

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1  
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## Comment on nhess-2021-193

Anonymous Referee #1

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Referee comment on "Monitoring the Daily Evolution and Extent of Snow Drought" by Benjamin James Hatchett et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-193-RC1>, 2021

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The paper provides a visualization of the progress of snow water equivalent and simultaneously precipitation which allows to determine onset evolution and termination of snow drought this work contributes to monitoring and managing snow droughts the presented approach is an improvement to single date approaches. It also presents an implemented application of the approach in the western US snow monitoring (web tool). I think the approach is very useful and should be disseminated. I really appreciate the idea to not stick to a calendar day to define snow status but rather using the evolution and setting it in perspective to the longterm expectation to be able to define a drought. The paper is written clearly and has a logic structure, however I have some comments that the authors might want to consider before publication.

### Main comments

- While I really like the proposed visualization using phase diagrams to simultaneously track snow pack and precipitation, I think the paper does not advertise the approach enough. The opportunities that are opened by using the phase diagrams to visualize could be even more clearly presented. That is in my opinion not because it is not written but because it is hiding a bit in the many "side stories" in the paper. For instance, now there is relatively much space given to the description of the web-based tool, which I would keep rather short to better present different opportunities these method offers beyond the application it already has in the web tool. On this line, the authors could also clearer discuss, e.g., the impact of the snow evolution on summer low flows; is there a effect in summer at all?
- Since not everywhere in the world there is such a snow measuring network like SNOTEL it would be good to put the comparison of station two gridded snow data a bit more in focus which makes this approach more interesting for areas without dense station network.

- The authors might consider and discuss for which region regions of the world the presented approach might be a useful approach this is not everywhere the case because winter precipitation is the main driver off summer flow conditions (e.g., Jenicek et al. 2016)
- How sensitive are the seven days longterm that are used to define the drought via quantiles should that be per calendar day or rather day of progress of the snowy season, i.e. day after start of season?

### **Minor comments**

L21 add that for some areas this very much depending on the climate see for example Jenicek et al. (2016) as opposed to Godsey et al. (2014) where that is true

L96 regarding the percentiles does this really reflect drought severity as it does for precipitation i.e. are the same range is adequate for snow data?

L382/3that a drought onset is approximately at 85% of median snowpack should be made mentioned earlier in the article.

Figure 2 left panel: I would suggest to put the annotations outside the plot and just add a line pointing at the labeled parts particularly under the left side of the plot it is very dense and is better readable outside the plot; right panel: Some of the text is hard to read consider larger font or darker color

### **Technical comments**

L9 add with before streamflow

L22 "in efforts of 89% of areas western United States" please reword not clear

L23 change "will" to "are predicted to"

L30 defined or not? maybe rather use roughly or about

L41 to be for varied user groups

L44 allows -> allow; "track their" referring to signals? Not clear

L41-44 consider breaking the sentence into for better readability

L46 remove also before demonstrate

L58 add reference to Table 1

L64 What was the motivation to use this station? Why not one for each snow climate?

Figure 1: is it possible to push elevation legend bar down a bit?

L68 add space before "Phase "

L69 is -> are

L77 are -> is

L104 remove the before 31

L 427 National Weather Service specify that this is for the US

#### References:

Godsey, S. E., Kirchner, J. W., and Tague, C. L.: Effects of changes in winter snowpacks on summer low flows: case studies in the Sierra Nevada, California, USA, *Hydrol. Process.*, 28, 5048–5064, doi:10.1002/hyp.9943, 2014.

Jenicek, M., Seibert, J., Zappa, M., Staudinger, M., and Jonas, T.: Importance of maximum snow accumulation for summer low flows in humid catchments, *Hydrol. Earth Syst. Sci.*, 20, 859–874, <https://doi.org/10.5194/hess-20-859-2016>, 2016.