

## ***Interactive comment on “Hydrograph separation and scale dependency of natural tracers in a semi-arid catchment” by R. Bohté et al.***

**R. Bohté et al.**

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The authors wish to thank the reviewer for the thorough analysis of our manuscript and constructive comments. The reviewer indicates that we did not convincingly address the scale problem of tracers studies due the limited amount of data we have. Especially the uncertainty analysis and the implications (or conclusions) related to the semi-arid environment that we studied need to be elaborated on. We structure our response as follows: - General comments about the requested focus shift of the paper more towards the particular aspect of hydrological processes in a data scarce, semi-arid region. - Then we will go through most specific points raised by the reviewer and we will give direct answer or indicate how we want to address it. Our responses to these comments are of course related to the proposed changes in focus of the manuscript from

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scale dependency to more the regional hydrological behavior and recommendations for similar work in semi-arid regions.

The paper's methodology is insufficient to address the issue of scale dependency of natural tracers. We repeat our response to reviewer #1: When submitting the paper, we believed it is a useful contribution to the literature to put the paper in the perspective of scale dependency, and we decided to stress that point in the manuscript. However, we have to agree with the reviewers that the presented data too are limited. We do not have data from 5-10 catchments to elaborate on the scale problem. We therefore accept the reviewers argument that it is not sufficient to address this issue.

Uncertainty analysis should be included and interpret the work in terms of a semi-arid region with limited data. We agree with the reviewer that the data sets and the insights we got from them are worthwhile but that we did not address this point enough so far due to our decision to focus on the scale issue. We propose to re-structure the manuscript and focus on hydrograph separation and its uncertainty/errors and discuss the methods applicability in such an environment and its scientific significance. We believe we already pointed out the interesting results we obtained from our method in this region but agree we have to stress larger implications. To do so, we proposed in our response to reviewer #1 that we then need to present the study area in more detail, will add all tracer results that we conducted together with an analysis of the errors and uncertainty, interpret the hydrological information that we gained from it (as in the current paper) and will draw conclusions about the specific circumstances of doing hydrograph separation in semi-arid regions. These major revisions of the manuscript we can do in a period of 6-8 weeks, and ask the editor whether this is acceptable.

Specific comments Ad p1344) We will specify the abstract such that it is more clear. Add p1345-1346) We will include a catchment description and research set up in more detail. Ad p1347) We used standard raingauges and collected all the rain water as soon as possible after the rain event to minimize the evaporation from the raingauge. This was normally the morning after the rain event, unless indicated (such as in Fig.2).

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Ad p1348 l18) We will do as suggested. Ad p1348 l24) The 4 days field campaign was 25-28 March 2008 as shown in figure 2, right panel. Ad p1349) We feel it is more appropriate in the method section. Ad p1350) We will elaborate on this and make it a more central theme of our revised manuscript. To the best of the authors knowledge, there are 3 articles (except of Mul et al. 2008 in semi-arid Africa). We will check the literature once more. Ad p1351 L15-17) Idem. We will focus on this in our revised manuscript. Ad p1351 L21-22) We will provide a better map, give all information and use names more consistently. Ad p1352) We will specify locations, dates etc. We will also include the 18O values both in the text as well as in the figure. Ad p1352 L14) The 55% is based on the SiO<sub>2</sub> hydrograph separation, the range is between 34 and 55% is based on the three hydrograph separations performed (using SiO<sub>2</sub>, dD and EC), where SiO<sub>2</sub> and dD show very similar values. Ad p1352 L120-22) Currently, we have no idea, but we will investigate this further during the planed revisions of the manuscript. Ad p1353 L2-3) The contributions from the two catchments were determined also by hydrograph separation using the hydrochemical and isotope concentrations from the two streams just before the confluence. We will add this description to the methodology. Ad p1353 L20) The sampling threshold at the larger scale was indeed 30 cm and not 10 cm. Ad p1353 L27) We will rephrase as "a slight drop" and adjust the figure. Ad p1354 L16-19) We agree to bring this to the methodology section. Lines 25-26 are somewhat descriptive and we will rephrase this. Ad p.1355 L3) OK. Ad 1356 L12-14) We agree to include the other hydrochemical parameters in the revised manuscript and analyze them also concerning their spatially variability. Ad p1358 L5-7) and L 23) We have no data supporting this statement and thus it is correct that we assumed that the spatial variability of smaller scale could be neglected. Ad Table 1-2.) We will explain the methods of runoff determination and runoff ratio calculations and follow the suggestion to be consistent in our terminology. Ad Figures) We will redraw all figures taking into account the reviewers' suggestions and explain the step functions and quick decline. Figure 5: The sudden declines are a result of the automatic pressure transducer taken out for cleaning and reading out of the data, which will be clarified in

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the revised manuscript. We thank the reviewer also for the technical corrections which we will all include in the revised manuscript.

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