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Earth System Science Data Discussions

Interactive comment on "Remote sensing of lake water volumes on the Arctic Coastal Plain of Northern Alaska" *by* Claire E. Simpson et al.

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The authors present the methods and data to derive lake depths from Landsat imagery for the Sand Sea region of the Arctic Coastal Plain in Northern Alaska. The lakes in this regions are characterized by a special morphology with distinct shelves and typically deep central basins. Compared to other lakes on the ACP these lakes are very clear and therefore potentially suitable for water depth estimation with optical remote sensing data. The topic and scientific problem is important for understanding lake related landscape processes and associated activities in permafrost. For this region this study is unique and important for the understanding of permafrost hydrology. However, probably the scope is rather local and specific for ESSD. The presentation of the manuscript is good, but needs some more detail in several parts. These include e.g.

the raw data acquisition and software/workflow, preferentially with processing code. It is unclear which software the authors used for data processing/model creation. The analysis is robust, but rather basic, with only one used image, simple band ratios and simple regression models. The authors may apply more advanced analysis in all these points, which are easily accessible in several software packages of choice (e.g. python with scikit-learn). They would probably help create a regional model. The inclusion of software/platform used, would have helped to provide more specifics. The datasets are accessible and working.

Detailed comments and suggestions for improvement are stated below.

54: supra lake bluffs?

95ff: rather undetailed description.

95ff: Transect lines how dense? Which observation frequency distance between points? I like the method to use a float plane as a platform for taking samples. I think this is very important for fieldwork in the Arctic.

106: 2.2. Your database of only one used image is VERY small. I suggest that you use more different images. There should be plenty of data and acquisitions

107: Does it make sense to merge them initially? I think it is ok to do that later or on the fly, but differences between lakes would be an interesting point to analyze. Spatial sampling strategies would help to make the analysis more robust.

109: TOA data OK as SR is not perfect in high latitudes. Also OK for only one image. Please refer that there are SR data available, but that they come with disclaimer for high latitudes.

111: Interesting that the coastal band did not improve results as it is specifically designed for this purpose as far as I know.

124: maybe you can use a better term than degraded. E.g. merged, resampled

142: The statement that there was no suitable 2017 image should come earlier, as it is confusing to start stating that you used 2016 imagery.

162: This sentence sounds a bit unclear and complicated to me.

187: You mentioned that you merged all data, here you say you have them sampled for each lake. Please clarify.

187: I am not sure is a random sampling within one lake is really feasible, as spatial autocorrelation can be an issue. This may lead to an overestimation of your accuracy. However, I understand that input data were taken as a transect and that field work in the Arctic often prohibits more sophisticated/robust spatial sampling design (e.g. grid).

245: If blue performs well, then the question is why the “coastal” band did NOT perform well, as it is more or less designed for this application.

281: good point mentioning the limitation of extrema. I would say this is typical for almost all predictive models.

301 ff: I would like to see a discussion about regression models. Are there better models available? More sophisticated one, which take more information into account? E.g. Machine-learning or Deep-Learning models, LASSO, . . .

Fig 5a: Should “< 0” be “> 0”?

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