1. **Materials and Methods**

**1.4) Ecophysiological processes: biogeochemical fluxes and stocks**

The following overview of the model's ecophysiological processes focuses on describing the main ecosystem processes related to the variant traits considered in this work (carbon allocation fractions and residence times) as well as its trade-offs. The full description with the detailed parameterizations is provided in Appendix XXX.

Dois tipos de forma de crescimento: gramínea/herbácea e árvore

Não lembro se tem c3 e c4

The photosynthesis equations are based on Farquhar et al., (1980) that consider three limiting factors: Rubisco carboxylation (; Eq. (XX)), light (; Eq. (XX)) and electron transport (; Eq. (XX)). Therefore, the gross primary productivity(are functions, and constants summarized in auxiliary table XX):

(XX)

Leaf level gross photosynthesis is calculated as the minimum (smallest root) between the three limiting rates (, , ) multiplied by a water stress function (; Eq. (XX)):

(XX)

where (Eq. XX) is the minimum between and .

(XX)

The response to water stress is a function of the ratio between the potential supply for transpiration (; Eq. XX) and the atmospheric demand of transpiration (; Eq. XX). This approach is based on Pavlick et al. (2013) and aims take into account the role of fine roots allocation on water uptake:

(XX)

The variable is calculated in function of a constant water uptake capacity by fine roots equal to 0.0005 mmH2OkgC-1day-1 (PAVLICK et al., 2012b)⁠, the amount of carbon present in the fine roots compartment (; Eq. XX) and the degree of water saturation in soil (; Eq. XX) ressaltando que o

w utilizado no modelo de fotossíntese e de respiração é o do dia anterior ao do cálculo:

(XX)

The photosynthetic active radiation () that hits the canopy represents 50% of the short wave radiation that hits the terrestrial surface ():

(Eq. XXX)

Because CAETÊ do not represent mechanistically the ecological process of competition, it can not represent the shading of understory strategies by the dominant canopy strategies and the consequent light competition. For this, we have used a simplified approach in order to represent the differential light acquisition and the role of the aboveground woody tissues on it: 5% of the PLS that presented the relative higher biomass in aboveground woody tissue compartment ( ; Eq. XXX) in a given grid-cell captured 100% of the IPAR while the others captured 80%. This approach was necessary because it included a trade-off associated to the allocation and residence time of aboveground woody tissue. Without the benefit of capturing more light the aboveground woody tissues would lead only to respiratory costs and would failure to represent woody strategies with consequences for the final computation of biogeochemical fluxes and stocks as well as of functional diversity. Thus:

The amount of carbon () in each compartment in a given PLS in a given time is determined by fraction of NPP allocated (; Table XXX) and the carbon residence time (; Table XXX) in this PLS' compartment:

(Eq. XXX)

Then, the total biomass () of a PLS is the sum of all compartments' carbon amount in a given time:

(Eq. XXX)

**1.4.2)Other ecophysiological processes**

(H) Are the state variables, forcing functions, and the parameters clearly defined and dimensionalized

(preferably in a table)?

(I) Are the equations presented in sufficient detail? Should they be presented in an appendix (or

on-line)?

**1.5)Inputs**

**2) Validation**

**2.1. Biogeochemical cycles**

**2.2. Functional traits**

**2.3. Functional diversity**

There is still several impediment for validate functional diversity. Despite it is a growing body of knowledge. Several methods for measuring it. There is not a "map" for functional diversity. The different trait utilization (since it depends on the study subject).

Validar com o do Lamana? Apesar de serem difrentes traits dá uma indicativa?

CWM: represents the functional identity of the community. It shows o valor preponderante

**1.3)The low functional diversity version**

**2) The inclusion of functional diversity improves the representation of biogechemical cycles and functional diversity?**

**3)A first model application. What are the effects of climate for biogeochemical cycles and functional diveristy ? In what extent The inclusion of funtional diversity changes the results?**

**4) What are the effects of climate change on functional traits of carbon allocation and residence time? What are the implications for global carbon stock and for biomass? A consideração leva a resultados contraditórios com a presente literatura?**

We identify the most likely ranges of biomass change as the maximum value of the PDFs (modal value) and the corre- sponding interquartile range. These values are good indicators for the shift in biomass change projections (modal value) and the underlying uncertainty of predictions (interquartile range). In the results section, the modal value and its inter- quartile range are denoted as ‘most likely range’. (RAMMIG et al., 2010)⁠