

Interactive comment on “In situ interactive characteristics of reactive minerals in soil colloids and soil carbon preservation differentially revealed by nanoscale secondary ion mass spectrometry and X-ray absorption fine structure spectroscopy” by Jian Xiao et al.

Anonymous Referee #4

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This paper, by Xiao et al., presents a study about the influence of fertilization (organic vs inorganic) on the colloidal interactions between soil organic matter and Al-/Fe- rich minerals. The authors used top end micro- and nano- scale techniques to characterize the mineralogy, the redox and the amount of organic matter in their sample.

The general topic of the study is well within the scope of biogeosciences.

I find this manuscript well written and that the study appears well designed. The ab-

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stract quality is good. The introduction provides a descent description of the scientific context of the study and presents the goal of this study. The sample and methods are well described. Nevertheless, I believe that the manuscript could really be improved before acceptance for publication. My main criticism is that I would expect the authors to discuss their data in more details. They seem to have acquired an impressive dataset, but the interpretation and discussion of the data, in addition to the insight we get from their comparison, is too short, to my sense. I'm sure there is much more to tell from their results. The authors should also present and discuss potential mechanistic processes that may explain their observations. Overall, this manuscript appears frustrating (we expect more in the discussion!).

In addition, I feel that some of the results should be presented in more details. For instance, the description of the NanoSIMS study, lines 208 to 211, is very short! I'm sure you have plenty of nice images. Please provide deeper description. Be more specific and indicate to the reader what the NanoSIMS brings to the study.

There are few additional points that should be clarified : - lines 114-116: "In this study, we chose 6 spots ..." unclear, should be rephrased. What do you mean when you write organo-mineral complexes were included? - line 128: you claim that depth resolution of the Cs beam is 15 nm. Where does it come from? Is it a calculation? Was it measured by anyone? Please add the source for this number. - line 131: it is ok to cite previous studies for details about analytical protocols, but the authors could at least provide their image size and resolution (i.e. number of pixels) as this is something that is adjusted from one study to the other. - lines 134 and following: the sorting in ^{12}C rich and less rich areas is unclear, and the authors should explain why they have different conditions (limit at 90 or 50 pixels) depending on the sample. How does it give comparable results if the conditions to define areas are different? - line 142 and following: what do you mean by "the ROIs of the AIO and FeO images were combined..."? Please provide more detail. Do you proceed this way to obtain a ROI corresponding to mineral rich regions? - line 270: I'm not really convinced that figure 3 shows what the authors claim.

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