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Interactive comment on "Scale-dependent relationships between soil organic carbon stocks, land-use types and biophysical characteristics in a tropical montane landscape" *by* Marleen de Blécourt et al.

Anonymous Referee #2

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In the manuscript "Scale dependent relationships. . ." from de Blecourt at al. a comprehensive data set on SOC stocks is presented from different land use types in a region in China and their drivers including soil related variables, land-use type, topographic variables and vegetation related variables. The aim of the study was to elucidate the underlying drivers of SOC variability at scales ranging from within plot scale (< 1 ha) to between plot scale and with the same land-use type and between land use types at landscape scale (10,000 ha). The study is written well and concise. The conclusions that can be drawn from such a study a rather limited but reflect the difficulties in predicting soil organic carbon (SOC) stocks at larger than plot scale. Some major issues

have to be solved and clarified before the manuscript is in shape for publication.

Specific issues: 1.) The title is rather unclear, the readers do not know what scale the paper refers to (spatial) and whether it's a micro scale study or a global study. Also in the abstract (l. 23) the reader need to get informed about which scales are investigated. 2.) The term "biophysical characteristics" used throughout the manuscript (e.g. l. 20) is undefined and unclear. I suggest finding a better term. For example in figure 2 three parameters refer to soil organic matter, seven to soil characteristics, three to topography and three to vegetation. Instead, you combined the first to categories in fig 2a and the last two categories in 2b. I recommend to always use these three classes of drivers and one class of target variables and not to combine them randomly. 3.) The "subplots" I did not understand. The variance analysis is conducted without the subplot scale (e.g. Fig. 2). Why? If not enough driver data are available at this scale you may have to delete the subplot aspect completely. For the moment the role of the subplots are unclear. Moreover, the different numbers of samples in different depth increments (l. 145-149) may hamper a proper analysis? If still mentioned in the abstract you should provide the size of the subplots. In l. 217 you even write about "subplot plots"- what's this? 4.) You should never use SOC without specifying if you talk about SOC stocks or SOC content (e.g. l. 33). 5.) It seems to be a contradiction that you state "SOC stocks did not differ among land use types" (l. 29) but "variability of SOC (stocks?) was influenced by land use type" (l. 35). Please rephrase. 6.) You find different drivers for SOC stock variability among plots for different land use types due to a nested analysis of variance. Did you try the analysis without stratification by land use?(l. 207) 7.) Recommend to delete "with relevance for policy makers. . . .interest for" and write "for SOC accounting such as the Clean Development Mechanism. . ." in order to make it clearer. 8.) Please avoid the term "land-use cover" but only use "land-use" throughout the manuscript (e.g. 59). "Land cover" and "land use" are two different concepts. 9.) L. 62: Change clay type to clay mineralogy. 10.) L. 62 and throughout the manuscript: "soil group" should be replaced by "soil type" to make it easier to understand. 11.) L. 80-83: You mention several studies. For the reader they only make sense as introduction

into the topic if you also mention the results of these studies in relation to SOC stocks variability. 12.) L. 84: Second objective is rather unclear; please rewrite and take into account comment 1, 2 and 4. 13.) I recommend deleting paragraph 86-93. Its Material and Methods that are described in the next chapter anyway. 14.) L. 105-107: This sentence describing the forest vegetation should go to l. 132 were also the other land use types are described in detail. 15.) The studied landscape was between 800 and 2000 m asl. The plots were only between 1147 and 1867 m asl. Why did you exclude the valleys? 16.) L. 117 and l.123-126: the sampling design is difficult to follow. I recommend a figure with the sampling scheme. What are the 12 units (l. 122)? How do they refer to 16 equal area units? 17.) L. 140: The fire aspect is interesting. Was the mature forest also burned? Was there a difference in burning frequency between land use types? (l. 291). To which soil depth did you detect char coal pieces (l. 141)? 18.) L. 147: Provide the diameter of the auger. 19.) L. 171: Write the full word for ECEC the first time it appears. 20.) L. 186: The equation is wrong, since it does not take into account the stones. Stones are almost C-free and thus need to be subtracted. 21.) L. 197: Specify to which soil characteristics you are referring to. 22.) L. 205: Why was silt and clay analysed separately but taken into account for the statistical analysis only as silt-plus-clay? 23.) L. 205: Why was ECEC from topsoil no explanatory variable for SOC stocks but only subsoil ECEC? 24.) L. 209: correlated “with each other”? 25.) L. 229 and l. 239: Change “differences” to “significant differences”. 26.) L. 234: Change “lower” to “narrower” 27.) L.241 and 247: To what does the R2 refers to? To the model efficiency of the regression model? If yes, you may need to rewrite this or use EF as model efficiency or the explained variance as indicator for the model performance. 28.) L. 249: Was SOC content decreasing with increasing slope for all land use types? Thus, was erosion similar among land use types (l. 336)? 29.) L. 258: Please rewrite this sentence. It is unclear. 30.) L. 270-282 and 315-317: Several other studies are mentioned here. You should also add and discuss why some other studies found other results than you. 31.) L. 294-296: Provide an explanation for this reported finding. 32.) L. 371-374 and 37-40: The conclusions are rather weak – please rewrite them.

It is nothing new that requires this additional study to find out that for the detection of land-use change effects paired plot designs are better that stratified, random or grid sampling designs. Much more interesting is where the variability of SOC stocks comes from at which scales. At which sampling plot size do we achieve representative sampling for the field site?

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