Geophysical Research Abstracts
Vol. 15, EGU2013-14109, 2013
EGU General Assembly 2013

Variability of the wind-driven rain effect on soil erosion in different landscapes

Wolfgang Fister (1), Thomas Iserloh (2), Miriam Marzen (2), Manuel Seeger (2), Nikolaus J. Kuhn (1), Goswin Heckrath (3), and Johannes B. Ries (2)

(1) University of Basel, Physical Geography and Environmental Change, Basel, Switzerland (wolfgang.fister@unibas.ch), (2) Trier University, Physical Geography, Trier, Germany, (3) Aarhus University, Department of Agroecology, Aarhus, Denmark

Laboratory investigations on wind-driven rain during the last decade showed that wind modifies the characteristics of the falling raindrops in many ways. Most importantly, the impact angles and impact frequencies as well as the drop velocities and drop sizes are modified, what result in a higher kinetic energy. Consequently, the results indicate that erosion rates increase under the influence of wind. However, these experiments were mostly accomplished on highly disturbed loose substrates, which cannot reflect the complexity of natural soils. Therefore, the Portable Wind and Rainfall Simulator (PWRS) was utilized on different soils in The Netherlands, Denmark, and Spain to explicitly investigate the importance of wind-driven rain for soil erosion in relation to erosion rates without the effect of wind.

All experiments were done by using the same extreme rainfall event (88-96 mmh-1), to ensure comparability between the results, with disregard to the actual rainfall characteristics and intensities prevailing in these landscapes. The test sites differed from crusted silty loam to fine loose sand and leeward slopes from less than 2° up to 10°. The results showed highly variable and therefore ambiguous results regarding the importance of the wind-driven rain effect. Soil erosion rates varied between zero and up to 150 g m-^{2} in 30 minutes. In most cases, the erosion rates under wind-driven rain exceeded or were at least similar the ones under windless conditions. However, apart from the wind-driven rain itself, no clear correlation could be found between the influencing parameters (e.g. slope angle, initial soil moisture content, surface roughness) and erosion rates. Not even the amount of runoff shows a clear correlation with erosion rates. Therefore, so far no explicit reason or single parameter could be found that determines the importance of wind-driven rain on soil erosion rates, which reveals the fact, that the response of natural soils to (wind-driven) rainfall events is highly complex and far from being well understood. To further our understanding of the processes involved and to enable us to adequately implement the processes of wind-driven rain into physically based soil erosion models, it is indispensable to develop better techniques to assess the initial soil properties and to accomplish more experiments on autochthonous soils with realistic boundary conditions.