**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 and net primary productivity (NPP) in current climatic conditions and carbon storage under low precipitation. We employed CAETÊ using two approaches to represent functional diversity: (i) using three plant functional types (PFTs), the PFTA and (ii) applying a varying trait-based approach (TBA) creating 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 carbon storage. A 50% reduction in precipitation caused a similar decrease in total carbon storage 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 through changes in abundance of PLSs in the community and in functional diversity components (increase in richness and evenness and decrease in divergence). Consequently, new functional niches were created in the TBA, enabling new/previously rare trait combinations to emerge from the available plant life strategies pool. Then, we observed, for TBA, a selection of strategies that invest more carbon in fine roots than in woody tissues 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 carbon storage in some grid cells. Hence, the use of too few PFTs overestimated the impacts of environmental changes due to limited capacity to reorganize, 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. We conclude 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