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Correlation of BC and CO during biomass burning and urban pollution episodes in eastern China

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Strong emissions of pollutants (e.g., BC and CO) in East China due to ever-quickening industrial development, surging automobile ownership, and intensive seasonal burning of biomass are well known, however, estimation of its emission has large uncertainties. Generally relationship between black carbon (BC) and carbon monoxide (CO) will help improve their emission inventories and the further evaluation of global/regional climate forcing effects. In present work, two field observation studies were performed at background mountain site (Mt.Huangshan 2007˜ 2009), and at coast site (Rudong, Jiangsu province 2010) about 100 km northern to Yangtze River Delta Region respectively. Results from Mt.Huangshan show that annual mean BC concentration was 654.6 +/- 633.4 ng/m3 with maxima in spring and autumn, when biomass was burned over a large area in eastern China. The yearly averaged CO concentration was 446.4 +/- 167.6 ppbv, and the increase in the CO concentration was greatest in the cold season, implying that the large-scale domestic coal/biofuel combustion for heating has an effect. The BC-CO relationship was found to have different seasonal features but strong positive correlation ($R > 0.8$). Trajectory cluster study combined with measurements of urban PM10 concentrations and satellite observations demonstrated that the deltaBC/deltaCO ratio for a plume of burning biomass was 12.4 ng/m3/ppbv and that for urban plumes in eastern China was 5.3 +/- 0.53 ng/m3/ppbv. The field campaign at Rudong site displayed different results with relatively lower deltaBC/deltaCO values of 4.5 +/- 0.2 ng/m3/ppbv for urban plumes and 8.9 +/- 0.3 ng/m3/ppbv in biomass burning influencing episode. This result for urban plumes was quiet similar with value (4.1 ng/m3/ppbv in INTEX-B) from statistical approaches, and transportation and industry were identified as controlling factors of the BC-CO relationship. Large uncertainties still existed for biomass burning smoke, and biomass types (grass, agriculture residues or twigs), combustion condition (inflammation or smoulder) seemed to be essential reasons to explain the discrepancies among the results.

Keywords: Black carbon, carbon monoxide, Emisson Inventory, Back trajectory