**Rates of soil organic carbon loss from rainforest to pasture conversion at a deforestation hotspot in the Amazon basin**

In this manuscript the authors present a relative straightforward study conducted in South East Colombia in which they use the chronosequence approach to assess changes in soil bulk density, soil C concentration, soil C stocks and origin of soil C based on 13C isotope analysis. They show that the soil C stocks declined over time, but surprisingly forest-derived soil C stocks losses were faster in the 10-20 cm depth interval than in the 0-10cm depth interval whereas the pasture derived soil C stocks increased faster in the 0-10 cm depth interval, which they explain with the change from deep roots in the forest to shallow roots in the pastures.

The strength of this study is that it was conducted in the field, based on a careful site selection with sufficient replication. It was conducted in an understudied area of the Amazon basin and as such it is important that these data become available to the scientific community. However, there are some critical points, that I think the authors should address before I can recommend publication.

We appreciate the reviewer for taking the time to read our study and for the valuable and constructive comments to improve our manuscript. Each point will be addressed below with our responses in blue.

-As is mentioned by the authors in the discussion (l. 202) soil texture can have a major influence on decomposition rates. Unfortunately, soil texture is never mentioned and may have had a strong influence on the results. The authors mention that soil were Ferralsols or Acricols (l. 75). Whereas these soils all have in common that they are highly weathered with a low CEC they may have substantial difference in soil texture, especially since Acrisols have undergone clay translocation. The best solution for this problem is if you can analyze back-up sample for soil texture (sand-silt-clay). At a minimum you should convince the reviewers that there were no significant differences in soil texture among the sampling sites.

Thank you for the important observation regarding soil texture. We mentioned Ferrasols and Acrisols in l.75 as these are the common soils found in the region of our study area. Fortunately, during the study we also collected samples for texture analysis. To assess the potential influence of texture, we retrieved our texture data from the 0-10 cm horizon for all sampling sites and conducted the following data analysis. We applied the arcsine transformation to the sand, silt and clay proportions to conduct a hierarchical cluster analysis where it determined that the optimal groups of textures were one (k=1, gap statistic) (Tibshirani et al., 2001), suggesting a consistent textural group across sampling sites. Most importantly, we evaluated whether texture (sand, silt or clay content) explained any residual variance in the soil carbon estimates by testing the correlation between arcsine-transformed texture variables and the model residuals at the 0-10 cm soil horizon. We found non-significant relationship for sand, silt and clay content (Fig. 1), indicating that the variation in soil organic carbon stocks was mostly explained by the variables contained in the model (time and $\delta^{13}C$). These findings suggest that soil texture did not influence the reported results and will be further addressed in the discussion section.

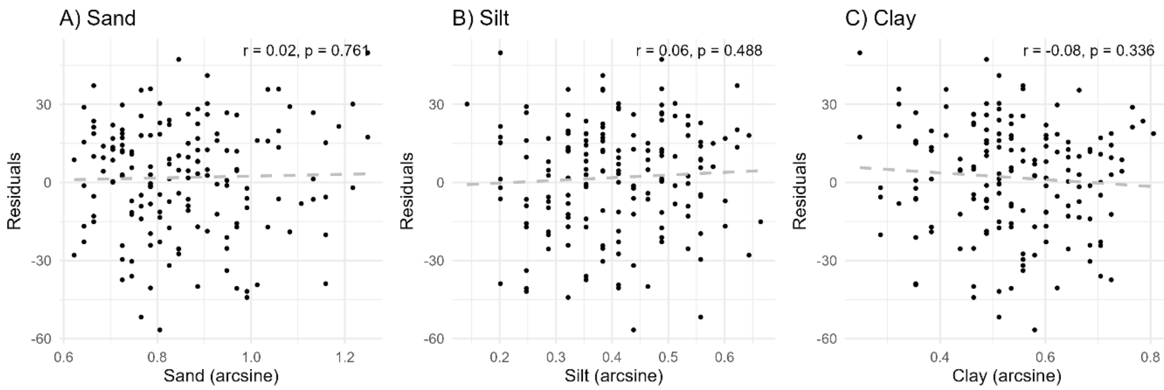


Figure 1. Correlation between arcsine-transformed soil texture data and soil carbon model residuals. Dashed lines represent a linear regression between variables.

-To assess forest- and pasture-derived C normally you also need an 13C values of the 'endmembers' (**forest litter and pasture litter**). If I am not mistaken, this is not mentioned. Please give the 'pure' signatures of C3 and C4 that you used and explain how you assessed them.

In our analysis we used average values from 13C at 0 and 30 post-deforestation years (-29‰ and -21‰ respectively), by the assumption that 0-year was forest-dominated and 30-years was pasture-dominated. However, we agree with the reviewer comment, we have now revised our data and calculated 13C values from forest litter and pasture litter samples (~ -31‰ forest and -16‰ pasture). We employed these values in our model (Equation 4 – l.125) and found slightly higher rates of forest-derived SOC loss, meanwhile the reported pattern across soil horizons remained the same – higher rate of forest-derived SOC at 10-20 cm and higher rate of accumulation of pasture-derived SOC at 0-10 cm. Moreover, the updated model suggests that after 30 years following deforestation, pasture-derived SOC accounts for approximately 90% of the total SOC pool in the topsoil. These adjustments will be made in the manuscript; we thank you for highlighting this important point.

-In your assessment you assume that the forest was replaced with a 100% C4 pasture. However, in my experience, pure C4 pastures do not exist, especially in frontier areas like where you worked. So the C-input in the pasture, will be at least partly be from C3 plants and this contribution may even increase with pasture age if a pasture degrades and C3 bushes start to grow. I think this may be the main reason why you actually found slower forest-derived SOCc loss in the top 10 cm compared to the 10-20 cm depth interval: you assume that all C3 carbon in the top 10cm was forest-derived, but part of it is probably from C3 herbs or bushes in the pastures. There is no simply way to fix this, but you could do an analysis in which you make assumptions about the C3 carbon input and how this may have affected your results.

That is a good point, as pasture management is variable across the Colombian Amazon (Navarrete et al., 2016). Based on previous studies in the west of the Colombian Amazon, the pastures in our chronosequence are located where intensive cattle grazing systems are employed, as described by Navarrete et al., (2016). Therefore, we expect that presence of C3 weeds and shrubs don't influence our results.

-I noticed in Figure 1 that there are irregular yellow areas that have no pasture age. Could you explain what these areas are?

In Figure 1, there is an underlying raster map of forest/non-forest cover, the irregular yellow areas are regions with no data. These gaps are caused by cloud cover or missing satellite imagery that affect the land cover classification. We will clarify the figure caption in the manuscript.

-I did not see the original data (maybe I missed them). However, I think it is very important that these data will become available without restrictions and I encourage you to include them in an appendix or in a data repository. I know that you write that they will be made available upon request, however, it is possible that the first author cannot be reached in some years which would make the data unavailable.

Yes, we are currently checking data repositories to make our study data available. We appreciate the suggestion.

**References**

Tibshirani, R., Walther, G. and Hastie, T.: Estimating the number of data clusters via the Gap statistic, Journal of the Royal Statistical Society B, 63, 411–423, 2001.

Navarrete, D., Sitch, S., Aragão, L. E. O. C., and Pedroni, L.: Conversion from forests to pastures in the Colombian Amazon leads to contrasting soil carbon dynamics depending on land management practices, Global Change Biology, 22, 3503–3517, https://doi.org/10.1111/gcb.13266, 2016.