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Size segregation process along the soil-saltation-dust continuum: observations in southern Tunisia

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The particle size segregation processes occurring between the soil, the saltation layer and the dust layer close to the surface are not well described while they are key steps for a precise assessment of dust emission. Improving our understanding and quantifying the role of the processes acting in these three compartments should significantly enhance the consistency of dust emission models.

Data obtained during the WIND-O-V (WIND erOsion in presence of sparse Vegetation) field campaign that took place in spring 2017 in southern Tunisia have been analyzed. Eight saltation events of durations from 1 to 4 hours were sampled and corresponded to a range of wind friction velocities between 0.28 and 0.46 m s⁻¹. The dispersed and non-dispersed size distributions of the soil and of the saltation fluxes were characterized and the micrometeorological conditions were also analyzed. Simultaneous measurements of size resolved saltation fluxes and size-resolved vertical dust fluxes were carried out. The combined analysis of size distributions of the parent-soil and of the horizontal and vertical fluxes reveals an enrichment of fine particles that increases with height. A consistent behavior is observed when comparing the particle size distribution of the saltation and of the vertical dust fluxes. Moreover, we observe changes in the size distributions from one event to another that are similar for the saltation and the dust fluxes. This strongly suggests that the processes controlling the saltation significantly affect the dust size distribution. The roles of the vertical transfer and of the micrometeorological conditions on the size distributions are also discussed.