Hi, Carlos

I would like to thank you very much for your return. Sorry for the late response but I’m also a bit slow on these crazy days.

So, first I will try to clarify you my design. As I said, in this study we used the vegetation model that we are developing (CAETÊ). For this paper we emcompassed only the Amazon basin. We applied two climatic scenario: regular climate (refence climatology from 1980-2010) and reduced precipitation (homogenous decrease in precipitation of 50% for the whole basin). We aimed to understand the impact of reduced precipitation on functional diversity and on the ability of the forest to absorb and store carbon. For this, we used six functional traits: allocation and residence time for leaves, aboveground woody tissues and fine roots. In order to understand the role of functional diversity on the response of Amazon forest, we initiated the model using two types of approaches that provided us two levels of initial funcional diversity: high and low. For the low diversity approach we used 3 tropical PFTs and the values of the functional traits were assigned by consulting previous literature (Table 1). For the high functional diversity we used a trait-based modelling approach in which the values of the traits are randomly sampled from ranges of values for each functional traits (Table 2), what creates a functional space with thousands of trait value combinations what we call as Plant Life Strategy (PLS; Fig. 1) from which we sample 3000 PLS (this modelling framework was primarily based on the one used by Pavlick et al, 2013 – Biogeosciences (doi:10.5194/bg-10-4137-2013). All the grid-cells are initiated with the same amount and indentity of PFTs/PLS, and with envinronmental filtering, the trade-offs between the functional traits and the physiological processes we end up with each grid-cell with its own community. From this we were able to create TPDs and analyze the distribution of all 6 traits, comparing both the two modelling approaches and the climatic scenarios.

In summary what we found is that for both approaches the dissimilarities between the curves (pre and post disturbance) are high (greater than 0.5) and we concluded that the reduced precipitation changed the functional structure and diversity of the communities (Table 3). In commmon, both approaches showed an expressive reduction of dominance for all the traits, what enabled the occurrence of strategies that were rare or that were not occuring before, in agreement with the compensatory dynamics theory (Fig. 2 and 3). Despite of this similirarity between the approaches responses, the distribution curves are quite different. One can observe, for example, that the PFT approach presents for all traits a limitied possibility of the occurrence of new trait values, presenting, in the the reduced precipitation scenario, trimodal curves. On the other hand the trait-based approach showed a more spreaded occupation of the functional space. It reflected on the functional diversity facets (Table 3): both approaches showed an increase in functional richness for the considered functional traits, however it was in a much higher magnitude for the trait-based approach. In terms of evenness, the trait-based approach showed an increase (higher than 100%) for all traits, while the PFT approach showed a decrease in this variable for the majority of the traits. Finally, divergence decreased (except for leaf allocation) in the drought scenario for trait-based approach; on the other hand the PFT approach showed an increase in divergence (except for leaf allocation and fine roots residence time). In my understanding, these results indicate that the trait-based approach was able to better occupy the functional space with the disturbance in comparison with the PFT approach, enabling the chances of the community to adapt to different climatic conditions. These constranst in the results must be due to the difference between response diversity of the approaches imposed by the level of functional diversity in which the model was initiated: very limited for the PFT approach since it had only 3 possibilities of trait combinations against 3000 for the other modelling approach. It shows the importance of functional diversity for the ecosystems response to climatic changes and also the value of rare traits in the functional reorganization of communities to deal with different environmental conditions.

In terms of composition, with the reduced precipitation we observed, for the trait-based approach, an increase in the investment for fine roots to the detriment of woody tissues and leaves, while the carbon partioning for the PFT approach did not change (Fig. 4). The change on composition allowed the trait-based approach to deal better with the drought, allowing the maintenance of carbon storage in several regions where the other approach was not able to. Nevertheless, as fine roots contribute in a lesser extent to total carbon stock when compared to woody tissues and also present lower residence times, it implies in a relative smaller ability to store carbon when considering the ecosystem scale.

In that sense, in this paper, we point out that the functional diversity and the resilience of ecosystem (if we consider maintenance of biomass as a proxy for resilience) is not as straightforward as several studies have claimed.

So, Carlos, I would like to have your opinion about my main conclusions. Do you think I’m d following a good path to discuss the results regarding to functional diversity?

Do you have another interpretation or comments?

Finally, I’m having some troubles in represent the graphs of the TPDs because the dimension of the y axis is much bigger for the PFT approach than for the trait based approach. If I join them it becomes almost impossible to observe the changes on the distributions for the trait-based approach.

Do you have some advice to deal with this?

p.s.: see the figures and tables on a separate pdf file.

I am very greatfull for your help.

Best wishes