Answer to Reviewer 2

General comments:

Gaudard et al. presents a web-based platform for visualization and promotion of lake model outputs that are openly accessible to the general public. The web-based platform currently includes 54 lakes in Switzerland, and it could be useful in synthesizing lake model outputs in other geographical regions.

We thank Reviewer 2 for his comments

Specific comments:

Pg1, L13-14: and appropriate model, unless the authors have validated Simstrat v2.1

Simstrat v2.1 is validated for mid latitudes lakes and previous version were used in tropical lakes. We believe that this model can be used at global scale

Pg2, L24: please replace 'It' with a real subject (e.g., model output data) to avoid potential interpretation confusion for this sentence.

The sentence has been modified:

"Yet, model output data should not only be seen as a tool for temporal interpolation of measurements. Models also provide data of hard to measure quantities which are helpful for specific analyses (e.g., the heat content change to assess impact of climate change, or the vertical diffusivity to estimate vertical turbulent transport). Models finally support the interpretation of biogeochemical processes which often depend on the thermal stratification, mixing and temperature"

Pg2, L26-27: 'and it can support the interpretation of biogeochemical observations, if the relevant processes are driven by thermal stratification and mixing'. This is confusing- does it mean models cannot support the interpretation of biogeochemical observations if the relevant processes are NOT driven by thermal stratification and mixing?

Our model is a physical model for temperature, stratification and mixing in lakes. It is therefore correct that it can only help interpreting biogeochemical processes, if they are influenced by the physical processes. However, most biogeochemical processes in lakes are to some extent influenced by stratification, mixing and/or temperature. To clarify this, we modified the sentence to:

"Models finally support the interpretation of biogeochemical processes which often depend on the thermal stratification, mixing and temperature".

Pg3, L26-27: please replace 'adiabatic vertical rate' with the commonly used 'adiabatic lapse rate'. What are the ranges of altitude difference between the lakes and the meteorological stations? Adiabatic lapse rate is not necessarily -6.5 C/km, so such assumption could result significant errors when the altitude difference is large.

We have modified the sentence and have added a table indicating the altitude and coordinate of all meteorological stations used in this study. The difference is typically

O(10m) for low land lakes but this difference is indeed large for high alpine lakes like Lake Ritom and Lake Cadagno (~1000 m of altitude difference compared to the meteorological station), Daubensee (~ 800 m of altitude difference). We now indicate in the manuscript that meteorological station near high altitude lakes would be needed. “This correction is a source of error in high altitude lakes like Daubensee for which dedicated meteorological station would be needed.”

Pg4, L3-5: any reference that supports the light absorption coefficient parameterization described here?

We refrain to refer to all papers providing secchi disk information on a Swiss lake. We used one already cited reference (Schwefel et al. 2016)

Pg4, L8-10: what’s the gap size for the ‘highly seasonal variables’? How large is the inter annual variability for the ‘highly seasonal variables’, based on available measurements?

We have rewritten the paragraph as follow: “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.”

Pg5, L7: how do the authors determine the existence of ice? Is it measured or modeled?

The existence of ice is modeled. The model presented in Appendix B has been calibrated for Swiss lakes based on in situ observation of ice cover.

Pg5, L25: what is the model validation period for RMSE? Is it the model timeframe listed in appendix A?

Indeed. We have decided to use the entire time series and do not split between a calibration and a validation period. This could be done for the lakes having long time series of observations but reduce the accuracy of the calibrated parameters for shorter time series of observations

Pg 5, L 26: how large were the overestimations in the 6 lakes with RMSE > 2C?

We have modified the sentence as follow: “Out of the 46 calibrated lakes, the post-calibration root mean square error (RMSE) is < 1 °C for 17 lakes, between 1 and 1.5 °C for 15 lakes, between 1.5 and 2 °C for 8 lakes and between 2 °C and 3°C for 6 lakes (Figure 3), calibration data was not sufficient for 8 lakes in which we used standard settings.”

Pg 6, L9: is the 'surface temperature' air temperature at the surface or lake surface temperature? Could the authors plot measured air temperature in Figure 4a?

We thank the reviewer for this comment that helped to rethink the Figure 4. We now also indicated other temperatures such as air temperature, total lake temperature and tributaries temperature. We show that the lake surface temperature (not the entire lake) is warming at a faster rate than the air temperature and discuss this in section 3.1.

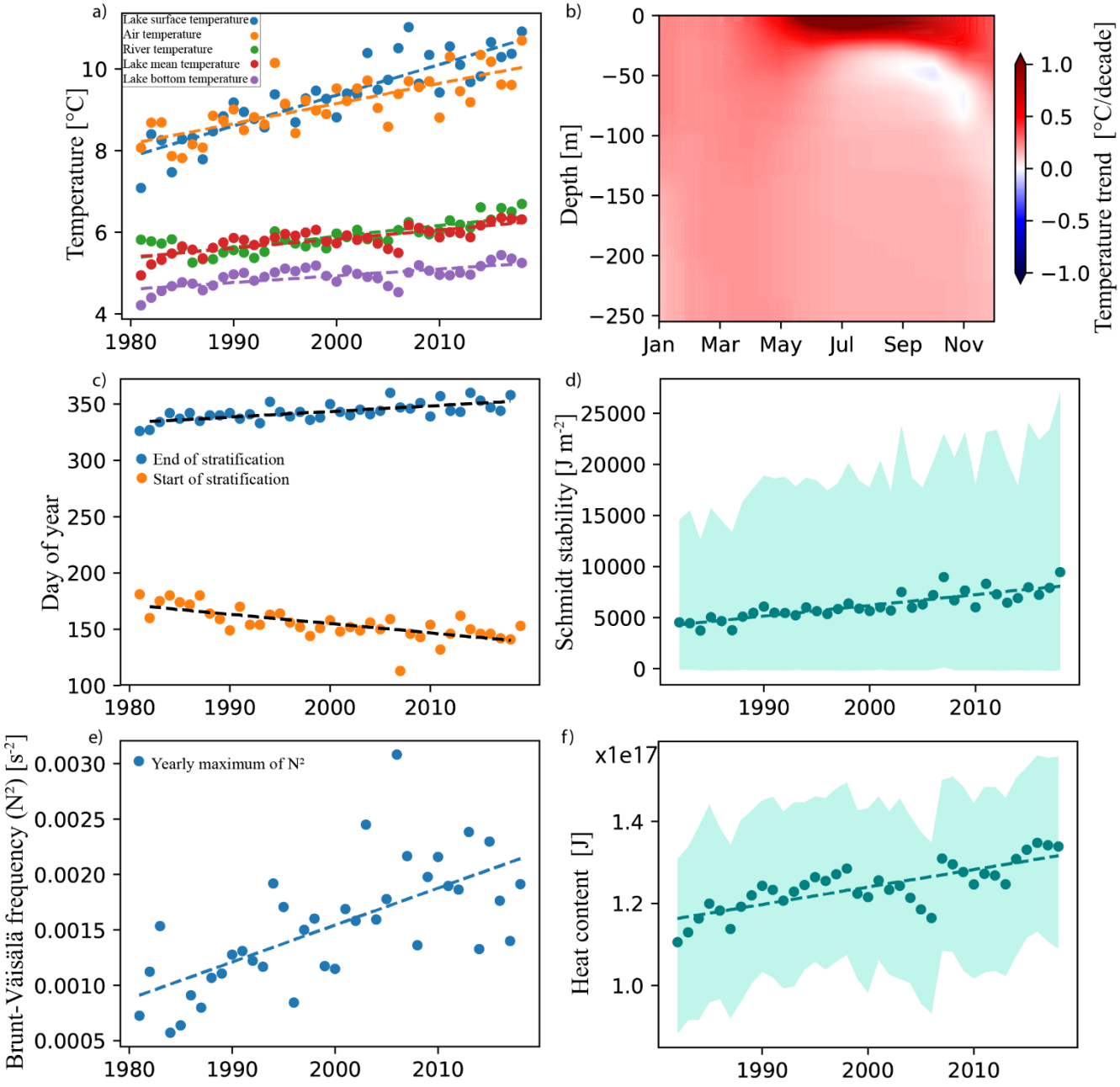

Figure 4. Evolution of several indicators for Lake Brienz over the period 1981-2018; all linear regression have p_values << 0.001: (a) yearly mean lake surface temperature (0.74 °C/decade), yearly mean air temperatures (0.50 °C/decade), yearly mean tributary temperatures (0.26 °C/decade), yearly mean lake temperatures (0.22 °C/decade) and yearly mean bottom temperatures (0.16 °C/decade), with linear regression, (b) contour plot of the linear temperature trend through depth and month, (c) yearly start (+3.7 days/decade) and end (-7.5 days/decade) day of summer stratification, with linear regression, (d) yearly mean (line), min and max (shaded area) Schmidt stability, with linear regression, (e) yearly maximum Brunt-Väisälä frequency ($3.3x10^{-4}$ $1/s^2$/decade), with linear regression (f) yearly mean (line), min and max (shaded area) heat content.

Pg 6, L20: Figures 4e and 4e

Modified

Discussion paper P12, Fig1: please provide the full names of each abbreviation, e.g., what are Swisstopo, CTD, FOEN? Some abbreviations are defined in the main text (but scattering around), and it would be very helpful to list them in the figure caption. Also, observation files should be listed as an intermedium product instead of an output.

We have modified Figure 1 as well as the caption