



The effect of the formation of the micro-terraces on the connectivity of the sediment transport on sandy granitic soil

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In sandy soil, the step and mound-like formation of the erosion/ deposition structures have been reported (Ribolzi et al., 2011; Mayer et al., 2008) by visual observation or small-scale experiments though it has not been analyzed quantitatively in the field. Especially no data are available on the sediment transport distance in such erosion areas. Recently, the development of Unmanned Aerial Vehicle based Structure from Motion (UAV-SfM) technique can provide the hi-resolution and hi-accuracy topographic data. This study aimed to detect the step-like erosion and deposition and discuss the step-like erosion and deposition process.

Our study site was located in Yamakiya district, Fukushima, Japan. This area was decontaminated in 2014 by the Ministry of Environment to reduce the air dose rate by removing topsoil and overlaying decomposed granite soil (organic matter: 4.6%, sand: 68.8%, silt: 19.7%, clay: 6.9%, measured on 10/10/2019). We installed a USLE soil erosion plot (5 m wide and 21 m long) on the farmland slope. The topography in the plot was measured by the UAV-SfM method. UAV used in this study was Phantom4 Pro and flying height was 5 – 10 m. 200 – 400 photos were taken for each survey. Photos were imported to Photoscan, and 3D point clouds were reconstructed. 3D point clouds were imported to ArcGIS pro and converted to DSM data. Finally, soil surface changes were calculated for each survey period. Transport distances of soil particles were measured by RFID tags. RFID tags were coated with cement, bronze powder, fluorescent paint, and topcoat and had 3 – 5 mm size and 2.0 – 3.0 g cm⁻³ density. 100 RFID tags were set to the soil surface.

Step-like erosion and deposition were observed between 8/28/2019 – 10/16/2019. Soil surface change in this period showed that erosion and deposition were repeated and higher erosion on the lower slope position. Topography data also showed steeper step structures in the eroded area than the depositional area. Median transport distance of RFID tags in the interrill areas is 4.1 cm, and 76 cm in the terracet areas. Therefore, we found the effect of soil mounds and the terracettes on the bare soil connectivity significantly increase the sediment connectivity and sediment transport distance.