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

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GENERAL

The authors couple a wavelet filter with an autoregressive (AR) model to predict the annual number of rainy days and the annual rainfall total. A disaggregation curve is used to disaggregate the annual data into monthly data. Four rainfall stations in north-eastern Thailand are considered.

From the beginning of the manuscript this reviewer has found it very difficult at times to follow the text, due to lack of conceptual rigour and cryptic assertions. Thus it is not clear how the original time series were filtered, where the predictions are based upon, and how the generated annual rainfall data are merged with the generated sub-period rainfall records. The description of the AR process contains a number of elementary errors. My overall impression is that the manuscript is clearly below the minimum quality required for publication in Hydrology and Earth System Sciences.

SOME SPECIFIC POINTS OF CRITICISM

(The Greek symbol epsilon has been replaced by an e)

1. The wavelet transform is poorly described: (a) the determination of the expansion coefficients aj,k is not given, (b) the mother wavelet is not defined, and (c) there is no information on the decomposition of the original signal into a low-frequency component A and a high-frequency component D. How are the two complementary filters (page 546, line 24) defined ?

2. It is not clear why the AR is the 'intuitive' time dependent model (page 547, line 5). There are many other stochastic processes where the value of a variable at the present time depends on the values at the previous time. For stationarity, it is not sufficient that the parameters are constant. The roots of the characteristic equation must also be outside the unit circle (Box and Jenkins, 1970, pp. 53,54). The innovation et in eqns. (5) and (6) does not depend on yt-1,...,yt-p, but it is correlated with yt (contrary to what is stated on page 547, lines 13,14). It directly follows from eqn. (5) that

cov (yt, et) = var et $>$ 0.

It should further be noted that the variance of et cannot be equal to the variance of yt as the authors state on page 547, lines 14, 15. The relationship between the two variances is given by eqn. (3.28) on page 56 of Box and Jenkins (1970).

3. The choice of a fourth order AR needs some explanation. The order is quite high for annual data. It is remarkable that the same order can be used for the A and D components and that this order applies to all rainfall stations.

4. The argument for coupling the wavelet filter with the AR model on page 547, lines 20, 21 is rather curious. It is not clear why the use of this filter should lead to a normal series if the original series comes from a non-normal distribution.

5. If eqn. (5) is used to generate a sequence yt, then this sequence will be independent of the original sequence. Where do the high values of R-square in Tables 2 and 3 then

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come from? And to what does the mean square error in these tables refer?

6. The linear disaggregation model of Valencia and Schaake defined by eqn. (7) is not used in the manuscript and should therefore not be given. Moreover, even for a univariate time series, Y and e are vectors rather than scalars.

7. Details on the polynomial fitting are not given (page 548, line 24) and it is also not clear what a 'mean value curve' is.

8. The sentence 'For the monthly rainfall prediction, D of the annual series is considered in detail' (page 549, lines 3,4) seems to be in contradiction with the statement that 'the D of the annual rainfall has to be eliminated' (page 549, lines 6,7).

9. The problem that I have with the R-square values in Tables 2 and 3 (point 5) also applies to Tables 4, 5, 6 and 7.

10. What is a downscaled model? (first words of the title of the paper). Downscaling usually relates to the results of the model.

11. The statement that the rainfall series are the hydrological time series composed of deterministic and stochastic components (page 544, lines 14, 15) suggests that this is generally not the case for streamflow series. Is this true? Other remarkable phrases: (a) the nuances of the series, which is noise of signal (page 544, line 16), (b) the hydrological process is studied in different time scales (page 544, lines 20, 21), (c) the frequency or logarithm of scale (page 546, lines 16, 17), (d) Various forms of AR models,..., represent the same autoregressive process (page 548, lines 16, 17), and (e) high level...in all levels (page 548, line 28).

12. For each calendar month several dots have been plotted in Figure 4. It is not clear what these dots represent.

13. The reference list contains a large number of publications that are not cited in the main text: Carlson et al. (1970), Jury and Melice (2000), Koutsoyiannis (2001), Mallat (1998), Matalas and Willis (1971), Salas et al. (1985), Torrence and Compo (1997) and

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Tsui et al. (1997).

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