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Identification of Saharan dust events over Athens using remote sensing data and back-trajectory analysis

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This study focuses on the identification of the Saharan dust (SD) events over Athens covering a 6-year (2000-2005) period. Daily data of aerosol optical depth at 550 nm (AOD550) associated with fine-mode (FM) fraction values from the MODerate resolution Imaging Spectroradiometer (MODIS) onboard EOS- TERRA polar-orbiting satellite and Aerosol Index (AI) values from the Total Ozone Mapping Spectrometer (TOMS) have been used in order to obtain the climatology and seasonal trends of SD events over Athens. FM fraction is the proportion of AOD contributed by the small particles, mainly soot or anthropogenic aerosols, while AI is an index that indicates the presence of elevated absorbing aerosols (desert dust) in the atmosphere. All the above parameters have been obtained on daily basis with spatial resolution of 1Œ1o (10Œ10 km) centered at Athens (37.5oN 23.43oE). Firstly, from the relation between AOD550 and FM, the coarse-mode aerosols were discriminated, probably corresponding to dust particles due to SD events. For the sake of the study the threshold values AOD550$>$0.3 and FM$<$0.6 were adopted. Out of the 1809 days of measurements, 337 satisfy this criterion not necessarily corresponding to SD events. These 337 cases are further discriminated with the use of 4-day back trajectories computed with the HYSPLIT model at 3 altitudes (500 m, 1000 m and 4000 m). Using strict criteria regarding the trajectory and the source of the air masses, it is established that 85 out of the 337 cases correspond to SD cases. These 85 events exhibit higher occurrence in July, followed by September and April. Moreover, the highest AOD550 values along

with the highest AI were found for trajectories that correspond to air coming from the Sahara. As a conclusion, the study shows that combined remote-sensing measurements and the HYSPLIT model are powerful tools for the identification of SD events over Athens, and the whole Mediterranean Basin in general.