Development of land use regression models for particle composition in twenty study areas in Europe

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Land Use Regression (LUR) models have been used to describe and model spatial variability of annual mean concentrations of traffic related pollutants such as nitrogen dioxide (NO2), nitrogen oxides (NOx) and particulate matter (PM). No models have yet been published of elemental composition. As part of the ESCAPE project, we measured the elemental composition in both the PM10 and PM2.5 fraction sizes at 20 sites in each of 20 study areas across Europe. LUR models for eight a priori selected elements (copper (Cu), iron (Fe), potassium (K), nickel (Ni), sulfur (S), silicon (Si), vanadium (V), and zinc (Zn)) were developed. Good models were developed for Cu, Fe, and Zn in both fractions (PM10 and PM2.5) explaining on average between 67 and 79% of the concentration variance (R(2)) with a large variability between areas. Traffic variables were the dominant predictors, reflecting nontailpipe emissions. Models for V and S in the PM10 and PM2.5 fractions and Si, Ni, and K in the PM10 fraction performed moderately with R(2) ranging from 50 to 61%. Si, NI, and K models for PM2.5 performed poorest with R(2) under 50%. The LUR models are used to estimate exposures to elemental composition in the health studies involved in ESCAPE.

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