Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "Water restrictions under climate change: a Rhone-Mediterranean perspective combining 'bottom up' and 'top-down' approaches" *by* Eric Sauquet et al.

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This comment was written by a student in the MSc course ESS 401 Current topics in Earth System Science at the University of Zurich, Department of Geography. The students were given the task to select a manuscript in review at one of the EGU journals and to write a review. I discussed this review with the student, and find the comments actually quite valuable. Therefore, I post the review here in the hope editor and authors will find them useful to improve the manuscript.

Best regards, Jan Seibert

In the study of Sauquet et al. the vulnerability of current drought management plans (DMPs) in the Rhône-Méditerranée (RM) are evaluated under future climate. To do so water restrictions (WR) from 2005 and 2016 and hydrological data from 1958 to 2013 were analyzed in 106 catchments to derive a framework to reproduce water restriction durations based on low-flow indicators. As the authors write in this framework socio-political factors that can influence the imposition of water restriction are not included. Based on the drought of 2011 a critical threshold of acceptable WR was defined to decide if the DMPs in the future will still be effective. The study aims to assess the effectiveness of current DMPs under climate change to be able to revise the DMPs for the most vulnerable basins. They find out that in temperature-sensitive catchments the water restrictions will increase significantly in the short term and that for this reason there is a need to adapt the DMPs. In the catchments where the precipitation determines the water restriction, they see difficulties to adapt the DMPS as the uncertainties in precipitation is high. They state in the conclusion section several points they did not include in their study but could play an additional role besides the analyses of water restriction duration influenced by temperature and precipitation. These are for example socio-economic system stressors like agricultural practices, population growth, water demand, etc. which also should be considered in the DMPs.

In my opinion, it is an important topic to discuss the reliability of current decision-making rules regarding water scarcity in the future when climate changes. The method used in this study can give a good overview of where there is a need to rethink the DMPs. But in my opinion, it would be quite important to take the socio-political factors into account in the framework to reproduce water restrictions. A further improvement would be if the economic system stressors would be included to evaluate the DMPs. Therefore the current method has still a lot to improve, and that's why it is not fully clear what the substantial contribution of this paper is. Further, I think the description of the method of the hydrological modeling and the framework to reproduce the water restrictions could be more detailed.

Detailed discussion of the manuscript Major comments:

P1-L22 and P16-L423: The four classes could be explained in P16-L423. The same for Figure 11 and 14, it would be easier to understand if each class would be shortly explained in the figure description.

P2-L54: Is the scenario-neutral approach the same as a bottom-up approach? The authors could use the word "bottom up" as well, as they use it also in the title and it is not used in the rest of the paper. Please clarify difference or similarity.

P4-L106 to P5-L120: In section "2.3 Hydrological data" it would be good if the 15 regimes suggested by Sauquet et al. (2008) could be shortly explained.

P5-L121 to P5-L126: In section "2.4 Climate data" Table 2 the RCP2.6, RCP4.5, RCP8.5 scenarios could be explained. And why is Terray and Boé (2013) not listed there as his projections are used in section "5.1 Definition of perturbed climate conditions to build WR response surfaces"?

P6-L163: Is duration d, the time used for deciding if water restrictions are imposed? In this case, I do not understand what is meant by 10d-VCNd(T) in p7-L171. In Figure 5 VC3 has a value for every day. Is it calculated from the last three days? Please clarify.

P7-L173: VC3 was selected, as it is the most common single indicators used in DMPs of the RM district. I might have missed something, but this seems not to be the case for the 15 test catchments chosen for the evaluation of the WR modeling framework. It is not clear for me how you can compare these different low-flow monitoring indicators with each other. This should be described clearer.

P9-L244: Are the 15 catchments used for calibration or only for evaluation? Please clarify.

P13-L343: It is not clear for me if the perturbation of the climate is based on different climate scenarios as RCP2.6, RCP4.5, RCP8.5 or which exact projection is used. In the reference Terray and Boé, 2013 the authors are using they are also talking of

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different projections. This needs to be clarified.

P19-L513 to P19-L518: The first two sentences of the conclusion would better fit in the introduction.

Minor comments: P3-L68: Why not saying Rhone-Méditerranée district in southeastern France to be consistent?

P3-L78 to P4-L95: In section "2.1 Study area" a map or a cross-reference to Figure 1 would help to get an overview of the area.

P4-L90: Why just speaking about the irrigation needs? It might be interesting to get the whole picture for what the water is used.

P4-L106: "2.3 Hydrological data" should be in bold.

P4-L109: I do not understand what the authors mean with "Time series including null values or gaps in the data records above 30% of time were disregarded". Does this mean one null value or 30% null values? Please clarify.

P10-L268: Figure 6 in the figure description: "Table 2" should be "Table 1".

P16-L426: In Table 5 in the table description please add where this standard deviation Sd is taken from.

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