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Interactive comment on "Interactions of local climatic, biotic and hydrogeochemical processes facilitate phosphorus dynamics along an Everglades forest-marsh gradient" *by* T. G. Troxler et al.

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We thank the referee very much for the very constructive comments that will substantially improve the manuscript.

In response to the two issues raised in the General comments regarding (1) redox potentials and (2) P limitation of the oligotrophic marshes. With regard to redox potential, we are very grateful to the referee for raising this critical point and will clarify that, given the evidence that some proportion of the TP is Fe-bound, there is a possibility that redox state contributes to P dissolution related to the reductive dissolution of Fe(III)-oxides. We will further clarify that while redox can have a significant effect on P availability, the difference in mineral content (and Ca-P) is greater in magnitude than the difference in hydrology between the two sites. Similarly, while DO only differs at 0.5-0.6m depth between high head and wet head soils, TDP and SRP at this depth are similar. We will also add references to bring forth that generally, in an unimpacted state, the influence of limestone bedrock governs P dynamics in the Everglades. With regard to P limitation in adjacent, oligotrophic marshes, we will provide text and references (i.e. Noe et al, 2001; McCormick et al. 2009) to bring forth studies that test for the oligotrophic status of freshwater marsh in the region where the study was conducted.

Specific comments:âĂÍ

10291âĂÍ C: Is there any way to describe (other than ET) how the P is taken up by the different species. Did you extract p or do uptake into the plants on a whole ecosystem throughout the Island ? there is mention of root uptake later in the paper but it because of the species or the soils? Unclear R: The referee notes an interesting prospect for future research based on the results of this study. P uptake by plant species is currently under investigation. However, no P uptake studies were conducted as part of the larger study presented here.

10292 C: 21 cores is a lot. Is it 21 random or along the gradient? UnclearâĂÍlater in the paper you TDP and here you say you measured TP clarifyâĂÍAlso in fig 1 the caption has ABC but I can only see an A and B in the fig. (no WCA labeled)âĂÍwhy did the authors use 1M KCl in stead of NH4Cl clarify in more detail

R: We will insert in line 21 numbers of replicates for each of the communities and reference to Supplementary material, Table 3 where this information is currently presented.

The editorial correction will be implemented in revised manuscript. We thank the referee for noting it.

The rationale for KCl and the extraction concentrations will be revised as such in methods section to address the referees notable concern: “Soil fractionation followed an inorganic P fractionation scheme using a modified Hieltjes and Lijklema (1980) method as described in Reddy et al. (1998). Briefly, instead of 1M NH4Cl, 1M KCl was used and the 0.1 M NaOH extract was analyzed for TP, with the difference between TP and Pi assumed to be organic P associated with humic and fulvic acids (Reddy et al., 1998). Like NH4Cl, KCl is a neutral salt and commonly used to measure exchangeable NH4-N. As a result, some researchers have replaced NH4Cl with KCl in this extraction scheme, thus allowing measurement of exchangeable N and P simultaneously, though only P used here. Soil P was fractionated into five compounds: labile P (KCl-Pi), Fe/Al-boundP (NaOH-Pi), organic P (NaOH-Po = NaOH-TP−NaOH-Pi), Ca/Mg bound P (HCl-Pi, 0.5 M HCl), and calculated residual P. The TP concentration in the NaOH extract solutions was assessed via standard Pi methods following acid digestion.

10292 C: did the wells have tips or closed off at the end so you got true flowthrow? Clarify maybe that is the anchor section?âĂİ R: We will clarify in this section that the wells with the anchor sections are closed off at the end, and open only to the specified depth.

10923 C: line3- Did the wells go through the limestone or just to the bedrock? Clarivy̆âĂİ

R: The piezometers were driven to the bedrock and supported by anchor sections. The wells placed 2m and 8m depth were installed into the bedrock (through the limestone). We will clarify this in the revised text.

C: Line 13- Slug tests – more detail. Did you do it in the well or above the well and how did you sampleâĂİ

R: The slug tests were performed in the wells following the hvorslev method. The technical details will be described in the text and appropriately referenced.

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C: 2.4âĂÍmeasured DO, temp, pH and Spec. cond. But is is not presented may be useful to help with the P story

R: These parameters are presented in Supplementary materials, Table 2 and will be referenced to further develop discussion with reference to redox state and P availability.

10925

C: results did you separate roots for TN TC, etc. from soils and roots themselves did you sieve them out if so state that in the methods. Did try to sieve to a common size which I doubt you could not that part needs to be addressed but did you try to get the roots out?

R: Yes, roots were separated from soils in all samples. We will clarify this in the revised text.

C: I can't see supplement 1 maybe my computer?

Discussion C: The first paragraph reads like an abstract and again the acronym have already been described – correct. Rework.

R: WE will revise to present a more appropriate introductory paragraph to the Discussion section.

C: They make a lot of suggestions of other papers suggesting that CO2 is really important and why but no measurements were made

C: Could add in the DO they do have and work on that there are calculations you can do to help and calculate redox and explain P dynamics.

R: With regard to redox potential, we are very grateful to the referee for raising this critical point and will clarify that, given the evidence that some proportion of the TP is Fe-bound, there is a possibility that redox state contributes to P dissolution related to the reductive dissolution of Fe(III)-oxides. We will further clarify that while redox can have a significant effect on P availability, the difference in mineral content (and Ca-P) is

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greater in magnitude than the difference in hydrology between the two sites. Similarly, while DO only differs at 0.5-0.6m depth between high head and wet head soils, TDP and SRP at this depth are similar.

Table 1

C: P is used for precip. And Phos. ClarifyâĂÍI plotted the all parameters and very cool

R: Thank you. We will change the abbreviation for Precipitation to “Prec”

Table 2aâĂÍ

C: Wet head TDP is huge can you explain

R: We presented a short discussion of this (10307, l. 26) however that was not well elaborated. However, we will supplement the discussion of Figure 6 and in so doing will further elaborate on the potential mechanisms leading to high TDP concentration in the wet head.

Fig.2 AâĂÍ

C: While this very dynamic differences between HH and the others could maybe blow up the other three on another scale to show the differences between them and the the depths, it is described in the paper but may be good to see visuallyâĂÍ

R: We were concerned about the length of the paper and wanted to emphasize the difference in soils between community types since we found no significant differences among depths (10296, l.25).

Fig 2 BâĂÍ

C: Love it

R: Thank you.

Fig. 3

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C: Throw in arrows when you sampled?

R: Thank you for this suggestion. We will modify the figure as suggested by the referee.

Fig. 5âĂÍ

C: I understand of the lack of SE and that they weren't sig. but may be nice to see them and interesting data ! R: Standard error is presented, when possible, in Table 1. We will add +/- to clarify this in table 1. We will also provide a reference to Table 1 in the legend of Figure 5.

Fig. 6

C: Looks like a fig. off a t a talk or paper to me confusing and you said you sampled surface water but never saw it is that 0-10 depth? Clarify

R: We will provide an elaborated discussion of Figure 6 in the text. Surface water is depth = 0m and, where sampled, is presented in Table 2a.

Interactive comment on Biogeosciences Discuss., 10, 10287, 2013.