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SOIL BULK DENSITY EVALUATED BY X-RAY MICROTOMOGRAPHY FOR CARBON STOCKS QUANTIFICATION

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Soil carbon stocks are important data for agriculture and environmental studies. Total carbon and soil bulk density are used for soil carbon stocks determinations and the bulk density has been traditionally determined by gravimetric methods. X-ray microtomography (micro-CT) has become advantageous to provide high resolution cross-sections images of an object, that later can be used to recreate a virtual 3D-model of the object. With wide application, the technique may be useful in the development of methodologies for evaluation of soil properties such as soil bulk density. However, beam hardening and the polychromatic nature of the used x-rays make it difficult to directly quantify the soil bulk density. In parts, this difficulty is avoided by filtering the emitted X-ray radiation of the micro-CT equipment using metallic filters. The objective of this study was to use microtomographic images to estimate the soil bulk density of three soils with different textures (clay, sand clay loam and loamy sand), collected at 0-10 and 10-30 cm depths. The obtained results were compared with bulk density values determined by the gravimetric method in oven dried (2 days at 105 °C) undisturbed soil samples (100cm³). Undisturbed soil samples were imaged with the SkyScan 1172 Micro-CT system using a copper-aluminum filter. Linear attenuation coefficients correlated linearly with the soil bulk density for each soil and the angular coefficient were associated with the mass attenuation coefficients. Such parameters are related to soil structure and can be very usefully in soil dynamic studies and soil carbon sequestration evaluations.