

## ***Interactive comment on “A model for hydraulic redistribution incorporating coupled soil-root moisture transport” by G. G. Amenu and P. Kumar***

**Anonymous Referee #2**

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This paper introduces a model that allows to account for hydraulic redistribution in the root zone. A simulation study is set up where the new model is compared to a Richards equation-based model that does not include hydraulic redistribution. Finally, the new model is applied to a real world case. This paper definitely presents some novel concepts and the model developed is important to better describe the water fluxes in the unsaturated zone. The methods used are well explained, and the references are up to date and sufficient. The paper is well written and there is no need to shorten or lengthen the paper, or remove figures or tables.

My major concern with respect to this paper is that this practical case uses data from the NARR and IGBP datasets. I have some doubts on the accuracy of these types of

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data with respect to the model that is used (which is actually a point model). The paper should definitely more elaborate on this aspect. What is the accuracy of these datasets at the point where it is applied? Furthermore, soil moisture data and flux observations from a nearby FLUXNET station is used. Given the fact that both are spatially very variable, is it allowed to use these data as validation in this modelling exercise (it is mentioned in the paper that due to these problems one should not expect a close match)? Furthermore, the validation data only contains near surface soil moisture: is this sufficient to really demonstrate that the hydraulic redistribution, as calculated by the model, indeed represents the actual process? In other words, the section in which the comparison is made with observations should definitely contain more elements on the uncertainty in input, and how this uncertainty translates into uncertainty in the model results, and on the uncertainty in the validation data.

Since the validation on real data is not really demonstrating the potential of the model, stating that the model "effectively simulates the soil moisture and water uptake patterns" (see conclusions, line 12, page 2740) is not correct. This statement should be qualified.

Further, I mainly have some minor remarks. A first, but important one, is that one should not use the same variable name for different variables. I.e. in equation 7, 8 and 9,  $K_{rh,ax}$  each time has a different definition (and different units). As this can introduce confusion, I would suggest to, each time, use a different variable name and relate one to another.

Equation 10 does not assume that there is no storage (as indicated in line 17 on page 3726)

Explain after equation 15 what variable  $b$  means, or, refer to the appendix (equation A2).

Where does equation 17 come from: reference? If not, explain why this equation has this form.

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Page 3731: add Latin names to the plant species.

Some typing errors: line 28 p. 3721: the stomata close (instead of closes) line 21 p. 3734: the stomatal closure (instead of closer) line 26 p. 2736: when the stomata close (instead of closes)

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 3719, 2007.

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