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To the Editorial Board
Copernicus Publications
Journal Soil

Dear Editorial Team,

Thank you for giving us the opportunity to do the minor revision. We found the comments and questions by the unknown referee #2 very useful and suggest revisions of the manuscript accordingly. All of our responses are listed below.

Response letter

Response to the comments and questions of the referee's related to the manuscript:

MS No.: soil-2020-98

Special Issue: Tropical biogeochemistry of soils in the Congo Basin and the African Great Lakes region

With the title:

“Aluminous clay and pedogenic Fe oxides modulate aggregation and related carbon contents in soils of the humid tropics”

Response to the comments of referee 2.

Referee 2: *“I think the comments are easy to address and I would rate them as a minor revision even though the changes in text for section 3.2 and 4.1 might still be more substantial. While revising sections 3.2 and 4.1, consider that SOIL has a very broad readership and I think it is worthwhile going the extra length in revising and streamlining the MS (especially section 4.1).”*

General response: We will revise the logical structure of sections 3.2 and 4.1 as suggested by reviewer 2. We will further try to focus on the core messages of the article in order to improve the readability of the article in these sections.

Introduction:

Referee 2: *“Line 72: Not sure what other sources of uncertainty the authors are listing here as the previous sentences were examples of the relevance of individual cementing agents on aggregation. Please rephrase this sentence and better connect the argument starting from line 68 up to line 80 to enhance clarity about your problem statement.”*

Our response: With this sentence we want to summarize the fact that different authors have recognized various influencing factors on the aggregation and we also assume that a different relative composition of the clay fraction (aluminous clay and pedogenic Fe) may explain these differences. To make our intention clearer, we have rephrased the sentence (Lines 72–75: “Such kind of uncertainty may derive from the fact that the clay size particle fraction (< 2- μ m) not only contains OM and different types of clay minerals, but also variable contents of pedogenic Fe and aluminum (Al) oxides (Barré et al. 2014; Fernández-Ugalde et al. 2013; Wagai and Mayer 2007).”).

Referee 2: *“Line 81: This was not really stated above. Consider starting the paragraph with “Soil aggregation...””*

Our response: We agree with referee 2 and will remove “As indicated above,...” to start the sentence with “Soil aggregation...” (Line: 83).

Referee 2: *“Line 108: insert “of” main mineral constituents”*

Our response: We agree with referee 2 and will add “of...main mineral constituents” (Line: 111).

Referee 2: “*Line 117: Good to add this clarification but neither here, nor in the methods the authors include an explanation as per why this depth increment was further separated from 0–5 and 5 to 10 as explained in the response to reviewers “In the forest soils, we identified two different soil horizons at this depth varying in soil OC and soil structure. Hence, we differentiated between 0–5 cm and 5–10 cm. To have a consistent sampling design, we applied this distinction to the cropland sites, too” Please add this somewhere in the methods, line 136 perhaps?*”

Our response: We agree with referee 2 and will add additional information (Lines 139–142: “This procedure was chosen because we identified two soil horizons at 0–5 and 5–10 cm depth based on differences in color and structure. To have a consistent sampling design, we applied this distinction to the cropland sites, too.”

Methods:

Referee 2: “*Line 193: change treatments for “land uses and depths”*”

Our response: We agree with referee 2 and will rephrase the sentence (Lines 198–201: “To test for significant differences between mineralogical combinations, land uses, and depths, we applied the linear model function [lm()] in combination with analysis of variance [aov(lm()).”).

Referee 2: “*Line 201: how can the n for ‘high clay–high Fe’ under forest be 7 if only 6 plots from forests were used?*”

Our response: This is based on the fact that we have drawn clear threshold values for the content of aluminous clay and pedogenic Fe for assignment of samples to defined mineralogical combinations. As a result, the six forest locations examined were distributed over the four selected mineralogical combinations and caused a different number of repetitions in each combination.

Results:

Referee 2: “*Table 1: What do the capital letters in Fe_d /clay ratio represent?*”

Our response: We understand the resulting ambiguity and will adjust the text of the table and remove the capital letters for the Fe_d /clay ratio. We'll add the following sentence to clarify what the capital letters mean for the OC content (Lines 224–225: “Lower case letters

indicate significant differences within a certain land use as separated by depth, and capital letters denote significant differences between land uses.”).

Referee 2: “Section 3.2: This section is still convoluted and hard to follow. To enhance the readability of this section, maybe focus first on the results from Figure 1 to then describe results from Table 2 or whichever order the authors consider best.”

Our response: We agree with referee 2 and will streamline section 3.2. For this purpose we will remove the following sentences to bring focus on the most relevant results of the manuscript (Lines 243–...: “For most combinations, about 74% of soil mass was present in aggregates > 2 mm (Figure 1a), whereas in forest soils with low contents in both aluminous clay and Fe oxides only 40% could be assigned to aggregates > 2 mm. Only –12% of total soil mass remained in < 0.25 mm aggregates (Table 2).”; Lines 304–...: “The same model separated by soil depth showed similar relationships (Table S1).”; Lines 319–...: “Only under cropland we observed a negative effect of aluminous clay and a positive influence of Fed on microaggregate contents (aggregate mass < 0.25 mm0–5 cm: $r^2 = 0.8$, $p = 0.004$; aggregate mass < 0.25 mm5–10 cm: $r^2 = 0.61$, $p = 0.03$).”)

Furthermore, we will rephrase the section header and will add subheadings to guide the reader through the complex matter of the section (Line 240: “3.2 Influence of aluminous clay and pedogenic Fe on aggregate size distribution”; Line 241: “*Mean weight diameter*”; Line 256: “*Macroaggregate s > 4 mm and 2–4 mm*”; Line 306: “*Microaggregates < 0.25 mm*”; Line 335: “*Summary*”).

We will take information out of the section and refer to the corresponding tables to facilitate reading (Line 244: “and 3.7 mm in 5–10 cm depth (”); Line 245: “and 3.7 mm in 5–10 cm depth (, and 4.6 mm in 5–10 cm depth”; Line 247: “ $MWD_{Forest\ 5-10\ cm}: r^2 = 0.15, p = 0.06$ ”; Line 248: “($MWD_{Forest\ 0-5\ cm}: r^2 < 0.01, p = 0.79$; $MWD_{Forest\ 5-10\ cm}: r^2 < 0.01, p = 0.30$, Table S1)”; Line 250: “0–5 cm depth and 2.7 mm in 5–10 cm”).

Referee 2: “Line 256: Figure 1a does not report significance results, please add the table where these results are.”

Our response: We do not agree with referee 2, because figure 1a was introduced to the manuscript to provide the reader a fast overview about the general trend in the aggregate mass distribution, which means that the means of both depth increments calculated to reduce complexity of the data. The detailed results, differentiated between the 0–5 and 5–10 cm

depths with their significant differences are given in table 2 already. Adding another table to the manuscript would distract the reader from the main results of the manuscript.

Referee 2: “*Line 316: across all plots(?), including both land uses and depths*”

Our response: We agree with referee 2 and will rephrase the sentence (Lines 373–374: “ In the entire data set, variation in mineral constituents caused pronounced differences in the OC content of the soils between 19 to 95 g OC kg⁻¹ (Table 1).”).

Discussion:

Referee 2: “*Section 4.1: I suggest to better synthesize this section. Please focus only on the main results and observed trends that allow you to support/reject your hypothesis. Maybe split this section and discuss separately the impact of land-use change on aggregation and aggregate stability.*”

Our response: We agree with Referee 2 and will introduce subheadings to clarify what focus we are covering in the relevant paragraphs (Line 420:“ *Mineralogical control on the formation of large macroaggregates*”; Lines 491:“ *Land use impact on aggregation within mineral combinations – implications for aggregate stability*”). We try to discuss our objectives point by point in order to be able to answer our hypothesis, but due to the complex nature of the aggregation, a certain intersection of our results is essential. Nonetheless, we will change the order of the paragraphs to first discuss the effects of aluminous clay and pedogenic Fe on aggregation with focus on macroaggregation, followed by the effects of land use change.

We will further reorganize the following sentence thematically and shorten it (Lines 445 –...: “Consequently, this rather indicates the importance of kaolinite for macroaggregation, which is in line with the results of two oxisols in Brazil (Vrdoljak and Sposito, 2002) kaolinite is the backbone of the aggregate size fractions examined. ”), and will add the sentence to the previous paragraph (Lines 439–441: “This is in line with results from two Oxisols in Brazil (Vrdoljak and Sposito, 2002), showing kaolinite being the backbone of macroaggregates.”).

Referee 2: “*Line 442: “does” not*”

Our response: We agree with referee 2 and will add “does” to the sentence (Line: 538).

Referee 2: *“Line 467: Please abstain from using words that imply a temporal dimension like “during” when comparing forest and croplands, it gives the false impression that the study included a temporal scale.”*

Our response: We agree with referee 2 and will rephrase the sentence (Lines 563–565: “Despite the high physical stability, OC contents of macroaggregates declined substantially in most mineralogical combinations if forest was compared with cropland land use.”).

We would like to thank referee 2 for the meaningful and constructive comments again, which were really helpful to further improve the entire manuscript. We would also like to thank the editorial board for giving us the opportunity to improve our manuscript again.

Sincerely yours,



Maximilian Kirsten