2008 - International Year of Planet Earth

EUROSOIL 2008

SOIL - SOCIETY - ENVIRONMENT

25 - 29 August 2008
Vienna, Austria

MAIN HIGHLIGHTS OF THE CONGRESS

Venue:
University of Technology, Vienna
Karlsplatz 13
1040 Vienna, Austria

© University of Technology, Vienna

Transport of Reactive Anions and Cations in a Volcanic Soil: Experiments and Modelling

J. Sansoulet[1], F. Feder[1], J. Simunek[2], V. Bochu[1], A. Findeling[3], E. Doelsch[4]

[1]CIRAD, UPR Recyclage et Risque, Saint-Denis, la Réunion, France,
[2]University of California, Riverside, CA, United States,
[3]CIRAD, UPR Recyclage et Risque, Montpellier, France,
[4]CIRAD, UPR Recyclage et Risque, Aix en Provence, France.

Agricultural crop fields are commonly amended with nitrogen and heavy metals, such as using rich pig manure, which can lead to soil and groundwater pollution. The ability to predict accurately water flow and solute transport into and through the soil is essential for an effective management of such fields.
To study the impacts of a pig manure amendment on the retention and flux of chemical elements in the soil from the Reunion Island, we constructed three large columns (85 x 40 cm) from a Nitisol in a laboratory. Over a 120-days period one untreated column and two amended with pig manure received regular amounts of water of 200 mm a week (tropical conditions). Soil moisture regimes of the soil were continuously monitored at four depths (17.5, 30, 55 and 85 cm).
Hydrodynamics functions, exchange properties of the soil and mineralization of the spread pig manure were also measured. The hydrobiogeochemical program HP1 was selected for the study to simulate variably-saturated water flow and transport of chemical elements in the soil columns. The HP1 model couples the previously separate HYDRUS-1D software package accounting for variably-saturated flow and solute transport with the PHREEQC code simulating equilibrium and kinetic biogeochemical reactions.
Experimental and modelling results showed that there was an interaction between anions and cations in the soil exchangeable phase. While all copper and zinc were retained in the first horizon of the soil, nitrate, calcium and potassium also interacted with anion and cation exchange complexes, chloride and sodium were less adsorbed and thus more mobile. The rapid manure nitrification led to an acidification of the soil solution mainly in the surface soil horizon.
These results present evidence of the specific mechanistic exchange properties of a volcanic soil under tropical conditions.