Hydrol. Earth Syst. Sci. Discuss., 10, C619–C621, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C619/2013/

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 #2

Received and published: 4 April 2013

This paper examines a new method (abbreviated 'BCSA') to downscale GCM precipitation data so as to improve the estimates of rainfall spatial and temporal properties. The latter include daily precipitation depths as well as the lengths of wet and dry spells.

The paper is generally clear and well organised. Some of the Figures, especially the many small maps of Florida, are difficult to read owing to the small size of the individual maps.

I did not feel that a strong case was made for the relevance of data downscaled to daily level, for use in hydrological or other models. In many cases, daily data offer insufficient temporal resolution (e.g. for urban hydrological modelling, daily data are

far too coarse; the same can be said for many soil loss and erosion models, which require at least hourly data). Likewise, the lengths of wet and dry spells are very coarse measures of a precipitation time series. Importance attaches to other aspects of such a record, including rainfall rates and rainfall event properties. Moreover, the authors present no discussion of the sensitivity of hydrological models to the kinds of discrepancies between various existing downscaling methods, and thus make no compelling case that a better method is needed. The kinds of hydrologic questions that can be answered from daily precipitation data may well not require high precision in the data. In other words, is the few percent improvement in the accuracy of downscaled data achieved by the authors actually significant? I raise this below in the specific context of whether correct prediction of the median daily rainfall is actually necessary, or whether a more important challenge is correct prediction of extremes, e.g. the 99th percentile.

Thus, in terms of method, it seemed to me that the authors should have given consideration to which aspects of the precipitation are the most important to estimate correctly in the downscaled data. The authors employ comparisons of predicted 50th and 90th percentile daily precipitation amounts. But is it, for instance, more important that a downscaling method has good success in predicting the 99th percentile, for instance, in relation to flood inundation damage or other management issues? This is an important point, since the success of downscaling can only be judged against the purpose for which the data are downscaled. The paper lacks any such consideration, and consequently seems very narrow and inward-looking, as though precipitation downscaling is an end in itself. Similarly we could ask is correct prediction of dry spell length of more or less significance than the correct prediction of wet spell length? The authors seem to take the rather simplistic view that improved prediction of the parameters that they happen to have adopted in the paper is indeed significant. I think that more thought is required on this point.

An issue that I felt warranted more attention was the nature of the observational data

from Florida. These were apparently gridded to a regular spatial resolution, and I was not sure how much bias might have been introduced during the gridding process. This is potentially important since it is the gridded data that are used to bias-correct the downscaled GCM data. Likewise, I was somewhat concerned by the use of somewhat old GCM output, since there have been significant advances in GCMs in recent years.

Writing is generally good, though the authors begin too many sentences with "Note that ...." and it would make better reading if they used other ways to begin sentences.

GCM stands for 'general circulation model', not 'global circulation model' as the authors write in the first paragraph of the Abstract.

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