Responses to the comments of Referee#3 on HESS-D paper hess-2010-65:
"Hydrochemical analysis of stream water in a tropical, mountainous headwater catchment in northern Thailand"

We highly appreciate the constructive and helpful comments of Referee#3. The referee remarks that this work has been carried out in a data-scarce region and could be accepted for publication in HESS provided that MAJOR REVISIONS will be performed. We went carefully through his comments. In the following we give a short summary of the comments and explain for each of the comments, how we will address the mentioned issues.

A technical note: References not yet included in the reference list of the manuscript are listed in Appendix 2 – References. New figures (A1 to A7) and tables (Table A1) are shown in Appendix 1.

Response to Referee #3

Comment 1) The referee states that only the vertical flow paths are discussed, but the measurements origin from a 7 km² catchment, where the stream flow is most likely as well affected by different parts of the area. The referee asks, if there are any details on the vegetation, topography, geology, soils, etc.?
Reply 1) There is a coarse land use map of the year 2003, but a detailed soil map and a digital elevation model are available for the Mae Sa Noi catchment. We will include both in Figure 1.

Comment 2) How much does the stream network extend during rainy season?
Reply 2) The stream shown in Figure 1 is perennial. We observed two more tributaries in the rainy season, but we did not continuously observe the stream network in the subbasin.

Comment 3a) The referee says that a clear definition of 'interflow' is needed, **3b)** the sampling method and the sampling sites should be described more clearly, and **3c)** surface runoff sampling is unclear as well (where, how many samples).
Reply 3a) We consider the water leaking from the soil at the foot hill close to the river as interflow. Technically, as it emerges from soils before it enters the stream (probably due to constraints by the bedrock), it could be named throughflow, too. However, the assumption is that the water travels laterally below soil surface.
Reply 3b) In Figure A1 and A2 (Appendix 1) we show pictures of the leakage, which can be included in the paper, and we will go into more detail while describing the sampling methods and sides. The 'interflow' was sampled at the foot hill while leaking from the soil, and it was sampled on different locations along a 10 m strip nearby to the outlet.
Reply 3c) The surface runoff was sampled with a trench of 2 m length at right angles to the slope collecting the water from the upper slope. The samples for each event were collected as mixed samples in a 15 L bulk collector, in which the trench ended in (see Figure A3, Appendix 1). In total, 6 mixed samples of surface runoff were analyzed. During the sampling in 2009 (Duffner et al. 2010) two more trenches were set up along the hillslope to test the spatial variability on EC values of surface runoff.

The methods and other details regarding the new data set will be properly described in a revised version of the paper.

Comment 4) The referee notes that **4a)** based on the small data base, conclusions should be made carefully and that three events do a little amount of information, **4b)** the general measurement design was insufficient and might give limited insight, **4c)** no rain gauge can be found in the catchment, **4d)** the pesticide part is highly speculative and asks for data on pesticides during any of the events. It is asked if **4e)** further attempt of hydrometric measurements in the catchment was done.
Reply 4a) We are aware of the data limitations. We would like to strengthen the data base by using additional data from two events observed in 2009 (Duffner et al. 2010) (Figure A4-A7 Appendix 1) at the same study site. Furthermore, we will critically revise the conclusions based on information which can be justified by observations or measurement.
Reply 4b) This work was carried out to get a first overview of the hydrology of the catchment. We focused on that particular study site, because there are data available which are not available for the rest of the subbasin. However, it is correct that the limited spatial extent must be discussed much more strongly and that the assumption must be stated more clearly in a revised manuscript.
Reply 4c) This issue was addressed by Referee#1, too. Therefore, we would like to refer to *Reply 6b* of *Response to Referee#1*.
Reply 4d) Unfortunately, there are no pesticide data available for these three events. This paper was thought to be a base-line for upcoming work, which will combine tracer with pesticide transport experiments (in preparation). Regarding the revised manuscript, we decided to delete all cross-references to pesticide transport except in the introduction section where we outline the purpose of our paper.

Comment 5) The applied tracers can not necessarily be assumed to be conservative. Why were no isotopes used (O-18, Deuterium)?
Reply 5) The tracers used in this work are commonly used for hydrograph separation, as documented in the literature. Yet, these tracers are, of course, not completely conservative. O-18 and Deuterium would probably have given more precise results, but their use was not possible in the specific situation (remote site in a developing country, no mass spectrometry available and budget constraints).

Comment 6) Figure 1 should only show what is used in the study.
Reply 6) We will change Figure 1 and reduce it to the present study site.

Comment 7) The referee asks how the high variations of the data in the event in Figure 3 are explained and if it is caused by an earlier event (as stated by the authors) and if it would not invalidate the hydrograph separation?
Reply 7) We will extend the axis of the graph to show the minor event in advance. In our understanding it does not invalidate the hydrograph separation, because the data used for the separation are measured continuously over the course of the discharge curve.

Comment 8) Add uncertainties in Figure 8 and Figure 9 and Table 2.
Reply 8) We will include the uncertainties.

Comment 9) Is Figure 10 needed?
Reply 9) This figure will be removed from the revised manuscript.

Comment 10) Show the number of samples in Table 1
Reply 10) The amount of samples will be given in the table (See Appendix 1, Table A1).