Hydrol. Earth Syst. Sci. Discuss., 7, C2220–C2223, 2010
www.hydrol-earth-syst-sci-discuss.net/7/C2220/2010/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Reconstruction of sub-daily rainfall sequences using multinomial multiplicative cascades" *by* L. Wang et al.

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General Comments:

This paper proposes to use "multinomial cascade processes" to disaggregate hourly rainfall as estimated by 5 minute empirical raingauge sequences. Multinomial cascades are special cases of multiplicative cascades which were originally proposed in the 1960's as disaggregation models for turbulent energy fluxes, and since the 1980's for the disaggregation of rainfall. Most of the theory and techniques (some which incidentally was elaborated specifically for handling rainfall) have been around for over 20 years. Unfortunately, the approach proposed here is quite unsatisfactory. In a nutshell, it combines unrealistic "microcanonical" assumptions, sophisticated parame-

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Discussion Paper

ter estimation techniques, an incompatible, (canonical, acausal, left-right symmetric) "Log-Poisson" model, with uncritical acceptance of low and zero empirical rainrate estimates. Even the title belies a difficulty: a "multinomial cascade" is one with a finite number of weights per cascade step whereas both the analyses and the actual model discussed in the text have a continuum of weights. The paper appears to be devoid of multinomial cascades! I suspect that there is a confusion between the (academic, unrealistic) discrete scale ratio feature of their model and the quite separate (and also academic!) discrete number of states ("weights") of a multinomial model. In a separate pdf file we extensively consider these points more closely and present numerical results which quantify the biases introduced by the authors' use of "fragmentation ratios" to estimate cascade "weights". I have gone into this in some detail since these issues crop up in many applications of cascade processes to precipitation modelling.

-Shaun Lovejoy

Figure captions (see the pdf for discussion)

Fig. 1: Histograms showing the probability density of the weights (black) and the fragmentation ratios (red, purple) for $\lambda 0$ =2, 4 respectively. The weights were from a Log-Levy distribution with α =1.5, C1 =0.3; there were 10,000 simulated ratios.

Fig. 2: The scaling moment function K(q) for the weights (top right), the fragmentation ratios for $\lambda 0$ =4 (right, middle), and for $\lambda 0$ = 2 (right, bottom). The corresponding C1 = K'(1) are 0.3, 0.21, 0.15.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/7/C2220/2010/hessd-7-C2220-2010-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 5267, 2010.

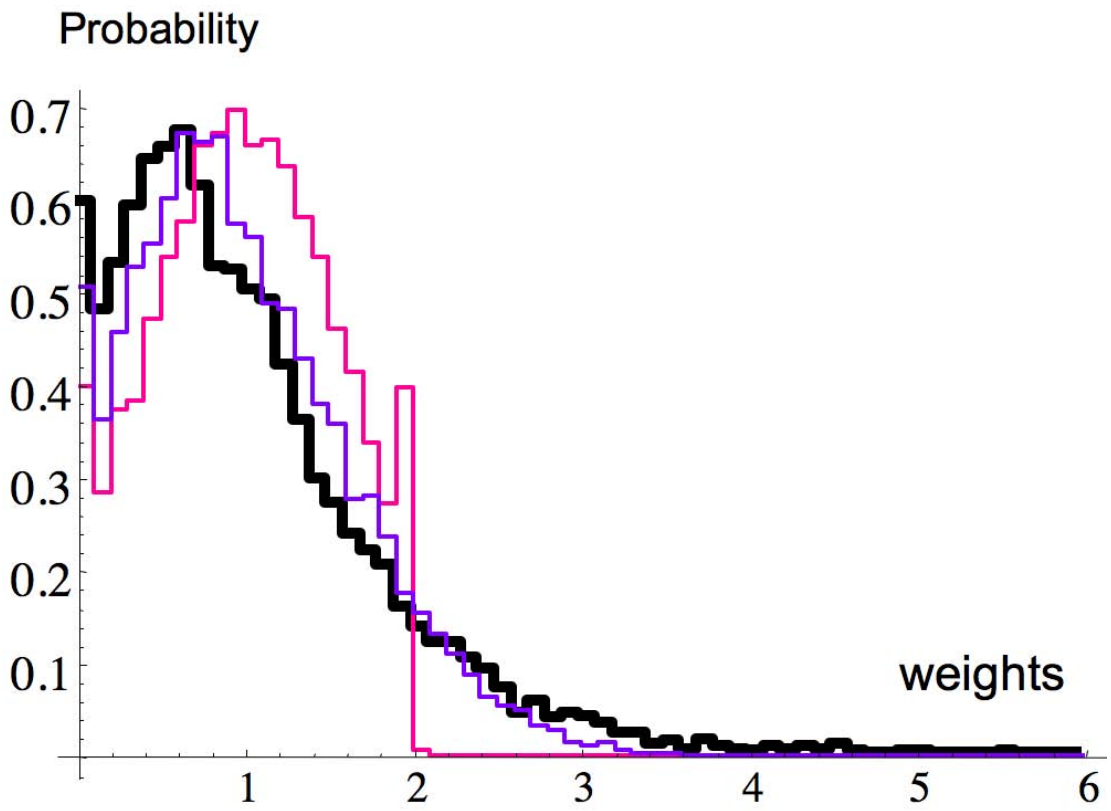

Fig. 1.

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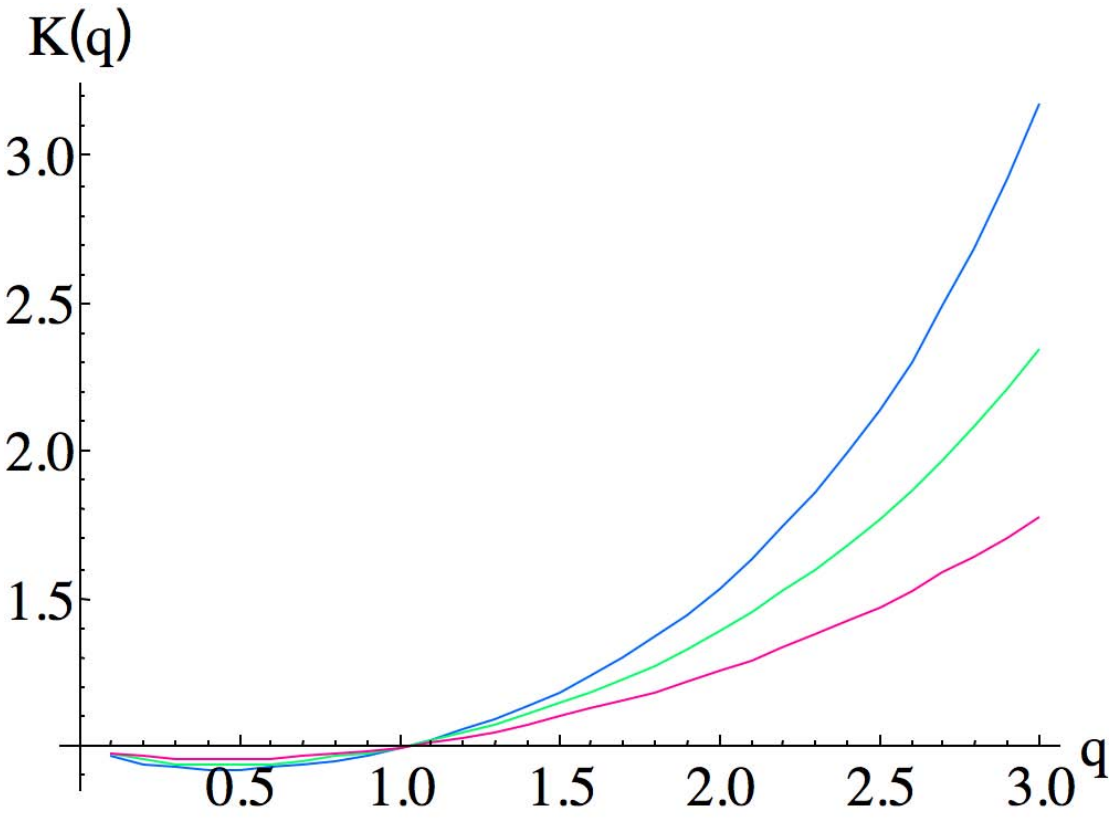

Fig. 2.

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