

## Analysis of one-dimensional vertical unsaturated flow in layered soils

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It is well known that there are typical discontinuities in the water content, the variable of Kirchhoff transform (K transform) and the gradients of both the flux and the pressure head at the interface between two dissimilar soils. Although, using the K transform has advantageous in simulating in the infiltration equation in vadose zone, it has severely restricted to apply in nonhomogeneous soils because K transform highly counts on the soil hydraulic properties. This paper proposed a new algorithm, which use finite analytic method (FAM) to combine the continuity of pressure head and flux conservation at a heterogeneous interface, to simulate one-dimensional water movement in the vadose zone of layered soils. The model establishes on typical stability and convergence. To verify the model, the results of FAM are established in numerous test problems by comparing the numerical results with the analytical solutions. In addition, FAM is also compared with modified Picard finite different method (MPFD) by using mass balance error and local error. The results show that the proposed method not only can obtain high accuracy, quite stability numerical solutions and significantly reduce the mass balance errors, but also can effective handle the discontinuity across the boundary between different soils.

Keywords: finite analytic method, heterogeneous soils, modified Picard finite different method