The Lake Model Intercomparison Project (LakeMIP) : overview of the project

Andrey Martynov (1), Stéphane Goyette (2), Victor Stepanenko (3), Marjorie Perroud (2), Xing Fang (4), Klaus Jöhnk (5), and Dmitry Mironov (6)

(1) Centre ESCER, Université du Québec à Montréal, 201 Av. du Président-Kennedy, H2X 3Y7, Montréal, Canada
(andrey.martynov@uqam.ca), (2) Climatic Change and Climate impacts, University of Geneva, Route de Drize 7, Carouge,
1227, Switzerland (stephane.goyette@unige.ch), (3) Moscow State University, Research Computing Center, Faculty of
Geography, Leninskie Gory, building 4, Moscow, GSP-1, 119991, Russia (vstepanenkomeister@gmail.com), (4) Auburn
University, Department of Civil Engineering, Auburn Alabama 36849-5337, USA (xing.fang@auburn.edu), (5)
Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Dept. Limnology of Stratified Waters, Alte Fischerhutte 2,
16775 Stechlin-Neuglobsow, Germany (k.joehnk@igb-berlin.de), (6) Deutscher Wetterdienst, Forschung und Entwicklung,
FE14; Frankfurter Str. 135, D-63067 Offenbach am Main, Germany (Dmitrii.Mironov@dwd.de)

The Lake Model Intercomparison Project (LakeMIP) is an international project initiated by participants of the workshop "Parameterization of Lakes in Numerical Weather Prediction and Climate Modelling" held in September 2008 in St. Petersburg (Zelenogorsk), Russia. LakeMIP offers an opportunity for a comprehensive evaluation and validation of many lake-model formulations and relevant physical parameterizations over a wide range of lake environments, and is expected to provide valuable information for further developments as well as guidance for their application within climate and NWP models. LakeMIP emphasizes on the crucial physical mechanisms and their parameterizations such as vertical turbulence mixing (both shear- and buoyancy-driven) in lakes, solar radiation absorption in the water column, heat exchange at the water-sediments interface, the effects of ice and snow cover, and others. Heat, moisture and momentum fluxes in the water-air interface are of particular interest, given their importance for the coupling with atmospheric models. A special attention in the project is paid at the computational efficiency of lake models, since there is significant limitation of computational resources for additional routines in climate and NWP models. Currently, seven one-dimensional lake models participate in the LakeMIP project.

The first phase of the project includes testing different lake-model formulations, using observed meteorological data to drive them in the context of off-line simulations (i.e. detached from atmospheric models). Lake model outputs (water temperature profiles, surface temperature, heat fluxes, ice thickness, etc.) are compared among them and with available observations revealing their capabilities and limitations. Lakes, representing different climate conditions and mixing regimes, were chosen for simulation in order to encompass the variety of hydrological and thermodynamic regimes. Two lakes have currently been taken into account: Sparkling Lake in Wisconsin, USA and Kossenblatter See in Germany. Other lakes are considered for further experiments, including Toolik Lake in Alaska, USA and Laurentian Great Lakes.

Further steps will consider surface parameterisation schemes for heat flux, momentum transfer as well as different representations for ice and snow cover. Atmospheric models, coupled with one-dimensional lake models as well as with 3D lake models will also be involved in LakeMIP.

This voluntary project is open to all researchers, interested in testing their lake models in standardized conditions and in comparing their performance with other models.