HESSD

Interactive
comment

Interactive comment on "A discrete wavelet spectrum approach to identifying non-monotonic trend pattern of hydroclimate data" *by* Yan-Fang Sang et al.

Anonymous Referee #1

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Thank you for the opportunity to review "A discrete wavelet spectrum approach to identifying non-monotonic trend pattern of hydroclimate data" by Sang et al. The paper indicates that non-monotonic trends found by a discrete wavelet spectrum (DWS) approach can have higher significance than the trends identified by a Mann-Kendall (MK) test. The paper also demonstrates the DWS approach using two synthetic time series that have a lower-frequency periodic component and higher-frequency "noise", and time series of temperature and potential evaporation in China.

The method section seems to be the main contribution of this paper, but it is a bit terse and would be challenging for someone not familiar to wavelets to understand the approach. Wavelets are described in many papers and textbooks, but the use of wavelets

to identify trends is not common in hydrology. It would be helpful to provide the reader with more background information so the reader can understand why certain decisions are being made here. That is, methods have few equations and have short statements of the assumptions that go into the choice of equations. The following comments identify specific locations of the text where the reader could use more information on the methods.

Line 121: It would be helpful to the reader to provide background on decomposition M and why this is important for identifying a trend. Please consider adding some background on the decomposition level and why the largest level has a temporal scale that is L, the length as the time series. More specifically, why the largest level could be considered to be a trend. It could be noted that a smaller temporal scale could be important, and the decomposition level can be calculated as log2(T) if T is a temporal scale other than L, the length of the time series.

Line 126: Can you indicate which wavelet is used in this analysis?

Line 140: The text says that a spectrum is needed. Can you explain why E(j) is needed for each sub-signal?

Here are comments on various parts of the text.

Line 82: This is a good opportunity to add references to prior studies that document the DWT approach for trend estimation.

Line 90: Can you add more description about which common practice is disobeyed?

Line 135: Other studies have described similar approaches to identify a deterministic trend using DWT (e.g. Kallache et al., 2005). Could a stochastic component be added using the framework presented here?

Line 137: This statement is subjective. Can you add references here to show why you are assuming that these methods are reliable and reasonable? What is your criteria for what is reliable and reasonable?

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Line 145: Please consider omitting the word "obviously." This is subjective and the result may not be obvious to everyone.

Line 180: This statement has no supporting information. Please consider deleting this sentence.

Line 227: Can you provide an explanation of why the DWT approach has a different level of significance for different data lengths than the MK approach? The benefit of the DWT approach doesn't seem to be fully explained unless you describe the reason for it to be more stable than MK.

Various parts of the text say that a result is "interesting." Please try to omit this term, and let the reader decide which results are interesting.

Figure 1: Please consider adding the numbered steps from lines 159 to 178 to the flow chart. It may be difficult for some readers to relate the numbered steps to the steps in the flow chart. Why are the DWT equations shown at the top of the flow chart? These equations are already part of the first step on the upper left of the flow chart. Figure 3, can you provide more guidance on how to assess the significance at different data lengths? It appears that the DWS is significant when it plots above the 95% confidence bar in the blue lines. Can you provide more guidance?

References: Please add publication year to each reference.

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