



Water flow in an artificial macropore and interaction at the macropore-matrix interface

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With a series of infiltration experiments into an artificial macropore situated in fine sand, the flow of water through the interface macropore-matrix was investigated. The experimental setup consisted of a half-cylinder with a height of 110 cm and a radius of 50 cm with the macropore located along the center-line.

Varying the infiltration rate directly into the straight, vertical and artificial macropore inbedded in the fine sand matrix we found that for medium and small injection rates, the macropore does not becomes activated in its full length (110 cm). For these conditions, macropore flow only took place to a fairly shallow depth. The macropore-matrix interface is used as a “transfer station” for water infiltrating into the matrix. This observation is true for early times when the matrix is still fairly dry. After longer durations of the experiments (hours), with constant injection into the macropore, the matrix surrounding of the pore becomes more and more water saturated, thus the suction across the interface gradually ceases and vertical downward flow along the macropore-matrix interface increases more and more. Only for very (unrealistically) high injection rates into the macropore, macropore flow becomes dominant and can generate fast vertical flow. Also interesting patterns of water spreading into the matrix, especially massive lateral water flow components, were observed.

In “advanced” experiments we inserted a horizontal layer of silty material in the system. Then a change in water front movement due to the interactions at the interfaces between macropore and the different porous materials and due to interactions along the interface of the different porous media (silt and sand) could be observed.