

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

### **Anonymous Referee #3**

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The objective of the study is to develop a risk-based framework to simulate water restrictions (WRs) under climate change in Rhone-Mediterranean district in order to evaluate the vulnerability of current Drought Management Plans (DMPs) to future climate conditions. The proposed framework is based on the assessment of three components: sensitivity of WRs to changes in different climate factors, sustainability of WRs for users and exposure in terms of climate response surfaces.

General comments The paper presents an interesting topic. Although the applied methodology seems appropriate to some extent, it is rather unclear in some parts. Overall, I believe that further details should be added to the paper in order to support

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the interpretations and conclusions drawn from the analyses carried out by the authors.

#### Major comments

Section 3 For the sake of better understanding, I suggest to report the equations of low flow indicators and regulatory thresholds used in the manuscript.

Section 4.2 Details on the rainfall-runoff model should be added, with special reference to the way how the influence of reservoirs is taken into account.

Section 4.3 The description of the water restriction level modelling is unclear in some parts. For instance, I would expect that the comparison between simulated WRLs driven by GR6J data and historical WRs will provide a lower sensitivity score than the comparison with simulated WRLs driven by HYDRO data (considered as benchmark), but it's not (see Lines 287-290). Could it be a consequence of the fact that the model disregards socio-political aspects of the decision making-process?

These sentences must be better explained: lines 295-296- “Furthermore, GR6J performance under low-flow conditions show no statistical link with its WRL modelling performance . . .” lines 300-301 “. . .possible biases in rainfall-runoff modeling does not affect much the ability of the WR modeling framework to simulate correctly or not declared WRs” It seems that despite the difficulties of GR6J model in simulating low-flows accurately, the results of WRL modelling driven by GR6J data are good anyway. How do the authors explain that?

Section 5.3 Vulnerability is computed against a critical threshold. The latter is defined as the difference between the number of WRs simulated by the WR GR6J modelling framework for 2011 and over the baseline period. On the other hand, the Vulnerability Index is computed as the proportion (frequency) of RCM-based simulations that fail above the critical threshold. It sounds like a frequency is compared to a number. I believe that this step must be described in details. For the same reason, it is not clear how the black dotted lines representing the critical threshold are drawn in Figures 10

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and 14.

Section 5.4 With regard to the hierarchical cluster analysis for catchment classification at regional scale, the authors should specify the catchment characteristics considered to investigate similarity through the Euclidean distance (see line 421-424). Details on the CART model and its implementation should be added.

Technical comments

In Line 260, "VC3 is with 10d-VCN3(T) each day . . .", something is missing.

In Lines 273-274 "OBS WRLs are correctly reproduced by both GR6J and HYDRO simulations, but also can be consistent with OBS" (???). This sentence is rather misleading, I wonder if "OBS" at the beginning of the sentence could be a mistake and could be deleted.

In line 420: ". . . a classification (of what?) was conducted on to define typical response surfaces, . . .". Please specify.

In line 482: "come catchment" to be replaced by "some catchments".

In line 540: replace "precipitations" with "precipitation".

Missing references:

- Brekke et al., 2009 - Weib, 2011 - Schlef et al., 2018 - Gupta et al., 2009 - Kay et al., 2014

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