**Abstract**

The impacts of projected reduced precipitation on functional diversity and how its components (richness, evenness, divergence and composition) modulate the Amazon forest carbon sink remain elusive. We present a novel trait-based approach, the CArbon and Ecosystem functional-Trait Evaluation (CAETÊ) model to investigate the role of trait diversity for projecting carbon storage (CS) and net primary productivity (NPP) in current climatic conditions and CS under low precipitation, by using two approaches to represent functional diversity: (i) Plant Functional Type Approach (PFTA) including three PFTs, and (ii) a varying Trait-Based Approach (TBA) including 3000 plant life strategies (PLSs). Six functional traits were considered: carbon allocation and residence time in leaves, aboveground woody tissues and fine roots. Trait variability inclusion improved model performance in representing NPP and CS. A 50% reduction in precipitation caused a similar decrease in total CS for PFTA and TBA (~60%) but carbon loss in PFTA was much more sharped and widespread within grid cells. This difference owns to TBA higher ability to functionally reorganize (due to new functional niches) through changes in abundance of PLSs in the community and in functional diversity components (increase in richness and evenness and decrease in divergence). Also, TBA showed a selection of strategies that invest more carbon in fine roots, which made the community less sensitive to limited water availability but led to a higher root:shoot ratio (increase of 74.74%) resulting in relatively lower CS in some grid cells. The use of only a few PFTs overestimated the impacts of environmental, and results from the PFTA should be interpreted with caution. Our findings suggest that functional diversity plays a vital role when evaluating ecosystems sensitivity to climate change, and that including trait variability in models enables more realistic projections under future scenarios, thus paving the way for better understanding the biodiversity-ecosystem functioning relationship**.**

**Keywords:** trait-based modeling, climate change, carbon allocation, trait space, functional reorganization, Amazon forest