Geophysical Research Abstracts,
Vol. 10, EGU2008-A-12014, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-12014
EGU General Assembly 2008

Effect of variable flow-pathways on in situ mobilization of soil colloids in structured soils

C. Kjaergaard (1), J. Mogensen (2), A. Høj (2) and C. Petersen (2)

(1) University of Aarhus, Faculty of Agricultural Sciences, Department of Agroecology and Environment, Research Centre Foulum (PO Box 50, DK-8830 Tjele, Denmark), (2) Copenhagen University, Faculty of Life Sciences (DK-1870 Frederiksberg C, Denmark)

The transport of strongly sorbed environmental contaminants may be enhanced due to sorption to mobile soil colloids. The most common source of mobile colloids in soil is the in-situ release of water-dispersible colloids (WDC). The ratio between soil volumes conducting water versus soil volumes bypassed by water-flow, defining the degree of preferential flow, may be an important property influencing both in situ colloid mobilization and the subsequent translocation. Preferential flow may accelerate the transport of externally applied colloid-contaminant complexes or colloid-contaminants complexes located close to the preferential pathways, but decrease the in situ mobilization and leaching of colloid-contaminant complexes located at some distance from the preferential flow paths.

The objective of this study was to further evaluate the processes controlling in situ colloid mobilization in structured soils. In structured soils inter- and intraaggregate porosity affects the accessibility of the colloids to the infiltrating water and ion diffusion. Based on the conceptual perception that most colloids are associated in aggregates, we hypothesize that in situ mobilization of colloids may be controlled by the active flow-volume of infiltrating water. In this study we investigated colloid mobilization in 36 undisturbed soil cores (10 and 18% clay) exposed to variable irrigation intensity (1 and 10 mm/h) as well as variable soil-water potentials (psi approx 0, -5, -10 hPa), simulating different flow conditions through the soil plough-layer.

The results elucidate the effect of flow-pathways on colloid mobilization from situa-

tions where the macropores are not fully functional to situations with fully functional macropores and different degrees of preferential flow. At 18% clay, the 3H2O-tracer breakthrough curves (BTC's) demonstrated that, water flow was always preferential with only minor changes in degree of preferential flow as psi increased. Increasing irrigation intensity resulted in significantly faster breakthrough of tracer. At 12% clay, water flow changed from matrix-dominated flow at -10 hPa towards slightly preferential flow at saturation. Increased irrigation intensity at saturation significantly increased tailing of the BTC. Mobilization and leaching of colloids was significantly affected by flow-pathways, and demonstrated the quantitative importance of the active flow-volume on in situ colloid mobilization.