

Interactive comment on “Source, composition, and environmental implication of neutral carbohydrates in sediment cores of subtropical reservoirs, South China” by Dandan Duan et al.

Anonymous Referee #3

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Duan et al. obtained a very nice, enriched, dataset including neutral sugars and other parameters in three subtropical reservoirs. Based on the concentrations and composition of the neutral sugars, isotope values of TOC, and C/N ratios, they investigated source and diagenesis pathways of sedimentary organic matter (SOM). They concluded that the dominant source of SOM was phytoplankton in the ZT, LA and upper XFJ reservoirs, and there was not much degradation of carbohydrates downward in the sediment cores. Also, there seems to be a nice correlation between temperature and the levels of carbohydrates over the past 60 years. I think this paper would be of interest to the community and worthy of being published, but I have issues with the way they presented, too broad and without a clear focus. The authors discussed a lot of

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possible sources and phytoplankton among different reservoirs, but they did not even mention why different patterns, ZT and LA vs. XFJ, were observed,. In addition, some of the conclusions are very speculative. Overall, I do not feel this paper is ready without a major revision.

The section of Materials and Methods needs more work. They need to include the information about measuring the sedimentation rate and pyrolysis. I know they have these in the Duan et al. 2015 paper, but these should be briefly described, since they use those data in the Results section and you can't force the audience to read your other paper. It is unclear how many cores they collected. In other words, how representative are these cores to the whole reservoirs. If these systems have been impacted by human activities, such as dredging, sediments in these reservoirs can be very heterogeneous.

A main issue with the manuscript is the lack of focus on the discussion. They talked about a lot of different topics, but it was written like a result section with titles like, "OM characteristics", "Monosaccharide composition", "Source of neutral carbohydrates", and so on. In other words, it reads more like a data report rather than a research paper.

Line 43: "offer"

Line 49: delete "and impacted"

Line 54: any evidence about the Suess effect would be particularly stronger in the industrialized areas such as Pearl River Delta? I would assume this should be about the same worldwide considering the fast CO₂ mixing in the air.

Line 127: awkward wording, should be "productivity significantly contributed to dissolved oxygen content"

Line 130: nutrients levels are always higher in the deeper depth. What do you mean by "be brought" to deeper depths"?

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Line 136: again, describe the pyrolysis

Lines 193-196: have to be careful about the C/N ratios. Decomposition of terrestrial organic matter can decrease C/N ratios, not necessarily source related. This has been well documented in composting studies. Also, the C/N ratios of 3 in the XFJ upper layers should be interpreted in a more careful way. I don't think you can simply say "algal origin", because C/N ratios fresh algae are typically about 6-7, and even pure bacterial biomass typically have C/N ratios of 4. It is not very clear how you would get SOM with such low C/N ratios.

Line 200: the removal of CH₄ (13C light) should lead to the accumulation of 13C-heavy SOM

Line 214-216: too speculative. The DO level you mentioned refers to the water, not sediment. I think the major OM decomposition in these OM-enriched sediments is through anaerobic pathway, unless you have DO profile data in sediment cores.

Line 270: it's interesting to note the correlations between Zn and Cu and carbohydrates. I think more data analysis is needed, such as the contents of Zn and Cu in algae and how they trace metal got preserved, etc. It's not enough to simply have a correlation and then argue they were from phytoplankton. For example, it could have been sourced from industry contamination.

Section 4.4. When the individual carbohydrates are normalized to TOC, I don't think there is much a decreasing trend at all (Table S2). In other words, carbohydrates simply are not good indicators of diagenesis. This section should be strongly condensed.

Section 4.5. This section is interesting, but still at a speculative stage. Issues why we would expect carbohydrate increase, such as increased phytoplankton production or decomposition of SOM under warmer climate?

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