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Slope incline as a factor influencing the ejection of two-phase soil splashed material

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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 physical degradation is water erosion, where the first stage is the splash phenomenon caused by water drops hitting the soil surface during rainfall. This process results in detachment and ejection of splashed material and transport thereof over different distances. One of the factors that influences the magnitude of soil splash is the incline of the surface (slope). The aim of this study was to check the effect of the slope on the course of the splash phenomenon caused by single-drop impact, with respect to the mass and proportions of the ejected material, taking into account its division into solid and liquid phases i.e. soil and water.

The measurements were conducted on three types of soil differentiated in terms of texture, in moistened conditions (pressure head corresponding to -1.0 kPa). Three slope inclines were investigated: 5° , 15° , and 30° . After a single-drop impact (with a diameter of 4.2 mm), the ejected material was collected using a splash cup. Based on this the following quantities of splashed material were measured: the total ejected mass, the mass of the ejected solid phase and the mass of the ejected liquid phase. Also, the distribution and proportions (soil/water) of the splashed material were analysed in both the upslope and downslope directions. The results showed that: a) the change of slope had a variable influence on the measured quantities for different soils; b) the measured values were mainly influenced by the texture; c) with the increase of slope, the splashed material was mostly ejected in the downslope direction; d) the ejected material consisted mostly of water, this occurred for material ejected both upslope and downslope.

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References:

Beczek M., Ryżak M., Mazur R., Sochan A., Polakowski C., Bieganowski A.: Influence of slope incline on the ejection of two-phase soil splashed material. PLOS ONE 17(1): e0262203, 2022

