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Discussions

Interactive comment on "Coupling sediment flow-paths with organic carbon dynamics across a Mediterranean catchment" *by* C. Boix-Fayos et al.

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Comments to the manuscript by Boix-Fayos et al. submitted to HESSD.

The authors present a very valuable case study on the link between soil erosion and sediment-associated OC transport and deposition in a medium sized catchment in SE-Spain. The authors provide great results on the changes of sediment and OC characteristics (esp. grain size and OC concentration of various C-fractions) along the flow-path of the sediment and OC, including hillslope and fluvial processes. The structure of the discussion should be improved and the wider implications of their results should be discussed in more details (see detailed comments below and in the annotated pdf).

In summary, I find this manuscript suitable for publication after minor revisions. For

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detailed comments, the authors are referred to the general comments (below) and the attached annotated PDF of the manuscript.

Title: The title suggests that the authors are coupling the sediment flow-paths with organic carbon dynamics. I suggest to use an alternative title such as: 'Sediment-associated organic carbon dynamics across a Med. catchment' or 'Organic carbon dynamics associated with soil erosion and sediment delivery in ...'

Abstract: The abstract summarizes the study very well. The final conclusion should be strengthened.

Study site:

- If available you should give more details on rates and contributions of different processes (e.g. bank/gully erosion versus sheet/rill erosion).

- Describe what you mean with non-selective erosion; and what is selective erosion?

- Improve Fig. 1, for a better representation of the study site, as suggested below.

Methods:

- Motivate the fractionation; what do you expect for different fractions in terms of selective erosion and stability?

- Why do you use the IA and ASC? What is the expected impact of micro-aggregates on the lateral C flux?

- State that C:N is used as a proxy of C-depletion. What happens to the N during transport?

Results:

- I suggest to restructure the results presenting first the data on grain size and texture in different pools, secondly the OC and C:N and finally the link between the texture and OC and C:N.

- In addition to Tab. 3, I would like to see scatter-plots of clay content and IA versus TOC, C:N etc. with different symbols for different pools.

- You compare the OC in soils (sampled in the upper 10cm) with the OC in wedges sampled down to 125cm. This is very problematic, since OC is typically much higher in the upper 20cm than below!

- You should give more information on the depth distribution of OC on slopes and in different deposits. Additionally, this should give information about the stability of C in the deposits (see e.g. Van Oost et al 2013, PNAS).

Discussion:

- Currently, the chapter 5.1 and 5.2 are partially redundant and there is not clear distinction between the topics.

- I suggest to structure the discussion in terms of changes along the sediment cascade as depicted in Fig. 1; starting at the soil and C sources and then discuss the lower pools with greater transport distances. This information is then used to highlight the mechanisms of C loss and gain in different depositional settings and with greater transport distance.

- In line with my suggestion to restructure the results, I suggest to discuss the selectivity of the grain sizes first and then to stress the effects of grain size selectivity on the mechanisms of the C cycle.

- No information of the age of the sediments is given. Do you have any ideas of the age of the dated samples and how this relates to depletion and enrichment of OC in the different pools.

- Differences between TOC, POC and MOC are only marginally discussed. Are there major differences in the processes of erosion, transport, deposition and depletion between these fractions?

- In contrast to other cited studies, the authors highlight that their results show a decrease/depletion of OC after soil erosion and transport. However, the reasons for this difference are insufficiently discussed. Is this basically due to different erosion and transport processes, or different spatial and temporal scales of OC transport, or both, or something else? Please extend the discussion on the controlling factors of the depletion/enrichment of OC during transport.

Figures:

- Figure 1: I suggest to show names of the subcatchments and rivers which are mentioned in the text. Is it possible to show the topography of the basin? It is hard to see anything meaningful in the picture of the channel bars.

- You should add a Figure with the location of the sampling sites and stations for suspended sediment sampling.

- Figure 2: I suggest to add letters for the different plots within the Figure and specify the references in the text, accordingly.

- Figure 3: In my point of view, it is sufficient to present sand, silt and clay fractions and skip the other fractions.

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Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/11/C1813/2014/hessd-11-C1813-2014-supplement.pdf

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