



Pumped rainfall simulators: the impact of rain pulses on sediment concentration and particle size distribution

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Many pumped rainfall simulators used in soil erosion studies use pulsed rain to control the rainfall intensity. Computer simulations, using a physically-based soil erosion model, suggest the effect of rain pulsing on erosion and transport processes cannot be ignored at fine temporal scales. We investigated the effect of rain pulsing on sediment concentration and particle size distribution experimentally using three different pulse cycles with the same rainfall intensity. There was considerable variation in sediment concentration through the pulse cycle: the highest concentration was up to four times that of the lowest concentration. Furthermore, the particle size distribution also varied: the peak median particle size was double the lowest median particle size. The magnitude of differences in sediment concentration and particle size increased with the duration of the rain pulse cycle. The experimental observations are matched by model output, which is a validation of the soil erosion model with respect to the dominant processes operating under rainfall.

Consequently, this work shows that rain pulsing can significantly affect experimental observations. Given these effects will vary between rainfall simulators and studies we suggest the impacts are investigated prior to experimentation and, if necessary, sampling periods designed to avoid bias introduced by these fine temporal scale sediment dynamics.