ARE SHALLOW IMPERMEABLE LAYERS BENEFICIAL FOR VEGETATION FUNCTION IN THE SEMI-ARID ZONE?

A.T. Brunello; C.A.N. Quesada; T.F. Domingues; J.J. Lloyd

Universidade de São Paulo, Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto, Avenida Bandeirantes, 3900, Vila Monte Alegre, Cep: 14040-900.

Ribeirão Preto, SP. email: brunelloflorestal@gmail.com

INTRODUCTION

This work develops upon the idea that - not only should root systems in precipitation limited ecosystems have shallower optimal rooting depths than vegetation types growing where water is more abundant – but also, due to reduced drainage losses, that shallow soils with an impermeable layer should actually be beneficial for vegetation function in water limited situations (Lloyd *et al*. 2015).

OBJECTIVE

The present work aims to evaluate how vegetation structure relates with soil depth across 19 sites in the Brazilian semi-arid zone.

MATERIAL AND METHODS

Data presented here were collected from 19 sites across the Caatinga (a SDTF – Seasonally Dry Tropical Forest). Those sites were sampled as part of Nordeste Project, a NERC/FAPESP consortium. Measurements were made during two fieldwork campaigns from March to May 2017 and February to May 2018. Both vegetation inventory and soil sampling were conducted following standard protocols from Rainfor Project (www.rainfor.org/pt). Soil sampling can be accessed in details in Quesada *et al*. (2010). Briefly, soil variables evaluated were major cations content, soil depth, physical constraints and particles size distribution. Climatic data were obtained from WordClim (Hijmans *et al*., 2005).

RESULTS AND DISCUSSION

We show that sites with shallow impermeable layers (usually 0.5 to 1.0 m deep) typically tends to support higher vegetation biomass than what is found at sites under the same climatic conditions but without impermeable layer. There is a positive correlation between mean annual precipitation and biomass (? = 0.50*), whereas there is not statistical differences in the correlation between major cations contents and biomass, neither for the presence/absence of impermeable layers and biomass, despite it is possible to notice some tendencies. As demonstrated by Lloyd *et al*. (2015), large contrasts between forests and savannas biomass can be explained by a simple statistical model taking into account “effective plant available soil water” - (?p) and upper layer potassium concentration [K]as. We expect to include another 15 new sites in these analyses, in order to better test the role of the water in controlling Caatinga biomass. Further nutrients analyses will also be performed to test if and which cations could acts as a forest structure modulator considering the usual water deficit scenario, as Egilla *et al*. (2005) and Umar (2006) have shown for potassium.

CONCLUSION

These preliminary results are found to be consistent with predictions of ecosystem water use as obtained from a simple plant carbon-investment/water uptake trade-off approach and we suggest, contrary to common assumption, that potentially deeper rooting zones are not always beneficial for the ecosystem biomass. Often, deeper and sandy soils allow water to drain quickly, while impermeable layer holds the water within the root zone for longer periods of time.

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