

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2022-78

Anonymous Referee #2

Referee comment on "Estimating propagation probability from meteorological to ecological droughts using a hybrid machine learning-Copula method" by Tianliang Jiang et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-78-RC2>, 2022

Review of "Estimating propagation probability from meteorological to ecological droughts using a hybrid machine learning-Copula method" by Jiang et al.

The manuscript is well organized and possesses novelty for understanding the propagation mechanisms between different drought types. Overall, I think the topic falls into the scope of HESS. I therefore recommend moderate revisions.

moderate revisions:

(1) Some works, e.g., the systematically literature review of propagation probability model, need to be added into the Introduction or Discussion sections.

(2) Line 214 (i.e., Eq. (10)), the " $n - 1$ " is shown in the inner product should be revised as " $n - i$ ". Moreover, please define or explain the symbols that appeared in this and some other equations, e.g., the term c is not defined. Please carefully check them.

(3) For Section 4.2, please provide specific information about paired drought events so that we can identify the characteristics of four paired categories. At the same time, I found the statement "Among them, the peaks of the meteorological drought event appeared two months ahead (December 2007) that of ecological drought (February 2007)" may be wrong in Lines 250-251. As you know, the duration between December 2007 and February 2007 is far more than two months. Please revise it.

(4) An essential part of this article is the use of machine learning to solve a binary

classification problem. In this context, I suggest adding a plot that shows the severity, duration, and affected area of meteorological droughts propagated and didn't propagate.

(5) I suggest replacing "Three-dimensional drought identification method" with "Three-dimensional clustering method".

Minor revisions:

- Lines 24-25, for specification, the drought classification should be changed as the "drought types". Please revise it.
- Lines 66-68, "Taking a typically ecological fragile region ... to meteorological drought", I suggest revising it as "**Taking a typically ecological fragile region, Northwestern China (NWC), as an example, the motivation of this study, from a three-dimensional perspective, is proposed a novel hybrid machine learning-Copula method to investigate the response probability of ecological drought to meteorological drought**" to highlight the novelty of this paper.
- Line 94-99, authors should refine their explanation of why SPI-3 is used to represent meteorological drought.
- Section 3.3.2, the number of steps regarding the *Spatiotemporal connection of two drought types* may be disordered, e.g., the statements of steps were listed as Firstly and Secondly in Lines 154-155, but that remained as the Secondly in Line 163. Please check it.
- Lines 206-207, please revised the "Cramer-von Mises (CM) test" as the "Cramer-von Mises (CvM) test" based on common sense.
- Line 224, I recommended the authors revised the caption of this section as "**Top ten meteorological and ecological drought events according to drought severity**".
- For Figure 5, as the double y axes are used, I suggest the authors display them with different colors, e.g., the red and blue y-axes are used to display the extent of area and severity. Similarly, please revise Figure 8.
- Line 255-256, the "of five-fold cross-validations" should be removed from the latter part of this sentence as the relevant statement has been presented in the former.
- Line 257-258, the GP and MP should be listed as full names when they appear for the first time.
- In Figures 2 and 7, based on the terms commonly used, the drought levels regarding the "serious" should be revised as "severe". Of course, the same statement about this need to be changed throughout the manuscript.
- In Figure 2, I think the title in purple color should be changed to "Constructing response model of ecological drought to meteorological drought"
- In the caption of Figure 7, the "different levels" should be pointed out to increase the readability, e.g., (a) extreme, (b) severe, and (c) moderate. Please check it.