# *Interactive comment on* "Tree size and age induced stem carbon content variations cause an uncertainty in forest carbon stock estimation" *by* Suhui Ma et al.

**Anonymous Referee #2**

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This paper addresses the question to which extent variation in carbon (C) content of plant organs affects the precision of C-estimates at aggregated levels when only a mean value is used for all plant organs.

Because forests globally play a key role in the C-cycle and thus affect atmospheric $CO_2$ and global warming trends, even small errors at the scale of individual plant organs and plants can scale up to very large total amounts of C. The comprehensive analysis of 576 trees belonging to 24 species comes to the conclusion that the estimates could be 2.5% too small to 6% too large. The authors should perhaps discuss in more detail if they consider this a sufficiently large error to be of concern for the accuracy of global

C estimates and their consequences for predictions of global warming or other trends.

In their analysis the authors focus on differences in C content between plant organs and trees of different size and age; they eliminate site and species effects as random terms in mixed models. For the fixed terms they use type-III sum of squares (SS). I suggest that they may want to look at species as fixed effects as well to discuss differences among species with regard to C-allocation to different organs. This could make for a much richer analysis. Alternatively, they could also test specific fixed-term contrasts among groups of species, e.g. deciduous vs. evergreen or soft- vs. hard-wood species and keep species identity within these groups as random term. Generally, type-III SS have gone a bit out of fashion because they lead to difficult hypotheses if explanatory variables are correlated. It can happen that a set of explanatory variables (here tree size and age) together has a very high type-I SS yet if one adds up their type-III SS the sum is very small. I would prefer different sequences of type-I SS, perhaps followed by a hierarchical partitioning analysis. A problem of type-III analysis is that its result will differ from those shown in Fig. 1-3.

This manuscript needs linguistic corrections before it can be put online. Whereas the general grammar and sentence structure are fine, there are many cases where a plural "s" should be added or where an article "the" or "a" is missing. Also, for the title I would suggest putting "variations" in front of "stem":

"Tree size- and age-induced variations in stem-carbon content cause uncertainties in forest carbon-stock estimations"

Overall, this is a concise and well-presented paper that will be relevant to a broad readership.

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