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Discussions

Interactive comment on "A model of landslide triggering by transient pressure waves" *by* G. W. Waswa and S. A. Lorentz

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Please, our final response is uploaded here as an attachment (Figure 1).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 2355, 2014.

Final Author Response to the Referees' Comments on "A Model of Landslide Triggering by Transient Pressure Waves, by G. W. Waswa and S. A. Lorentz"

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Derivation of diffusion equation from Richards' equation

It has been commented that the Richards' equation is the appropriate means of arriving at a diffusion equation that can describe the transmission and diffusion of pressure head through a saturated porous media (saturated soil), as demonstrated by Iverson (2000) and Berti and Simoni (2010).

Richards' equation can either be expressed as water-content (θ) dependent or matric-suction (ψ) dependent. This is because of the existence of a relationship between soil-water content and pressure head. In fact, Richards stated that "if from experimental data, unsaturated hydraulic conductivity, K-unsat, and soil water capacity, C, can be expressed as a function of the capillary potential, then matric-suction is the only dependent variable occurring in the equation. Either ψ or θ may be used as the dependent variable and K-unsat and C may be expressed in terms of either one. It seems that ψ will be the easier variable to use when experimentally investigating the nature of K. If ψ is a single valued function of θ, the choice is simply a matter of mathematical expediency." Richards (1931: Page 325) added that "in order to make use of the above equations, it is necessary to have information concerning the functions $\theta(\psi)$ and $K(\psi)$.

Therefore, whether one is dealing with the matric-suction/energy picture (as Iverson did) or mass picture, in order to make use of the Richards' equation, one needs the relation between soil water content and pressure-head. This implies that, where change in pressure head takes place without change in water content, Richards' equation (unless modified) cannot be used to predict pressure

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Fig. 1. Authors' final response