang (CA), J. Li (CN), K. Ahlgren (US), K. Matsuo (JP), L. Sánchez (DE), L. Sjöberg (SE), M. Filmer (AU), M. Sideris (CA), M. Varga (HR), M. Véronneau (CA), M. Willberg (DE), R. Barzaghi (IT), R. Pail (DE), S. Claessens (AU), S. Dalyot (IL), S. de Freitas (BR), S. Hilla (US), T. Jiang (CN), V. N. Grigoriadis (GR), W. Featherstone (AU), X. Li (US), Z. Qilong (CN).