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Biogeosciences Discussions

Interactive comment on "Relative contribution of stand characteristics on carbon stocks in subtropical secondary forests in Eastern China" *by* A. Ali et al.

A. Ali et al.

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Ali et al. present a study on an interesting and important topic: biomass estimation for subtropical forests in the East Asian monsoon region. The study is generally well intraoduced and clearly structured. The data set is most probably appropriate to tackle the research questions raised by the authors. The choice of analytical methods, however, needs considerable reconsideration in some regards.

=> We are grateful to referee #1 for providing useful comments on our study. We will follow your suggestions and those recommended by referee #2 to revise this manuscript (MS). According your constructive comments, we have reorganized the conceptual models (please see attachment) by considering comments from referee #2 as well.

In addition, we re-analyzed our data with SEM model and we believe that this MS will be improved thoroughly. Thank you.

Please find our responses to your specific comments below.

1) Measurements and calculations of carbon stocks - There are no measurements of carbon stocks, just calculations based on allometric equations, so please adjust the section title accordingly.

=> We will adjust the section title. Thank you.

- I was not able to find eqn 1 in Brown et al. 1989, please indicate exact reference or modification if applicable.

=> Actually, we used the revised form of Brown et al.'s (1989) equation, which had been published in FAO papers (1997). We apologize for wrong citation. In the new revision, we will estimate AGB by using Chave et al. (2014) equation in the revise MS, based on the comments of referee #2.

- 14% of variance in tree height are not explained by diameter. This information could be used to improve allometric estimates, since the diameter-height-allometry varies with environmental conditions, and might provide valuable additional information.

=> This is a constructive comments. In the new revision, we will employ Chave et al. (2014) model by using DBH, H and wood density as predictors, and we believe that this model can improve the estimation of AGB of big trees. Actually, we have finished the data analysis by following Chave et al. (2014) model.

- However, there is no way of validating your AGB estimates, since no yield data are available. In the same regard, the comparison of eqn 1 with other allometric equations is not useful, since you never know the true AGB for the plots. If this comparison shall be kept, then please change it into some kind of uncertainty estimate. RËĘ2 values do not help much here, since all equations are based on the same parameter (diameter), so please report RMSE values. Related: in fig. S3, please provide equidistant scaling

of the axes.

=> We agree with your comment that we cannot validate AGB estimates in the previous MS. We will use Chave et al. (2014) equation, as it has been found to be the most suitable and appropriate equation for tropical and subtropical forests. Therefore, there will be no need to compare AGB estimates from different allometric equations. However, we will validate our AGB estimates by conducting correlation with stand basal area. Thank you.

- L191 ff: To me, it is unclear how to relate the DBH of a single tree to area-based basal area estimate. Please elaborate here.

=> Sorry for lack of clarity in the previous version of our manuscript. Tree basal area is pi*(DBH/2)ˆ2, and stand basal area is the sum of all tree basal area. We will provide a correlation figure between stand basal area and AGB per plot, and fitted the regression line with Type II - RMA. Thank you.

- L197: You are not using a D-H model.

=> We will clarify this in the revised MS.

2) Calculation of structural diversity - L210ff: Why do you optimise for a good correlation between H for DBH and height? If you so, you might as well use only one of these factors as a surrogate variable for general tree dimension diversity. I suggest comparing results for different discretization cutoffs instead. This would also interesting for the SEM approach: stand age drives structural diversity, but the direct link between stand age and C-stocks is stronger than the indirect one. One reason for this might be a mismatch in classification resolution.

=> We agreed with your suggestion, we will compare results for different discretization by employing SEM models and select the best model through AIC. For example, we will use different combinations of height and DBH diversities based on different discrete classes in the SEM models and then select the best model through AIC. Moreover, in

the new revision, we will use structural diversity as a latent variable that includes both DBH and height diversity indices. Before making this reply, we indeed have done data re-analysis by following the approach mentioned above.

3) Statistical analysis - You present a variety of linear modeling variants, when all you want to know is how a set of six parameters influences two response variables. The first set of analysis is contained in the second set, and the second set is a complicated way of doing an AIC based stepwise procedure (under the assumption that collinearity in the design matrix is manageable, which you suggest, but might want to reconsider given the explained variance of the single predictors sum up to > 160% (see L330ff)). - The basic question, as I understand it, is: which set of variables is the best choice for predicting C-stocks. Following this logic, a validation approach would be suited to address the problem, either using a stepwise procedure, using explicit variants of multiple regression models (like already done for the second stream of analyses), or a learning routine that allows for inspection of relative variable importance (like random forests). 80 plots could well be enough for such a validation scheme.

=> Thanks for your constructive comments here. We would like to follow your comments on diversities and compare the results. Therefore, we will only use SEM model for comparing different models based on different combinations of DBH and height diversities of different discrete classes. Further, we will also redesign our conceptual model in order to test the complex paths in one SEM model, instead of two models (as conducted in the last MS).

The results are presented in a clear and concise fashion, and the discussion is consistent, comprehensible and linked to current literature, given the results based on the complex analysis scheme.

=> Thanks a lot!

Some minor corrections: - L339 "range“ instead of "ranged“ - L480 "which was also found“ - L537 "to increase C storage“ - L187 "using Brown’s“ - L190 why switch from

DBH to D? - L192 "using Brown's“ - L194 "that Brown's“ - L201 AGBt - L247 "using equation 3“

=> We will correct all these mistakes in the revised MS. Thank you.

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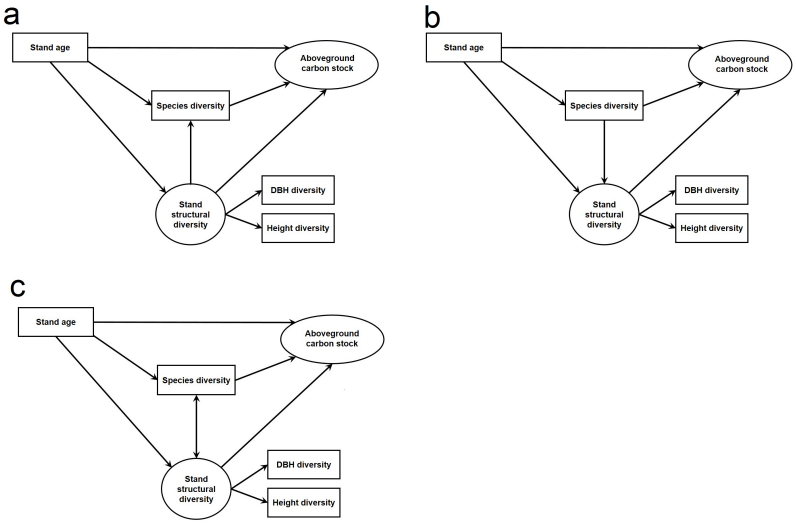

Fig. 1.