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Satellite remote sensing of long-range transported dust storm over Eastern Mediterranean and Greece

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In springtime several Saharan dust events are transported over Eastern Mediterranean mainly driven by the thermal cyclones. Some of these events are characterized of large intensity since the dust is uplifted from the North African desert regions by the strong surface winds and is transported in the vertical (from surface to about 5 km), thus strongly enhancing the columnar AODs and the surface PM concentrations. In this study we mainly focus on the intense dust event of 16-17 April 2005, when a thick dust layer transported from Libya affected the whole Greek territory. Very high aerosol optical depth values obtained from Aqua-MODIS sensor were observed over Greece (mean 2.42±1.25) on 17 April, while the respective mean April value is 0.31±0.09. The AOD550 values over Crete were even larger, reaching $\tilde{4}$.0. In addition, during the dust event the AI values derived from TOMS and OMI sensors exhibited very high (above 3.0) values. As a consequence, the PM10 concentrations over Athens are dramatically increased reaching up to 200 μgm-3. On the other hand, the fine-mode fraction values obtained from Terra-MODIS showed a substantial decrease in the whole Greek area on 17 April, with values below 0.2 in the Southern regions. The intense dust layer showed a complex behavior concerning its spatial and temporal evolution and allowed us to study the changes in the optical properties of the desert-dust particles along their transport routes due to mixing processes with other aerosol types. The Saharan dust event on 17 April was clearly evident via satellite true-color images as an intense dust plume originating from Libya, traversing the Mediterranean and arriving over Greece and the Balkan countries. The dust characteristics along its pathway from the African coast to continental Europe showed significant spatial inhomogeneity, since the larger particles were deposited near the source and the smaller transported to long distances. As a consequence, the AOD550 continuously decreased along the dust pathway. On the other hand, the mixing of the dust particles with anthropogenic aerosols over continental Europe had a clear effect on the increase of the fine-mode values.