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Assessing the influence of the variability of soil surface characteristics on infiltration and runoff: an experimental approach in the lab.

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Soil surface characteristics (SSCs) are highly variable even at a small scale ($<$ 1m2) and the infiltration-runoff partitioning under rainfall is dependent on the spatial variability and spatial structure of SSCs. For a better understanding of the influence of the variability of SSCs on infiltration-runoff partitioning, a modelling approach may be needed due to the complexity of the problem, but at the same time experiments are needed with measurements of all components of the soil water balance, namely soil water storage, drainage, soil surface detention and runoff. The aim of this paper is to describe the experimental setup and the first results of an infiltration-runoff experiment conducted in the lab under simulated rainfall on a 2D model of heterogeneous remoulded soil. A 50cm long x 10cm wide x 20 cm high model of soil with a wavy surface was first built. The wavy surface created 3 depressions of increasing depth (0.2 to 2.5 cm) from upstream to downstream. 3 pats of compacted soil were then inserted at the bottom of the depression: this model was representative for a system of sedimentary crusts and undisturbed soil. 24 micro-tensiometers were inserted to measure soil water matrix potentials every 10 s, and runoff flow was recorded at the same time step. Distributed drainage flow was manually measured. The soil model was then placed under a rainfall simulator using the facilities of the INRA Soil Science Lab in Orléans, France. Hydrodynamic properties of the un-compacted soil and compacted soil were measured with the Wind's evaporation method. Digital Elevation Model (DEM) of the soil model was obtained at the beginning and at the end with a laser profile-meter and with a photogrammetric method. Photogrammetry was also used to

estimate the amount of water stored in depressions at the soil surface. First results show the relations between the evolution in time of the depressional water storage, the runoff flow and the soil matrix potentials. This kind of experiment provides data helpful for the validation of numerical model coupling distributed soil infiltration and distributed runoff and accounting for the variability of soil hydrodynamic properties.