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Interactive comment on "Spatial estimation of soil carbon, nitrogen and phosphorus stoichiometry in complex terrains: a case study of Schrenk's spruce forest in the Tianshan Mountains" *by* Zhonglin Xu et al.

Anonymous Referee #2

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Comments on the paper Spatial estimation of soil carbon, nitrogen, and phosphorus stoichiometry in complex terrains: A case study of Schrenks's spruce forest in the Tienshan Mountain submitted to "Biogeosciences Discussions" by Xu et al.

General Comments: The paper of Xu et al addresses an ecologically important issue: The stoichiometry of C, N, and P in forest ecosystems/forest soils is probably a key factor governing growth response patterns as well as community shifts induced by climate change and/or elevated atmospheric CO_2 concentrations. Adequate spatial estimation and modelling of ecosystem or soil C:N:P stoichiometry is important to correctly model

and predict such tree and forest growth response patterns on a large spatial scale, particularly in regions where data on soil C, N, and P are sparse.

Despite this general relevance, I unfortunately must suggest rejection of the paper due to several problems with the manuscript, which are described in more detail below. The most serious problems refer to the soil sampling technique and the reported N concentration data, which both are critical for the results reported in the paper.

1. Soil sampling: According to the Materials and Methods Section, soil samples at 10 cm intervals were collected using a soil auger at each study site. However, the topsoil of many forest soils consists of two separate sections which strongly differ with respect to their ecological traits as well as their C:N:S stoichiometry: The forest floor (organic surface layer with an OC concentration > 15 mg/g) and the Ah horizon (humic mineral topsoil with a OC concentration <15 mg/g). I suppose that at least in some of the samples (according to the reported range of C concentrations an the statement on "litter fall accumulation above soils" made by the authors on page 20) a forest floor is present. Pooling forest floor and humic mineral topsoil to a single is not scientifically sound.

2. More important, the reported soil C:N ratios (49-1327) are far too wide to be true. The C/N ratio of microbial organic matter is around 8, that of typical forest topsoils ranges between 15 and 30. The extremely wide C/N ratios presented in the paper probably are caused by wrong (far too small) N concentrations (0.02- 0.74 mg/g). As the N concentrations are a key parameter for the stoichiometry assessments in the paper, the entire paper is based on wrong input data. In my opinion this is a crucial fault making a publication impossible.

3. Probably also the P concentrations have been underestimated, because perchloric acid digestion does not completely mobilize/recover silicate-bound P, resulting in wrong C:P stoichiometry data.

4. Moreover, I want to emphasize that the MLR model partly is based on inappropriate

assumptions. In contrast to the authors I do not think that the reported soil C and N concentrations as well as N:P ratios are normally-distributed, but skewed (as clearly to be recognized in the Histograms presented in Figure 2 and the Scatter plots presented in Figure 5a,b. Probably the K-S test has been applied inadequately.

5. Furthermore, in contrast to the statement made by the authors in the paper, the model explains only a small part of the data variance (according to the R^2 values presented in Table 1 only 16% for C, about 40% for N and P). This means that 84% of the variance of the C concentrations remains unexplained by the model.

The English grammar style and spelling is unsatisfactory.

Specific Comments:

The introduction is far too long. It must be shortened considerably. L68 Citation Müller et al 2017: wrong position in reference list. L127 "Soil nutrient stock": Very general and vague phrase. L144/145: Independent and dependent variables probably are mixed up here. L188/189: Why was the soil sampled using an auger, even though profiles were available?

Page 11ff: No line numbers are given.

Results Section: Results are presented "over/pseudo-exact" (not warranted by the analysis precision): e.g. C concentrations 15.85 g/kg; C:N ratio: 123.84, etc.)

Table 1: No units are given. Data are too "pseudo-precise". C/N ratio unrealistic.

Page 20, lower paragraph: Soil C concentrations are also strongly governed by soil texture (protection of OC by clay, Fe,Al oxides, aggregates). The statement that "the more suitable the temperature and precipitation conditions (are), the more litter fall accumulates above soils" is wrong. O layer accumulation is maximal at particularly wet and cool conditions, which cannot be termed particularly suitable.

Please also note the supplement to this comment:

https://www.biogeosciences-discuss.net/bg-2017-536/bg-2017-536-RC2-supplement.pdf

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2017-536, 2018.