

## ***Interactive comment on “Accounting for dependencies in regionalized signatures for predictions in ungauged catchments” by S. Almeida et al.***

**Anonymous Referee #3**

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This paper presents a method to cope with the problem of using correlated signatures when calibrating rainfall-runoff model on regionalized signatures. This is a well-recognized problem often neglected in regionalization studies and the methodology proposed in this paper appears satisfactory to estimate the potential uncertainties stemming from using multiple (in)dependent signatures. The paper is well written, to the point and very convincing.

Below are some minor comments that, to my opinion should be addressed to improve the clarity of the text.

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Figure 4 suggests that the performance of the model constrained by signatures is relatively poor (median NSEprob around 0.6) whereas synthetic flows are taken as the reference. I am a bit confused by this result. Does this mean that the selected signatures are not informative enough to constrain satisfactorily the model parameters or does this stem from the uncertainties brought by the regionalization of these signatures? What would have happened if the ‘observed’ signatures were used instead of the regionalized ones?

The description of the model should include at least the time step and the number of calibrated model parameters. Besides, it is not clear how the parameters are sampled from the posterior when generating an ensemble of flow simulations. Are the correlations between parameters taken into account in this procedure?

The discussion proposed in section 3.4 is very interesting but could eventually be extended. With regards to the sensitivity of the results to the signatures used, I guess that the methodology presented in the paper does not allow removing uninformative signatures. One signature might be quite well regionalized but poorly informative for constraining the model and thus a methodology that gives more weight on well regionalized signatures might not be suitable in all cases. I fully understand that this is not the specific point discussed in the paper but since regionalization studies often focus on a specific flow range, the operational main question is which signatures are to be taken into account rather than how to avoid redundant information in the chosen signatures. . .

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