Hydrology and Earth System Sciences Discussions

Interactive comment on "Downscaled Rainfall Prediction Model (DRPM) using a Unit Disaggregation Curve (UDC)" *by* S. Tantanee et al.

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General comments

- this paper describes a methodology to downscale annual rainfall to monthly rainfall and to derive the number of rainy days per month/ year. The derived temporal distribution of rainfal in a year can be used in water resources planning and management. This subject is within the scope of HESS and may be important under specific circumstances. However, it is not clear why rainfall should be downscaled to monthly or daily time scales when (apparently, not clear) daily rainfall is available for a period of 52 years, i.e. the motivation of the downscaling is not explained

- the downscaling is done using a combination of well-known mathematical concepts and thus, novel apects should be found in the combination of these concepts and its application. However, the description of the methododology, its implementation and

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the description and discussion of the results is not always very clear (see also specfic comments and technical corrections) and need to be clarified at several points in order to assess its value.

- the organisation of the paper needs to be improved, in particular on the following points:

* introduction; divide the introduction into three parts: general introduction of the subject, brief literature review of relevant issues + resulting research gap, research objective and approach (with short outline)

* separate the theory, methodology and results; e.g. on p547-548 several results are mixed with the description of the theory and methodology (Tables 2 and 3, the choice of annual and monthly time scales etc.). Therefore, first describe the general methodology, then describe the experimental set-up in this case study or implementation (e.g. annual to monthly time scales, values of parameters) and then the results (together with section 4)

- the results of the downscaling are compared using observed rainfall series. However, it is not clear how you can compare stochastically downscaled rainfall series with observed rainfall series using the squared Pearson linear correlation coefficient ($R2$) and the mean square error (MSE) (e.g. p547, l25-26). Shouldn't you compare the statistics (mean, standard deviation, auto-correlation, cross-correlation between stations, higher-order moments) of observed and generated rainfall series instead of using correlation-based and error-based criteria?

- results are shown for the period 1973-2002, 1997-2002 and for only 2002. Is 2002 included in the first two periods and why presenting the results of a separate year? Moreover, why not using all data of the 52-year period? Or is this related to the calibration and validation of the DRPM? Please clarify all this

- a native English speaking person should preferably edit the text

Specific comments (p = page, l = line)

- p543: amongst other things, an unit disaggregation curve is used. Moreover, why not referring somewhat more to the application of the DRPM (annual to monthly rainfall etc.) in the title?

- p544, l1-11: the abstract is not completely clear and self-explanatory

- p544, l1-2: make clear in the abstract from which coarse time scale (annual) to which finer time scale (monthly and number of rainy days per year/ month) downscaling takes place

- p544, l7: did you use 52 years of daily records ?

- p544, l16: what do you mean with "noise of signal", I would call the deterministic part of a time series 'signal' and the stochastic part 'noise' (see also p549, l4-6)

- p544, l17: what do you mean with this sentence?

- p544, l19: "the model"; is the AR model the only model applied for analyzing rainfall series in literature?

- p544, l20-25: the reason why disaggregation approaches should be used in hydrology is not clear and the role of wavelet transforms is not clear as well

- p545, l1: what is meant by "process"; isn't it more something like a methodology/ framework?

- p545, l5: is the simulation model mentioned in a hydrological model?

- p545, l6: after the introduction, it is still not clear what will be done and how, please make more clear (e.g. number of rainy days/ year?)

- p545, l6: give an outline of the paper at the end of the introduction

- p545, l14-17: explain the two steps more clearly (only the downscaling step (of what to what?) is somewhat explained) and refer to the sub-sections (3.1 and 3.2) where

these steps are described

- p545, l15-16: is the UDC constructed for each rainfall station? Please clarify

- p545, l16: which kind of 'pattern' of rainfall distribution; spatial or temporal?

- p546, l1-5: explain the relation between equation (1) and (2). Why is a two parameter system (or two-dimensional, see l9) used "For the wavelet"?

- p546, l5, l20: why using two summation signs in equation (2) and one in equation (4); is it a different summation with j and k?

- p546, l14: so t could be a spatial or temporal dimension?

- p546, l17: where did it turn out to be effective; do you have some references showing this?

- p546, l21: isn't DWT a filter process itself instead of "An efficient - filter process."?

- p547, l4-5: provide the references of l17-18 already here to show the extensive application of AR models in hydrology and water resources analysis

- p547, l5: what do you mean with "ituitive"?

- p547, l13: isn't 'eta' the (uncorrelated) noise instead of "the time independent series"?

- p547, l20-21: thus, the wavelet filter has been used for the transformation (instead of a logaritmic or z transformation)? Clarify

- p547, l25: did you use Pearson's linear correlation coefficient-square? Moreover, explain/ give a definition of the MSE

- p547, l26-p548, l1: it is unclear how the number of rainy days/ year (or month) has been determined; also by using a coupled wavelet-AR approach?

- p548, l2-3: so what is the conclusion about the appropriate number of layers in the filtering process? Does there exist the risk of overfitting in this context (similar to over-

fitting problems related to artificial neural networks)?

- p548, l10: what is "the current observation of the series being generated"?

- p548, l27: what is meant by "and the rainfall"?

- p549, l6-8: I don't understand why the 'D' of the annual rainfall has to be eliminated before the downscaling process is conducted?

- p549, l11: rainfall at which temporal scale has been used in the simulation?

- p549, l18: monthly rainfall series simulation?

- p549, l10-27: the discussion of the results is very brief and doesn't include the implications of the results, their limitations, their generality etc. This needs to be elaborated and summarised more clearly in the conclusions.

- p561, p564: in figure 6, the details part (right part) of figure 3 suddenly disappeared, where it was added to the deterministic part in figure 3; could you explain this? And why not combining figure 3 and 6?

Technical corrections/ typing errors (p = page, l = line) (adding/ omitting small words like 'the', 'of' etc. is not included in this part)

- p543: "Rainfall downscaling prediction model" instead of "Downscaled rainfall prediction model"?

- p543: "an unit" instead of "a unit"

- p543: avoid using abbreviations in the the title

- p544, l1-2: "for generating rainfall at fine time scales from rainfall at coarser time scales" instead of "for generating finer time scaled rainfall from higher time scaled data" (the use of both fine and high time scales is confusing)

- p544, l3-4: "under the assumption of" instead of "under the concept of"?

- p544, l3: omit "technique of"

- p544, l16: avoid using different words for e.g. noise (and nuance)

- p544, l22: "Schaake" instead of "Shaake"

- p544, l24: is it "Koutsoyiannis, 1992" (in text) or "Koutsoyiannis, 1994" (in references)?

- p545, l8: "period" instead of "records"?

- p545, l9-10: "used." instead of "analyzed using the Downscaled Rainfall Prediction Model (DRPM)."

- p545, l10-11: "obtained from" instead of "part of"

- p546, l1: use another symbol to indicate the maximum value for the integer index

- p546, l19: "combining equation (2) and (3)" instead of "the series"

- p547, l3: use "an AR model" instead of "AR"

- p547, l4: omit "autoregressive"

- p547, l8, l13, l14: "y_subscript t" instead of "yt"

- p547, l17-18: is it "Yevjevich, 1972" (in text) or "Yevjevich, 1972a or b" (in references)?

- p547, l18: is it "Box and Jenkins, 1972" (in text) or "Box and Jenkins, 1970" (in references)?

- p548, l3: "Therefore," is not logical in this context; omit or replace

- p548, l9: if equation (7) is a vector-matrix equation, please use bold symbols to indicate vectors and matrices (look in guidelines for authors)

- p548, l13: "assumption" instead of "concept"?

- p548, l18-19: delete the line "A demonstrates - the signal." (repetition)

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- p549, l7: "downscaling" instead of "downscaled"

- p549, l9: "Results and discussion" instead of "Result and discussion"

- p549, l10: "52 year period of historical data" instead of "52 year historical data"

- p549, l24: figures 9 and 10 also show the number of rainy days (besides the (temporal) rainfall distribution)

- p550, l6-7: number of rainy days per year? (also in other parts of the paper)

- p550, l14-15: reference is not in the text

- p550, l22-23: reference is not in the text

- p550, l26-27: reference is not in the text

- p551, l3: reference is not in the text

- p551, l4-5: reference is not in the text

- p551, l10-11: reference is not in the text

- p551, l21-22: reference is not in the text

- p551, l23-24: reference is not in the text

- p552: column 'no. year of record' could be omitted

- p552: mean number of wet (rainy) days per year? Some numbers are very precise!

- p553-558: describe more precisely in the table captions what is in the tables; e.g. for Table 2: "The squared Pearson linear correlation coefficient (R2) and the mean square error (MSE) of the observed and simulated number of rainy days per year for four stations and three levels of the wavelet filter."

- p559-568: the same as in the previous comment applies to a less extent to the figure captions - p559-560, p562-568: figures are too small and sometimes really unclear

(e.g. Fig. 4, 5, 7 ,8) - p559: is there a source for Fig. 1?

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