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Modelling flume-scale soil erosion experiments

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Soil erosion experimentation is fraught with difficulties. Experimental results are affected by initial and boundary conditions, surface and subsurface heterogeneities, as well as sampling and measurement techniques. It is therefore important to interpret these results rightly, not least where they are used in the evaluation of soil erosion models.

This contribution presents our attempts at reproducing experimental results of flume-scale soil erosion studies using a physics-based model. We discuss the representation of initial and boundary conditions, soil properties, surface microtopography, and infiltration as affected by surface sealing in the model. Discrepancies as well as agreements between experimental and model results, in terms of discharge, total sediment concentration and particle size distribution, are highlighted. We then examine the optimised model parameters and demonstrate equifinality, emphasising the importance of process understanding, parametric constraints, and experimental design. Finally, we discuss the implications of our findings for model transferability.