Biogeosciences Discuss., 12, C9591–C9593, 2016
www.biogeosciences-discuss.net/12/C9591/2016/

Biogeosciences Discussions

Interactive comment on "Amazon forest structure generates diurnal and seasonal variability in light utilization" *by* D. C. Morton et al.

Anonymous Referee #3

Received and published: 7 February 2016

Morton et al. use a 3D model to simulate radiation transfer in an Amazon forest canopy to demonstrate that there is diurnal and seasonal variability of canopy light utilization. The main finding suggests that light utilization is lowest during the dry season months. This result is explained as a mixture of shading and light saturation effects.

The topic of the paper is timely and relevant: understanding canopy architecture effects on the diurnal and seasonal light utilization by canopies will help to understand the current seasonal dynamics of ecosystem exchange of water, carbon and energy. Additionally, given the plethora of satellite products available at the moment, the study is also timely given the variability found in daily canopy utilization values.

I found the start of this paper hard to understand, with parts of the methodology not being explicit. i.e. how was light utilization and light saturation estimated? See specific

ines below. Also, some parts of the text is not self explanatory, and assumes that all readers are expert in the topic. Figures are rather vaguely explained, this could improve.

Although these are modelling results, the results are presented as 'truth' with no discussion on the sensitivity of the results to the underlying assumptions. How sensitive are these results to the assumptions of: 1) Light utilization calculation 2) Assumptions of light saturation. Top canopy leaves would have much higher light saturation values than mid and low canopy levels, also these leaves should be adapted/acclimated to usual dry season irradiance levels. This ought to be accounted for at least as a sensitivity test as it might be one of the key driver of this paper results 3) Parameterisation of light absorption by woody elements and ground surface 4) Volume or area of branches simulated with DART 5) Amount of atmospheric aerosols chosen for these 1 day simulations per month. A sensitivity analysis to the above assumptions is pertinent.

Aerosols levels in the Amazon region are known to be high during the dry season months with estimated relevant impacts of diffuse radiation effects on GPP during these months (Rap et al 2015). It would be relevant to see specific effects of diffuse radiation during these months on light utilization/LUE and how the specified value of AOD/aerosols in these simulations influence the dry season results.

The paper suggests that these results could be an alternative explanation to the observed Amazon forest seasonality. However, lower light utilization during dry season months will necessarily mean lower photosynthetic uptake which is opposite to what the actual observations show for most forest sites in the amazon region.

Is there any possible way to validate any of these results with some observations of LAI profiles through the canopy http://www.scielo.br/pdf/aa/v35n4/v35n4a07.pdf or vertical profiles of radiation measurements, measured at one of the Tapajos towers? or with any other observations?

Specific comments:

Line 26, page 19049 Light utilization, this is a key concept on this paper, for clarification purposes would be best if the equation used is added

Lines 23-24, page 19049, Light saturation effects: explain what these are and explicitly how this was accounted for. What values were used?

Line 25, page 19050, shadowing effects: where can we see this?

Fig 2, is not described /explained

Fig 5, light saturation effects in this figure are not clear

Interactive comment on Biogeosciences Discuss., 12, 19043, 2015.