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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Laboratory modelling of urban flooding: strengths and challenges of distorted scale models" *by* Xuefang Li et al.

Anonymous Referee #1

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General Comments The authors present an interesting paper on scale effects in the context of the modelling of urban flooding using geometrically distorted models, based on the reanalysis of existing lab data. I am not aware of any similar analysis done in this context, and the paper will be of significant interest to those undertaking such studies. The paper is well written and clear and I would certainly recommend publication. I have made some suggestions for potential improvements below. Specific Comments 1. The abstract (L17) contains a comparison of uncertainties from scale effects to those from hydrological data. This analysis does not seem to be in the paper or conclusions. The abstract should not contain information that is not in the full paper; hence this should be removed or added to the paper. Please also note the typo on the last line. 2. Introduction (2nd paragraph) – The authors point out the difficulty in obtaining velocity data in

field conditions with which to validate flood models. However point velocity data is also uncommon for lab studies of urban flooding (for example due to the low flow depths and the difficulty in installing equipment such as ADV probes). Indeed the studies the authors use is based on flow and depth data. Some studies which provide velocity data in a lab setting have recently come available (e.g. Martins et al 2018, WRR) and the authors may at some point in the paper wish to consider the benefits of velocity + depth data for model validation or scale model studies, as well as clarifying the relative rarity of velocity data in lab or field studies. 3. P2 L16 – It would benefit the introduction if the authors could be a bit more specific regarding what they mean by 'artefacts'. Perhaps with a specific example of how these might arise in scaled experiments, what is the physical cause etc. 4. P2 L 25 – Chanson gives some specific recommendations, however it would be good if the basis for these recommendations was briefly mentioned. 5. P3-P4 The authors provide a good review of physical models and scaling issues in the simulation of surface urban flood flows. The authors should briefly note that studies of 'dual drainage' (surface and sewer flows) also exists however the scaling issues are somewhat complicated by the combination of pressurised pipe and surface flow. This generally posed some additional limitations on these studies (either associated with the hydraulic conditions which can be simulated, or the minimum size of the model). 6. P5 – For both data sets the authors do not discuss the quantification of the inflow discharge. It seems to be assumed that the error within the quantification of this discharge is negligible. Some justification for this assumption should be given. 7. The treatment of frictional resistance within scaled models is an interesting topic which the authors mention only briefly within the discussion. Given such models are generally constructed from smooth materials can the authors comment further on the representation of roughness within scaled models and any implications? Why is friction expected to be underestimated in more distorted models? 8. P9 L11 – Can the authors comment on why they expect the third effect to be probably dominant? Perhaps this should be phased 'The third of these effects. . ..'

Technical comments 1. P2 L2 'then ever observed in the past' should be removed (too

many points in one sentence) 2. P3 L6 ‘ replace ‘were’ with ‘have been’ 3. P3 L11 – Seems to have a divide symbol? 4. P4 L34 – Replace ‘it was never’ with ‘has not to date been’

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