

Modeling of Latosol development on geomorphic surfaces of the Brazilian Central Plateau: First results.

Adriana Reatto-Braga, Ary Bruand, Euzébio M. Silva, Osmar Abilio de Carvalho Jr, Michel Brossard, Fabrice Muller, Sophie Cornu, Guy Richard

► **To cite this version:**

Adriana Reatto-Braga, Ary Bruand, Euzébio M. Silva, Osmar Abilio de Carvalho Jr, Michel Brossard, et al.. Modeling of Latosol development on geomorphic surfaces of the Brazilian Central Plateau: First results.. Workshop on modelling of pedogenesis, 2006, Orléans, France. 4 p. hal-00103770

HAL Id: hal-00103770

<https://hal-insu.archives-ouvertes.fr/hal-00103770>

Submitted on 5 Oct 2006

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Modeling of Latosol development on geomorphic surfaces of the Brazilian Central Plateau: First results

Adriana Reatto^{1,2*}, Ary Bruand², Eder S. Martins¹, Euzébio M. Silva¹, Osmar Abílio de Carvalho Jr³, Michel Brossard⁴, Fabrice Muller², Sophie Cornu⁵, Guy Richards⁵

¹ Empresa Brasileira de Pesquisa Agropecuária (Embrapa Cerrados), BR 020, km 18, 73310-970, Planaltina, Distrito Federal, Brazil (Adriana.Reatto@univ-orleans.fr);

² Institut des Sciences de la Terre d'Orléans (ISTO) UMR6113 CNRS/Université d'Orléans 1A, rue de la Férollerie 45071 Orléans, France Cedex 2;

³ Departamento de Geografia – Universidade de Brasília (UnB), 70910-000, Brasília, Brazil,

⁴ Institut de Recherche pour le Développement (IRD), Unité Valpédo, BP 64501, 34394 Montpellier Cedex 5, France;

INRA Orléans, Unité de Science du Sol, Ardon, BP 20619, 45166 Olivet Cedex.

* Corresponding author e-mail: Adriana.Reatto@univ-orleans.fr

Latosols are deeply weathered soils characteristic of the moist tropics. Many Latosols have kaolinitic horizons overlying more gibbsitic ones (Lucas, 1989), for which there has been no satisfactory pedological explanation and why they have often been considered as a sedimentary succession. Several hypotheses to explain this phenomenon were expressed: biogeochemical recycling of Si by the forest (Lucas et al., 1993) or the activity of termites (Volland-Tuduri, 2005). The objective of this study is to model the development of Latosols of the Brazilian Central Plateau considering the respective effect of parent material, time or biological activity. This plateau is constituted of the two main geomorphic surfaces: the South American surface (Surface I) and the Velhas surface (Surface II). In the Central Plateau, the Latosols can be identified as Red Latosols (~28%), Yellow Red Latosols (~10%) and Yellow Latosols (~2%), (Reatto, 1998).

Ten Latosols (L) developed in different parent materials were selected along an approximately 350 km long regional toposequence across the South American surface (L1 to L4) and Velhas surface (L5 to L10), (Figure 1). The Latosols L5 and L6 were located on the upper Velhas surface, L7 and L8 on the intermediate Velhas surface, and L9 and L10 on the lower Velhas

surface. Samples were collected in the diagnostic horizon (Bw) of these Latosols. Basic soil characteristics were determined on the air-dried <2 mm material according to the Brazilian standard procedures, (Embrapa, 1997). The chemical composition of the < 2 mm and < 2 μ m fraction was determined after fusion with lithium metaborate. The mineralogical composition of the < 2 mm and < 2 μ m fraction was determined using X-ray diffraction.

First results showed that the Latosols L1 to L4 from the South American surface, whose parent materials were originated from lateritic crusts and saprolites of detritic and mafic granulite rocks, were gibbsitic Latosols. These Latosols were characterized by a kaolinite/(kaolinite+gibbsite) ratio < 0.5. The kaolinite content ranged from 20 to 41 g.kg⁻¹, the gibbsite content from 44 to 63 g.kg⁻¹, the goethite content from 8 to 17 g.kg⁻¹ and the hematite content from 0 to 20 g.kg⁻¹. The Latosols (L5 to L10) from the Velhas surface, whose parent materials originated from colluvial pediments and saprolites of pelitic rocks, were kaolinitic Latosols. They were characterized by a kaolinite/(kaolinite+gibbsite) ratio > 0.5. The kaolinite content ranged from 40 to 65 g.kg⁻¹, the gibbsite content from 18 to 37 g.kg⁻¹, the goethite content from 0 to 9 g.kg⁻¹ and the hematite from 8 to 20 g.kg⁻¹.

Further analysis will consist in establishing a more detailed description of the < 2 μ m mineralogy by using high resolution transmission electron microscopy and selective chemical dissolutions. Indeed, 2:1 clay minerals were recognized in similar Latosols by Vollant-Tuduri (2005) and their presence in the Latosols studied remains to be established. Then, the geochemical composition and associated mineralogy of the diagnostic horizons will be discussed according to the characteristics of the parent material (chemical composition, mineralogy, density). Finally, we will develop a model based mainly on the age of the Latosol and the characteristics of the parent material that will account for the current characteristics of Latosols of the Central Brazilian Plateau.

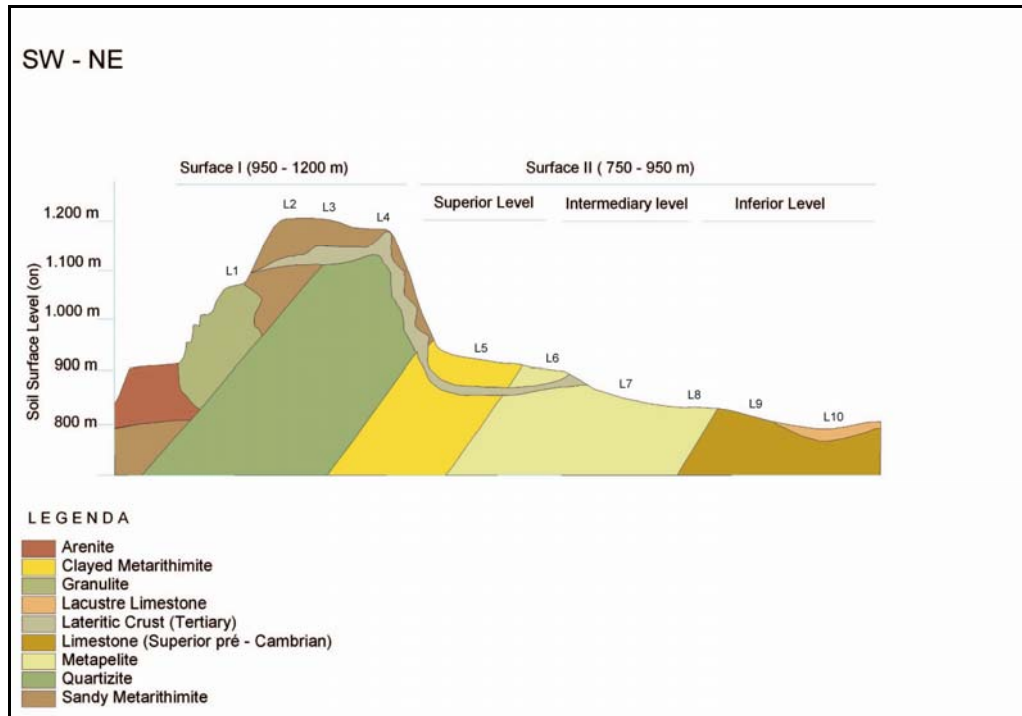


Figure 1 : Position all sampling of the 10 Latosols (L) in each geomorphic surface in the regional toposequence of Central Plateau – Brazil.

REFERENCES

1. Embrapa. 1997. Manual de métodos de análise de solo. 2 ed. Empresa Brasileira de Pesquisa Agropecuária, Rio de Janeiro, 212 p.
2. Embrapa. 1999. Sistema Brasileiro de Classificação de Solos. Empresa Brasileira de Pesquisa Agropecuária, Rio de Janeiro, 412 pp.
3. Lucas, Y. 1989. Systèmes pédologiques en Amazonie Brésilienne. Equilibres, déséquilibres et transformation. These de Doctorat de l'université de Poitier.
4. Lucas, Y., Luido, F.J., Chauvel, A., Nahon, D. & Rouiller, J. 1993. The relation between biological activity of the rain forest and mineral composition of soils. Science, 260, 521-523.
5. Reatto, A., Correia, J. R., Spera, S. T. 1998. Solos do Bioma Cerrado: aspectos pedológicos. In: Sano, S. M. & Almeida, S. P. (ed.): Cerrado: ambiente e flora. Planaltina, EMBRAPA-CPAC, 47-88. Soil Survey Staff. 1998. Keys to Soil Taxonomy.

8 ed. United States Department of Agriculture, Natural Resources Conservation Service, Washington. 326 pp.

6. Volland-Tuduri, N. 2005. Nature et mode d'assemblage des constituants minéraux et organiques dans des Ferralsols de la région des Cerrados (Brésil). Evolution après mise en culture. PhD Thesis, Université d'Orléans, Orléans-France.231 pp.

http://tel.ccsd.cnrs.fr/documents/archives0/00/00/93/47/index_fr.html