

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2  
<https://doi.org/10.5194/hess-2022-126-RC2>, 2022  
© Author(s) 2022. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## **Comment on hess-2022-126**

Anonymous Referee #2

---

Referee comment on "Seasonal variation and release of soluble reactive phosphorus in an agricultural upland headwater in central Germany" by Michael Rode et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-126-RC2>, 2022

---

### **Main comments**

This research addressed the question of SRP release to surface water during baseflow conditions in different seasons (Winter and Summer). The research combines measurements of SRP in stream water sections, in streambed sediments, sediment pore water and groundwater, as well as tracers' tests and Rn measurements to localize and quantify GW inflow. This is important to better understand P delivery and release to surface water and the respective role of the different P sources.

I think that it is a manuscript with great potential but with a lot of information that need to be more organised to have a clearer story. There are quite a lot of grammatical issues to correct throughout the manuscript, a thorough proofread is needed. There are some details in the material and methods section to correct/add (measurement methods, uncertainty...). The discussion comes also very late and is too short, without many references to other studies. I would separate the results and discussion sections and would develop the later by discussing YOUR results and the processes that may be involved.

### **Technical comments**

I would improve the resolution of Figure 1 and the y axes (colours when the scales of the 2 y axes are different, labels).

I would add one figure with all the sampling/measurements points, that would make things much clearer.

Check the references to figures and tables (all need to be cited in text and be the right one).

No abbreviations ("SRP") or numbers ("52%") at the beginning of a sentence.

Superscript and subscripts to check.

There is a lack of consistency in the terminology (Summer/Winter, September/January).

### **Specific comments**

Line 20: I think there is a mistake in the email address.

### **Abstract**

Line 30: SRP-fraction for DP? It is unclear.

### **Introduction**

Line 50: I would try to improve the transition between the temporal variability of SRP concentrations and the different P sources, it is too quick as it is now.

Lines 56-59: I would suggest separating in two sentences, it is a long sentence that may be difficult to follow and understand.

Lines 63-66: I would also here separate the sentence in two.

Lines 68-69: The sentence about temperature-dependent processes and its link with the redox conditions discussed above are hard to understand, I would clarify this. The transition to temperature-dependant processes would need to be improved.

Lines 71-75: The first part of this paragraph is hard to follow and understand due to grammatical errors, lack of clarity and organisation.

"In situations, ...": I would not use this, but would go directly to the point.

"fed by baseflows": I would say "fed by groundwater" or "during baseflow conditions".

"Data suggest...": which data? Reference needed here.

Line 79: I am missing here a paragraph about geogenic sources of P, as it has nicely been done for the other P sources in the above paragraphs.

Line 88: I am not convinced using the expression "headwater baseflows", maybe instead "in headwaters during baseflow conditions?".

## **Material & Methods**

Lines 110 and 111: I would not use "e.g." when referring to conductivity values, I would give a range or a mean value instead.

Line 112: I think "circa" is commonly used before dates, so I would delete it and just keep "below 0.4 m".

Line 113: Which "detailed topographic characteristics"? I would give more details here.

Line 121: DPS is Degree of P Saturation.

Line 124: I would specify "declines of WSP in the topsoil...".

Lines 135: We go from precipitation/Q (Figure 2) to GWL (Figure 4) without mentioning air temperature (Figure 3). Either the data presented in Figure 3 should be presented in the text or Figure 3 should be deleted.

Lines 148 and 149: Change "between X-X" to "between X and X" as before.

Lines 146-150: To which period(s) (e.g. 2010-2020?) do these values refer to?

Line 152: I would write "January 2019 during a period of..." instead of "January 2019 with..".

Line 153-155: It reads like dilution tests and  $^{222}\text{Rn}$  measurements were also used to characterise stream water, groundwater and sediments, which is not true. I would correct this; the sentence can then be used to organise the section.

Here we have: 1) in-stream tracer dilution tests and  $\text{Rn}^{222}$  measurements to analyse lateral inflows and 2) what measurements? to characterise stream water, groundwater and sediments properties.

I would slightly change the headings of the section 2.2. to improve its organisation:

## 2.2.1. Lateral inflows to the stream

### 2.2.1.1. Water balance of stream sections measured by tracer dilution tests

### 2.2.1.2. Groundwater discharge investigated by Radon measurements

## 2.2.2. Stream water, groundwater and sediments chemistry

Lines 169-191: This is a very good section; the methodology is clear.

Lines 203-204: How do these 6 locations relate to the 6 locations used for the tracer dilution tests? Are they different? If so, why? How far are they from each other?

Lines 208-210: I would develop on the method on how to get from Rn data to the localisation of groundwater discharge and its quantification. How is the rate of radon degassing determined?

Lines 212-228: I would improve the organisation of this section, maybe follow: field instrumentation-field sampling-field measurement-lab analysis? Which method did you use for iron analysis?

Line 215: Please specify which methods you used (and with references) for P analysis, this is important. Include the method detection limit or uncertainty.

Lines 229-235: This part of the section is more organised and easier to understand.

## **Results & Discussion**

Line 240: Change "in..." to "during the two summer campaigns...".

Lines 241-242: I would not use "highly" and "very".

Line 241: "Constant" instead of "consistent"?

Lines 241-243: This is a long sentence; I would separate it in two sentences.

Lines 243-244: I would rather use a factor for comparison instead of a concentration.

Line 250: Should it be summer instead of autumn?

Line 256: I would specify in the heading "along the study reach of the stream".

Line 267: "proportion" not "proportionate".

Line 268: Do not start a sentence with number.

Line 270: The term "neutral" cannot be used here, I would rewrite the sentence.

Lines 279-288: I would gather this part into a first paragraph presenting the results: longitudinal patterns and concentrations.

Lines 288-319: Then, in a second paragraph, I would discuss why we see these patterns and concentrations by bringing in the info on groundwater discharge localisation and rate. I think that would improve the organisation of this section.

Lines 296-309: More information in the methods section on the FINIFLUX model would help to better understand the uncertainties related to the modelled results.

Line 312: I think you already said that before (lines 287-288?), in a different way. I would avoid repeating the results.

Line 321: Why are you investigating sources of SRP only in September 2020? Explain why, it is not clear for me.

Line 322-324: It is hard to locate these observation points, a figure showing all sampling/measurement points would help a lot.

Line 356: "are at work", please rewrite this sentence.

Lines 351-364: There are some good things here but there is no references at all to support your points, and the discussion about the underlying processes is almost absent. The discussion needs to be developed.

Lines 374-386: It is too much focused on presenting the data, and not enough on discussing them. I would discuss briefly how your results compare with long-term data ("our results are consistent with...") but discuss more about YOUR data and the processes explaining what you observed.

Line 374-375: I would rewrite this sentence, some grammatical issues there.

Line 385: Any reference to support the suggested dilution pattern?

Line 394: I feel like the REAL discussion starts here, so very late. I think separating the results and discussion would be beneficial.

Line 414-426: I really like this part where you discuss your findings, related them to land use and soil type. Some references are missing when you refer to other studies in the same catchment.

Line 418: Please rewrite the beginning of the sentence, it does not seem right.

### **Figures/Tables:**

Figure 1: This figure is hard to read, the resolution needs to be improved. In the legend, I would not use "soil types" since it does not refer to WRB soil types. Maybe hillslope or topographical position?

Figures 2/3/4: I would gather the three figures and use panels. Units of the y axes should be in square brackets.

Figure 4: I would show only the same period as in Figures 2 and 3 in the text, a longer time series can be shown in the Supplement maybe. Is there an issue with where the vertical lines are located? It does not look to be the same dates as in Figures 2 and 3.

Figure 5: Maybe consider colouring the y axes (blue/red) so it is easier to see that they have different scales.

Figure 6: In the caption I would use "during the three sampling campaigns" and not "in". Should it be "SRP net flux" instead of "SRP net" in the y axis title? Maybe consider colouring the y axes (blue/red) so it is easier to see that they have different scales

between January and September. I would also change the order of the panels since Q net is calculated from Q and SRP net flux is calculated from SRP flux: Q, Q net, SRP flux, SRP net flux.

Figure 7: I would add a sentence explaining the dashed line in the caption (even though it is already in the text), so the reader does not have to look for it in the text. In the y axes titles, you use here winter/summer but in Figures 5 and 6 you use January/September, I would stick to one of them and not mix the two, be consistent. I would also change the colours to red and blue to be consistent with the other figures and I would colour the y axes (blue/red).

Figure 8: What is the uncertainty of the modelled Rn concentrations?

Figure 9 : Why are there only 3 points here? And not all the measured concentrations points? Is it the average of each campaign? I am surely missing something here, I would clarify.

Table 2: "nd" refers to "not determined" or "not detected"? If it refers to not detected I would say "< MDL" instead. These MDL need to be given in the method section.

Table 3: Where do these data come from? Any reference?