We appreciate the time and efforts of the editor and referees in reviewing this manuscript and the valuable suggestions offered. In addressing all issues indicated in the review report we trust that the revised version meets the Reviewers' comments and the journal's publication requirements.

[Reviewer 1] General Comment:

Chen et al. generated high-resolution (~1 km) explicit maps of above- and belowground biomass) for woody vegetation in China between 2003 and 2020. I believe the combined use of low-frequency microwaves and laser remote sensing data provides a more accurate estimation of biomass. Overall, the manuscript conducted good work on data collection, statistic analysis, and results presentation. This map could be important for monitoring and estimating woody biomass in China. It has the potential to serve as input or for calibration in Earth System Models. I think it is publishable if several minor issues can be addressed.

Response: Thank you for your positive comments to our work. We have addressed the suggestions you raised, and improved the data selection and data making algorithms.

[Reviewer 1] Specific Comment:

1) Line 126: for MOD44B v006- dataset need citation and description.

[Response]: Thanks for the remind. In the revision, **we adopted the newest version: v061** of this dataset, and then added the citation and the description as follows: "By adopting the MODIS vegetation continuous fields (VCF) data (MOD44B v061) **which includes three ground cover components: percent tree cover, percent non-tree cover, and percent non-vegetated (Dimiceli et al., 2022)**, we first calculated the mean tree cover (hereinafter, TCmean) and non-tree vegetation (short vegetation) cover (hereinafter SVCmean) during 2011–2015, and resampled them from 250 m to 1/120°." (Lines 149~154 in the revised manuscript).

2) Line 144: 10 m×10 m plots were not included as the training target here. What is the plot area for the training dataset, such as mean, sd of the area?

[Response]: In the original manuscript, the plot sizes, the time periods and the methods to obtain the AGB records were all different, which may introduce uncertainties to the benchmark AGB mapping. Therefore, following your comment and the comments of other reviewers, we **selected another more standardized** in-situ forest AGB carbon stock dataset. We revised the data description as follows: "A reviewable, consistent ecosystem carbon stock inventory was conducted in China between 2011 and 2015 (Tang et al., 2018). We requested the AGB carbon stock (AGBC) data at more than 5,000 30×30 m sized forest plots from the authors. Due to the scale mismatch between the maps of biomass, canopy height or tree cover and the field measurements, we dropped out the data within the 1/1200° resolution grids in which the standard deviation of tree cover was greater than 15%, according to (Chang et al., 2021), leaving 2444 homogeneous forest plots remaining (Figure 2)." (Lines 117~123 in the revised manuscript).

3) Line 146: the conversion of plot level AGB and pixel-scale introduce uncertainties, you could mention it in discussion?

[Response]: Following your comment, we have revised the source of forestland fraction data to reduce the uncertainties in the conversion of plot level AGBC to grid-scale wall-to-wall AGBC, following: "The AGBC records in these forest plots were further multiplied by the mean fraction of forestland over 2011–2015 in the corresponding grid, which was computed from the annual 30 m resolution China Land Cover Dataset (CLCD) (Yang and Huang, 2021)." (Lines 124~127 in the revised manuscript). Moreover, we also **added a discussion on this issue**, following: "During benchmark AGBC mapping, we converted the in-situ AGBC data at forest plots into the grid-scale average AGBC by multiplying the fraction of forestland during the time period of field investigation. Considering the overall high-quality of the China's land-use/cover datasets developed via **human–computer interactive interpretation** of Landsat images (Liu et al., 2014; Yang and Huang, 2021), and that the producer's accuracy (PA) and user's accuracy (UA) for forestland classification in the CLCD dataset used in this study were **73% and 85%** respectively, the errors within the benchmark AGBC mapping induced by the scale conversion based on the forestland area fraction was generally limited." (Lines 371~378 in the revised manuscript).

4) Line 156: you need to describe hyperparameter tuning for RF.

[Response]: We have added the description accordingly, following: "… we trained ten-fold RF models **using MATLAB R2021a®**. **The number of regression trees was set to 500**" (Lines 210~211 in the revised manuscript). Please also note that during the benchmark forest AGBC mapping in the revision, we applied nonlinear regression between GlobBiomass 2010 and the plot measurement-based grid-scale AGBC instead of using the RF model.

5) Line 232: 2.3 High-resolution woodland AGB mapping in China from 2003 to 2020. Why is RF simulation under 1/12 resolution instead of keeping everything at 1/120°?

[Response]: Following your advice, we have **changed the algorithm**, and now perform the long-term continuous forest AGBC simulation **at 1/120° resolution** by directly utilizing the MODIS VCF data. Please refer to section 2.2 in the revised manuscript for details.

6) Line 246-250: data processing and rescaling include many assumptions which can introduce uncertainties, should mentioned in discussion.

[Response]: We agree that the previous method contained many assumptions which can introduce uncertainties. In the revision, we have **largely simplified the method but without reduction in data quality**. Now, there remains **just one main assumption**. This assumption is described as follows: "…, we first calculated the mean tree cover (hereinafter, TC_{mean}) and non-tree vegetation (short vegetation) cover (hereinafter SVC_{mean}) during 2011–2015, and resampled them from 250 m to 1/120°, the same resolution as the benchmark AGBC map for 2011–2015. Because the canopy heights of trees are usually similar **within a small area**, the **regional AGBC per TC_{mean} can be assumed the same**, which is referred to as the 'homogeneous assumption' hereinafter." (Lines 155~157 in the revised manuscript).

In order to keep this assumption basically correct, **the maximum searching window was set to 9×9**, which is a small area of approximately **9 km× 9km**. The related description reads: "However, if the regression failed even if the window size has reached 9×9, we **stopped expanding the searching window to avoid the 'homogeneous assumption' being invalid**" .

7) Line 314: what is the data distribution of the plot sites AGB and BGB? Normal distribution or other?

[Response]: Following this comment, we have added the cumulative frequency curve and histogram of the AGB carbon stock measurements at 2444 homogeneous forest plots, as well as those of AGB and BGB data at 8182 forest forests with both AGB and BGB measurements as Figure S1 in the revised Supplementary Information. This figure is also shown below. According to the figure, the collected forest AGBC records, AGB and BGB data in this study **all exhibit a positive skewed distribution**. Whether the data follows the normal distribution or not may not influence the random forest model efficiency.

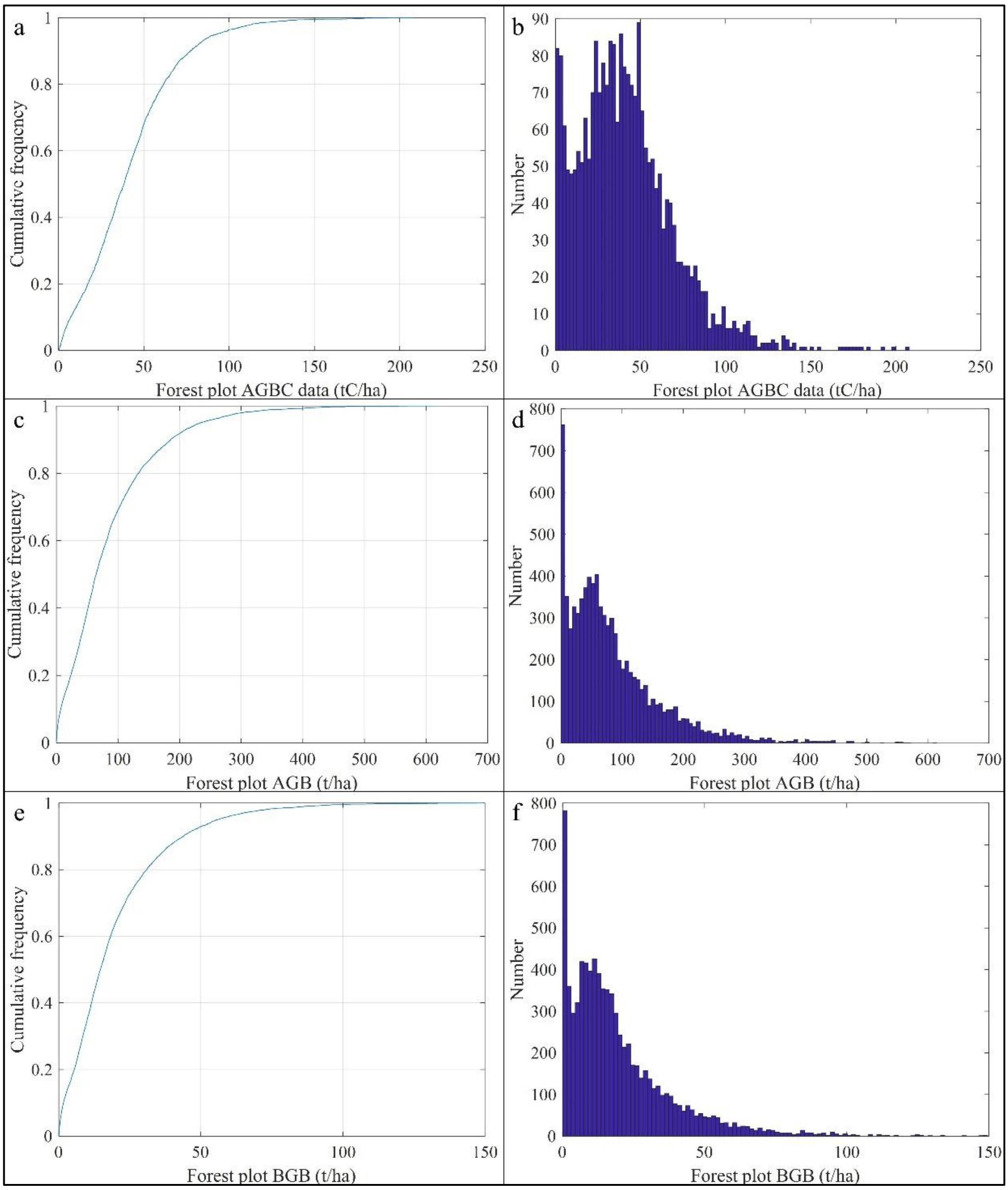

Figure R1. The (a, c, e) cumulative frequency curves and (b, d, f) histogram of (a~b) AGB carbon stock measurements at 2444 homogeneous forest plots; (c~d) AGB data at 8182 forest plots with both AGB and BGB records; (e~f) BGB data at 8182 forest plots with both AGB and BGB records.

8) Line 376: why does why RF of BGB show higher R^2 than AGB?

[Response]: Because **BGB is closely related to AGB** (Huang et al., 2021), the R^2 of **plot-level BGB** estimation using **plot-level AGB measurements**, forest stand age records and climatic backgrounds is expected to be very high. Meanwhile, we related multiple **remote sensing-based AGB maps** with **plot-level AGB records**. Due to the **errors and uncertainties within these AGB maps** and the **scale difference** between these AGB maps and in-situ measurements, the random forest model R^2 in the original manuscript (or the regression R^2 in the revised manuscript) will be a bit lower (Chang et al., 2021).

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