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The relative contributions of fossil fuel and biomass burning to the ambient black carbon (BC) concentrations in the Los Angeles Basin

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In this study, patio-temporal trends of Black Carbon (BC) were investigated at four sites, including central Los Angeles (CELA), Anaheim, Fontana, and Riverside (ranging from near-road to sub-urban), in the Los Angeles Basin between 2012-2013 and 2016-2017, and sources of BC were apportioned using Equivalent Black Carbon (EBC) model. Seven wavelengths using Aethalometers (AEE33) were used for BC measurements in this study. BC measurement results revealed that Anaheim had the highest annual total BC concentration (1.37 μg.m^{-3}) across all sites. Furthermore, BC concentrations in the colder season were approximately as twice as high as the levels in the warm season, increasing from 0.60 to 1.17 μg.m^{-3}, 0.74 to 2.01 μg.m^{-3}, and 1.24 to 1.33 μg.m^{-3}, 0.71 to 1.30 μg.m^{-3} for CELA, Anaheim, Fontana, and Riverside, respectively. In addition, EBC source apportionment results indicated that annual fossil fuel combustion contributions to the total BC concentrations (vary between 82% in Riverside to 91% in CELA) are drastically higher than those of biomass burning (vary between 9.3% in CELA to 18.7% in Riverside). In the sites close to major freeways, such as CELA and Anaheim, the aforementioned effect was more pronounced. In addition, relative contributions of fossil fuel combustion and biomass burning to the total BC concentrations were higher in warm and cold seasons, respectively. For fossil fuel originated Black Carbon (BC_{ff}), major peaks were observed during the traffic rush hours, whereas the contribution of Black Carbon that originated from biomass burning (BC_{bb}) was maximum in the cold season especially during nighttime, reaching values as high as 25-30% of total BC concentrations. Moreover, due to the implementation of strict regulations in California, the absolute BC concentrations and the relative contributions of BC_{ff} to total BC concentrations have gone down since 2012, indicating the efficacy of the regulations that have been put into effect. Based on the main result of the study, due to stricter regulations on controlling fossil fuel combustion sources emissions, BC_{ff} is experiencing a decreasing trend over the years. Consequently, this will increase the impact of non-fossil fuel combustion sources, including biomass burning, to the overall BC concentrations.