

Interactive comment on “Asynchronism in leaf and wood production in tropical forests: a study combining satellite and ground-based measurements” by F. Wagner et al.

Anonymous Referee #1

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General comments: The work attempted in this manuscript is of great value and relevant to the audience of Biogeosciences. A greater understanding of the controls of seasonal patterns of wood and litter production, which remains poorly understood, is of great importance if we wish to improve how we model tropical systems. However, I advise that the manuscript requires substantial work before publication. Primarily the style in which the manuscript is written needs changing; the authors should try to simplify and formalise their writing style, provide more concise, less confusing descriptions and properly proof read the document as it contains numerous misuses of words and typos. Also figures and tables need to be properly explained in order to interpret the results.

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Specific comments: 1. Tree selection and representativeness: You state that you used 256 trees in your methods, but you do not state how these trees were selected and the habitats they were selected from. Stahl et al 2011 use trees from seasonally flooded and terra firme plots, do you mix trees across these environments? If so how do you expect this to influence your results, as there must be a different seasonality of woody growth between these environments if water is a growth driver? Is an average tree from these plots representative of an average tree across the multiple forest types in French Guiana? Also not having plot level data for woody growth means you are comparing EVI and MODIS data on an area basis with tree growth data which cannot be scaled to an area basis. Potential biases introduced by such tree sampling should be discussed in the paper. 2. Data comparisons: Why was the CRU data used rather than the data from the eddy covariance tower, which is situated very close to the plots which you are studying. How does the CRU data compare to the tower data? Also is it possible to show comparisons between EVI and NDVI measured on the tower? Also can the authors compare MODIS data to LAI data measured on the plots? This would provide a lot more confidence in the use of MODIS. As there is an abundance of ground data available on these plots it seems sensible that prior to the analysis a comparison with these data should have been done. 3. Bark thickness: I acknowledge that determining the effects of bark expansion and shrinking on growth is very difficult to do and I appreciate the authors trying to resolve this issue. However, I would suggest that the density and structure of the bark is an equal if not greater determinant for its capacity to expand and shrink than the thickness. Also bark expansion will be positively correlated with water availability, as is growth, so would you not expect there to be similar variation between trees with thick and thin bark no matter whether bark expansion is large or small? Thus does the relationship in Figure 1 really tell us that bark expansion and contraction has no effect on growth? 4. Explanation of cross correlation (p8256-8267): The explanation of how you did your cross correlation is very difficult to understand, particularly to somebody who has never performed this analysis. Also looking at table 4 is no help, as the table is poorly explained. I believe you have

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done the following, but am still not 100% certain: a. Taken a time series of 2 data types and correlated them b. Performed a cross correlation on these, lagging the correlation both forwards and backwards in time, to find the point at which the maximum correlation occurs. c. You have then taken both data time series and randomly re-ordered them and then re-performed a cross correlation above. d. You repeat 1000 times e. You then use your 1000 replicates to generate confidence interval based on the 5 and 95% limits on the ranges of the 1000 values for each lag period. f. You test whether your initial cross correlation with the correct time series peaks outside of your CI limit created from the 1000 randomly ordered time-series. Is this what you did? If so, please can you show an example figure showing a cross correlation and the CI limit. Also please can you mention the maximum lag you used during your cross correlation as it would seem to me that your results in Table 4 should be highly dependent on the maximum lag you used. Interpreting Table 4 is very difficult. The authors do not explain what corr+, corr-, lag cor+, lag cor-, IC+ and IC- actually are, or what any of the units may be and what the bold typeface means. Also there is no explanation as to the significance of having both a +corr and -corr in bold (which I presume is related to significance). The authors need to re-do this table and the explanation of the cross correlation. Can I suggest that the table also uses different numbers of stars for differing level of significance rather than listing IC (which should be CI) values. Also maybe plot out the correlations of the significant variables for the reader. Currently it is difficult to fully assess the results of the paper without a better explanation of this. 5. The authors state that the correlation between litter-fall and radiation is important, but their correlation is only 0.36, does this not suggest that 74% of the variance remains unexplained? What else explains this variance? It would be nice to see a plot of the litter-fall radiation correlation with a R² and P value. Also it would be apt to discuss how general this relationship is. i.e. does data from papers such as Chave et al 2010 show that litter-fall happens around the same peak period in dry season for other forests? 6. Using EVI (P8259-8260, L25-6): Is solar zenith angle the only problem with EVI? The authors do not discuss studies such as those by Asner and Alencar 2010 and Anderson et al 2010 and others which

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discuss the problems of using EVI. Can the authors provide any type of evidence that EVI is an accurate measure of leaf production? Otherwise it may be appropriate to discuss other potential problems with using EVI. 7. Multiple types of EVI data (Figure 2): Why do you use EVI for all these forest types? Do you average all these forest types in your overall EVI data in Figure 3? If so why? Surely the study plots on which you have data only represent the high forest with regular canopy category. Either explain why you use all these forest types when you do not have data for all of them, or only use appropriate EVI data.

Technical comments: 1. P8248 L11, 'Magnitude' is the incorrect word for this sentence, do you mean EVI increased with leaf renewal. 8. P8248 L25: 'On the other hand' is a very colloquial phrase for a scientific paper. 9. P8249, L5: 'Tree growth occurs in two ways' should be followed by a colon not a full stop, as it is the start of a list. 10. P8249, L6-7 insert a comma and the word 'which' after 'Primary growth' 11. P8249, L7 insert comma and 'and' after 'root development'. 12. P8249, L7 insert a comma and the word 'which' after 'Secondary growth' 13. P8249, L7 Incorrect use of the word 'gathers' 14. P8249, L13 'We will study their...' state exactly what you will study do not use their. 15. P8249, L25 Do you mean photosynthetic capacity? 16. P8249, L25 Replace 'were' with have been 17. P8249, L26 'in the heart of the dry season'. Can you replace heart with middle throughout the document if this is what you mean? 18. P8249, L25-28: this sentence needs re-writing it is poorly written. 19. P8250, L1: by secondary growth do you mean woody growth in stems? If so maybe just use the term woody growth or woody stem growth throughout. 20. P8250, L4: Remove the word 'obviously' it is not necessary. 21. P8250, L8: Do not need the word 'Most' 22. P8250, L10: Again if starting a list you need a colon not a full stop. 23. P8250, L13: 'key role in the forest's'. Which forest's? 24. P8250, L21-22: But also see Doughty et al 2008 & 2011 who find evidence of down regulation of biochemical processes with increased leaf temperature in tropical forests. 25. P8250, L26-28: This sentence starting 'This increase' is difficult to understand 26. P8250, L28-29: I don't really understand what you are trying to say with this sentence, why was it 'more variable at times'. Also you should provide a clear

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link to the sentence before, remembering the difference between measuring NSC as in Wurth et al and measuring photosynthesis as in Stahl et al 2013. 27. P8251, L1-3: you don't need the word 'Very' at the start of the sentence and you could link sentences 1 and 2 of this paragraph to make it easier to read. 28. P8251, L4: What do you mean by 'reasonable'? 29. P8251, L7: Get rid of the 'While' at the start of the sentence. 30. P8251, L18: 'Modis' should be in capital and acronym explained here not on the next page. 31. P8251, L18-19: I am not sure about using the words 'apparent paradox' but if you use you should remind the reader of what it is, i.e. why is wood production and leaf production at different times a year a paradox. You have not clearly stated this. 32. P8251, 19: 'Biomass productivity' should be 'biomass production' 33. P8251, L19: can you use another word instead of time overlap as this is slightly confusing when you are actually talking about a shift in resource allocation over time. 34. P8252, L25: It would be good to provide a summary of your methods here and describe how they will be laid out. 35. P8252, L25: Word missing in sentence starting 'This typology' 36. P8252, L17: Missing word 'are' 37. P8253, L15: Why do you use an approximate sign rather than an equal's sign in all your equations? Surely if it is a model it should be =. 38. P8254, L15: Does the log sign on both sides of this equation not cancel out? 39. P8254, L15-17: Sometimes you use H without a hat to indicate height and sometimes H with a hat over. 40. P8255, L4 & L11: Both of these equations create a $\Delta ABG_{paracou}$ one with a t and one with an m, but one states it is wood production of paracou and the other wood production from MODIS data. This is confusing as they look very similar and also t symbolises time in your equations. Can I suggest you use something like BD (biomass dendrometer/DBH) and BM (biomass MODIS). 41. P8256, L9-10: What are MODLAND-QA and VI usefulness? 42. P8255, L11: I don't understand why you have chosen this equation form, why ' $\Delta ABG_{paracou,m+1}$ '. Also why so many parameters, what is the logic behind including them all, and please explain what they all mean under the equation, or refer to Table 1. Was AIC used to thin this model? Also why do you assume that the model is linear? 43. P8256, L16: Has 'n' not already been used for the number of trees in previous equations, maybe choose

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another letter so as not to re-use. 44. P8256, L18: You use a summation symbol with the letter i, but it does not appear anywhere in the equation thus you seem to be summing nothing. Please check your equation. 45. P8256, L21: Do you mean from the 'R package season'? 46. P8256, L16: Sometimes you use 'leaf fall' and sometimes 'leaffall' in the document. Leaffall is incorrect. Also perhaps litter-fall is a more standard term to use. 47. P8257, L16: Please quantify rather than using 'increased quickly' 48. P8257, L23: What is a cosinor test? This is not explained in the methods. 49. P8258, L10: Remove the word 'meanwhile'. 50. P8258, L12: Is significantly a better word than highly? 51. P8258-9, L28-1: This sentence is hard to understand. You can just simply state that the carbon flux from litter-fall is of a similar magnitude to the carbon flux from woody growth. In doing this you can combine with the second sentence of this paragraph, rather than repeating yourself. 52. P8259, L7: You have not introduced the ideas of greening-up of the amazon in your introduction but you discuss it a lot from now on with the words 'so called'. In this first sentence and first use of the term, you do not use quote marks and do not reference greening-up as you do later on. 53. P8259, L16-20: Simplify sentences and combine 54. P8259, L19: 'After a while' is not very scientific! 55. P8259, L20-21: You need a reference for tropical leaf ages. 56. P8260, L6: by index of canopy photosynthetic capacity do you mean EVI? 57. P8260, L15: 'In the end' is not necessary 58. P8261, L10: 'wood production presents'?? Surely 'wood production has a complex link to leaf production' is a better way to say this. 59. P8261, L20: Do you have data on leaf maturity times? If not I do not understand how you are inferring leaf maturity from your data? 60. P8261, L22-24: This sentence needs simplifying and re-writing. 61. P8261, L26: Productivity of what, leaves or wood? 62. P8261-8262, L28-9: This can be simplified and cut down. In essence you are just saying that wood production could be indirectly linked to irradiance via a shift in resource allocation from wood to leaves as irradiance increases. Also try to cite some sources of ground based evidence for resource re-allocation e.g. from Malhi et al papers and not just remote sensing papers. 63. P8262, L9-16: Again this section needs simplifying. Also this is the first time you mention a connection between wood

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production and temperature and it is not discussed in your results section. Therefore this section needs to be removed or discussed more explicitly in results. 64. P8262, L19: 'A few months later' than what? 65. P8262, L19: Remove 'or stopped' 66. P8262, L24: The Tapajos forest is not an ecosystem. 67. P8262, L26-28: I don't think numbers are necessary here as it is an explanation not a list. 68. P8262-8263, 28-22: This section is difficult to read and complicated. You need to simplify this section and connect the pieces of information you are discussing directly to your results or remove them. Currently it is very hard to see the purpose of this section in your paper. 69. P8263-8264, L24-19: I suggest you re-write the conclusion. Currently there is one sentence on your results and 9 sentences on work in other studies and future work! The conclusion is for the conclusions of your paper. 70. Table 2: Are you referring to MODIS wood production or actual wood production? Please make this clear in all figures and tables and in the text. 71. Table 3: please explain your column headings amplitude of what? Also I suggest you put high and low phase and explain what they are. 72. Table 4: See Specific comments above. Also please note confidence interval should be abbreviated to CI not IC. 73. Figure 1: What are the grey bars, they are not explained. Also the key in the plot only shows the solid line. 74. Figure 2: This plot is not properly discussed in the text. Also you do not explain what the lines and the dots are. 75. Figure 3: You do not explain what the lines and the dots are.

Interactive comment on Biogeosciences Discuss., 10, 8247, 2013.