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Estimating soil resistance to erosion on plot scale - Do we really need artificial rainfall simulations?

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Rainfall simulators are an important tool for research of initial detachment and infiltration. Recent publications highlighted the great importance of simulator calibration in soil erosion studies. However, falling velocity and size distribution of raindrops assumably play a significant role only on the first meters of the slope. With increasing slope length runoff volume increases while effects of falling droplets become negligible.
In this regard the plot length of rainfall simulators is determining the processes we measure. For reasons of efficiency and repeatability such experiments are mostly conducted on small plots, which imply strict limitations in process simulation. In order to simulate the more important runoff driven erosion processes small plots need an additional sediment loaded runoff surplus, which allows virtually enlarged slope lengths.
The presented study shows examples of runoff feeding devices for parameter identification of the process based soil erosion and deposition model EROSION 3D for certain rainfall simulators and varying slope lengths (0.65-3 m). Resulting soil erosion resistance values are reasonable and comparable to previous investigations using a large scale rainfall simulator. Additionally the devices were tested without rainfall yielding to similar erosion resistance values. That leads to the following conclusion: If we want to simulate important erosion processes with artificial rainfall simulations, additional runoff is needed for virtual plot length enlargement. The effort we made referring to calibration of rainfall simulators we also should make in extending the devices by runoff reflux approaches in order to model slope size erosion processes.