Geophysical Research Abstracts
Vol. 17, EGU2015-15201-1, 2015
EGU General Assembly 2015

Extensive rill erosion and gullying on abandoned pit mining sites in Lusatia, Germany

Franziska Kunth (1), Andreas Kaiser (1), Markéta Vláčilová (2), Marcus Schindewolf (1), and Jürgen Schmidt (1)

(1) Soil and Water Conservation Unit, Technical University Bergakademie Freiberg, D-09599 Freiberg, Germany, (2) CTU in Prague, Faculty of Civil Engineering, Czech Republic

As the major economic driver in the province of Lusatia, Eastern Germany, the large open-cast lignite mining sites characterize the landscape and leave vast areas of irreversible changed post-mining landscapes behind. Cost-intensive renaturation projects have been implemented in order to restructure former mine sites into stabile self-sustaining ecosystems and local recreation areas. With considerable expenditure the pits are stabilized, flooded and surrounding areas are restructured.

Nevertheless, heavy soil erosion, extensive gullying and slope instability are challenges for the restructuring and renaturation of the abandoned open-cast mining sites. The majority of the sites remain inaccessible to the public due to instable conditions resulting in uncontrolled slides and large gullies.

In this study a combined approach of UAV-based aerial imagery, 3D multi-vision surface reconstruction and physically-based soil erosion modelling is carried out in order to document, quantify and better understand the causes of erosion processes on mining sites. Rainfall simulations have been carried out in lausatian post mining areas to reproduce soil detachment processes and observe the responsible mechanisms for the considerable erosion rates. Water repellency and soil sealing by biological crusts were hindering infiltration and consequently increasing runoff rates despite the mainly sandy soil texture. On non-vegetated experimental plots runoff coefficients up to 87 % were measured.

In a modelling routine for a major gully catchment regarding a 50 years rainfall event, simulation results reveal runoff coefficients of up to 84% and erosion rates of 118 Mg*ha-1. At the sediment pass over point 450Mg of sediments enter the surface water bodies.

A system response of this order of magnitude were unexpected by the authorities. By applying 3D multi-vision surface reconstruction a model validation is now possible and further may illustrate the great importance of soil conservation measures under the described conditions.