



RIO18
21st World Congress
of Soil Science

21 WORLD CONGRESS OF SOIL SCIENCE

Sunday 12 – Friday 17 August 2018

Rio de Janeiro, Brazil

Rio de Janeiro August | 12 - 17

Use of magnetic susceptibility for the Identification of Pedogenetic Environments in Archaeological Black Earth in southern Amazonas, Brazil

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In the Brazilian Amazon region, it is common the existence of archaeological sites in which there are significant changes in the physical, morphological and chemical aspects of the soils, promoted by the human action known as Archaeological Black Earth (ABE). Although many studies have been conducted in order to understand the magnitude of these modifications and their reflexes in soil genesis, many questions need to be clarified, especially those related to the mineralogy of these soils. The objective of this study was to use the magnetic susceptibility (MS) to identify different pedogenetics environments in ABE in the southern region of the Amazonas. Thirteen profiles of ABE and one (1) a forest profile (non-anthropogenic) were analyzed, being collected samples by horizon in each profile. Mineralogical analysis was performed, and certain minerals of the clay fraction hematite (Hm_012), goethite (Gt_110) and maghemite (Mh_220 and Mh_400) being characterized by x-ray Diffraction (XRD) at blades made with powdered material. Were determined the iron contents extracted with dithionite–citrate–bicarbonate of sodium (FeDBC (in %)), iron contents extracted with ammonium oxalate (FeOAA (in %)) and total iron (in %). The MS was evaluated in soils (earth thin air-dried), in the ashes of plants and in ceramic fragments found in ABE areas, being determined to SM in low frequency (MSlf) and the percentage of frequency-dependent magnetic susceptibility (χ_{fd}). The ceramic fragments have greater magnetic susceptibility compared to soils with archeological black earth (earth thin air-dried), and can be one of the reasons of the highest values of magnetic susceptibility in relation to non-anthropogenic soil. On the other hand, it is possible to observe through the diffractograms the characterization of clay fraction oxides Hm and Gt, including discreet expression of Mh in ABE. The ashes of the plants showed low values of magnetic susceptibility, indicating the phytogenetic influence in the values of MS of ABE can occur as a result of the cumulative process of burning of the plants over the years. The χ_{fd} has greater variation in subsurface in the archeological black earth, due to the mixture and accumulation of minerals formed in normal conditions (hypothesis pedogenetic and/or lithogenetic), in addition to the influence of fire (pedogenic hypothesis) and ashes of the plants (hypothesis phytogenetic).

Keywords: Amazonian soils, ferrimagnetic minerals, mineralogy

Financial Support: FAPEAM, Unesp, IFPA



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