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Interactive comment on "Soil Aggregate Stability of Forest Islands and Adjacent Ecosystems in West Africa" *by* Amelie Baomalgré Bougma et al.

Anonymous Referee #1

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In "Soil Aggregate Stability of Forest Islands and Adjacent Ecosystems in West Africa," Bougma et al. evaluate soil aggregate stability in forest islands, savannas, and agricultural fields at 11 locations representing a precipitation gradient in west Africa (Burkina Faso, Ghana, and Nigeria). Overall, they found that as mean annual precipitation increased, microaggregate stability also increased. However, they found no effects of land use on microaggregate stability. In contrast, precipitation had no effect on macro or meso aggregate stability. Land use was an important predictor of aggregate stability for these size classes, but there were no differences in stability between forest islands and savannas; agricultural fields generally had lower stability meso and macro aggregates than the other two land use types. Additionally, soil carbon content was strongly correlated with macroaggregate stability and macroaggregate stability and aluminum

content were strongly correlated with meso aggregate stability.

Overall, this study is scientifically sound, and the topic is of interest to the readership of SOIL. However, there are critical details missing from the methods section, the motivation for the study should be elaborated on, and the implications of this study must be added. Finally, while the authors suggest that the soil properties they evaluate in this study may lead to the development of forest patches (lines 22-23; lines 231-232), it seems more likely that changes in soil properties are the result of human establishment of forest patches (lines 22, 45). I suggest that the authors re-phrase and state that their study focuses on the effects of the development of patches with relatively luxuriant vegetation on soil aggregation.

Specific line comments are as follows:

Line 31 The implications of this study should be highlighted at the end of the discussion.

The introduction is short, but comprehensive. However, given that the authors find that soil mineralogy, climate, and agricultural disturbance are more important drivers of soil aggregation than vegetation per se, I suggest elaborating on the two sentences found in lines 38-42. The reader would benefit from more background information on these factors driving aggregate formation and develop the tension between physical and chemical drivers vs. biological drivers of aggregate formation. Additionally, the potential importance of these factors for different aggregate fractions should be described.

Line 78 This method is not used to "obtain each aggregate class," but rather, to assess aggregate stability in the different classes.

Lines 83-90 It is not clear to me why or how the sand fraction was determined for the stable aggregates from each size class. Currently, the methods suggest aggregate classes were separated by dry sieving and stability of these different fractions were determined by wet sieving. This all makes perfect sense to me. However, as it currently

reads, it sounds like these stable fractions were then subjected to particle size distribution analyses (%sand, silt, and clay) and afterwards, these solutions were sieved through a 0.5mm sieve. For the meso and micro aggregates (all <0.5mm), nothing should remain on the sieve. Why would only the sand content be relevant for only the stable aggregate pool and not the whole pool of soil in a given size fraction? And how would this method work for the smaller aggregate pools?

Line 95 Please describe the aluminum analyses. What are the different aluminum and iron fraction indicative of?

Line 99 Describe how the R2 values (in Table 2) were derived from the mixed linear models. How were the P-values derived in Table 3? What were the post-hoc tests used to evaluate drivers of differences among the land use types? How were statistically different distinctions made using these statistics? For instance, in the results, the authors state that precipitation and depth were the only significant variables for microaggregate stability, while land use, but not precipitation, was an important predictor for macro and meso aggregate stability. How was this determined? Describe how the statistics in Table 4 were derived.

Line 101 Here and throughout the manuscript, be careful about using the phrase "aggregate fractions." To me, aggregate fractions refer to the relative proportions of aggregates in different size classes derived from dry sieving. I believe what the authors are referring to are the relative aggregate stability in each dry fraction. Be clear that the factors affecting aggregate stability in the different fractions are the focus.

Line 102 Why did aggregate fraction need to be arcsin and log transformed?

Line 128 Delete the word "of."

Line 174 What implications do these results have for erosion? This was a major motivation in the introduction, but not mentioned in the discussion. Additionally, why did different parameters drive stability of the different aggregate fractions? This should be

explicitly addressed in the discussion.

Lines 181-186 It's not clear how this phenomena might enhance microaggregate stability. It might increase relative microaggregate abundance, but this parameter is not evaluated in this manuscript.

Line 189-191 Organic matter concentrations can both enhance and be enhanced by macroaggregates. This duality should be addressed in the discussion.

Lines 229-230 Only for macro and meso aggregates, respectively.

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