Experimental Evaluation of Relative Efficiency of MWAC, MDCO, CDSC, and CDS Aeolian Dust Traps

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Abstract

Quantitative measurement of aeolian dust may help properly monitor and control the wind erosion. The aim of this study was to evaluate the efficiencies of four aeolian dust samplers including the modified Wilson and Cooke sampler (MWAC), cyclone dust sampler with cone (CDSC), cyclone dust sampler (CDS), and marble dust collector (MDCO) in comparison with the big spring number eight sampler (BSNE) in different velocity rates and particles sizes. For this purpose, MWAC, MDCO, BSNE were simulated and CDSC and CDS were designed and constructed. The relative efficiencies of the CDSC, CDS, MWAC, and MDCO were evaluated for the 80, 137, 260 micron diameter particle sizes (D_{50}) in 2-7 ms^{-1} velocity by wind tunnel. The results showed that relative efficiency of CDSC is higher than CDS, MWAC, and MDCO as a consequence of the wind speed. CDSC and CDS relative efficiencies varied in relation to wind velocity, but MWAC, MDCO relative efficiencies remained constant. Also, CDSC, CDS, MWAC, MDCO relative efficiencies varied from 0.8, 0.48, 2.18, 0.58 times by increasing the particle size diameters from 80 to 260 micrometers, respectively.

Keywords: Wind tunnel, Horizontal dust sampler, Vertical dust sampler.

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