

## ***Interactive comment on “Flash drought onset over the Contiguous United States: Sensitivity of inventories and trends to quantitative definitions” by Mahmoud Osman et al.***

### **Anonymous Referee #1**

Received and published: 3 September 2020

Osman et al. provide an overview of definitions that have been developed to identify and quantify flash droughts (including a new definition developed by the authors here) and examine the robustness of these definitions with regard to characterizing flash droughts over the United States. They find that different definitions often lead to different conclusions with regard to flash drought frequency and trends, as well as the characterization of well-known past events. The results stress the importance of careful consideration of physical drivers when selecting a flash drought definition and the need to exercise caution when interpreting the results derived from a given definition. The paper is both informative and comprehensive and the topic is highly relevant to the broader scientific community, which is becoming more and more interested in the

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topic of flash drought. I have only minor comments related to clarity and presentation, described below.

Comments:

Figure 1: While this figure is generally informative and understandable, some aspects of it are a bit confusing and can use further explanation/clarification. First, I suggest expanding the acronyms SM, PET, and AET on the figure. The general reader may not immediately know what these acronyms represent, especially since they do not appear to be defined prior to Fig. 1 in the text. Second, some aspects of the diagram itself are unclear. For example, it's unclear exactly what the box "pre-drought conditions" fundamentally represents and why there is an arrow drawn to it from "agriculture and ecological impacts" and another arrow drawn from this box toward "PET". Also, it seems some information may be omitted from some boxes, which may raise questions – e.g., could PET itself also be a function of crop type and density, and isn't air temperature also a function of surface heat fluxes? Overall, I think it would be helpful to provide a brief explanation of this figure (either in the main text or as part of the caption), to clarify some of the issues raised above.

L98 and in the Fig. 2 caption: Please define NDVI and briefly explain what this quantity represents. Including a reference that provides more information would also be helpful.

L122-126: The procedure to compute SESR could use more clarification. As currently written, the method is difficult to understand, particularly with regard to changes in SESR and how they relate to the given percentiles (40th, 25th). A suggestion is to emphasize that the change in SESR must be less than the Nth percentile of SESR changes (determined from a distribution of SESR changes, with lower percentiles representing more negative changes or larger decreases).

L283: "SESR stands out as having no positive correlation with any other definition" - There is indeed one positive correlation. I suggest adding the phrase "(except with QD1.0, which is small)" to the end of this sentence.

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Fig. 5 and especially Fig. S1: It would help to display the region name above each panel.

L339-340: Could you say a bit more about the scientific consensus on when the 2017 flash drought actually occurred, as done for the other 3 events? Is it believed to have started in the summer?

Fig. 9: Is this for CONUS? Please clarify in the figure caption.

Typos/writing:

Abstract, L17: "several types of event" -> "several types of events"

L62: "is the concept of flash drought robust to different definitions" should end with a question mark.

L289: I suggest changing "less flash droughts frequency" to "lower flash drought frequency"

Fig. 7: For temperature, the legend shows a square but on the plot it is an "x". Please correct.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2020-385>, 2020.