

## ***Interactive comment on “Validation of lake surface state in the HIRLAM NWP model against in-situ measurements in Finland” by Laura Rontu et al.***

**Anonymous Referee #2**

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General comments:

Rontu et al. utilize archived forecast data (2012-2018) from the NWP model HIRLAM to validate the analysed and forecasted state of lakes with respect to observations within a model domain. Due to unfortunate circumstances this specific HIRLAM version included a bug which prevented snow to accumulate on the lake ice. Due to this bug the model data related to ice behaviour and spring LSWT temperature became unrealistic and therefore the corresponding results and discussions are of very limited interest. Okay, it illustrates the importance of representing snow on ice when simulating lakes in cold climate conditions.

The manuscript is in general carefully written and can be considered as a useful guidance on how to validate the state of lakes in a NWP or climate model when correspond-

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ing in-situ observational data are available. The authors carefully describe uncertainties with respect to representativeness of observations and representation of lakes in a model domain. Also, they describe how ice conditions may be estimated based on other data. All this information can be valuable for scientists planning similar exercises for other combinations of model and lake observations.

As the authors say it is a well known behaviour of FLake to overestimate summer LSWT. This is also seen in the presented results. However, it can not be excluded that part of those biases presented may be explained by for example any biases in near-surface temperature conditions in general. After all, the lakes represent only some 10% of the land area even in Finland so a bias in near-surface air temperature due to discrepancies in representation of land processes can also contribute to the presented biases. Thus, I would like to see a comment on the general near-surface temperature bias in this HIRLAM setup. The authors do comment on the quality of simulated downwelling short-wave irradiance but a comment on long-wave would also be relevant.

Detailed comments:

Page 2, line 3: Sounds a bit strange to combine observed LSWT and simulated ice thickness to estimate fractional ice: “Fractional ice cover (lake ice concentration in each grid-square of the model) is estimated separately based on the analysed LSWT and the ice thickness predicted by FLake.”

Page 5, line 15 19: Here you refer to Figure 2 for the first time but in the caption of Figure 2 you use the abbreviation LID which is defined later in the text. Please, e.g., introduce “lake ice dates” also in the figure caption for clarity.

Page 8, lines 1-2: A bit strangely formulated sentence: “including in the comparison data over all months”. Please make it more clear.

Pages 9-12, Section 4.2: The bug which prevents snow to accumulate on ice in this HIRLAM version will seriously affect all results presented in this section so I think it

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would be fair to the reader to comment on this in the beginning of this section although it has been mentioned in previous sections.

Page 13, line 5: You say that “Lake Kilpisjärvi is an Arctic lake at the elevation of 473 m”. This is a complex terrain area so the height difference between the real lake and the model lake might contribute to estimated biases in temperature. What is the corresponding height of the HIRLAM grid box here? Would a height correction of temperature make any difference for the results?

Figure 1: In the text it says that (page 2, line 33 – page 3, line 1) “the prognostic Flake variables are not corrected using the analysed LSWT, which would require advanced data assimilation methods” but in the figure it says “INDEPENDENT LAKE DATA ASSIMILATION IN AN INTEGRATED NWP + LAKE MODEL”. I suggest to remove “DATA ASSIMILATION” here since that is not done according to the text. And ice cover is simply 0 or 1 when ice is present or not, right? So, this is not really a diagnostic estimation I would say. Or does this include something else which is not yet clear from the text. . . ? Okay, becomes clear on page 4. Maybe better to refer to Figure 1 a bit later when the background to the figure is clear from the text.

Figure 11: Colour indications of freezing and melting dates in the caption (blue and red) do not fit with the figure (orange and magenta).

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2018-270>, 2018.