Earth Syst. Dynam. Discuss.,
doi:10.5194/esd-2016-57-RC1, 2016

Earth System Dynamics Discussions
Open Access
EGU

Interactive comment on "Multi-method assessment of reservoir effects on hydrological droughts in an arid region" *by* S. Rangecroft et al.

Anonymous Referee #1

Received and published: 19 December 2016

This paper study the anthropogenic effect of the Santa Juana dam on drought in the Huasco basin in Chile. The Standardized Indices (SI) and Threshold Level (TL) method with different thresholds are applied to observed and modelled data. The study illustrates the effect of the Santa Juana dam on different characteristics of the drought, including duration and intensity. Also, the performance of the SI and TL method on the observed and simulated data is compared. The topic of this manuscript is interesting, as reviewer found the study was more like to investigate the reservoir operation and reservoir's capability on mitigating drought conditions instead of drought monitoring and prediction. The current manuscript suffers from some major issues as reviewer listed below.

Major comments: 1. Motivation: Reservoirs are able to change the patterns and magnitudes of streamflow. This is an unknown fact. Reviewer is unclear about the experiment

Printer-friendly version

Discussion paper

design of this study. If both observed and simulated results shown reservoir was able to delay the timing, frequency or magnitude of drought events, then this again is a re-state of known fact. Therefore, how this study can be used for more efficient reservoir operation or planning for droughts events still have questions. Authors are suggested to summarize more about recent published paper in WRR and GRL to better formulate the motivation of this study. (search key words: reservoir operation, water allocation, drought conditions).

2. Motivation and Organization: The introduction has described why drought is important and previous studies focusing on the relationship between human activities and drought conditions. However, reviewer find it difficult to understand the contribution of this study with respect to those mentioned studies in this manuscript. What is the scientific problem that this study is trying to solve and how this study will contribute to those existing findings about human activities amplified or alleviated drought condition? Reviewer believe this study is not targeting on methodology advances rather than application of certain existing analytical methods to a case study in Chile. Then, the question become how this application is unique and novel as compared to the uses of similar techniques to analyze the functionality of reservoirs on droughts.

3. Justification of results: In results section (line 337-338), authors also quoted that "This temporal difference between observed droughts upstream and downstream reflects the impact of human activities, also observed in other studies (Assani et al., 2013; Liu et al., 2106)." Then, the explanation is needed to justify in what aspects this study will differ from others?

4. Justification of results: The "human-influenced" results only reached NSE=0.454, which is a rather poor performance. Considering the temporal resolution (monthly) and the length of analysis (over decade), this NSE value lacks proper accuracy to represent any simulation of human activities. This critically undermines the main motivation of analyzing the functionalities of reservoirs in alleviating drought conditions.

5. Justification of results: line 15, “A delay in timing of drought events has been observed also with the presence of the dam” how is this being illustrated in the results and conclusion as this is one of the main concluding remarks in the end?

6. Experiment Design: Reviewer also found it is confusing about the experimental design. For instance, in Figure 4, both daily data from 1965-2013 for upstream discharge (this becomes reservoir’s inflow) and downstream discharge (reservoir’s outflow) were used in the “pre-dam versus post-dam” scenario. The results for the first scenario was compared with a “naturalized versus Human-influenced” scenario as shown on the right panel, in which the resolution of data become monthly and coverage of data starts from 1960 to 2010. It is confusing, or lack of explanation why different resolution and lengths of data were used and compared. Isn’t that Pre-dam the same as Naturalized, and Post-dam is human-influenced?

7. Experiment Design: Reviewer noticed that the length of the observed data and simulated data are different (Figure 5, 6, and 7). Any comments on some drought events happened after 2010 as many figures are showing a significant decreasing trends during the recent years?

8. Clarity and Presentation: A general overview of the WEAP model (inputs, output, general structure. . .) can give better understanding of the result section, as the author mentioned variation in water use as the reason for the performance of the model.

9. Support of Conclusion: Line 575-592. This section again states some already known facts of reservoir operation, and the functionality of reservoir in mitigating droughts. One argument authors drawn was on reservoir has capability of mitigating short-term drought, and has limited capability for multi-year droughts. This is not a surprise and it is due to the sizing of reservoir and local hydrology. None of the reservoir in the world will have unlimited resiliency for extreme water supply conditions. What is the uniqueness of the selected reservoir in Chile? and what the novelty of using author proposed methods to identify something already known?

10. Support of Conclusion: Last but most importantly, authors started the manuscript with a very new terminology of “anthropogenic drought”. This is true for deforestation, urbanization, and ground water over drawing or human actives induced temperature/CO2 increases. However, this manuscript focuses on analyzing the modelled and observed data prior and after a single reservoir built in Chile. The scope of work falls better into reservoir operation, and drought mitigation by reservoir releasing strategies, instead of anthropogenic activity induced drought conditions.

11. Some English grammar issues such as:

Line 12: which basin? Line 76, “It is currently unclear on what is the ....”, the word “on” seems to be extra. Line 389, “including a having of average duration and deficit volumes with the presence of the dam” is not clear and need to be restructured. Line 500, “in which it they have”, the word “it” seems to be extra

In closing, reviewer cannot agree this manuscript been published given the fact that the current content suffers from many major issues, including the motivation, design of experiments, justification of results, support of conclusions, clarity and presentation, as reviewer listed above.

Interactive comment on Earth Syst. Dynam. Discuss., doi:10.5194/esd-2016-57, 2016.

Printer-friendly version

Discussion paper