

## ***Interactive comment on “Influence of aquifer and streambed heterogeneity on the distribution of groundwater discharge” by E. Kalbus et al.***

**E. Kalbus et al.**

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First of all we thank both referees for their critical but constructive points addressed in their review. They raised a number of interesting questions and made helpful suggestions to which we respond below.

Reply to M. Westhoff:

General comments:

The study builds on a previous study which has already been published. Some issues raised by the referee are explained in more detail in the published article, therefore we did not discuss them in this article. Particularly the first point on S1257 (missing discussion about the chosen variance of  $\ln(K)$ ) is discussed in the published article.

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However, we feel that this issue causes unnecessary confusion for the present study. We will therefore leave out the description of the procedure to calibrate the variance of  $\ln(K)$ , because it is actually not relevant for the present study. We will then simply refer to the published article when describing the choice of model parameters.

To the second point on S1257: It is a very good idea to look at a relation between a measure of connectivity and the groundwater discharge distribution. We will include that in the revised manuscript.

Specific comments:

P2203 line 16: we will leave out this issue as explained above

3.2 Scenarios: The K-fields of the aquifer were exactly the same as in the base case, we will make that clearer in the revised manuscript.

4 Results and discussion: we will include a quantification of the discharge distribution.

P2208 line 5: This paragraph discusses the case B (heterogeneous streambed, homogeneous aquifer). Therefore, we assume that the referee would like to know if increasing the variance of  $\ln(K)$  of the streambed would lead to a flux distribution that mimics the base case. We have not tried that, because the chosen variance of 2.1 is a realistic value, and variances larger than around 4 would be unrealistic. However, we will perform some more simulations with increased streambed variances to see how large it would have to be.

Fig 4: The larger range in case C is again a result of the better connectivity. We will discuss that in the revised manuscript.

All other specific comments and technical corrections will be implemented accordingly.

Reply to S. Krause:

We gave the information from previous studies at the field site to explain why we came up with the present study and to provide the relevant data for the present study. We

tried to avoid too much repetition from already published data but still wanted to give enough information to understand the current work, particularly since the previous study was published in German. However, it appears from the referee's comments that we did not fully succeed in that, and will rearrange and rephrase the introduction and background sections.

Specific remarks:

2203 8: We will specify the flow and temperature boundary conditions and discuss temporal influences.

2203 16-22: This is old data. As mentioned above, we will leave this out to avoid unnecessary confusion.

2203 23ff: Macrophytes can lead to clogging but can also prevent sediments from clogging (e.g., Brix H., Water Science and Technology 35(5), 1997, 11-17). Also, bacterial growth and biofilms can reduce the infiltration of stream water. We did not mention possible reasons for clogging. However, we will give some examples for clogging processes in the revised manuscript.

2204 25: The background is, that the investigated stream is a man-made stream with a constructed streambed, so we know the thickness of the streambed. We will make that clearer in the revised manuscript.

2204: In line 9-11 on this page we explain that we based the numerical study on field data to obtain results in realistic orders of magnitude. We could as well have used literature data only, but we believe that using real world data produces more representative results. Furthermore, the study was inspired by previous results obtained at the study site.

All other specific remarks and suggestions will be implemented accordingly.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 2199, 2008.

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