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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.

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This article addresses the downscaling of global meteorological fields to catchment scale and the model performance to describe rainfall statistics.

The article is of high scientific importance as it demonstrates the power of statistical downscaling and contributes to a deeper understanding of Monsoon rainfall, which is of crucial importance for Indian livelihood.

The following points would help to further improve the quality of the article.

1) I am not sure, if "prediction of monsoon rainfall" as stated in the title is really what the article is about. The paper deals with downscaling of global meteorological fields (reanalyses). "Prediction" usually is seen in the sense of "forecasting" and would mean:

GCM analyses (pressure levels, SST, etc.) days, weeks or months in advance are used to predict rainfall later on (short term or seasonal prediction). However, this is not captured and addressed in the article. To my opinion, the article is more about describing mesoscale or station rainfall on base of large scale features. But this is not what "prediction" (in the sense of forecasting) is about. If I am correct, you make think about a new title which fits better to the work presented.

2) Albeit the references to previous papers dealing with the same methodology are given, I have the impression that readers would somehow appreciate a brief tour through the basis steps of the methodology of the stochastic rainfall simulation. To my opinion, 2.1.2 could have the same extent as 2.1.1. That would bring more transparency into the methodology.

3) What is the impact of the number of realizations (n=30, section 3.2.3) chosen for the stochastic weather generator. Did you check for convergence of moments? It might be that your results change significantly if you apply 50 or 100 realizations. It even might be that the increase of n helps in reproducing the extreme values.

4) Figure 8: it seems that annual or seasonal rainfall is plotted instead of monthly, as the years 1963-1994 are indicated and every year has one data point (but this is not clearly visible). Axes, however, are indicated as "months". Please correct and clarify what is plotted. Additionally, please highlight calibration period and validation period.

5) Figure 8 & section 3.2.3: The quality/performance of the downscaling should be discussed and analysed behind the following background: monthly rainfall above/below the mean value should be reproduced/simulated also above/below this mean. For example: at Thandla, in the year 87, comparatively high precipitation was observed, but the downscaling produced very little. This raises the question: if you assume a "trivial" downscaling which simulates every month/year the mean value, is your statistical downscaling "predicting" better or worse? I therefore suggest to choose a different figure, showing the deviation of observed and "predicted" monthly/seasonal rainfall

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from the mean value. The performance of your downscaling is already better than the “trivial” downscaling, if your approach always shows the same algebraic sign for the differences.

6) From the high correlation coefficients from Table 5 for Thandla (0.96) and Jhabua (0.94), I would expect much less differences between observed and simulated monthly rainfall. Is this due to the fact that prediction in the dry season (“no rain at all”) is always very good (but the “trivial” model would behave well here, too). In that case it would be interesting to evaluate the correlation coefficient of Table 5 only for the rainy season.

7) Usually NCEP reanalysis is given in 2.5° resolution. Why are you using 5°?

8) Figure 1: please increase size of figure, in particular catchment figure.

9) Figure 2: please increase size. The legends are not readable.

10) Figure 4: the label “observed -simulated” unfortunately masks the name of the respective stations. Please correct.

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