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Interactive comment on "Modeling the uncertainty of estimating forest carbon stocks in China" *by* T. X. Yue et al.

A. Ali (Referee)

ashehadali@fas.harvard.edu

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Dear Editor

Find below my remarks to the authors:

Yue at al. 2015 used five different approaches to estimate forest carbon stocks of China and reported the uncertainty associated with each of the methods. I appreciate their effort towards understanding the carbon stocks and I know this paper is timely in earth system science. This paper is quite interesting because the authors also examined estimates of carbon stocks for different geographical regions and at various time-scales.

I think more work is needed for the improvement before the publication of this paper.

In general, I think the authors need to discuss the interpretation of their results in much more detail. For example, I think the authors need to be explicit about the landscape heterogeneity in addition to differing plant functional types e.g. topography, soil type, phenology, and whether these changed with time and in space, particularly with the mechanistic model (LPJ) that they employed. The authors did not discuss any mechanisms that aided LPJ to reduce the mean relative error when it was assimilated. I did not understand how helpful the cross-validation approach was as there is no citation about this method. Did this approach generate any parameter sets for the models? Did cross-validation eliminate any bias? If so, I think the authors need to discuss this.

Let me explain other things that might help improve this manuscript:

1) It seems that the introduction is too lengthy. One means to condensing introduction could be to discuss the various models which is mentioned from Line #23 on page 19537 through line #20 on page 19542 in less depth. I would suggest shorten these to two or three paragraphs only.

2) Section 2 that talks about previous estimates of forest carbon stocks can also be condensed since it is a review. A brief overview of it can be made in the "Experimental design" section and the details can be put in the Appendix or Supplementary.

3) It also appears that the "Experimental design" section is too lengthy. Again here, I would suggest the authors to take most of the materials and put it in the Supplementary.

4) In the results section, I think the text from line#21 to line#26 on page 19551 is not part of the results but is a part of the methodology so it should be in the methods section.

5) The results section looks okay, overall. However, I would like the authors to be consistent in the usage of acronyms throughout this paper e.g. Is it AMCS or MACS, MACD or AMCD? I think acronyms should be again defined in all of the table and figure captions.

BGD

12, C9806–C9808, 2016

6) In the discussion section, line#19 though line 24 on page 19554 has been already mentioned before. I do not think it is worth repeating here. If you'd like to state this statement, I would suggest eliminating this statement earlier on.

7) All of the equations in the results section can be discussed, I think. I would suggest the authors to discuss them.

8) I would like to see discussion (in addition to what I've said above) of the following results: how the mean annual carbon stocks varied in space across various methods e.g. they have large MREs and so what is contributing to those large values and how. For example, Figure 2 shows differences as well as similarities in the spatial distribution of forest biomass using different methods. The authors need to discuss these, I think.

9) Overall, there isn't considerable difference in the carbon densities for different periods. Clearly, it is approximately 25 year period and so it's too short for the forest succession to occur, for example. There are other factors that might be important such as harvesting, forest management, and possibly other types of forest e.g. bamboo forest and economic forests. Would considering these factors change your results? Perhaps the authors can discuss the limitations of the models in the discussion section in this regard.

Considering these elements, I recommend them to clarify these issues and fix the details where necessary before publication.

I would like to thank Chonggang Xu for taking a look at my review comments together with the manuscript.

Ashehad Ali

Interactive comment on Biogeosciences Discuss., 12, 19535, 2015.

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