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Interactive comment on "Responses of soil physico-chemical properties to combustion: a space for time substitution study to infer how changes in climate are likely to affect response of topsoil to fires" *by* S. N. Araya et al.

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This paper conducted very detailed and well-controlled experiments to study the influence of fire on top soils. The experimental results are clear and the discussion is reasonable. Some comments are provided to help improve the paper.

1. The use of word "combustion" should be avoided in the title and the main text. In general, it is possible to sustain a smoldering combustion in organic soils. However, it is questionable if such combustion is possible for high-mineral soils tested in this paper. In the furnace below 400C, the mass loss in soil is a mainly a result of pyrolysis

which produces pyrolysates and black chars which does not require oxygen, so it is not a combustion. When the furnace temperature exceeds 400C, chars are further oxidized which can be called as combustion. Without such high-temperature furnace, combustion may be sustain in soil. Therefore, using "combustion" and "combustion temperature" here can be misleading, instead "heating" or "soil or environmental temperature"

2. Both the fire heating temperature and heating duration determine the fire severity. In real fire, the duration for soil sustained in a higher temperature is usually shorter, rather than a fixed 30 min. Of course, in lab experiment controlling the heating duration makes a better comparison. But it is better to emphasize what is the real fire condition to avoid confusion.

3. The air supply during the heating is not mentioned in the paper. Is the air supply sufficient, or is the furnace sealed? The oxygen supply can significantly change the decomposition process of SOM.

4. In the paper, SOM is used very often, however, its value is not given for any soil samples. SOM should be easily measured, for example, by quantifying its inorganic matter after a complete oxidation in high-temperature oven. Comparatively, the organic carbon in soil is not so simple to quantify. Therefore, using SOM to correlate other parameters such as pH, CEC is more useful and reproduce current experiments with different soils. In fact, SOM correlates with C very well: generally increasing with the organic carbon. Correlating SOM will not alter the conclusions in this paper.

5. I recommend to split the discussion section and add a short discussion in each subsection of results. Most of experimental results are expected, and can be explained by a simple analysis right after showing the figure. It will also make readers easier to follow the discussion.

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