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Particle size distributions in the Eastern Mediterranean troposphere

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Abstract. Atmospheric particle size distributions were measured on Crete island, Greece in the Eastern Mediterranean during an intensive field campaign between 28 August and 20 October, 2005. Our instrumentation combined a differential mobility particle sizer (DMPS) and an aerodynamic particle sizer (APS) and measured number size distributions in the size range 0.018 μm –10 μm . Four time periods with distinct aerosol characteristics were discriminated, two corresponding to marine and polluted air masses, respectively. In marine air, the sub- μm size distributions showed two particle modes centered at 67 nm and 195 nm having total number concentrations between 900 and 2000 cm^{-3} . In polluted air masses, the size distributions were mainly unimodal with a mode typically centered at 140 nm, with number concentrations varying between 1800 and 2900 cm^{-3} . Super- μm particles showed number concentrations in the range from 0.01 to 2.5 cm^{-3} without any clear relation to air mass origin. A small number of short-lived particle nucleation events were recorded, where the calculated particle formation rates ranged between 1.1–1.7 $\text{cm}^{-3} \text{s}^{-1}$. However, no particle nucleation and growth events comparable to those typical for the continental boundary layer were observed. Particles concentrations (Diameter <50 nm) were low compared to continental boundary layer conditions with an average concentration of 300 cm^{-3} . The production of sulfuric acid and its subsequently condensation on preexisting particles was examined with the use of a simplistic box model. These calculations suggested that the day-time evolution of the Aitken particle population was governed mainly by coagulation and that particle formation was absent during most days.

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