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## ***Interactive comment on “Use of rare earth oxides as tracers to identify sediment source areas for agricultural hillslopes” by C. Deasy and J. N. Quinton***

**Anonymous Referee #2**

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The manuscripts presents a relevant work in a very active field in the last years, a topic of interest to most the scientist working in sediment tracking at field scale. It has been made with a sounded scientific approach and the results are relevant. That is why, in my opinion, this manuscript should be accepted for publication. However there are some issues that although could probably not been completely solved within the scope of the work presented in the manuscript, given the relative novelty of the technique, should be given more space in the manuscript.

I have two main general comments.

1- The first goes in the line of the limited statistical significance of differences based on

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the results presented in the manuscript (especially those in Figure 2). I am not sure if that is the result of averaging the results of the four plots or represents a relatively large variability in the analytical results coming from the sediment collected at each of the four plots. Including more information about the methods and results on the analytical results of RRE in sediment would benefit the manuscript and the discussion.

2- My second comment goes in line with the previous one. It is apparent from the low depletion rates (between 0.01 and 0.15 % per event approximately) that the concentrations for a given RRE element in the sediment might be very small. I have to apologize but I have not been able to perform the back calculations myself from the information in the manuscript and the supplemental material. The manuscript could gain providing the actual concentration of the different RRE measured in the sediment, their variability and the implications for future sampling and analysis.

Other comments of minor relevance that might help the authors to improve the manuscript are:

1- Ventura el al. published a further paper (Ventura el al., 2002. *catena* 48: 149-161) in which they mentioned as a major limitation the preferential sorting of their tracer compared to the soils, and also that the ration tracer: sediment in runoff did not remain constant under different rainfall intensities. This would probably been worth mentioning in the introduction.

2- Figure 2 is really difficult to read with error bars overlapping. I would suggest presenting these results in a format similar to that of Figure 4 in Stevens and Quinton 2008 (*Catena* 74: 31-36) and also including a Table with the individual results per plot. This might facilitate understanding by the reader and discussion.

3- The authors assume in the manuscript homogeneous tagging of the soil in the top 1 cm of the soil based on the results of Stevens and Quinton (2008). However it is apparent from Figure 3 of these authors that concentration of RRE decreases in soil from surface (0 cm depth) to 0.5 cm depth. It will be interesting to address this issue,

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and also the potential differences in distribution based on the two different methods of application of the RRE (between Stevens and Quinton 2008 and those in the revised manuscript).

4- Zhang et al. 2003 (SSSAJ 67: 279-288) determined the extraction efficiency of the RRE used, using this recovery rates in their calculations. These recovery rates varied between 88 and 110% for the elements used in this manuscript. It will be useful to other authors to include in materials and methods this recovery rate for the procedure used.

5- It is apparent that deposition of detached sediment had to be very small. However I wonder if the authors might considered useful in the context of their study to complement sediment analysis with analysis of soil samples taken after the rainfall period (or periods) to keep track of the sediment moving along the slope as done, for instance, by Polyakov et al. 2004, Earth Surf Proc Land 29: 1275-1291.

6- Inclusion of the dimensions of each area in Figure 1 might be helpful, also specific indication in the manuscript of there were some traffic in the plots during the experiments. Also if ground cover was similar in the differently tagged areas during the experiments.

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Interactive comment on Solid Earth Discuss., 2, 195, 2010.

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2, C61–C63, 2010

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