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Four-year observations of aerosol physical and optical properties during coarse and fine aerosol episodes, from the AErosol RObotic NETwork station at Crete (Eastern Mediterranean) and MODIS

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Aerosols play an important role in the Earth's radiation budget and hence affect its climate and hydrological cycle. Mediterranean is a climatically sensitive region threatened by desertification associated with possible climatic changes. Moreover, it represents a best-suited study region for aerosols since their radiative effect is very large there due to large solar radiation amounts (small cloud cover) and large aerosol loads. Therefore, determining the aerosol physical and optical properties over the Mediterranean basin is of great importance, especially given that a variety of aerosol types is found there (originated from different sources) such as maritime particles (mainly sea spray), mineral dust (mainly transported from north Africa deserts), and anthropogenic particles (local and long-range pollution). Crete-island constitutes an ideal natural observatory for aerosols due to its key location in the eastern Mediterranean. Thus, an Aerosol Robotic Network (AERONET) station was installed and has been operating since 2003. In this work, aerosol optical properties, namely spectral Aerosol Optical Thickness (AOT) and Angström parameter ($\alpha_{440-870}$) were analysed for the 4-year period 2003-2006. It was found that the 4-year mean AOT at 1020, 500 and 380 nm is 0.11$\pm$0.09, 0.21$\pm$0.11 and 0.28$\pm$0.13 respectively, whereas the corresponding value for $\alpha_{440-870}$ is 1.13$\pm$0.50. Subsequently, a discrimination of fine and coarse

particles episodes is performed, based on combined values of AOT and α and on spectral variation of α (curvature effect). In addition, a methodology is invented and applied for defining aerosol episodes, i.e. days with high aerosol loads, and estimating their characteristics, namely their timing, duration and intensity. During the study period, 90 episodes of coarse particles and 130 of fine aerosols have been identified. Information of daily AOT and Angstrom parameter available from the Moderate Resolution Imaging Spectroradiometer (MODIS) was also used to assess the possibility of satellite observations to observe aerosol episodes detected from ground. A relatively good correlation was obtained in case of strong aerosol episodes. It was found that coarse-particle events are associated with dust transport from Africa, mainly occurring in spring and secondly in autumn. On the other hand, fine particles episodes are linked with pollution transport from west and east Europe as well as from Balkans and Athens, with a maximum of frequency of occurrence in summer. Finally, the correlation between the coarse and fine particle episodes and prevailing synoptic circulation types has been estimated.