

Presented at the FIG e-Working Week 2021,  
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# SMART SURVEYORS FOR LAND AND WATER MANAGEMENT CHALLENGES IN A NEW REALITY



**e** WORKING WEEK 2021  
**20-25 JUNE**

**Jacob Heck** (USA), **Michael Craymer** (Canada)

**Updating the International Great Lakes Datum:  
Enabling the integration of water and land management  
in the Great Lakes region (11046)**



Natural Resources  
Canada

Ressources naturelles  
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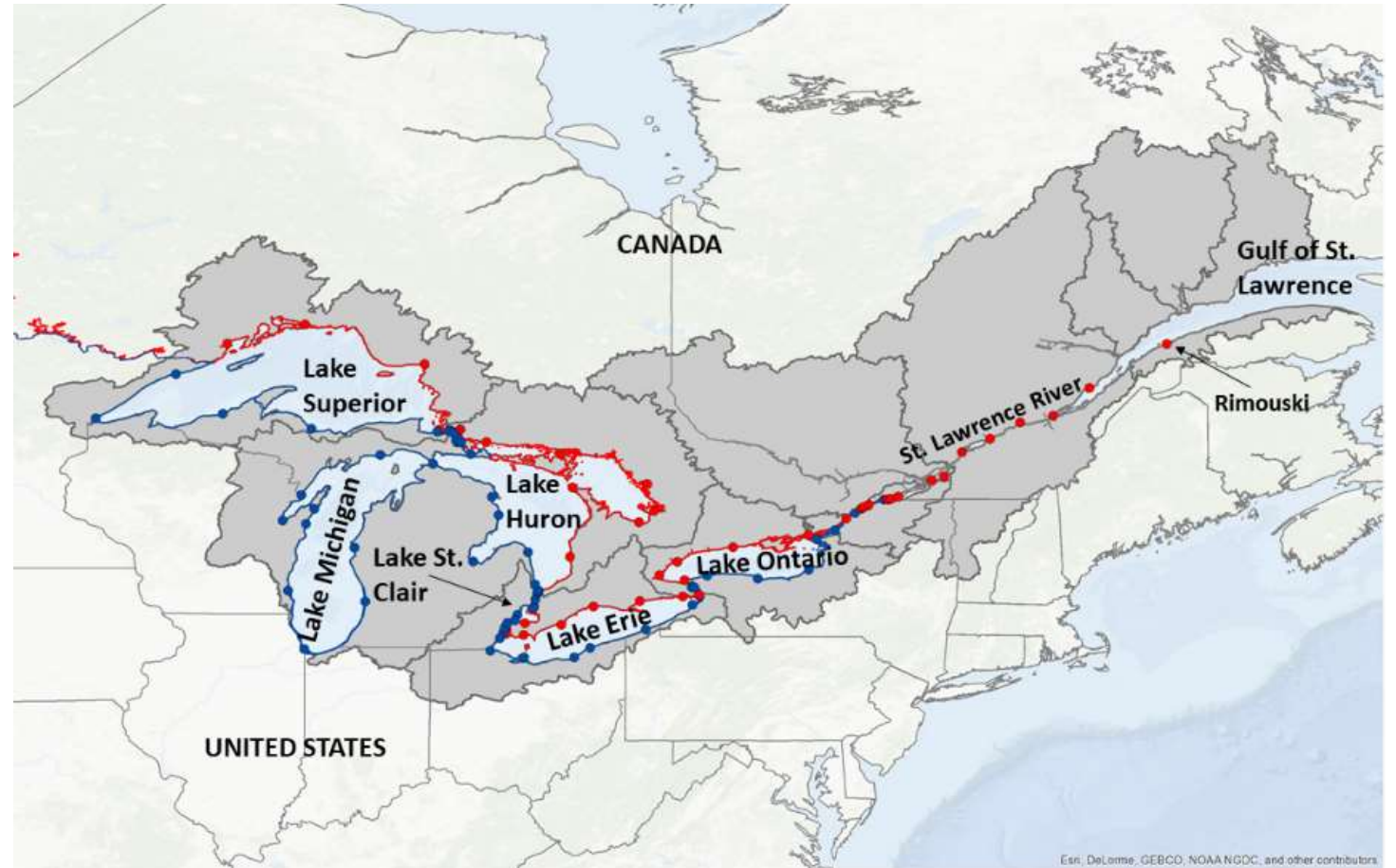
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## Outline

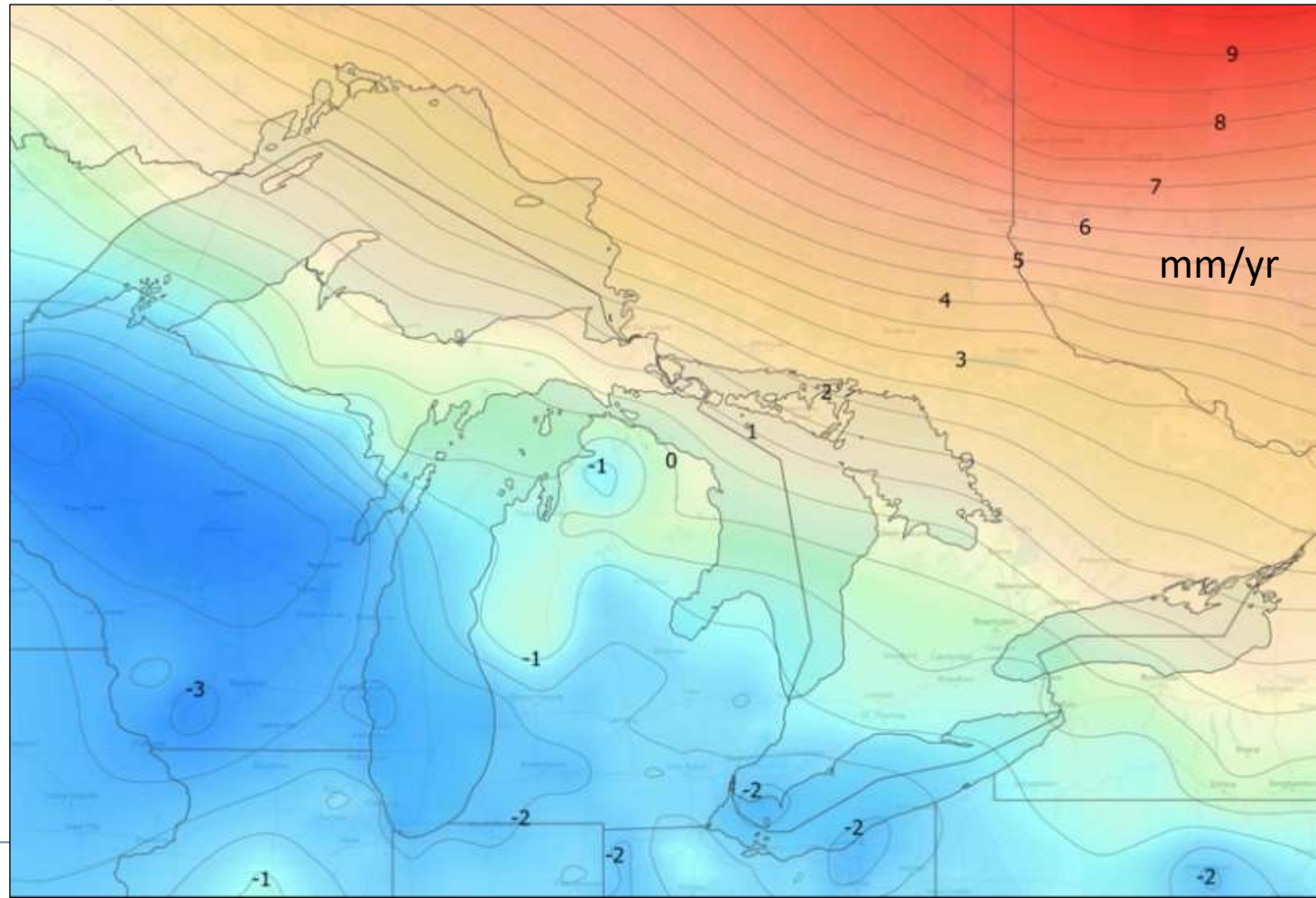
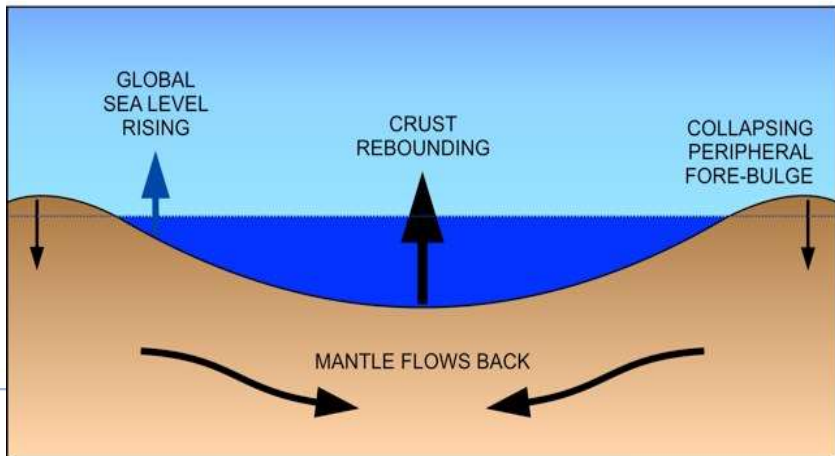
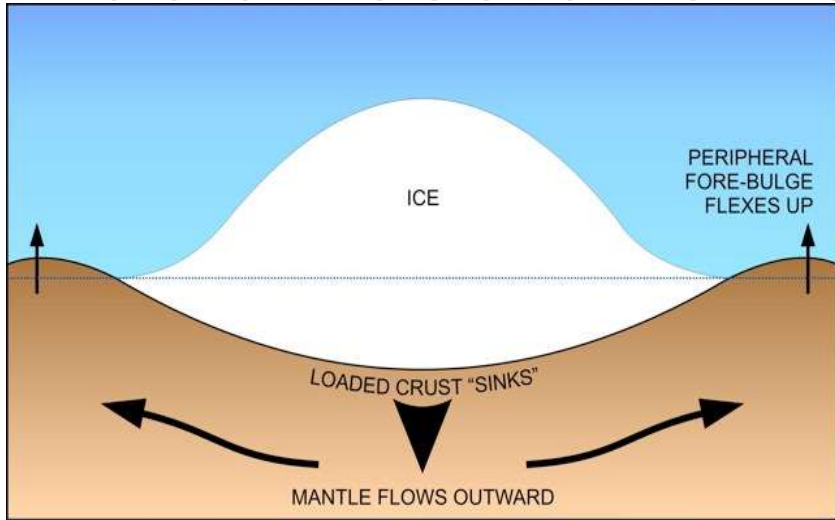
- International Great Lakes Datum (IGLD) is a joint effort between the United States and Canada
- Maintained by the Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data
- Due primarily to Glacial Isostatic Adjustment, IGLD is updated every 25-35 years
- The next update will be IGLD (2020)







# Glacial Isostatic Adjustment

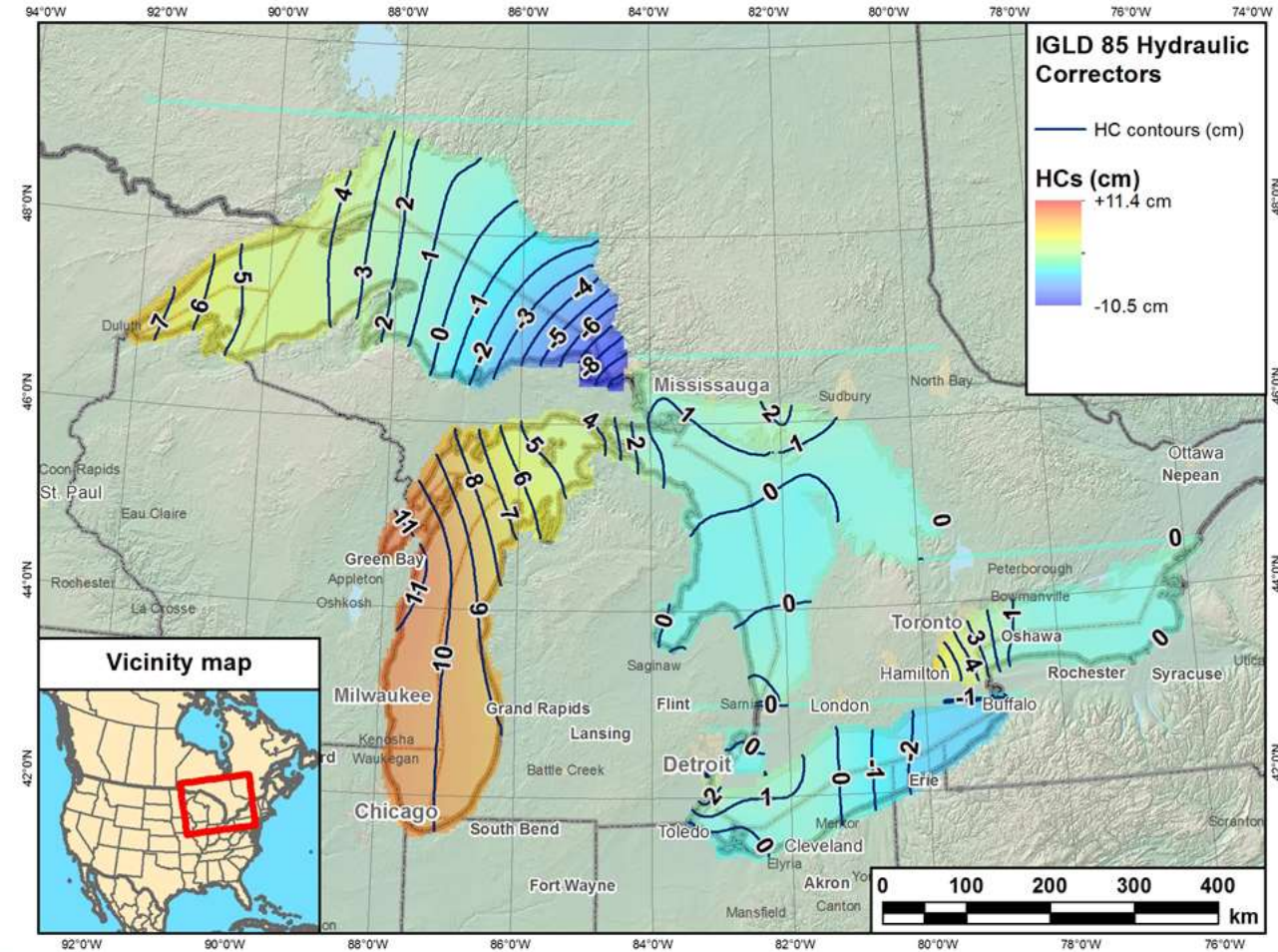






## Current IGLD

- IGLD (1985) replaced IGLD (1955) in 1992
- Same reference zero as NAVD 88 (at Pointe au Père, Québec)
- Reference surface determined from leveling
- Dynamic heights
- Hydraulic correctors





# Definition of IGLD (2020)

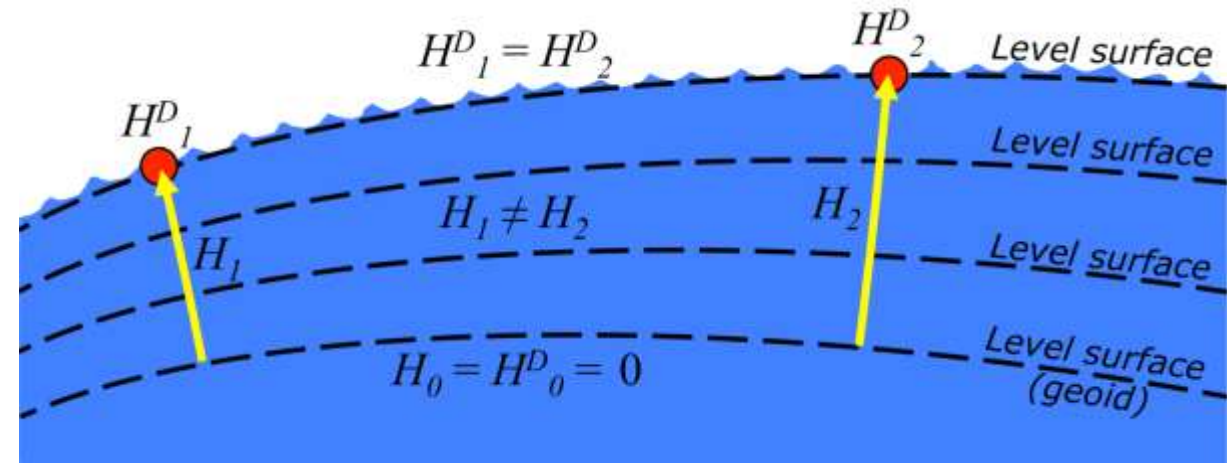
- Reference Zero
  - $W_0 = 62,636,856.00 \text{ m}^2/\text{s}^2$  that the U.S. and Canada have adopted for the new geoid-based North American-Pacific Geopotential Datum of 2022 (NAPGD2022)
- Realization of the Reference Surface
  - Geoid model that represents the reference zero everywhere over the Great Lakes – St. Lawrence River system and not only where leveling and bench marks exist
- Reference Epoch
  - 2020.0, the central epoch of the 7-year water level observation period of 2017–2023
- Dynamic Height
  - The dynamic height represents the difference in potential above the reference surface and is the same at all points on a level surface
  - IGLD (2020) will use dynamic heights derived from GNSS-determined ellipsoidal heights





# Determining Heights in IGLD (2020)

- $H^D = \frac{\bar{g}*(h-N)}{\gamma_{45}}$
- $h$  determined from GNSS
- $\bar{g}$  determined from surface gravity model and Helmert height reduction formula
- $N$  determined from geoid model
- $\gamma_{45}$  is normal gravity at 45 degrees (constant)



*Dynamic heights,  $H^D$ , and orthometric heights,  $H$ .*



## Status

- GNSS field campaign originally scheduled for 2020 is now postponed until 2022 due to ongoing travel restrictions
- Seasonal gauging continues on a limited basis
- Working group set up to investigate the need for hydraulic correctors in IGLD (2020)
- IGLD (2020) is planned for release immediately after NAPGD2022 is released



# Thank you

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