Answer to the Referee 3

1.There is too little innovation in this paper compared with their previous paper Tong et al. (2010).

Reply: In the introduction part, we have added sentences "However, they only assumed that the parameters are constant during the simulation, and they did not analyze the experimental and modeling results with variable incomplete mixing parameters, which will not give us more accurate predictions with some conditions.". And the main objective of this paper is try to find a way to identify and analyze the incomplete mixing parameters for the two-layer model with different conditions, and to give us more accurate predictions in future. From these sentences, we can see that this paper is based on the previous paper Tong et al. (2010), and this paper will more accurate prediction with variable incomplete mixing parameters.

2.Because the innovation of this paper is the time variability of the infiltration parameters, 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.

Reply: We have added sentence "the main objective of this paper is try to find a way to identify and analyze the incomplete mixing parameters for the two-layer model with different conditions, and to give us more accurate predictions in future.". From these sentences, we can see that it is important to account for this time variability and on the implications for the model use to give more accurate prediction.

3.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?

Reply: Section 2.2 described how to identify the parameters, where the incomplete parameters γ and α are assumed to become variable at the sampling time after surface runoff. Equations (8-10) showed details. According to Equations (8-10), we can see that the parameters are constant during the sampling time gap from $t_r+t_1+t_2+\cdots+t_{m-1}$ to $t_r+t_1+t_2+\cdots+t_{m-1}+t_m$, while they are variable at the sampling time. However, we plot the identified values at the sampling time in this paper, so they change temporally based on the assumption that the parameters were constant in time.

4.The paper does not explain clearly how the optimization of both parameters is achieved: "α and γ 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.

Reply: The Section 2.2 described how to identify the parameters, where the incomplete parameters γ and α are assumed to become variable at the sampling time after surface runoff. Equations (8-10) showed details. According to Equations (8-10), we can see that the parameters are constant during the sampling time gap from $t_r+t_1+t_2+\cdots+t_{m-1}$ to $t_r+t_1+t_2+\cdots+t_{m-1}+t_m$, while they are variable at the sampling time. The predicted data is the solute concentration in the surface runoff. The incomplete mixing parameters α and γ are unknown, and they are identified to fit the observed solute concentration in the surface runoff.

5.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.

Reply: Section 2.2 described how to identify the parameters, where the incomplete parameters γ and α are assumed to become variable at the sampling time after surface runoff. Equations (8-10) showed details. According to Equations (8-10), we can see that the parameters are constant during the sampling time gap from $t_r+t_1+t_2+\cdots+t_{m-1}$ to $t_r+t_1+t_2+\cdots+t_{m-1}+t_m$, while they are variable at the sampling time. However, we plot the identified values at the sampling time in this paper, so they change temporally based on the assumption that the parameters were constant in time. We have added some sentences in section 2.2 to indicate it.