

Hydrol. Earth Syst. Sci. Discuss., author comment AC1  
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## Reply on RC1

Harris Ramli et al.

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Author comment on "Influence of drop size distribution and kinetic energy in precipitation modelling for laboratory rainfall simulators" by Harris Ramli et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-462-AC1>, 2022

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The authors wish to thank the editorial team for managing the technical review. The authors also thank the reviewers for the comments and appreciate their support in making the paper more readable and more beneficial. Attached is the response to the comments and suggestions made by the reviewer (in PDF format).

No.	Comment	Action	Notes
1	The authors are kindly advised to revise the article as the presented does not allow, in its current form the readers of HESS to use the results / the rainfall simulator discussed in this work. Major revision and/or rewriting of the article is needed to clear up parts that are unclear and to add information that is currently missing.	They are considered in the revised manuscript.	The authors thank you for the comments and appreciate the support and involvement of the reviewers to improve the paper.

2 A photo of the system needs to be added. Regarding this comment, the author changed "0.8 m" to "8 cm", similar to the drawing in Figure 1b. Thanks to the reviewer for this comment.

The text mentions that every lateral contains 10 drip emitter at 0.8 meter, which would make the system 8 meters long. I'm assuming that this is 0.08m, as per the drawing in figure 1b.

3 The system seems to be 80 x 80 cm of nozzles. The text says that the flour pallet method is used to determine drop sizes. Regarding this comment, the author rewrites the sentence to provide a more clear view, where the sentences have been modified to read as follows: The sentences have been revised to avoid confusion with Figure 1b, as the lateral flow line spans over one metre (72cm + 39cm), with the drip spaced at an 8cm interval. Section 3.2 Drop Sizes elaborated on the method of using a flour pallet.

The system consists of 100 nozzle drip points distributed throughout a 72 cm × 72 cm square area. Ten lateral lines connected to the mainline contain ten nozzle drips equally spaced at 8 cm. The system's effective test area is 80 cm × 80 cm.

4

The author make no mention of the 'edge effects'? Did all the rain fall within the 1 square meter of the board? Of so: was it uniform?

Regarding this comment, the author added a paragraph on rainfall simulator calibration to provide a more clear view:

Thanks to the reviewer for this comment and suggestion.

The rainfall simulator was calibrated in terms of rainfall intensity to achieve reproducible and consistent rainfall characteristics. Throughout the calibration and experiment, any element that may affect the changes in wind flow, such as an air conditioner or fan, is controlled to ensure that the raindrop falls vertically within the effective test area. The calibrating process was split into two parts. The first step measured the rainfall intensity and spatial rainfall distribution on the designated surface. To obtain high-resolution datasets, 100 cylindrical rainfall collectors are positioned on an area of 80 cm x 80 cm under the drip used. Each collector was weighed to determine the amount of rain collected after one hour of simulated rainfall. Based on the observations, no droplet crosses the cylindrical during the calibration and all land

directly on the cylindrical beneath the drip. This initial calibration step ensures that each nozzle produces an equal amount of rainfall. A second step involved using a single large, plot-sized collection to determine net rainfall intensities. The volumetric method of flow measurement was utilised to calibrate the simulated real intensity. Two laboratory steel trays with top dimensions of 80cm x 80cm x 10cm and bottom dimensions of 100cm x 100cm x 8cm were used for volume control and placed beneath drip systems. The different heights of the top and bottom are merely a coincidence due to the laboratory's available tray. The primary technical requirement is that the central collection tray (small) must fit within the dimensions of the designed test area and be tall enough to collect the intended rainfall intensity (in this work, the maximum is 80 mm/h.), whereas the secondary collection tray must be larger than the effective test area. Collector boxes were placed in a central location (in relation to the drip location) and collected the precipitated volume at a set

pressure. The volume of precipitated water was determined using a measuring cylinder. A ruler was used to measure the water level, and then the precipitation volume collected was recorded. No raindrops landed on the large bottom tray during the second calibration stage based on the observations. This demonstrates that the raindrop area's uniformity is reproducible.

5

How was the calculation from water flow to mm/hour done?

Regarding this comment, the author added sentences to provide a more clear view:

Thanks to the reviewer for this comment and suggestion.

The calibration result enables the flowmeter to correlate the amount of water controlled by the flowmeter to the amount of water emitted from the nozzle. Thus, the simulator delivers the desired rainfall intensity (mm/hr).

6

Figure 1a suggest that the 'soil' is uneven and thus that different heights are possible in this system. If this is true it needs to be made explicit. If it is not, figure 1a needs to be corrected

No changes in manuscript

Thanks to the reviewer for this comment. The uneven soil profiles result from another aspect of this research that is not covered in this paper. Calibration results indicated that small changes to these soil profiles do not affect the rainfall simulator's performance.

7

The authors do not mention in their introduction what range their new simulator targets, nor for which applications it is build.

No changes in manuscript

Thanks to the reviewer for this comment and suggestion. The main intention of this simulator setup is to simulate targeted rainfall intensities similar to the cases of landslide occurrences in the authors country. The simulator is applied to a laboratory setup of a specific selection of slope criteria for further understanding on rainfall impact in groundwater level changes. It is beyond this manuscript context; therefore, the authors excluded the explanation of the simulator's application.

8	<p>Paragraph 3 contains a mix of theory and experimental setup that is hard to disentangle. The choices made in how to conduct the experiment are mentioned in between citations to literature. I strongly recommend separating paragraph 3 in a 'theory' and a 'experimental setup' paragraph.</p>	<p>No changes in manuscript</p>	<p>Thanks to the reviewer for this comment and suggestion. The third paragraph discussed solely with the subject's literature.</p>
9	<p>To check the amount of water coming out of the system the flow meter is read for different settings of the pump pressure. It is not mentioned how this experiment was conducted: for how long was the valve opened? Was the flow allowed to settled before starting the measurement? Or was it the same 1 to 4 seconds mentioned in paragraph 3.2?</p>	<p>As mentioned in the previous comment (No. 4 and No. 5), the author added a paragraph on rainfall simulator calibration to provide a clearer view.</p>	<p>Thanks to the reviewer for this comment and suggestion.</p>
10	<p>To check the drop sizes generated with this system, the flour pallet method was used with the flow opened for 1 to 4</p>	<p>Regarding this comment, the author added sentences to provide a more clear view:</p>	<p>Thanks to the reviewer for this comment and suggestion.</p>

seconds (how much?  
How was this  
determined? Was the  
idea to only have a  
few drops? How  
many?)

According to  
Kathiravelu et al.,  
2016, the flour pallet  
test would be  
conducted by various

This needs clearing up  
on what was done and  
how it relates to what  
is reported.

researchers between 1  
and 4 seconds,  
depending on the  
intensity of rainfall. In  
our experiment, a 1.0  
m x 1.0 m plate  
containing a 2.54 cm  
(1 inch) layer of  
uncompacted fine  
wheat flour was  
exposed to a split  
second of rainfall. The  
drops must not fall at  
the same point during  
rainfall simulation and  
formed corresponding  
to the drop size on  
impact. The objective  
is to collect a single  
drop of water. The  
flour plate was  
positioned 1.5 metres  
below the drip and  
covered with two  
layers of tray. A  
collection tray is used  
on both the top and  
bottom trays. The top  
collection tray's  
purpose is to capture  
the initial 1 to 2  
seconds of rainfall  
when the valve is  
opened. This ensures  
that every nozzle  
produces a raindrop.  
Simultaneously with  
the top tray being set  
aside, the flour plate  
was exposed for a  
split second before  
being covered by the  
bottom tray. The  
valve was immediately  
closed to halt the rain.  
Based on the  
observation, the



raindrop pattern is within the effective test area.

11

The authors indicate they open and close the valve for 1 to 4 seconds. Is this how it will always be operated? Or will it be opened fully when used in practice?

No changes in manuscript

Thanks to the reviewer for this comment and suggestion. As explained in comment No. 10, the statement of 1 to 4 seconds is for the flour pallet test only. During the actual rainfall simulation test, the intended volume of rainfall is applied according to the rainfall intensity and duration.

Please also note the supplement to this comment:

<https://hess.copernicus.org/preprints/hess-2021-462/hess-2021-462-AC1-supplement.pdf>