

Interactive
Comment

Interactive comment on “Phosphorus status of soils from contrasting forested ecosystems in Southwestern Siberia: combined effects of plant species and climate” by D. L. Achat et al.

Anonymous Referee #2

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Achat et al. studied the soil P status and the effect of vegetation and climate on P stocks and P availability in soil in Siberian boreal forests. They found high total P storage in the organic layer/topsoils and considerable accumulation of diffusive phosphate ions in subsoils. Vegetation and climate both affected organic matter decomposition and thus, P availability. Although I feel that this is an interesting topic which is of interest to the readers of Biogeosciences, I have major concerns with respect to the experimental design. Therefore, the focus of the study needs rearrangement resulting in a completely rewritten manuscript. Except for the experimental design, the authors produced an im-

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pressing and comprehensive data set on the P status of their studied plots. Using this treasure and data published on phosphorus in boreal forests (or ecotones; e.g. Giesler et al. 2002, Turner et al. 2004, Vincent et al. 2012), the authors could enhance their conceptual model using an adequate data basis. The following more detailed remarks illustrate my decision and might help to improve the manuscript:

- 6367/11: The introduction on the mechanisms underlying the role of P for C sequestration must be improved. On the one hand, reduced productivity can be expected in case of P limitation resulting in decreased C sequestration. On the other hand, P limitation might also reduce decomposition potentially associated with increased organic matter accumulation and thus, increased C sequestration. What do the authors suspect? Furthermore, how can the effect of potential nutrient limitation on C sequestration be ranked relative to climate change effects?

- 6369/20-23: The authors aim at studying local climate effects. However, the local climate is not well simulated if laboratory (incubation) experiments are used. Based on the methods used for this study, the second hypothesis cannot be tested. Similarly, the effect of the duration of snow cover was not monitored neither were the respective soil variables measured during (or before and after) snow cover. The hypotheses need to be rephrased to match with results.

- 6370/14-26: Climate and soil type differ between the upland and the lowland site. Therefore, any differences in soil P status might not only be caused by climate but also by soil type.

- 6371/4-14: What area do the “sites”/“plots” cover? Generally, the authors used too few replicates for statistical comparisons (vegetation effect: $3 \times n = 1$; climate effect: $2 \times n = 1$). Three replicates per plot represent pseudoreplicates because of spatial dependency within the plot (6377/20-24).

Minor comments:

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6370/18: The soil texture is usually given as proportions of sand, silt (instead of loam), and clay. Loam is a mixture of these.

6378/9: Description of comparisons in methods (6371/4-14) does not match with ANOVA results in tables: obviously the authors tested all plots against each other.

6382/13-22: Much more literature is available for comparisons (Cross & Schlesinger 1995, Negassa & Leinweber 2009, Alt et al. 2011)

6384/26: This statement seems like textbook knowledge and I doubt that it originates from recent literature only.

6385/1-3: The number of references must be reduced (usually three are enough).

6390: Some parts are literally identical with the abstract. These need to be rephrased or deleted.

Figure 1: This figure is not necessary to reach objectives and can be deleted.

Figure 2: How does this figure relate to the objectives of this study? In the text, an additional reference to the next figure places this figure into context. Figure 2 might be deleted as well.

Figure 5: Such conceptual considerations require an extensive data set which does not apply for the current study. Based on the restricted data set the conceptual model remains highly speculative.

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