Effect of stone on threshold friction velocity in Tsogt-Ovoo, Mongolia: Observation and Model simulation

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In arid areas, surface roughness is mainly controlled by inert non-erodible elements such as rocks, stone, gravel, and green and senescent vegetation. They affect the erosion threshold in two ways. First, the elements cover part of the surface and thus protect it from the Aeolian erosion. Secondly, they consume part of the wind momentum that will not be available to initiate particle motion (Marticorena et al., 1997). Although the effect of stone and gravel on sand flux is studied by mainly a field wind tunnel measurement, there are few reports on the simulation of threshold friction velocity and field observation with the stone effect of the Gobi Desert. We will show the results of the threshold friction velocity and sand flux by observation and simulation around Tsogt-Ovoo located in the northern part of the Gobi Desert, Mongolia. Simulations were conducted with two conditions which are with and without stone effects. We made measurements of stone coverage, sand saltation count, and meteorological parameters at 11 sites during 31 April –5 May 2018 and 25 April –10 May 2019. Threshold friction velocities were estimated from sand saltation count data observed at 30-seconds intervals. Vertically integrated sand saltation flux for each dust event was estimated from saltation amount data observed by passive samplers installed at 10 cm, 30 cm, 50 cm, and 100 cm heights. We used the dust emission scheme of Shao (2004). Figure 1 shows that simulation results are improved very well at sites by an installation of stone effects except for the Main site and the site of 2019Sub14A in 2019. Regarding the Main site and the site of 2019Sub14A, we are thinking the senescent vegetation and soil crust suppressed the sand saltation, but we don’ t have quantitative data about them.

Keywords: saltation, stone, roughness, erosion threshold, Gobi Desert

