The impacts of drought on Amazon forest carbon sink capacity are permeated by uncertainties. The underexplored impacts on functional diversity (richness, divergence and evennes) and how it modulates carbon sink may be a missing piece in this puzzle, since it directly affects ecosystem functioning, although the mechanisms for this connection are still under debate. Here we investigate how a 50% homogeneous reduction in rainfall can affect carbon stocks and functional diversity in the Amazon forest. For this, we used two modelling approaches in which functional diversity is or is not predefined and hard coded: one model version uses a plant functional type approach (PFTA; fixed values for functional traits in 3 tropical PFTs) and the other version uses a varying trait-based approach (TBA; semi-random combination of functional trait values creating 3000 plant life strategies). Six functional traits were considered as fixed/variant: carbon allocation and residence time on leaves, aboveground woody tissues (ABGW) and fine roots. The imposed drought caused a widespread loss of total carbon storage in a similar magnitude in both approaches: ~60%. However the TBA presented an increase in fine roots investment (~10%), whereas the PFTA reduced carbon in all plant compartments. The changes on functional diversity were considerably different in magnitude and direction between TBA and PFTA: TBA(PFTA) showed for leaf allocation +15.15%(+0.47%) in richness; +276.54%(-74.71%) in evenness and -26.01%(+0.15%) in divergence for fine roots allocation. These impacts was a consequence of the observed functional reorganization thanks to the decrease on functional dominance observed mainly on TBA, what allowed previously rare trait values to increase its density and to a consequent change on functional composition

[DISCUSSION/CONCLUSION]

This modeling exercise demonstrates that the ability of a community to functionally reorganize and deal with the new conditions is highly dependent on its traits diversity. It also shows that trait-based modeling opens the opportunity to explore questions that goes beyond biogeochemical cycles such as how functional diversity is connected to ecosystem processes as well as communities respond to climate change in terms of its functional structure, composition and diversity.

[METHODS]

One model version uses a plant functional type approach (PFTA; fixed values for functional traits in 3 tropical PFTs) and the other version uses a varying trait-based approach (TBA; semi-random combination of functional trait values creating 3000 plant life strategies). Six functional traits related to plant carbon balance were considered as either fixed or variant: carbon allocation and carbon residence time on leaves, aboveground woody tissues (ABGW) and fine roots.

[RESULTS]

The imposed drought caused a widespread loss of ~60% of total plant carbon storage in a similar magnitude in both modeling approaches. However there were differences in the carbon stock changes of specific plant compartments, with the TBA showing an increase in fine roots investment, whereas the PFTA invariably results in reduction of carbon in all plant compartments. In regard to functional diversity (considering the six functional traits in focus), the outcomes were considerably different, with the TBA(PFTA) showing a decrease of XX% (XX%) in functional dominance, that allowed (did not allow) previously rare trait values to increase its density and a consequent change on functional composition and on the functional diversity components (increase in richness and evenness and reduction on divergence). Beyond that, PFTA showed a decrease in evenness and an increase in divergence.

[DISCUSSION/CONCLUSION]

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