

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1  
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## **Comment on hess-2021-118**

Fabio Cramer (Referee)

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Referee 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-RC1>, 2021

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### **GENERAL COMMENTS**

The study by Stoelzle and Stein is clearly written and carefully performed (e.g., elaborate and somewhat conservative classification scheme and cross-checks between reviewer team to reduce bias) and addresses an important topic from a new angle: This is the first time that a systematic review of unscientific rainbow colour maps is performed in an environmental journal covering almost a thousand papers in total and opens an important usage-over-time perspective with the previous review by Borland and Taylor (2007). This study is therefore useful not only to understand the current (mis)use of faulty colour maps and colour combinations, but also provides valuable information on the community-wide usage through time. Moreover, the study offers a valuable up-to-date overview over current resources needed for science-proof data visualisation.

Even though visualisation is a fundamental, and widely-used scientific method, the results found by the authors underline the lack of education in visualisation, and hence awareness, amongst scientists from an empirical standpoint. Even more dramatic is the finding that some editors and authors have disregarded expert review comments on figure accessibility and accuracy.

The authors have done a fine job to cover and refer to previous work on the topic and provide an insightful new angle. Given the widespread lack of understanding about the importance of colour in scientific data representation, and the relevance to the specific readership, I highly recommend this manuscript, after minor revision, for publication in Hydrology and Earth System Sciences.

## SPECIFIC COMMENTS

Figure 6: The figure could be made more intuitive by clearly labelling the top row of panels too (which are currently not labelled). It should be clear (either by additional on-figure text or via the caption and added panel labels) that the ‚original‘ panel is the not suited version to improve, and the three panels to its right-hand side are options to make it suitable. So, I suggest to add (a), (b), (c), ... labels to all panels or clarify the on-figure explanation, e.g., by „story-telling graph titles“.

lines 257-259: These points were also made in Crameri et al., 2020 (already in reference list of the current manuscript), to which the reader could be pointed to here as well.

lines 310-311: The reference for the actual Scientific colour maps is:  
Crameri, F. (2018). Scientific colour maps. Zenodo.  
<http://doi.org/10.5281/zenodo.1243862>

lines 312-318: The authors might consider clarifying that there are two other potential data types/options (which however might be less common): multi-sequential (e.g., bathymetry + topography with a centric value but not diverging) and circular/cyclic (e.g., river orientation; with repeating colours for e.g., 0 and 360°) as outlined in Crameri et al., 2020.

line 320-321: This is a valid point to make.

line 322: Crameri et al. (2020) provides a handy flow chart to select a colour map based on the data to be visualised, which could be referred to here as well.

lines 343 and 391: I suggest to change: „Marie Curie“ to „Marie Skłodowska-Curie“

line 341: The reference for „Shephard et al., 2017“ should be:  
Crameri, F. (2017), The Rainbow Colour Map (repeatedly) considered harmful, edited by G.E. Shephard, EGU-Geodynamics Blog,  
<https://blogs.egu.eu/divisions/gd/2017/08/23/the-rainbow-colour-map/>, last access: 13 January 2021  
or something like that, as it was written by myself and edited by Grace Shephard without contribution from others.

line 374: A good reference to back up this statement would be:

Moreland, K. Why we use bad color maps and what you can do about it. *Electron. Imaging* 2016, 1–6 (2016).  
who concludes that the widespread use of the rainbow is the main reason scientists (and others) propagate it further.

line 405: Not to leave out the other important aspect investigated here, the authors may rewrite to: „...to banish the rainbow color map, and simultaneous red and green usage, ...” or something along these lines.

## **TECHNICAL COMMENTS**

lines 127-128: That sentence sounds unclear to me; consider clarifying. E.g., the term „vision deficiency scale” sounds somewhat arbitrary.

line 132: If it is actually the case, consider clarifying that it means „all papers published in HESS”.

line 212: Consider informing the (potentially non-hydrologist) reader that the following suggestions are specific to/from the field of hydrology, as some of the used terms (e.g., ‚response surfaces’) are likely not familiar to readers from outside the discipline, and a potential source of confusion.

line 234: „point” instead of „points”

line 318: Point D needs to be clarified grammatically.

lines 369-371: I do miss some critical commas throughout the manuscript. Here, for example, after „perspective” and „With that”.

line 398: „alarming” to „alarmingly”?