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SALT MOVEMENT THROUGHT A SOIL PROFILE IN TRANSIENT FLOW CONDITIONS : APPLICATION OF A SIMPLIFIED MODEL

J.-E. DUFEY [1], **P. HENNEBERT** [2]

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A mathematical model of salt movement in transient flow conditions is presented in this paper. The modeling of solute transport by convection and dispersion process in soil solution is very simplified. The profile is divided into layers of constant thickness ; the water fluxes are calculated from the variation of water contents with time and depth, and from the flux at any one point of the profile. This elementary model is connected with an equilibration model that regulates the distribution of chemical species between solution, precipitate, and exchange phases (Dufey and al., 1979).

Irrigation experiments were carried out in columns of 12 cm diameter and 110 cm height.

A loamy soil, that had been washed with $CaCl_2$, was subjected to four aspersion-evaporation cycles (table I). Two types of water were used : 1) $CaSo_4$ 0.027 N, 2) $CaSO_4$ 0.004 N— Na_2SO_4 0.036 N. Chloride, sulfate and sodium contents were measured with time and depth. Experimental and simulated data are compared in Fig. 2.

It is concluded that a model, simplified with respect to water movement but more elaborate with respect to physico-chemical processes, can simulate the transport of reactional sclutes with adequate precision. This is only strictly valid for the physical conditions of the present study : macroscopically homogeneous medium without macropores or cracks.

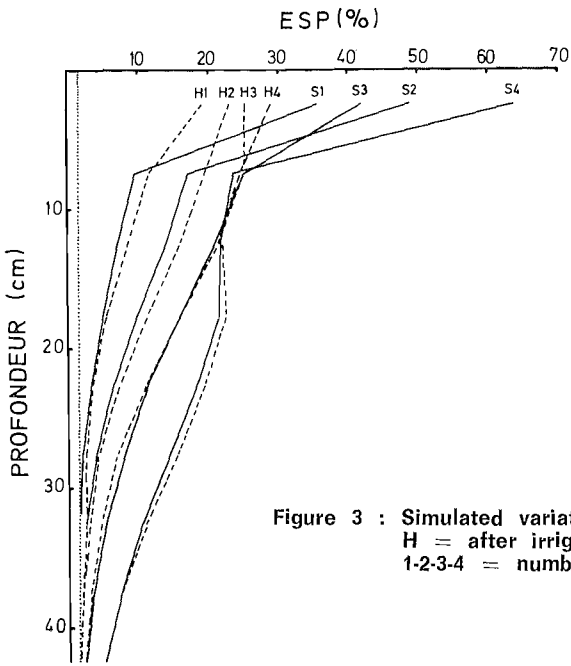

Figure 3 : Simulated variation of E.S.P. during the 4 cycles. H = after irrigation ; S = after evaporation ; 1-2-3-4 = number of cycles.

1) Université Catholique de Louvain - Science du Sol - 2, place Croix-du-Sud, B-1348 Louvain-la-Neuve (Belgique). Research Associate of the National Fund for Scientific Research.

2) Université Catholique de Louvain - FARG 7320 - 73, avenue Mounier, 1200 Bruxelles.

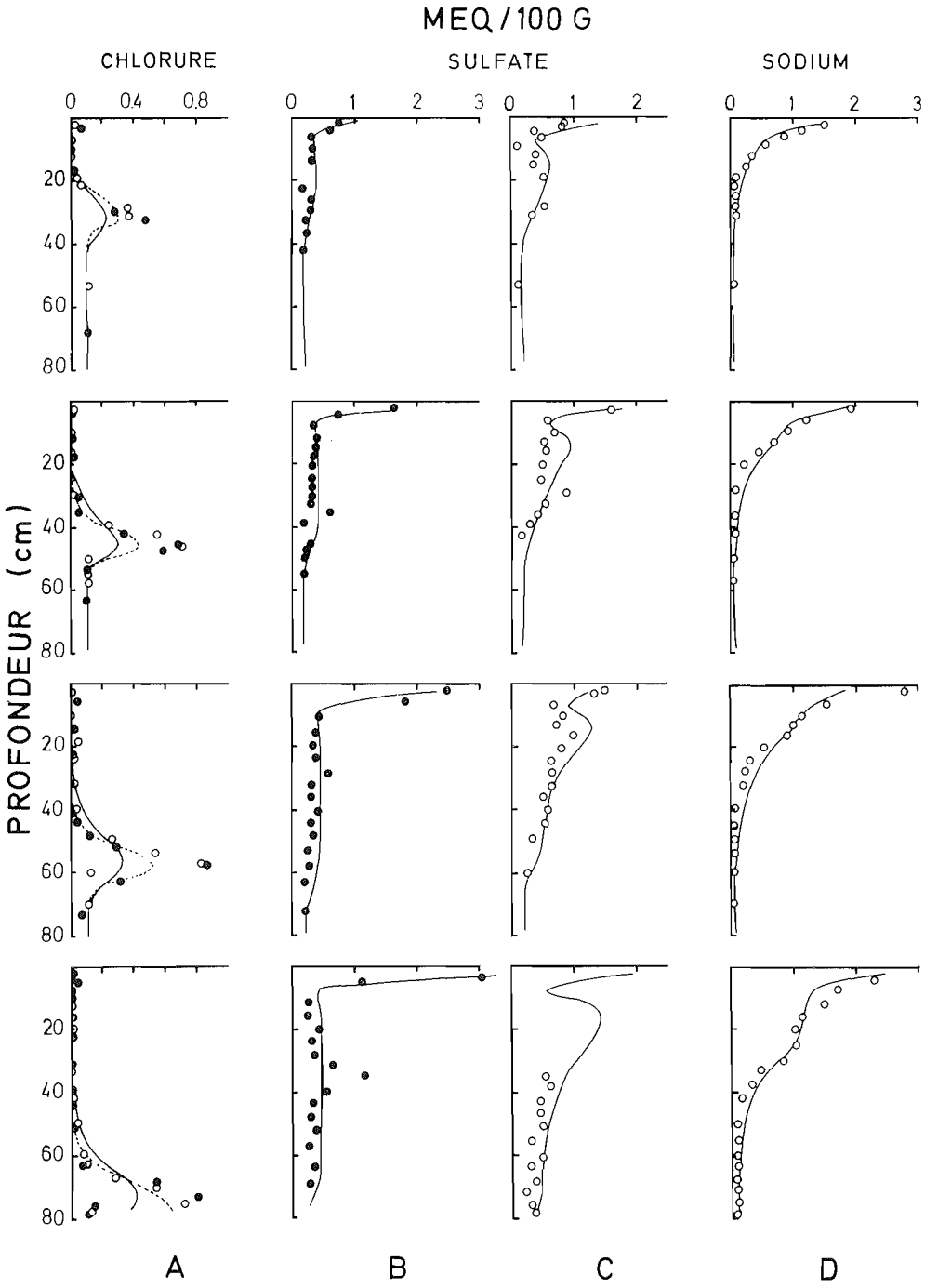

Figure 2 : Chemical composition of the soils after (downwards) 1, 2, 3, and 4 irrigation-evaporation cycles. The experimental points «●» and «O» refer the columns irrigated by water no. 1 and water no. 2 respectively. The full curves were simulated with h = 5 cm and k = 0.5 day ; the dotted curves were obtained with h = 2.5 cm and k = 0.5 day.