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Biogeosciences Discussions

Interactive comment on "Inventory-based estimation of aboveground net primary production in Japan's forests from 1980 to 2005" *by* Y. Wang et al.

Y. Wang et al.

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—Response to Referee #1—

We sincerely thank you for your careful reading of our manuscript. Our responses to your comments and questions are as follows.

**Your comment 1: Although the authors did not include below-ground NPP (BNPP) for good reason, there is some literature available and it would be informative if there could be a short section added to the discussion about the relative magnitude of BNPP compared with ANPP, even if the available estimates are not from Japan.

Our response: We thank you for the constructive comment. We have added the following discussion in Page 1471, Line 8: The large ANPP estimated in this study may also imply a large belowground net primary productivity (BNPP), since BNPP often vary proportionally with ANPP (Gower et al. 1997; Kajimoto et al., 1999; Xiao et al., 2003; Tateno et al., 2004; Hertel et al. 2009). However, these studies also indicate that the ratio of ANPP to BNPP can vary largely depending on physical environment, forest stand age and plant species composition etc. Therefore, the exact BNPP of the forests in Japan remains to be further explored in the future.

**Your comment 2: Regarding the mean ANPP values for “Other Needle-leaf forests” and “Other broadleaf forests” (table 3 and p. 1469), because these values are constant over the time series (lack of significant relationship), perhaps these types should be excluded from the analysis after table 2. Also in table 3, the area of “Other N” includes an unusual temporary increase in 2000, which may be a land classification problem embedded in the inventory data.

Our response: Yes, we agree with you, but after some discussion we have come to a conclusion that it is better to keep the two items as they were. The major reason is that the two forest types share a significant proportion either in terms of area, or in terms of biomass and productivity, which some attentions should be paid to in the future. To address your concern, we have added the following statements in page 1469, line 15, by citing your comment.

Moreover, we noticed that the forests in two categories, ‘other needle-leaf forests’ and ‘other broadleaf forests’, showed no clear trend in temporal variation both in area and other variables, as compared with other forests. We have no detailed information available for further explanation on the involved mechanisms. A possible error may exist in the inventory data due to land-surface classification differed in different periods. Further attentions on the two forest types should be paid in the future because of their significant area, biomass and productivity.

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**Your comment 3: Final paragraph of discussion and table 4. It would be informative to compare the results from Japan with published estimates from plantations elsewhere in the temperate zone, not just averages which in many countries include some very low productivity sites. For example: McNulty, S. G., J. M. Vose, et al. (1996). "Loblollypine hydrology and productivity across the southern United States." Forest Ecology and Management 86(1-3): 241-251.

Our response: We appreciate to this comment, and also agree with the meaningful comparison based on the plantation. However, the NPP distinguished heavily not only depend on forest types, but also depend on site conditions, making it difficult to give reasonable judgment on plantation level all over the world. Therefore, in this study, we just roughly classified the forest to 'Needle-leaf forest' and 'Broadleaf forest' and pay attention on the studies reported on countries or regions level using the similar analysis method. Nevertheless, in order to respond to your comment, we have revised the discussion (page 1471, line 4) by adding the following statement and citing the reference you provided.

Actually, high ANPP have been reported in some plantations in the southern United States (e.g. McNulty et al. 1996) and Europe (e.g. Xiao et al. 2003). It is note that, however, the NPP distinguished heavily not only depend on forest types, but also depend on site conditions, making it difficult to give reasonable judgment on plantation level all over the world. Therefore, in this study, we just roughly classified the forest to 'Needle-leaf forest' and 'Broadleaf forest' and pay attention on the studies reported on countries or regions level using the similar analysis method.

**Your comment 4: Figure 3. It would be very useful to include error bars in this figure.

Our response: We have revised this figure.

**Your comments on technical corrections:

*1. P. 1467 line 6: TNPP is not a component of NPP. Need slight re-wording of this.

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Our response: We have corrected the error.

*2. P. 1467 lines 25-26: when I look at the statistics in table 2, it seems like Chamaecyparis should be added to the list of forest types that lack a strong relationship.

Our response: We appreciate this comment. We kept it as it was since the Chamaecyparis forest covers a large area and the P-value in the regression for this forest type is still very small (P=0.007). In addition, using the specific model should have less bias than using a model derived from the mean ANPP.

*3. P. 1470 line 16: change “likely” to “did”.

*4. P. 1471 line 8: change“different” to “compared”.

Our response: We have changed the words.

—Response to Referee #2—

We thank you very much for your careful reading of our manuscript. Following is our response to your comments and questions.

**Your questions: The authors have one-to-one relationships TNPP–ANPP, NPPs–ANPP, NPPL–ANPP (Table 1), and AB–ANPP (Table 2), but which relationship was used to estimate ANPP in Table 3? If you only used AB–ANPP relationship, what is your intention to show the all the relationships?

Our response: As we have mentioned in the manuscript (page 1466, line 24-26), since some original data did not include ANPP, we developed the equations in Table 1 to estimate those ANPP. Data calculated by these equations were further used to obtain the models in Table 2. The values of mean ANPP shown in Table 3 were estimated by using the models in Table 2 and the data of “Mean AB” in Table 3.

**Your comment: Coefficients are at best only statistical estimates, so I suggest that the number of significant digits used in Figs 1 & 2 and Tables 1 & 2 be decreased, i.e. use 0.81x+0.4 rather than the very “precise” numbers used.

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Our response: Since the number of digit in the model parameters can affect the results presented in Table 2 and 3, we kept them as they were.

**Your comment: The unit of ANPP should be specified, dry matter-based or C-based.

Our response: We have revised the statement in the end of section 2.1 (page 1466, line 22) as follows: In this study, biomass and ANPP are all dry-matter based.

**Your question: How can you get the numbers labeled above the triangles in Fig. 3?

Our response: The numbers labeled above the triangles in Figure 3 were calculated as the overall mean of "Mean ANPP" which listed in the rightmost column of "Mean ANPP (Mg ha-1 yr-1)" item in Table 3. Moreover, as suggested by other reviewer, we have revised Fig. 3 and the legend.

Legend of Figure 3: Changes in mean aboveground net primary production (ANPP) of Japan's forests from 1980 to 2005: (a) needle-leaf forests; (b) broad leaf forests; (c) overall forests. The vertical lines extending from the top of boxes indicate standard error of the means for different forests.

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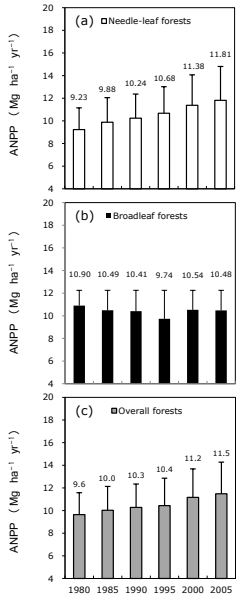

Figure 3: Changes in mean aboveground net primary production (ANPP) of Japan's forests from 1980 to 2005: (a) needle-leaf forests; (b) broadleaf forests; (c) overall forests. The vertical lines extending from the top of boxes indicate standard error of the means for different forests.

Fig. 1. Figure 3 (revised)

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