Geophysical Research Abstracts
Vol. 20, EGU2018-2193, 2018
EGU General Assembly 2018
© Author(s) 2018. CC Attribution 4.0 license.

Breakdown and transportation relationship between rainfall kinetic energy and soil aggregate

Yu Fu (1), Li Guanglu (1,2), Wang Dong (2), and Zheng Tenghui (1)

(1) Institute of soil and water conservation, Northwest Agriculture and Forestry University, Yangling, China (aily_fy@163.com), (2) College of Resources and Environment, Northwest Agriculture and Forestry University, Yangling, China (guangluli@nwsuaf.edu.cn)

Splash erosion, which is the main dynamic for the detachment and transport of soil aggregates, is the initial stage of soil water erosion. Destruction of the plough layer aggregate has a negative effect on the content of soil available water and soil fertility, destroying the soil structure and restricting agricultural development of the Loess Plateau in China. The purpose of this study was to determine the effect of different rainfall kinetic energy on the breakdown of soil aggregates in plough layer and its characteristic of transportation and fractions distribution during splash erosion. The study analyzed the soil aggregate splash mass and fractions distribution under six rainfall conditions (rainfall kinetic energy: 2.41×10-5-22.4×10-5 J m-2s-1) at five splash distances (0-50 cm). Dark loessial soil was selected as research subjects, which was located at the agriculture ecological experimental station of northwest A F university in Changwu County, Xianyang City, Shaanxi Province (107° 40′59″E, 35° 14′27″N). The splashed fragments were sieved with aperture (2, 1, 0.5, 0.25, 0.053 mm) using an aggregate analyzer (HR-TTF-100). All aggregate fragments were oven dried for 24 h at 105°C and weighed. The results indicated that splashed aggregates mainly distributed at the splash distance 0-20 cm. The splash amount significant decreases exponentially with the increase of splash distance for the same rainfall kinetic energy (P [U+FF1C] 0.01). The splash amount significant increases power function relationship with the increase of rainfall kinetic energy at the same splash distance (P < 0.05). A model was obtained to predict the amounts of splash detachment (M) for the rainfall kinetic energy (E) and distance of splash detachment (S): M=5.932×108E3.529 S-1.949, (R2=0.921 [U+FF0C] P [U+FF1C] 0.001). The aggregate content of the particle size > 0.25 mm presented down-up trend with the increase of the rainfall kinetic energy. The fractal dimension (D) with rainfall kinetic energy changed evidently as quadratic function. And the extreme point of rainfall kinetic energy was 1.286×10-4 J m-2s-1 which made the aggregate broken degree largest. The result confirmed that ER values for >1 mm fragments were close to 0. The particle size of 0.25 mm was the critical particle level of the splash erosion, and the large aggregate (> 0.25 mm) was mainly broken into the particle size 0.25-0.053 mm aggregates. The results can be insight into the variation of the aggregate in the soil layer during rainfall, and put forward the design reference basis to lay prevention and control measures of soil splash erosion.