THE PERFORMANCE OF THE SPH METHOD IN SIMULATING SURFACE RUNOFF ALONG A SATURATED SOIL SLOPE

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ABSTRACT

Rainfall-induced slope failures are one of the most disastrous and frequently occurring natural hazards. Hence, it is indispensible to predict their occurrence and their post-failure velocity in order to save lives and properties in mountainous areas. The rain that falls on a soil slope results in either infiltration or surface runoff, depending on the site characteristics. For saturated soil slopes, the amount of rain that goes as infiltration is usually less than the amount that goes as runoff. As a result, surface runoff scours the slope surface, thereby removing the soil slope protecting covers and eventually putting the slope, at least, in a marginally stable condition. This article reports the performance of the smoothed particle hydrodynamics numerical scheme in simulating runoff along a saturated soil slope with emphasis on predicting the velocity of flow. The average velocity of flow using the smoothed particle hydrodynamics method was compared with the average value obtained using a standard open-channel hydraulics empirical equation. The results show that the smoothed particle hydrodynamics method could be used as an alternative method for predicting the runoff velocity along a soil slope in hilly areas.

Keywords: Compressible fluid, incompressible fluid, infiltration, meshless numerical methods, runoff, SPH.

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