EGU2020-15394
https://doi.org/10.5194/egusphere-egu2020-15394
EGU General Assembly 2020

The use of high-speed camera technique for observation of soil splash phenomena

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Soil, i.e. the natural outer layer of the lithosphere and an important component of many ecosystems, may be subjected to various degradation processes dependent on different factors. One of the forms of degradation is water erosion, where the first stage is the splash phenomenon. This process is caused by water drops hitting the soil surface during rainfall, which results in detachment and ejection of splashed material and transport thereof over different distances. The aim of this study was to present the application of the high-speed camera technique for investigations of surface phenomena (effects) influenced by the impact of a single water-drop onto the soil surface.

The measurements were conducted on types of soil differentiated in terms of texture and variants of initial moisture content, which helped to observe different aspects of the soil splash phenomenon. Water drops with a diameter of 4.2 mm fell on soil samples with various kinetic energy values depending on the height of the drop fall (up to 7m). Phantom Miro M310 high-speed cameras were used to observe the effects of the drop impact. The devices registered images with a speed of 3260 fps (frames per second) at the highest available resolution (1280x800 pixels). The following phenomena were observed: I) ejection of splashed particles (including solid soil particles, water droplets, solid particles within the water sheath); II) crown formation – when the drop impacting onto wet soil surface forces the liquid layer to rise up and form a crown (important for the mode and amount of transferred material); III) micro-crater formation – the deformation of the surface and formation of a shallow pool after the drop impact.

This work was partly financed from the National Science Centre, Poland; project no. 2018/31/N/ST10/01757.

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