

EGU22-3290

<https://doi.org/10.5194/egusphere-egu22-3290>

EGU General Assembly 2022

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Determination of Rill Erodibility and Critical Shear Stress of Saturated Purple Soil Slopes

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The hydrological conditions near the soil surface influence the soil erosion process, as determined by the soil erodibility and critical shear stress. The soil erodibility and critical shear stress of saturated purple soil slopes were computed and compared with those of unsaturated purple soil slopes. The detachment capacities computed through the numerical method (NM), modified numerical method (MNM) and analytical method (AM), from rill erosion experiments on saturated purple soil slopes at different flow rates (2, 4, and 8 L min⁻¹) and slope gradients (5, 10, 15, and 20°), were used to comparatively compute the soil erodibility and critical shear stress. The computed soil erodibilities and critical shear stresses were also compared with those of unsaturated purple soil slopes. At the different slope gradients ranging from 5° to 20°, there were no significant differences in the soil erodibilities of the saturated purple soil and also in those of the unsaturated purple soil. The critical shear stresses slightly varied with the slope gradients. The saturated purple soil was relatively significantly more susceptible to erosion. The NM overestimated the soil erodibility of both saturated and unsaturated soils by 31% and underestimated the critical shear stress. The MNM yielded the same soil erodibility and critical shear stress values as the AM. The results of this study supply parameters for modeling rill erosion of saturated purple soil slope.