Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2017-84-RC3, 2017

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Development and Evaluation of a Stochastic Daily Rainfall Model with Long Term Variability" *by* A. F. M. Kamal Chowdhury et al.

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Received and published: 11 April 2017

The manuscript describes four variants of the normal two-part model with the objective of preserving the variability at longer time scales. The evaluation of the models lacks rigor. Even though the developed models are for daily rainfall, no evaluation is made at daily time scale. A daily model should be assessed at the daily level first and then at monthly and annual time scales. Lines 178 and 179 mention that the mean and standard deviation of rainfall depths at daily to multiyear resolutions but the daily results are not presented in the manuscript. It is surprising to find that the autocorrelations were calculated up to lag 20. Except for lag one, all the other autocorrelation coefficients do not appear to be significantly different from zero. Because of seasonality, the

autocorrelation coefficients will have a cycle of 12 months. Hence there is no need to calculate the autocorrelation coefficients up to lag 20. Since only a lag one Markov model is used (Eq 4), there is no need to present the autocorrelation coefficients for lags up to 20 (Figure 5). Some parts of section 6 needs improvement as detailed below. Almost all the model evaluation is carried out subjectively using figures only. Since Z-statistic is used in evaluation, it would have been better to give the number of cases where the value of Z is outside +/-2. A number of specific comments are listed below. I recommend publication once these are taken care of.

Specific comments:

Lines 155-156: It is meaningless to apply these single site models with dynamically downscaled data as these models do not have spatial correlation in them

Lines 185-198: This is not bootstrapping. In stochastic data generation, the usual practice is to generate a number of replicates and the mean values of the statistics from the replicates are compared with the observed values. The confidence limits can be obtained from the values from the replicates without making any assumption as to the distribution of the statistics. For instance, from 1000 replicates the 25th and 975th ranked values will give the 95% confidence limits.

Lines 258-261: What is meant by" parametric bootstrapping"? Section 3.2 does not mention the word "parametric" at all. Equality of means and variances can be easily tested by t-test and F test respectively.

Line 277: What is "ONI" index?

Lines 304-306: Not relevant to the subject matter of this manuscript

Line 364: "while the inter-decadal variabilities of parameters are less in Adelaide and high in Sydney (Figure 2)" - This is out of place and confusing. What are the authors trying to say here? The mean annual rainfall from the 1000 replicates is about one standard deviation away (Figure 8) from the observed value. What is the bias in terms

of percentage of mean annual rainfall? One would expect the bias is less than 5% for a model to be considered as good.

Lines368-376: None of the models appear to preserve the SD of monthly number of wet days for all the months. Some of the sentences in this paragraph are either self-contradicting or clumsy. There is only one model (HMC) that has stochastic yearly varied parameters but it is mentioned as ". . .. models with stochastic, yearly varied, parameters for the MC part of the model . . .." .This paragraph needs rewriting.

Lines 378-382: The results for the monthly resolution are not presented. The first sentence is strange. This paragraph needs rewriting as well.

Lines 395-400: I presume that the blue shading in Figure12 represents the 95% confidence band. For Sydney, none of the autocorrelation is significantly different from zero.

Lines 421-425: Mean and standard deviation of daily rainfall are neither presented nor discussed in the manuscript earlier. Provide these results to support this paragraph

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2017-84, 2017.