Response to the editor for hess-2023-246

We are very grateful for the comments and suggestions from the reviewers that contributed to improving the manuscript. We appreciate the time they spent to evaluate our work. All comments were taken into account and were individually addressed. Note that answers are in blue and sentences added/adjusted in the manuscript are in quotation marks. Lines and figures numbers are to be understood in reference to the first submitted manuscript, so as to be consistent with the reviewer's comments.

Responses to reviewer #2

R. 1. Reply to my general comments 1 and 5: I thank the authors for their explanations to my questions regarding specific methodological choices (i.e., use of multiple variables in the breakpoint analysis and seasonal resolution). I would suggest the authors briefly add their arguments also in the manuscript, to clarify these points to all readers as well.

Authors: We appreciate the suggestion of the reviewer and in response, we have incorporated methodological justifications into the methods section. Addressing general comment 1 concerning the selection of low-influence reference periods, we have revised the sentence in line 152 from *"By employing this approach, we ensure the selection of streamflow breakpoints that are not predominantly influenced by climatic variations"* to *"breaking points in both streamflow and human activities time series, while ensuring the absence of discernible precipitation shifts. We analysed multiple variables instead of using only water use data to achieve a more robust selection of the training period. This reduces the effects of inter-basin water transfers and land cover changes, which may obscure the ability of water use data to accurately capture the magnitude of anthropogenic intervention in the basins."*

Regarding general comment 5, we have addressed this by adding the following text in lines 204-208 of subsection 2.4 (Hydrological drought events characterization): *"In this way, we assessed the influence of human activities over observed hydrological droughts by calculating the relative difference in each drought characteristic (DC) in the observed and near natural scenario. To keep consistency with the attribution methodology (Sect. 2.3), drought events were characterised at a seasonal scale, as indicated in Eq. 5."*

R. 2. Reply to my general comment 4: I am glad to see that the authors agreed on the hint of the event-scale analysis to get novel insights on human influences on hydrological drought characteristics during prolonged droughts, and with their additions on that in Sections 2.4 and 3.4. In my opinion, adding some discussion in Section 4 on the results of this analysis and their consistency with other findings – from either previous literature and the current study - would also be nice. Regarding the new Table 3, I recommend to double-check the headings, as I assume they should be the same as in Tables C1–2, and revising the number of digits reported (here and elsewhere, to make the numbers reported in the text easy to grasp from the tables as well).

Authors: In response to the suggestion of adding a discussion in Section 4 on the results of this analysis and their alignment with existing literature, we have incorporated relevant discussions in Section 4.1. Specifically, lines 382-396 now emphasize the following:

"Despite a general decrease in the impact of human influence on streamflow reductions between the pre-megadrought and megadrought periods, the Limari, Choapa, and Aconcagua basins show a relatively stable human contribution to drought characteristics before and during the megadrought, while the Elqui basin experiences a notable increase in human contribution. These observations highlight two key insights. First, they suggest that human activities have a greater influence on drought conditions and characteristics than the solely relative impact of human activities on total streamflow reductions. In the context of meteorological drought, increased and inelastic human water demand exacerbates streamflow reductions, causing them to exceed hydrological drought thresholds in terms of both magnitude and frequency. Second, the increase in human contribution to drought characteristics in the Elqui basin leads it to similar patterns of hydrological drought conditions than the other basins, despite having lower precipitation deficits. This suggests that the role of human water demands is particularly relevant in semi-arid basins with limited precipitation and high interannual variability in terms of precipitation regime, such as Elqui. Consequently, highly intervened basins in semi-arid regions are more susceptible to experiencing severe hydrological droughts during periods of precipitation deficits. These findings align with the observations of Huang (2016), who highlighted that sustainable agricultural development is threatened in arid and semi-arid regions due to limited available water resources, and with Saft et al. (2016), who demonstrated that aridity is a crucial factor influencing streamflow sensitivity to interdecadal climate variability."

Regarding the headings of tables and number of digits reported. We have revised Tables 3, C1, and C2 for consistency in headings. Additionally, we have ensured uniformity in the number of digits reported across all tables, establishing two digits after the decimal point for clarity and ease of comprehension.

R. 3. Reply to my specific comment 2: I assume the second part of the reply is intended to be the addition in Section 4.2.3, even though it is not formatted as the other additions and I cannot see it in the abovementioned section. I encourage the authors to double-check this point, if they really meant to add this paragraph to the discussion.

Authors: Thank you for bringing this to our attention. Upon reviewing our decision, we have indeed opted not to include the paragraph in question in Section 4.2.3. This decision was made after thorough consideration, as the topic of glaciers was not previously addressed or problematized in the text. Therefore, it was considered more appropriate to maintain coherence within the discussion section by refraining from introducing new topics that had not been adequately introduced earlier in the manuscript.

R. 4. I think that the novelty and relevance of the work for the international community could be stressed better throughout the manuscript (see also the introduction of my first review).

Authors: In response to the reviewer's suggestion we have revised the conclusions to better highlight the significance of our findings. The last paragraph of the conclusion now reads as follows:

"This paper demonstrates that during long and persistent dry periods, human activities in basins in central Chile have intensified drought propagation, by increasing both the intensity and the duration of hydrological droughts. This highlights the importance of understanding the impacts of human activities on drought propagation, and to consider such evidence in water management policies. In particular, to prevent implementing maladaptive measures, the feedback loop between water usage, human activities, and the hydrological system should be considered in the adaptation strategies. These considerations are particularly important not only in Chile but also in other regions worldwide, where the dry signal is consistent and expected to persist."