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Hydrology and Earth System Sciences Discussions

Interactive comment on "A stochastic approach for the description of the water balance dynamics in a river basin" *by* S. Manfreda and M. Fiorentino

Anonymous Referee #2

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Comments on 8220;A stochastic approach for the description of the water balance dynamics in a river basin8221;

General comments

This study developed a theoretical method for modelling soil moisture dynamics at basin scales by considering catchment heterogeneity. The method is based on the concept of catchment water storage capacity distribution used in the Xinanjiang model and the probabilistic water balance model of Rodriguez-Iturbe et al. (1999). The paper presents an interesting theoretical study on the effect of catchment heterogeneity on soil moisture dynamics. The paper is well structured and the presentation is clear. My main criticisms of the paper relate to the assumption of uniform rainfall distribution in

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space and the saturation runoff mechanism embedded in the Xinanjiang model. The paper will benefit from discussions of potential implications of these assumptions on the model behaviour. I recommend the paper be accepted for publication with some revisions.

Specific comments

P726. The assumption of uniform rainfall distribution at basin scales is not generally valid, especially in arid and semi-arid regions. The authors should discuss the implications of this assumption for the model developed in this study.

P727. Should W in Equation (2) be lower case?

P728. It is not clear what the assumptions are. Do you mean the soil water content follows the same distribution as the soil water storage capacity in a basin?. 8220;8230; cumulating in the areas with lower soil depth.8221; Not clear what that means? Also, the caption for Figure 2 is not self-contained and the authors should explain the conceptual diagram in relation to the basin map. I assume the concept here is the same as the one used in the Xinanjiang model.

P729. A number of symbols were introduced to represent the same variables, for example, nZr is to represent W and a is to represent f/F. I suggest the authors use the symbols consistently and it will help readers to follow the paper.

P729. Is wmt the actual soil water content or the water level of the basin? What is the difference between wmt and wt in Equation (6)?

P729. Again, another symbol was introduced. Is 61562;61472;the same as wmt?

P730. Delete the words 8220;to remark8221;.

P731. Delete the second 8220;I-Vs8221; from Equation (11).

P732. Should the water balance equation include runoff? To me, Equation (15) should read: dR/dt = (Y-Q)/wmax- 61562;(R).

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