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Size-distributions of *n*-alkanes, PAHs and hopanes and their sources in the urban, mountain and marine atmospheres over East Asia

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Abstract. Size-segregated (9 stages) *n*-alkanes, polycyclic aromatic hydrocarbons (PAHs) and hopanes in the urban (Baoji city in inland China), mountain (Mt. Tai in east coastal China) and marine (Okinawa Island, Japan) atmospheres over East Asia were studied using a GC/MS technique. Ambient concentrations of *n*-alkanes ($1698 \pm 568 \text{ ng m}^{-3}$ in winter and $487 \pm 145 \text{ ng m}^{-3}$ in spring), PAHs (536 ± 80 and $161 \pm 39 \text{ ng m}^{-3}$), and hopanes (65 ± 24 and $20 \pm 2.4 \text{ ng m}^{-3}$) in the urban air are 1–2 orders of magnitude higher than those in the mountain aerosols and 2–3 orders of magnitude higher than those in the marine samples. Mass ratios of *n*-alkanes, PAHs and hopanes clearly demonstrate coal-burning emissions as their major source. Size distributions of fossil fuel derived *n*-alkane, PAHs and hopanes were found to be unimodal in most cases, peaking at 0.7–1.1 μm size. In contrast, plant wax derived *n*-alkanes presented a bimodal distribution with two peaks at the sizes of 0.7–1.1 μm and $>4.7 \mu\text{m}$ in the summer mountain and spring marine samples. Among the three types of samples, geometric mean diameter (GMD) of the organics in fine mode ($<2.1 \mu\text{m}$) was found to be smallest (av. 0.63 μm in spring) for the urban samples and largest (1.01 μm) for the marine samples, whereas the GMD in coarse mode ($\geq 2.1 \mu\text{m}$) was found to be smallest (3.48 μm) for the marine aerosols and largest (4.04 μm) for the urban aerosols. The fine mode GMDs of the urban and mountain samples were larger in winter than in spring and summer. Moreover, GMDs of 3- and 4-ring PAHs were larger than those of 5- and 6-ring PAHs in the three types of atmospheres. Such differences in GMDs can be interpreted by the repartitioning of organic compounds and the coagulation and hygroscopic growth of particles during a long-range transport from the inland continent to the marine area, as well as the difference in their sources among the three regions.

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