

**Keywords:** Soil texture; Soil quality; Organic matter; Land conservation.

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**(2652 - 2160) Space variability of carbon stock and organic carbon of soil with cupuaçu cultivation in south of Amazonas, Brazil**

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The Amazon is an important biome for the world, highlighting high and rich biodiversity that is one of its great attractions and interest to researchers, much of this biome is concentrated in the state of Amazonas. Soils of the Amazonas have as characteristics soil with a high degree of weathering, presenting predominance of the Latosols and Argisols class, with high aluminum content, low CEC and light, great values of organic matter and verify the behavior of certain attributes is crucial to be it may be possible to understand its characteristics. The objective of this work was to verify the spatial variability of the carbon and organic carbon stock of the soil in an area under cupuaçu management in the South of Amazonas. The study is located in the in Canutama municipality in southern Amazonas, Brazil, where he was selected an area with management cupuassu and held a mesh of 80 points with an area of 70x90 me 10 m spacing between points where these were georeferenced with a device of GPS, and in each point samples were collected in three depths 0.00-0.05; 0.05-0.10 and 0.10-0.20m. After samples were taken, they followed the shed where the leftovers were dried and then discharged, to carry out the analyzes of soil density(Ds), organic carbon (CO) obtained by calculation from the organic matter and soon after the carbon stock (est C). The results were submitted to analysis of variance, descriptive statistical analysis, and finally, the spatial variability was evaluated using geostatistics. By the descriptive statistics it was observed that the mean and median were close having a symmetrical distribution two data, where also the asymmetry and kurtosis were close to zero. The values obtained for R<sup>2</sup> and VC indicate perfect adjustment of the semivariograms, all being higher than 0.7. The spherical and exponential models were the ones that best fit the variables analyzed, thus confirming these models as the ones that best apply to studies within soil science. At the degree of spatial dependence, these were in moderate and strong degree of spatial dependence, and the scopes were higher in the attributes of Est. C, Organic Carbon and soil density in the depth of 0.00-0.05m evidencing a high variability and consequently a low degree of correlation. Thus, the highest reaches were found in the soil surface layer, as well as the highest values of organic carbon.

**Keywords:** Amazonian soils; geostatistics; Carbon.

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**(4836 - 1847) Spatial variations and influencing factors of soil organic matter contents in different layers and agricultural land uses in Taoyuan, Taiwan**

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More and more studies focus on spatial variations and influencing

factors of soil organic matter (SOM) in different agricultural land uses. In this study, SOM contents and other soil properties were obtained from a detail legacy soil survey data by Taiwan Agricultural Research Institute (TARI). 1163 soil profiles with different agricultural land uses (paddy field, dry land, orchard, and abandoned agricultural lands) were sampled by soil auger to 0-15 and 15-30 cm depth. Annual average Normalized Difference Vegetation Index (NDVI) was calculate by the NASA's Vegetation Indices 16-Day L3 Global 250m data. Slope, Curvature, Topographic Wetness Index (TWI), and Terrain Roughness Index (TRI) were calculated by 20-m grid resolution DTM. Correlation and regression analysis was performed by SAS 9.4 software. Results showed that the distribution of SOM contents, CEC, and other nutrient elements were higher in the 0-15 cm layer. The elevation and CEC were significantly correlated with SOM in both 0-15 and 15-30 cm soil layers ( $p < 0.001$ ), and pH was significantly correlated with SOM in 15-30 cm layer as well. Regression analysis by using the DEM(elevation), CEC, and pH, 52%, 69%, 35%, and 71% of variation on 0-15 cm SOM can be explained in land uses of paddy field, dry land, orchard, and abandoned agricultural lands. In 15-30 cm layer, 52%, 55%, 48%, and 64% of SOM variation can be explained in land uses of paddy field, dry land, orchard, and abandoned agricultural land, respectively. The different explaining ability between land uses may be caused by different farming management. Taoyuan is the mainly origin of rice and fruits, and farmers used many intensive management methods such as weed control, irrigation and drainage control for higher yields of rice and fruits. Therefore, the SOM contents may be more agree with the natural situation on abandoned agricultural land and dry land. Moreover, the explaining ability was lower on paddy filed and orchard, and higher abandoned agricultural land and dry land. These results can help us estimate SOM contents and stocks more accurately and efficiently between different agricultural land uses.

**Keywords:** Soil organic matter, spatial variations, correlation analysis, regression analysis, agricultural land uses

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**(1932 - 1860) Stock of organic carbon in spodic horizons of Brazilian Spodosols**

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Soils classified as Spodosols in Brazil occur at different landscapes, from coastal plains to high altitude areas. Although they are present in different environments, these soils are formed mainly under humid climates, from sandy parent materials, and usually with shrub and grasses vegetation. They differ from Spodosols from the cold climates and under coniferous forests, from where the concept of podzolization process derived. This order of soils is defined by the Brazilian Soil Classification System (SiBCS) by the presence if a spodic horizon, which must have organic carbon (C org) accumulation in relation to the overlying horizons. To highlight the importance of the preservation of these soils due to their storage of carbon in subsurface, among other reasons related to the flora and fauna they support, the objective of this work was to estimate the organic carbon stock (Ec) of spodic horizons in Brazil. From an extensive bibliographical search, 38 profiles identified as Spodosols according to the SiBCS were selected, and the C org in  $g\ kg^{-1}$ , bulk density (Ds) in  $Mg\ m^{-3}$  and thickness (E) in cm of the spodic sub-horizons data was organized in a spread sheet for evaluation of descriptive statistics. The Ec in  $Mg\ ha^{-1}$  was estimated according to the equation:  $Ec = (E.Ds.C\ org) / 10$ . The thickness of the 67 spodic sub-horizons ranged from 1 to 95 cm, with a mean of 26 cm and a median of 20 cm. The Ds varied from 1.14 to 1.93  $Mg\ m^{-3}$ , indicating that the spodic horizons varied

from high porosity to dense ones, the last are the cemented types. The mean and median values of  $D_s$  were 1.49 and 1.47  $\text{Mg m}^{-3}$ , respectively. The levels of C org ranged from 0.4 to 99.2  $\text{g kg}^{-1}$ , with the mean and median being 17.2  $\text{g kg}^{-1}$  and 14.4  $\text{g kg}^{-1}$ , respectively. As for the  $E_c$  of the spodic sub-horizons, the mean was 52.9  $\text{Mg ha}^{-1}$  and the median was 41.7  $\text{Mg ha}^{-1}$ . The maximum value of  $E_c$  was of 220.5  $\text{Mg ha}^{-1}$  and the minimum value of 0.7  $\text{Mg ha}^{-1}$ . Although the tropical climate favors the intense cycling of organic matter added to the soil in the surface, and thus reduce the amount available for translocation and thus accumulation of C org in sub-surface, the spodic horizons showed overall high carbon stock in depth, which is them protected from losses to the atmosphere by emission of  $\text{CO}_2$ . Thus the safeguarding of areas with Spodosols, besides the preservation of important ecosystems, contributes to minimize the effects of global warming in the regions where these soils occur.

**Keywords:** Spodosols; SiBCS; carbon stock in soils.

**Financial support:** CNPq; Embrapa Solos; PPGA-CS/UFRRJ

#### (2586 - 1550) Structural study of humin and its interaction with humic acids by Fourier-transform mid-infrared spectroscopy

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Soil organic matter (SOM) is a complex mixture of molecules with different physicochemical properties, with humic substances being the main component. Humin is the insoluble component of SOM that remains after extraction of the other humified components that are soluble in alkaline aqueous solutions (humic acids). Humin usually makes up a substantial component of humified organic matter, but its lack of solubility and intractable nature have made it difficult to study. On the other hand, attenuated total reflectance spectroscopy (ATR) in the mid-infrared is a promissory technique for the study of characteristic functional groups on organic molecules, as well as, as for the study of intermolecular interactions by the analysis of the change in the vibration spectrum of molecules. The aim of this work was to study, by Fourier-transform mid-infrared spectroscopy, the structural features of humin and its interaction with humic acids (fulvic and humic acids, FA and HA, respectively). For that, different soil samples were selected from different zones and characterized physicochemical. FA and HA were extracted by alkaline dissolution, fractionated by acidification and purified by ultrafiltration. Sequential washed were performed in order to remove all humic substance and obtain the clay-humin system. FA, HA and humin were analysed by ATR. Interaction between humic acids and humin was studied by mixtures of humified components with humin in different proportions. In order to achieve a major structural resolution of humin different interactions with different low-molecular weight molecules were performed (acetic acid and sorbitol). Spectra were analysed by Pearson spectral similarity index and Functionally-enhanced derivative spectroscopy. It is concluded that the composition of humin differs considerably from the alkaline-soluble components of the SOM, in addition, supramolecular aggregates are formed mainly by the formation of hydrogen bonds.

**Keywords:** Infrared spectroscopy, humic acids, humin, hydrogen bonds

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#### (9741 - 1635) Study by attenuated total reflectance spectroscopy of structural changes of humified organic matter by chemical perturbations via alkaline dissolution and peroxidation

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The humified organic matter is an important parameter for physicochemical description of soils; the cationic exchange capacity (CEC), pH buffering capacity, ability to form particle aggregates, porosity, water storage and other properties are defined or influenced by HOM contents. The objective of the present work was to evaluate the applicability of the attenuated total reflectance spectroscopy (ATR), in the medium infrared, for the description of changes in the spectral response of soil samples subjected to controlled perturbations by chemical methods of humified organic matter and to explore its potential use for quantitative applications: determination of the CEC. For this, six types of soil samples were characterized in terms of physicochemical properties (pH, content of HOM, CEC, exchangeable cations, salinity and texture, as well as by ATR in the mid infrared. Soil samples were chemically disturbed by two methods: alkaline dissolution with NaOH and chemical oxidation with  $\text{H}_2\text{O}_2$ . Chemical treatments were performed at different concentrations and contact different times. Later, samples were analysed by ATR and infrared spectra were analysed by spectral correlation analyses in function of pH, MO and texture using Pearson spectral similarity index and Functionally-enhanced derivative spectroscopy of Fourier-transform infrared spectrum. Finally, CEC for all samples were calculated by perturbation-ATR results and compared with results obtained by ammonium acetate method. It is concluded that the use of the ATR in conjunction with chemical perturbation techniques of the MOH is a promising method for the simple and fast monitoring of the CEC and the study of HOM in soils.

**Keywords:** Infrared spectroscopy, cationic exchange, chemical perturbation, humified organic matter

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#### (1959 - 530) Study of the molecular structure of peat and humic substances from peat soils

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Raw peat and humic substances from the mire peat soils of the forest-tundra zone of the European northeast part of Russia have been characterized in terms of molecular composition. This was accomplished using solid-state  $^{13}\text{C}$  NMR techniques and ESR spectroscopy. The composition depended on the intensity of cryogenic processes in the active layer, the quality of the humification precursors (the degree of peat material transformation), and the biochemical selection of aromatic fragments during humification. It was shown that climatic factors are the main driver of the formation of soil organic matter (SOM) as well as the quality and degree of natural polymer destruction. These parameters are reflected in the functional groups and molecular compositions of the humic substances studied in both relic and modern formed peat layers. Humic acids (HAs) and fulvic acids (FAs) of the permafrost peat soils presented low-density molecular structures with a low portion of carbon species from aromatic fragments (15,2-36,3% for HAs and 1,6-12,8 for FAs). In comparison with the mineral soils, the content of carboxylic groups was lower in the peat materials. This reflected the anaerobic conditions in the permafrost peat soils. The content of functional groups and molecular fragments in the HAs illustrated a trend of decreasing paraffin groups and the accumulation of aromatic species of HAs, as well as carboxylic groups from FAs along the depth of the peat soils profile. This resulted from the higher degree of SOM transformation. Transformation of the linear aliphatic fragments leads to the cyclization of paraffin chains with the formation of stable aromatic fragments. As a result of the low biochemical activity of the permafrost peat soils, labile fractions of carbohydrates demonstrate a