Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-319-RC3, 2019

Biogeosciences Discussions

Interactive comment on "Increasing soil carbon stocks in eight typical forests in China" *by* Jianxiao Zhu et al.

Anonymous Referee #2

Received and published: 3 October 2019

Using soil inventory data from four forest sites, authors of this paper explores soil carbon stock change between 1990s and 2010s. They found a significant carbon sink in the forest soils, though magnitude varies greatly. Overall, the manuscript is well written. The core message is clear and contributing to growing knowledge of forest carbon cycling. I believe the manuscript can be accepted for publications after some revision.

The change of soil carbon stock is almost the most uncertain component of ecosystem carbon balance. Although previous studies (e.g. Pan et al., 2011) suggest globally the dominant component of ecosystem carbon sink is in the forest biomass, it is of great interest to compare the sink strength in the soil and in the biomass at different forest ecosystems. Therefore, the authors should compare the strength of the biomass carbon sink and soil carbon sink over these sites, instead of at regional scale with other

inventory data.

Heterotrophic respiration was found to significantly increase at global scale (Bondlamberty et al., 2018), the existence of soil carbon sink would indicate that the increment of NPP outweighs the increment of HR. This could be further discussed in order to better clarify the processes that contribute to the formation of the carbon sink. The ratio of soil carbon sink to NPP seems very large for some sites, it would be great to extend discussions on why this large ratio of soil sink to NPP is plausible.

Since the soil carbon were measured over four sites (8 plots), it is a bit misleading to call it as "8 typical forests" in the title. The scarcity of available data has made even four sites of data much valuable. There is no need to exaggerate what has been nicely achieved in this study.

In the analyses, it could be interesting to know whether forest types or climatic variations plays a more important role in the size of soil carbon sink. Since some sites only have one plot, it is probably important to further acknowledge this limitations when interpreting the results, which is particularly the case when looking at figure 2.

It is also important to report uncertainties of the magnitude and change of soil carbon stock in figure 3.

The authors spent quite some efforts discussing why their results is in contrast to one study over the Alps. Can the loss of soil carbon in the Alps result from soil erosion? The wood harvests not only reduce the carbon input into the soil, but also expose the soil to erosions, which could be of particular importance in mountainous area. This would be a very interesting discussion since carbon stock change was often treated without considering horizontal soil carbon loss.

The conclusion section also needs some improvements since it highlights the potential role of disturbances, which had not been well discussed or supported before. It is of course reasonable to assume disturbance may affect the soil carbon stock, but the

impacts are very complex and uncertain. The SOC change of protected forests are not very informative to the relationship between disturbances and SOC change, unless further evidences on disturbed forest sites are presented.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2019-319, 2019.