飛砂風洞装置を用いた弱い土壌クラストが飛砂とダスト発生に与える影響の解明

Wind tunnel experiments for saltation and dust emission under weak crusted Mongolian soil

*石塚 正秀[1]、中原 優祐[5]、政岡 瞳見[6]、中尾 元軌[6]、石井 智之[6]、黒崎 泰典[2]、萩野 裕章[3]、中村 公一[7]、Gantsetseg Batdelger[4]、南光 一樹[9]、西原 英治[8]、鈴木 覚[9]
*Ishizuka Masahide[1], Yusuke Nakahara[5], Hitomi Masaoka[6], Genki Nakao[6], Tomoyuki Ishii[6], Yasunori Kurosaki[2], Hagino Hiroaki[3], Kouichi Nakamura[7], Batdelger Gantsetseg[4], Kazuki Nanko[9], Eiji Nishihara[8], Satoru Suzuki[9]

1. 香川大学創造工学部、2. 鳥取大学乾燥地研究センター、3. 森林総合研究所東北支所、4. モンゴル水文気象環境情報研究所、5. 香川大学大学院工学研究科、6. 香川大学工学部、7. 鳥取大学工学部、8. 鳥取大学農学部、9. 森林総合研究所森林研究部門
1. Kagawa University, Faculty of Engineering and Design, 2. Tottori University, Arid land research center, 3. Forestry and Forest Products Research Institute, Tohoku Research Center, 4. Information and Research Institute of Meteorology Hydrology and Environment, 5. Kagawa University, Graduate school of Engineering, 6. Kagawa University, Faculty of Engineering, 7. Tottori University, Faculty of Engineering, 8. Tottori University, Faculty of Agriculture, 9. Forestry and Forest Products Research Institute, Meteorology and Hydrology

Dryland area is enlarging and its environment is changing in the globe. Mineral dust is generated from such dry area and causes various problems such as health damage which is caused by well-known air pollutants such as $PM_{2.5}$, traffics stoppage due to low visibility, and a reduction of agricultural productivity due to loss of nitrogen and phosphorus contained in surface soil. The nutrients and soil minerals make algal blooms in ocean and its photosynthesis makes CO_2 absorption from atmosphere. Mineral dust itself acts as an ice nuclei primarily and effects cloud formation, and absorbs and/or diffuses solar and infrared radiations secondary. In addition, it transports biological gene of microorganism and bacteria attached to the soil surfaces. Like this, mineral dust gives large influences for various fields and is important to understand the natural and social changes.

This study focuses on the emission process of dust, especially, soil crust effect on the saltation and dust emission. Soil crust is one of the ground surface conditions, which affects dust generation largely due to strong soil aggregation. But it is well not understood how much soil crust effects saltation and dust emission amount yet. To clarify this, wind tunnel experiment was conducted in a laboratory of Forestry and Forest Products Research Institute, Tsukaba, Japan. Toyoura sand is used as saltating grains and Mongol soil which has both finer and larger particles (Loam) sampled at Tsogt-Ovoo in the northern Gobi Desert is used as a target soil. The water ratio is set 0-15 % for making artificial soil crust.

PTV (Particle Tracking Velocimetry) analysis by using a high-speed camera (30000 fps) shows the reduction of kinetic energy of saltation particle after it hits the ground surface. The crusted surface soil was not much erodible under the higher water ratio. Dust concentration decreases under the crusted condition. These findings are fundamental for elucidating the process of dust emission and will link to improve dust forecasting accuracy by atmospheric models.

キーワード：黄砂、アジアンダスト、乾燥地、含水比、PM2.5

Keywords: KOSA, Asian dust, dryland, water ratio, PM2.5

