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Atmospheric circulation and meteorological conditions during dust aerosol episodes over the broader Mediterranean Basin. The case of 16 June 2016

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Mediterranean Basin (MB), due to its position near to the greatest world deserts (the Sahara Desert in North Africa and the deserts of Middle East), is frequently affected by dust transport. This results in dust episodes, associated with high Dust Aerosol (DA) loads reaching the northern parts of MB, taking place every year with different intensity, but with specific seasonal and spatial characteristics. The seasonal and spatial characteristics of Dust Aerosol Episodes (DAEs) in the region are connected to specific atmospheric conditions that favor the injection of DA into the region's atmosphere, as well as to specific atmospheric circulation characteristics favoring the transport to the MB.

DA not only are affected by, but they also can affect the atmospheric conditions and thus the regional weather and climate regime. Specifically, due to their ability to absorb the shortwave, but also the longwave, radiation, DA can modify the temperature structure of the atmosphere as well as the radiative budget. In addition, DA are effective Ice Nuclei (IN), and also, under mature stages, Cloud Condensation Nuclei (CCN), thus affecting cloud properties. These effects of DA become more important, but also complicated, when high dust loads are associated with other aerosol types, e.g. sea-salt (SS) and biomass burning (BB) over a region with high solar radiation, diverse topography and cloud regimes such as the MB.

In the present study, the atmospheric circulation (geopotential height and mean sea level pressure), as well as the meteorological conditions (cloud fraction, cloud optical thickness, cloud phase, temperature and humidity profiles and vertical velocity) before, during and after an extreme Dust Aerosol Episode Case (DAEC) that took place over the western MB on June 16, 2016 are examined. The studied DAEC is identified using a satellite algorithm, which uses MODIS C6.1 and OMI OMAERUV derived aerosol optical properties. Emphasis is given to the understanding of

the 3-D structure of the episode and its possible effects on the atmospheric temperature and humidity regime, as well as on cloud properties. For this reason, different reanalyses and satellite data, namely from the NCEP/NCAR (National Centers for Environmental Prediction/National Center for Atmospheric Research Reanalysis Project), MERRA-2 (Modern-Era Retrospective analysis for Research and Applications, Version 2) and MODIS databases, are analyzed. In addition, the vertical aerosol profile is obtained from MERRA-2 data.