

Updating the International Great Lakes Datum: Enabling the Integration of Water and Land Management in the Great Lakes Region

Jacob Heck (USA) and Michael Craymer (Canada)

Key words: Vertical reference frames; Dynamic heights; Integrated land and water management

SUMMARY

The Great Lakes – St. Lawrence River system is one of the world’s greatest freshwater resources and has important environmental, cultural, and economic value for the United States and Canada. The use and management of these resources requires knowledge and measurement of water levels, depths, volumes and flows throughout the region. A fundamental requirement for coordinated management of this data is a common height reference system or vertical datum by which these measurements can be meaningfully related to each other. The International Great Lakes Datum (IGLD) is such a common height reference system that is defined and maintained under the auspices of the Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data, a bi-national committee with representatives from the Governments of Canada and the United States.

The first IGLD datum was the International Great Lakes Datum of 1955 (IGLD (1955)) which was later updated to IGLD (1985). These datums used dynamic heights and were defined by spirit levelling, an expensive method susceptible to the accumulation of systematic errors. To ensure the datums can provide sufficiently accurate heights, they must be updated every 25-30 years to account for the effects of glacial isostatic adjustment (GIA) throughout the Great Lakes region. A new IGLD (2020) is now presently under development and planned for release in 2025. Unlike previous IGLDs, IGLD (2020) will use a geoid-based vertical datum referenced to a geometric reference frame that will be accessible using modern GNSS technology. This will provide the capability for millimeter-level measurements of water levels in support of safe navigation, regulation of waters & flows, lake level forecasting, hydroelectric power generation, and many other land and water management and development activities in the Great Lakes and St. Lawrence River region.

IGLD (2020) consists of four main attributes: (1) a reference zero equivalent to that being adopted

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for the new North American – Pacific Geopotential Datum of 2022 (NAPGD2022); (2) a reference equipotential surface or geoid that is also equivalent to that being adopted for NAPGD2022 and referenced to its companion geometric datum, the North American Terrestrial Reference Frame of 2022; (3) a reference epoch of 2020.0 equal to the central epoch of the water level observation period (2017-2023); and (4) the use of dynamic heights for management of water levels. We discuss the efforts related to the development and implementation of IGLD (2020) and the new method of accessing the datum. We also briefly mention the evaluation and modelling of lake topography (hydraulic correctors) and the need to update the representation of low water datum for safe & efficient navigation, as well as for land use management along the shorelines.

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