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Atmos. Chem. Phys., 5, 2065-2079, 2005

www.atmos-chem-phys.net/5/2065/2005/

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Measurements of Saharan dust aerosols over the Eastern Mediterranean using elastic backscatter-Raman lidar, spectrophotometric and satellite observations in the frame of the EARLINET project

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Abstract. We report on the vertical distributions of Saharan dust aerosols over the N.E. Mediterranean region, which were obtained during a typical dust outbreak on August 2000, by two lidar systems located in Athens and Thessaloniki, Greece, in the frame of the European EARLINET project. MODIS and ground sun spectrophotometric data, as well as air-mass backward trajectories confirmed the existence of Saharan dust in the case examined, which was also successfully forecasted by the DREAM dust model. The lidar data analysis for the period 2000-2002 made possible, for the first time, an estimation of the vertical extent of free tropospheric dust layers [mean values of the aerosol backscatter and extinction coefficients and the extinction-to-backscatter ratio (lidar ratio, LR) at 355 nm], as well as a seasonal distribution of Saharan dust outbreaks over Greece, under cloud-free conditions. A mean value of the lidar ratio at 355 nm was obtained over Athens (53 ± 1 sr) and over Thessaloniki (44 ± 2 sr) during the Saharan dust outbreaks. The corresponding aerosol optical thickness (AOT) at 355 nm, in the altitude range 0-5 km, was 0.69 ± 0.12 and 0.65 ± 0.10 for Athens and Thessaloniki, respectively (within the dust layer the AOT was 0.23 and 0.21, respectively). Air-mass back-trajectory analysis performed in the period 2000-2002 for all Saharan dust outbreaks over the N.E. Mediterranean indicated the main pathways followed by the dust aerosols.

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Citation: Papayannis, A., Balis, D., Amiridis, V., Chourdakis, G., Tsaknakis, G., Zerefos, C., Castanho, A. D. A., Nickovic, S., Kazadzis, S., and Grabowski, J.: Measurements of Saharan dust aerosols over the Eastern Mediterranean using elastic backscatter-Raman lidar, spectrophotometric and satellite observations in the frame of the EARLINET project, Atmos. Chem. Phys., 5, 2065-2079, 2005. ▣ [Bibtex](#) ▣ [EndNote](#) [Reference Manager](#)

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