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Interactive comment on "Soil properties override climate controls on global soil organic carbon stocks" *by* Zhongkui Luo and Raphael Viscarra-Rossel

Anonymous Referee #2

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Soil properties override climate controls on global soil organic carbon stocks

This is a well-written and very worth-while study that will be of high interest to readers. There are a few grammatical issues that should be carefully checked before publication. I have some questions about the analyses that need clarification below.

(*Note, I was unable to open the supplemental materials file and it's possible that some of the information I'm asking for is there)

Biotic covariates- Is there any attempt to account for how different plant functional types contribute different amounts of their NPP to soil carbon, or is all NPP assumed to have the same contribution to soil C? Can this be accounted for by land cover type

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somehow? A lot of NPP does not contribute much to SOC. For example, in DayCent the metabolic:structural ratio is used to estimate this, which is based on the lignin:N ratio of litter. The LiDEL model (Campbell et al., SBB) also provides another example of how litter chemistry can dictate the amount of soil C input from different types of plants

GBM model- It appears that the same edaphic factors were used to gap-fill missing BD values and SOC stocks (in the BRT model) as were used in the GBM model to determine the weight of influences of different factors on SOCs. Since the vast majority of the data was missing BD, doesn't this mean that the edaphic factors are overweighted/double counted in your analysis?

PCA- the PCA of the climatic variables is a nice approach. Why didn't you do the same for the edaphic properties, since many of them are also co-variates?

Discussion- Is soil LL15 an edaphic property? Isn't it also related to climate and vegetation?

Does NPP have any greater influence on deep SOC in wetter environments than dry, indicating the importance of leaching in translocating plant inputs deeper into the soil? This would be very interesting to know.

Uncertainties and Limitations- Did you included agricultural and managed landscapes into one analysis? It seems like you should split converted/managed lands into a separate analysis from non-managed lands due to this large impact of disturbance that you discuss here.

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