Hydrol. Earth Syst. Sci. Discuss., 10, C771–C773, 2013
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Hydrology and Earth System Sciences Discussions

Interactive comment on "Development and comparative evaluation of a stochastic analog method to downscale daily GCM precipitation" *by* S. Hwang and W. D. Graham

Anonymous Referee #3

Received and published: 13 April 2013

Review of: Development and comparative evaluation of a stochastic analog method to downscale daily GCM precipitation

by: Hwang and Graham 2013.

Overall: This paper describes a comparison between several bias correction downscaling methods for GCM rainfall applied at a daily time scale. A method called bias correction stochastic analog is provided as an alternative among the other existing methods e.g., BCSD, BCCA, SDBC and is presented to be more superior among the others. As we all know, this is the usual conclusion when one proposes another method among the existing ones. But this needs to be seen still. In short i am *not* convinced

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yet.

Before the paper shall be considered for publication in HESS i suggest several actions to be done.

The authors did not show the basis of selecting the GCMs in the downscaling. This is important so please provide. I want to see a correlation (just simple R is enough, no complex indices needed) between monthly and seasonal (exclude ANNUAL!!!) rainfall with GCMs (all used or mentioned) with observed (not the gridded but stations). I don't know the gridded data how they are developed, their characteristics in terms of biases etc should be also shown and discussed.... are these 12-km gridded 'station-scale' data or averaged across 12-km scale? Daily?

For the BCSA, i did not really get how analogs were used in the downscaling as presented in the paper. I have been working with analogs so i understand what and how they are used but as presented here it is not clear. How much more of those laymen who are interested to understanding the method? How can they understand? Step by step procedure is important as this is the only contribution of the so-called new method to BCSD.

All complicated indices are shown but the most important index which is correlation R was not at all shown. This is the most important skill score that shows if you can really use your downscaled data with dynamic hydrologic models.

In this vein, i also feel and strongly suggest that the paper should link *now* the downscaled rainfall data with a hydrologic model to simulate the response of the system say the watershed that the authors had mentioned. The paper is incomplete without this. All the performance indices presented among the downscaling schemes are *useless* if the hydrologic model will not be able to represent reality using them (that is at the simulation mode). I suggest that you use local datasets (station data, for weather, hydrology) for doing this important addendum to the study.

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Also, in addition to the gridded 12-km downscaling application, it would be interesting to see the results at station level. Daily data averaged across domain is not a good benchmark for downscaling - do to the station level. Here, statistics e.g., dry spells, time structure etc will be more meaningful.

Another issue that is important is how is the prediction skill of the method, say of you force your GCM with forecasted SST for the season of interest. I know that GCMs poorly predict summer rainfall in South East US. I think even with the simulation period i will not be so optimistic if you find very low predictability. This is important to do in this paper.

Some useful references for you (pls see new pubs too):

Ines, A.V.M., Hansen, J.W., Robertson, A.W. Enhancing the utility of daily GCM rainfall for crop yield prediction (2011) International Journal of Climatology, 31 (14), pp. 2168-2182.

Mehrotra, R., Sharma, A. An improved standardization procedure to remove systematic low frequency variability biases in GCM simulations (2012) Water Resources Research, 48 (12), art. no. W12601, .

Johnson, F., Sharma, A. A nesting model for bias correction of variability at multiple time scales in general circulation model precipitation simulations (2012) Water Resources Research, 48 (1), art. no. W01504,

In short, i recommend a major major major revision of this paper before even considering for publication.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 2141, 2013.