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Simulated rainfall experiments on water repellent post mine sites

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Reclaimed lignite mine areas are heavily endangered by erosion by water. This leads to heavy soil losses, especially on hydrophobic and non-vegetated soil surfaces. Beyond that, erosion-induced discharge of detached dump particles in abandoned open pits leads to acidification of surface waters.
Therefore land management in former mining regions requires long-term and safe structuring of recultivation areas. The objective of this ongoing study is the development of a methodology to determine erosion risks on slopes in recultivation areas with the help of the event-based physical erosion model EROSION 2D/3D (Schmidt, 1991, 1992; v. Werner, 1995). The widely used model is able to predict runoff as well as detachment, transport and deposition of sediments.
Lignite dump materials show strong water repellency due to hydrophobic substances that coat soil particles. As affecting infiltration processes the effect of water repellency had to be implemented into EROSION 2D/3D. To obtain necessary input data for erosion modelling (hydraulic roughness, infiltration rates, calibration factors, etc.) a number of rainfall experiments on non-vegetated as well as recultivated reclaimed mine sites in the Lusatia lignite mining region (southeast of Berlin, Germany) were conducted. Very low infiltration rates were measured on non-vegetated water repellent sites. These processes could be described by EROSION 2D infiltration modelling. Changes of surface runoff and particle detachment and dynamic effects on infiltration are considered with the experimentally determined parameters “skin-factor”, “resistance to erosion” and “hydraulic roughness”. Current analysis show that a newly developed water repellency-factor helps to depict infiltration and erosion processes on water repellent dump soils.