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Aerosol properties in the eastern Mediterranean based on the AERONET station at FORTH/Crete

A. Fotiadi (1,2), E. Drakakis (2,4), **N. Hatzianastassiou** (2,3), C. Matsoukas (2,5), I. Vardavas (1,2)

(1) Department of Physics, University of Crete, Greece, (2) Foundation for Research and Technology-Hellas, Heraklion, Crete, Greece, (3) Laboratory of Meteorology, Department of Physics, University of Ioannina, Greece, (4) Department of Electrical Engineering, Technological Educational Institute of Crete, Greece, (5) Department of Environment, University the Aegean, Greece (nhatzian@cc.uoi.gr / Fax: ++30 26510 98699)

Aerosols affect the Earth's radiation budget, and hence climate, trough their direct and indirect effects. However, the scientific understanding of their physical and optical properties is still low, so that they represent the largest uncertainty in climate predictions. To improve the accuracy of estimates of the aerosol radiative effects, better characterization of the properties of various aerosol types is necessary. The Mediterranean is a climatically sensitive region offering ideal conditions for studying the properties of aerosols. In this work, aerosol optical properties, namely aerosol optical thickness (AOT), Angström wavelength exponent (α) and volume size distribution, are studied over the eastern Mediterranean basin, using spectral measurements from the recently established AERONET station in Crete, for the two-year period 2003-2004. The AOT is found to have maximum values during Spring, due to the maximum dust loading mainly transported from African deserts, and minimum values in winter. Large AOT values at 340 and 500 nm persisting during summer are due to transport of urban/industrial and biomass burning aerosols, whereas secondary maximum values in AOT_{870} and AOT_{1020} in October are attributed to autumn dust events. The dust events are characterized by a drastic increase in AOT at all wavelengths accompanied by a drastic decrease in α to values below 0.3. The frequency distributions of AOT and α suggest mean values for AOT_{340}, AOT_{500}, AOT_{870}, AOT_{1020} and α equal to 0.34$\pm$0.14, 0.21$\pm$0.11, 0.11$\pm$0.09 and 1.17$\pm$0.53, respectively, and this along with the scatterplot of α versus AOT_{870} indicate a great variety of aerosol types over the study region. These types include dust particles, urban-industrial/biomass

burning aerosols, maritime aerosols and mixed types as well. The aerosol volume size distributions are bimodal throughout the year with a fine and a coarse mode having effective mean radius of 0.13 μm and 2.12 μm, respectively, and corresponding volume concentrations of about 0.036 and 0.057 $\mu m^3/\mu m^2$. Our analysis shows that the higher values of AOT are related to easterly/southeasterly and southerly winds, associated with dust aerosols, and westerly/northwesterly winds, associated with pollution.