World Academy of Science, Engineering and Technology
International Journal of Geological and Environmental Engineering
Vol:13, No:04, 2019

Effects of Pore-Water Pressure on the Motion of Debris Flow

Authors : Meng-Yu Lin, Wan-Ju Lee

Abstract : Pore-water pressure, which mediates effective stress and shear strength at grain contacts, has a great influence on the motion of debris flow. The factors that control the diffusion of excess pore-water pressure play very important roles in the debris-flow motion. This research investigates these effects by solving the distribution of pore-water pressure numerically in an unsteady, surging motion of debris flow. The governing equations are the depth-averaged equations for the motion of debris-flow surges coupled with the one-dimensional diffusion equation for excess pore-water pressures. The pore-pressure diffusion equation is solved using a Fourier series, which may improve the accuracy of the solution. The motion of debris-flow surge is modelled using a Lagrangian particle method. From the computational results, the effects of pore-pressure diffusivities and the initial excess pore pressure on the formations of debris-flow surges are investigated. Computational results show that the presence of pore water can increase surge velocities and then changes the profiles of depth distribution. Due to the linear distribution of the vertical component of pore-water velocity, pore pressure dissipates rapidly near the bottom and forms a parabolic distribution in the vertical direction. Increases in the diffusivity of pore-water pressure cause the pore pressures decay more rapidly and then decrease the mobility of the surge.

Keywords : debris flow, diffusion, Lagrangian particle method, pore-pressure diffusivity, pore-water pressure
Conference Title : ICCEGE 2019 : International Conference on Civil, Environmental and Geological Engineering
Conference Location : Tokyo, Japan
Conference Dates : April 22-23, 2019

Open Science Index, Geological and Environmental Engineering Vol:13, No:04, 2019 publications.waset.org/abstracts/98059.pdf