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Biogeosciences Discussions

Interactive comment on "The role of tectonic uplift, climate and vegetation in the long-term terrestrial phosphorous cycle" *by* C. Buendía et al.

Anonymous Referee #1

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Review of manuscript entitled: "The role of tectonic uplift, climate and vegetation in the long-term terrestrial phosphorous cycle" by Buendia et al. This paper presents a modeling framework for the study of phosphorus (P) cycling in terrestrial ecosystems over long time scales. The authors concentrate on the effect of uplift, atmospheric input, and biotic cycling, and investigate the hydroclimatic controls on the steady states of major pools of P. The results are presented in the context the dependence of these states on soil moisture and uplift rates. The manuscript is original, technically sound, and well written. It is appropriate for the readership of biogeosciences. I have only a few comments: 1) It is not clear what soil moisture represents in this paper. I believe it is the long-term average soil moisture but it should be clarified in the text. 2) Values of average soil moisture around 0.20 could be high for dry soils. Values around 0.7 could be appropriate for extremely wet soils. 3) Equation 4: I don't think P

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uptake is necessarily proportional to transpiration. As the authors noted, mycorrhizal associations play a crucial role in P uptake. Is there any study in the literature on the relation between transpiration and symbiotic mechanisms of P uptake? 4) Page 303 line 28: you should cite Swap, R., M. Garstang, S. Greco, R. Talbot and P. Kallberg. 1992. Saharan Dust in the Amazon Basin. Tellus 44(B):133-149. 5) Page 304, line 7: if you talk about the history of guano deposits and their explotation you should also go through a rich literature on UK and US colonization of guano islands, and this would take you away from the main stream of your paper. I would just omit this information on ancient or recent history. 6) Page 304, Line 26: If you talk about complex non-linear dynamics in P cycling you could cite another simple long-term model of P cycling in tropical forests. DeLonge, M., P. D'Odorico, and D. Lawrence, "Feedbacks between phosphorous deposition and canopy cover: the emergence of multiple states in dry tropical forests", Global Change Biology, 14 (1), 154–160. doi:10.1111/j.1365-2486.2007.01470.x, 2008. This model shows the emergence of bifurcations and complex dynamics in P cycling. 7) Page 305, line 9: how are these locations related to the chronosequences (Franz Joseph) mentioned in the abstract? I believe that you could stress this relation. 8) Page 315, Line 11: I think that symbiotic associations are only one of the ways in which vegetation may limit P losses. In this context the authors could also refer to Lawrence, et al., (2007), who showed how vegetation reduces leaching losses and increases depositional inputs, thereby increasing the available dissolved P. Mature forests do this better than secondary forests and crops. [Lawrence, D., P. D'Odorico, L. Diekmann, M. DeLonge, R. Das and J. Eaton, "Ecological feedbacks following deforestation create the potential for a catastrophic ecosystem shift in tropical dry forest", Proc. Natnl Acad. Sci, USA, PNAS, vol. 104, no. 52, 20696-20701, 2007]

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/7/C184/2010/bgd-7-C184-2010-supplement.pdf

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Interactive comment on Biogeosciences Discuss., 7, 301, 2010.