Figure 1. Schematic diagram of CAETÊ in its trait-based model approach. From functional trait ranges the values are uniformly sampled and the combination of all creates a potential functional space. Each combination of trait values is a Plant Life Strategy (PLS) which will present a different performance, in terms of carbon balance, depending on the grid cell. From the potential functional space 3000 PLS are randomly sampled. The environmental filtering, the trade-offs between the chosen functional traits and the physiological processes determine if a PLS survives (positive carbon balance) or dies and is excluded from the grid-cell. From the performance (its relative biomass in the grid cell) of the PLSs the grid-cell is occupied as a mosaic. From the grid cell occupation the ecophysiological variables are updated and returns to the model for the iteration until equilibrium is reached. This modelling framework allow us to access the model results not only regarding to biogeochemical variables but also in terms of traits distribution and, as a consequence, the different components of functional diversity.

Figure 2. Percentage change on total carbon storage (a and b) fine roots carbon storage (c and d) with reduced precipitation (-50%) for the two employed modeling approaches: the PFT (PFTA - low functional diversity) and the trait-based (TBA- high functional diversity).

Figure 3. Density distributions of traits using the Trait Probability Densities method (TPD; Carmona et al., 2016). The curves correspond to the probability density of traits values across the Amazon basin. The orange curves represent the results with the applied low precipitation scenario and the blue ones represent the results concerning to the regular conditions of climate. The figures from (a) to (f) show the results regarding to the allocation traits and the figures from (g) to (i) display the results for the residence time traits. TBA: trait-based modeling approach. PFTA: PFT modeling approach. ABGW: aboveground woody tissues. The dissimilarities between the distributions before and after the disturbance is presented in Table 1. Note that the scales of y and x axis are different for each functional trait and each modeling approach. The graphs are in this way presented to improve readability.

Figure 4. Hypervolumes created with the six functional traits together for the (a) trait-based (TBA) and the (b) PFT (PFTA) modelling approach through the method of Blonder et al. (2018). The hypervolumes were created after the data were submitted to a PCA analysis (see Figure SM.2.). The blue points indicate the data in a regular climate scenario and the red ones the scenario of drought (-50% of precipitation). The darkest the color of the point the higher the density of the value within the functional space. The bigger circles represent the centroid (i.e. the mean values) of data distribution. Here the volumes of the different approaches are shown separately to improve readability, hence, they are not presented in the same scale For the volumes of the two approaches together see Figure SM.3.

Figure 5. Percentage change on the functional diversity components (divergence, evenness and richness) with the applied precipitation reduction scenario (-50 %) for the two employed modeling approaches, TBA (trait-based) and PFTA (PFT), and for the six used functional traits: carbon allocation to (a) leaves, (b) ABGW and (c) fine roots, and carbon residence time for (d) leaves, (e) ABGW and (f) fine roots. ABGW: aboveground woody tissues.

Table 1. Dissimilarities of traits distribution (Figure 3) with the applied reduction on precipitation (50%) for both employed modeling approaches: TBA (trait-based) and PFTA (PFT). The closer to 1, the more dissimilar the curves are to each other. α: allocation; τ: residence time; Abgw: aboveground woody tissues.

Figure A.1. Box plots representing the values of the six functional traits and of the total plant carbon storage simulated by CAETÊ in its trait-based approach**.** Each boxplot represent the median value (orange tick) and variance for each of the 10 runs. The boxes extend from the first to the third quartiles

and the whiskers extend from the minimum and maximum data. The outliers are not shown in here. Each represented simulation ensemble contains 10 simulations with the same number of PLS (50, 100, 200, 500, 1000, 3000) randomly sampled from the potential functional space (see Appendix A.1). Total C.: total plant carbon storage; ABGW: aboveground woody tissues; F. roots allocation: fine roots allocation; res. time: residence time. PLS: plant life strategy.

Table A.1. Functional traits values for each Plant Functional Type (PFT) used in the PFT modelling approach. The values were chosen based on previous literature: Enquist & Niklas, 2002, Foley, 1996; Krinner et al., 2005; Kucharik et al., 2000; Malhi et al., 2009; Malhi, Doughty, Galbraith, 2011; Sitch et al., 2003. α: allocation; τ: residence time; Abgw: aboveground woody tissues

Table A.2. Range of functional traits values from which values are sampled and its combinations create the different Plant Life Strategys (PLSs). Used in the trait-based modelling approach. α: allocation; τ: residence time; Abgw: aboveground woody tissues; *months; **years

Table A.3. Functional traits (carbon allocation and residence time for leaf, woody tissues and fine roots), their respective trade-offs and associated equations. The equations are described in the Appendix A.3 together with the model description. ABGW: aboveground woody tissues.

Table A.4. Variables used in CAETÊ equations, its descriptions and units.

Table A.5. Constants parameter used in CAETÊ equations, its descriptions, values and units. IPAR: incident photosynthetically active radiation.

Figure SM.1. Principal component analysis of the trait values used to produce the hypervolumes (Figure 4). The data set is composed by the model results regarding to the six functional traits for both modeling approaches TBA (trait-based) and PFTA (PFT) and for both climate scenario (low precipitation and regular climate).

Figure SM.2. Percentage change on (a) Aboveground woody tissues (ABGW) carbon storage and (b) leaves carbon storage with reduced precipitation (-50%) for the two employed modeling approaches: the PFT (PFTA - low functional diversity) and the trait-based (TBA- high functional diversity).

Figure SM.3. Hypervolumes created with the six functional traits employed. Here, the trait-based (TBA) and the PFT (PFTA) modeling approaches are shown together as well as the two climate scenarios: regular climate and low precipitation. The hypervolumes were created after the data to be submitted to a PCA analysis (see Figure SM.3.). The darkest the color of the point the higher the density of the value within the functional space. The bigger circles represent the centroid (i.e. the values mean) of data distribution.

Movie SM.1.