1. Title

On the time scale of meteorological, soil moisture, and snow drought indices to assess streamflow drought over catchments with different hydrological regime: a case study using a hundred Chilean catchments

2. Research question

From abstract and introduction

- i) what temporal scales of (the frequently used and easy to calculate) SPI and SPEI meteorological indices can be used as proxies for streamflow drought in catchments with different hydrological regimes?
- ii) considering that the soil acts as a natural reservoir to maintain streamflow during periods of reduced P, can a soil moisture drought index be used to assess streamflow droughts instead of the SPI and SPEI meteorological indices?
- iii) considering that snowmelt is an important moisture contribution to streamflow and surface water availability during spring and summer months in catchments with a pronounced snow influence, can a SWE (Snow Water Equivalent) index be used to assess streamflow droughts instead of the SPI and SPEI in those catchments?

3. Goals

From introduction and research question

- To define temporal scales for SPI and SPEI for using them as proxies for streamflow droughts in different hydrological regimes.
- To evaluate the suitability of a soil moisture drought index for using it instead of SPI and/or SPEI meteorological indices to assess streamflow drought.
- To evaluate the suitability of SWE index to assess the streamflow droughts in snow-influenced catchments.

4. Findings

From abstract

- i) there is no single meteorological, soil moisture, or snow drought index and temporal scale that could be used to characterise all streamflow droughts across Chile, and
- ii) the greater the snow influence in a catchment, the larger the temporal scale of the drought index to be used as proxy of streamflow drought.

5. **How do you rate this paper in absolute terms? Poor to fair, good, very good to excellent.**

Good to very good.

6. **Recommendation.**

My decision is between “accepted after minor revisions” to “accept without changes”.

7. **Confidential comments to the editor**

The paper has been well written: the results are clear (however, some improvements are still possible), well presented, and explained. The research questions are pertinent because it is necessary to improve the understanding of drought propagation in the hydrological cycle.

The proposed minor changes in the document (in “comments to the author”) do not affect the paper quality. Also, I made some specific questions that must be easily answered by the authors.

That is why my decision between “accepting” and “accepting after minor changes”.

8. **Comments to the author**

I had a hard time following the explanation of the results of the Spearman correlation analysis. What variables were compared in this analysis? I believe it is easier to present these results in a table, preserving the text explanation. The text alone makes it tremendously difficult to understand what is meant.

9. **Questions**

How do you feel about your assumption that the SSI-1 is the most representative of streamflow deficit conditions for the several catchments? Is it possible that catchments with higher storage (e.g., snow-influenced basins) should characterize their hydrological droughts with SSS for longer durations? Why yes, or why not, do you believe that SSI-1 is suitable for all your catchments?

You say that SSI-1 integrates catchment-scale hydrological processes. I think that it would be feasible for Chilean catchments ¿Is it (the SSI-1) suitable for larger catchments than those catchments in Chile? ¿Do you think that SSI-1 integrates the catchment-scale processes in larger basins?

Is the SWE suitable for all snow basins in Chile??? If the answer is no, ¿is that the reason why the spatial scales 1, 3, and 6 months were selected?

Is it possible to use other linear or non-linear analyses to establish the relationship between the indices and SSI-1? Correlation analysis gives a first look at the relationships, but it is a linear version of the analyses. It may be that non-linear relationships that are possibly hidden in the treated data cannot be seen. Here a question arises: is the Event Coincidence Analysis (ECA) strong enough as an alternative method of assessing the relationship between droughts and their triggers? ¿Why?

In the case of the ECA, ¿were the same thresholds selected for the several indices? That is, if moderate hydrological drought events were selected in the SSI-1 (SSI-1<-1.0), it was assumed that they were triggered by moderate meteorological/soil/snow events (e.g. SPI<-1.0, SPEI<-1.0, ...). ¿Do you consider merging the severities of hydrological and meteorological/soil/snow droughts? (e.g. that some severe droughts SSI-1<-1.5 are triggered by moderate meteorological droughts: -SPI<-1.0, or SPEI<-1.0-).

Pag. 13, you say:

While the analysis was done for diverse lags, the cross-correlation values and precursor coincidence rates, decreased gradually from zero lag (lag = zero months) to a lag of 12 months.

¿Is true that sentence for all the analyzed catchments? If the answer is "yes", ¿what do you think is the process that drive the flow in the catchments? The response is especially interesting in the nival and nivo-pluvial catchments, where the runoff should be delayed some weeks with respect to snow precipitation.