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Interactive comment on "Evaluating the effect of nutrient redistribution by animals on the phosphorus cycle of lowland Amazonia" *by* Corina Buendía et al.

Anonymous Referee #2

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This manuscript attempts to show the importance of spatial redistribution of P from rivers to land, among sub-basins to maintain P cycles of lowland Amazonia. This is an interesting challenge to understand the P cycles from the view of functional roles of animals. Therefore, this manuscript would attract many readers' attention. The introduction section is generally well written and explains the characteristics of Amazonian ecosystems and the P cycles. However, as described below, there are several concerns to be addressed before recommendation can be made for publication in Biogeosciences.

Main comments: In Introduction, the authors emphasize the dynamic nature of nutrient cycles in Amazon, particularly focusing on the lateral P transfer between different

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Discussion paper

ecosystems or different sub-basins by terrestrial animals. For example, the authors mention that this study shows animals (herbivores and detritivores) redistribute P from flooded sub-basins to P-poor terra firme sub-basins (e.g., P4L20). However, it is unclear at least to me whether this manuscript actually explores the lateral P transfer. It seems that the authors examine how herbivory and detritivory, and the resultant P mineralization affect the amount of vegetation P within "each" sub-basin of three ecosystems that differ in P availability and precipitation (Fig.4 and 5). The mathematical model of this study seem to include only terrestrial piscivores as a vector causing lateral transport of P from river to land, and the results look very confirmatory. If my understanding is correct, I would like to recommend the authors to rewrite and reorganize the manuscript largely to clarify the rationale and the goal of this study.

In addition, it would be necessary to reorganize Discussion section because most of the sentences seem not relevant to the findings of this study. Please discuss the present results by referring to earlier studies on herbivory and detritivory rates as well as ecosystem properties associated with P cycles in Amazon and other ecosystems. To do this, some sentences could be brought from Introduction section.

Minor comments:

Materials and Methods

P8L8(Fig.3): If P transport from flooded area to non-flooded area (terra firme) is not modeled in this study, it would be better to depict the two boxes representing herbivores or detritivores separately for each area.

P8L15: Please explain the equation and each symbol more carefully here. What OoE stands for?

P10L3: discussed

P10L10-16: These sentences have been described already in Introduction, and thus could be deleted.

P10L17: It would be needed to explain about Rio Negro basin and its relation to the overall Amazon here.

P10L21: I could not understand how the value 1895.84 molP per km2 per year was calculated. Please explain.

P11L3: A reference should be needed here.

P11L4-11: These sentences seem to have been explained already, and thus redundant.

Results

P12L6: What 4 vs.5 stands for?

P12L16: From where is P transported to terra firme ecosystem? If it comes from terra firme vegetation itself, the expression “transport” should be misleading.

P13Figure.4: Please change the order of the panels so as to match the order of site explanations in text (1, Rio Negro, 2, Caqueta-Japura, 3 Cerrado). And, add (%) to the x axis label as in Figure 6.

P13L3: delete “we”

P14L5: What does “s<0.4” mean?

Discussion

P15L8: Starting new paragraph here should not be necessary.

P15L9: different results between what?

P17L2: redistribution, for example, ...

P17L16: Again, it is unclear from where the animals transport P into terra firme ecosystems. Please explain.

P17L17-18:This sentence could be deleted.

P17L19-P18L6: These sentences could be deleted, because they are not directly relevant to the present results, and seem very speculative.

P18L6-7: The sentence seems lack of scientific basis.

P18L14-P19L17: These sentences concerning human impacts and megafauna should not be the main topics of this manuscript, and therefore could be deleted.

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