Reviewer 2

We would like to thank the Reviewer for the general positive opinion about our manuscript as well as very constructive comments and suggestions. In the following we response to all of the comments (in bold italics).

General comments:

1. ***Overall, I think the organization of sections 3 and 4 could be streamlined / redone a bit so they make more sense. The previous reviewer commented about combining 3.3 and 3.4, which could be a good start. But more broadly, I would make it very clear (and potentially group sections) based on how the data were collected (continuous instrumentation vs. discrete sampling) and/or the purpose of the data. Section 4 is organized into 1) water column data, 2) hydrochemistry data, and 3) modern sedimentation. Am I confused, or is the hydrochemistry data actually also water column data (that were collected from 40 m and 1 m, rather than every 10 m)? Perhaps Section4 should be divided into a broader section of water related data, and another about sediment, with subsections as appropriate (i.e., for continuous vs discrete measurements, and/or for water properties vs hydrochemistry). Section 3 could follow the same general outline, so that it's easier for the reader to track the datasets presented as continuously measured vs sampled in the field (I found myself getting a little confused about this with the switching back and forth and different organization patterns in the different sections). The word "limnology" is used in the metadata to describe a subset of the water column data that are not hydrochemical; maybe this is a good framing to use in the paper organization, too.***
   We changed the structure of sections 3 and 4 according to the suggestions of both reviewers. Now, section 3. Methods is divided into 3.1 Strategy for long-term monitoring, 3.2 Water column measurements and sampling (this section incorporates 3.2, 3.3 and 3.4 from the previous version), 3.3 Sediment trap sampling and analysis, and 3.4 Ice cover data. Section 4 Results is now divided into 4.1 Water column data time series and 4.2 Modern sedimentation.
   In this way we simplified the structure and made sections 3 and 4 more comparable. Methods section 3.2 corresponds to results section 4.1 while section 3.3 corresponds to section 4.2. We do hope that the structure of new version is more logical and in line with the expectations of the reviewers.
2. ***In the introduction, the authors state that their results are relevant for modeling studies, and I think they're right. Though I realize this is not the main focus of the paper, I think the conclusion section would be strengthened with a brief discussion of the presented datasets and some more pointed recommendations for how they could be used in future limnological and modeling studies.***
   Thank you for this comment. We specified two potential directions of further use of our data: (i) modeling changes in lake water mixing regime and their ecological consequences, and (ii) investigations on the impact of climate warming on sedimentation processes in lakes. Now, this section reads as:

   We present a decade-long and multi-parameter dataset with high temporal resolution for a typical eutrophic temperate lake system. Combined with available meteorological data, the dataset presented here can potentially be essential for modeling physical and

biogeochemical processes in lakes. By incorporating long-term monitoring data into models, we can improve our ability to make accurate predictions about future lake dynamics. This is particularly important due to ongoing climate change and human impact on lake ecosystems. Lake Żabińskie seems to be an extremely interesting object for studying the impact of increasing air temperature and decreasing seasonality (mild winters) on the lake water mixing regime. This, in turn, has a huge impact on the oxygen conditions in the lake along with changes in the nutrient cycling, and serious ecological consequences, e.g. massive blooms of harmful cyanobacteria species. Modeling these processes based on data from Lake Żabińskie may have a more universal application in relation to small and deep lakes of the European Lowland. Part of this dataset has already been used to investigate the links between meteorological and limnological conditions and their influence on biochemical varve formation in Lake Żabińskie, showing a great potential in reconstructing paleoenvironmental conditions. However, there are still open questions related to preservation of sub-seasonal meteorological events in the sediment records, which can be further translated to climatic signal over the longer time scales. Therefore, this unique dataset will be valuable for inter-site comparison of sediment fluxes variability and their relations to meteorological conditions, which may provide important regional or global context.

Specific comments:

L27-32: these statements follow a phrase about varves, specifically, and I think one of the main applications of these data is to understand what controls annual laminations, so it's a bit confusing that you then broaden out here to speak about lake sediments in general. Maybe rephrase or refine.

We specified that the whole paragraph is about varves by changing "lake sediments" with "varved lake sediments" as well as "sediment records" with "varved sediment records".

L49-50: "lakes of temperate climate zones"

Corrected.

L51: "allow us to assess"

This statement has more general meaning and is not related strictly to our work. Therefore, we prefer not to change this fragment.

L95: how did these initial observations differ from "regular" ones?

We performed first measurements during coring campaign in September 2011. However, we were not ready at that time to start the monitoring with monthly resolution and full range of parameters due to lack of equipment. Organization of field and lab infrastructure took some time, thus comparable data in terms of measurement techniques and range of parameters are available from 2012. Also, we are not sure about the quality of all results from 2011 because of technical issues. Therefore, we decided to present the measurements from 2012.

L104-105: link to dataset

Done.

L122-123: I don't know what this means "daily mean values computed during the incremental database maintenance were recovered and used to fill the daily time series." What is the "incremental database maintenance"? Do you mean during the regularly

scheduled field sampling? Or something else? Either way, specify when / how often this occurred.
We clarified and rewritten this part. This reads now as:
Due to hard drive failure and corruption of raw files with data from the logger installed at a depth of 1 m, no raw data is available from 2017.11.04 to 2019.01.30. However, we update our logger database and calculate daily means every time new data is acquired, which happens roughly once a year. We were able then to restore this lower-resolution data and use it to fill the gap.

Section 3.4: how often were water samples collected?
Water samples were collected with monthly or biweekly intervals at the same dates as limnological measurements. We added an explanation in the text.

Section 3.6: more detail needed in the metadata; can you document how you acquired these data in each year presented, given the different methods outlined in this section? Can you give an estimate for the certainty/confidence somehow?
Thank you for this comment. Indeed, the process of ice cover formation and breakup take some time. It is very difficult to precisely indicate the beginning of the process without continuous (daily) monitoring of the lake surface. Also the end of the process is not easy to determine because remnants of ice cover can survive longer in specific locations, e.g. in the littoral zone overgrown with reeds. Since we rely mainly on observations of local citizens, the dates we present in the manuscript should be interpreted as follows: (i) the date of ice breakup is the first day with central part of the lake completely free of ice (but discontinuous ice cover still possible in the littoral zone), (ii) the date of ice cover formation is the first day with the whole central part of the lake covered with ice. We also used Landsat and Sentinel satellite imagery datasets to confirm the presence or absence of ice cover but due to cloud cover it was often not useful. We added an explanation to the metadata file as suggested by Reviewer 1 as well.

L175: "physiochemical"
Corrected.

Like the other reviewer, I did not find it immediately intuitive to use the links provided to access the meteorological data. Could this be made more seamless, and/or provided directly in the metadata?
Source of meteorological data is independent of our research and we cannot provide the files. However, in the section "Data availability" we provided wider explanation with a reference to a paper which explains how to retrieve data for specific meteorological station from the IMWM-NIR database. This part now reads:
„Long-term, daily meteorological data from the meteorological stations in Kętrzyn (approx. 40 km west of the lake; ID 12185) or in Mikołajki (approx. 50 km southwest of the lake; ID 12280) are publicly available from the Institute of Meteorology and Water Management – National Research Institute (https://danepubliczne.imgw.pl/). However, because of complicated manual data access procedure we suggest using the provided Application Programming Interface (API), for example using R "climate" package (Czernecki et al., 2020) and provided station IDs."
Czernecki, B.; Głogowski, A.; Nowosad, J. Climate: An R Package to Access Free In-Situ Meteorological and Hydrological Datasets for Environmental Assessment. Sustainability 2020, 12, 394. https://doi.org/10.3390/su12010394.

Figures 3, 4, and 6: are these annual averages, or for a particular season?
Figure 3 - the red line represents mean daily values as explained in the figure caption.
Figure 4 – this figure presents the results from 130 measurement series (field campaigns in monthly or biweekly intervals). Each series consist of several parameters (water temperature, dissolved oxygen concentration, pH, specific conductivity, and chlorophyll-a concentration) in the water depth range of 0–40 m with 1 m intervals.
Figure 6 – this figure presents the daily fluxes, i.e., mass accumulation rates (MAR, g m−2 day−1) calculated for 93 samples collected from the sediment trap. Also values of TOC and TIC come form elemental analysis of the 93 sediment samples.

Figure 3: this is Hobo data, correct?
Yes, this dataset comes from measurements done with HOBO thermistors. We added this information to the figure caption.

Figure 4: can you specify which data were collected by continuous instrumentation vs. discrete measurements, and what we're seeing here?
This figure presents the results from 130 measurement series (field campaigns in monthly or biweekly intervals). Therefore, these are discrete measurements in contrast to Figure 3 where continuous thermistor datasets are presented.

Figure 5: what time period (in years) is this representing?
This figure presents data for the entire monitoring period (2012-2021). We added this information to the figure caption.

In the metadata, I think you need to specify somewhere what the IDs of the tributaries (O1, I1, etc.) correspond to. I realize this is somewhat done in figure 1, but these should have easily retrievable and identifiable coordinates that correspond to a title like "outflow 1" and then the abbreviation.
We modified the metadata file. This reads now as:

- in_out (stream id): I* – inflow, O* – outflow; character:
    - I1: major inflow from Lake Purwin (54.13590731° N; 21.98398011° E)
    - I2: episodic inflow from the direct catchment (54.13160649° N; 21.98812808° E),
    - I3: major inflow from Żabinka village (54.12980987° N; 21.98246778° E),
    - O1: major outflow to Lake Gołdopiwo (54.13060358° N; 21.97381504° E).

Also, in the "homogenized" temperature data, it's not clear to me what "series" and "period" refer to, and I don't think it's defined in the metadata (sorry if I missed that).
We have rewritten this metadata information as follows:
Series: one data series means that data logger operated continuously without any interruptions from the beginning of logging to the data offload.
Period: one period encompasses one or more series. Continued period means, that the end of one series is followed immediately by the beginning of the next series. Change from series to series means that only short logger offload time is introduced into the data. Continued period allows uninterrupted data homogenization procedure. Change in the period variable means that the next series did not follow preceding one immediately and requires reset of the homogenization procedure.