



Towards a Global Unified Height System

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Abstract

The International Height Reference System (IHRF) was introduced by the International Association of Geodesy (IAG) in 2015 to provide a global standard for the precise determination of physical heights. The IHRF is based on the combination of a geometric component given by coordinates \mathbf{X} referring to the International Terrestrial Reference Frame (ITRF), and a physical component given by the determination of potential values W_P at the positions P defined by the ITRF coordinates. The primary vertical coordinate is the geopotential number ($-\Delta W_P = C_P = W_0 - W_P$), which may easily be converted to a metric physical height (orthometric, normal or dynamic height). The IHRF vertical datum is realised by the equipotential surface of the Earth's gravity field defined by the conventional value $W_0 = 62\,636\,853.4 \text{ m}^2\text{s}^{-2}$. The realisation of the IHRF is the International Height Reference Frame (IHRF). The IHRF realises the IHRF in two ways: physically, by a set of globally distributed reference stations, and mathematically, by the precise determination of potential values at the reference stations. Thanks to a strong international cooperation hosted by the IAG, a first proposal for the IHRF reference network is completed. Present efforts concentrate on the determination of the potential values at the global IHRF reference stations. After evaluating different computation approaches, a standard procedure to determine potential values based on existing regional and global gravity field models was compiled and applied to release a first preliminary IHRF solution. This contribution summarises advances and present challenges in the establishment of the IHRF/IHRF.

Keywords: *Global Unified Height System, International Height Reference System and Frame, Global Vertical Datum, World Height System*