



Comment on **essd-2020-309**

Anonymous Referee #2

Referee comment on "Total contents and mobile fractions of chemical elements within a soil toposequence in the south-east of the Valdai Hills, Russia" by Polina Enchilik et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2020-309-RC2>, 2021

General comments

The data set presents some statistical analysis of total and mobile concentrations of 67 chemical elements from four soil profiles of a toposequence from a taiga biosphere reserve. I have found considerable shortcomings at several points concerning the data set, methodology, and English. I do not suggest the data set be published in its present form.

Data set problems. One of the major problems with the data set is that the exact elemental concentration values in the analyzed geochemical fractions are not provided. Only the results of some descriptive statistics, correlation analyses, statistical differences, and concentration ratios are given. Information about such statistical analyses may be informative, but they do not replace the basic data set on elemental concentration values. Additionally, the data set provided is sometimes incomplete, or it should be revised. See suggestions in the specific comments. The other major problem with the data set is that its uniqueness is not demonstrated in the manuscript. Based on the supported information, the reader is convinced that there is any useful potential for the data set.

Methodological problems. The sampling strategy is not clear for me. The sampling was carried out on a toposequence instead of on a whole catena. What suspensions were used to study soil pH? How did you analyze the CaCO₃ content? The selectivity of the extractants used is questionable for the target phases. At what pH were the extractions carried out? What organo-mineral complexes are expected to be dissolved using NH₄Ac+EDTA? The selectivity of 1M HNO₃ for hydrous Fe and Mn oxides must be very low. Such phases are generally extracted using a reductant and a complexing agent or a reductant together with slight acidification. But their selectivity is still very variable. The referred study (Vodyanitskii et al., 2020) also used such a method (the Tamm reagent) for hydrous Fe and Mn oxides and not 1M HNO₃. Additionally, they did not use the other two extractions to study specific operationally defined elemental fractions. What digestion method was used for total element concentrations? What about the quality control and quality of the analyses? Did you use parallel analyses? What standard reference materials were analyzed?

The manuscript is hard to be understood. A thorough English revision is necessary.

Specific comments

Use "concentration" instead of "level" for chemical elements in the soil.

L8 (and other places) I would not say seasonal sampling after four sampling campaigns on different dates.

L10 (and other places) "Loams" is not a petrological term.

L13 Do not use the term "heavy metal" for Rb, Sr, etc. Better to use trace metal and metalloids or trace elements.

L16 Soil "basicity" or alkalinity is measured through pH analysis. You have analyzed (?) the carbonate content of the soils.

L23 What is the "geochemical structure of a landscape"?

L38-39 What "substances enter the ground" at the "summit" position? Why do they not also enter lower slope positions if they are expected to enter through wet or dry deposition?

L39 Use "deposition" instead of "precipitation".

L78-79. What is the relevance of the parent material in Karelia for the study area?

L98 Table 2 does not present the descriptive statistics.

L102 Element concentrations are not proxies in this case.

L108 What differences do you mean?

Figures

Figure 1. A more detailed and informative location map is needed.

Tables

Table S1. Wrong mean pH values (G9, G1425, G2133, G2841, and in many other cells). "July" appears instead of "June" from B356 to B709 cells.

Table 3 and Table S2. Information is supported only for 3-10 elements in Table 3 and 14-17 elements in Table S2 for a chemical fraction. What about the other elements? The significance level is missing in several cases in Table 3. Different elements are presented in the two tables with minor overlapping.

Table S3. Coarse sand, density, and concentration values in several elemental fractions (e.g., Ag1, Al1, etc.) are not given here, although these values were presented in Table S1. Why?

Table S8 – Relative error for what? Are they calculated from the parallel analyses? 100% for Al% fraction seems to be very high. Very bad values are provided in many other cases. What are the reference solutions?