



## ***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.

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Interactive Discussion

Discussion Paper



**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 ( $\theta$ ) dependent or matric-suction ( $\psi$ ) 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  $\psi$  or  $\theta$  may be used as the dependent variable and  $K$ -unsat and  $C$  may be expressed in terms of either one. It seems that  $\psi$  will be the easier variable to use when experimentally investigating the nature of  $K$ . If  $\psi$  is a single valued function of  $\theta$ , 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

**Fig. 1.** Authors' final response

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