# High time resolution measurements of equivalent black carbon in an urban background site of Italy

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Carbonaceous aerosols represent a significant component of atmospheric aerosol. Among them, the equivalent black carbon (eBC), identified as the result of optical determination of the carbon content in the atmospheric aerosol (PM), has become a serious concern because of its detrimental impact on human health, and because it is regarded as the second most major contributor to global warming after CO2. Also the recent EU Directive 2024/2881 highlights the need to monitor emerging pollutants like black carbon more effectively.

This study presents results from an intensive field campaign, between March and April 2023, at an urban background site (southern Italy), for characterizing the carbonaceous aerosols. Daily samples of PM10 and PM2.5 were analyzed using a Sunset thermal-optical analyser to determine organic and elemental carbon (OC, EC), while real-time equivalent black carbon (eBC) was measured with three independent instruments: MAAP and Giano BC1 for the PM10 fraction, while AE33 for the PM2.5 fraction. Total carbon (TC) was monitored using an online TCA08 thermo-catalytic analyser, working in together with AE33 in order to obtain secondary organic carbon (SOC) and primary organic carbon (POC) evaluation for PM2.5. The average concentration of PM10 was 17.1 µg/m3 and 10.4 µg/m3 for PM2.5. On average, OC and EC represented 16.5% and 3.6 % of PM10 mass, and 22.6% and 5.5% of PM2.5, while the SOC accounting for the 36% of the measured OC in the fine PM fraction. The in-situ MAC, recalculated for the ECO site ranged between 8.0 m2/g and 12.22 m2/g. eBC measurements shown a pattern modulated by both the daily evolution of the planetary boundary layer height and combustion sources (traffic and biomass burning). The apportionment of eBC was: 65% of fossil fuel (eBCff) and 35% of biomass burning contributions (eBCbb). Biomass burning emissions are confirmed by optical measurements of brown carbon (BrC).

**Keywords: in-situ MAC estimation; black carbon apportionment; brown carbon.**