Geophysical Research Abstracts
Vol. 18, EGU2016-6837-2, 2016
EGU General Assembly 2016

An experiment of rainfall infiltration under different boundary conditions

Shuang Hao, Fuguo Tong, and Song Xue
Three Gorges University, YiChang, China (sallyhao@ctgu.edu.cn)

Rainfall infiltration is a two-phase flow of water and gas, which should be simulated through solving the nonlinear governing equations of gas and water flow. In order to avoid the three main problems, such as convergence, numerical stability and computational efficiency in the solution of the nonlinear governing equations, Richard equation was usually used to simulate rainfall infiltration when the effect of gas phase could be ignored. The purpose of this work is to study the effect of boundary condition on rainfall infiltration, and to know in which cases Richard equation is available for the simulation of rainfall infiltration. The sample of soil has a height of 1200 mm. It is tightly enclosed in a toughened glass sleeve. The gas pressure is equal to the atmospheric pressure on the top surface of the model. The gas tight of its bottom can be controlled by a tap to simulate two different gas boundary conditions, permeable boundary and impermeable boundary.

When the bottom of the model is not gas tight, the water infiltration rate is entirely bigger than gas tight. There is a big difference over the long time of rainfall that infiltration rate tends to be stable to 0.05cm/min when permeable but it is only 0.002cm/min when impermeable. The dramatic contrast reflects that gas paly a hindered part during rainfall infiltration. In addition, the gas pressure is obviously lower when the model is not gas tight. Although the pore gas pressure rise a little bit when water block gas, it is still same with atmospheric pressure all time. The situation is different when gas tight, the pore gas pressure increases sharply in the early stage and stable to a higher value, such as 10cm gas pressure on 67cm depth.

Therefore, people basically negate the correlation between gas pressure and rainfall infiltration rate, but the evidence points out that the effect of gas pressure is in a significant position and Richard equations are not accurate under gas impermeable condition.