

## ***Interactive comment on “Spatially resolved soil solution chemistry in a central European atmospherically polluted high-elevation catchment” by Daniel A. Petrash et al.***

### **Anonymous Referee #1**

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In the paper, hydrological problems rather than soil properties are discussed. Unfortunately, the paper is not generally well written, organized and balanced. The introduction is very short and quite approximate. A real state of the art is completely missing. Introduction should more concisely lead to the objectives of the work. Usually, a general rationale is needed. What is the purpose of the study? Methods, results and discussion of soil properties are poor. Authors indicated that soil profiles were described according to FAO guidelines, but no descriptions are included in the paper. They investigated Podzols, but soil properties are described and discussed referring only to a layer of a depth of 40-80 cm, without taking into account soil genetic horizons. In two different sites on each hilltop and slope only one profile was investigated, and they

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are compared with the properties of only one soil profile located in a valley. All together, five soil profiles were investigated, and soil properties were compared. Soils are very different in their properties, especially in a mountain areas, so the number of soil profiles was not sufficient to compare and to conclude on differences in such soil properties as carbon content, pH, cation exchangeable capacity, base saturation, etc. This, in addition to ignoring soil genetic horizons of Podzols investigated, is a reason of the weakness of data interpretation. Furthermore, soil properties, especially pH, changes in time through a year. It seems that soil samples were collected only once (in October 2010?). Why pH values are compared to pH values of water collected during a whole year (page 5 lines 25-26)? It is not clear what data were measured by authors and what data were cited from the literature (Oulehle et al. 2017). It is not clear how authors define runoff and throughfall (amount of water versus chemistry of water) and how these parameters were measured. These parameters should be defined. Conclusions summarize obtained results, but not contain real conclusions. Authors did not underline any innovative aspect that this article provides with respect to what is already present in literature. Several sentences are hard to follow, thus English proofreading is necessary. Summarizing, I do not consider this paper as relevant enough that deserves publication in the Soil journal. After a major revision it would be considered for publication in a journal dealing with hydrology.

#### Detailed comments

page 4, line 1: "A total of 15 replicates (3 per sampling location) were collected monthly". What replicates were collected? Does that mean water samples collected from 5 sites, each 3 times monthly?

page 4, lines 6-7: soil material from the depth 40-80 cm was collected. What soil horizons corresponded to this depth.

page 4, line 16: "Runoff samples were collected monthly at the limnigraph location". How these samples were collected?

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page 4, line 4: " After centrifugation and filtration through 0.45 um cellulose–acetate filters, the filtrates were analyzed for cations" - this is not clear. Do these data refer to exchangeable cations? If so, the method was described in a wrong way. If not, what these data were measured for? Where these data were presented in the paper ?

page 5, lines 25-26: "Table 2 lists physical data for mineral soil and chemical data for soil extracts from the 40-80 cm depth layer and compares them with data for soil solutions collected by suction lysimeters (50-cm depth)" - what does mean "soil extracts"? Were they obtained as described on page 4, line 4? See comments to page 4, line 4.

page 6, line 3: "characterized by acidic pH". Reaction can be acidic, but pH may be high or low.

page 6, lines 4-5: " The mean pH of soil solutions ranged similarly between the first and the second year, except for the valley (pH valley of 4.1 in year 1, and 4.5 in year 2; Table 2). The two-year averages of soil solutions were", - this part of the text belongs to the paragraph 3.1. (Soil texture and pH). Does this data refer to soil extracts (page 4 line 4)? It seems that soil samples were collected just once in 2010, so how was it possible to obtain two-years averages? If these data refer to soil solutions obtained from lysimeters (page 3, line 28), they should be included in paragraph 3.3. (Solute concentrations in soil waters).

page 6, lines 9-10: how 33 meq and 58 meq can give mean 32 meq?

page 6, lines 10-17: usually cation exchange capacity differ significantly through Podzol profiles, from ectohumus through albic and spodic horizons. The same concerns base saturation. I have a doubt if these values may be compared without referring to given soil horizon.

page 6, line 26: authors used different terms to characterize chemical properties of water, namely: soil water, soil solution, mineral soil solution. It is not clear to what data refer concentration in soil water? Are they data from lysimeters? Nomenclature should

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be unified.

page 7, line 2: how was runoff measured? Were data in table 1 obtained by authors?

page 7, lines 10-11: " Our results for NO<sub>3</sub>- across the lysimeter network also show that this chemical species was readily bioavailable along mostly in the valley, where its concentrations were one order of magnitude higher than in the upslope soil solutions" - it is not clear how this was deduced.

page 10, line 3: table 2 does not provide sufficient information on soil textures heterogeneity

Figure 2 is unreadable due to unclear crosshatch. Does it present data obtained by authors?

Table 1. In Hydrology, throughfall is the process which describes how wet leaves shed excess water onto the ground surface. Was throughfall measured by authors? If so, how it was measured?

Table 2. Why (and how) soil particulate size (> 10 cm and <2 cm) were expressed in t/ha?

Figure S2. What does mean the following: "hydrochemical data for runoff, atmospheric in lysimeters"?

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