

## ***Interactive comment on “Post-depositional vivianite formation alters sediment phosphorus records” by Nikki Dijkstra et al.***

**Anonymous Referee #1**

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This is a well-written paper presenting a large data set from cores taken in the Baltic Sea. The take home message that post-depositional vivianite formation can confound sediment P records is reasonable. The good news in terms of sedimentary P records is that vivianite forms and is mobilized under fairly unique conditions. Thus, especially in records where one sees fresh water to marine transitions, one should be mindful of potential alterations involving iron phosphates. I am not sure how common such transitions are in the geologic record. Nevertheless, it is good to be aware of this potential complication.

Perhaps I sense some frustration of the authors in this manuscript in that their studies yielded no direct evidence of the mineral vivianite in their system. Essentially the presence is inferred from extractions, modeling, blue particles and its presence in other

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similar marine systems. The XANES measurements were not consistent with the presence of vivianite and the molar ratios of iron to phosphorus in SEM-EDS analyses do not seem to be that close to the values expected for vivianite. I have no doubt that there is some form of iron phosphate in these sediments but it may not be vivianite. There are many different iron phosphate minerals. My guess is that the iron phosphates are mixture of a number of poorly crystalline iron phosphate minerals. Given the absence of clear and direct evidence for vivianite, I believe it is a bit bold to state that its presence is “demonstrated” (line 7, page 2). Rather, it would be more accurate to say vivianite presence is inferred. Although using the term vivianite is a nice shorthand, it would be more representative of the findings to say something like “iron phosphates” in the title and throughout the text.

Discussion of the blue aggregates could be expanded. Mole percent analyses are presented in Figure 8 but they are not deeply discussed. How do these mole percent values compare with vivianite? How do they compare with other possible iron phosphate containing minerals?

Overall this is a very nicely presented study, other than the overly bold assertion for the specific presence of vivianite.

Minor issues:

Figure 11 is hard to understand. The graphs are tiny and it is unclear what the all the lines and shadings represent. Either the figure should be redesigned or a more extensive caption is needed to help the reader.

Line 9 page 13 change “is” to “are”

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