Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02382, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02382
EGU General Assembly 2008

Water flow and chlorotoluron transport affected by varying soil structure of different diagnostic horizons of three soil types

R. Kodesova (1), N. Vignozzi (2), M. Rohoskova (1), T. Hajkova (1), M. Kocarek (1), M. Pagliai (2) and J. Kozak (1)

(1) Dept. of Soil Science and Geology, Czech University of Life Sciences, Prague, Kamycka 129, 16521 Prague 6, Czech Republic (kodesova@af.czu.cz), (2) CRA-ABP, Centro di ricerca per l'agrobiologia e la pedologia, Piazza M Azeglio 30, I-50121 Florence, Italy

Soil pore structure, soil structure stability, and water flow and chlorotoluron transport were studied in different diagnostic horizons of various soil types: Haplic Luvisol, Greyic Phaeozem, Haplic Cambisol. Soil pore structure and porosity of all diagnostic horizons was studied in thin soil sections of size 7x4 cm. Soil structure stability of all diagnostic horizons was evaluated using the index of water stable aggregates. Water flow and chlorotoluron transport was studied on 1125.1-cm3 undisturbed soil samples. Three undisturbed soil samples were taken from the Ap, Bt1 and Bt2 horizons of Haplic Luvisol. Two soil samples were taken from the Ap and Ck horizons of Greyic Phaeozem. Two soil samples were taken from the Ap and Bw horizons of Haplic Cambisol. Chlorotoluron solution was applied on the top of the soil samples followed by two sequences of ponding infiltration performed in two days. Cumulative water infiltration was measured. Solute outflow and its concentration at the bottom were monitored in time. Pressure heads were measured at two positions using the micro-tensiometers. Soil samples were divided into 8 layers after the flow experiment and a chlorotoluron content remaining in each layer was determined. The highest infiltration rate and herbicide mobility were observed in the Bt1 horizon of Haplic Luvisol due to a well developed prismatic structure. The lowest infiltration rate was measured in the Bw horizon due to the poorly developed soil structure and absence of gravitational pores. The lower infiltration rates and herbicide mobilities were observed in the

humic horizons compared to those in the inner horizons in Haplic Luvisol and Greyic Phaeozem. On the other hand the higher infiltration rate and herbicide mobility was monitored in the humic horizon compare to that in the inner horizon of Haplic Cambisol. In all cases except the Bt2 horizon of Haplic Luvisol, infiltration rate during the second infiltration significantly decreased compare to infiltration rate during the first infiltration. The reasons may be a soil structure breakdown, swelling of clay and air entrapped in the soil sample. The larges soil structure breakdown and infiltration decrease was observed in the Ah horizon of Haplic Luvisol due to the low stability of initially well aggregated soil structure. Single-porosity and dual-permeability flow models in HYDRUS-1D were used to estimate the soil hydraulic parameters from the first part of the laboratory transient flow data via numerical inversion. The dual-permeability flow and transport model was used to optimize solute transport parameters. Despite the structure changes observed during the experiment affecting water flow and solute transport, the dual-permeability model more or less successfully fitted the measured data.

Acknowledgement: Authors acknowledge the financial support of the Grant Agency of the Czech Republic grants No. 103/05/2143 and 526/08/0434, and the Ministry of Education, Youth and Sports grants No. 2B06095 and No. MSM 6046070901.