



Five-years of atmospheric aerosol number size distribution measurements in Eastern Mediterranean

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The first long term measurements of atmospheric particle size distributions from the Eastern Mediterranean region are reported. Atmospheric aerosol number size distributions have been measured at the environmental research station of University of Crete at Finokalia, Crete, Greece (35°20'N, 25°40'E, 250m a.s.l) on a continuous base since 2008. A custom built (TROPOS type) scanning mobility particle sizer (SMPS) is used covering size ranges from 8 to 900 nm. The system is humidity controlled so that relative humidity is kept below 40% most of the time. Throughout the measuring period the average number concentration of the particles in the studied size range was found to be $2354 \pm 1332 \text{ cm}^{-3}$ (median of 2098 cm^{-3}). Maximum concentrations are observed during summer while minimum during winter, reflecting the effectiveness of the removal processes in the region. Clear annual cycles are found for the number concentrations of nucleation, Aitken and accumulation mode particles. Nucleation mode is presenting different pattern from the other two modes, with the highest concentrations during winter (and March) and the lowest during summer. New particle formation events are more frequently observed during March and October.

The number size distributions present different seasonal patterns. During summer, unimodal distributions centering on the lower end of the accumulation mode size range are dominant in our observations. The prevailing meteorology characterized by the Etesian winds (Meltemi) and the lack of precipitation along the trajectory results to the arrival of well mixed air masses at Finokalia, carrying aged aerosol mainly from central and Eastern Europe. Regarding the other seasons, the shape of the distributions is more variable and strongly dependent on the air mass history: When the air masses are of marine origin or precipitation has affected them, the size distributions are mainly bimodal (peaking both in Aitken and in Accumulation mode). These distributions are representative of the background marine conditions at Finokalia. Unimodal distributions can be observed as well during the rest of the seasons depending on whether aged anthropogenic aerosol reach Crete before being removed from the atmosphere or not. The nucleation mode is observed mainly when new particle formation occurs and rarely can it be attributed to combustion processes or other sources.