



Comment on soil-2020-96

Anonymous Referee #2

Referee comment on "Heterotrophic soil respiration and carbon cycling in geochemically distinct African tropical forest soils" by Benjamin Bukombe et al., SOIL Discuss.,
<https://doi.org/10.5194/soil-2020-96-RC3>, 2021

In this manuscript, the authors present the results of a 120 day soil incubation study of three soil types (mafic, felsic, and mixed sediment) sampled across topographic positions and investigate the biological and chemical controls on respiration rates and respired $^{14}\text{CO}_2$. This manuscript is a significant contribution to the soil organic carbon research because the soils are from tropical Africa, a region where few studies have been carried out. Furthermore, this manuscript looks at the important C stabilization mechanisms in highly weathered soils, which are also poorly sampled and understood relative to less weathered soils often found in temperate regions. Another positive is that the researchers examined 3 depths within the soil profile. I found no glaring issues with the methods used in this study. I did have some questions about the way some of the data were presented. On one hand, this paper could be shorter and more streamlined, but on the other hand the lack of data from Tropical Africa does greatly increase the value of all the parameters reported here. I offer some suggestions on how to shorten the paper below.

Line comments:

107-125: This whole paragraph would be better as a Table intruding the sites and their location and chemistry. A table would be easier to read than a paragraph and make it easier to compare the sites.

154: 12 mm seive seems like a rather large size when the usual is 2mm. It seems that the authors did not want to disrupt aggregates. that reasoning should be given here.

174: An average of the respiration rates over 120 days, when the rates usually decrease exponentially, seems like an odd metric. Why was this parameter chosen instead of say, cumulative C loss over 120 days?

185: How was the ^{14}C collected from three replicate jars into one evacuated container? Wasn't the vacuum in the container a different strength for each replicate so that they may not have been sampled equally?

254: How did you evaluate the distinctness of the RCs based on F-values?

Section 3.1: To help streamline the manuscript, I recommend getting rid of the discussion of TPR in the results, since SPR is the focus of the manuscript. Perhaps the TPR graphs and language could be in the supplement? I am not sure what additional understanding the TPR variable really adds here.

280-281: I think this sentence is basically a repeat of the first sentence

Fig 1. Are the standard errors based on the replicates or the measurement times since all were averaged to get these values.

Fig 2. I think these graphs could better show the differences between the bulk and respired ^{14}C based on how you discuss the results in section 3.2. It would be easier to compare bulk and respired ^{14}C if they were put on the same graph. The way they are now it is hard to see when they are similar and when they are not.

345-349: I am not sure what the extrapolation of the respiration rates of the fossil organic C add here and in Table 1. Given the caveats, which you mention in the discussion, it would be better to leave these numbers to the discussion only.

Fig 4. After all the data that is presented in the results, it is odd that the discussion starts off with yet more data! I find figure 4 overwhelming. It has 8 graphs, each with three correlations, with a total of 24 to examine! Many of these are not significant. I suggest saving the whole figure for the supplement and choosing 1-3 graphs to highlight in the discussion. Furthermore, something should indicate which relationships are significant here, maybe make the r and p values bold where they are significant?

474: I am confused by the attribution of mineral stabilization mechanisms to controlling SPR here as amorphous and crystallized oxides had no relationship to SPR and pyrophosphate-extractable had a positive relationship indicating it was not stabilizing the carbon.

Fig 5. Can you bold the p values for what is significant here? Same for the similar graphs in the Appendix.

502: specify high C:N here