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Interactive comment on "Productivity of aboveground coarse wood biomass and stand age related to soil hydrology of Amazonian forests in the Purus-Madeira interfluvial area" *by* B. B. L. Cintra et al.

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First of all, we thank Dr. Markku Larjavaara for all the time and his effort to review our manuscript. His critics and suggestions are very helpful and will for sure increase the quality of our manuscript.

The report of different values of productivity in tables and text is surely due to the use of more than one allometric equation. For a revised version of our manuscript we suggestto use only one equationto avoid this confusion. For that we will use the recently improved allometric equation by Feldpausch et al. (2012), which considers regionally varying parameters for the estimates of aboveground wood biomass due to the varying relationships in diameter and tree height. Therefore, we recalculated the productivity of all trees and plots and remade the analysis. The results and relationships remain basically the same.

The sampled trees with DBH > 30 cm were chosen following their crescent identification number in the inventory. In the sampling method of the RAPELD program, the trees are numbered in the 250 x 40 m plot first along the first 1 x 250 m to the left, then back the first 1 x 250 m to the right. The same is done for the next 9 x 250 m to the left and to the right and then the next 10 x 250 m to the left and to the right. This way, choosing the trees by following their crescent identification number in the inventory, the sampled trees will always be spread along the plots. We agree that information on the 22 trees that weren′t considered for the estimate of productivity should be provided, and we will do it.

The concern about the term productivity is fair. We will better define each equation used in the article and clarify why we use them in each analysis. AGWBPmean, for example, is used to detect differences in productivity that is not affected by structural differences between the plots, but this equation does not mean turnover. Productivity relative to basal area means how much the wood is productive, independent of the size of the plot. However, we consider the suggestion of including turnover instead of productivity relative to basal area interesting. This will result in large modifications in the manuscript, which we are willing to do, because we believe thais these modifications will improve the results make them simpler to interpret. We calculated the turnover as the ratio between productivity and biomass multiplied by 100 resulting as an estimate of the annual replacement of the biomass stock assuming that the studied old-growth forests are in an equilibrium state. The new results and relationships were in accordance with the presented ones. We will present, interpret and discuss these new results in a revised manuscript.

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We also find that the stand age data is of great relevance, and it is fair to try to compute it in a fast and easy way to comprehend. We considered the suggestion and we decided that the best way to compute this term is by calculating the average age of individuals with DBH > 30 cm and between 10 and 29.9 cm, and taking the mean value of these two valuesweighted by the relative number of individuals of each class in the plot.

Trees and woody structures with DBH <10 cm are not included. This is indeed the reason that we use the term “coarse wood” in the title. We do not agree including biomass in the title because we do not analyze biomass variations.

Almost all of the plots are wetlands. Even at the driest sites, the water table comes very close to the surface in the rainy season, although not so close to waterlog the soil. The choice of the driest and wettest plots in each module was a strategy to sample a gradient of hydrological conditions. We will clarify this in the abstract and introduction using less terms to refer to the hydrological conditions of the area and also integrate this information in Table 2 (see supplement).

We agree that simplifications can be made to facilitate the reading. We have decided to use only one allometric equation (in agreement with suggestions indicated by reviewer #2)and we will avoid some acronyms like “HAND”.

This proposed mechanism is complementary to the second hypothesis we presented in our discussion, and we will consider the effects of long floods at wetter sites. Indeed, we did not express ourselves correctly when we said that saturation is favorable for tree growth. Flooding inhibits diameter growth due to the anoxic conditions in the soil limiting the uptake of water and nutrients (Worbes 1997, Schöngart et al. 2002). We discussed that tree growth might be favored during the dry season by water-logged, but not superficially flooded, soils. In soils with a characteristic plinthite layer, this could mean that trees would only grow during saturation, since they probably are not be able to reach the underground water under the plinthite layer during the dry season.

Response to specific comments:

P18L13: The direction is positive. We will correct this.

P18L15: The hydromorphic properties include the structure of the soil related to water fluctuation, such as the depth to which the roots can penetrate, the depth of the water saturated zone and the texture of the soil.

P18L18: As indicated above, this will be clarified.

P18L24: We chose to write as "…is favored by available water during a longer period after the beginning of the dry season".

P20L22: We agree on that.

Table 1: All suggested modifications in the captions and related to the acronyms will be included in a revised manuscript. We are doing our best to join tables in order to reduce the number of tables and to concentrate and synthesize information. As we suggest in accordance with both reviewers to use only one allometric model and one term of productivity the number and size of tables will be reduced in the revised version of our manuscript.

P22L12: It was paved forty years ago, then abandoned and now is partially paved. We will include this informationin the text.

P23L13: The samples were air dried in a ventilated room at ambient temperature and humidity.

Table 3: We thought it may be best to merge this table with table 6 (see supplement Table 2) that now presents values of one equation only. But we removed the third column and the percentage values of the second column.

P25L9: The distance to the tree was measured using a 50-m long tape. Usually the distances to the trees were between 15 and 30 meters and the reading of the clinometers between 35 and 50 degrees, depending on the height of the trees. Most height measurements with the clinometer were done by the first author of the manuscript, but a few were done by technicians trained in field by the same person. Errors in height measurements are real. This is why we present in Table 2 (see supplement) an error propagation in biomass estimates. In the chosen equation for the next version, the equation on Feldpausch et al 2012, the error propagation presented by the author are specifically due to biases of including height in the biomass estimates.

P25L12: It was the same as for all trees, 1.4 m, always coring among the buttresses directly into the trunk. Whenever the coring among the buttresses directly into the trunk was not possible, the tree was not cored.

P25L15: From 3 to 9 days and analyzed as soon as arriving in the laboratory.

P25L120: We believethat botanical data is important to characterize the plots and provide some information which tree species occur at the studied areas as well as to give information on specific tree growth and related parameters. This is an issue that has been brought up before and discussed among the authors. At that time we decided to leave the information for this version. After this review, we will re-evaluateagain.

P26L12: We agree with reviewer's comment.

Eqs. 2 and 3: We replaced these equations. We decided to use equation of Feldpausch et al. (2012). The new values will be included in the revised version. The new Table 6 (Table 2 from supplement) includes the revised values of AGWB and AGWBPc (calculated from the equation of feldpauqsch et al. 2012), stand age (calculated weighting each DBH class by its relative number of individuals in the plot, instead of the relative basal area) and includes the values of Biomass turnover for each DBH class. More details on other variables presented in this table are clarified below in the answers to the other comments.

Eq. 4: We contacted the authors of the paper. They informed us that they did not intend to use their equation to estimate C% on wood of other species than the ones they studied. They sent us another paper, Kirby and Potvin (2007), in which they consider

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C% in wood of species in general to be 47%, considering the study of Elias and Potvin (2003) and another study from Mexico. Therefore, we recalculated all values of C% in the plots considering 47% of carbon in woody biomass. The results are displayed in the Table 2 (see supplement). P27L24: The error propagation of the equation of Feldpausch et al. (2012) is based on the errors provided by the authors of the equation.

Table 4: We will reduce the acronyms and better define the columns in the table caption. Canopy height was calculated as the average of the heights of trees with diameter above 30 cm. Wood density was weighted with basal area, but tree height wasn't. Mean tree age is the same as stand age. We will indicate this clearer. In the reviewed version, mean tree age was calculated based on the basal area of trees with DBH >30 cm and between 10 and 29.9 cm. For a revised version, this calculation will be based on the number of individuals of each class in the plot. This results inslightly lower values for stand ages, but does not affect the main results and relationships between stand age and other parameters. This table will be merged with Table 6 in the revised version (see supplement Table 2). The models of Height x DBH presented in this table will be displayed as graphics in the revised version.

Fig 2. This information can be provided, although we thought at first it would be unnecessary because of the number of sampled trees. Still, the limitations of the core sampling method are real and we will discuss them.

P31L7: Will be done. Fig 3.Will be done. There are cores with less than 50 mm because many trees are not round but elliptic instead, presenting asymmetric piths, so that the pith of those trees has a smaller radius and a larger radius. This shall be included in the discussion of the core sampling method suggested in the last comment. Table 6: We will check this carefully.

P31L24: Three of the plot were characterized by a SWS index of 3 indicating seasonal floodings. The two plots of M01 are flooded which can been observed by the marks left on the tree trunk. The other plot that has the SWS index 3 (M11TN2500) is strongly saturated, but we didn′t find flooding marks on the trunks, probably because flooding in this plot is less than 50 cm high. The numbers of the equations will be changed after we use only one allometric equation. All the number of the equations, figures and tables will be carefully checked for the revised version.

Table 7: They are zeros. The zeros will be included for the next version.

Fig 5a: This will be provided in a revised version of our manuscript.

P32L27: We will describe this dataset in the methods. We can also mark the eight sample plots in the graphic.

P33L7: Will be corrected.

P33L7: We meant that the trees should start growing at the end of the flooding season, when the soil is not flooded anymore, but still saturated with water, so in saturated soils trees can grow, but trees cannot grow during flooding. We will discuss this better in the revised version, taking in account the also comments made by the Referee#2.

P34L2: This is a great idea. In Table 4 (see supplement) we show both the vertical distance and the horizontal distance to "quantify" the smooth topography. Details about the calculation of the horizontal distance will be provided in the methods description of the revised version.

P35L4: We agree. We can change the sentence to: "A high productivity means that trees grow faster and achieve larger diameters at lowerages, especially when the trees present low wood density." This helps the reader to understand the forthcoming sentence about expecting lower wood densities for the trees with higher productivity (p35L6).

Table 8: This value will be changed and corrected in the revisedmanuscript. There are actually some differences in the methods. Some of the mentioned studies include productivity of trees with DBH <10 cm. We will discuss this in the revised manuscript.

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P36L6: We do not agree that measuring height can generate more bias than not measuring is. Still, we can alter the text to: "...allometric models which do not consider tree height for the estimates of AGWBP, which are important to detect variations in forest structure and biomass, despite the difficulty to measure height in tropical forests...".

P36L23: Sustainability includes both the ecological concern and the economical concern. For an economically viable extraction in the region, more wood than the forest can regenerate would have to be extracted. Either economically or ecologically, the extraction would not be viableand therefore not sustainable.

P37L22: We did not attempt to do this, yet. Building chronologies for the region is one of our future objectives, but will require a lot of effort since we do not have discs, only cores, and we do not have many cores of the same species. So either we will have to go to the field again or we will have to try to build a multi-species chronology, which we don′t know if will be possible (especially with core samples).

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/10/C3100/2013/bgd-10-C3100-2013-supplement.pdf

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