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Title:	Modelling Arctic coastal plain lake depths using machine learning and Google Earth Engine
Authors:	Yunus, Ali P. (/jspui/browse?type=author&value=Yunus%2C+Ali+P.)
Keywords:	Arctic coastal plain Machine learning Google Earth Engine
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Abstract:	Numerous shallow thermokarst lakes in northern Alaska's Arctic coastal plains recently show a decline in lake abundance and area due to global warming. While in a few lakes, bathymetric surveys have been completed using sonar instruments, the majority of the lakes in the region have not been surveyed primarily because of logistical issues pertaining to the remoteness of these sites. Employing machine learning models together with Google Earth Engine (GEE), in this study, we mapped the bathymetry of hundreds of Arctic coastal lakes using Landsat-8 OLI images. Our results show that satellite-derived bathymetry is capable of retrieving depths up to 21 m, consistent with field data. Furthermore, the results show agreement to within 0.55 m mean absolute error (MAE) and 0.9 m root mean square error (RMSE), with an accuracy of over 88%. The average lake depth in the region was found to be 1.44 m. Among the various machine learning models employed, random forest (RF) outclassed both classification and regression trees (CART) and support vector machines (SVM) in estimating the depth values. High-resolution and spatially extensive bathymetric datasets developed in this study complement climate warming and degradation studies in the Arctic coastal plains.
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