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Interactive comment on "Anoxic conditions maintained high phosphorus sorption in humid tropical forest soils" *by* Yang Lin et al.

Anonymous Referee #2

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General Comments

The manuscript "Anoxic conditions maintained high phosphorus sorption in humid tropical forest soils" describes an experiment using tropical soils from the Luquillo experimental station to assess the effect of anoxic conditions on the adsorption capacity, kinetics and P sorption strength in those soils. Two sets of soils, two topographical units (slope and valley) and two oxic conditions (anoxic and oxic) were used. The results are of great importance for the biogeochemistry community because: (1) few studies on the influence of anoxic conditions to the P sorption capacity/strength in tropical soils are published, (2) because it contradicts the stablished assumption that reducing conditions increase P availability. While I have no specific grammar corrections, the fluidity of the text should be revisited. Moreover, inconsistencies in the methods, results and

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Discussion paper

discussion sections of the manuscript are visible. I would recommend the publication of the study, after the following major revisions.

Major comments

Although the authors have executed a very interesting work, lack of information on the sample prior to analysis and subsequent analysis during the discussion are not well documented. The authors justify their chosen topographical units as inherent more oxic and less oxic sites yet, no information on the P content, FeOA, AlOA, FeHCl and AlHCl prior incubation is available in Table 1, while the reader is referred to several citations, the addition of this data to Table 1 would be very beneficial. Moreover, while the authors aim to compare the effect on anoxic conditions on the soil capacity to adsorb P no information on the soil specific surface area (SSA) before and after the experiment is available. Moreover, I would recommend the use of SSA for isotherm to analyze the P loading on the minerals (g P/m2) while adsorption occurred.

We also question the use of just 4 points in each isotherm, without lower values or zero, the lack of fit statistics (r2, among others) and general lack of detail. Later the authors also rely in the lower values of PSI to analyze and compare their sorption curves, while they also refer to the PSI concentration as rate in page 6 line 19. The authors also mention several times the precipitiation of viviatine, while no evidence more than the mention of a MINTEQ simulation to the reader. Altough the information in in the supplementary section the reader is never refered to it. The details of this MINTEQ simulation are also omitted in the Methods section.

At the results, the authors describe the P concentrations added as rates, this is extremely confusing as rates refer to a quantity over time. Which would be the kinetic data. The authors also continue to discuss data from figure 1 (adsorption isotherms) while comparing p-values for the different concentrations of the isotherm while no table or figure is mentioned. The data that this refers is supplementary table 1, where the author refers to the rates as levels, yet in the paragraph no mention to this supplementary

table is made.

In the discussion, the authors disregarded their kinetic and solubility data and support their discussion on the PSI and its correlation with AlOA and FeOA. The author does not seek to discuss the nuances a faster sorption rate at their simulated anoxic condition in the slope sites. On the other hand, the authors never discuss what minerals/solid phases could be the ones extracted by their HCl(FeII) and HCl(FeII) and how is this related to the higher P soption and rates in some soils. They base their conclusion on their solubility analysis yet this information is never related to the previous analysis. I would recommend the authors to discussing their results in comparison with the study “Sorption isotherms and kinetics of sediment phosphorus in a tropical reservoir” by Adhityan Appan, and Hong Wang; which is very similar to theirs.

Minor revisions

Page 12 line 9: change The to their

Page 12 line 10 change “due to the” to “do to the tropical soils‘”

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