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Application of optical disdrometer to characterize simulated rainfall and measure drop size distribution

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Soil erosion by water is becoming a major threat in tropical and semiarid regions, which is causing a serious of land degradation and socio-economic problems. Knowledge of rainfall characteristics, drop size distributions and relationship between rainfall elements is essential for development of erosion-mitigation strategies. Thus, this research was carried out to further investigate the nature of raindrop size distribution, median volume drop diameter (D50) and radar reflectivity (dBz) of the different intensities using simulated rainfall and optical distrometer. Besides, operational principle and capabilities of the optical distrometer (Laser Precipitation Monitor (LPM)) to characterize rainfall of different intensities and conduct measurement was evaluated. The rain was simulated from 12 meter height and the sensor constantly and automatically recorded the diameter and terminal velocity of each raindrop and gave the output in every 1 minute interval. The median volume drop diameter (D50) of the simulated rain was found to be higher than the natural rain for almost all rainfall intensities, which might be attributed to variation in rainfall types and prevalence of turbulence in natural rain that makes larger drop sizes unstable. The result of radar reflectivity (Z) and intensity (R) relationship revealed that, similar to natural rainfall, power law function is the most suitable equation for all rainfall rates (Z=aRb). For the whole rainfall intensity datasets (1.5 to 202 mm h-1) a varies from 0.94 to 2.46 while b ranges from 162 to 706. The optical device used in the study was found to be efficient and suitable to the purpose of rainfall characterization at 1 min resolution.