Detection of submerged aquatic vegetation to improve satellite-derived bathymetry in Canadian Arctic waters

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Satellite-derived bathymetry (SDB) uses satellite remote sensing techniques to survey shallow waters. Although SDB has proven to accurately predict water depth up to 12 m with approximately 1.2 m error, it often mistakes shallow water where submerged aquatic vegetation (SAV) is present as deep water due to their similar spectral characteristics. Since some SDB methods are better suited to predicting water depth with SAV present, this study classifies SAV in two satellite images and determines which SDB method best represents water depth over the classified area. This study focuses on improving already created SDB in Cambridge Bay, Victoria Island, NU. To determine how to best classify SAV, five different classifiers were assessed in the study site. Results indicated that both random forest (RF) and support vector machine (SVM) performed best with overall accuracy values up to 92%. The SAV area produced by the RF classifier was then used to assess four different SDB techniques. It was determined that the automatic photogrammetry SDB approach best predicted water depth with SAV present. By replacing the SAV area in the SDB layer with this method, there was an improvement in the 0 to 2 m depth range of the SDB with the error being reduced from 1.26 m to 1.19 m. However, the error increased slightly in the remaining depth classes. These results indicate that while there was no overall improvement for this SDB layer, there is potential for improvement in future study sites with high SAV, particularly over very shallow water.