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Earth Surface Dynamics Discussions

Interactive comment on "Short Communication: Humans and the missing C-sink: erosion and burial of soil carbon through time" *by* T. Hoffmann et al.

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We thank the anonymous referee 2 for his/her positive and helpful comments on our manuscript. Below, we comment on the reviews and give details on the changes we made in the manuscript:

This specific suggestion is then contextualised with an example in which cumulative emissions during the Holocene have been modelled for the lower Rhine basin (Fig. 4), set against Holocene carbon storage data (Fig. 3) which is based on Hoffman et al. 2013. This contextualisation, however, is not as convincing as it could be as there is insufficient detail provided here as to how the data have been derived, what the

uncertainties are, and how comparable the two distinct datasets are.

We added an additional section in the supplementary material to give more information on the methods applied for the large-scale hillslope and floodplain OC-budget. We basically argue that not all OC stored in post-Neolithic hillslope and floodplain deposits are directly linked to human induced soil erosion, but may result from in situ soil formation processes. In the case of floodplain sedimentation, high sequestration rates are, however, conditioned by high sedimentation rates (as described in the text) and thus indirectly linked to human induced soil erosion. Additionally, we extended caption of Fig. 3 to describe the results and to put it into the context of chapter 4.

Figure 2, which provides lifetime vs sequestration for selected C pools is also a useful illustration supporting the arguments made in the manuscript, however, the same limitation applies. It is not clear why these specific examples have been selected, how representative these are as a whole and what limitations/ uncertainties the data presents. Some information is given in the supplement (in which it appears wrongly to be referred to as Figure 1), but this information does not address the issues raised above.

We fully agree that the information on Figure 2 are very limited in the submitted script and extended the supplement with a focus on data selection, methods, limitations and representativeness of the used data. In general, Fig. 2 presents a first attempt to evaluate the long-term effects of OC-storage on different systems that are highly modified by human land-use. We basically used all information, which could be interpreted in terms of fluxes (x-axis) and lift-time (y-axis). However, we are fully aware that this Fig. provides only a first approximation and a more detailed comparison is necessary. However, this is beyond the scope of this paper.

I recommend publication, however, suggest to be more specific (in the text or figure captions) about the supportive data presented so that the paper can be read and understood without having to consult a variety of previous sources. Furthermore, it would

be useful to set the examples used here into context in terms of their applicability to other climatic and geomorphological settings, and in comparison with natural (nonhuman induced) soil erosion processes.

The paper is on human-induced impacts on C budgets along the hillslope-fluvial continuum, and addresses the question whether that will have positive or negative impacts, which should be addressed by considering the entire pathway and sinks. The key argument is that considering individual elements along this pathway (hillslopes, channels, floodplains) in isolation is insufficient, but that these need to be considered as an entire 'chain'. Comparison to natural soil erosion is not the subject of the paper. Our focus here is on Central Europe, since it provides the highest data density for the analysis on long-term human impacts on sediment and OC-fluxes. We added several comments to relate our examples from temperate regions (e.g. Central Europe) to Mediterranean landscapes (as suggested by the review of J.M. Garzia-Ruiz, see reply there).

Interactive comment on Earth Surf. Dynam. Discuss., 1, 93, 2013.