A Simplified Drain Boundary Condition

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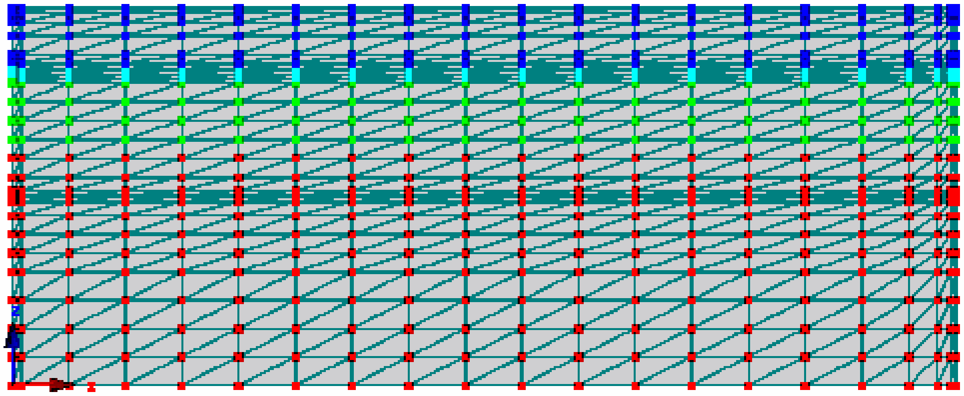
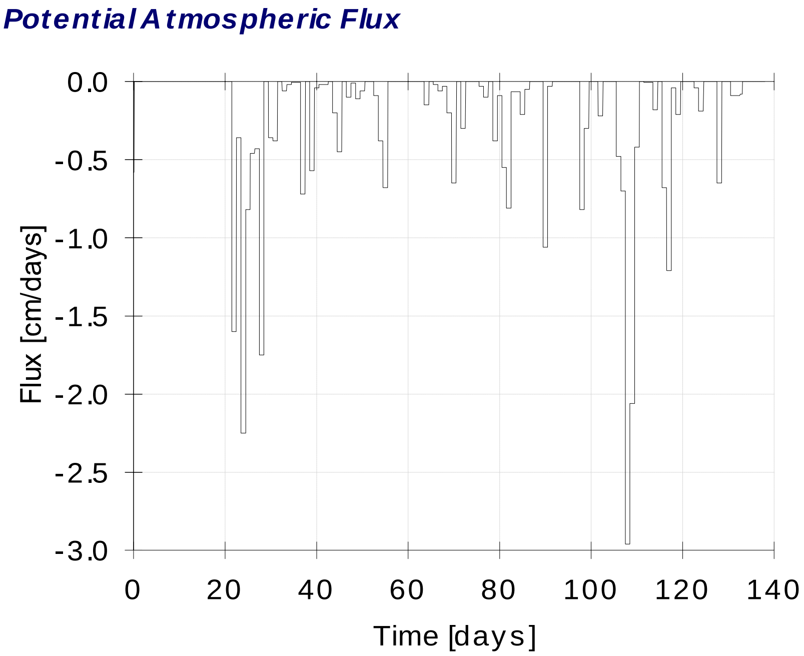
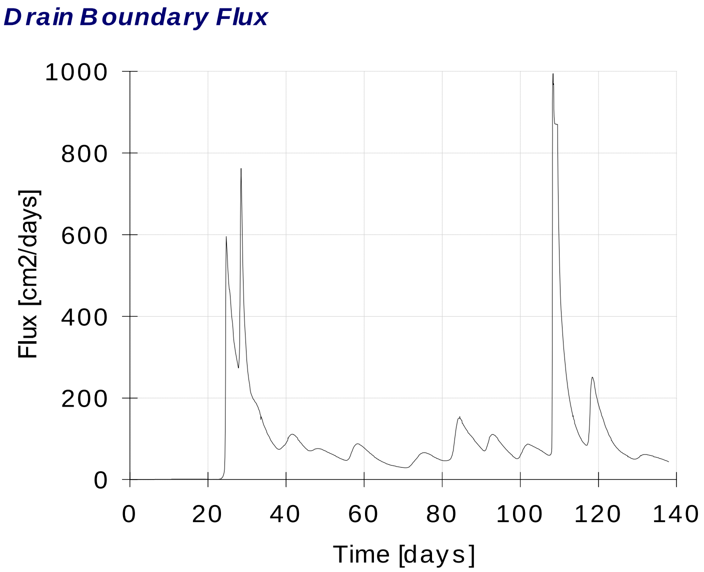
These two examples demonstrate the use of the (simplified) drain boundary condition and the effects of the immobile water content on accelerated solute movement. In both examples the transport domain is 500 cm wide and 200 cm high. It consists of four soil horizons.



Simulation is run for 138 days. Daily values of precipitation are specified. A solute pulse (tracer) is assumed to be applied during the first day.



Tile drains are assumed to be located 10 m apart at a depth of 100 cm. Due to symmetry (it is assumed that flow is symmetric around two vertical axes: a) through the drain and b) in the middle between two drains) only half of the transport domain needs to be simulated. Tile drain is located on the right side of the transport domain and a simplified drain boundary condition is used to represent the drain. The figure below shows the calculated water flux through the drain.



Water flow field, i.e., initial and boundary conditions, soil hydraulic properties, water fluxes, and water contents are the same for both examples. While in the first example (Drainage), equilibrium solute transport was evaluated, in the second example (DrainageF) we considered the dual-porosity solute transport model (mobile-immobile water content model) assuming that the immobile water content was equal to 0.25 throughout the transport domain. We did not assume any mass transfer between the mobile and immobile domains (notice that Alpha=0) and thus we basically assumed that solute was excluded from the immobile zone. This led to significantly accelerated solute transport as documented in figures below. Figures below show drain solute fluxes for the equilibrium transport model (left) and for the dual-porosity model (right).