General impression

Botter et al. examines in the resubmitted manuscript "Anthropogenic and catchment characteristic signatures in the water quality of Swiss rivers: a quantitative assessment" the dataset of the Swiss National River and Survey Program (NADUF). The revised version gained clarity on some aspects but also still contains some points to improve.

Different inconsistencies and errors in referring to figures or findings exist and confuse when reading the manuscript (e.g. L391 but also others).

As mentioned in the comments to the first version of the manuscript, a geological map is necessary and would help to link observations and catchment characteristics. L148 mentions "crystalline silicic rocks are dominant" but it seems that the HA or DI catchments have mainly sedimentary rock. Including this in the results and discussion would certainly help.

A methodologically concern is how the parameter a was treated. This was never explained and it is therefore not clear whether this parameter was fixed or variable and could potentially affect conclusions concerning the temporal variable parameter b. Please clarify this point in the manuscript.

The comment to the definition of "hybrid catchments" was previously made to stimulate the thinking of the authors about the reason why these catchments are hybrid. My interpretation about the meaning is that they are defined "hybrid" because they contain one or multiple lakes, which could cause a dampened run off, residence of water particles and in or decrease of certain solute concentrations. This is also visible in the different figures. Please discuss the effect of lakes in your study.

The discussion is long and contains a lot of information. One would expect that the analysis of water collected in a human influenced catchment would show an anthropogenic signal. However with the rich dataset and analysis already performed, it is possible to link the different results in a logic way and will allow the reader to understand which are the effects of the climatological forcing (temporal variable signal), catchment characteristics (difference between plateau, alpine and "damped" catchments with lakes) and human influence (specific solutes and their temporal variably). Subsequently it is possible to see different catchment with different runoff regimes and temporal solute behaviour in relation to each and allows highlighting differences and why certain observations or patterns were observed or not. By ending each discussion section with a short summary could help to make stronger statements and highlight the main findings. A summarizing paragraph at the end of the discussion would also help to go beyond a statement that solutes are human induced and write a more specific abstract and conclusion.

These modifications are of minor type. Incorporating the general and specific comments will improve the manuscript and better highlight the specific novel aspects of the manuscript.

Specific comments referring to line

Sometimes basins were used while other times 11 catchments. Please use consistent wording for all definitions throughout the manuscript.

L23	"certain solutes" add which ones.
L25	Which variability temporal or spatial is meant here? Which one is higher, the natural or the anthropogenic? The conclusion L587-590 is much clearer.
L106	The Erlenbach and Lumpernenbach seem not really river basins. Please classify them differently!
L107	Which are the subcatchments? Please specify.
L129	Please specify which are the detection threshold and accuracy of the different instruments are. This will help to better understand the signal. I.e. if the instrument accuracy in solute X is ±0.1 and the signal variability as well as, there is not a significant difference between the different catchments (Figure 2). This example is valid for all other figures. Please take this into account and modify accordingly.
L148	Please include a geological map similar to map made by v. Freyberg 2018.
L156	What is a low intensity fertilization, please specify the tons ha^{-1}.
L161	Please add after "south-north gradient" and within the alpine valleys.
L164-166	Move to introduction
L177	Maybe you could use a classification: basin (Biggest scale - dampened), catchment ("meso scale"10-... km^2) and subcatchment (Small scale <10km^2)
L178	What do these extremes relate to, magnitude or timing. Please be specific and use hydrological terms.

L184-192   How the index of variability was calculated and presented was confusing. Especially the caption of Figure 4 confuses "*Bar plot of the index of variability. Each bar represents the monthly variability of average concentration 900 relatively to discharge variability per catchment class.*" However, which month was presented in Figure 4, or where different average or spatial average presented here? It's not clear. Please clarify and rewrite this section.

L394-399   S2a and S2b do not correspond with text and makes this section difficult to read. Please modify.

L427   Which analysis and figure support this statement?

L434   Not only fertilizer application but also manure can dissolve calcite and affect Mg/Ca ratios. Please discuss this in the manuscript with appropriate references.

L449   Here the geological map of Switzerland would help. Please also perform a multiple comparison to show significant differences between the different catchments which will help to relate H_4SiO_4 to geology.

L460   Is there a reference available to support this statement? Not all Alpine catchments do have high sediment loads (Figure S5).

L463   For clarity refer to the respective figure.

L483   Precipitation amount but also annual distribution are important. When describing precipitation e.g. table 1 it is not clear how this was calculated and also if spatial variability was incorporated e.g. max and min mm y^{-1}.

L491-493   By using residence time runoff flow paths are inferred and not demonstrated. Please modify.

L506   "Removal" and entrain are rather similar. Is the word "removal" linked to biological reduction e.g. nitrification? Please specify in the manuscript.

L518-520   This sentence confuses since earlier H_4SiO_4 was linked to weathering and geology (L303) while now to bioactive processes. Please clearly state which is the dominant process.

L526   Please specify here which catchments are mentioned here.

L528   But fast response is followed by fast recession, are alpine and sub-alpine rather affected by dilution caused by the high precipitation?

L532   This statement is not fully clear. Isn't it that the water "picks" up a certain composition due to its flow-path?

L567   Statement concerning subsurface flow is not clear. Is subsurface flow only occurring with natural conditions while human activity influences overland flow? Please modify this sentence

L588   All or only certain solutes?

What is the anthropogenic signal, one solute or a series? What is the influence of the catchment characteristics? Do small catchments with high agriculture % behave different solutes compared to large catchments with lakes? Although statistically it is difficult to show relations between observations and catchment characteristics, a quantitative statement can be made to explain certain observations. Also, explain what caused the temporal variability in Figure 5, 6 and 8. Clearly highlight in your take home message e.g. there is a variability due to climate but anthropogenic can be noticed in region 1 while less in catchments in region 2 because of ...

L594   What is a "macro-pattern"? Please explain or remove.

L604   Important findings are missing e.g. a non-seasonal behaviour of "anthropic" induced solutes as e.g. discussed in L395 and differences between different catchments are missing.

L606-608   This statement is too general and not fully clear.

L614   A clear take home message of how the different regions or catchment types are missing and would be valuable to include.

Figure 1   catchment boundaries are difficult to see. From the stream network it seems that the hybrid catchments containing lakes, are dampened. Maybe just call them dampened catchment. This would also be agreement of Figure S2. Also add letters a-... to facilitate connecting the text and different panels.

Figure 5 &S2 The variability in time is interesting. Is it possible to relate this temporal pattern to climate variability, i.e. wetter and drier decades? In addition is it possible to state that in wetter years the anthropogenic signal is higher or lower (e.g. Mg, No$_3$ or …) ? Please include in manuscript.

Figure 8b   Really interesting to see changes but which variable do I see…? Continue to label the different panels as letters or add as new figure.