Geophysical Research Abstracts
Vol. 21, EGU2019-2315, 2019
EGU General Assembly 2019

Comparison of Geopotentially Implied Water Topography on the Great Lakes

Daniel Roman and Xiaopeng Li

U.S. Government, Commerce/NOAA/NOS/National Geodetic Survey, Silver Spring MD, United States (dan.roman@noaa.gov)

The U.S. and Canada jointly maintain the Great Lakes through international treaty. The hydrologic and hydraulic signals are monitored via an established dynamic height datum, currently the International Great Lakes Datum of 1985. IGLD 85 was developed from the same geopotential numbers as the current vertical datum in the U.S., the North American Vertical Datum of 1988 (NAVD 88). NAVD 88 will be replaced in 2022 by a common geopotential model that will serve as the common vertical datum in North America - the North America-Pacific Geopotential Datum of 2022 (NAPGD 2022). Hence, IGLD 85 will be updated to IGLD 2020 in 2025. The US and Canada have entered into an intensive seven year program to collect data in order to develop the best model possible for this new dynamic height datum. However, this is not the only period in which data have been collected. Leveling data is collected every year at about half the sites. GPS data has been collected at five-year intervals to monitor regional deformation and to provide insight into the expected behaviors of the water surface of longer periods of time. GPS campaigns were conducted in 1997, 2005, 2010, and 2015 on bench marks in the vicinity of the approximate 100 water level stations (WLS) scattered around the Lakes. Comparisons will be made between the geometric coordinates over the four campaign epochs and compared to the recently completed Repro2 results to ensure consistency. Leveling is performed from these bench mark sites to connect to the WLS to the geometric frame. In turn, the WLS measurements of the water surface transfer the geometric heights to the water surface where geopotential models are applied to estimate the dynamic heights. The water surface of the Lakes can vary by many decimeters over the period of the year as water flows into and out of the Lakes. Additionally, significant storm events can trigger meter level shift of the water over a period of days. Hence, it is necessary to average over periods of time to mitigate these effects. Data gaps occur as the WLS sensors go down, and these must be taken into account when developing the smoothed average surface. Finally, a comparison is necessary at the four epochs to assess if the apparent water topography observed on a Lake is consistent at different Lake water level heights and over decades of observations.