Multi-source apportionment of polycyclic aromatic hydrocarbons using simultaneous linear equations

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A new approach to identify multiple sources of polycyclic aromatic hydrocarbons (PAHs) and to evaluate the source contributions to atmospheric deposition of particulate PAHs is proposed. The approach is based on differences in concentrations of sums of PAHs with the same molecular weight among the sources. The data on PAHs accumulation in snow as well as the source profiles were used for calculations. Contributions of aluminum production plant, oil-fired central heating boilers, and residential wood and coal combustion were calculated using the linear mixing models. The concentrations of PAH pairs such as Benzo[b]fluorantene + Benzo[k]fluorantene and Benzo[g,h,i]perylene + Indeno[1,2,3-c,d]pyrene normalized to Benzo[a]antracene + Chrysene were used as tracers in mixing equations. The results obtained using ratios of sums of PAHs were compared with those obtained using molecular diagnostic ratios such as Benzo[a]antracene/Chrysene and Benzo[g,h,i]perylene/Indeno[1,2,3-c,d]pyrene. It was shown that the results obtained using diagnostic ratios as tracers are less reliable than results obtained using ratios of sums of PAHs.