The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2022-175

Anonymous Referee #2

Referee comment on "Fusion of Landsat 8 Operational Land Imager and Geostationary Ocean Color Imager for hourly monitoring surface morphology of lake ice with high resolution in Chagan Lake of Northeast China" by Qian Yang et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-175-RC2, 2022

The authors present a study on the morphological properties of ice cover on ~200 km2 large shallow Lake Chagan in China. The ice cover morphology was investigated in terms of formation of ice ridges, their evolution during the ice-covered period, and relationship to the wind force/direction. The central point of the ms is the exploration of the ability of satellite-based remote sensing with regard to quantification of the ice ridge properties. A second "parallel" story develops throughout the ms, discussing a distinct and rarely reported type of lake ice---the "ice balls"---which were encountered by the authors during their field campaigns in support of the remote sensing data analysis.

The subject of the study is suitable for "The Cryosphere" and can potentially be of interest for the journal's wide audience: seasonal lake ice is a relatively poorly investigated part of the cryosphere, which attracts growing attention of researchers during the last several decades. Indeed, ice cover on lakes with large (compared to the length scales based on the ice thermal expansion coefficient or on the length scales of the mechanical deformation) spatial dimensions tends to have a complex morphological structure with long-lasting ridges, cracks, stamukhi, and other quasi-regular features requiring a deeper investigation for correct understanding of the role played by seasonal ice cover in large lake dynamics and land-atmosphere interaction. In this sense, the authors present a valuable dataset and a well-supported methodology with a potential for expansion on other large lakes worldwide.

I had several major concerns raised when reading the manuscript:

- The story about the ball-shaped ice structures discovered by the authors on the lake surface is not connected to the declared subject of the study on the capability of satellite imagery for monitoring ice morphology. The phenomenon of "ice balls" per se is interesting for understanding the physics behind the processes of ice formation at different weather conditions, and the authors presented a reliable hypothesis on their formation

supported by meteorological observations. However, it should be considered in a more consequent way and presented as a separate study in glaciological literature. Otherwise, the results will remain hidden under a wrong title and will only disturb the presentation of the actual topic of the study. As a separate study, the presentation of the "ball ice" should be accompanied by an extended discussion on frequency of its formation in waters of different types and geographical location and on its potential effects on the ice properties and under-ice conditions with analysis of information from other reports on the phenomenon. In addition to the works cited by the authors, the phenomenon was described in the literature on Lake Baikal under the russian term "kolobovnik", see, e.g.,

- Granin, N.G., Aslamov, I.A., Kozlov, V.V. et al. (2019) Methane hydrate emergence from Lake Baikal: direct observations, modelling, and hydrate footprints in seasonal ice cover. Sci Rep 9, 19361. https://doi.org/10.1038/s41598-019-55758-8

- Vologina, E. G., Granin, N. G., Vorobeva, S. S. et al. (2005). Ice-rafting of sand-silt material in South Baikal. Russian Geology and Geophysics, 46(4), 420-427.

- and citations therein.

- The discussion on the main topic of the study, detection of ice ridges from satellite imaging, is rather short and superficial. To put the results in the right context, it should be extended with information on potential application of the results in lake ice studies and comparative analysis against other publications on the same subject.

- It is annoying to put language issues on the list of concerns. However, in this case, the authors have to perform hard and responsible work to make this text understandable to the reader. The text is full with repeated words, unfinished phrases and sentences. Figures lack comprehensive legends and are overloaded with irrelevant information. Apart from a careful proofread, the help of a native speaker is recommended. Some of my remarks are provided in the (non-exhaustive) list of detailed comments below.

Line 14: "prosed" -> proposed

Line 20: "closed related" -> closely related

Line 30: "scarce work studies" -> studies on… are scarce

Line 34: “has the advantages of” -> is

Line 44: “the cost is too expensive” -> costs are high

Line 45: “time series” -> “temporal coverage”

Line 61: ”coarse and fine resolution and coarse resolution…” -> ?

Lines 74-76: The abbreviations SAR and UAV are in the meantime widespread. Nevertheless, they should be better expanded.

Line 90: how the lake length of 107 km was determined? With the surface area of 253 km2, it would mean the lake “width” of less than 3 km. The map in Fig. 1 looks however different from that.

Line 129: What is meant under “A 16-degree angle with an interval of 25°”? Reformulate in a clear way.

Line 151: “The morphological extraction”: replace the section title with a meaningful one

Line 153: “Canny operator”: replace with “the Canny edge detection algorithm” and provide a reference.

Line 153-156: revise the whole sentence to make it understandable.

Line 155: “inter” -> inner (?)

Lines 160-180: the whole paragraph is barely understandable and controversial. At Lines 160-170 the validation of a predicted image on Nov 22 is discussed and the correlation value of 0.93 is declared. On Lines 171-180 the correlation of 0.935 is referred to the date of Nov 28 (???) What is the difference between the two validations? Why was Nov 28 additionally used to Nov 22? What kind of new information is provided at Lines 171-174 compared to the Lines 160-170? The paragraph has to be deeply revised, repeated information removed, and the results delivered in an unambiguous way.

Line 183: “display” -> “displays”

Line 187:”liner” -> “linear”

Line 191: “Figure 9” -> Figure 6

Line 200: remove “rapid”

Line 212: “ball” -> balls

Lines 213-214 -> insert “In 2022” (?) Otherwise, the sentence is senseless

Lines 218-224: The whole passage is completely distracting. “The ice thickness had the smallest value” - WHERE? The difference between summer 2021 and winter 2021 - the difference of WHAT? “Differences were not significant enough to explain what we observed..” WHAT did you observe? “The ice thickness… showed spatial coherence... especially with the ice thickness” - the phrase is senseless. The passage looks like a piece of a draft text understandable to the author only and inserted into the ms without any editing. As I mentioned above, the information on the “ice balls”, as presented here, is irrelevant to the main subject of the study and should be completely removed for consistency. However, this presentation style is inacceptable for a scientific work and should be reconsidered by the authors before submitting it somewhere else.

Line 226: what is “wind rise” in this context? Revise phrasing

Line 227: how the freeze-up and break-up dates were defined?

Line 246: “uncanny” -> replace with a stylistically neutral word.

Line 247: “ball” -> balls

Lines 274-275: there are no reports from Finland in the cited works. What is “...and so

on”? The majority of the reports on “ice balls” comes from the coastal ocean and Laurentian Great Lakes.

Line 277: How was the exact threshold of -10°C determined? Why is it not -8°C or -12°C?

Line 480, Fig. 6: The legend lacks explanation of the panels a-d. Information on Panels a-b is barely understandable and has no reference to other Panels. The in-figure legend on Panel c seems to be wrong: red line refers to “stable process” not to “growth process”. It is unclear what kind of statistics (spatial or temporal) is used in the box-whiskers chart in Panel d.

All figures are overloaded with unnecessary and unexplained information. They should be deeply revised to provide essential information in an unambiguous way.