Optimizing the Accuracy of Bathymetric Maps Developed Using Automated and Manual Techniques to Extract Training Data from ICESat-2 Data

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SDB (satellite-derived bathymetry) is a cost-effective solution for large-area bathymetric mapping. Calibration of SDB models relies on in situ depth points traditionally obtained from ship-borne measurements, presenting challenges in collecting data in remote shallow areas. ICESat-2 (Ice, Cloud, Land, Elevation Satellite-2) is equipped with a laser altimeter that successfully records shallow water depths (<40m), providing an efficient solution for acquiring in situ depth data. This study compares manual and automated ICESat-2 bathymetric photon extraction techniques and determines an optimal bathymetric photon event sampling strategy. The objective is to assess how these techniques impact the accuracy of SDB maps. Integrated with Sentinel-2 imagery, the extracted ICESat-2 data train bathymetric inversion models. Various controlled ICESat-2 bathymetric photon resampling techniques are then employed to determine the optimal approach for improving the accuracy of SDB maps. NOAA lidar reference data are used to compare the automated and manual SDB extraction and evaluate the impact of resampling ICESat-2 bathymetric photon events. Anticipated results show that the depth distribution of ICESat-2 bathymetric photon events and the automated bathymetric photon extraction techniques have a considerable impact on SDB map accuracy. These findings hold significance for supporting initiatives in navigational safety, coastal management, marine ecosystem studies, and seafloor mapping.