

Horizontal sand-dust flux and particle size characteristics with height and the underlying surface during an intense sandstorm in Minqin oasis

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Abstract:

Aeolian dust is one of the main components of aerosols in troposphere and plays an important role in the climatic system. Detailed weather conditions and particle diameter distribution over three surfaces with different land cover characteristics in Minqin area have been measured. The results indicated that: (1) As dust storms progress through the desert and beyond the edge of and into the oasis, the variation of underlying surface not only influences the wind profile by modifying U_* and Z_0 , horizontal sediment flux and concentration of the sublayer (1-49 m), but also changes the vertical structure of the aeolian sediment transport pattern. (2) The particle size frequency distributions over three different surfaces all show a unimodal distribution, but the differences between desert and oasis are primarily in lower boundary layer and above 17 m the differences are much less. (3) When the sediment transported through desert finally reached the oasis, the horizontal sediment flux and concentration of the aeolian sediment with the four particle size ranges ($< 10 \mu\text{m}$, $10 \mu\text{m} - 63 \mu\text{m}$, $63 \mu\text{m} - 100 \mu\text{m}$, and $> 100 \mu\text{m}$) all decreased gradually with increasing transport distance over the oasis. (4) The variation of underlying surface influences the vertical structure and transport pattern of aeolian sediment significantly by changing the ratio of the particle settling velocity and friction velocity of the air mass, (V_{set}/U_*) .