

Interactive comment on “Contrasting pH buffering patterns in neutral-alkaline soils along a 3600 km transect in northern China” by W. Luo et al.

W. Luo et al.

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Dear Reviewer, We would like to thank you for the constructive and helpful comments for our manuscript. We have carefully considered them and revised our manuscript accordingly. All other comments were also carefully considered and incorporated. Grammatical mistakes have been corrected throughout by our native co-authors. In order to make the changes easily viewable, we marked the main revision with color in the revised manuscript. Detailed responses to each comment are listed below. Response to reviewer 1: Question 1: The key problem in this study is how to separate carbonate containing soils from non-carbonate ones. I am very curious that there is no carbonate in alkaline soils (pH>7). In addition, I have noticed that there are some overlaps for soil collecting sites between this study and Yang et al. (2012), where they put out

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high-carbonate regions vs. low-carbonate soils. Maybe the authors can consider this kind of expression. Reply: Thanks very much for your suggestion. Yes, it is difficult to separate carbonate containing soils and non-carbonate containing soils. In the Method Section, we have defined the non-carbonate soils as those from which we were unable to detect the CO₂ release upon addition of HCl (lower than the detection limit). See Page 10 Line 206-208. Question 2: Because soil pH is widely used in many studies, and can be used as an effective and direct parameters to assess soil acidification status, I would like to see the pattern of soil pH, and its relationship with soil pHBC, and other environmental parameters. Reply: According to reviewer's suggestion, the relationships of soil pH with soil and climatic variables (new Figure S5 and S6) were reported in the revised manuscript. The relationships between soil pH and soil pHBC were shown in several places in the version accepted for discussion (original Figure 3). Question 3: I think the new point in this study is the different patterns of soil pHBC in regions with different aridity index. So it is better to put it out in the abstract. Reply: Thank you very much for the suggestions. In the revised manuscript, we have added the information in the abstract section. Question 4: Line 98, I would like to see the response to the second question in the discussion question. If possible, please show the data of acid deposition in the studied regions. Reply: The amount of acid deposition is unknown across northern China. Thus, we are unable to provide detailed data showing the patterns of acid depositions. We must admit that this lack of data is unfortunate. Nevertheless, its absence does not weaken the main findings and conclusions in this paper. Further studies are needed to deal with this matter. Question 5: Line 190, 201: AI is an important index in this study, please show how to calculate it in detail. Reply: Thank you very much for the suggestion. In the revised manuscript, we provided additional text to illustrate how to calculate aridity index (AI) in detail. See Page 10 Line 199-205. Question 6: line 280-281: please give the reference. Reply: We have added the reference as suggested. Question 7: Line 314-315: Please add some references for this statement. Reply: We have given more references for the statement in the revised manuscript. Question 8: L333-339: I would like to see the confirmation

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on clay mineralogy type in this study. Reply: We agree that this information would be very useful. Unfortunately, this information is not available. While our study is mainly focused on the relationship between pHBC and environmental variables, a detailed description of the clay mineralogy at each sampling point across the 3,600 km transect is beyond the scope of this paper. Question 8: L358, "...effects" is not exactly here. It is just a positive relationship. Reply: In the revised manuscript, these words have been revised according to your suggestions as following. "In our study, there was a significant positive relationship between soil pHBC and soil exchangeable Na concentration among the carbonate containing soils." Question 9: L366: Figure 4. Reply: We checked manuscript, and corrected it accordingly. Question 10: I cannot find climate information in Fig. S1. Please have a check on all Figures, so that they can be matched well. Reply: Sorry for these mistakes. In the revised manuscript, we have checked all Figures according to your suggestions. Question 11: L404-409: "the first" sounds not very exact, considering there are similar studies in the same regions, and soil pHBC can be an alternative parameters for assessing soil acidification except soil pH. Reply: In the revised manuscript, we deleted these words and rewrote this sentence. Question 12: Table 1, please give how to measure soil pH. Did the authors measure it using water suspension (e.g., a soil: water ratio of 1 : 2.5)? If so, please give an annotation. Reply: Thanks very much for your suggestions. We have added the information in the revised manuscript according to your comments. We have also revised the whole manuscript thoroughly to improve the overall quality of the manuscript. All changes are marked in color in the revised manuscript. Once again, thank you very much for your comments and suggestions.

Kind regards, Wentao Luo

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Response to reviewer 1:

Question 1:

The key problem in this study is how to separate carbonate containing soils from non-carbonate ones. It is very curious that there is no carbonate in alkaline