Response to Reviewer

General comments:

In my first review I identified major deficiencies of the paper as a set of methodological drawbacks and a lack of scientific novelty. Though, I still deem the paper does not deliver a significantly new knowledge to community, I admit that the authors considerably improved the manuscript and answered my comments carefully.

Response:

We appreciate the reviewer's recognition of our work in the revision of this manuscript.

Specific comments:

1. I recommend to avoid naming the stretching numerical grid by the term adaptive grid, as the latter is usually applied to meshes evolving in time.

Response:

Removed as suggested.

2. I realize now that I misunderstood the setup of background diffusivity in the original version of manuscript and that the authors indeed used Fang and Stefan (1996) formulation for background diffusivity. Note, however, that expression (9) of the manuscript originally includes the lake surface area, missing in the current text. Please also consider choosing the proper reference: formula (9) was first suggested by Hondzo and Stefan (1993), not in Fang and Stefan (1996).

Response:

We thank the reviewer for this reminder. We also noticed this equation should have included lake area. However, unlike the Minlake model developed by Riley and Stefan (1988), the WRF-Lake model does not take lake area into consideration. A similar issue exists in CLM4-LISSS, which adopted the values measured at an ice-covered lake (Fang and Stefan, 1996) for equation (9) by setting $\delta = 1.04 \times 10^{-8}$.

We adopted the same treatment as CLM4-LISSS but admit that this coefficient may vary from lake to lake (partially explained by lake area) and thus need to be tuned under specific scenarios. The text in the manuscript has been updated with the correct reference as suggested (see Page 10).

Reference:

Riley, M. J., and Stefan, H. G.: Minlake: A dynamic lake water quality simulation model, Ecological Modelling, 43(3), 155-182, 1988.

Fang, X., & Stefan, H. G.: Long-term lake water temperature and ice cover

simulations/measurements, Cold Regions Science & Technology, 24(3), 289-304, 1996.

Response to Editor

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1. Is it possible to archive the version of the code described in the manuscript, e.g. in a Zenodo repository?

Response:

We have archived the code associated with this manuscript in a Zenodo repository, which can be found at https://doi.org/10.5281/zenodo.2624892.

2. Is it possible to clarify the license under which the code is available?

Response:

We have chosen MIT as the license for the code and has clarified it in *Code and data availability* of the manuscript.

3. Please also ensure that data is deposited in an appropriate repository, as described in the Copernicus data policy.

Response:

The complete dataset for the year 2015 cannot be made public at present in order to comply with the confidentiality agreements between Tsinghua University and China Huaneng Group Co., Ltd. However, a one-week subset of the whole dataset can be accessed at https://doi.org/10.5281/zenodo.2624892. Also, the readers may have access to the whole dataset by emailing T. Sun (ting.sun@reading.ac.uk) with a specific request.

The following statement is added to the *Code and data availability* part of the manuscript:

The WRF-rLake source code (under MIT license) with a sample dataset can be accessed at https://doi.org/10.5281/zenodo.2624892. Instructions for running the offline model can also be found in README.md via the above link. The whole dataset used in this paper is available upon request to TS (ting.sun@reading.ac.uk).