

Interactive comment on “Predicting biomass of hyperdiverse and structurally complex Central Amazon forests – a virtual approach using extensive field data” by D. Magnabosco Marra et al.

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Title: Predicting biomass of hyperdiverse and structurally complex Central Amazon forests – a virtual approach using extensive field data

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The study performs predictions of dry mass of above-ground biomass (AGB) from a
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Central Amazonian terra firme forests considering a large sample size from 727 harvested trees from at least 135 tree species comprising different tree species assemblies, successional stages with varying tree architectures, wood densities and allometries. Different scenarios were produced for virtual forests on 100-ha plots considering variations in forest structure and species compositions using data from the harvested trees to predict AGB considering the heterogeneity of successional stages. The estimates of AGB in comparison AGB predicted of recently developed pantropical models by Chave et al. (2005, 2014) indicates huge biases when applying pantropical models. The developed allometric models in this study reduce considerable biases in AGB estimates considering forest structure, tree species composition, species identification and wood densities in comparison to often applied pantropical models and therefore significantly improve AGB estimates at landscape levels. This studied is an important and novel contribution of broad interest for scientists in tropical forest ecology and biogeochemistry. It is of high relevance in the current discussion of the role of tropical forests as carbon storage and carbon sink as for instance in the REDD+ program (Reducing Emissions from Deforestation and forest Degradation) of the United Nations Framework Convention on Climate Change (UNFCCC). The REDD+ program includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks especially in developing countries as Brazil. Tropical forest ecosystems play a crucial role in carbon capture and storage and the strategies of the REDD+ program allows intact forests to compete with historically more lucrative, alternate land uses resulting in their destruction. This is especially important for developing countries as Brazil. Therefore I suggest including these aspects in the manuscript and discuss the importance of reliable estimates of AGB in the framework of the REDD+ program.

The manuscript is well written and straightforward and fits well in the scope of Biogeosciences.

Minor corrections:

Abstract: L. 24: Indicate the meaning of AGB the first time used in the text.

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Introduction: L. 72/73: I suggest some studies on wood anatomy and also tree-ring analysis (for instance, Worbes, Brienien).

Material and methods L. 164/165: Indicate the period of the observed annual average temperature and total annual rainfall.

L. 167-170: The sandy soils on the slope bottoms (baixios) are subject to seasonal flooding during the rainy season, however, in contrast to the floodplains (igapó and várzea) along the huge Amazonian rivers with a monomodal and predictable flood-pulse, the baixios are characterized by a polymodal and not predictable flood-pulse patterns with many, sporadic and short inundations (Junk et al., 2011). This should be better described.

L. 172-173: There is no doubt that terra firme forests are the predominant forest type in the Amazon basin. However, many of the terra firme forests in the Western Amazon basin are paleovárzeas with lower C-stocks in AGB, but a higher AGB productivity (Quesada, et al. 2012). Junk et al. (2011) estimate that wetlands cover approximately 30% of the Amazon basin.

L. 227: Should it not be “species” instead of “studies”?

L. 247: variables (plural form).

Discussion: L. 431/432: I think you should add “one” after “either”.

L. 492-494: Avoid using three times the word “dataset” in the same sentence”.

L. 583-588: Not all of these indicated methods allow the measurement of wood density in live trees. X-densitometry and high-frequency densitometry are performed in laboratories as they require the preparation of the wood samples to perform the analyses which require a sophisticated infrastructure.

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