

Interactive comment on “A standardized index for assessing sub-monthly compound dry and hot conditions” by Jun Li et al.

Anonymous Referee #1

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Understanding the compound dry and hot events is very important to human being society and environments. This study proposes a new compound drought and heat index on daily scale, SCDHI, based on SAPEI and STI. This index is useful to quantify sub-monthly characteristics of compound dry and hot events. The topic is very interesting and suitable for HESS. I recommend the manuscript for acceptance with a minor revision. The detailed comments are provided below:

- 1) This study focuses the non-arid areas in China. Is SCDHI suitable for the arid areas?
- 2) There was a similar index for characterizing CDHEs (Hao et al., 2020). I suggest the authors to discuss the difference between this study and the study of Hao et al. (2020), and highlight the novelty of this study in the Introduction section.

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Hao, Z., Hao, F., Singh, V. P., Ouyang, W., Zhang, X., & Zhang, S. (2020). A joint extreme index for compound droughts and hot extremes. *Theoretical and Applied Climatology*, 1-8.

- 3) Why is the growing season selected to identify CDHEs in Section 3.3? Please explain a little bit more on it.
- 4) Abstract: the regional difference exists in the future change of the CDHE characteristics. The authors may want to add this in the abstract.
- 5) P143: how reliable is interpolated data based on the kriging method? Did the author evaluate the interpolated 0.25-degree data?
- 6) P152: what is the standard number of GB/T 20481-2017? It would be clearer if the authors add some more information on it.
- 7) P155: soil moisture data in different depths is available in the GLDAS product. Why did the authors choose the root zone soil moisture to evaluate the drought indices? How about soil moisture in the surface layer and in total column?
- 8) P163: the resolutions of eight climate models are different. Are the results from these models resampled to the same resolution?
- 9) P164: five is missing after phase.
- 10) P448: what does the national weather reports look like? I did not see the information on the two CDHEs from the national weather reports.
- 11) Figs. 3 and 5: is soil moisture is represented by the standardized anomaly? If yes, please briefly describe this. And what is the solid black line all the way from the beginning time down to the ending time?
- 12) Figs. 4, 6, and 10: please add the longitude and latitude on the figures.
- 13) Fig. 8: I cannot see the difference among three panels in the last line. Is it because

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an inappropriate colorbar is used?

14) Figure 11d): the numbers 1.8 and 2 in the colorbar are placed wrongly. They should be exchanged.

15) Figs. 12 and 13: is the historical period used here 1961-2005 or 1951-2018? The authors mentioned that they obtained the model outputs for the 1961-2005 period in Section 2.1. However, the 1961-2005 period does not show up in the results. And is the historical data from the CMIP5 climate models or from the interpolated observations? If the observational data is used as the reference, how the authors resolve the resolution difference between the observational data and the model results?

16) Please check through the manuscript and correct all the grammar mistakes.

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