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Diurnal and seasonal variations of primary and secondary organic carbon at an urban traffic site in Istanbul

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Ambient air pollution is responsible for premature death of four million people every year. Fine particulate matter is one of the main air pollutants with adverse effects on human health and climate. The organic fraction is a major component of fine particulate matter and can be divided into three fractions: (1) organic carbon (OC) which is highly reactive, semi-volatile, and soluble, (2) elemental carbon (EC) or black carbon (BC) which is refractory, light-absorbing, and non-volatile, and (3) carbonate carbon (CC). Elemental carbon is directly emitted to the atmosphere by anthropogenic combustion sources (i.e. industrial emissions, road transport, domestic heating) while organic carbon can be both, emitted by natural (e.g., biogenic emissions) and anthropogenic sources (i.e. combustion processes), and also of secondary origin (i.e. gas-to-particle conversion processes). Important diurnal and seasonal variations in OC and EC concentrations are due to changes in emission sources and local meteorology (e.g., temperature, relative humidity, radiation). In this work, PM2.5 samples were collected for 2h during the day (i.e. 07:00-19:00h) and 12h during the night (19:00-07:00h) for three weeks during the winter and one week during the spring, summer, and fall. OC, EC, and TC concentrations were obtained with a Sunset thermo-optical carbon analyzer in approximately 300 high-time resolved PM2.5 samples in an area heavily influenced by traffic in Istanbul for the first time. Concentrations of primary and secondary organic carbon are calculated with the OC/EC minimum ratio method and their diurnal and seasonal variations investigated with respect to meteorology and traffic. High-time resolved OC and EC concentrations are useful for determination of the impacts of local emission sources, formation of secondary organic carbon, and effects of air mass advection. In this work we intend to fill gaps of knowledge by investigating carbonaceous aerosol in high time resolved PM2.5 in Istanbul for the first time.