**Biogeosciences
Discussions**

Interactive comment on "Inferring Amazon leaf demography from satellite observations of leaf area index" *by* S. Caldararu et al.

S. Caldararu et al.

s.caldararu@sms.ed.ac.uk

1 General comments

1.1 Paragraph 1, page C5340

My main question is how the spatial scale of model fitting influences the skill of the resultant model(s).[...] each modeled grid cell contains a mixture of forest types, and an unspecified fraction which is "empty"

All variables used are expressed as values per unit ground area (LAI, PAR) or percentage (soil moisture) and there is no explicit spatial distribution within the grid

C5850

cell, which implies there is no resulting empty fraction, just an average value for each cell.

How well can the model be fitted in grid cells with an even distribution of forest types, vs. a dominant type?

The forest types provided by the MODIS landcover product are evergreen needleleaf forest, evergreen broadleaf forest, deciduous needleleaf forest, deciduous broadleaf forest and mixed forest, with the majority of pixels in the Amazon basin identified as evergreen broadleaf. These forest types are not necessarily representative of the existent forest types in the Amazon, which are mostly dependent on factors such as soil type and nutrient availability. Furthermore ground based studies have found significant differences between stands of different ages (old growth vs. secondary forests) which is also not included in the MODIS landcover scheme. A better landcover map of the Amazon that would include these factors (which is currently not available) would indeed improve our analysis of spatial scale and forest heterogeneity.

It would be interesting to see the maps of fitted parameters in Figure 6 (and their uncertainty) compared to the MODIS land cover map. This could indicate whether finer spatial resolution of model fitting is warranted.

As mentioned above, such an analysis for the central basin would not be very informative. However, for our future research such an analysis would prove valuable if we were to include larger areas with a more varied forest cover..

1.2 Paragraph 2, page C5340

The question of spatial scale and model fitting could also be explored by use of plot scale observations such as the auxiliary data from eddy-covariance sites. This data includes LAI, soil moisture and PAR, plus ecological observations and carbon and water fluxes, which could be used for comparison and model validation.

The use of such data would indeed be very useful both for applying our model to finer spatial scales and for validating the current model results. this is currently outside the scope of this paper which merely describes the tropical phenology model but will be included in our future work.

Observed carbon fluxes could be added to a Figure 8-type analysis, as well.

The carbon assimilation component is currently presented for illustrative purposes only and an example of the possible uses of our phenology model. Future work will include coupling our model with a full-scale carbon assimilation model which would then be compared to flux measurements.

2 Specific comments

P10393 L 23 *Alpine areas could be screened using a digital elevation model, such as the one from the ASTER instrument (http://asterweb.jpl.nasa.gov/).*

Further filtering of high elevation forests together with a detailed analysis of landcover at the forest boundary, will be part of our future work which will extend the model to other tropical areas.

P 10397 *L23 With respect to Figure 6d, I don't see the trend of much lower leaf lifespan in the east. Perhaps it would be easier to see if the sub-regions being compared were outline*

Figure now clarified accordingly.

P. 10398 L3 *Figure 7 - comparative leaf age distribution - is very interesting! It would be good to compare it with more detailed info about the distributions of forest types in those areas (e.g. from the MODIS land cover map).*

We agree with the referee that an analysis of leaf age distribution for each forest type would be very interesting. However, as mentioned above (comment 1.1), we do not have sufficient information about the existing forest types.

P 10421 Fig. 8 *Is this figure for the whole study area? It's hard to tell. It would be helpful to break out a few different forest types, and compare the skill of the phenology-based model for predicting carbon fluxes between the types.*

Figure 8 is for an example location in the Eastern Amazon, now clarified in the text. With respect to landcover see comment 1.1