

## ***Interactive comment on “Exchange between a river and groundwater, assessed with hydrochemical data” by E. Hoehn and A. Scholtis***

**Anonymous Referee #2**

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### **General**

The manuscript discusses the hydrochemical processes associated with bank filtration from the river Thur into an alluvial aquifer. Special attention is given to the expected effects of river restoration measures on water quality. A conceptual model on the surface water/groundwater interaction at the river Thur is presented. I think the manuscript discusses an interesting topic and fits well within the scope of the journal. However, I also think it would benefit from a more thorough discussion on the topic of river restoration and more specific details on the precise quality effects to be expected (despite a change in the age of the bank filtrate/raw water). I therefore recommend some revision before the manuscript can (and should) get published in the journal.

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### **Specific comments**

- Page 9024, Lines 2-5: “The aim of this work is to investigate the chemical processes, which are necessary to manage groundwater quality during river restorations”. I do not understand this sentence. Please explain what you mean by it.
- Page 9027, Line 17: What exactly does river restoration include? Simply enlarging the river-bed? Or also giving the river more room to meander etc.? I think since river restoration is the major topic, the paper would be improved if it was explained more specifically what restoration includes other than simply enlargement (or is this really all?).
- Page 9029, Lines 3ff: What made you choose the groundwater in >300m as an end-member, if it is still partly bank filtrate? To my understanding, this is not really what I would call an end-member. Was it not possible to sample water that is definitely recharged by precipitation only?
- Section 2.4: I am not sure I understand the hydrogeology right. The section is named “water from the valley slope” but what you discuss is the chemistry of the alluvial aquifer, with the gaining reach and the saturated/unsaturated BF and the changes that could happen due to climate change. Are the yellow areas in Fig. 2 those that mainly contain groundwater from springs from the tertiary sediments from the slopes or from recharge by precipitation? Maybe it is obvious but I think it should be explained in more detail what the non-BF water is. I would also find a cross section helpful. And I would consider renaming the section and structuring it differently.
- Page 9031, Lines 8ff: One of the major fears in relation to climate change appears to be a change to reducing conditions in hot summers. For non-alpine systems this is very often the general case and not a big problem because it can be dealt

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with easily during treatment. How is the drinking water treated? I guess it is presently not aerated and therefore, adding a treatment step would be a cost factor? Maybe adding a sentence on the topic would help.

- Fig. 4: Where does water in the green areas come from? To me it looks as if it is upstream BF? Or does it originate from the valley slopes?
- Fig. 5 and explanations in text: I cannot see the general rise in water table since 2003. Also, I am not convinced that the Nitrate storage concept presented is right. I am also not sure how this relates to the topics of river restoration or bank filtration. I would consider deleting this paragraph.
- Section 5: You discuss the effect of river enlargements on the age of groundwater. Couldn't it also be thinkable that river restoration leads, at least in some wells or in another hydrogeological context, to longer travel times? If the river is given more room and starts to meander etc., it may develop high energy areas with river bed sediments with a high permeability while at the same time, in lower energy areas the sediments are less permeable? Or is this unthinkable at the River Thur? Or are you considering a worst case scenario? I think the paper would be much improved if the actual river restoration practices and the specific consequences on water quality would be discussed in greater detail and with other literature on the topic.

#### Technical corrections

- Fig. 1: I suggest to use a different color for the small thickness legend, as it resembles the pink of the towns
- Fig. 2: I think if you use different color shading it would be better to also give a legend instead of just the information "high" or "low" alkalinity for various colors each.

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- Fig. 3: Again, I think a legend explaining the concentrations for each color range would be much better than the explanation that yellow, orange and red all is low oxygen.
- Fig. 5: Please add description of the y-axis – which parameter is plotted where and what are the units?
- Page 9032: "The phenomenon qualifies the information..." I don't understand this sentence.
- Page 9031, Line 23: High temperatures?
- Page 9034, Line 3: fraction of young gw?

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 9023, 2010.

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