Rainfall simulation experiments – drop size distribution and fall velocity of artificial rainfall

Ries, J. B., Iserloh, Th., Fister, W.

Universityt of Trier, Physical Geography, D-54286 Trier, Germany (riesj@uni-trier.de / Fax: +49 651 201 3976

A lot of study groups in Germany, Spain, Morocco and other countries use small mobile rainfall simulators to quantify soil and water losses under different crops, tillage systems and treatments especially on agriculture land in semi arid and arid landscapes. Often a small mobile nozzle type simulator with a motor-driven pump and a single conventional nozzle in a high of 2 m is used. A high number of experiments were made with such simulators but just small information is published about the structure of the artificial rainfall and the fall velocity. The produced artificial rainfall of our simulator has an intensity of ca. 40 mm h^{-1} on a plot of 0,3m^2.

To elaborate the drop fall velocity two methods are used: 1. Thies Laser Disdrometer and 2. commercial digital small format camera. The result of the measurement with the Laser Disdrometer shows that the drop size distribution is quite similar to natural rainfall, but the artificial drops with small diameters are faster than the natural rain drops with same diameter. The large artificial drops behave opposite. They are slower than the natural rain drops with the same diameter. This is an important factor for the applied kinetic energy, which increases potentially with increasing drop size under natural conditions. It seems that the nozzle produces this problem. The water is atomized under the used pressure. Therefore small drops were accelerated on a velocity which is not realistic for rain. The big drops are created by a 'large drop adapter' behind the jet but the hight of 2 m is not sufficient for the end velocity of natural large drops.

With a digital camera the drops can be documented with the right exposure time. But only the larger drops can be viewed on the picture and the sterical problems prevent accurate data.