



A pressure nozzle inventory for rainfall simulations in soil erosion research

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Rainfall simulations became a very important tool for soil erosion research. They enable researchers to focus explicitly on different factors and processes to improve our understanding of processes and help to quantify erosion rates independently from natural events. During the last decades a multitude of different simulators for various purposes were developed. A major problem, which every scientist has to face while constructing a new rainfall simulator, is to find the best nozzle available for the aspired scientific purpose. Nozzle characteristics like water consumption, homogeneity of spray pattern, "natural" drop size spectrum and fall velocity, and the reproducibility of characteristics are most important for their utilization in rainfall simulations. However, the characteristics of simulated drops vary for each nozzle with water temperature, system pressure, and setup of simulator. The selection of one out of hundreds of possible nozzles is very difficult and often involves very time consuming testing. The aim of this study was therefore to create an inventory of pressure nozzles, which are frequently used in soil erosion research and to describe their rainfall characteristics following a standardized set of tests. The drop fall velocity and drop size was measured with the Thies Laser Precipitation Monitor, rainfall kinetic energy with a Joss-Waldvogel Distrometer, and the spatial rainfall pattern with rain gauges (area of 12x11 rain gauges, each with an opening of 10x10 cm). The results show a wide range of different drop spectra, spatial homogeneity and through-flow. It can be seen that there is not one single nozzle that fits all purposes, but a lot of nozzles that might be useful for various purposes. This inventory can support researchers in finding the best nozzle for their aim, by providing a list of nozzles with specific characteristics and thus reducing the amount further testing.