# Elemental and organic carbon measurements in Beijing during winter, spring and summer

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Measurements of elemental (EC) and organic carbon (OC) concentrations in PM2.5 were made at Peking University in Beijing, China during the winter, spring, and summer period in 2006. EC and OC concentrations were measured every hour with a semicontinuous thermal-optical analyzer. Carbon monoxide (CO) and carbon dioxide (CO2) concentrations were also measured using nondispersive infrared absorption (NDIR) instruments with a time resolution of 1 min.

In the winter period, the average concentrations of EC and OC were 7+-6 ug/m3 and 20+-20 ug/m3, which are 4-5 times higher than the average concentrations in Tokyo. In this period, the CO and CO2 concentrations were 2.1+-2.1 ppmv and 424+-43 ppmv, on the average. The average concentrations of EC, OC, and CO in spring were 6+-4 ug/m3, 11+-7 ug/m3, and 1.1+-0.7 ppmv, respectively. During the summer, EC and OC concentrations were 6+-3 ug/m3 and 10+-5 ug/m3. The CO and CO2 concentrations were 1.1+-0.6 ppmv and 402+-27 ppmv in the same period. EC and CO2 concentrations were relatively stable by season, while the concentrations of OC and CO in winter were higher than those in summer. The high level of OC and CO was originated from domestic heating by fossil fuels.

The variation of aerosol and gas concentrations in atmosphere depends on meteorological conditions, especially wind speed. To clearly evaluate the effects of the emission sources by fresh components, diurnal profiles were analyzed by data having wind speed of less than 2 m/s. EC diurnal averages were characterized by pronounced peaks around midnight because of the increase of diesel engine exhausts caused by the influx of night trucking after midnight. Domestic heating caused significantly high OC level during night time in winter, whereas OC did not show diurnal fluctuation in other seasons. Diurnal CO averages had similar trends to diurnal OC values because of heavy truck traffic at night. The CO concentrations in Beijing were generally much higher than in other mega cities, leading to the lower dEC/dCO and higher dCO/dCO2 ratios. The diurnal dEC/dCO values in Beijing showed different aspects in comparison with the variation of Tokyo which had peaks during morning and evening rush. In spring and summer, the dEC/dCO ratios reached maximum values between 0200-0600 local time owing to the increase of trucking. However, the high level of dEC/dCO ratios in the same period were masked by residential heating during the winter period. The diurnal dCO/dCO2 ratios showed discernable different trends between the seasons. In the winter season, the high ratio of dCO/dCO2 revealed after midnight due to the increase of CO concentrations originated from domestic heating using coal or bio fuels. However, the dCO/dCO2 showed low level from midnight to dawn due to well processed combustion sources such as vehicular engines. According to our dCO/dCO2 value (42.2 ppbv/ppmv), anthropogenic CO emission inventory in Beijing of Streets et al., [2003] was overestimated.