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A simulation of rainfall infiltration based on two-phase flow

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Rainfall infiltration in slope usually is one of major reasons cause landslide, which involves multiphase flow coupling with soil, water and gas. In order to study the mechanism of landslide caused by rainfall infiltration, a simulation of rainfall infiltration of DaPing slope, which locates in the Three Gorges Region of China, is presented based on the numerical solution of governing equations of two-phase flow in this paper.

The results of this research suggest that there are two sections can be divided in the surface of slope, one is inflow area and the other is overflow area, according to where it is infiltration and discharge. The general inflow area is on the upside of slope, while the overflow area is on the underside. The middle section of slope is on a fluctuant position between inflow and overflow area, which is dramatically affected by the water content inside of slope. Moreover, the average rate of infiltration is more stable in both inflow and overflow area, whose numerical value is depend on the geometry and transmission characteristics of slope. And the factors of rainfall characteristics, surface flow and temperature have little effect on them. Furthermore, in the inflow area, when rainfall intensity is higher than infiltration the rain on the surface of slope will run off, otherwise water and gas will completely infiltrate through soil. The situation is different in the overflow area whose overland flow condition is depended on whether it is saturated or not inside of slope. When it is saturated in the slope, there is no infiltration in the overflow area. But when it is unsaturated, the infiltration intensity will equal to rainfall intensity.

In a summary, the difference from inflow and overflow area is the evidence that the landslide may likely to happen on the slope of overflow area when it comes to a rainfall. It is disadvantageous for slope stability when transmitting the pressure of saturated water weight at the top of slope through the pore gas to groundwater, the groundwater pressure will increased sharply.