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Hydrology and Earth System Sciences
Discussions

Interactive comment on "How rainfall event characteristics affect the applicability of I_{30} as an index of intense or erosive rainfall: a brief review with proposed new rainfall index" *by* David L. Dunkerley et al.

Anonymous Referee #5

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This paper is based on a misconception of the intended purpose of the I30 index when it was originally developed and how it is calculated in that context. Originally, storm erosivity was thought to be directly related to storm energy (E) (see Trans ASAE 39, 285-291 (1958) but it was recognized that a period of "sustained" high intensity rainfall contributed to the effect of runoff on soil loss. Wischmeier and Smith observed that the combination of E and I30 was effective in predicting soil loss when runoff occurred. In the context of the USLE, I30 is given by twice the maximum amount of rain in a 30 minute window. Wischmeier and Smith found no advantage in replacing I30 by I15

(calculated as 4 times the maximum amount of rain recorded in a 15 minute window).

In the context of modelling erosion by the USLE, no minimum storm duration is associated with either I30 or I15 While storms may be considered to be separated by 6 hours of no rain, the 30 minute window can considered to extend beyond the beginning of the 6 hour gap. "When the duration of the storm is less than 30 min, I30 is twice the amount of rain" (page 332 of USDA Handbook 703). Consequently, if rain in a "storm" only occurs for 20 mins and produces 10 mm, then I30 is 20 mm/hr. If rain in a "storm" only occurs for 5 mins and again produces 10 mm, then I30 is again 20 mm/hr. Both values are NOT reflective of the average intensity of the rain recorded but I30 was not developed for that purpose.

Originally, the I30 index was developed to be combined with E to provide an index that was effective in predicting soil loss when runoff occurred, not as a stand alone independent variable. Dunkerley's primary criticism of the I30 index focusses on the use of I30 for purposes that are not associated with modelling erosion by the USLE. It is apparent that some people have misinterpreted the function of the I30 index and have MISUSED the I30 because of that. Dunkerly points out that I30 represents diminishing proportion of increasing long rainfall events and that this can be eliminated if an index such as the wettest 5% of the event duration is used instead. He notes that the average value of I30 at two locations he examined was the same but his new index indicated that there is a greater concentration of rain at the arid site than at the wet tropical site. While that may be true, Dunkerley does not show how removing the cited limitations of I30 by using his new index changes the ability of something like USLE based models to predict soil loss even though the title of the paper is "How rainfall event characteristics affect the applicability of I30 as an index of intense or EROSIVE rainfall: a brief review with proposed new rainfall index". Neither does Dunkerley discuss what exactly his index can be used for outside the USLE based modelling environment. There may be good reasons to use an index like Dunkerley has suggested but they are not discussed in the paper.

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