

Landscape system mapping of the humid Baturité massif and its semi-arid piedmont (Northeastern Brazil): a multilayer integration of environmental parameters



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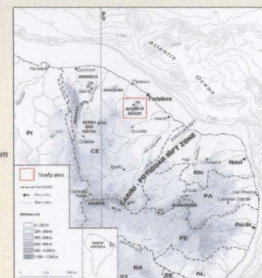


Fig. 1 - Location map of the study area. Onshore topography from the SRTM GTOPO30

1. Introduction

The Baturité massif is the erosional remnant of the northwestern shoulder of the Potiguar rift (Fig. 1), a rift structure formed in Early Cretaceous times. Present humid bioclimatic conditions on this upstanding residual landform contrast with the semi-arid conditions of the surrounding plain (Sertão). Located ~100 km south of Fortaleza (Ceará, NE Brazil), the study area exhibits a characteristic vegetation continuum between evergreen forest (mata atlântica) of the humid zone and deciduous 'caatinga' of the semi-arid piedmont via a semi-deciduous forest belt in the transition zone. Systematic soil successions and landform variations were also identified through this topo-climatic framework (Fig. 2). The objective of this work was to develop a method of landscape system mapping that accounts adequately for these new pedogeomorphological observations, and that could be applicable to other humid residual massifs of the semi-arid interior of Northeastern Brazil.

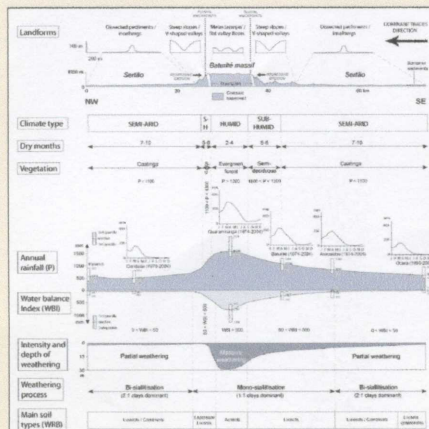


Fig. 2 - Synthetic section across the Baturité massif showing the succession of landforms, climate, vegetation, weathering patterns and soils.

2. Methods and survey procedure

Our method of landscape system mapping is based on a pedogeomorphological analysis of the landscape. This method emphasizes the relationships between landforms and soils and is easy to use with a genetic soil classification such as the World Reference Base or the Brazilian one (Bourgeon, 1989). Combined with an extensive field work, the survey was performed using GIS techniques by overlaying a digital elevation model (SRTM 90), topographic maps at 1:100,000, digital geological data, processed Landsat imagery, and available soil maps. The GIS survey also allowed to take into consideration other fundamental environmental parameters such as rainfall distribution and water balance calculations (WBI, length of the dry season) that are useful to understanding soil distribution and mesoscale topographic patterns.

3. Results



Photo 1 - Summit topographic surface with typical multicover landscape of 'meias laranjas' associated with flat valley floors or 'bae-flores' (sub-unit 1).



Photo 2 - Highly dissected landscape with steep slopes and V-shaped valleys dominated by residual migmatitic rock domes (sub-unit 2).

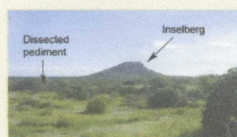
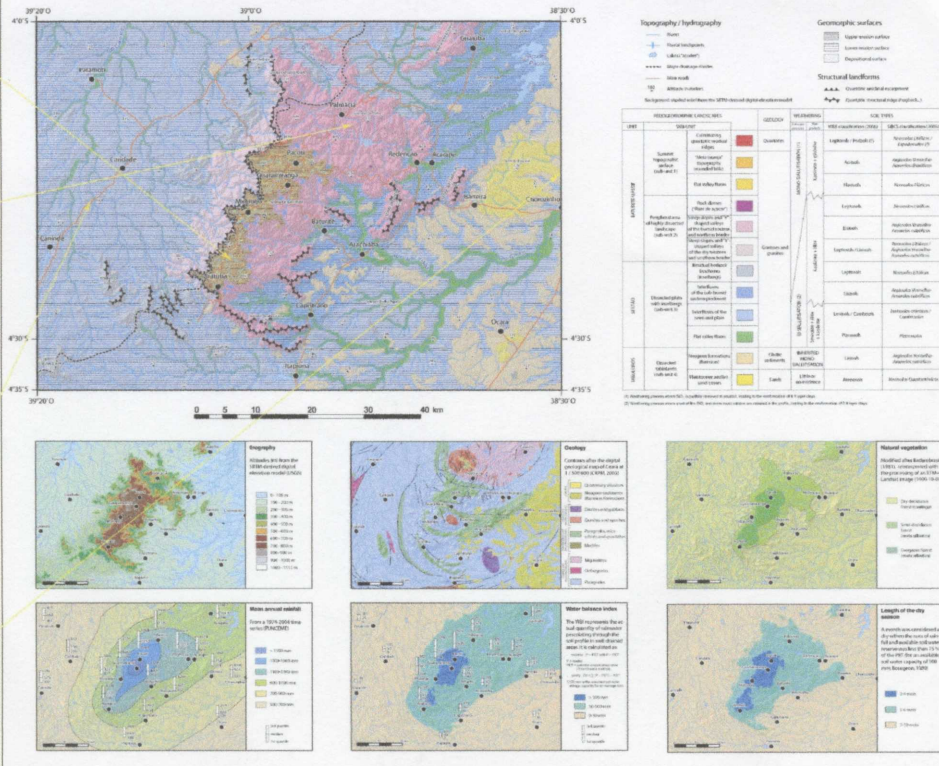


Photo 3 - Characteristic landscape of the semi-arid plain (Sertão) with dissected mantled pediments and residual bedrock landforms (sub-unit 3).



Photo 4 - Dissected tablelands with Pleistocene aeolian sand covers overlying the Neogene clastic sediments of the Barreras Formation (sub-unit 4).

LANDSCAPE SYSTEM MAP OF THE HUMID BATURITE MASSIF AND ITS SEMI-ARID PIEDMONT (NORTHEASTERN BRAZIL) AT 1 / 250 000



4. Conclusions

The resulting landscape system map leads us to original conclusions by capturing the key features of the regional pedogeomorphologic landscapes: (1) the humid Baturité massif is characterised by a summit surface (800-900 m a.s.l.) exhibiting *meia laranja* topography with monsoialitic weathering and low-activity-clay Acrisols; (2) a sub-humid peripheral area of highly dissected landscape (200-800 m) displays more shallow weathering and soil profiles (Lixisols); (3) in the surrounding plain (0-200 m), the semi-arid 'Sertão' is a landscape of dissected pediments with shallow basaltic gull associated with red Luvisols and brown Cambisols; (4) dissected tablelands form the low-lying 'Tabuleiros' where Neogene clastic sediments are capped by plinthitic paleosols (Lixisols) whereas Pleistocene aeolian sands are highlighted by poorly developed soils (Arenossols).

5. References

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