

ABSTRACT

Spaceborne lidar Ice, Cloud, and land Elevation Satellite (ICESat)-2 provides the ATL13 data product for inland water bodies. However, its quality characteristics are not yet fully understood. This study presents a robust method for extracting lake water level data and make a comprehensive evaluation on the determined water levels. The selected study areas are Lake Huron and Lake Superior, which are part of the Great Lakes. The extracted water levels from ATL13 over a period of four years are validated by using the field measurements at the closest NOAA hydrological stations. The evaluation is carried out in terms of data specifications, wind speed, frozen precipitation, distance of photon segments to hydrological stations, data acquisition time, and beam intensity. The determined water levels are then further used for seasonal monitoring and modeling of water surface. This work demonstrates the critical need on outlier removal and the capability of the ATL13 data. A total bias of 9 - 10 cm is found in the ATL13 product. It is found that frozen precipitation can lead to an overestimation (~ 5 cm) of the water level. However, the uncertainty of water level determination is not found to be significantly related to the laser beam intensity and data acquisition time. We expect that these findings to be valuable for users employing the ATL13 inland water body product and for developers producing future versions of the ATL13 product.