The 2022 GNSS Survey for a New International Great Lakes Datum: Overcoming Challenges with International Planning and Digital Tools

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SUMMARY

The Great Lakes region in the United States and Canada is home to one of the largest surface freshwater resources on earth. It is a dynamic environment that is influenced by crustal motion due to glacial isostatic adjustment (GIA) as well as short and long-term environmental factors. The International Great Lakes Datum (IGLD) is a joint product developed by the binational Coordinating Committee on Great Lakes Basic Hydraulics and Hydrologic Data to account for these changes and provide a consistent water level datum across the entire Great Lakes and St. Lawrence River region. In 2022, NOAA'S National Geodetic Survey (NGS) and Natural Resources Canada's (NRCan) Canadian Geodetic survey (CGS) conducted a GNSS survey across the region to observe over 350 bench marks located at or near water level stations throughout the Great Lakes region both in Canada and the United States. The coordinates derived from this survey, combined with geodetic leveling ties between marks and water level sensors conducted by NOAA's Center for Operational Oceanographic Products and Services (CO-OPS) and the Canadian Hydrographic Service (CHS), will provide consistent ellipsoid heights on water level gauges, tying the water level stations into the new IGLD (2020) datum. In addition, the survey will help determine vertical velocities of water level gauges to assist in developing a crustal movement model. The GNSS survey campaign required immense planning, equipment, and personnel to complete within a 6-week window coordinated between both countries. Strict survey protocols were developed for both observers and managers to provide quality control and quality assurance (QA/QC) in near real time. Both of these steps were heavily supported by leveraging digital tools to plan, conduct, and visualize the GNSS survey. Additionally, NGS field staff and managers employed a mobile application and a data-rich GIS webmap to implement and monitor the survey results. The survey's success will lead to project completion and provides an example to follow for the future campaigns of similar complexity and magnitude.