

Interactive comment on “Assessing different imaging velocimetry techniques to measure shallow runoff velocities during rain events using an urban drainage physical model” by Juan Naves et al.

Anonymous Referee #1

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General comments

This study assesses four image based velocimetry techniques for measuring water velocity in shallow flows as would be observed in overland flows over paved surfaces during rainfall events. The problem is physically challenging, and the authors use a dedicated lab setup to assess these techniques with an eye to evaluating their potential for more difficult and varied conditions in the field. The work is derived from a larger project that has led to a number of significant publications over the last couple of years and is a direct extension of a 2019 paper that validated one of the approaches used

C1

(LSPIV). The validated approach is used as the reference condition for the current paper. The paper overall was well written and the methods appeared to be suitable for assessing the other velocimetry techniques.

Despite the quality of the work, the authors in my opinion are too positive about the results. In looking at the results from my reviewer's perspective, it appears that the unseeded techniques are not suitable for measuring velocities in shallow flows. Even in relatively straight flows with low precipitation, there is an offset between the unseeded techniques and the LSPIV results that is not well explained. It is not clear to me how the magnitude of this offset could be predicted without controlled tests. As the precipitation intensity increases, the error in the unseeded techniques increases to the point where the results are no longer even correlated with the validated technique. In these conditions I would argue that the unseeded techniques are simply not suitable. Despite this, many of the statements in the discussion and conclusions are quite positive about the techniques. The optimism seems to be related to other studies or results that are not included in the current paper. Something needs to be adjusted, either by including those results (maybe cases without any precipitation at all?) or by drawing sharper lines about which techniques are reliable in different conditions.

Questions/Comments:

148 – Is the LSPIVb procedure significantly different than the LSPIV? In reading the methods I thought that the results might arrive at the same point as each requires a threshold, one applied to the difference, the other to the base images and then the difference is then calculated. The results also show that they are nearly the same. The point of the LSPIVb analysis is not emphasized in the paper. What is the motivation for evaluating this technique? It is not really discussed in the results or appear in the conclusions to a significant extent. Does it ‘better remove background and shadows...’? Should other people use it instead of the regular LSPIV?

Minor issues

C2

16 - complex sentence. should split into one about the natural tracers and the second about the raindrop impacts.

24 – replace ‘Specifically’ with ‘However’?

47 – sentence starting with ‘For instance’ is not clear to me. Should be rewritten in a more direct style.

61 – sentence starting with ‘That study’ is too complex. Should be split into two ideas.

87 and 106 – is Naves et al 2019b an archive? Data availability should be clarified.

101 - Best to say what was done step by step. e.g. Videos were recorded at 4K resolution and 25Hz. 1500 frames (eq. to 60 s) were extracted from the longer recording for analysis.

117 – ‘estimate’ is better than ‘obtain’ for this sentence.

117 – ‘from the analysis of the images presented in the previous point’ is not necessary.

120 – so all particles are assumed to be moving? Is this realistic? Is there a velocity threshold?

156 – restatement of the aim/objective. Not necessary in the methods.

166 – Description of correlation matrix calculation is too brief. Need to help readers who may want to apply this technique themselves. Is this following what was done for other publications?

174 – not clear what you mean by ‘which were investigated as an optimum’.

180 – again repetition of aim, but shouldn’t be necessary.

183 – novelty should be addressed in intro with aim and objectives.

193 – more repetition of the aim

195 – I think that the reference technique statement should also be used as a scop-

C3

ing statement at the end of the introduction with the aim/objectives. Mixing it in here reduces the clarity of what is being done and what the starting point for the new contribution is.

224 – suggest ‘typical of’ rather than ‘in consonance with’

226 – ‘This was to approach the conditions of worse devices ...’ is not clear.

261 – Acronym not introduced until next page (FAR)

279 – what type of flow specifically is in the area? The shallowness? Should be clarified.

284 – should note that there is a degradation of quality with FAR, as expected.

317 - change phrasing. The current sentence uses a double negative. i think you mean that the unseeded technique is not able to measure the highest velocities, but i’m not sure.

322 – ‘non-artificial’ is again kind of a double negative. Just say what it is - the natural bubbles.

325 – suggest ‘prevents’ rather than ‘avoids’.

325 – ‘from’ obtaining

414 – should be Figure 10

445 – do you mean that the problem is not trivial?

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