

Wintertime lakes in the weather models of Finnish Meteorological Institute

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Lakes influence the energy exchange between the surface and the atmosphere, the dynamics of the atmospheric boundary layer and the near-surface weather. This is important for weather forecasting over Fennoscandia where lakes with a large yearly variation of the water temperature, freezing in autumn and melting in spring, cover a significant area of the surface.

Description of the lake surface state influences the numerical weather prediction (NWP) results, in particular in the models whose resolution is high enough to account for even the smaller lakes. The operational MetCoOp HARMONIE-AROME NWP system (MEPS) includes a prognostic lake scheme, Freshwater Lake (FLake). FLake allows to predict the lake surface state in interaction with the atmospheric processes treated by the NWP model. The High Resolution Limited area model HIRLAM, operational at FMI 1990-2022, includes FLake since 2012. Comparison of the behaviour of the lake parametrizations in the two operational NWP models allows to understand the impact of model resolution and other factors.

We validate the MEPS forecast using in-situ LSWT measurements, lake freezing and melting dates and measurements of ice and snow thickness by the Finnish Environment Institute (Suomen Ympäristökeskus = SYKE). Special attention is paid to the influence of snow on lake ice on ice break-up in spring. Also, we compare MEPS forecast to satellite images over Lake Ladoga.