

## ***Interactive comment on “Comparison of different base flow separation methods in a lowland catchment” by A. L. Gonzales et al.***

**Anonymous Referee #1**

Received and published: 8 June 2009

### **General comments**

The manuscript by Gonzales et al.: "Comparison of different base flow separation methods in a lowland catchment" compares several tracer based two-component separations as well as a three-component separation on the one hand with several different non-tracer based separation techniques on the other hand. It is of special interest in that it shows the uncertainties or range/variability of results associated with both approaches. As the choice of non-tracer based separation method strongly influences the result (making results obtained with different methods, i.e. in different studies, very difficult to compare), a general recommendation as to which method to choose or how to choose would be very helpful. In this study, the tracer based separation (even though

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it was only carried out for three events) aided in choosing the most appropriate non-tracer based separation technique which was then applied over a longer time series.

The manuscript also discusses runoff generation processes in low lands, mainly based on the dynamics of groundwater and surface water levels, but also with respect to the tracer data.

In the abstract the authors remark that none of the many baseflow separation methods focusses on lowlands. As a consequence, I was expecting something like a discussion of the advantages and disadvantages of the many different methods that were applied in this study, especially concerning their applicability in lowland areas. Which of the methods might be useful in mountainous areas but not in lowlands? This could be discussed in more detail. Can you give a general recommendation in that for lowland areas generally those non-tracer based separation methods should be applied which allow for a highly dynamic baseflow response during events? Is it recommended to always carry out at least a two-component tracer based baseflow separation (how many events are needed?) in order to choose the best non-tracer based separation technique? Is it likely that this chosen separation technique might vary depending on season? (One method might be closer to the tracer results during the dry months, another during the wet season?) I can understand that you currently do not have the data to answer this question conclusively, however, you still might be able to say something about it in the discussion section.

The language of this manuscript needs to be improved by a native speaker. The wording is often clumsy, some sentences are grammatically incorrect.

### **Specific comments**

Abstract

1) in the abstract there is an abrupt jump from the explanation of why it is important to study runoff generation processes to methods of baseflow separation. A short explanation why baseflow separation is important in this context would be helpful here.

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2) does a good correlation between groundwater levels and discharge really always mean that most of the measured discharge during events comes from groundwater? Maybe use more careful wording here.

page 3486 and others:

e.g. l.27 define terminology to clearly differentiate between hydrograph separation based on filters/graphs/etc. from hydro-chemical separation. Otherwise things become confusing.

page 3487

l.8-15: sentence not clear (and too long)

page 3489

l.25-28: why were especially these methods chosen?

page 3490

l.19 what is the difference between weirs and inlets?

page 3491

are 4 wells enough to observe the groundwater level dynamics at the catchment scale?

l.14 what is ponded water in this context?

page 3493

l.26 - what if rainfall continues after the peak of the hydrograph? Is this method still applicable?

page 3493

l.6 discharge at the catchment outlet assuming it is all baseflow?

- is equation 8 also applied to the rising limb? or how is the baseflow hydrograph constructed for the rising limb?

page 3497

- maybe eq. 9 and 10 and the corresponding explanations should be moved to the methods section

- how were the hyd. conductivity and the storativity determined?

page 3499

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l.16 is there a spatial trend or pattern in the dissolved silica concentrations in groundwater? Could it be that during events areas with higher concentrations contribute which cancel out the low conc. of surface runoff?

l.20 10page 3500

l.9-11 what is the range in concentrations in the deep groundwater wells? how do know that the shallow groundwater is not contributing to flow during recession periods?

l.20-22 surface runoff was a discharge component even some days after the rain event - so how can you assume that you only have deep groundwater contribution during recession periods?

page 3501

It would be helpful if the results of the different methods were summarized in a table

l.7 are these runoff ratios mean values or cumulative values? over which period of time?

l.8 in what way are these results the worst? overall amount of direct runoff or dynamics?

l.13-14 sentence unclear - why don't you analyze all events of the period studied?

Discussion: I would be interested to know more about the the chemistry of the inflow to the study area at the inlets. Do you also find some sort of dynamics here which are not due to runoff processes as they are found in the study area?

In what way does the management of the weirs and inlets influence the response at the main stream gauge? See also general comments above.

Figures:

Figure 1 - what is the difference between weirs and inlets? They are difficult to differentiate on the map.

Figure 4 - what are the daily? oscillations that can be seen in February?

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Figure 5 - legend: difficult to differentiate the line types of Ca and Mg. At what time resolution were these samples taken? Mg, Ca 4 hours, SiO<sub>2</sub> 8 hours?

Figure 7 - why does not only the fraction, but also the total amount of shallow groundwater go down during the first peak?

Figure 8 - I can only see the black line (silica separation) during certain periods. What about the events in December? If there was no separation for these events how did you compare the results (runoff ratio) with the non-tracer based methods? Is the runoff ratio only determined for the events where silica data is available?

### Technical corrections

page 3484

l.2 I wouldn't use the word "kept" in this context

l.9 in this study, instead of in this research

l.27 "resulted in good results" - please rephrase

page 3485

l.17 in the science of hydrology

l.19 delete "up to the present"

l.21 in this study, instead of in this research

page 3486

l.11 uses

page 3487

l.16 little experience with this technique

page 3488

l.5 In the north

l.26 as is typical

page 3489

l.20 should be or were carried out?

page 3490

C1104

l.3 rephrase sentence

l.15 "are relatively spatially wie spread..." - rephrase

page 3491

l.12 "Water chemistry was observed" - please rephrase

l.15 at the main stream gauge

page 3497

l.1 delete "the amount of"

l.2 as a result of instead of in view

l.11-13 sentence unclear

page 3500

l.15 to a lesser extent

page 3501

l.8 worst results

l.8 come some closer to the tracer-based results - are closer to?, please rephrase

page 3502

l.6 a good correlation instead of relation?

l.28 delete one "only"

page 3503

l.15 proved

page 3504

l.4 verified instead of "proofed"?

some figures have labels that are in very small print (esp. fig.8), could be made more reader friendly

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 3483, 2009.

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