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Long-term measurements of carbonaceous aerosols in the Eastern Mediterranean: evidence of long-range transport of biomass burning

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Abstract. Long-term (5-year) measurements of Elemental Carbon (EC) and Organic Carbon (OC) in bulk aerosols are presented here for the first time in the Mediterranean Basin (Crete Island). A multi-analytical approach (including thermal, optical, and thermo-optical techniques) was applied for these EC and OC measurements. Light absorbing dust aerosols were shown to poorly contribute (+12% on a yearly average) to light absorption coefficient (b_{abs}) measurements performed by an optical method (aethalometer). Long-range transport of agricultural waste burning from European countries surrounding the Black Sea was shown for each year during two periods (March–April and July–September). The contribution of biomass burning to the concentrations of EC and OC was shown to be rather small (20 and 14%, respectively, on a yearly basis), although this contribution could be much higher on a monthly basis and showed important seasonal and interannual variability. By removing the biomass burning influence, our data revealed an important seasonal variation of OC, with an increase by almost a factor of two for the spring months of May and June, whereas BC was found to be quite stable throughout the year. Preliminary measurements of Water Soluble Organic Carbon (WSOC) have shown that the monthly mean WSOC/OC ratio remains stable throughout the year (0.45 ± 0.12), suggesting that the partitioning between water soluble and water insoluble organic matter is not significantly affected by biomass burning and secondary organic aerosol (SOA) formation. A chemical mass closure performed in the fine mode (Aerodynamic Diameter, A.D. $1.5 \mu\text{m}$) showed that the mass contribution of organic matter (POM) was found to be essentially invariable during the year (monthly average of $26 \pm 5\%$).

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