Interactive comment on "Adaptive clustering: A method to analyze dynamical similarity and to reduce redundancies in distributed (hydrological) modeling" *by* Uwe Ehret et al.

Anonymous Referee #2

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The main objective of this paper was to propose a new way to analyze hydrological systems using adaptive clustering. The study is interesting by dynamically identifying and clustered similar model elements. Representatives per cluster inferred the dynamics. Although the application of the proposed framework looks promising, additional investigations and explanations are necessary before this paper can be published in HESS. In the next sections, I outline my major comments and suggestions that should allow the authors to improve their manuscript. Thus, my recommendation is to be accepted after the following points are clarified: 1. The dynamic, comparability, and similarity were emphasized in the proposed framework for adaptive clustering. However, the definitions of dynamic, comparability, and similarity are ambiguous. For example, the

dynamic in hydrological simulation includes temporal dynamic and spatial dynamics. In particular, time scales for the application of hydrological models in the temporal dynamics are critical. 2. The main result of high redundancy in geology and climate information is obvious. The key reason is the intricately linear or nonlinear correlation among the subsystem. The technique of adaptive clustering extracts the nonlinear correlation but not nonlinear information. Further analysis of the nonlinear relationship between subsystems is suggested. 3. Only one basin, Attert basin, was studied. Moreover, Figure 2 and the relevant analysis did not elaborate on the geology and climate conditions, which are vital for the clustering of subsystems and hydrological simulation. The number of study areas is suggested to increase. The generalization of the framework proposed in this study is recommended to be demonstrated. 4. One critical issue is that the definitions of some technical terms were vague, such as aggregated characteristics and dynamics of such systems, co-evolution, catchment-uniform, and multi-criteria estimation. Please explain them in detail or replace them with easy-to-understand terms to enhance the readability of the study. 5. Unfortunately, the grammatical errors, confusing sentences, redundant vocabulary, and an erratic writing style hinder the message that the authors want to convey, and in some cases, render some statements ambiguous or even mistaken. I recommend that the authors encourage further to undergo a resubmission process. Data and methods section and results section are confusing, vague wording. I suggest elaborating on the description of the adaptive clustering. Otherwise, it is hard to understand how does analyze dynamical similarity. The main steps in 2.2.1 section are suggested to describe in points. 6. The resolution of Figure 2 is low. The information cannot be extracted. The explanation for Figure 3 and Figure 4 is difficult to understand. 7. In the data and methods section, excessive writing space is used for introducing the SHM model and its structure, which are not vital in this study. The structure of this article is suggested to adjust and enhance readability. In the results and discussion section, the principal results and conclusions are suggested to summarize briefly. 8. How to estimate the weights in Eq. 12? I think weight has a significant influence on the streamflow simulation in different

phases, which is essential for the applicability of the proposed framework. Moreover, the Nash-Sutcliffe efficiency only prefers the simulation accuracy of high flow. 9. How to identify and estimate the representatives which have a strong influence on the performance of adaptive clustering. 10. Importantly, the mechanism for the improvement of model performance was not discussed. For example, What operations lead to improvements in model performance (also involving high flow, middle flow, or low flow)?

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