The possible modification in Amazon forest’s ability to store carbon due to climate change has been the subject of countless studies in recent decades. However, this topic is still full of uncertainties (FINEGAN et al., 2015)⁠ and also still non well explored elements, for example, the role of functional diveristy on the strenght of the carbon loss (POORTER et al., 2015; SAKSCHEWSKI et al., 2016a; SITCH et al., 2008). Dynamic global vegetation models (DGVMs) have being widely used to explore the climate change impacts on Amazon's carbon sink capacity (CRAMER et al., 2001; SCHEITER; LANGAN; HIGGINS, 2013), however, their results are contradictory and diverge both on the magnitude and on the direction of change (HUNTINGFORD et al., 2013; RAMMIG et al., 2010)⁠. The different scenarios and parametrization (e.g. the strenght of CO2 fertilization) may be some possible reasons for such degree of uncertainties (HUNTINGFORD et al., 2013; QUILLET; PENG; GARNEAU, 2010; SITCH et al., 2008)⁠⁠. Nonetheless, the poor representation of plant diversity, especially regarding to functional trait diversity, may be hampering the DGVMs’ ability to make more accurate projections on carbon this issue (PAVLICK et al., 2013a; SCHEITER; LANGAN; HIGGINS, 2013; VAN BODEGOM et al., 2012; VERHEIJEN et al., 2015).

As the climate changes, the environmental filtering becomes different, and hence, the requirements for an individual to be successful change as well (WEBB et al., 2010)⁠. It means that the physiological tolerances determined by functional traits is also modified what could generate a rearrange of the community traits and select for alternative communities functional structure and composition (THOMPSON et al., 2009)⁠. This rearrangement can turn the community more suitable for the new climate conditions and, thus, be less suscetible to the imposed changes (AGUIRRE-GUTIÉRREZ et al., 2019; ENQUIST et al., 2015; FAUSET et al., 2012)⁠. For example, it is foreseen for Amazon, and other tropical forests, an increase on drought intensity, frequency or longevity (FAUSET et al., 2012; SHEFFIELD; WOOD, 2008)⁠, however if the functional composition of Amazonian forest communities shifts in favour to more drought-tolerant traits, its ability to store carbon in front of climate change can be less suscetible.

However, the scheme used for the majority of DGVMs to represent the vegetation is not able to capture such community rearrengement and it possibly overerestimate the impacts of climate change on ecosystems (FYLLAS et al., 2014; SCHEITER; LANGAN; HIGGINS, 2013). DGVMs commonly use the concept of Plant functional types (PFTs) to represent plant diversity (REU et al., 2014; SCHEITER; LANGAN; HIGGINS, 2013; VERHEIJEN et al., 2015): this approach uses a small set of fixed parameters, in space and time (through mean values) to represent plant functional traits and aggregates groups of plants with presumably similar ecological roles responding in a comparable manner to environmental conditions and performing similar influences on ecosystem functioning (LAVOREL; GARNIER, 2002; PAPPAS; FATICHI; BURLANDO, 2016; PAVLICK et al., 2013a; VAN BODEGOM et al., 2012; VERHEIJEN et al., 2015)⁠.

As a consequence, the use of PFTs prevent the identification of the change on the frequency and occurrence of functional traits with environment change (YANG et al., 2015)⁠. This drawback precludes advancements in the compreenhension of the still uncertain effects of climate change on functional diversity (DÍAZ; CABIDO, 2001; LAVOREL; GARNIER, 2002). These uncertainties are especially important and challenging on ecosystems such as Amazon forest and tropical forests as a whole, which are hyperdiverse (AGUIRRE-GUTIÉRREZ et al., 2019)⁠ and also are among the most threatened ecosystems by climate changes (CHAMBERS et al., 2012)⁠.

Thus, in order to overcome the weakness that a PFT approach imposes, some vegetation models, the so called trait-based models, are trying to represent the diversity of plants in an ecologically more trustworthy way (FYLLAS et al., 2014; PAVLICK et al., 2012; SAKSCHEWSKI et al., 2016b; SCHEITER; LANGAN; HIGGINS, 2013)⁠⁠. This type of model replace the fix parameters of PFTs for variant ones (WEBB et al., 2010; WULLSCHLEGER et al., 2014): in this approach each functional trait is a model parameter chosen from its possible range of theoretical and/or empirical values, determining, together with the other functional traits, the growth and survival of individuals (PAVLICK et al., 2013b; REU et al., 2014)⁠. Thus, trait-based approaches provides the important opportunity to look beyond biogeochemical variables creating potential for exploitation of a multiplicity of ecological questions (SAKSCHEWSKI et al., 2016b)⁠; for example, it enables the advancement in understanding the connection between functional diversity, ecosystem funcitioning and climate change (AGUIRRE-GUTIÉRREZ et al., 2019; CARMONA et al., 2016; SAKSCHEWSKI et al., 2016b; YANG et al., 2015). However, the development of this modelling strategy is only on beginning, and many questions that could be adressed (specially regarding to functional traits and functional diversity) remain unexplored and unanswered. (S. VILLÉGER , N. W. H. MASON, 2008)

In this article we present a new trait-based model, the model CAETÊ (Carbon and Ecosystem Functional Trait Evaluation model), and show the results of a first-order modelling exercise in Amazon forest. We seeked to answer the following questions: (i) does a trait-based approach indeed improve the representation of biogeochemical variables, such as carbon storage, when compared to a PFT approach?; (ii) in a drought scenario, does the trait-based and the PFT approach differ in their results regarding to the ability to store carbon?; and (iii) what is the impact of a drought scenario on Amazon forest’s functional diversity and how is it connected to the carbon storage?