



EGUsphere, referee comment RC1
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Comment on egusphere-2022-388

Anonymous Referee #1

Referee comment on "Bedfast and floating-ice dynamics of thermokarst lakes using a temporal deep-learning mapping approach: case study of the Old Crow Flats, Yukon, Canada" by Maria Shaposhnikova et al., EGU Sphere,
<https://doi.org/10.5194/egusphere-2022-388-RC1>, 2022

This paper used a temporal deep learning mapping approach for the purpose of classifying bedfast and floating ice in the Old Crow Flats. The authors have clearly done some work, but the manuscript needs major revision and in my opinion several aspects of the study need to be revisited before it can be considered for publication.

Major comments:

1. Your method is different from those used in previous studies (thresholding method or data mining approach), why did you not perform a comparison between them? If it works better, it is logical to proceed by presenting the method. The authors could do a more careful job comparing the proposed method with the approaches used previously by using the same dataset. Right now, there is not enough information to understand if the new method is necessary. There is almost no information about how the training and testing data sets were selected, what is the time stamps and amount of them?

2. The sentences that were used to describe the implementation of the deep learning

mapping approach is not enough. This cannot be used to judge whether the deep learning model was implemented correctly. How to determinate the model parameter values? Did you compare the model performances when using different parameter values? What is the loss curve of your model? More details are needed here to evaluate your model.

3. Several types of SAR images were used in your paper, but the effect of their differences (e.g., spatial resolution) was not considered in your model.

4. The author still analyzed the lake ice dynamics. However, as you pointed out in the manuscript, the lake area is also changing, how to consider the effect of this on the lake ice dynamics analysis.

5. Most of the figure citations are short and simple, more details should be listed as in that case the readers can easily understand the figures.

Specific comments:

Line 12 "less lakes are expected to develop bedfast ice", Line 504 "lake ice fraction analysis from the available 18 years of data suggests that bedfast ice fraction has increased by 11% despite a warming climate". Is there a contradiction between these two sentences?

Line 20-21, do you have any evidences to support this point?

Line 22-23, more bedfast ice?

Line 31-32, here you said that a subsequent decrease in the number of bedfast ice lakes has been noted by many researchers. However, in Line 504 "lake ice fraction analysis from the available 18 years of data suggests that bedfast ice fraction has increased by 11% despite a warming climate".

Line 40, as you said there are many extensive studies, you should compare your method to theirs.

Line 45, 'only THREE lakes shifted from bedfast to a floating ice regime', why?

Line 49, 'one of the study areas', it should be more specific here.

Line 53, why did you choose the Old Crow Flats as your study area, more reasons are needed.

Line 61-61, there is a distinct backscatter patterns for floating and bedfast ice, thresholding method may be enough for the lake ice classification.

Line 70, a comparison to threshold-based classification is needed to prove that your method is necessary.

Line 78-79, this accuracy is comparable to your method. So you need to clearly point out the advantage of your method.

Line 85, what are the remaining challenges?

Line 88-89, does your method still work well for these lakes with different phenomena or ice properties?

Line 104, did the data for different sensors/with different resolutions/acquired in different years affect the method performance? How to consider these?

Line 116, so your method is mainly used for shallow lakes?

Line 125, dose the decreasing lake area affect the analysis of bedfast ice dynamics?

Lien 128-129, 'Despite the overall trend of decreasing water surface area, most lakes are increasing in surface area'??

Figure 1, longitude and latitude are suggested to use, more detailed descriptions about this figure are needed.

Line 143, how to consider this effect on your model?

Line 157-158, 'Adjusting the filter size allowed to account for the pixel size differences.'. According to the resolutions listed in Table1, this may be not true.

Line 161, again, how to consider the effect of data inconsistence on your classification results, which may further affect the ice dynamics analysis.

Line 167, what are the spatial distributions of these labeled pixels?

Line 169, what is the detailed process of the visual assessment, how to deal with the mixed pixels?

Lien 175-176, this process should be more quantified?

Lien 181, why using early fall scenes to identify land areas?

Line 183-184, how many data were obtained from the interpolation?

Line 189-190, how to consider this effect on your method?

Figure 2, the colors of two types of ice are difficult to classify.

Line 218-224, how to determinate the optimal parameter values for your model?

Line 231, this subtitle seems to be subordinate to Section 3.3.2 (TempCNN architecture).

Line 242, why THREE SETS were used here?

Line 250, which dataset was used to train the TempCNN model?

Line 254, what elevation data was used here?

Line 257, what is the spatial distribution of these field data.

Line 262, does the Canadian Lake Ice Model have the enough resolution for method evaluation? Because the resolution of ERA5 is quite coarse.

Line 268, why 2 m? in Line 116 you mentioned an averaged depth of 1.5 m.

Line 272-274, figure or table are suggested to use here to help readers understand your opinion.

Line 284, the lake area is still changing, a single lake mask may include some uncertainties.

Line 292-293, what are the known lake drainage and refilling events?

Line 300, so did you apply any quality control strategies for the SAR images?

Line 302, when S1 data are not accessible, what is the coverage of other data in the study area?

Line 316, 'the major features of the lifecycle can be lost', why?

Figure 6, is ice area in 2021 larger than that in 2004?

Table 2, more detailed descriptions are need.

Line 321-323, some possible explanations are suggested to add here.

Lien 328, why the dark spots are particularly pronounced for R1 2001, ERS 1993, 1994, are they related to sensor?

Line 340-341, did you use the optical images in this study? Do you mean that your training dataset may contain erroneous labeling?

Line 381-392, how can the ice thickness data be used to evaluate the lake ice classification results?

Line 1.29, what about the ice whose thickness between 1.14 and 1.29 m?

Line 474-475, does the changing lake area affect the ice dynamics analysis?

Line 482-483, how to reduce the effect from spatial resolution difference?

Table 5, how many areas of floating ice transferred to bedfast ice? How many areas of bedfast ice \square floating ice, ice \square land, land \square ice? You can add this information into this table.

Line 499-500, so the accuracy of lake ice maps in different periods are variable. Does this affect the final ice dynamics analysis?

Line 505-507, more evidences are needed here.