Supporting Information for

Improving lake ice modeling in ORCHIDEE-FLake model using MODIS albedo data

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Contents of this file

Introduction

These tables provide supplementary information for our paper that is presented in the main text. Table S1 summarizes the calibrated values of the albedo parameters for water, snow and ice in comparison to prior values. Table S2 presents the RMSEs (modeled vs observed albedos), obtained with the new parameterizations in comparison with the prior model. Table S3 presents the median values of the time errors (simulated vs observed) for the simulation of the ice-on, ice-off and duration of the lake ice cover.

Table S1. Lake surface albedo parameters used in ORCHIDEE. Prior values proposed in Bernus and Ottlé, 2022 and new calibrated values (this work) are given for free water, snow and ice cover.

Albedo	Water	Snow		Ice	
		Min	Max	Min	Max
Prior	0.07	0.77	0.87	0.3	0.5
Post	0.07	0.50	0.87	0.15	0.5

Table S2. RMSEs and improvement factors between MODIS albedo and simulations. Prior refers to the standard model, Post to the albedo revised one.

Lake	Erie	Huron	Michigan	Ontario	Superior
Prior Albedo RMSE	0.38	0.32	0.30	0.22	0.54
Post Albedo RMSE	0.17	0.08	0.05	0.06	0.16
Improvement factor	0.55	0.75	0.83	0.73	0.70

Table S3. Median values of the time errors (in days) simulated by ORCHIDEE-FLake for each lake category (shallow, medium and deep) in the simulation of ice-on, ice-off and duration of the lake ice cover. Prior refers to the standard model, Post to the albedo revised one.

Lake category	Ice-on errors (in days)		Ice-off errors (in days)		Duration errors (in days)	
	Prior	Post	Prior	Post	Prior	Post
Shallow	-7.0	-6.0	+14.9	+5.5	+21.2	+8.8
Medium	-6.6	-1.3	+14.2	+1.8	+20.9	+3
Deep	+4.8	+3.5	+25.7	+7.7	+23.7	+6.9