Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2018-270-RC3, 2019

Geoscientific Model Development Discussions

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 #3

Received and published: 26 January 2019

General comments:

The paper presents the detailed validation of the FLake model implemented in the HIRLAM NWP system, focusing mainly on the lake surface state and utilizing in situ measurements. The validation period is considerably large spanning over six years and a large number of lakes are included in the investigation. The validation area covers only Finnish lakes, consequently results are referring to arctic conditions and might not be generalized to other climate regimes. The technical properties of the modelling system as well as the observational dataset are described properly. A lake water temperature assimilation scheme is also presented, however, it is mentioned that this is only a diagnostic product. Perhaps, the application areas of this product could be highlighted so that the purpose of it is clearer for the reader.

During the validation, lake surface water temperature (LSWT), freezing and melting dates and ice thickness are investigated. Regarding LSWT results are in line with previous studies, namely an overestimation by FLake is pointed out. Freezing dates are simulated by an adequate precision, however, melting dates are poorly forecasted. The cause of this problem is enlightened during the investigation of the ice and snow thicknesses, namely due to a coding error snow is not accumulated on the ice surface. Physical consequences of this bug (missing insulation in winter and different albedo in spring) are well described.

Detailed comments:

1. Page 5 line 18: it is mentioned that water temperature is measured at 20 cm below water surface. Could the authors comment, whether this depth was used also in previous validation studies they are referring to (e.g. Kourzeneva 2014). Also, are there any difficulties in the validation when water is already frozen, but ice thickness is not reaching 20 cm?

2. Page 10, line 8: "with an area of 1 kmˆ-2" should be "with an area of 1 kmˆ2"

3. Page 13 line 14: "common to the majority of lakes" is a bit vague, "similar to the results averaged over all lakes" might more precise.

4. Page 15, line 9: "125 Wm-2": "-2" should be superscript as one line above.

5. Perhaps the authors could shortly comment, whether the bug revealed had any detectable impact on the forecasts of atmospheric variables (e.g. 2 m temperature) in the HIRLAM model in the six year period.

6. The use of in-situ observations is definitely of great value in the validation of lake surface state, however, when describing plans the authors might comment on the usability of satellite products as well.

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

2018.

C3