**Biogeosciences
Discussions**

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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 #1

Manuscript: "Phosphorus status of soils from contrasting forested ecosystems in Southwestern Siberia: combined effects of plant species and climate"

General: This paper addresses the effect of vegetation and climate in contrasting forest ecosystems on the phosphorus status in soils. The study is comprehensive and includes a number of different soil measurements. The data are interesting but the paper lacks clarity and would need considerable work to improve the readability. There is a major concern with regards to the aim of the study and how this is approached. The study includes four plots at two different locations. Three of the plots are in one lo-

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cation and includes three different vegetation types and the fourth plot is in the second location with contrasting climate. Comparisons for climatic effects are restricted to two plots without any replication and this is also valid for the three vegetation types. The statistical comparisons are thus restricted to comparisons between the different plots but it can hardly be used for generalizations with regard to vegetation and climate. For this, the authors would have needed replicated sites of the different vegetation types and climate conditions. The current design only provides replications within the plots. Neither can interactive effects between plant species and climate be studied; the latter is suggested by the title. The last part of the title is thus misleading. The current focus of the paper does not match the design of the study and conceptual figures such as fig. 5 in the paper are not justified by the data in this study and this is also true for a large part of the discussion. The data itself is, however, interesting and deserves publication. Especially, the more general relationships across all soils are interesting (for instance Figs 2 and 3) and the approach to detail the depth profiles is a strength of the study. I would recommend the authors to focus their paper on these findings (aim 1, line 7) i.e. differences and similarities in the depth distribution of P across the four sites. I can, however, not recommend the paper for publication in its current stage. Below are some more specific comments/suggestions.

Specific comments: Introduction; In general, the intro needs more focus towards on the main aim of this study i.e. phosphorus in the soil. The current intro lacks focus and jumps between different topics throughout the text. Almost a third of the intro is related to climate change and C sequestration to motivate the study. There are, however, few studies from boreal forest ecosystems that indicate that these systems are P limited. Instead most fertilizer studies show that boreal forests primarily are N limited. Why would " P scarcity" be a major issue in the type of ecosystems described in this paper. This need at least to better supported in the text and by relevant references. The aims of the study is with regard to the role of vegetation and climate not relevant since the design of the study does not allow more general tests of these effects (see above). You can only speculate in that the differences you see between the plots are related to

differences in vegetation or climate but not test them.

Material and Methods; Overall, the MM section is many times unclear and the structure can be improved. 2.1 I would separate soil sampling and the site description. Give more detail on the description of the soils, especially for the different soil horizons; for most readers the soil classification terminology won't help much. The general description (3.1.1) and Table 2 could be moved to this section. I would also structure this paragraph so that you start with climate followed by vegetation and soils. The soil sampling is somewhat unclear. What do you mean with representative zones? How big are the plots? How did you sample the different horizons besides the samples for bulk density? Were sub-samples from the whole soil layers taken and how? 2.2, 2.3 and 2.4 The separation between these three paragraphs is unclear. For instance, microbial soil properties are included in both 2.2 and 2.4. I suggest that you put all microbial measurements under 2.4 and all physiochemical characterizations under 2.2. 2.3.2 This paragraph is not easy to follow and would benefit by some re-writing. A number of abbreviations are used that are not always clearly defined. For instance the abbreviation iP is used for inorganic P but in the description in 2.3.2 it seems that it refers to phosphate ions, such as Cp and Pw. Why not, for instance, use phosphate in soil solution instead of writing iP in soil solution. The units are sometimes unclear, give the unit for Pr in the text. The mass of soil should be kg and not g in the text if the unit of Pr is mg kg-1 (Fig 1). The definition of Pr can be clearer, why not use exchangeable phosphate since this is what you measure. Later in the paragraph you talk about desorption of the soil solid phase but desorption is a specific process and cannot just be related to the solid phase. In the next sentence you use the term "exchange". Overall, this paragraph needs some re-writing to improve the clarity. 2.4 Did you determine the water holding capacity and how since you added water in relation to it? Give units for abbreviations used in formulas were possible. Results Overall, there are far too many subtitles and the section could be condensed and more focused. Some comments: General, it is not necessary to say " moist composite samples" whenever you mention results were these have been used. You have already explained this in MM. 3.2.1 Is

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it really justified to extrapolate the Pr values determined from 400 min to up to 1 year; i.e. the linear relationship in Fig. 1. 2. 2.2 Yet another definition appears; explain what you mean with available iP.

Discussion I have not given any specific comments since the discussion need a completely different focus (see above).

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