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Identification of loess deposits in northeast Iran using particle size distribution analysis

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Despite the occurrence of highly silty soils in northeastern Iran, there is no information about the aeolian origin and/or *in situ* formation of these soils. The main objective of this investigation was to determine the source of silt generation in this area. The study area is located in southern Mashhad, an economically important and a highly populated city in northeast Iran. In this area, residual soils on granitic hilly lands have been discontinuously covered by a layer of silty deposits. In piedmonts, silty material is as thick as several meters. Four profiles including a residual soil covered by a silty layer, a residual soil with low amount of silt throughout the profile, a highly silty soil and an alluvial soil as well as a deep profile containing a succession of highly silty soils and alluvial materials were studied. Lithologic discontinuity was investigated through depth distribution curves of silt/sand ratio, Folk inclusive graphic standard deviation (σI) and Folk inclusive graphic skewness (SKI). Based on the results obtained, pure loessial (L), residual (R), alluvial (A) horizons and residual-loessial (R-L) and alluvial-loessial (A-L) horizons were identified. The average particle size of these layers was 5.5, 1.8, 3.1, 4.2 and 2.7ϕ, respectively. Loessial horizons consist of more than 70 % of total silt and more than 50 % coarse and medium silt. The cumulative particle size distribution curve of L horizons was sigmoidal in shape and is easily distinguishable from that of the other horizons. In contrast, cumulative particle size distribution curves of R and A horizons were best fitted by a spherical model. Besides, cumulative particle size distribution curves of both R-L and A-L horizons did not completely follow a sigmoidal or a spherical model but something in between. Particle size distribution histograms of R-L and A-L horizons were bimodal, a mode for sand and a mode for silt, suggesting two different sources. The L horizons had

the highest SKI but the lowest σI factors. Both R-L and A-L horizons showed the minimum SKI factor (almost zero) and the highest σI suggesting the addition of silt through aeolian processes. Depth distribution of silt/sand ratio, SKI and σI showed a drastic change between L horizons and the other layers. The lithologic discontinuity suggests that the silty layer and the underlying horizons are genetically different. In conclusion, despite the possible contribution of granitic parent rocks to silt generation in the area, loess deposits recognized in the area appear to have been mostly transported by aeolian movement.