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Interactive comment on "Shifting Mineral and Redox Controls on Carbon Cycling in Seasonally Flooded Soils" *by* Rachelle LaCroix et al.

Anonymous Referee #2

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LaCroix et al. report findings on C storage and changes in the physical-geochemical composition of soils minerals and redox conditions under the seasonal flooding soils. Nevertheless, in different part of the manuscript several strongly weak points have been identified that must be addressed from the authors. Moreover, I do not find that results provided insight into the mechanism on C storage and the changes in the shifting minerals and other critical factors.

1. Synchrotron-based X-ray analyses and FT-ICR-MS analyses. There are plenty of literatures on these methods, as a reviewer also a reader, I suggest simplify these parts and move the detail descriptions into SI.

2. Results. In figure 2, the symbols are too small and similar to be recognized, while and the resolution are lower.

3. In 3.3, compared with Feo and Alo, the authors haven't presented the detailed data of Fed and Ald, which are more sensitive to the changing of environmental factors. Meanwhile, the soil iron cycling is sensitive to the seasonal flooding, the recrystallization processes of iron oxides as well as aluminum oxides during the shifting of seasonal flooding soils are critical factors to the variation of the iron/aluminum species, which are further controlled the reactivity of iron/aluminum species in soil environment.

4. In 3.4, carboxylic/aromatic C ratios is a suitable indicator to present the different of oxidation degrees, however, from fig 5b, it's inaccurate to describe the increase trends of those values above in C horizons. It doesn't present significant different in fig 5b.

5. In discussion part, the authors just repeated the obtained results described in results part in another similar way, lacking of further discussion around the mechanism among C storage and the changes in the shifting minerals and other critical factors. As a reader, I find it's hard to get new information in this important parts.

6. Further experiments should be designed and conducted to illustrate the mechanism on soil chemical-physical properties and C storage.

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