Theme 3 | Soil data for policy and decision-making

Vegetation responses to pedoclimates traits and their implications for policies on preservation and management plans

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Introduction

The climate-vegetation interactions are widely discussed to determine the distribution of vegetation types. However, the soil properties can also contribute to this determination, being pertinent to investigate how that happens and its practical implications on environmental policies related to the preservation of natural resources.

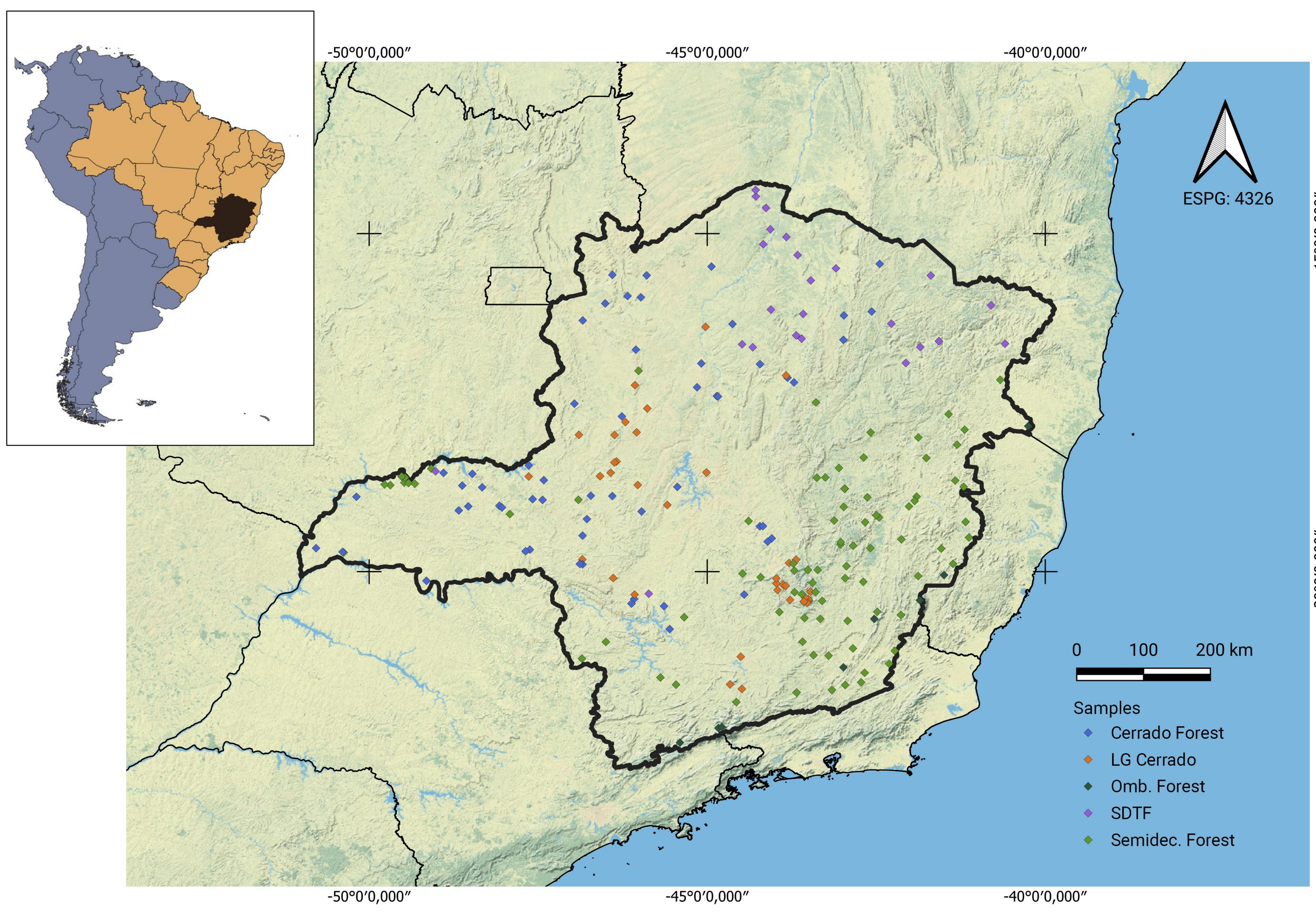

Fig. 1 – Samples and their vegetation types in the Minas Gerais state, Brazil

Material and Methods

- Landsat, Google Earth images and data provided by MapBiomas platform (https://brasil.mapbiomas.org/) to build a land use time series (1985-2022) for all the 667 sample locations available in the soil bank of Minas Gerais state, Brazil (sampled in 2010-2014) (de Souza et al., 2015).
- Division of the vegetation provided by the Instituto Brasileiro de Geografia e Estatística (IBGE) (1:250.000 scale, 2021 version) (https://www.ibge.gov.br/) into five types: seasonally dry tropical forest (SDTF), semideciduous forest (SF), Cerrado stricto sensu (CSS), Cerradão (CE) and ombrophilous forest (OF).
- Selection of samples with native vegetation or in progressive natural regeneration (from 1985-2014) (Fig. 1).
- Principal component analysis (PCA) utilizing the soil and climatic data (annual mean temperature, annual precipitation, temperature seasonality, precipitation seasonality and aridity)
- Random Forest modelling was applied to rank the pedoclimatic variables in order of importance.

Results and Discussion

The most important variables that separates the SDTF and the OF were the climatic variables. SDTF presented high aridity and precipitation seasonality, meanwhile OF were opposed from them by high temperature seasonality and annual precipitation. The SF presented a strong influence by the soil variables. Likewise, the division of CSS and the CE were more explained by the soil variables. It occurs because climatic variables exert a similar influence along these vegetations (CSS, CE and SF) and were not configured as aggregation factors, which explain the fact that these vegetation types have similar climatic niches but not pedological ones.

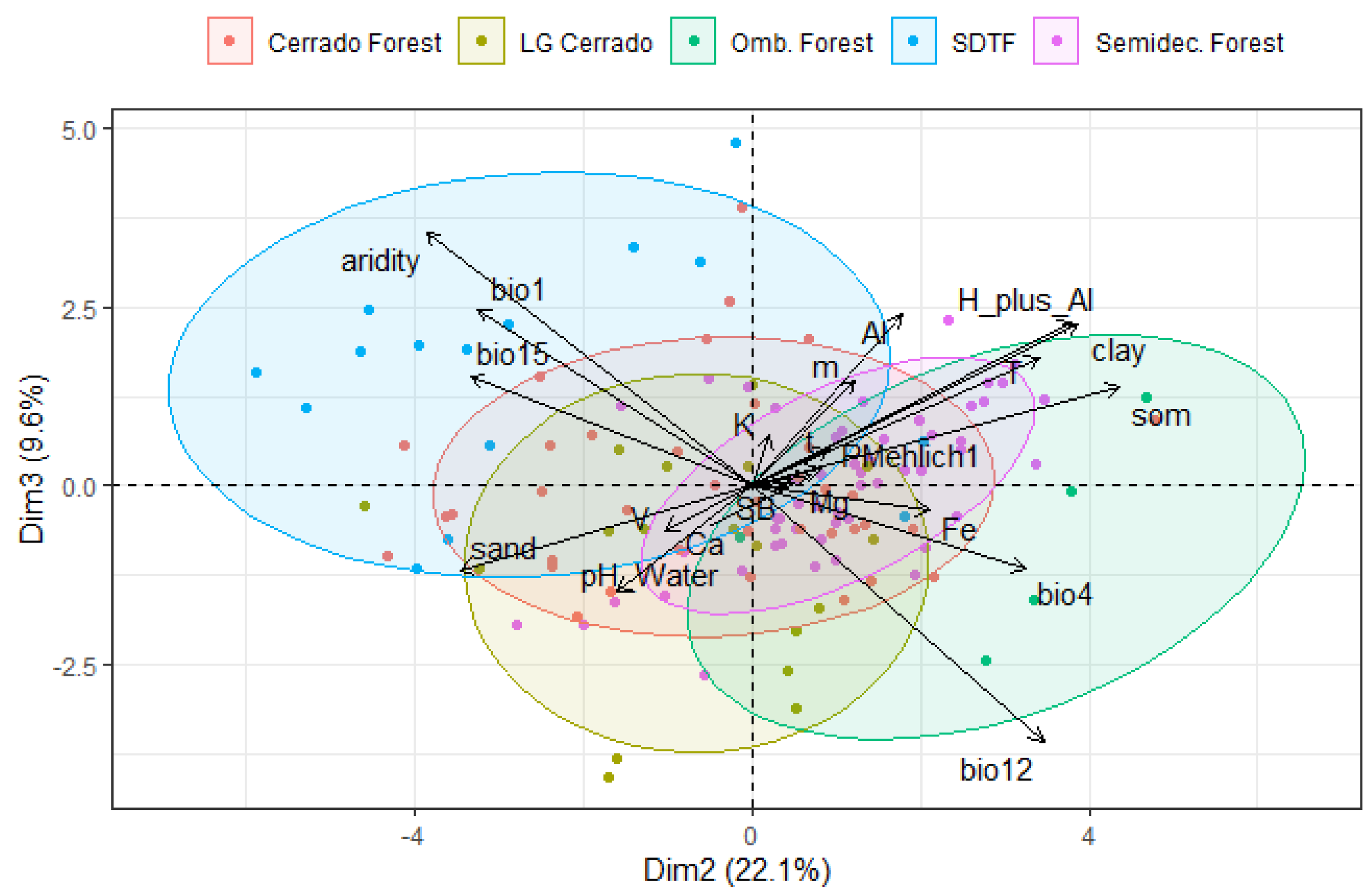

Fig. 2 – Vegetation types and the influence of soil and climatic variables.

Conclusions

Those are important results concerning the practical separation of CSS, CE and SF vegetations by soil properties, since only SF are protected by law (nº 11.428/2006), and must be applied to improve management plans, restoration founds and support for scientific researches.

References

de Souza, J.J.L.L. et al., 2015. Geochemistry and spatial variability of metal(loid) concentrations in soils of the state of Minas Gerais, Brazil. Science of the Total Environment 505, 338–349.

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