

Earth Syst. Sci. Data Discuss., referee comment RC3
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Comment on **essd-2021-399**

Anonymous Referee #3

Referee comment on "A global drought dataset of standardized moisture anomaly index incorporating snow dynamics (SZI_{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-RC3>, 2021

Tian et al. proposed a drought dataset for indicating drought across multiple categories and temporal scales. The proposed SZI_{snow} dataset includes different physical water-energy processes, especially snow processes. The evaluation for different spatiotemporal scales indicates the dataset can distinguish different types of drought. The SZI_{snow} shows superior performance over the cold regions. In addition, the dataset successfully described large-scale drought events over the world.

The purpose of the proposed work is clear and essential in order to establish a drought dataset including snow information for other studies related to drought. The manuscript is generally well-structured, the method description, evaluation, and data availability were well-written. However, several points should be addressed in the revised manuscript. I offer comments below in the hope this can be used to improve the paper further.

Major comments

First, in lines 102-103, the author stated that the GLDAS-2 drives the Noah land surface model (LSM), forced by the global Princeton meteorological forcing data, to approximate the observed land surface state. However, the Noah is not the only land surface model used by the GLDAS-2. I get the information from the URL: <https://ldas.gsfc.nasa.gov/gldas>. Could you explain why you chose the Noah model? Are there any differences among these land surface models? Second, the author adopted the log-logistic distribution to standardize precipitation, streamflow, and soil water storage to compute the Standardized Precipitation Index, Standardized Streamflow Index, and Standardized Water Storage Index. As I know, other probability distributions can be used to standardize. Are your evaluation results independent of different methods?

Minor comments

1) Lines 19-20, 22

Some numbers keep two decimals, and some do not.

2) Lines 99-101

Show some reasons to explain why the better performance of GLDAS-2 compared to that of GLDAS-1?

3) Line 140

I did not quite understand why the WER is regarded as a comprehensive drought indicator? What is a comprehensive drought indicator? Is there any definition for it? Please give more information.

4) Line 155

Did you evaluate the capacity of your dataset across different climate zones? I did not see these mentioned climate zones in the following sections of the manuscript. I guess you wanted to say that the evaluation was conducted over different geographical parts of the world. Please clarify this.

5) Lines 221-222

What is the name of dimensions in your 3D and 2D dataset? Please clarify this.

6) Line 273

It seems this content has been repeated in the main text. Delete it to make the caption more concise.

7) Line 353

Is the geographical extent of Oceania equal to that of Australia? Give an exact definition.

8) Why wasn't Greenland included in Figure 6? It seems all the Greenland are missing values.

9) When you did the SAD analysis, how to process the drought over the Sahara Desert?

Technical comments:

1) Figure 1: The font size of the description to compare the strength and weakness of each index is small.

2) Figure 4: The font should be the same, use one type.

3) Figure 6: The stippling seems unclear.

4) Figure 9: Please supply information on the geographic coordinate system used in this figure. It can help others to compare their results with yours.

5) Figure S2: Adjust the minimum value of the legend. There is no grid with a SZI_{snow} value less than -4.0.

Comments for the dataset

1) Table 1 in the metadata file should be kept the same as Table 2 in the manuscript.

2) Add information relative to the size of decompressed files in the metadata file.

3) I recommend providing a thumbnail of your dataset in the metadata file.

4) If possible, provide some scripts for potential readers to plot your data.