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Interactive comment on "Interspecific variation in tropical tree height and crown allometries in relation to life history traits" *by* Isabel Martinez Cano et al.

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General comments

The overall aim of the study is to examine interspecific variation in allometric scaling among coexisting species in BCI, Panama, in relation to life history traits. Allometric relationships between tree height and diameter, and between crown area and diameter, were modelled using a hierarchical Bayesian approach, allowing to identify the best functional form (saturating or not), and including trait information.

The authors identified strong interspecific variation in tree height-diameter and crown-

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Discussion paper

diameter allometries, respectively related to sapling growth and wood density. They confirmed the saturating shape of the tree height-diameter relationships (best modelled with a generalized Michaelis Menten model) and showed the consequences for the estimation of biomass at the tree level, and across the 50 ha plot. Not using a saturating tree height-diameter relationship at community or species level, provided larger biomass estimates for large trees.

I really enjoyed reading the manuscript, specifically the relationships between the interspecific variation in allometric scaling and traits, though only few traits were examined... In a relatively recent work, we did find some nice relationships between crown allometry and dispersal mode among 45 coexisting species in central Africa though the inclusion of traits in the modelling was finally not included in the paper, we only kept relationships between functional traits and architectural traits derived from species-specific allometries (Loubota Panzou et al., 2018). The second aspect of the study examining consequences of height-diameter allometry on biomass estimates is more classical, and mostly confirmed previous work, though I believe it is nice to accumulate such evidence.

The way trees were sampled is not crystal clear, and additional information might be useful for the readers. In Figure 1, I would have preferred to see the raw data (not log-transformed, as in Figure 2d).

Below are some specific and sometimes really minor comments to help clarify the manuscript for the readers that might be less familiar with the study area and/or approach used.

Specific comments

P1 L11 Perhaps clarify 'finite size effects at the smallest and largest sizes' For the largest diameters, this refers to the saturation of the tree height-diameter relationships, but for the smallest diameters, it is not clear for me. Is that related to the inventory threshold?

P1 L13-14 List the trait data used since they are only 3 of them: wood density, growth and mortality. I was expected a larger set of traits at first reading.

P2 L10 The limitations of the power model for predicting the height-diameter allometry are nicely discussed in Molto et al. (2014).

P2 L23-26 I have the impression that dissociating the two arguments here, (1) the recognition of interspecific variation in allometry, and (2) the way to model it appropriately (with a hierarchical approach), would help clarify the text.

P2 L28 'a large dataset for a single site' might indicate that the 162 study species are coexisting? or do they cover multiple habitats?

P3 L15 Please consider adding a map, with the information on the old-growth and secondary forests, if possible, and sampled trees.

P3 L12 'Allometric data' sounds bizarre for me, since allometry describes relationships between tree dimensions. I would suggest 'Tree measurements' instead.

P3 L24 In the combined height-diameter and crown-diameter datasets, the number of trees differ, but the total number of species sampled remain the same (n=162 species). It would be nice to precise the average number of trees sampled per species, and the extreme values. . .

P3 L29-30 Missing space after and before '-'

P4 L1 Growth and mortality at sapling stage were considered as proxy of shade tolerance. I wonder whether more classical information on crown exposure at small size would be available on the site for the study species. The crown exposure index (CEI) at 10 or 15 cm is a good indicator of species light requirement or shade tolerance (e.g. Sheil et al., 2006), since there are always paradoxical species that deviate in their trait-performance relationships.

P5 L9-11 The generalized Michaelis Menten fitted here has 3 parameters while the 2 parameters model has shown to provide good fit as well to height-diameter allometries at plot (Molto et al., 2014) and species (Fayolle et al., 2016) levels. I did not get the advantage of including the b parameter.

P6 L3 The models were fitted after log-transformation, and this conditioned the way the results are presented (log-log scales in Figures 1 and S1). I did not get why? To be comparable with the power models?

P6 L6 The 'no trait' model includes interspecific differences, but considered random?

P7 L3 Check the units 'g cm-3'

P7 L7-8 I would have preferred to have this information on the sampling per species in the Material and Methods. . .

P8 L18 In the whole paragraph, please insist on the tree level (in kg) and forest level (50 ha pooled, in kg ha-1).

P8 L21 In the Figure 4, I do not understand the rationale behind the fit. . . AGB is predicted from Chave et al. (2014) using three predictors : wood density, diameter, and height. . . Here you have pairs of AGB estimates for each tree using height modelled with the power model and height modelled with the generalized Michaelis Menten model. . . I would suggest a simpler approach plotting the AGB_Hpow against AGB_HgMM, and the 1:1 line. . . and perhaps separately for the size classes examined in the Table 3.

P9 L8 Why 'ecological traits' here ? Please homogeneize throughout the manuscript.

P9 L19 Perhaps provide the average and range of the scaling coefficient across species for the power model, and mention the differences in estimated coefficients as well as the lack of fit of the power model.

P9 L23-26 This might be different in other tropical forests. In moist semi-deciduous forests that are widely distributed across central Africa, the forest canopy is dominated by long-lived light demanding species. . . and there are only few shade tolerant species that can attain large stature. . . This might be different in wet forests. The analysis of the relationship between functional trait (including shade tolerance) and architectural traits describing species stature is provided in our recent paper mentioned earlier (Loubota Panzou et al., 2018).

P10 L1-24 There is a kind of contradiction between the two paragraphs: community average and interspecific variation in crown allometry.

P10 L15-18 The trait influence on crown allometry was weak. In a relatively recent work, we did find some nice relationships between crown allometry and dispersal mode among 45 coexisting species in central Africa though the inclusion of traits in the modelling was finally not included in the paper (Loubota Panzou et al., 2018).

P10 L24 Please clarify 'resource partitioning within stands', do you mean crown plasticity in response to competition?

P10 L31-32 In central Africa, using a massive destructive dataset (845 trees sampled for biomass in 6 sites), we found only little advantage of including height and crown dimensions for the prediction of AGB, possibly due to compensation between height and crown size across sites (Fayolle et al., 2018).

P11 L1-2 This has been already evidenced and discussed elsewhere (e.g. Feldpausch et al., 2011; Molto et al., 2014; Fayolle et al., 2016).

P12 L10 This has been already done elsewhere (Poorter et al., 2003, 2006; Loubota Panzou et al., 2018).

P12 L21-22 This a confirmation of previous work.

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