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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Automatic design of basin-specific drought indexes for highly regulated water systems" *by* Marta Zaniolo et al.

Anonymous Referee #2

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The manuscripts provides an excellent contribution to the field for characterizing basin-specific drought conditions within a powerful framework that offers automation, replicability and flexibility. This is particularly useful in applying the approach in management (and planning) decisions at various temporal and spatial scales including reservoir operation, hydropower generation and water allocation among various users and the environment. An fine review on drought types, commonalities and differences is a good compendium to cite for research and educational purposes. The two algorithms presented in the selection of predictors, target variable and index subsets is a great contribution to the field which is often dominated by standardized indicators of droughts that may lack relevance in a local basin context where other confounding factors including regulations, water rights, environmental constraints and long-time operation rules merit

representation. That said, the manuscript would benefit from a better presentation of results, minor editorial improvements and some more detailed explanation of some of the calculations involved in estimating the index. In what follows, I provide some recommendations for improvement.

Major Issues

1. One of the major issues in the manuscript is presentation of the final step, the drought index. There is a strong disconnect between what is presented in figure 2 and the calculated index? It is clear the at the linear model was a a balanced way to obtain the supply deficit and 'the index'. Is the automated index the supply deficit? Fitness is really good compared to the well-established State Index but how it all fits together considering the different units and how are things calculated? This might seem like an unnecessary question but it is important to present with clarity the fundamental outcome of the approach .

2. Likewise for Table 2, how are these weights applicated? Elaborate on the exclusion of Moy in the weight and how is brought back so is taken into account. IF this is too much detail for the main paper consider an appendix for 1 and 2 above.

3. The set of conclusions are succinct and useful. However, I would highly recommend to comment before (or as part of these) the cases in which this approach may not be suitable. What are the challenges in obtaining predictors and developing computations, and where the approach presented in the paper which is actually promising moving in the field.

4. Perhaps offer an online supplementary material section in which users can play with the approach. I found it very suitable for an educational setting and in helping basins worldwide in organizing information to characterize drought. Even when some of the algorithms require a fair amount of training from the users, having a pre-processed repository would be of great service to the community.

5. From what I understand, supply deficit is the target variable. Description of it and its connection with the indicators of the basin is poor. So I encourage the authors to improve it in the paper to make it easier to follow how do we go from predictors, Pareto optimal sets, to index estimation (see 1 above) and and tests.

Minor Issues

1. I through revision of the abbreviations/acronyms in the paper is recommended. Examples: MOEA, ELM, CHJ.

2. Abstract, explain how it that traditional drought indexes fail to detect events. Not in the abstract but in the opening of the paper or the contributions section of the paper.

3. paragraph line 25, Why is the Jucar index superior to other approaches? What is the basis for comparison?

4. LIne 33, are the $100 billion for all Europe, over the time period? What does this mean in terms of GDP or other indicators? PUt some context to it otherwise is useless. What sectors are included what type of impacts?

5. line 37 what is meant by economic damage?

6. A graphic showing the four types of drought described would be very useful although not the main objective of the paper. Spatial, temporal, supply and demand, and involved sectors in a basin could be outlaid in the infographic.

7. Sentence starting in line 93 is awkward please break into more sentences.

8. The equation below line 230, should it be f4(Si) >= f(Sj)?

9. Line 320 as per comment above, elaborate on Ie performance.

10. How would a 'traditional index' e.g. SDI would perform in Figure 5? How are we making the case of both Ie and the developed automated index are better? Please elaborate.

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