

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

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I thoroughly enjoyed reading this paper and subscribe to most of its views. Indeed, it is time that we start including the human dimension into drought analyses and prediction. The paper sets up a comprehensive framework for defining the various types of drought in the Anthropocene and identifies a number of research gaps. There is one major point I would like to make about the framing of the paper. It is claimed on page 3, line 14 that there are “gaps in our understanding of the complex interdisciplinary issue that is drought”. This seems to suggest that we as a community of hydrologist are unaware of the fact that drought is a many-headed dragon. I beg to differ here. I am not sure it is lack of understanding per se. It depends on who the “we” are in “our understanding”.

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Surely, hydrologists that are used to simulating or studying the hydrological system holistically, understand how the interactions between the hydrological states and fluxes and human intervention on these work conjunctively. It seems to me that it is more the general public and the policy makers that don't know or understand, partly because we as scientists lack a proper description of the interacting parts (ontology) or use the incorrect terms (semantics). So the question is not so much as “do we (as hydrologists) lack understanding?” but rather “do we as scientists lack the correct ontology and terminology for drought in the Anthropocene and therefore fail to convey understanding with the general public and the policy makers?”.

This being said, this does not mean that all issues are resolved. Indeed, if we acknowledge that the study of drought also encompasses the human dimension and we also extend drought impacts from mere indices or water volumes to socio-economic and ecological impacts and if we want to understand how human water demand reacts to extreme events or a changing normal in the future, we need additional knowledge, i.e. understanding of additional system parts. In conclusion: I would set the stage a bit differently: there are two problems with current treatment of drought:

1) Lacking the correct ontology and associated semantics to describe what makes a drought, which results in lack of understanding of (the causes of) drought of public and policy makers.

2) Necessary extension of the drought research into including human impacts on drought, human response to droughts and the socio-economic and ecological effects on drought that leads to a number (you name it) areas with lack of understanding of the (inner workings of) parts of the system.

Some minor points to make:

- Page 3, line 12: “Hydrological drought?”
- Page 4, lines 26-28: Great definition. But what if human activities lead to reduced

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drought? Think about the impacts on dams on low flows (your Figure 5) or return flows from deep (industrial) groundwater abstractions that also increased discharge in low flow periods (see de Graaf et al., *Advances in Water Resources* 2013)

-Page 5, line 30: Here there is a problem with your definitions. Before you defined "normal" as long term average under human and natural conditions. You should then add to the conditions that define a normal that there is long-term balance of fluxes.

- Page 12, line 24: remove the reference or find another. It is of no use to refer to an in prep paper.

- Page 12, lines 28-31 "Many water management. ....scenario (Watts et al., 2012)". Actually that is also the case for many of the global hydrology and water resources models such as PCR-GLOBWB where water abstractions are a function of water availability".

- Page 13: de section title "Changing norm in the Anthropocene". Given the terminology you use, it is not better to use "changing normal" (see also your Figure 4 and the use of the term "normal" in meteorology)? A norm has also a normative connotation.

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