

Interactive comment on “Geogenic organic carbon in terrestrial sediments and its contribution to total soil carbon” by Fabian Kalks et al.

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We gratefully thank the reviewer #2 for all the comments and advises to improve the manuscript. We will take all comments into account in a revised manuscript version.

22. Bacteria fixing GOC will produce fresh ^{14}C -depleted organic matter. The method mentioned here will thus overestimate GOC. - The organic matter taken up by bacteria is the material in the place where they live. Thus, even if bacteria produce fresh ^{14}C -depleted organic matter, its origin is still geogenic, and will thus not overestimate GOC. We will change the sentence in l. 55 to “OC that originates from deposition during sedimentation and rock formation” to make it more clear. Methods

23. More details on land-use history of the sampled soils are needed. What about

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the soil samples from agriculture field? - We will add more information about the sites from a detailed soil classification. In addition, we will give an estimation about the duration of historical agricultural use of the Loess site.

25. What about the effects of the different vegetation/land-use history on soil weathering, DOC, root input? - The different effect of vegetation/land-use history on past soil weathering can be neglected for the samples sites to the best of our knowledge since it is more the initial substrate and the atmospheric input that drives the weathering rates according to Watasuki (1992, “Rates of weathering and soil formation”). However, the effect of different land use on DOC input and deeper rooting trees will be discussed in more detail.

26. What about O_2 during the incubation? It is difficult to follow the soil treatments before incubations. - Since the vessels were flushed with ambient air before the incubation started (see l. 217) and the air volume was quite high (around 5 l) we can assume that the O_2 is not limiting during the incubation but O_2 concentrations were always $>20\text{Vol}\%$. We will describe the soil treatments before incubation more detailed.

27. Why only show the incubations with the intact rocks in Fig.3, as crushed rocks better estimated the effect of weathering and showed significantly higher respiration rates. - Fig. 3 shows the respiration rates for the crushed samples and not for the intact cores. We will make this clear in the Figure caption and in the text.

28. Line 203: please delete under optimal conditions. - Will be deleted

29. It is important to mention that the calculation (eq. 7) assumes that no labile fraction is derived from ^{14}C -dead bacterial biomass. - Since we will replace the double pool model (see comment on 8) and replace it with assuming a linear mineralisation model, we will rewrite it. ^{14}C -dead microbial biomass as part of a possible labile OC fraction in the sediments will be discussed.

30. Discussion Line 495-499: This is again assuming no bacterial assimilation. Please

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discuss this. Also, delete the last sentence line 499, as this would argue the opposite
Line 512-524: same as before. ^{14}C values of the respired CO_2 could help here. - This
will be changed because we will replace the double pool model by linear regression
analyses. But as responded to 29, we will now also discuss the possible microbial
contribution with ^{14}C free biomass. Since we do not have $^{14}\text{CO}_2$ values (see comment
on 8) we have to work with the data we obtained.

31 Line 565: change to" Incubation of sediments seem to indicate that this geogenic
contribution. . . - Will be changed. Additionally - The suggested literature (Seifert et al.
2011 and Schwab et al. 2019) will be cited.

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