

Biogeosciences Discuss., author comment AC1
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Reply on RC1

Chen Yang et al.

Author comment on "Updated estimation of forest biomass carbon pools in China, 1977–2018" by Chen Yang et al., Biogeosciences Discuss.,
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RC1

In response to the achievement of carbon neutrality target in China, Yang et al. estimated the forest biomass C storage and its changes over the past four decades and especially updated in the most recent decade. The scientific question was quite straightforward, the methods were well established, and the conclusions were reliable and robust. Although the MS is well written, there remain a few minor issues to address (see short list below). but I think these should be straightforward.

General comment:

One of my concerns is that the estimate of forest C stocks and C uptake capacity should not only focus on plant biomass but also consider soil C sequestration. Additionally, compared with other biomass estimation studies, what are the advantages and innovations of this study?

Response: Thanks for the comments. Biomass carbon is the first component of carbon cycling in forest systems, followed by litter carbon and soil organic carbon. We agree with the reviewer that soil carbon should also be included when estimating carbon sink in forest ecosystems. As showed in the title of the manuscript, however, in this study we focus on biomass carbon stocks and carbon sinks because the forest inventories are of timber volumes primarily and related directly to forest biomass. To estimate changes in soil carbon in forests, we need much more detailed information of the carbon cycling in forest ecosystems which are beyond the targets of the present study. As pointed by the reviewer, soil carbon is equally important to biomass carbon in forests, we have added brief discussion in the revision (Lines 202–207) by referencing to previously published studies of forest soil carbon.

There have been published literatures concerning national scale forest carbon of China. The estimated carbon stocks in those studies are less comparable because of the methodological differences and the databases adopted. The magnitude of carbon sink will be misleading when they were derived by comparing the estimated carbon stocks in those

separated studies. In this study, we applied a method, which had been proved of the least bias, consistently over the period of all the eight national forest inventories from 1977 to 2018. The estimated carbon sequestration derived from the comprehensive databases of this study are thus of high precision and more persuasive. Additionally, the incorporation of the latest two inventories, 2009-2013 and 2014-2018, in the temporal analysis in this study revealed the significance of the planted forests and the persistence of carbon sequestration in natural forests of China. The results will be a robust baseline for further studies of forest management both on national and regional scales.

Specific comments:

From your method, you should have calculated the biomass of each province, can you add the biomass results of each province in the attached table?

Response: Thanks for your suggestion, we did calculate the biomass results of each province. The relevant data have been added to the appendix A (see Table A3 and A4).

Line 19: Density can be taken several ways, best to define this term. It is the average stock per area? May be C storage per unit area.

Response: Density is defined in the MS (Line 19) as the C pool per unit area.

Lines 21–24: The data you given here needs to be confirmed.

Response: Yes, we have confirmed.

Line 27: China's

Response: Thanks! Yes, we did (Line 25).

Line 28: Ecological

Response: Yes, we did (Line 27).

Lines 46–48: It just is not been studied much.

Response: Yes, we did (Line 45).

Lines 107–109: Specific tables or figures should be added to show where this part of the results came from.

Response: We have added Table 1 and Figure 1 (Line 128).

Table 2: Please add the averages for 1977–2008 and 2009–2018 in the format of Table 1. And please add the corresponding content to the result section.

Response: We have supplemented the relevant data in Table 2 and added the corresponding content at Results section (Lines 148, 133–135 and 137–139).

Line 142: “The average C sink for the previous 30years was calculated by ...” Please add a space between 30 and years.

Response: Thanks! Yes, we did (Line 167).

Lines 154–158: Similar with Lines 107–109.

Response: Yes, we did (Line 182–184).

Lines 167–172: Why did Fang et al. adopt a linear relationship that makes the C sink for 1977–2003 lower than the result in this paper.

Response: Fang et al. adopted a linear relationship in early studies, where the forest C pool before 1999 were estimated significantly lower than the results in this study, making the C sink during 1997–2003 higher than our results. More detailed data can be found in Fang et al., 2007.

Reference: Fang, J., Guo, Z., Piao, S. and Chen, A.: Terrestrial vegetation carbon sinks in China, 1981–2000, *Sci. China Ser. D-Earth Sci.*, 50, 1341–1350, 2007.