

Interactive comment on “Evidence for vivianite formation and its contribution to long-term phosphorus retention in a recent lake sediment: a novel analytical approach” by M. Rothe et al.

Anonymous Referee #1

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Summary

The paper presents results from a characterization of the vivianite content in a lake sediment using a new analytical procedure. It assesses the accumulation of vivianite in the sediment layer that corresponds to the period after the lake was treated with iron versus the vivianite content in the layer below. A significant result is that the vivianite content was found not to correlate with the degree of porewater supersaturation, which suggests that the mineral precipitation is controlled by mechanisms other than thermodynamic driving forces.

Vivianite is an important mineral for the long-term retention of P in lake sediments,

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and the dynamics of its formation is still poorly understood. This manuscript presents important information that should help our understanding of P retention as well as can influence management practices. The study and the interpretation of results appear carefully conducted. I believe the specific criticisms listed below can be addressed upon a minor revision.

Major comments

Both porewaters and solid sediment were handled aerobically. I would like to see a brief mentioning of how this might have affected the results. My feeling is that the porewater results should stand, as they were already filtered through the dialysis membrane and quickly fixed in acid, whereas the vivianite content in the solid fraction might have been modified slightly. A potential effect of freeze-drying is also worth discussing.

Minor comments

p.7361, lines 5-7: I suggest adding a reference to support the statement about the importance of long-term burial vs short-term immobilization, as this subject has been a source of confusion in the past (e.g., Katsev et al. 2006, Hupfer and Lewandowski 2008).

p. 7364, line 6: I suggest specifying the pore size for the dialysis samplers.

p. 7365, line 16: Would any of the dissolved Fe in the porewater samples be associated with organically-complexed Fe?

p. 7376, line 27: Attributing the spherical shape of the vivianite crystals to pore voids is strange, or perhaps worded confusingly. Would pore voids be expected to be spherical? Wouldn't the shape of the crystal be more strongly affected by the regime of precipitation, e.g. slow near-equilibrium growth vs. fast disequilibrium precipitation, perhaps catalyzed by some surface?