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MODELING SOIL ORGANIC MATTER UNDER DIFFERENT BRAZILIAN BIOMES SUSCEPTIBLE TO LAND USE CHANGES USING DAYCENT

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INTRODUCTION

- ✓ Land Use (LU) change plays a major role in the carbon (C) cycle. Understanding and quantifying its effects is one of the main challenges for effectively implementing climate change mitigation actions.
- ✓ Estimating the equilibrium for major soil types in the three biomes is fundamental for evaluating C dynamics and the soil C loss regarding LU changes.
- ✓ Our objective was to calibrate the Daycent model to estimate the references equilibrium soil organic matter (SOM) for three important Brazilian biomes: Atlantic Forest (AF), Cerrado (CE), and Pampa (PA).

MATERIAL AND METHODS

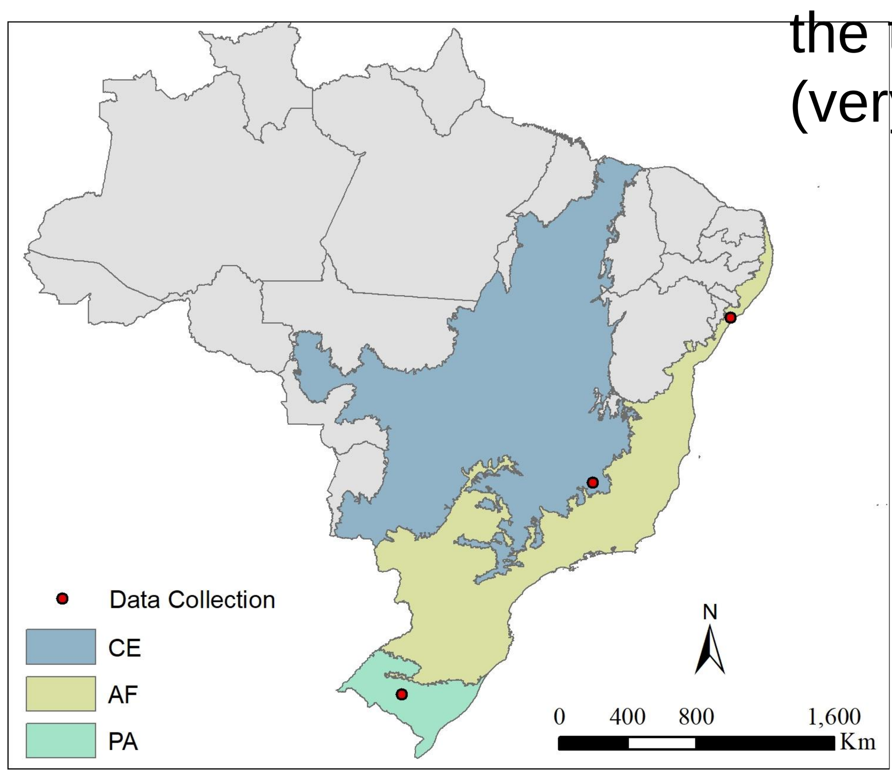
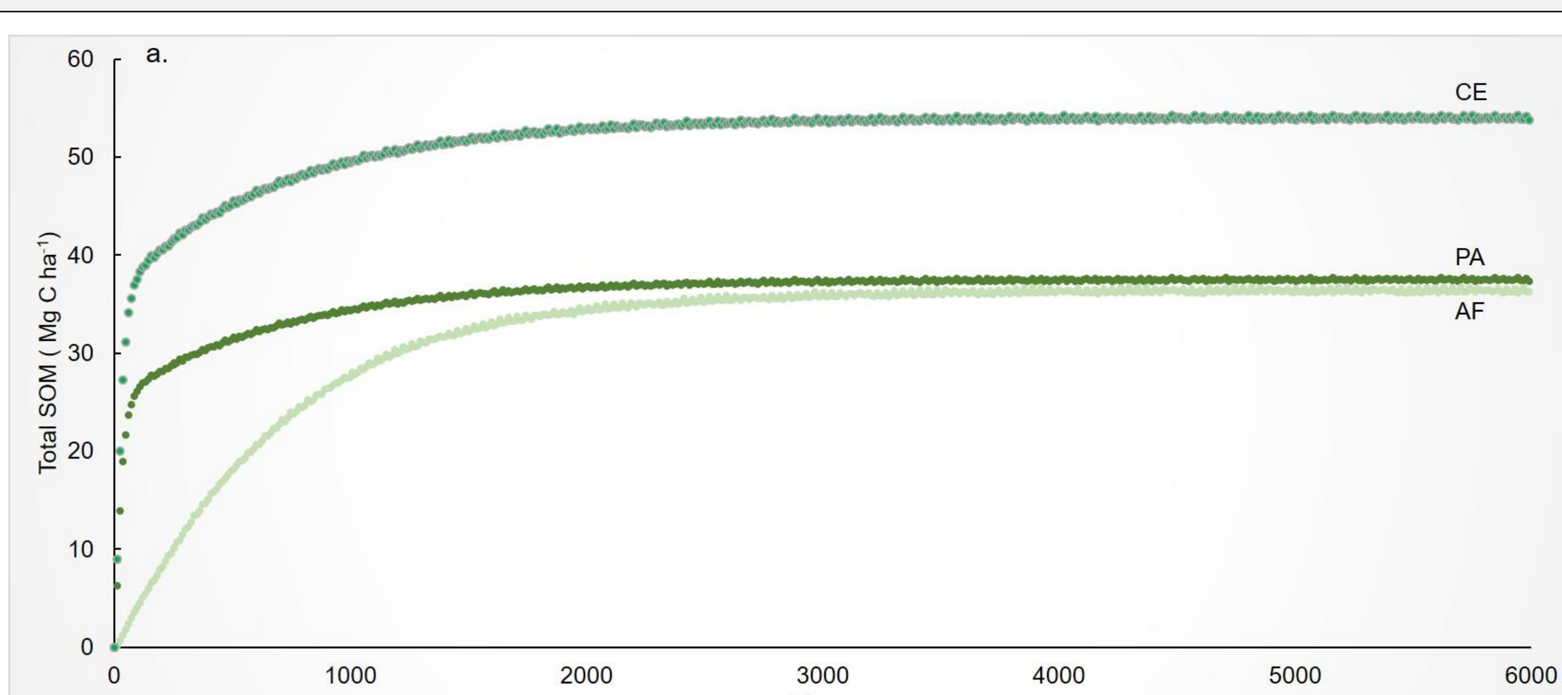


Figure 1. Location of the study area

- ✓ Data from literature, including SOM, were collected for the three biomes: PA (soil with sandy loam texture), CE (very clayey texture) and AF (sandy texture) (Figure 1).
- ✓ Daycent parameters to represent the biomes biophysical properties were initially set up with values from local literature.
- ✓ Measured SOM was then employed during the calibration of the Daycent model.
- ✓ We ran the model for 6,000 years for the equilibrium simulations, obtaining the stabilization of the SOM compartments (active, slow, and passive).

RESULTS AND DISCUSSION



- ✓ For the biomes' biophysical properties the parameters for maximum potential production (PRDX) were adjusted for each biome, PA with 0.92 g C m^{-2} , AF with 1.5 g C m^{-2} and CE with 0.9 g C m^{-2} (default = 0.5 g C m^{-2}).
- ✓ The relative error between measured and predicted total SOM was lower than 2% for all biomes, thus representing the equilibrium properly for the study conditions.
- ✓ The largest C compartment of the biomes (slow organic matter in the soil) had 71.7% for AF, 68.5% for PA, and 63.7% for CE of the total SOM (Figure 2b, 2c and 2d).
- ✓ The highest SOM values were found in the CE, with 53 Mg C ha^{-1}, followed by the PA with 37 Mg C ha^{-1}, and in the AF with 35 Mg C ha^{-1}.
- ✓ There is a wide range between SOM in all biomes. However, the PA and AF had approximate SOM, and the EC had the greatest amplitude (Figure 2a). This significant variation can occur even within biomes, as it varies mainly by precipitation, temperature, clay content, and adopted management practices (Oliveira and Cerri, 2015).

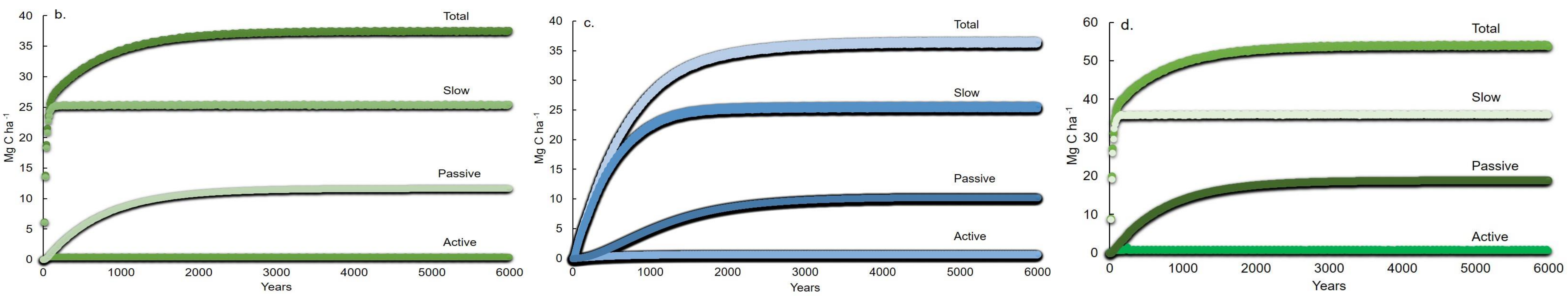


Figure 2. Time series plot of Daycent model equilibrium for the biomes in the study simulated for 6,000 years using total soil organic matter (Total SOM), active soil organic matter (Active SOM), slow soil organic matter (Slow SOM) and passive soil organic matter (Passive SOM) (Mg ha^{-1}) in 0-0.2 m soil depth. **a.** Comparison of Total SOM between the biomes simulated in the study; **b.** Pampa (PA); **c.** Atlantic Forest (AF); **d.** Cerrado (CE)

FINAL REMARKS

Eventual LU changes will impact the SOM equilibrium of these native vegetation, thus sustainable practices must take place to avoid C losses as far as possible.

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