

Interactive comment on “Simplified stochastic soil moisture models: a look at infiltration” by J. Rigby and A. Porporato

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The present manuscript introduces a very interesting comparison between two infiltration schemes for the description of the soil moisture dynamics in the root zone. In the first schematization, the runoff is generated by saturation excess, while in the second one by infiltration excess (Hortonian runoff).

Authors obtained very similar results in the temporal behaviour of the soil moisture. This is surprising to me and probably related to the limited set of soil textures investigated and to the range of parameters used to characterize the rainfall process. In a similar work we have found, using numerical simulations, that the Hortonian runoff may significantly influence, in some cases, the right tail of the soil moisture probability distribution reducing the asymmetry of the soil moisture PDFs. Furthermore, the differences

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in the PDFs generally increase with the rate, λ , of the Poisson process of rainfall, in climates characterized by short duration and high intensity storms and when the soils have low permeability (*Manfreda et al.*, 2004).

About the Dunne mechanism

In the present case, the use of the term "Dunne runoff" is probably incorrect since the authors are dealing with a point process. It would be more appropriate to consider this process as runoff generation for saturation excess.

The Dunne mechanism is a very specific process acting at the basin scale through the redistribution of subsurface runoff or due to the presence of a shallow water table. It produces, in this way, the so called partial contributing area that is the saturated portion of the basin where the runoff production takes place, commonly near channel wetlands. It is also known that this process takes place in humid and vegetated areas with shallow water tables, where infiltration capacities of the soil surface are high relative to normal rainfall intensities (*Dunne and Black*, 1970).

References

Dunne T. and R. Black, An Experimental Investigation of Runoff Production in Permeable Soils, *Water Resour. Res.*, 6(2), pp 478-490, 1970.

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