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Biogeosciences Discussions

Interactive comment on "Sedimentary phosphorus and iron cycling in and below the oxygen minimum zone of the northern Arabian Sea" *by* P. Kraal et al.

Anonymous Referee #1

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P. Krall et al. provide an excellent study on the cycling of P and Fe in sediments from and below the OMZ of the Arabian Sea. Most of their results are based on the measurement of P and Fe in different fractions of the sediment after sequential leaching. Though this kind of work has been previously performed in a number of studies, Krall et al. demonstrate that the highest concentrations of calcium phosphate minerals (carbonate fluorapatite CFA) is restricted to areas where bottom oxygen concentration fall below 3-4 μmol/L, and represent the main sink for P in the Arabian Sea (and also in all oceanic OMZ). More importantly, their data and modeling results shows that a large fraction of the buried CFA is surprisingly not of authigenic origin but instead that dust input (through the water column) represents a great source to the sediments.

Some specific comments : 1. Lead210 and Carbon14 analyses : The authors write

that these geochemical data are used to calculate the linear sedimentation rate (at least for station 4). Whereas the authors provide the 210Pb profile, I would suggest the authors to provide also the 14C datings in a table and to give an estimation of the linear sedimentation rates for station 4, and also to give some indications (if possible) on the sedimentation rates at the other stations. 2. Are there any seasonal variations in the bottom water oxygenation ? If yes, could these variations have an impact on the sedimentary diagenetic cycling of P and Fe? 3. Station 1B and 2 are both located in very similar oceanographic settings in terms of oxygenation conditions and present quite similar major inorganic and organic compositions. We could thus expect to find similar P and Fe cycling in these two stations, which is not the case, Station 2 resembling more the deeper and better oxygenated stations. Is it just a question of spatial variability in benthic conditions as claimed by the authors? Could it be related for instance to threshold levels of oxygen below which some reactions occurs at greater rates? 4. In paleoceanography, we use some geochemical and micropaleontological proxies to study the OMZ variability through time (like redox sensitive trace metals, nitrogen isotopes, benthic forams, etc...). I would appreciate that the authors tell us (conclude) in their paper how and if P under its different forms can be used as a proxy to evaluate past oxygen variations, and how it can be complementary to the other proxies.

I must finally say that I really like this study and do not have major criticisms. I suggest that the paper merits publication in Biogeosciences with very minor revision.

Interactive comment on Biogeosciences Discuss., 9, 3829, 2012.