

***Interactive comment on “ Mortality as a key driver
of the spatial distribution of aboveground biomass
in Amazonian forests: results from a Dynamic
Vegetation Model” by N. Delbart et al.***

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Review of paper “Spatial distribution of aboveground biomass in Amazonian forests”
by Delbart et al 2010.

The subject area this addresses is especially important, as ultimately it relates to the
modelling of the Amazon basin and predictions of its stability in a changing climate.
What the authors find is that existing modelling exercises get the spatial mean above-
ground biomass correct, but not the more detailed spatial patterns. In fact the global

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mean is a balance of compensating errors.

The authors find that even if spatial variation in NPP is actually prescribed, then there remain large errors in biomass, unless a hereto observed correlation between NPP and mortality is included. What makes this analysis so impressive is the extensive use of datasets (for both NPP and biomass) to back the working theories.

In my view the paper is very good and will not require much further effort to attain publication status. Hence I list below a few pointers which the authors might like to consider:

(a) There are quite a lot of plots, and so the main message can get lost slightly. I found it difficult at first to move between the plots whilst simultaneously moving around the paper. For instance, Figure 2(a) shows very clearly the over-estimate by ORCHIDEE of NPP. But then one jumps to Fig 3(a) and the opposite is true. (OK, so find in text that Fig 3a is only NPP for “above and below ground wood and to fruits”, but this is still “overestimated”. Figure 3a looks like a model under-estimate to me? Is there a typo around page 3105, line 11?)

(b) I'd be very tempted to split up Figure 5 in to two separate plots. The reason for this is that Fig 5(a) is an important part of the modelling exercise and is adopted from elsewhere. In fact, without this, the new modelling cannot be completed. Then Figures 5(b)-5(e) are the overall model new verification, which is a separate issue. Also, by removing Fig 5(a) to a separate panel, it will also allow Fig 5(b)-(e) to be bigger. This is important – I'd like to see how the red and black plots overlay each other in more detail i.e. make 5(d)-(e) larger. It is these two sub-figures that show the new theories work!

(c) Many of the plots in the paper present, as a way of differentiating geographically, values against Longitude. I did wonder if this was implying that we should introduce a longitude-based variation in NPP and/or other parameters if we were to build a predictive model?

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(d) I'd like the authors to comment a bit more on exactly what would be required to make a predictive pan-Amazon set of simulations i.e. introduce geographical variation. The authors demonstrate (very clearly) that NPP is incorrectly modelled, but even if it was correct, then AGWB is wrong. To get this correct requires the earlier discovered relation between turnover rate and NPP. So, if we assume the latter relationship is robust everywhere (??), then am I correct in thinking that GCMs would only then require new geographical variation introduced in to NPP. However, if we don't have observations of AGWB, what do we do to get this NPP variation introduced in to geochemical models of the land surface?

(e) So following on from the above, the authors suggest that we might be able to resolve the geographical uncertainties if we knew nutrient availability. Can we relate this to other work regarding phosphorus availability? Aren't these things slowly becoming available?

(f) I wondered if the authors might like to comment on the very large general overestimate by the models of NPP? I only mention this because there is so much interest in the "die-back" possibility for future climates. Does having in fact lower NPP values than expected bring us nearer to potential thresholds of the sort first considered by Cox et al (2000)? I'm certainly not suggesting a long excursion in to future predictions with this paper – it is not what it is about – but could we make some sort of link to Malhi, PNAS 2009 for instance?

A few other small things. For instance:

- The authors might like to make a quick sweep through the paper, tidying up a couple of notation things. For instance, where an acronym is introduced, usually describe with capitals e.g in Abstract, "Above Ground Woody Biomass (AGWB)". Check consistency everywhere through the manuscript.

- Could the symbols in Fig 1 be made slightly bigger? It is difficult to differentiate between the different shapes/colours.

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- I always think a paper looks better if units are given everywhere, even if they are obvious.

- So, related to the above, mortality is usually in units of (/yr) i.e. fractional turnover? However, from Equation (3), for this paper it is (ton C/ha/yr). That's fine, but best to state this.

I think this is an excellent piece of work. I'm happy to wave anonymity on this review, so if any of the above requires clarification, please feel to get in touch (Chris Huntingford chg@ceh.ac.uk).

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