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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Simulations of future changes in thermal structure of Lake Erken: Proof of concept for ISIMIP2b lake sector local simulation strategy" *by* Ana I. Ayala et al.

Anonymous Referee #3

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General comments: The manuscript entitled "Simulations of future changes in thermal structure of Lake Erken: Proof of concept for ISIMIP2b lake sector local simulation strategy" showed the effects of different time-scale forcing data and 4 model forcing and also the 2 RCP future scenario on the simulation with GOTM lake model over Lake Erken. It projected the similar future changing trends of thermal conditions and is helpful for local to understand the effects of climate change and adapt it.

Specific comments:

The work focused on daily characteristics of future thermal contracture in Figure 4-6. The simulated future changing trends are mostly similar with hourly or daily forcing.

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But lots of work were done to compare the simulation results with different historical data which may be simplified or removed. Then the work could pay more attention to the future changing characteristics.

L244-246 “Rates of change in whole-lake temperature calculated for over the length for RCP2.6 and 6.0 scenarios were projected to 245 increase except in the case of GFDL-ESM2M which showed weaker or non-significant changes for all measures of thermal stratification.” did not match with Table 5.

Some parts were hardly understood, such as “For RCP 6.0, the projected rate of change ranged from 0.15 to 0.27 âĄřC decade-1 (0.11 to 0.19 âĄřC decade-1). IPSL-CM5A-LR projected the largest increase being 0.59 âĄřC (0.43 âĄřC) under RCP 2.6 âĄřC and 2.51 âĄřC (1.79 âĄřC) under RCP 6.0.”. And IPSL-CM5A-LR did not project the largest temperature increase under RCP 2.6 as showed in Table 5.

Because the lake model parameters are different for different forcing in Table 2. It’s hard to know the source of the simulation difference in Table 4 and to evaluate the effects of the time-scale of forcing.

L230 “From these average yearly values were calculated using the months between April and September, due to the fact that the GOTM model was not able to simulate lake ice and winter water temperatures at the same level of accuracy as during the remainder of the year”. Does the inaccurate simulation of lake temperature in winter affect the temperature simulation without ice? L68 “The lake is dimictive with summer stratification usually occurring beginning in May-June and ending in August-September, while ice cover occurs from December-February to April-May.” Why the average yearly values were calculated including April?

The manuscript was submitted in 2019. It’s confused to compare 2006-2099 with 1975-2005 to get the future change.

Does the lake model need downward longwave radiation drive? What’s the usage of

the cloud cover when there is the downward shortwave radiation?

Usually the simulation in the calibration period is better. Why temperature simulations in the validation period were more accurate in the manuscript?

L 110 “under four emission scenarios“ As shown in the manuscript, there were only 2 emission scenarios.

If the years for calibration and validation match the years for training and validating, it may be better.

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