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Small scale rainfall simulators: Challenges for a future use in soil erosion research

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Rainfall simulation on micro-plot scale is a method used worldwide to assess the generation of overland flow, soil erosion, infiltration and interrelated processes such as soil sealing, crusting, splash and redistribution of solids and solutes. The produced data are of great significance not only for the analysis of the simulated processes, but also as a source of input-data for soil erosion modelling. The reliability of the data is therefore of paramount importance, and quality management of rainfall simulation procedure a general responsibility of the rainfall simulation community. This was an accepted outcome at the "International Rainfall Simulator Workshop 2011" at Trier University. The challenges of the present and near future use of small scale rainfall simulations concern the comparability of results and scales, the quality of the data for soil erosion modelling, and further technical developments to overcome physical limitations and constraints.

Regarding the high number of research questions, different fields of application, and due to the great technical creativity of researchers, a large number of different types of rainfall simulators is available. But each of the devices produces a different rainfall, leading to different kinetic energy values influencing soil surface and erosion processes. Plot sizes are also variable, as well as the experimental simulation procedures. As a consequence, differing runoff and erosion results are produced.

The presentation summarises the three important aspects of rainfall simulations, following a processual order:
1. Input-factor "rain" and its calibration
2. Surface-factor "plot" and its documentation
3. Output-factors "runoff" and "sediment concentration"

Finally, general considerations about the limitations and challenges for further developments and applications of rainfall simulation data are presented.