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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The paper applies a stochastic downscaling approach that has been tested and applied successfully in central Europe, to a different climatic region in north-west India. This is a nice paper, which I believe would be more useful if expanded to provide a clearer and more complete description of the methodology and more detailed discussion and analyses of the results.

Here are some comments that the authors may wish to consider.

- A more complete description of the methodology would be useful. Are the downscaled relationships based only on the atmospheric classification of the particular day, or are they also based on the classification of the previous day? Are the rainfall amounts on

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the previous day considered in the generation of the current day rainfall amounts? That is, does the method attempt to preserve the persistent in daily rainfall.

- Does the stochasticity relate only to the rainfall characteristics from a given set of atmospheric time series, or does the method also consider the stochasticity in the atmospheric time series? For example, does the method use only the one set of atmospheric classification time series (from historical data or from GCMs), or does it also generate replicates of CP time series based on the historical (or GCM) characteristic?

- What other atmospheric explanatory variables were used with this methodology for central Europe? Is the use of these indicators here in addition to the solitary 500 hPA geopotential height likely to improve the results considerably?

- It will be useful to report the correlations of rainfall amounts between stations, at the daily and longer time scales. You would hope that the methodology does produce the types of key results reported for the individual stations (monsoon season mean, standard deviation, maximum, etcĚ). Most single-site daily rainfall models can produce this, but the advantage of the downscaling approach is in the downscaling of atmospheric characteristics (which can be simulated more realistically by GCMs compared to catchment rainfall) to multi-site catchment rainfalls. I doubt the method, like most approaches, can reproduce the correlations at annual and longer time scales because of accumulation effects, but should at least reproduce the rainfall correlations between stations over shorter time scales (daily amounts, totals over several days, totals over monsoon season), given the context of the paper.

- The plots can be made clearer - it is difficult to interpret the current plots. Also show (and explain clearly where it is shown), that the 95% confidence intervals/envelopes are based on simulations of many stochastic replicates (I think they are?). Are 30 stochastic replicates used throughout? Are 30 replicates sufficient? Do they converge to similar results in the key statistics?

- It may be useful to compare more results in the verification/validation? For example,

it would be nice to know if fewer atmospheric classifications give better results in the validation, i.e., the balance between sufficient and over calibration.

- The suggestion on incorporating SST anomalies as an additional predictor variable could be useful. However, it is not entirely independent, as there must be also a connection between the CP and SST (just like rainfall and CP, and rainfall and SST).

- Is 700-1000 mm average rainfall over a monsoon season a semi-arid climate? How wet is central Europe?

- NCEP reanalysis is available at 2.5 degree resolution.

- "Stochastic downscaling" or "stochastical downscaling"?

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