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The Spatial Distribution of Selected Soil Physical and Chemical Properties of the Surface Layer of the Primary Forest Reserve 'Reserva Ducke' Near Manaus, Brazil

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Abstract

We studied the spatial distribution of selected physical and chemical soil properties of the surface soil layer of the 100 ha primary rainforest reserve "Reserva Ducke" near Manaus, Amazonas, Brazil. We studied particle size distribution, pH, total nitrogen, organic carbon, inorganic phosphorous, exchangeable cations and aluminium of the top 5 cm from 72 quadrates of 1 km^2. Each sampling area was separated equidistantly across the rainforest reserve.

Sand as dominant particle size ($> 60\,\%$) prevailed at lower altitudes (< 60 m) and on slopes whereas clay ($> 65\,\%$) predominated in the middle part of the reserve along the plateau. The pH (H_2O) ranged from 3.5 to 4.9 and the pH (KCl) from 2.7 to 3.9. Mean organic C was 26.3 g kg^{-1}. Lowest concentrations of about 7 g kg^{-1} were found at lower altitudes where sandy soils predominated and higher concentrations of about 40 g kg^{-1} were found along the plateau. Throughout most parts of the reserve very low inorganic phosphorous concentrations of < 4.5 mg kg^{-1} existed. The lowest concentrations were obtained along the plateau. The aluminium (Al^{3+}) saturation of the soils was 89 % on average. Highest exchangeable Al^{3+} concentrations (> 2.0 cmolc kg^{-1}) occurred on the plateau.

The spatial distribution of the particle sizes and the soil chemical characteristics coincided with the spatial occurrence of albic Arenosols at lower altitudes and ferralsols at higher altitudes and on the plateau.

The present study demonstrated the importance of topography as major determinant of the soil spatial distribution and physical and chemical characteristics of topsoils across an Amazonian rainforest.

Keywords: Amazon rainforest, soil spatial distribution

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