

Earth Syst. Sci. Data Discuss., referee comment RC2
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Comment on **essd-2021-399**

Anonymous Referee #2

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-RC2>, 2021

The authors developed a global dataset of standardized drought indicators incorporating snow information. They first evaluated the indicator and then employed it for the drought temporal-spatial analysis across the globe. This is an interesting dataset for the drought analysis at the global scale. I have several comments as follows.

Figure 1 In the box of hydrological drought. The advantage (green box) is "considers snowpack and water storage" and the disadvantage (red box) is "unsatisfactory performance over snow covered regions". What is the reason for the "unsatisfactory performance over snow..." if these indices already consider "snow pack"?

Figure 1 It seems the SZI addresses all the challenges of the indices mentioned in this figure. Is there any remaining disadvantage or limitation of SZI? Please clarify.

Lines 133: "We evaluated the ability of the SZI_{snow} and SZI to capture different" It is generally hard for a single drought indicator to capture all types of droughts. Is the SZI designed to capture all drought types? □

Lines 201-202: Here P and P_{snow} are used to define the water supply deficit. This equation is only applied in regions and seasons with snowfall, right? What about other regions (e.g., tropics)? Do you use a different set of equations to calculate SZI?

Lines 244-245: Here the authors used SPI to evaluate the proposed index SZI_{snow} . SPI mainly reflects precipitation-related droughts. There may not be snow information in SPI (it does not incorporate snowfall, right?). How do we know a higher SZI_{snow} -SPI correlation reflects better performance of the proposed index? Please justify this.

Lines 294-295: It seems the proposed index performs better for long-time scales. Any specific reason for this? Please clarify.

Figure 6. This trend analysis for each grid is performed for the annual time series? Or for a season? Please clarify.

Figure 7 Any speculation for the low SZI and high dry areas during 1985-1990?