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Discussions

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# *Interactive comment on* "Drought propagation and construction of a comprehensive drought index based on the SWAT-$K_{C'}$: A case study for the Jinta River basin in Northwestern China" *by* Zheng Liang et al.

**Anonymous Referee #1**

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The authors proposed a multivariate drought index based on precipitation-temperature, soil moisture, and streamflow using the copula approach. These hydroclimatic variables are simulated by SWAT model. After the evaluation of drought propagation time, the comparison of the proposed drought index is evaluated based on the spatial extent, severity, and onset/end time of drought through comparisons with the individual indicators. Finally, the trend analysis of drought in the study area is evaluated based on the proposed index. My comments are as follows. Major comments: (1) Grammar and language: In several places, the grammar and language hinder understanding of

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the meaning of statements (please see minor comments). This manuscript could be enhanced by carefully proofreading the context. (2) Structure: There are three main sections in the results. Are there any connections between them? For example, does the analysis of propagation time in 3.2.1 help the evaluation or explanation of 3.2.2? In the current form, it seems 3.2.1 and 3.2.2 are independent. This is also reflected in the title "propagation" and "construction". What is the connection?

(3) Novelty and evaluation: The novelty of the study seems to be the new drought index. A critical question following this is the evaluation of the index. How do we know that this proposed index is reliable? There is some comparison with the individual indicators. Apart from this, could you find some other evidence? For example, what about the public records or reports of historical drought events or losses in the study area?

Minor comments:

Line 31: please add related references on this. Lines 48-49: This statement can be more concise. Please also check the grammar. Lines 61-64: hard to understand. Please rewrite and make it clear. Line 68: "ensuring the independence of variables" what do you mean? Lines 70-71: Please check the grammar. Lines 82-84: This seems to be redundant, as similar statements have been shown in lines 33-34. Lines 86-87: "limitation. . .outweigh the advantages" . hard to understand. Please justify this or just remove it. Lines 251-253: "propagation time of agricultural drought to meteorological drought"? How so? (also in lines 264, 275, 279) Do you mean from meteorological drought to agricultural drought? These statements need revisions to make it clear. Line 267-268: Could you please elaborate how the "infiltration of soil water .." could induce the "long lag time"? Lines 299-301: The statement about "warming and humidification" leading to "increased rainfall and temperature" needs careful justification. Do you have references to support this?

Lines 38-309: "lack of empirical . . .with extreme values"? This limitation of the proposed index could be discussed in the conclusion or somewhere else.