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Interactive comment on "Determining the susceptibility of soils materials to erosion by rain-impacted flows" *by* P. I. A. Kinnell

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The objective of the manuscript is to describe a method that could be used to determine the susceptibility of erosion to rain-impacted flows without including an in depth review of the mechanisms involved in erosion by rain-impacted flows (comments #1 and #3). Arguably, the title should begin with "A method for ……." to make this objective more clear at the outset.

The reviewer comments on the fact that the method based on Eq. 2 is directed to the case where flow shear stress is not involved in causing detachment. Erosion is a two staged process, stage 1 being detachment, the plucking of soil material from within the soil surface where it is held by cohesion and interparticle friction, and stage 2, the transport of the detached material from the site of detachment. Certainly, there are

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situations where detachment results from both raindrop impact and flow shear in the same area at the same time (eg within a shallow rill during rain), but generally, the effect of flow shear on detachment is not considered significant in modelling interrill and sheet erosion. Eq. 1 is based on the consideration that sediment discharge from interrill and sheer erosion areas is dependent on runoff and sediment concentration where sediment concentration is empirically dependent on rainfall intensity and slope gradient. Eq. 2 is again based on the product runoff and sediment concentration with sediment concentration being empirically related to a function which accounts for the interaction of flow depth and drop size which is also dependent on drop velocity. As noted above, the manuscript was intended to focus on experimental methodology rather than the physics leading to Eq. 2 which was described in, for example, Kinnell 1993b.

Certainly, the method has been described to some extent in a number of papers but this manuscript brings together relevant information that is scattered among the papers the reviewer listed so that a user or potential user of the method has that information in a single place. The application of the method to determining soil erodibility is not discussed in any depth in the existing literature and so the tables are new. However, as noted above, the objective is to present a method which is unique in that it is the only one described in the literature which controls the flow and rain characteristics that influence the erosive factors in rain-impacted flow well. Those controls not only important in the determination of the susceptibility of soil to erosion by rain-impacted flow but are also important in determining how soil surfaces eroding under rain-impacted flow act as sources of pollutants that affect water quality.

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