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Interactive comment on "Drought in a human-modified world: reframing drought definitions, understanding and analysis approaches" *by* A. F. Van Loon et al.

Anonymous Referee #1

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Dear Editor and Authors,

In this draft opinion paper, the authors defined the term "drought in Anthropocene" and discussed the direction of future research on the topic. This is an opinion paper, but it is also a review paper on this research field. It includes both the views of eminent researchers and massive volume of information on the latest achievements and limitations of drought research which is potentially useful for the readers of HESS.

This is my first time to review an opinion paper. Because it basically conveys the authors' opinion, I have no strong recommendation on it. Below, I would like to express my honest impression of this paper which may be potentially useful for the authors for further revision.

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Discussion paper

I read through this draft paper for three times, but I still cannot fully grasp some of the authors' key meaning. Perhaps this is due to unclearness in the definition of "drought in Anthropocene" (Section 2) and the authors' attitude to include everything of drought (Sections 3 and 4). The latter point is a virtue of the authors, but some clear focuses would enhance readability.

After all, I couldn't fully understand the definition of the term "drought in Anthropocene" by the authors. First, although the authors used three pages to explain this term (Section 2), I couldn't find its conclusive definition. I understood that they newly proposed the concept of "human-modified drought" (page 4 lines 22-30), but is this the "drought in Anthropocene"? My confusion is originated from my belief that drought is a perception of humanity and society hence drought cannot be defined without humans. What does "drought in Anthropocene" exclusively mean? Next I couldn't clearly understand what "human modification of drought" means. The term "drought" indicates dry events that rarely occur (drier than normal, as the authors describe in Section 2.2). I found it meaningful to attribute the rareness to "human (i.e. the events that would not be happened if no humanity were there)" and "climate (i.e. the events that would be happened regardless the existence of humanity)". On the other hand, "human modification" basically occurs chronically. Why did the authors link this chronic state with probabilistically rare events? I guess this must be explained in text already, but finally I couldn't figure it out what are the authors' logic.

In Sections 3-4, the authors made great efforts to cover the diversity of drought issues from the scales of catchment to global, from the events of several days to several years, from moderate to extreme, from place to place. I agree with the authors that human interventions are seen every time and everywhere in the present world, but I believe their magnitude significantly differ by scale, period, events, and places. I guess humans play critical and exclusive roles in drought formation and consequence in a limited number of cases. It could be more informative and readable if the authors focus on the drought that humans' influences are obvious.

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Finally, I largely agree with the comments by Prof. Marc Bierkens. Although the latest hydrological analyses or models do not incorporate many of human aspects, it does not necessarily mean we do not understand the mechanism, consequences, and countermeasures of drought. Indeed, local water managers and citizens are often aware of them well. This paper would become further important if it is narrowed down what are the unknowns and what should be investigated by researchers.

Specific comments

Page 4 line 4 “Drought as a lack of water”: The subtitle doesn’t well reflect the key contents of subsection. I got similar impression for other subsections. Please revisit all the subtitles in text.

Page 4 line 32 “Furthermore, the terms we propose are not new”: Then what were newly added?

Page 5 line 16 “average water levels”: This is unclear and confusing. Do you mean mean-annual water availability here?

Page 5 line 25 “Drought is often confused with water scarcity and water shortage”: It would be highly helpful to add a table of conclusive definitions for drought in Anthropocene, water stress, and water scarcity, and relevant terms.

Page 5 line 31 “complemented”: “Coincided”?

Page 5 line 31 “with short-term drought”: Do you mean climate-induced drought here?

Page 6 line 9 “We have to point out that the definitions of drought and its impacts used here deviate from the definitions used in other scientific disciplines. . .”: I’ve read this paragraph again and again, but I couldn’t figure out the similarity and difference clearly. Again, it would be useful for readers if you add a table of definitions on drought and its impacts by disciplines.

Page 9 line 21 “resulting outflows depend on operational rules”: A relevant study is

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reported also in Mateo et al. (2014).

Page 10 line 4 “Impacts of drought in the Anthropocene”: In my impression the section describes general impacts of drought, not specific to Anthropocene. Since drought is a perception of humanity, drought cannot be defined without humans. What is the key difference from the traditional definition of drought?

Page 12 line 18 “One novel type of qualitative data is the use of drought narratives”: Is the data qualitative or quantitative?

Page 12 line 25 “classic water management models” What are the classic models? What differentiates from classic and another?

Page 13 line 9 “3.3” reads “3.5”.

Page 14 line 2 “continuous increases in abstraction, and step-changes in storage by dam building”: For instance, the works by Wisser et al. (2010) and Pokhrel et al. (2012) reported quantitatively simulations.

References

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