Geophysical Research Abstracts
Vol. 12, EGU2010-2582, 2010
EGU General Assembly 2010

Time trend of polycyclic aromatic hydrocarbon emission factors from motor vehicles

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Motor vehicle is an important emission source of polycyclic aromatic hydrocarbons (PAHs) and this is particularly true in urban areas. Motor vehicle emission factors (EFs) for individual PAH compound reported in the literature varied for 4 to 5 orders of magnitude, leading to high uncertainty in emission estimation. In this study, the major factors affecting EFs were investigated and characterized by regression models. Based on the model developed, a motor vehicle PAH emission inventory at country level was developed. It was found that country and model year are the most important factors affecting EFs for PAHs. The influence of the two factors can be quantified by a single parameter of per capita gross domestic production (purchasing power parity), which was used as the independent variables of the regression models. The models developed using randomly selected 80% of measurements and tested with the remained data accounted for 28 to 48% of the variations in EFs for PAHs measured in 16 countries over 50 years. The regression coefficients of the EF prediction models were molecular weight dependent. Motor vehicle emission of PAHs from individual countries in the world in 1985, 1995, 2005, 2015, and 2025 were calculated and the global emission of total PAHs were 470, 390, and 430 Gg in 1985, 1995, and 2005 and will be 290 and 130 Gg in 2015 and 2025, respectively. The emission is currently passing its peak and will decrease due to significant decrease in China and other developing countries.