Comment on essd-2021-399
Anonymous Referee #1

Referee comment on "A global drought dataset of standardized moisture anomaly index incorporating snow dynamics (SZI\textsubscript{snow}) and its application in identifying large-scale drought events" by Lei Tian et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-399-RC1, 2021

This manuscript introduces a drought product with a multitype and multiscalar drought index, SZI\textsubscript{snow}. The SZI\textsubscript{snow} dataset considers a relatively comprehensive extent of the hydrometeorological variables associated with drought development. It uniquely incorporates snow processes in the derivation of a drought index. This consideration is important as global warming has been affecting hydrological processes over the snow-covered regions. The dataset was evaluated across different spatial scales. The result shows the SZI\textsubscript{snow} has good performance over the snow-covered regions. The dataset was also used to survey the evolution of large drought events with the severity\-area\-duration method.

The topic of the study is interesting and well fits the scope of the journal, especially for this special issue. The manuscript is well written, logically organized, and the details of the derivation of the SZI\textsubscript{snow} are easy to follow. The data processing is careful and well documented, and the dataset was friendly to access. However, there are still some concerns that need to be addressed. Thus, I am supportive of the publication after a minor revision to further improve the quality or make it more clear for the readers to understand the results. Below are my suggestions:

General comments

#1 The main improvement in the SZI\textsubscript{snow} is the consideration of snow related processes, thus it is reasonable that the SZI\textsubscript{snow} in the snow-covered basins have a better performance than that of SZI as shown in Figure 3. However, I found that both the SZI\textsubscript{snow} and SZI have a similar performance over the snow-free basins. Please clarify this similar performance.
#2 The evaluation of the SZI\textsubscript{snow} is important compared to current drought indices (for example the scPDSI). Besides the SPI, I think the scPDSI is also a good index to assess the meteorological drought. Thus, it is necessary to evaluate the performance of SZI\textsubscript{snow} to capture meteorological drought compared with other indices instead of only with SPI. This can help to confirm the robustness of your conclusion.

**Specific comments**

#1 Is it possible to include the acronym of your new drought index in the title? Such inclusion can enhance the recognizability of your dataset and facilitate others to cite and employ your dataset.

#2 I suggest adding the spatial resolution of your dataset in the Abstract section.

#3 The author listed various current drought indices in Figure 1. Please make sure the corresponding references of these indices are supplied in the manuscript.

#4 Line 38: Correct the “focus” to “focuses”.

#5 Line 288: Did the two subplots in Figure S3 have identical contour levels and color bar? If did, please remove one color bar.

#6 Line 144: Consider adding a comma after the introductory phrase “meanwhile”.

#7 Line 300: What does the shading in the Figure 4d panel mean? It should be clarified in the Figure caption. The inset of the Figure 4d panel seems not clear to me, you can increase the resolution of your figure.

#8 Line 315: Did the subplots in the left and middle columns of Figure S3 have identical contour levels and color bar? If did, please remove one color bar.
#9 Line 330: Some corner strings (e.g. "a", "b" in panels) are bolded, but some aren’t. Please keep the format of these strings consistent across the manuscript.

#10 I recommend adding the values of trends in Figure 7 so that the reader can know more information from the figure.

#11 Line 352: It is a good way to use a country to describe the area of a drought event. Please add a number to show how large is the size of Guatemala.

#12 Line 400: The Interdecadal Pacific Oscillation just appears one time, it is not necessary to provide an abbreviation for it. Please correct the same problems throughout the manuscript.

Dataset

I downloaded the compressed files including all the files from http://doi.org/10.5281/zenodo.5627369. With the software of “ncdump” and “Panoply”, I checked the data files and had no problems to read and visualize the data. All the data is consistent as they were described in the manuscript.

Here I give some recommendations to improve the user-friendliness of the proposed dataset.

#1 The compressed file with a suffix of “.zip”. Is it possible add an introduction about how to unzip this kind of file?

#2 The SZIsnow datasets have different timescales, thus, months before the timescale are set as missing values. It would be nice to give a clear introduction about the missing values in your dataset.