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A case study of columnar marine and dust particle ratios calculated with photometric and lidar measurements during the CHARADMEXP campaign

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The CHARADMEXP campaign took place at the Finokalia meteorological station on the island of Crete, Greece from the 20th of June to 10th July 2014 deploying various instruments to monitor aerosol mixtures of dust and marine origin (more info at http://charadmexp.gr). In this study we focus on data recorded on 1st July. This day gain our interest because we had two distinguished layer of particles at different heights, sea salt near the ground and dust at planetary boundary layer height.

A raman/depolarization lidar (EMORAL) and a CIMEL photometer were simultaneously operating during the time of interest in the area. Multimodal analysis of retrieved AERONET volume size distributions on that day was used to distinguish between dominant aerosol types and to calculate the percentage contribution of each mode to the columnar volume concentration. Selection of the method was based on previous work which showed that in cases of mixtures that contain sea salt, bi-lognormals fail to recover key features of the average size distribution. Linear particle depolarization ratio profiles were used to discriminate spherical from non-spherical particles and to validate the columnar volume percentage contribution of different types provided by multimodal analysis.

We found that the column was dominated mainly by coarse mode aerosol of marine and dust origin in equal volume proportion in the morning hours. As the day progressed, dust concentrations declined and marine particles became dominant . Lidar profiles confirmed dual layering of particles. The aerosol load was found to be low (AOD$\approx$0.1-0.2) and allowed for a test of the sensitivity of the multimodal method at small concentrations.