Geophysical Research Abstracts
Vol. 17, EGU2015-4062, 2015
EGU General Assembly 2015

Analysis of topsoil aggregation with linkage to dust emission potential

Nitzan Swet and Itzhak Katra
Department of Geography and Environmental Development, Ben-Gurion University of the Negev, Israel (swet@post.bgu.ac.il)

Dust emission by soil erosion has environmental and socioeconomic significances due to loss of a natural resource and air pollution. Topsoil resistance to erosion depends on its physicochemical properties, especially on the soil aggregation. Aggregate size distribution of soil samples is commonly used for the assessment of soil stability and fertility. It is suggested that aggregates larger than 840 μm in their effective diameter are stable to aeolian (wind) soil erosion. However the physicochemical properties of aggregates should be considered in determining the dust emission potential from soils. This study focuses on quantitative analyses of physical and chemical properties of aggregates in order to develop a soil stability index for dust emission. The study integrates laboratory analyses of soil samples and aeolian experiments of dust emission. Soil samples were taken from different land uses in a semi-arid loess soil that is subjected to aeolian erosion and dust emission. Laboratory tests include particle size distribution (PSD), soil organic carbon (SOC), inorganic carbon ($CaCO_3$), water content (WC), and elemental composition by XRF technique. The size analysis shows significant differences in aggregation between natural-soil plots (N) and grazing-soil plots (G). The MWD index was higher in N (1204 μm) than that of G (400 μm). Basic aeolain experiments with a boundary layer wind tunnel showed dust emission of particulate matter (PM10) from both soils, although the concentrations were significantly lower in N plots. Aggregates at specific size fractions are characterized by different content of cementing agents. The content of fine particles (< 20 μm) and SOM were higher in macro-aggregates (500-2000 μm), while the $CaCO_3$ content was higher in aggregate fraction of 63-250 μm. WC values were highest in micro-aggregates (< 63 μm). However the lowest content of these cementing agents were mostly found in the aggregate size fraction of 1000 μm. Differences between the aggregate size-fractions were found also in particulate matter (PM10) concentration. Regression tests between aggregate size and the cementing agents show a significant correlation only with SOM (r2= 0.5). The next step will be advanced soil analyses and laboratory aeolian simulations in order to determine dust emission potential from different topsoil structures. The results provide a better understanding of aggregation processes, soil stability to erosion, and dust emission from soils.