

Six Years Observations of High-Resolution Organic Aerosol and Oxidative Potential of Particulate Matter at A Major Eastern Mediterranean City (Athens, Greece)

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Abstract

The role of atmospheric particulate matter (PM) and especially its fine and ultrafine fractions on air quality and climate attracted the interest of the scientific community the last years. Fine particulate fraction is mainly comprised of organic aerosol (OA) which has multiple sources of both anthropogenic and biogenic origin. Aerosol Oxidative Potential (OP) has been proven to constitute a crucial metric for health impacts, compared to PM mass concentration, since it depicts the ability of PM to generate Reactive Oxygen Species (ROS) in human cells. The current study presents for the first time to our knowledge in southern Europe six years measurements of OA levels and aerosol OP, in an urban background site, at the center of the city of Athens, Greece. OA is monitored using a high-resolution technique, via an Aerosol Chemical Speciation Monitor (ACSM) which provides real time and long-term observations of non-refractory submicron aerosol chemical composition. Furthermore, source apportionment of recorded OA took place, estimating critical parameters for the development of PM emission reduction strategies. The OP is determined through the acellular DTT assay, while ancillary data including Black carbon (BC) were concurrently recorded, by a 7-wavelength aethalometer AE-33, leading to the calculation of spectral absorption coefficients for BC fossil fuel (BC_{ff}) and BC wood burning (BC_{wb}). The statistical processing of all acquired data, indicates a good correlation of OP with biomass burning sources, mainly during the coldest period of the year, while the warmest period OP is mostly characterized by dominance of secondary atmospheric processes. These conclusions are in accordance with previous studies of OP, highlighting that the major source of aerosol OP is combustion and especially biomass burning, both as primary and secondary sources.

Early Career Scientist

YES, I am an early career scientist.