

Interactive comment on “Development and testing of a large, transportable rainfall simulator for plot-scale runoff and parameter estimation” by T. G. Wilson et al.

Anonymous Referee #2

Received and published: 22 July 2014

The manuscript addresses a critical need in upland surface hydrology. Land managers need measured runoff and erosion values to correctly ascertain if current management actions are meeting expectations. Hydrologic modelers need parameters that reflect actual field condition to correctly determine the precision and accuracy of model predictions. The need for cost-effective and transportable rainfall simulators capable of directly measuring the heterogeneous nature of runoff on large scale plots is well documented in the literature. To add significantly to the literature on design of rainfall simulators and the practical application the authors need to address the actual design, cost and transportability directly. The premise of this paper is a new design

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for cost-effective rainfall simulator that is transportable, has acceptable repeatability in application rates and distribution across the plot and minimal over spray for water conservation. The paper needs to discuss in more detail the specifics of the rainfall simulator design and costs in section 2.1. The paper needs to also address time and staff required to setup/dismantle and move simulator before it can be ascertained if it meets criteria of easy transportability on site. The article should also address size of vehicle or trailer required to move all pieces to a new location to address transportability. The article should provide enough information such that by reading the article a person could buy all necessary parts, have an expectation of costs, and know number of people required to setup and move the simulator. This type of information is critical when designing a project and selecting which type of rainfall simulator to use for a specific experiment. The article could be enhanced with more description and use of the actual simulator as this is the thrust of the article. Specifically I would like to see a table of a complete parts list, number of each part, cost at time of purchase, and manufacture of part. (i.e., actual make and model of nozzle, number required, and cost of the parts, type of screen used to redistribute raindrops, number of connectors and costs, pressure gages, size pipe and type of pipe used to construct framework, etc.). How the screen is attached to simulator that is used to form raindrops, such that it does not bunch or sag and concentrate rainfall in a local site. What type of material was used for the screen and how robust is it for ripping during movement or from wind. I would like to have described the spacing of the pipes that apply rainfall across the frame. Describe how pipes were held in place so they would not rotate during the simulation and also so that you get exact positioning after it has been disassembled and moved. Number of hours required to build simulator. Number of hours required to construct onsite and number of hours and staff required to disassemble and move to next plot. Why was 2 m selected for height of simulator? With water dripping from the screen at 2 m the raindrops energy should significantly be below terminal velocity. If authors had used height of 3.2 m then raindrops would be more closely approximated terminal velocity of size drops they recorded.

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Why is the rainfall simulator set inside of the plot walls (see figure 7)? Traditionally with rainfall simulators there is a small over spray of the entire plot to ensure that the plot is uniformly rained on. The location of the simulator within the plot may explain some of the soil moisture readings that indicated that the edges of the plot took the longest to reach saturation. This might be a function of minimal rainfall in these locations based on design of the plot wall location. Why the development of a large scale tipping bucket device to measure runoff? The extra effort to calibrate and the documented problems of tipping buckets where they chatter had high inflow rates and take excess time to tip at low flow rates should be justified. These flaws of this design are discussed in this article by the authors. This is an extra expense and added noise injected into the data that could be avoided if authors used a portable calibrated flume. The installation of an appropriate calibrated flume that is mounted on a steel plate with leveling legs requires minimal time to install, gives a smooth measurement of the entire runoff event, can be moved easily, and does not have biases of a tipping bucket device. With no moving parts a flume is much easier to maintain than this tipping bucket design and simpler to build. Did the authors install consider installing an in-line water filtration system to prevent clogging of nozzles during rainfall simulation? If not why not? Picture showing attachment of pipes that supply rainfall to frame. Picture showing how plastic ledge is install to collect runoff and direct to hose for transfer to tipping bucket. Picture attachment of screen to frame and how it is tensioned so not to sag or bunch. On line 10 on page 4269 the word "and" is repeated.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 4267, 2014.