

Bi-nationally coordinated water levels: charting the way for a new International Great Lakes Datum

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The Great Lakes and St. Lawrence River extend nearly halfway across the North American continent and border eight states of the United States and two provinces of Canada. The currently accepted bi-national water level reference for the region is the International Great Lakes Datum 1985 (IGLD (1985)). Updating and maintaining IGLD is the responsibility of the International Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data (Coordinating Committee). The Coordinating Committee is currently updating IGLD (1985) to a new geoid-based IGLD (2020) which will reflect long-term changes in hydraulic differences (surface topography) due to Glacial Isostatic Adjustment (GIA) and advancements in surveying techniques.

Both the United States and Canada maintain a network of permanent and seasonal water level monitoring stations throughout the Great Lakes and their connecting channels. Each lake is assumed to have a geopotentially equal surface and therefore, dynamic heights of mean water levels should, in theory, be the same at each of the lake's water level stations - this is not always the case in practice. Hydraulic correctors, or height adjustments, are applied to correct for discrepancies between water levels at gauging stations across each lake so that they are all in correspondence. As IGLD (2020) moves toward a geoid-based datum, it is uncertain if hydraulic correctors will need to be applied.

The bi-national coordination of unified, quality-controlled processing methods of Great Lakes water level measurements are necessary to disseminate common station-specific and lake-wide products (e.g. hourly heights, daily means, and monthly means). These are critical for safe marine navigation and transportation, lake level forecasting, water level regulation, flow determination, coastal zone management, nautical chart requirements, and more. This collaboration provides a unique case study for developing international standardization of data products and provides insights into the challenges, achievements and lessons learned throughout the update process.