Reply: We thank reviewer #1 for the valuable comments and suggestions on improving the manuscript. We have carefully followed the reviewer's suggestions revising our manuscript (see detailed responses below). We hope our response and the revised manuscript can be a satisfaction for the reviewer. FYI, we quoted line numbers regarding to the preprint manuscript online, and the revision will be updated once the reviewing process was completed.

General comments

This paper tried to use n-alkane proxies to reconstruct the contribution of different sources to sedimentary OM, which is significant for studying carbon cycling and carbon burial in lakes. The results from these proxies are generally credible and consistent with the current lake ecosystem systems and the natural background of the lake. This paper was well organized and written. I mainly suggested a further comparison of the results with those deduced from gross OM proxies (mainly gross OM carbon isotope).

Reply: Compared to *n*-alkanes, the gross OC can be more easily modified by degradation process during and after deposition (Mazeas et al., 2002; Jaffé et al., 2001). In this sense, the carbon isotope of gross OM might not be as indicative as the compound specific $\delta^{13}C$ values of *n*-alkanes (Ahad et al., 2011; Hyun et al., 2017). Comparison of $\delta^{13}C$ values between gross OM and *n*-alkanes would make another story of selective degradation of certain biomass or certain compounds, which is beyond the discussion of this paper focusing on the original sources for the organic carbon before degradation. Thus, we decided not to discuss gross OM carbon isotope in this manuscript and hope the reviewer can understand that.

Major changes

Line 30, the shallow lakes are generally defined as the mixing depth is larger than the maximal depth.

Reply: Accepted and revised this sentence (lines 31-32) as follows:

"Shallow lakes (mixing depth exceeding the maximum depth, Qin et al., 2020), accounting for the largest area of lakes globally (Downing et al. 2006; Verpoorter et al., 2014)."

Line 45, will phytoplankton contribute to the in situ productivity?

Reply: Yes, but phytoplankton only contribute a few to the total *in-situ* productivity. According to studies from Yu et al. (2007) and Ni et al. (2022), as well as our field investigations in recent years, Lake Wuliangsu is mainly covered by emergent plants (e.g., *Phragmites australis* and *Typha latifolia*) and submerged macrophytes (e.g., *Potamogeton pectinatus* and *Myriophyllum* spicatum). The amount of phytoplankton is relatively much lower. We have mentioned this situation in the manuscript (lines 63-64):

"Alternatively, the amount of phytoplankton is relatively lower compared to the widespread emergent plants and submerged macrophytes (Ni et al., 2022)."

Line 50, Zhu et al., 2018, Li et al., 2019, He et al., 2023. These are not original references about the function and carbon cycling associated with submerged macrophytes, please also adding the initial references

Reply: Accepted and references that are more appropriate were cited here in the revised version:

"The stems and leaves of submerged macrophytes can adsorb heavy metals from water, and fix

pollutants through their roots to improve the quality of lake water bodies (Gumbricht et al., 1993). Also, the outspread of submerged macrophytes would increase the carbon dioxide (CO_2) and methane (CH_4) release through the methanogenic decomposition of plant exudations and debris (Watanabe et al., 1999; Emilson et al., 2018; Waldo et al., 2019).”

Line 120 figure 1b should be added after the description of the aquatic macrophytes.

Reply: Accepted and detailed description was added as follows:

“The submerged macrophytes including Potamogeton pectinatus, Myriophyllum spicatum, and Potamogeton crispus, and emergent plants including Phragmites australis, Typha latifolia. The dominant species are Phragmites australis for emergent vegetation and Potamogeton pectinatus for submerged macrophytes (Duan et al., 2007; Qing et al., 2020, Figure.1b).”

Line 120 all the species of submerged/emergent macrophytes and their relative proportions should be provided.

Reply: Accepted and added. Also, please see our reply above.

Line 130, why these two types of macrophytes are selected as representations?

Reply: These two types of macrophytes are the dominant species and thus were selected as representations. There are of course uncertainties regarding to the contributions to *n*-alkanes from other types of macrophytes. However, the uncertainties should be neglectable considering that 1) most macrophytes share similar n-alkane distribution pattern and carbon isotopic values, and 2) two types of macrophytes are the dominant species in the specific case of Lake Wuliangsu.

Line 155, please give references for calculating CPI and P_{aq}, even the detailed method was given in supplementary material.

Reply: We have included the references as follows:

“n-Alkane-based P_{aq} (proportion of aquatic plants, Ficken et al., 2000) and CPI (carbon preference index, Eglinton and Hamilton, 1967) proxies were calculated using the following equations provided in the Supplementary Material.”

Line 175, the data 33.73% and 37.08% are from? or why you can get these data?

Reply: Sorry for the mistakes. These values are the results from the samples of submerged macrophytes and emergent plants measured by us. We actually have described the samples and method in preprint manuscript in section 2.2 (lines 130-131) and 2.3 (lines 142-145). We revised this sentence as follows, to avoid this potential misunderstanding:

“Relatively higher TOC values in the lake sediments than those in the lakeshore and riverine sediments suggest an additional supply of autochthonous materials of higher TOC values (33.73% and 37.08% for submerged macrophytes and emergent plants, see Supplementary Table S1).”

Line 190, this conclusion should be further evaluated as the *n*-alkanes might be selectively enriched relative to other OM fraction, resulting in a higher abundance in sediments than in biomass

Reply: Considering the uncertainty of *n*-alkanes (analytical uncertainty for concentrations of *n*-alkanes would be less than 5%, see lines 157-158), *n*-alkanes in sample S3 (137.05 μg/g) are similar with or very close to submerged macrophytes (132.75 μg/g). Therefore, we don’t think there would be selectively enriched *n*-alkanes relative to other OM fraction. The similar *n*-alkane concentrations between sample S3 and submerged macrophytes indeed indicate a predominant contribution by submerged macrophytes to this sample.

Why the abundances of short-chain *n*-alkanes were not considered in section 3.2?

Reply: The short-chain *n*-alkanes are not source-oriented (a mixture from algae, submerged macrophytes and terrestrial OC input, Aichner et al., 2010; Liu and Liu, 2016). Therefore, short-chain *n*-alkanes are not the main object of this manuscript. Moreover, the concentrations of the short-chain *n*-alkanes are much lower than mid- and long-chain ones (average values of 3.09 μg/g *vs*. 20.15 μg/g for lake and lakeshore sediments). Even results of these compounds are included, conclusion will not be changed. Therefore, we decided not to include them in section 3.2.

Line 205, our previous works reported the *n*-alkane distribution in surface sediments from 30 lakes in middle and lower Yangtze River basin (Environmental Science and Pollution Research 26, 22472-22484, 2019; Organic Geochemistry 122, 29-40, 2018), you can make a comparison with your work

Reply: We have carefully read these papers recommended, and found out that these papers further support our results. Thank you for that! We have cited literatures here as follows:

"Such n-alkane distribution patterns are similar to aquatic plants collected from lakes in Qinghai-Tibet Plateau (Aichner et al., 2010; Liu et al., 2015; Liu and Liu, 2016) and middle and lower Yangtze River basin (Zhang et al., 2018, 2019; Yu et al., 2021)."

Line 235, the first sentence in section 3.4 indicated the isotopic compositions of *n*-alkanes in aquatic macrophytes or sediments?

Reply: They are for all samples including aquatic macrophytes and sediments. We revised this sentence to clarify this issue:

"The $\delta^{13}C$ values of mid- and long-chain odd n-alkanes of all samples (n-C_{23}, n-C_{25}, n-C_{27}, n-C_{29}, and n-C_{31}) ranged from –36.6‰ to –24.1‰."

Line 250, the figure caption indicating sediment samples, but it seems the figure contained macrophyte samples.

Reply: Accepted and revised the caption to:

"Bar plots and corresponding line graphs showing the distribution of the mid- and long-chain n-alkanes (relative abundance, left axis) and their stable carbon isotopic composition (right axis), for six representative samples from the Lake Wuliangsu, including (a) submerged macrophytes (b) emergent plants (c) riverine soil (d) S3 (e) S6 (f) S13"

Line 295, the calculation methods stated here should be included in the main text.

Reply: For the purpose of readability of this manuscript, we decided to put all the equations in Supplementary Materials. Actually, all the calculation methods have been described in the main text. Therefore, we feel that our way of dealing the calculation methods stated here would be appropriate. Of course, this is not a scientific issue, so we can compromise a little bit if the reviewers and editor insist.

In 4.2, how about using the gross OM isotope to calculate the contribution from different sources, as the isotopes of all potential contributors can be easily obtained.

Reply: Please see our first reply to the comments above.

Additional information:

Here are references mentioned in this response, and some of them will be included in our revised manuscript:

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