

Interactive comment on “Hydrological drought typology: temperature-related drought types and associated societal impacts” by A. F. Van Loon et al.

Anonymous Referee #1

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General comments:

The paper includes two studies, a quantitative one analyzing the newly introduced “snowmelt droughts” and “glaciersmelt droughts” and their meteorological causing factors as well as a qualitative one investigating socio-economic impacts of “temperature-related” droughts. The topics of the paper are interesting and the paper is well written. I also highly appreciate the combination of the two approaches in one article.

However, in my opinion two points should be addressed, before publishing the article: First, the authors make use of a conceptual model to derive SWE and state that glacier

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was not explicitly modeled. However, some of the catchments are to a considerable percentage glaciated (up to 75%). The models are calibrated to observed streamflow and hence parameter that are sensitive to temperature - as can be found in the snow routine - are likely to be affected to compensate for a missing glacier concept. This could lead to questionable SWE estimations and affect the follow up analysis. Secondly, I have some difficulties talking about “drought” during a peak flow. I see that the definition of below average water availability includes these cases as well. The authors conclude from their qualitative analysis regarding “glaciersmelt droughts” that socio-economic impacts were not found. I could see also only socio-economic impacts of “snowmelt droughts” in combination with another drought type. With this lack of impacts connected to the new drought types, I am not quite convinced of the usefulness of their introduction.

While I am very happy to see the attempt to connect the qualitative and quantitative studies, I see potential to improve the connection between the two. The newly introduced drought types do not receive much attention in the second part of the study, while the other temperature-related droughts are not analyzed in the first part (which would be probably beyond the scope of the study).

Specific comments:

10472 L22: how was corrected for the elevation differences?

10473 L6: To which objective function was the model calibrated? I wonder a bit about the meaning of the Nash-Sutcliffe values when comparing glaciated with non-glaciated catchments see Schaeffli (2007)

10479 L15 in this section Pfister (2006) could be cited that also used historical sources to reconstruct (winter) droughts

Technical corrections:

10470 L17: remove first “normal”

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10476 L11: break into two sentences

10477 L15: "was not as well visible" – rephrase; 50-50% meaning?

10477 L21f: maybe influenced by SWE estimations?

10487 L7: Sentence unclear

10487 L26: What is intended to state here?; the USA

10499 Table1: the authors could add season durations

10507 Figure4: for clarity could be zoomed into the regions

10512 Figure9: the dots are not distinguishable in a b&w print

10513 Figure10: the dots are not distinguishable in a b&w print

10514 Figure11: red-green blind persons might have difficulties distinguishing between B and D. Please, explain the meaning of the dashed event in 1920 in the caption.

References: Schaefli, B., & Gupta, H. V. (2007). Do Nash values have value?. *Hydrological Processes*, 21(15), 2075-2080.

Pfister, C., Weingartner, R., & Luterbacher, J. (2006). Hydrological winter droughts over the last 450 years in the Upper Rhine basin: a methodological approach. *Hydrological sciences journal*, 51(5), 966-985.

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