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Advection patterns and aerosol optical and microphysical properties by AERONET over south-east Italy in the central Mediterranean

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Abstract. Aerosol products by AERONET sun-sky radiometer measurements combined with air-mass backtrajectories were analyzed to identify source regions and pathways of air masses carrying aerosols to south-east Italy, and to determine the dependence of aerosol mean optical properties on advection patterns. Aerosol optical depth (AOD), fine mode fraction (η), single scattering albedo (SSA), asymmetry factor (*g*), and lidar ratio (*Lr*) at 440 nm were used to characterize aerosol properties. The analysis of 5-day-backtrajectories ending in Lecce on south-east Italy and referring to 240 measurement days of the 2003–2004 years revealed that 32% of the measurement days were characterized by air masses coming from all continental European sources with the exception of Spain. 3% of the measurement days were characterized by air masses coming from both the Southern Mediterranean Sea and the Africa continent, and the Western Mediterranean, the Iberian Peninsula, and the Atlantic Ocean. 62% of the measurement days were characterized by mixed advection patterns. We found that AOD, SSA and *g* average values were not significantly dependent on air mass source regions. In contrast, η and *Lr* average values were quite affected by the air mass source region. AOD, &eta, SSA, *g*, and *Lr* average values, which were equal to 0.29±0.15, 0.93±0.03, 0.93±0.03, 0.67±0.03, and 72±20 sr, respectively indicated that the aerosol advected from all continental European sources with the exception of Spain, could be considered representative of "continental average aerosol", mostly made of water soluble and a small amount of soot and insoluble components. Polluted-desert dust particles characterized by AOD=0.29±0.05, η=0.72±0.05, SSA=0.94±0.03, *g*=0.69±0.02, *Lr*=56±13 sr, were advected over south-east Italy from the Southern Mediterranean Sea and the Africa continent. The Western Mediterranean, the Iberian Peninsula, and the Atlantic Ocean were instead responsible of the advection of maritime-polluted particles, which were characterized by AOD=0.27±0.17, η=0.8±0.1, SSA=0.94±0.03, *g*=0.67±0.03, *Lr*=58±24 sr. Hence, we found that the aerosol load over south-east Italy was dominated by moderately-absorbing, fine-mode particles even if it was also affected by the minor contribution of desert and maritime type aerosol. The application of an aerosol mask to the data points retrieved on measurement days characterized by mixed advection patterns, supported last comment

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