Geophysical Research Abstracts
Vol. 15, EGU2013-5992, 2013
EGU General Assembly 2013

Infiltration and soil erosion modelling on Lausatian post mine sites

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Land management of reclaimed lignite mine sites requires long-term and safe structuring of recultivation areas. Erosion by water leads to explicit soil losses, especially on heavily endangered water repellent and non-vegetated soil surfaces. Beyond that, weathering of pyrite-containing lignite burden dumps causes sulfuric acid-formation, and hence the acidification of groundwater, seepage water and surface waters. Pyrite containing sediment is detached by precipitation and transported into worked-out open cuts by draining runoff. In addition to ground water influence, erosion processes are therefore involved in acidification of surface waters.
A model-based approach for the conservation of man-made slopes of post mining sites is the objective of this ongoing study. The study shall be completed by modeling of the effectiveness of different mine site recultivation scenarios. Erosion risks on man-made slopes in recultivation areas should be determined by applying the physical, raster- and event based computer model EROSION 2D/3D (Schmidt, 1991, 1992; v. Werner, 1995). The widely used erosion model is able to predict runoff as well as detachment, transport and deposition of sediments.
Lignite burden dumps contain hydrophobic substances that cover soil particles. Consequently, these soils show strong water repellency, which influences the processes of infiltration and soil erosion on non-vegetated, coal containing dump soils. The influence of water repellency had to be implemented into EROSION 2D/3D. Required input data for soil erosion modelling (e.g. physical soil parameters, infiltration rates, calibration factors, etc.) were gained by soil sampling and rainfall experiments on non-vegetated as well as recultivated reclaimed mine sites in the Lusatia lignite mining region (southeast of Berlin, Germany). The measured infiltration rates on the non-vegetated water repellent sites were extremely low. Therefore, a newly developed water repellency-factor was applied to depict infiltration and erosion processes on water repellent dump soils. For infiltration modelling with EROSION 2D calibration factors (e.g. water repellency factor, skin-factor, etc.) were determined in different steps by calibrating computer modelled infiltration, respectively volume rate of flow to the measured data.