Hydrology and Earth System Sciences Discussions

Interactive comment on "**Prediction of monsoon rainfall for a mesoscale Indian catchment based on stochastical downscaling and objective circulation patterns**" *by* E. Zehe et al.
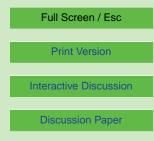
Anonymous Referee #5

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1. 'Stochastical' may not be a proper English word - have not come across this before - please check.

2. I am not sure what was the basis for the authors choosing the predictor variables they did. Given that the downscaling approach is most sensitive to the choice of predictors, some discussion on this would be helpful. The way the paper reads I was coming to an impression that they were using the same predictors they identified in a study in Germany to their study on the Monsoonal system in India - which would make sense only if they have tested this hypothesis thoroughly - hence clarifications would be helpful here.

3. Section 2.1.1 - is the standardisation done on a daily time step or using the full time

series (irrespective of season)? If yes - then you are distorting the persistence in your predictor variables from one day to the next - which may pose problems in representing temporal dependence in the downscaled series. If no - then your classification of 'low' 'high' etc is seasonally insensitive.

4. It would be nice if the authors could express their model that relates the atmospheric variables to rainfall through a system of equations which indicate clearly what needs to be optimised based on equations 1 and 2. The objective functions should really be coming after the model structure has been outlined.

5. Section 2.1.2 - I am afraid omitting the details of the conditional downscaling model totally is not helping. A small explanation is needed to give readers enough information to try and make sense of the results. I am assuming the structure should be along the lines of the rainfall being conditional to current CP, and the current CP being conditional to the CP on the previous day - the common CP on a given day enforcing spatial dependence in the daily rainfall, and the temporal persistence of the CP from one day to the next enforcing a semblance of temporal persistence in rainfall at each location. If this is true, the model will suffer from the use of discrete weather states (CPs), something that does not occur in reality. Consequently, the model will also suffer from a misrepresentation of the temporal dependence attributes of the resulting rainfall time series, a serious issue of results of the downscaling model are to be used for agricultural decision making and planning. Please include some minimal details on the model in your revision.

6. Is table 4 presenting results in cross-validation? If not, are these results really representative of what the model might do in the future?

7. The undersimulation of the number of wet days is interesting. The authors should try and hypothesise why that is happening. Is it because of a structural deficiency in the model or the nature of predictor variable chosen. I did not see any results on the spatial dependence of the generated rainfall. It might help to include a mention of how

well this is represented.

8. The authors should be careful in stating that this approach can be used for seasonal forecasting. Firstly, the downscaling results are not quite satisfactory (wet day fractions on a seasonal basis are significantly off). Secondly, reanalysis data often bears little semblance to GCM outputs, assuming that one has access to a GCM that is being run coupled to current conditions (using observed conditions to initialise the run) and this GCM is generating outputs that are on the same scale as the reanalysis data (same grid size, location).

9. Stehlik and Bardossy (2002) identified first three harmonics for describing the annual cycles of autocorrelation considering a specific area and record. This aspect needs to be investigated in the light of the data used in the study.

10. Page 5, I believe that NCAR reanalysis data is available on a grid size of 2.5 degree by 2.5 degree interval.

11. Figure 2 is very hazy and difficult to understand and interpret.

12. I found it difficult to judge the model performance using figure 4. Authors may consider presenting the results in some other form that can help conveying the results in a better way.

13. Results of correlation between daily rainfall among the stations may also be included in the Table 5. Similarly, results of simulation runs may also be included in the Table 1.

14. The atmospheric data used in the study is mentioned in an ad-hoc manner. For example in page 9 it says 'geopotential height at 500 hPa level' whereas on page 13 it reads 'NCAR pressure data for 500 hPa level'.

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