

Interactive comment on “No significant changes in topsoil carbon in the grasslands of northern China between the 1980s and 2000s” by Shangshi Liu et al.

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[Comment] This study used two periods of field collected soil carbon data and analyzed the soil carbon change for grasslands in northern China. Also two advanced statistical algorithms were used in linking soil carbon with environmental factors. These two methods should be able to incorporate more environmental information than previous commonly used regression methods. So in terms of data and methods, this study represents a big improvement over previous related studies. Overall the manuscript was written and organized well. The method is appropriate and results support the conclusions.

[Response] Thank you very much for your positive comments.

[Comment] One thing the readers might feel confused is that temperature has increased significantly on the Tibetan Plateau over the past decades. As a result, ecosystem productivity and vegetation cover have both increased on the Tibetan Plateau. Considering the close relationship between aboveground and belowground processes, the increased aboveground productivity is supposed to cause enhanced soil carbon too. I suggest that authors should discuss this conflicting result and the causes behind. Based on the above performance, I recommend minor revision of this manuscript.

[Response] You raised a good question. Thank you! Following your comments, we will discuss this conflicting result and its causes in Discussion section.

Although previous studies have showed a significant climate warming that increases ecosystem productivity and vegetation cover in Tibetan Plateau (Yao et al., 2012, Shen et al., 2015), our result suggested a relative stable SOC stock (a neutral sink) in this region during 1980s to 2000s. We explain this conflicting result as follows. Soil carbon dynamic depends on the balance between plant-derived carbon inputs and output though decomposition (Davidson and Janssens, 2006). Rising temperature can not only enhance the C input into soil by increasing ecosystem productivity, but also increase soil respiration rate. Therefore, a neutral SOC sink obtained from this study may be a result of the gain in C inputs by increased vegetation productivity being offset by the temperature-induced increase in soil decomposition rate.

[References]

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Yao, T., Thompson, L., Yang, W., Yu, W., Yang, G. and Guo, X., et al. (2012). Different glacier status with atmospheric circulations in Tibetan plateau and surroundings. *Nature Climate Change*, 2(9), 663-667.

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