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Abstract

Airborne in situ measurements of aerosol size distribution were conducted in May/June in southern Morocco. Observed size distributions are categorized into two groups with the first group having a larger number of small aerosols (effective diameter (D_p) < 0.1 μm, figure 1). The peak concentrations for group 1 and 2 are 0.05 μm and 0.11 μm, respectively (figure 1). For the size distributions investigated here, aerosols with D_p larger than 40 μm are rarely seen. D_p in the dust plume shows two main ranges: the first range peaks around 5 μm and the second around 8 μm (figure 1).

The effect of dry deposition on the aerosol number concentration is investigated. Figure 1 exhibits the number concentration of aerosol remaining in the atmosphere within 36 hours of observation. Subsidence removes aerosols of all sizes with faster subsidence rate for larger aerosols (figure 2b). If the mean density is 1 g/cm^3, for small aerosols the subsidence rate is less than 1 mm/s while for large aerosols (D_p > 10 μm) it exceeds 4 mm/s and after 36 hours roughly 35% of small aerosols remain in the atmosphere compared with less than 20% of large aerosols (figure 2a). If the mean density of aerosol is 1.5 g/cm^3, the subsidence rate exceeds 7 mm/s for large aerosols (figure 2b) and after 36 hours roughly 35% of small aerosols remain in the atmosphere while large aerosols are almost entirely removed (figure 2a).

The mean D_p of aerosols is 5 μm. If aerosol size dependence is neglected, the mean deposition rate is 2.4 mm/s. Such finding is on the same order of magnitude as Carlson and Prospero (1972) in which the deposition rate is found to be 1-2 mm/s. 71.6% of aerosols remain in the air after 12 hours, 47.4% after 24 hours and 27.4% after 36 hours assuming no size dependence.