Answer to Reviewer 1

In this study, the authors present a new open-access web-based platform with visualization and easy-access to simulations with the lake model Simstrat v2.1 for 54 lakes in Switzerland. The practical use of the platform is illustrated with two case studies, one to assess the effects of past climate change on the thermal structure of a lake, and second how short extreme events temporally affect the lake thermal structure. The presented platform is state-of-the-art but this might be stressed in the paper even more. Furthermore, the manuscript could benefit from some structural and textual changes, of which I included a list with suggestions under 'textual comments'. In general, the study can only be considered for publication if the comments specified here below are sufficiently addressed

We thank Reviewer 1 for his comments. We agree to stress more that the web-based one-dimensional hydrodynamic platform is state-of-the-art. This is now better stressed in the abstract, the introduction and the conclusion. We have also applied the structural and editing changes requested and thank the reviewer for this and took the opportunity of this review to extensively rework the manuscript.

General Comments

1. The main topic of the paper is to present the new online platform: I think this could be promoted even more throughout the paper:

a. The last paragraph of the introduction could be more elaborated. Also rewrite the sentence with 'with the intention of making our results openly accessible'. From what I understand, they are already open. More details could be provided on what is present on the platform. (In the introduction and/or in the results section, (P5 L13-15).

We have rewritten the last paragraph of the introduction. It now reads: "In this work, we present a new automated web-based platform to visualize and distribute the near real time (weakly) output of the one-dimensional hydrodynamic lake model Simstrat through an user-friendly web interface. The current version includes 54 Swiss lakes covering a wide range of characteristics from very small volume such as Inkwilersee (9 x 10^{-3} km^3) to very large systems such as Lake Geneva (89 km^3), over an altitudinal gradient (Lago Maggiore at from 193 m. a.s.l. to Daubensee at 2207 m. a.s.l.) and over all trophic states (14 euthrophic lakes, 10 mesotrophic lakes and 21 oligotrophic lakes, Appendix A). We focus here on describing the fully automated workflow, which simulates the thermal structure of the lakes and weekly updates the online platform (https://simstrat.eawag.ch) with metadata, plots and downloadable results. This state-of-the-art framework is not restricted to the currently selected lakes and can be applied to other systems or at global scale."

We have restructured the section 2.4 and the last paragraph was extended and moved to the beginning of the section. We also now provide more details on what is present on the platform

b. In the conclusion the main results of the two case studies as main advantages of the platform should be highlighted. I would also end the conclusion with a general statement about the platform.

We have modified the conclusion to better reflect the results from the case studies: “We demonstrated the benefit of the platform through two simple case studies. First, we showed that the high frequency modelled temperature data allows a complete assessment of the effect of climate change on the thermal structure of a lake. We specifically show the need to evaluate changes in all atmospheric forcing, in the watershed or through-flow heat energy and in light penetration to accurately assess the evolution of the lake thermal structure. Then we showed that the high frequency modelled data can be used to investigate special events such as wind storms, there in-situ measurements under current temporal resolution are failing. ”.

We have also added a more general statement regarding the platform at the end of the conclusion with the following sentences “By promoting a cross-exchange of expertise through openly sharing of in-situ and model data at high frequency, this open-access data platform is a new path forward for scientists and practitioners. ”

2. The manuscript could benefit from a slightly adjusted structure. Now, the results sections 3.1 and 3.2 describing the two case studies also include methodology and even literature review parts. Therefore I suggest to use a new structure as follows:

2. Methods

2.5. Case Studies

2.5.1. Long-term evolution of the thermal structure of lakes: Lake Biel Insert here paragraph 1 of page 6

2.5.2. Event based evolution of the lake thermal structure Add here first paragraph of page 7

We agreed that the case studies should be introduced in the method section. We have added a subsection 2.5 Case studies where we briefly present the 2 case studies.

Specific comments

1. In the abstract, it would be good to specify that the lakes on the platform are modeled with one lake model, Simstrat. Also the sentences could be rephrased more directly. Some examples are included in the textual comments.
   The model is indicated in the title and as website. We do not think it is necessary to repeat the information.

2. P3 L19: ‘an online platform’: be more specific on which online platform: the new platform you present in this study? (see also general comment)
   Changed to” update the simstrat.eawag.ch online data platform to display”

3. Figure 1: Please make the titles of the input and output boxes consistent. I suggest to only use ‘input’ and ‘output’ (so remove the ‘data’ in ‘input data’). Please apply the same consistency in the figure legend and caption.
   We have modified the figure and the caption accordingly

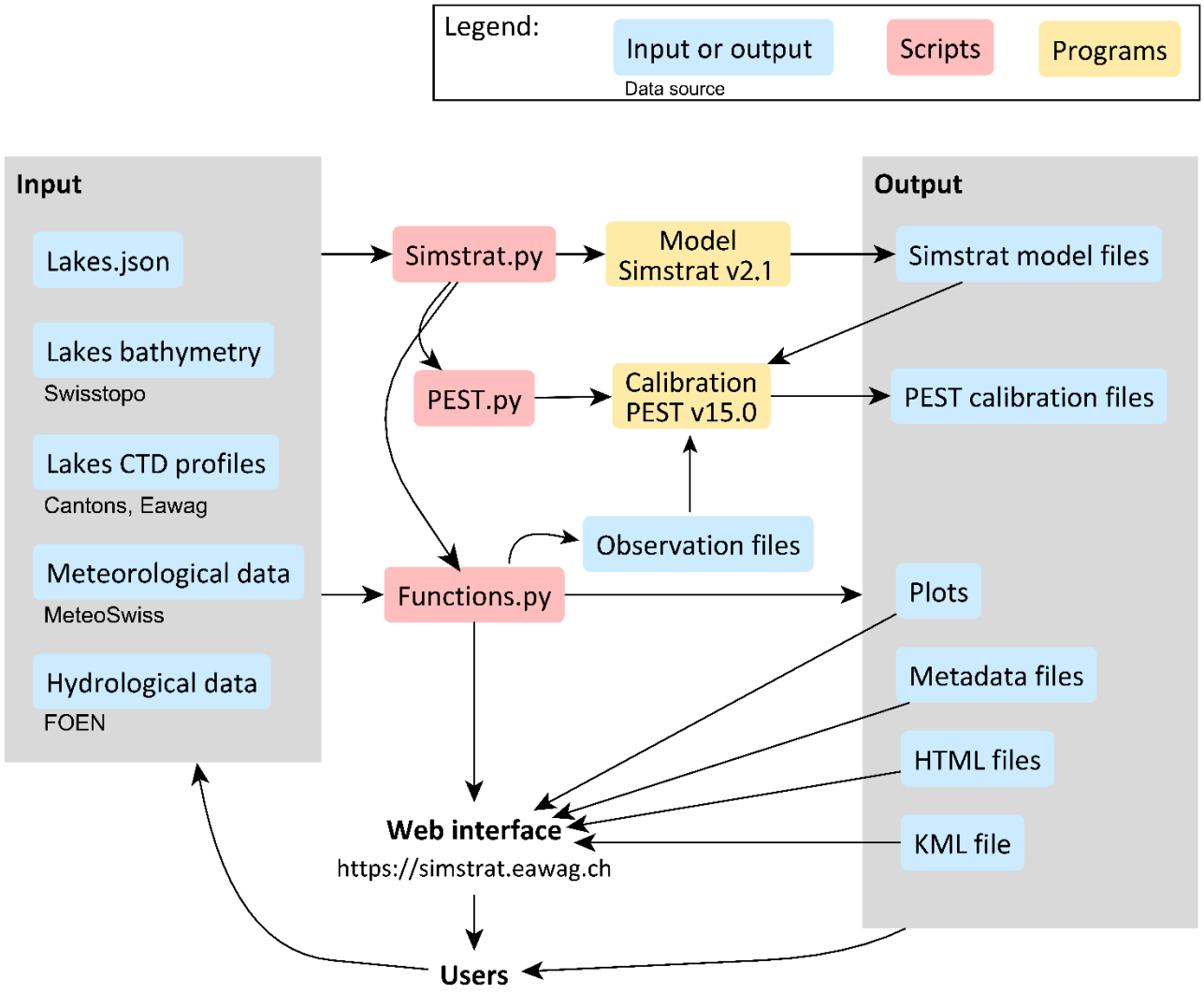

Figure 1. General workflow diagram. Model input (left box) is retrieved and processed by the Python script "Simstrat.py", which runs the model (Simstrat v2.1) and/or model calibration (using PEST v15.0) and produces output (right box). This output is then uploaded to a web interface (https://simstrat.eawag.ch) for general use. All scripts and programs are available on https://github.com/Eawag-AppliedSystemAnalysis/Simstrat/releases/tag/v2.1 and https://github.com/Eawag-AppliedSystemAnalysis/Simstrat-WorkflowModellingSwissLakes. Simstrat = one dimensional hydrodynamic model; CTD = Conductivity, Temperature, Depth profiler; PEST = Model independent parameter estimation and uncertainty analysis software; FOEN = Swiss Federal Office of Environment; MeteoSwiss = Swiss Federal Office of Meteorology and Climatology; Swisstopo = Swiss Federal Office of Topography

4. Figure 2: Please add color bar of lake temperatures and scale bar to figure. What is the green color on the figure representing? Please also add this in figure or figure caption.
   We now use the same color for each lake. The legend of the map is indicated as a link in the caption. We also now have indicated the locations of the 54 lakes.

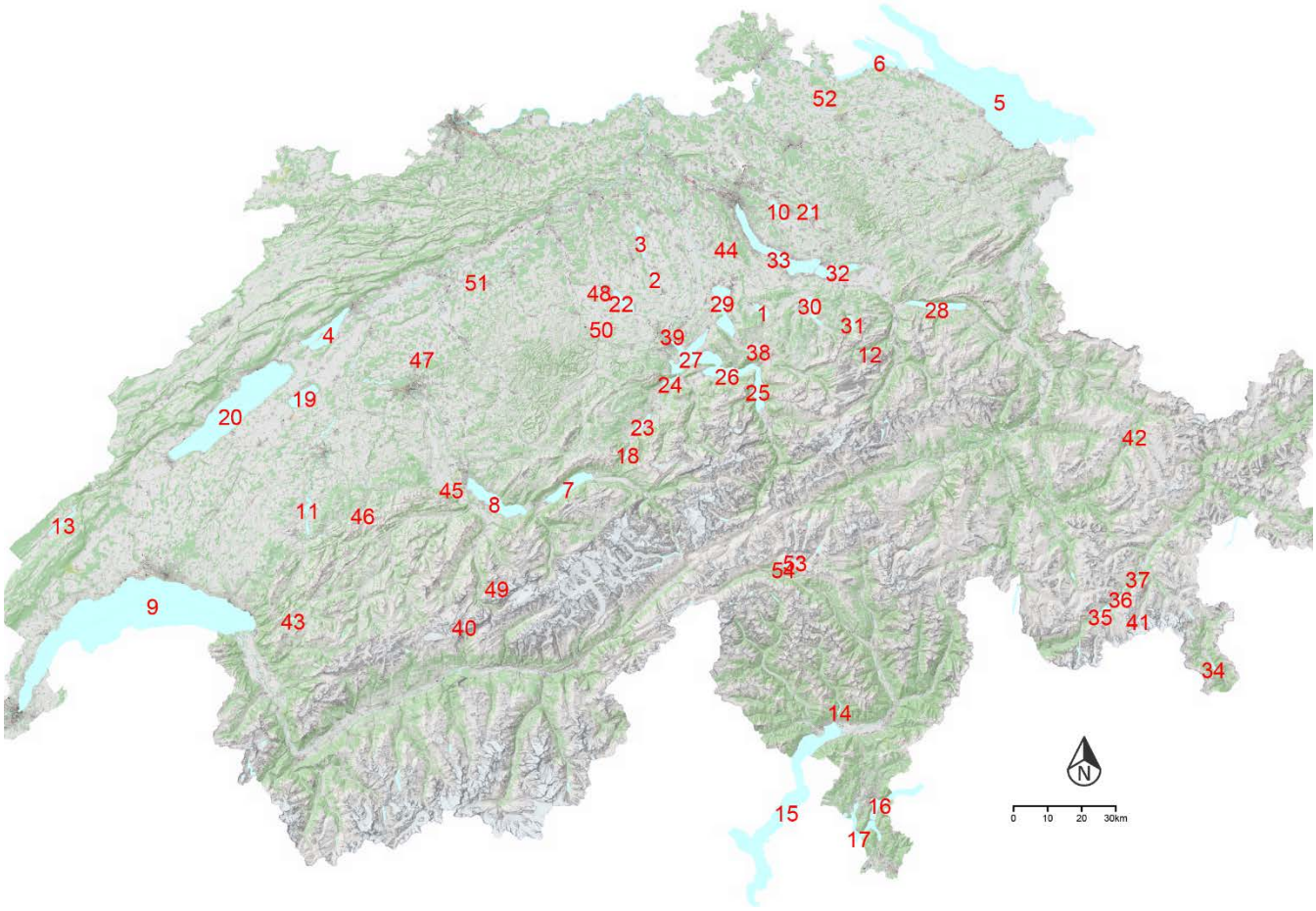

Figure 2. Illustration of the interactive map displayed on the homepage of the online platform: https://simstrat.eawag.ch. The location of the lakes discussed in this manuscript is also indicated with numbers (See Appendix A). Basemap is provided by Swisstopo and the specific legend can be found here https://api3.geo.admin.ch/static/images/legends/ch.swisstopo.swisstlm3d-karte-farbe_en_big.pdf

5. The authors state that 'inflows are disabled if no discharge or temperature data is available' (P4, L1). Is this the case for many lakes? Please identify the relevant lakes in Appendix table A and add the number in the text. Please also include a statement on the sensitivity of this methodological choice.

   We have modified the Appendix A to better indicate this. We also added the theoretical residence time when data are available. In all low altitude lakes, lakes where the discharge is not accounted for are lakes with very weak inflows/outflows and large retention time. The influence on the thermal structure is therefore minimal. The problem is potentially larger for small high altitude lakes and should be further investigated in the future. Missing inflows and more generally watershed data is a source of error in small alpine lakes, yet, such error can be compensated during the calibration process. We have modified the text accordingly: "The aggregated discharge is the sum of the discharge of all inflows, and the aggregated temperature is the weighted average of the inflows for which temperature is measured. Inflow data are often missing for small or high altitude lakes (Appendix A). Missing inflows and more

generally watershed data is a source of error in small alpine lakes, yet, such error can be compensated during the calibration process."

6. P4 L2-5 and Appendix table A: please also indicate in the table for which lakes the Secchi depth measurements are available. Please also add a column with the lake tropic status, or provide the methodology of the classification in this paragraph.
   We have added a new column regarding the trophic state and explicitly indicated the lakes with observed secchi depth information

7. For the story continuation it is better to switch the third and second paragraph of P4. Like this, it makes more sense to first describe the timeframes and then how data gaps are treated. Please also take care of the transition in the data-gap paragraph.
   We have reversed and then merged and finally slightly extended the paragraph:
   "The timeframe of the model is determined by the availability of the meteorological data (air temperature, solar radiation, humidity, wind, precipitation). Initial conditions for temperature and salinity are set using conductivity-temperature-depth (CTD) profiles or using the temperature information from the closest lake. We apply different data patching methods to remove data gaps from the forcing depending on the length of the data gap. For small data gaps with duration not exceeding one day, the dataset is linearly interpolated. In total < 1 % of the dataset is corrected using this approach. Longer data gaps of up to 20 days are replaced by the long-term average values for the corresponding day of the year. Only ~ 1.5 % of the dataset is corrected using this approach"

8. P4 L13-14: It is not clear to where the observations from the CTD profiles comes from. Please add the data source.
   All the data source are provided as a link to the online platform in the acknowledgment

9. P4 L17: please add more details on how the parameters for calibration were selected, at least include a reference of the previous sensitivity analysis.
   We added the following text to the Calibration section
   "Model parameters are set to standard default values, and four of them are calibrated (see Table 2). The parameters p_radin and and f_wind scale the incoming long-wave radiation and the wind speed, respectively, and can be used to compensate for systematic differences between the meteorological conditions on the lake and at the closest meteo station. The parameter a_seiche determines the fraction of wind energy that feeds the internal seiches. This parameter is lake-specific, as it depends on the lake's morphology and it's exposition to different wind directions. Finally, the parameter p_albedo scales the albedo of ice and snow applied to incoming shortwave radiation, which depends on the ice/snow cover properties and is unknown for the individual lakes. The calibration parameters were selected according to their importance for the model (e.g. based on previous sensitivity analysis), and their number was deliberately kept small in order to keep the calibration process simple and focused. Calibration is

performed using PEST v15.0 (see http://pesthomepage.org), a model-independent parameter estimation software (Doherty, 2016)."

10. P4 L21: 'unless significant changes are made to either the model, forcing data or observational data'. In when is this the case? Please add more textual details on this.
    We added the following information to the text: "e.g. release of a new version of Simstrat or delivery of a large amount of new observational data"

11. P4 L26: Please add the source of lake volume, temperature and densities.
    Lake volume are extracted from Swisstopo the Swiss Federal Office of Topography,
    In situ observations comes from cantonal agencies or organisation such CIPEL (for Lake Geneva). They are indicated in the acknowledgment and fully listed on the web-based platform

12. P5 L25-27: I would elaborate this paragraph, and discuss also the correlation coefficient showed in figure 3. Please also list the six lakes not shown in the figure caption.
    The six lakes with too large RMSE are now indicated with the symbol "°" in Figure 3.

    We also discussed slightly more the model performance shown on Figure 3:
    "The correlation coefficient remains always higher than 0.93 suggesting also that the model successfully reproduce the thermal structure of the investigated lakes. Overall, the quality of the results is better for lowland lakes than for high altitude lakes where local meteorological and watershed information are often missing."

13. P5 L27: Please add more info to the study of Bruce et al., 2018: is it a global lake modelling study? Do they incorporate lakes in Switzerland as well?
    We have modified the text and added the following information: "This is comparable to the RMSE range of ~0.7-2.1 °C reported in a recent global 32-lake modelling study using GLM (Bruce et al., 2018) also including Lake Geneva, Lake Constance and Lake Zurich."

14. P6 L26-31: On line 26 there is indicated that a 'similar analysis' is done for all modelled lakes, however, only an inter-comparison of winter and summer stratification is showed and discussed, while in the case study for Lake Brienz, the trends in stratifications are investigated. Please rewrite the text to be consistent with the figures showed. Please add also more information on the possible implications of the delay of melt water runoff. Also, in the caption figure 6, there is no information on winter stratification, but on ice cover. Please update the text so that it is consistent with the information on the figure.
    We agree with the Reviewer that we actually do not show the same analysis for all modelled lakes. This analysis cannot be summarized in 1 page in this manuscript and we have reformulated this statement accordingly. We also have modified the text regarding ice coverage and not inverse stratification as previously written. Note also that Figure 6 is now Figure 5. We removed the previous Figure 5 that was not necessary for this manuscript. The modified text related to this change is:

"Such analyses can be extended to all modelled lakes. An inter-comparison of the temporal extent of summer stratification and winter ice cover period is illustrated in Figure 5."

15. Figure 7: Please remove X and Y labels, and add 'in Schmidt stability' to 'Delay/ Recovery time' colorbar caption.
    Modified