

***Interactive comment on* “Towards improved instrumentation for assessing river-groundwater interactions in a restored river corridor” by P. Schneider et al.**

P. Schneider et al.

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Dear Editor,

hereby we submit the revision of the manuscript “Towards improved instrumentation for assessing river-groundwater interactions in a restored river corridor” by P. Schneider et al..

We thank you and the reviewers for their constructive comments helping to improve the paper. In the following, we discuss our responses to the individual comments. Line numbers in the comments refer to the original file. We have uploaded a revised

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manuscript-file "HESS_2011_41_manuscript_markedRevision.pdf" which contains all corrections marked in color. The changes for Figure 2 will need some more time.

*** Reply to referee I (B. Cardenas)***

A. specific comments

1. (P2506 L13-17) – agreed and changed in the manuscript to “River waters differs fundamentally from groundwater in respect to these parameters. Mixing processes between comparable old groundwater and fresh river-water infiltrate together with travel times along flowpaths play a central role for the protection of wells affected by bank filtration (Eckert, 2008, Shankar et al., 2009, Tufenkji et al., 2002)”.
2. (P2508 L17) – agreed and changed accordingly in the manuscript
3. (P2514 L3) – agreed and changed accordingly in the manuscript
4. (P2514 L22) – The transect s are not identical, the geophysical transect crosses the river perpendicular (90 degree) to the river corridor – and thus the main stream flow direction – whereas the well transect is placed approx. 45 degree to the river corridor. We have not included the geophysical profiles/transects in figure 2 as adding more lines with different styles & color will reduce the readability of that figure significantly.
5. (Section 3.3) – The temporary deployed shallow piezometers have been specifically designed for alpine and peri-alpine gravel aquifers with high hydraulic conductivity (inner diameter of piezometer 50.2 mm, filter length 100 mm, filter-hole diameter 10 mm, protected with cylindrical stainless steel mesh mounted in the inner part of the piezometer with mesh width 0.25 mm and wire diameter 0.16mm) – we will add in L6 P2516 "...using temporary shallow piezometers with 0.1 m screen length (0.01 m screen holes with inside screen cloth)".
6. (P2517 L6) – Agreed and changed accordingly in the manuscript.

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7. (P2518 L7-8) – Agreed and changed accordingly in the manuscript.
8. (P2520) – agreed and changed in the manuscript to (starting L9) “We grouped our monitoring wells in transects, which we will describe and discuss in the following section.”
9. (P2528 L11) – Agreed and changed in the manuscript to “The hydro-chemical milieu changes during and after infiltration together with the aging of water according to its travel time in the aquifer.”
10. (Figure 2) – Partly agreed. We will rotate the figure to increase the size. Flow direction follows the convention that flow is from right to left and it is indicated by the surface-water level lines. We have not included the geophysical in figure 2 as adding more line styles will reduce the readability of that figure significantly.
11. (Figure 3) – Agreed and changed accordingly in the manuscript.
12. (Figure 6) – We have tried a Piper diagram, but it is not useful in our specific case, because all samples lie in the same region of the diagram and cannot be distinguished due to the small variations. The line in the middle of each box is the sample median. If the median is not centered in the box, it shows sample skewness. The tops and bottoms of each "box" are the 25th and 75th percentiles of the samples, respectively. The distances between the tops and bottoms are the inter-quartile ranges. Whiskers are drawn from the ends of the inter-quartile ranges to the furthest observations within the whisker length (the adjacent values).
13. (Figure 10) – The depth interval shown in this figure (372-367 m asl) is completely screened for every well shown here. We have not modified the figure, but we have changed the Figure caption to: "...obtained by multi-level slug tests performed in fully penetrating monitoring wells along the transect A."

*** Reply to referee II (C. Anibas) – reply to general and specific comments ***

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A. General comments

Based on the results so far, we have to be careful to make general statements, as we have tested our approach at a single site only. As we haven't done an overview and tested our approach at different sites – which may vary from location to location and project to project as pointed out by the second referee C. Anibas – we cannot come up with a general statement yet.

Concerning the connection between the preliminary surveys and the design of the observation network, we agree with the first referee B. Cardenas that our paper aims to simply present instrumentation and some results in a descriptive and observational way, which seems to be done quite effectively, as the first referee stated in his general comment.

B. Specific comments

1. (P2505 L21) – Agreed and changed in the manuscript to “. . . , which cover just 5%....”.
2. (P2507 L22) – Agreed and changed in the manuscript.
3. (P2508 L22) – Agreed and changed in the manuscript.
4. (P2510 L4) – Agreed and changed in the manuscript.
5. (P2513 L22) – Agreed and changed in the manuscript to “light grey”.
6. (P2516 L7) – Agreed and changed in the manuscript.
7. (P2517 L19) – Agreed and changed in the manuscript.
8. (P2517 L26) – Agreed and changed in the manuscript.
9. (P2518 L11) – As the paper is already long, we do not want to extend this part, in which we have described how the preliminary investigations are the basis for the design of our monitoring well network.

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10. (P2519, L3-6) – Agreed and changed in the manuscript.
11. (P2519 L24) – Agreed and changed in the manuscript – 86 monitoring wells.
12. (P2520 L9) – This would make Fig. 2 too complicated to read in our eyes – others have already criticized, that we distinguish between our newly installed 2-ich monitoring wells and the already existing 4.5-icnch monitoring wells installed by the cantons many years ago. For the same reason we have not individually labeled each monitoring well with its name.
13. (P2520 L21) – Agreed and changed in the manuscript.
14. (P2521 L1) – Agreed and changed in Figure 2.
15. (P2521 L2) – The spacing is 5 m for the four monitoring wells next to the river and 10 m for the others in pumping transect A – but this additional information is of little value for the reader in our opinion (the pure numbers are not relevant for explaining our approach).
16. (P2521 L4) – Agreed and changed in the manuscript.
17. (P2521 L13) – The spacing ranges between 3 and 5 m for the monitoring wells next to the river and between 10 and 25 m for the others in forest transect B – but this additional information is of little value for the reader in our opinion (the pure numbers are not relevant for explaining our approach).
18. (P2521 L15) – Agreed and changed in the manuscript.
19. (P2525 L10-11) – DEM means Digital Elevation Model and is a widely used term. We used the 2-D hydraulic model basement, developed at VAW-ETH Zürich (www.basement.ethz.ch).
20. (Table 3) – Agreed, we have changed that in the caption of Tab. 3.
21. (Figure 1) – The flow direction of River Rhine is indicated by the heights of the

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mean water level of Lake Constance and the mean water level of the confluence of River Rhine and the Thur River.

22. (Figure 2) – Partly agreed. We will rotate the figure to increase the size. Colors used and named in the text, caption and figure have been adapted to the colors in the figure. We have not included the specific names of observation wells in figure 2 as adding more text will reduce the readability of that figure significantly.

23. (Figure 3) – Partly agreed. The text in the caption is corrected accordingly. The transects B and E have not been label as this might overload the figure. Instead, we have added in the caption of Figure 3 the following “... (left, R044 to R070 forming transect B in Fig. 2) and channelized (right, R084 to R068 forming transect E in Fig. 2)...”.

24. (Figure 5) – The gravel-clay interface indicated with the black line is derived by ERT (Fig. 5b). We assumed that the referenced text (P13, L13) to Figure 5 by the referee points to P2513 L13 “. . .local riverbed topography, which in turns create dynamic boundary conditions for subsurface and groundwater flow” – but we can’t see critics to the text when having Fig. 5 in mind.GPR reflection profiles are typically shown without a scale (Figure 5a). The reason is that the amplitudes of the electric field that are measured have been strongly altered in the processing sequence, such that there is no obvious physical significance of showing the actual values.

25. (Figure 6) – The line in the middle of each box is the sample median. If the median is not centered in the box, it shows sample skewness. The tops and bottoms of each "box" are the 25th and 75th percentiles of the samples, respectively. The distances between the tops and bottoms are the inter-quartile ranges. Whiskers are drawn from the ends of the inter-quartile ranges to the furthest observations within the whisker length (the adjacent values).

26. (Figure 7) – Agreed. We change that in Figure 7 and its caption accordingly.

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27. (Figure 8) – Agreed. We have taken out the points 1-3 out of Fig. 8a. “Downstream view” in Fig. 8b means that we look in the direction of flow on the cross-section – we will change that to “view in flow direction”.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/8/C1886/2011/hessd-8-C1886-2011-supplement.pdf>

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 2503, 2011.

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