Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2021-75

Shuqi Lin (Referee)

Referee comment on "Development of a coupled simulation framework representing the lake and river continuum of mass and energy (TCHOIR v1.0)" by Daisuke Tokuda et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2021-75-RC1, 2021

General comments:

This study involves tremendous data processing when coupling the river and lake dataset together before conducting the simulations. Could you provide a map or a chart to state the number of river and lakes in different groups you defined and how many systems among them have been processed specifically? I think it will be helpful for the readers to understand the whole dataset and reproduce the framework.

Specific comments:

2.1 Harmonization of geographical information

Did you basically implement the lake data from HydroLAKES and river data from MERIT Hydro?

I see a lot of preprocessing of lake and river geographical information in the second paragraph. Could you please provide a table or a chart to conclude the results of the preprocessing, like how many lakes are classified into the two groups, respectively, and how many inconsistencies are detected in two datasets and which dataset contained the largest upstream area you chosen in the end, etc.

Line 89: Could you provide the links of these dataset here?

3.2 Lake model

Line 166: Any reference of this 1D lake model?

Line 265: Should have a punctuation after the back bracket.

Line 298: How is the shortwave radiation weighted by the area of ice? Could you provide the equation here?

3.3 Implementation of coupling interface

Line 323: For how many river-lake systems in your study you have made the corrections? Are they the minor part of the whole dataset?

Why don't you leave off these particular systems to avoid the inaccuracy brought by the corrections?

4 Validation of harmonized geographical information

Table 1: Could you indicate these eight reservoirs in Fig 3 by different colors?

5.1 Simulation configuration

Line 384 - 385: Could you mention this information at the beginning of the paper (maybe in section 2?)

Line 407: Where are these initial values from?

5.2 Reference data

Line 444: You can get more vertical observations via https://www.glos.us/

5.3 River discharge at downstream areas of lakes

Figure 4: Could you please adjust the y-axis of (a) to integers?

5.5 Lake water surface elevation

Figure 9: It looks like the "lake-only" simulation simulated much higher water surface elevation than the reality and the "coupled" simulation. Are these results from 20-year spin-up time run? In line 503, you mentioned that is due to the imbalance between precipitation and evaporation. Because I see the increase rate of the elevation in the "lake-only" simulation was not quite sharp. Can you initiate the model with the observations and try the simulation with less spin-up time?

If the imbalance between precipitation and evaporation could induce such a big discrepancy, the upstream rivers must have a big backflows when you change to the "coupled" simulation.

5.7 Vertical profile of lake water temperature

Line 598: Can you manually correct the lake depth? Because, especially in the Great Lakes, the incorrect lake depth may induce a big error in the thermal structure.

Line 582: Have you validated the ice simulation in the Great Lakes during early spring? The assumption of ice thickness in this model may affect the temperature simulation in the Great Lakes.

7 sensitivity to meteorological forcing dataset

Is this section necessary in the main body of this manuscript if the different meteo forcing did not generate obvious discrepancy?

9 Conclusion

Line 672: Please list some metrics here to show how much the "coupled" simulation is better than "river-only" and "lake-only" simulations.

Technical corrections:

Figure 9: the unit of lake surface elevation should be (m) in the caption.