Geophysical Research Abstracts
Vol. 17, EGU2015-1528, 2015
EGU General Assembly 2015

Pore space connectivity and porosity using CT scans of tropical soils

Livia Previatello da Silva and Quirijn de Jong Van Lier

Divisão de Funcionamento de Ecossistemas Tropicais, CENA/University of São Paulo, Piracicaba, Brazil (liviapreviatello@cena.usp.br; qdjvlier@usp.br)

Microtomography has been used in soil physics for characterization and allows non-destructive analysis with high-resolution, yielding a three-dimensional representation of pore space and fluid distribution. It also allows quantitative characterization of pore space, including pore size distribution, shape, connectivity, porosity, tortuosity, orientation, preferential pathways and is also possible predict the saturated hydraulic conductivity using Darcy's equation and a modified Poiseuille's equation. Connectivity of pore space is an important topological property of soil. Together with porosity and pore-size distribution, it governs transport of water, solutes and gases. In order to quantify and analyze pore space (quantifying connectivity of pores and porosity) of four tropical soils from Brazil with different texture and land use, undisturbed samples were collected in São Paulo State, Brazil, with PVC ring with 7.5 cm in height and diameter of 7.5 cm, depth of 10 – 30 cm from soil surface. Image acquisition was performed with a CT system Nikon XT H 225, with technical specifications of dual reflection-transmission target system including a 225 kV, 225 W high performance Xray source equipped with a reflection target with pot size of 3 μm combined with a nano-focus transmission module with a spot size of 1 μm. The images were acquired at specific energy level for each soil type, according to soil texture, and external copper filters were used in order to allow the attenuation of low frequency X-ray photons and passage of one monoenergetic beam. This step was performed aiming minimize artifacts such as beam hardening that may occur during the attenuation in the material interface with different densities within the same sample. Images were processed and analyzed using ImageJ/Fiji software. Retention curve (tension table and the pressure chamber methods), saturated hydraulic conductivity (constant head permeameter), granulometry, soil density and particle density were also performed in laboratory and results were compared with images analyzes.