3.034 Experimental study on motion characteristics of saltating grains under crusted soils related to the dust emission in drylands.

Early Career Scientist

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Abstract:

Desertification is spreading in the world, and environmental change on the global scale is occurring. One of the peculiar phenomena in drylands is dust. Dust generated by saltation not only decreases agricultural productivity due to loss of nitrogen and phosphorus contained in surface soil and increases health damage due to air pollutants such as $PM_{2.5}$, but also affects the global climate. Soil crust is one of the ground surface conditions that affect dust generation (Ishizuka et al., 2012).

In this study, wind tunnel experiments are conducted to clarify the mechanism of soil crust destruction and particle motions under crusted soils. Toyoura sand is used as saltating grains and Mongol soil which has relatively larger particles (Loam) is used as a target soil. In addition to the Mongol soil, Kasaoka soil which has relatively fine particles (Silty clay loam) was used.

As a result of the wind tunnel experiment, the lift-off angle of saltating grains is larger in the Mongol soil than that in the Kasaoka soil. The lift-off velocity decreases due to the loss of kinetic energy after saltating grains hit the ground surface for both the Mongol soil and the Kasaoka soil. As for the amount of soil erosion weight under non-aggregated condition, the Mongol soil is more eroded than the Kasaoka soil. PTV (Particle Tracking Velocimetry) analysis by using a high-speed camera (8000 fps) shows the reduction rate

of kinetic energy in the Mongol soil is larger than that in the Kasaoka soil. As for the amount of soil erosion weight of the Mongol soil under aggregated condition, the more moisture supplied, the less amount of soil is eroded by saltating grains.