

Interactive comment on “Climate seasonality limits carbon assimilation and storage in tropical forests” by Fabien H. Wagner et al.

Anonymous Referee #2

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Overall Review

The manuscript presents a statistical analysis of how seasonality of climate variables is correlated to seasonality of photosynthesis (computed through MODIS EVI product), aboveground wood productivity and litter productivity, the latter data were compiled from a meta-analysis of published literature. The authors found that in wet sites (with approximately precipitation > 2000 mm/yr) photosynthetic capacity and wood productivity are out of phase. In these locations, the EVI seasonality is mostly correlated with maximum temperature interpreted as a proxy for surface radiation, while wood productivity is mostly related to water availability (precipitation). In drier locations, water limitation affects the seasonality of both photosynthetic capacity and wood productivity and their seasonal cycles are temporally correlated. Seasonality of litter productivity correlates less well with climate variables (mostly with cloud cover), and the authors

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Discussion paper



conclude that endogenous processes as plant phenological strategies could play an important role. The topic and questions addressed by the authors are of general interest, the description of the statistical analysis is sounding and thorough. Even though statistical correlation does not mean causality, the interpretation of the results is based on current knowledge of plant physiological processes and uncertainties are discussed. Most of the presented results are not very novel when compared with what has been already published (e.g., Wagner et al. 2013 Biogeo., Restrepo-Coupe et al 2013 AFM, Guan et al. 2015 Nat. Geo.). However, the authors are aware of this as stated few times in the articles (Page 11, Line 15, Page 12 Line 31, Page 13 Line 16). Even though the results may mostly confirm past studies, the large database assembled by the authors across tropical forests provides additional support and evidence for the pattern of seasonality and relationships with climate in those forests and therefore the article will be likely interesting for many readers. I have just a few minor comments listed below.

Minor Comments

Page 5. Line 20. I think how it is formulated the third hypothesis “photosynthesis on a global scale is mainly controlled by water limitations” is a bit misleading. I guess with “global scale” the authors just refer to the 89 sites in the tropics, and then although the correlation they found with precipitation is the most significant, this does not exclude other important controls.

Page 6. Line 19-22 or Page 8 Line 12-21. The authors may also want to refer to the issue of translating changes in diameter at sub-seasonal scale directly into carbon allocation, it has been recently shown that actual carbon allocation may follow tissue expansion by a considerable amount of time (Cuny et al 2015), or in other words there is a sub-seasonality of wood density in the wood formation period. This should not represent an issue for the present study since the results have been shown to be robust to the exclusion of the first month of wet and dry season (Page 9 Line 12-18) but it is probably worth of mentioning.

Page 14. Line 25. I would re-phrase the sentence with more cautious statements, while it is true that photosynthetic capacity and wood productivity correlates with “exogenous variables” there is still a large fraction of unexplained variability. In the presented statistical models, these exogenous variables explain 48

Page 15. Line 6-8 (also Page 6 Line 5-6 and abstract). I am not sure, I totally agree with this last sentence. While it is evident than in water limited forests a drier climate will lead to a decline in productivity, in the light-limited forests a drier climate is likely to decrease “cloud-cover” and therefore eventually increase productivity or at least there is no guarantee that water-limitations will become the dominant control and definitely this cannot be inferred from the current analysis.

I would suggest moving Fig. 4 and 10 to the Supp. Material but up to the authors.

Cuny et al. (2015) Woody biomass production lags stem-girth increase by over one month in coniferous forests *Nature Plants* 1, 15160 doi:10.1038/nplants.2015.160

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