Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2018-273-RC2, 2018

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Dealing with non-stationarity in sub-daily stochastic rainfall models" *by* Lionel Benoit et al.

Anonymous Referee #2

Received and published: 2 July 2018

This article suggests a novel approach of rainfall typing that can be applied on a series of radar rainfall (or any pixlelated) data.

My major concern on the suggested approach is as follow:

About the main idea:

1. The authors suggests that a rainfall type can alter from convective to frontal, or the other way around. I suspect whether this assumption can be verified (did you find any supporting literature?). I do not think that the similar conclusion would have been drawn if the authors adopted a Lagrangian approach instead of the Eulerian approach of fixing spatial window.

About the classification model:

2. Are the 10 rainfall characteristics used to parameterize each rainfall imagery independent? I suspect validity of the 10-dimensional Gaussian mixture model because most Copula tend to show awkward behavior as its dimension exceeds 2. Would you show a way to validate the GMM model you developed?

3. I do not believe that the distribution of all 10 variables used for GMM classification has a normal distribution, which is a fundamental model assumption. For example, most rainfall intensity in a time series (in your case, it corresponds to the II-2) has a skewed distribution. You may want to use a type of transfer function to convert the original variables to be normally distributed, and then run the GMM classification algorithm.

4. If you cannot validate the previous two points, I suggest you perform the principal component analysis to extract the principle variables, and then apply a simpler clustering algorithms based on the Euclidean distance (e.g. K-means clustering, Hierarchical clustering).

About the method of validation:

5. I believe that the result will be much more stronger if the analysis is performed on the years of the radar rainfall data at multiple locations. I agree with the view of the authors that the absolute validation of the result is not possible because we cannot see the nature thoroughly. However, it cannot be an excuse of not validating your model for a variety of situations.

6. In this view, running a sensitivity analysis will be more helpful. For example, you can change the size of the spatial window, or run the model at different locations with different meteorology, and see how your model behaves.

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