

## ***Interactive comment on “Stream temperature evolution in Switzerland over the last 50 years” by Adrien Michel et al.***

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Received and published: 3 October 2019

Michel and co-authors describe in detail stream temperature trends in Switzerland over the last several decades. The authors show how stream temperature trends are modified by catchment type and position on the landscape (e.g. fed by glaciers vs. lake outflow) as well as how seasonal differences (greater difference in winter and summer temperature) underly the annual trends. These trends have important ecological and economic implications as temperature thresholds are being reached more frequently. I think manuscript is well-written and important, however, there are a few items that I think could be clarified before it is suitable for publication. Please see more detailed comments below.

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General comment: The manuscript is quite long and I think could be distilled down to a few major points to improve readability. The most important points that came out to me were: 1) water temperature trends are increasing (Figure 2), 2) water temperature trends are influenced by air temperature but also modified by landscape position (I think a modified version of figure 5 would show this well, where water and air trends are plotted against each other and points are colored based on catchment type; Fig 6 also shows this), 3) Seasonal difference underly the annual trends (Fig 8, 15, and 16 show this most strongly), and 4) there are important ecological and economic implications for these temperature trends (fig 17 and 18). I encourage the authors to reduce the number of figures and condense some of the text or move to supplementary to make the main text a little bit more concise.

Specific comments:

Page 1 Line 13: example of ecological temp thresholds?

Page 2 Line 7: what is the global regime shift?

Page 10 Line 7-8: why did the authors choose a 4 hour moving window average?

Figure 2: I like this figure but it is hard to tell which water station site is referring to which line on the top panel. Have the authors considered having the site labels point to the start or end of the 5 year moving average line for each site? This might improve the interpretation of site specific time series, but it also may make the figure too busy. Another option would be to order the site abbreviations in order of stream temperature from end of 5 year moving average line (i.e. year 2016) rather than what appears to be alphabetically-ordered currently.

Figure 3. I think the labels could be ordered differently or point to the lines to which they correspond. See my comment for Figure 2 above.

Figure 5. Rather than plotting boxplots next to each other, I think plotting the water temperature trends vs. air temperature trends as well as discharge trends vs precipita-

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tion trends would convey more information. These scatter plots could also be colored by stream regime. You could keep the boxplots as marginal plots on the scatter plot figure to retain quartile and median information. It would be interesting to see when water and air temperature trends are correlated and when they are not.

Page 13 into Page 14: “Indeed, for both pairs, the hypothesis of different mean is clearly rejected with  $p$ -values $>0.15$ .” Is this testing the difference between DLA and SPJ, and ALP and HYP? I assume so, but I think this could be written a little bit more clearly to make explicit.

Page 15 lines 12-13: It isn’t clear to me how the authors concluded that air temperature is this main driver of water temperature trends for the SPJ catchments. Figure 5 shows a comparison between water and air temperature trends but all of the catchment types are grouped together in this figure so it is impossible to see the effect of air temp on water temp for SPJ catchments specifically. Please be clearer as to how you came to this conclusion.

Page 15 line 20: include some citations for the statement that this is ‘well known’.

Figure 7: I suggest adding the label ‘inflow’ and ‘outflow’ to the figure itself to help the reader quickly understand the figure rather than having to read through the legend to understand which line is inflow and which is outflow.

Page 18 line 4: Is ‘intra-annual’ not ‘infra-annual’ more appropriate here?

Figure 8: indicate what the panel months mean (DJF, JJA, etc. . .). I was confused until I read the main text.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2019-366>, 2019.

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