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Discussions

Interactive comment on "Response of ice cover on shallow lakes of the North Slope of Alaska to contemporary climate conditions (1950–2011): radar remote sensing and numerical modeling data analysis" *by* C. M. Surdu et al.

Anonymous Referee #3

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This paper addresses timing of lakes freezing and thawing in both floating and bedfast ice regimes, a topic of high relevance to TC. The concepts related to analyzing the timing of these events using the combination of remote sensing and modeling is novel leading to substantial conclusions. In general the scientific methods are well outlined, although the methods section could be revised to be more concise. Some assumptions in the manuscript could have been better justified (e.g. using an average lake depth of 3 m, when previously stated depth was 1-2m), and in general assumptions could have been more clearly stated. Nonetheless, presentation of assumptions did not greatly

detract from the soundness of the methods. Ultimately, the results appeared to be sufficient to support the interpretations and conclusions. The title and abstract appear to be appropriate for the manuscript. There are several areas (detailed below) that could be improved to make the structure and flow of the manuscript better. Based on the overall results, I am supportive of this manuscript for eventual publication, but only after major revisions to improve the readability, clarity and organization of the text and improvement/revision of the graphics.

Introduction: The authors may want to reference Jones et al., 2013 IJRS.

Section 2 Study Site: There is an exhaustive amount of detail here, some of which I am having trouble connecting directly to this study. eg. What is the importance of wind speed, or reporting two sets of temperature statistics? I suggest simplifying this section to only what is essential for understanding the manuscript so the reader doesn't get too caught up in unneeded detail.

P3788 L19-24: This is a good hypothesis, however it seems out of place in the "Study Site" section. Suggest moving to a more appropriate section.

P3789 L4: What is the difference between "pixel size" and "spatial resolution"?

P3789 L9-11: Please clarify – would you expect these to be the same? If so, is this an indication/effect of measurement uncertainty?

P3790 L1 – P3791 L7: These paragraphs appear to contain information that is not suited for the methods section. Suggest moving to a more appropriate location such as the Introduction, or creating a "Background" section.

P3729 L2-3: Visually assessed against the original SAR image for what?

P3791 L18: It's not clear why the user would select 3-5 classes at first. Please clarify.

P3792 L11 – 3793 L2: This paragraph would benefit from slight reorganization. The text alternates between ice on/off timing and ice thickness. Suggest grouping all sen-

tences for each topic together.

P3793 L21: Why chose a mean depth of 3m? On P3787 L15-19 the authors indicate a range of lake depths with most being 1.4-1.5 m deep and only 23% possibly being over 2.2 m. How much of an effect on the simulations does the lake depth have?

P3794 L14: This statistical relationship is absent on Figure 6.

P3795 L13: By what metric is this judged to be reliable? In comparison with what is 4% small?

P3795 L22-L25: This statement is convoluted and difficult to decipher what point is being made. Also, any demonstration of correlation is absent from the related Figure 8.

P3796 L1-14: This is hard to follow. What do earlier breakup days of 18.6 and 17.7 mean? Is this an average over some time, or just at the most recent year? Could uncertainty be assigned here? Same question with respect to ice durations. How is statistical significance tested without uncertainty?

P3796 L19 – P3797 L10: This is a nice analysis, however it would be stronger if it were put into context of other studies. Would it be possible to compare these results to previously published papers?

P3797 L10: Suggest starting a new paragraph at "Ice regimes of shallow…"

P3797 L10-L16: This is an interesting point, however the text only indicated previous studies. Is this same effect observed in the authors' data?

P3798 L3: Suggest indicating which figure in this manuscript after "… SAR data."

P3799 L3-L21: This paragraph seems to be a bit far removed from the main point of this paper. For simplicity and clarity, it may be helpful to reduce this concept to a more straightforward general point that is clearly related to the results.

P3799 L22 – P3801 L2: This paragraph also seems to be somewhat off topic. It is advisable to avoid introducing a new concept ("P-E") at the end of the paper. I suggest either restructuring the manuscript so that this concept is introduced in the beginning and related to the key objectives, or removing this text.

P3801 L12-17: This text does not summarize your study and belongs in an introduction or background section.

P3802 L9 – P3803 L9: This text does not summarize your study and belongs in an introduction or background section.

Conclusion Section: I suggest reworking this section to make it more concise and more clearly describing how this study achieved the stated objectives. Although the decision to include a "Summary" is left to the author, in general my opinion is that including extensive summary (or review) content in the conclusion section is not advisable because it distracts the reader from a clear presentation of the main points of the manuscript.

Figure 2: It's not clear how this data is utilized within the manuscript. Perhaps this figure could be briefly summarized in a sentence of text and the graphic deleted?

Figure 3: The images in this figure are quite small and difficult to evaluate. Also, it's not clear from the text or the caption what the author is attempting to demonstrate with this graphic, beyond simply that they have segmented the images (in which case, is a graphic really needed?)

Figure 4: Panel (a) doesn't seem necessary and the images in panel (b) would be clearer if they were larger and panel (a) was removed.

Figure 5: The color of the Ice and Snow lines appears to be identical. Please make the distinction more clear by using higher color contrast or different line texture.

Figure 6: This figure is challenging to decipher. The authors could consider using a more appropriate graph type rather than bars. The text is generally too small to read easily. Is simulated ice thickness for grounded ice only presented or is it for all lakes?

Figure 7: A stacked bar graph is not the best type of presentation to use for time series data. The trend is not indicated on the graph.

Figure 10: It's best not to present new data in the discussion. Suggest restructuring so this is in the results section.

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