

Chemical composition of the SCPs derived from fossil-fuel combustion in East Asia and their long transportation

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Spheroidal carbonaceous particles (SCPs) are produced by the high-temperature combustion of fossil fuels (e.g., in thermal power station) and are emitted to the atmosphere. They are unambiguous indicators of atmospheric deposition from industrial fossil fuel combustion. We examined elemental composition of the particles in surface sediments nearby industrial cities in East Asia to clarify the elemental characteristic of the particles emitted from each country. Then we also analysed the particles in surface sediments collected in islands in Sea of Japan and the sites along the sea to clarify their source area. We collected 9 samples in Japan, 6 samples in China, 6 samples in Korea, and 5 samples in Taiwan as samples of industrial cities, and 4 samples in remote islands in Japan Sea, and 3 samples at sites along the sea as samples of remote area. We used EDS (energy dispersive spectroscopy) to quantitatively analyze the concentrations of Na, Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, and Zn in the particles. As a results, the compositions of SCPs differ among Japanese, Chinese, Korean and Taiwanese cities, especially in terms of Si, S and Ti; particles in Japan and Korea are enriched in Si and S, particles in China are enriched in Si and Ti, and particles in Taiwan are enriched in Si, S and Ti. Results of liner discriminant analysis indicate the particles in each country are discriminated with high reliability of approximately 90%, based on their chemical composition. Based on these discriminant functions, the particles in Oki Islands, Iki Islands and Goto Islands were classified to three types of Japan-Korea type, China Type and Taiwan type. Over 30% of china type was recognized in each sample in these Islands, that are probably derived from China.

Keywords: spheroidal carbonaceous particles, fossil-fuel combustion, chemical composition, East Asia, long transportation