

## ***Interactive comment on “Parameter identification and analysis of soluble chemical transfer from soil to surface runoff” by J. X. Tong et al.***

**Anonymous Referee #3**

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This paper follows up on a paper by the same authors (Tong et al., 2010), in which they described an analytical 2-layer model that describes soluble chemical transfer from saturated and unsaturated soil to surface runoff. In this follow-up paper the authors investigate the temporal variability of the parameters of their analytical model during infiltration/runoff experiments, which were assumed constant in their previous work. Although this paper seems to contain more experimental results than their previous paper, this is not stated clearly. Overall, I find there is too little innovation in this paper compared to their previous paper and cannot recommend this paper for publication. Several major comments I have are listed below:

- Because the innovation of this paper is the time variability of the infiltration parame-

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ters, the authors should focus their introduction, discussion and conclusion on why it is important to account for/understand this time variability and on the implications for the model use. However, they do not do this at all: Their introduction basically is a rephrased copy of the introduction of their previous paper without much new material. The discussion and conclusion do not discuss the implications of the time variability of the parameters.

- The authors do not give any guidance to the reader on how to deal with the time variability of their parameters. How to use your model when we now know that the parameters are not constant with time? Or do you mean to tell us that we cannot use your model at all?

- Looking at your measured data, it seems very hard to constrain the 2 model parameters. The experimental results show a nice exponential decline which can probably be achieved by many different combinations of the 2 parameters considered. The paper does not explain clearly how the optimization of both parameters is achieved: “ $\gamma$  and  $\alpha$  can be obtained to fit the experimental data by changing one and keeping the other constant or changing both of them sometimes” (page 3908, line 7). This sentence does not contain any meaningful information on the optimization procedure. However this is the key point of the paper and should be crystal clear! The experimental results would have contained much more information to fit your model to, if you would have measured more variables that just the concentrations of the runoff water.

- The model results show clear time dependence of the parameters during the different experiments. However, because the method that is used to derive time dependence is very unclear, I cannot interpret these results.

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