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Hydrology and Earth System Sciences Discussions

Interactive comment on "Technical note on probabilistic assessment of one-step-ahead rainfall variation by Split Markov Process" *by* R. Maity and D. Prasad

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The manuscript entitled "Technical note on probabilistic assessment of one-step-ahead rainfall variation by Split Markov Process" by R. Maity and D. Prasad presents an interesting and new stochastic approach to assess daily rainfall variation. The Split Markov Process (SMP) is proposed to investigate the transition between states (mainly based on the rainfall amount) and sub-states (changes in the magnitude of daily rainfall). This is acceptable considering that the novelty of the paper relies on that proposed approach. Even though, to reach the standards of the Hydrology and Earth System Sciences Discussions, many questions have to be addressed by the author. Major

changes in the methodology, results and conclusions are expected by the reviewer, the algorithms and computations have to be more accurately introduced and justified with the aim of exposing more convincing reasons to reinforce conclusions derived by the authors. I think that extended discussion of several aspects of the method and some additional data analysis and graphics would substantially improve the paper.

Specific comments:

1. Lack of discussion on the most recent works in the application of Markov chain model for daily rainfall data in the literature review (see Kottegoda et al (2004); Deni et al (2009) etc.). In most cases, the daily rainfall can be described by the first order Markov chain model; however, there are cases where this model failed to fit the observed data. As an alternative, the use of the Markov chain model of higher order often improved these inadequacies (see Wilks, 1999; Hayhoe, 2000). Not only in the literature review, but also, it is expected that the Authors should provide with some ideas on applying the SMP for the higher order of the Markov model in the Conclusions section.

2. It would be very useful to see the topographical map of the rainfall station. Moreover, it would be better to include more stations in the analysis.

3. No explanation on the completeness of the data record. Is the record complete for the analysis period or are there gaps in the data set?

4. Markovian processes are commonly used to model the property of dependence in a time series. In this light, it is necessary to include the Markov chain property and assumptions in the beginning of the analysis. In the case of SMP, what is the method used in checking the property? Also, it is better to include the testing on the assumption of the Markov process, i.e. the stationarity and homogeneity (if more than one station) in the revised paper.

5. It is also suggested to include the descriptive analysis on the rainfall pattern such as the mean, median, coefficient of variation, skewness, kurtosis etc.

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6. The algorithms and computations of the SMP have to be more accurately introduced and justified. It is also interesting to demonstrate the numerical examples on the calculation of the transitional probability matrix and the estimation of the probabilities using SMP.

7. The plot in Figure 3 should be improved before publication. It would be interesting to compare various methods (RMSE, MAE, etc) in analysing the prediction performance.

8. The conclusion is relatively too short. It should be more discussion on the physical and hydrological interpretation of the findings or any conclusions drawn from the analysis. This section should be enriched by information about potential application of the higher order of Markov chain model and taking into account other locations as well as various applications in other field of study.

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