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Changes in soil aggregation and dust emission potential in response to aeolian processes

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Aeolian (wind) dust emission has high environmental and socioeconomic significances due to loss of natural soil and air pollution. Dust emission involves complex interactions between the airflow and the soil surface. The soil aggregates were dust particles are held determine the topsoil erodibility in aeolian erosion. Although the key role of soil aggregation in dust emission mechanisms, information on changes in soil aggregate size distribution (ASD) due to aeolian erosion is lucking. This study is focused on quantitative ASD analyses before and after aeolian processes (saltation). Aeolian experiments and soil analyses were conducted on semiarid loess topsoils with different initial conditions of aggregation. The results show that saltation rates and PM emissions depend on the initial ASD and shear velocity. In all initial soil conditions, the content of aggregates at saltator-sized 63-250 μm was increased by 10-34 % following erosion of macro-aggregates > 500 μm. It revealed that the aggregate-saltator production increases with the shear velocity (up to 0.61 m s-1) for soils with available macro-aggregates. The findings highlight the dynamics in soil aggregation in response to aeolian transport and therefore its significance for determining the mechanisms of dust emission from soil aggregates.