

Hydrol. Earth Syst. Sci. Discuss., author comment AC4
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Reply on RC2

Michael Stoelzle and Lina Stein

Author comment on "Rainbow color map distorts and misleads research in hydrology – guidance for better visualizations and science communication" by Michael Stoelzle and Lina Stein, Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-118-AC4>, 2021

We thank the reviewer for their supportive comments and advice.

Specific comments in RC2

- The paper focusses mainly on color vision deficiency (CVD) and people with low/reduced vision, however one might also argue that good visualisation and labelling is equally important for people with other cognitive differences, such as (I'm guessing) dyslexia. Has there been research on this? If so, this aspect might be worth including in your literature review.

The research in regard to cognitive difference and perception of data visualization is relatively limited (Lee et al, 2020; Wu et al, 2019) and mostly focused on general data visualization and not scientific data visualization. The main point when designing a data visualization for intellectual development disabilities seems to be the chart type (bar chart vs line chart vs pie chart) than visualization color (Wu et al, 2019). While we recommend scientists take advice on making their visualizations more accessible, the aim of our paper is the choice of color and less the choice of chart type.

- The discussion of color palette type (negative-to-positive, strictly negative, or strictly positive) comes a little late in the manuscript (Figure 7c-d). It might be worth describing the type of color gradient that is most suited for negative-to-zero, negative-to-positive, and zero-to-positive scales sooner; e.g. a red-white-blue palette, which is currently missing from Figure 1.
- It might be helpful to provide the readers with a "checklist" of items to verify when creating a readable scientific figure (e.g. "the data-ink ratio"; "a white mid-point at zero for negative-to-positive palettes").
- Some repetition could be avoided, e.g. section 3.4 also contains some repetitions about CVD etc; perhaps it could be condensed a little.
- It was useful to read about the colorblind options in R packages. Are there similar options for Python users?
- I wondered if the paragraph about preprints (l.89-95) was really useful. It seemed to me this was a small sample compared with the analyses in subsequent paragraphs, so the utility wasn't entirely clear.

We will restructure, shorten and clarify the manuscript as recommended by the reviewer. This will include a checklist of recommended steps and available tools to reach an accessible data visualization as also suggested by Thorsten Wagener in RC3. The checklist aims to include recommendations for the three main coding languages used in Hydrology: R, Matlab and Python.

- Lines 212-218 and elsewhere mention various types of visualisation (e.g. heatmaps at l.252), but it might be helpful to see examples (especially examples of good hydro-climatological visualisations).
- Finally, the title focusses on the hydrologic community but there were large parts of the text that were not specifically hydrological. Perhaps this could be strengthened a little. For example, Figure 1 could provide examples of hydroclimatic variables (i.e. highlighting which types of palettes are particularly suitable for specific variables).

For some often-used variables, such as temperature, precipitation or to indicate change in a variable, the IPCC Visual Style Guide for Authors (<https://www.ipcc.ch/site/assets/uploads/2019/04/IPCC-visual-style-guide.pdf>) offers some guidance for color choice. We have mentioned this issue in the manuscript (L327-330) but will revise the paragraph to give more guidance for variable-specific color maps. Beyond the regularly used variables, no obvious color association exists for some hydrological variables. For example, isotope concentration charts do not have obvious colors associated with them, as long as different concentration time series can be distinguished. Instead of providing rigid choices of color, it would therefore be more useful to offer tools for an appropriate choice of color.

Of course, we will address the technical and minor suggestions in the revised manuscript. We thank the reviewer also for the valuable comments on the Figures.

References

Lee, B., Choe, E. K., Isenberg, P., Marriott, K., & Stasko, J. (2020). Reaching broader audiences with data visualization. IEEE computer graphics and applications, 40(2), 82-90.
Wu, K., Tanis, S., & Szafir, D. (2019). Designing communicative visualization for people with intellectual developmental disabilities.