

Characteristics of aerosols in the forest area of Kumamoto city

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Abstract

Atmospheric particles, including Asian dust or Kosa, have gained considerable attention in the recent times because of their potential to affect human health and global environment. In this study, we try to clarify the regional characteristics of atmospheric aerosols by using a crust enrichment factor and mass closure model.

The research site is located in Tatsutayama Forest Area of Kumamoto city (Long: 130°44' E, Lat. 32°49' N) in Kumamoto Prefecture, the southwestern region of Japan. Aerosol samples were collected twice a month by the filter pack method from April 2004 to March 2007. A polytetrafluoroethylene filter with a diameter of 47 mm was set in a Nilu filter holder and placed at a height of 7 m above the ground. Sampling flow rate was 2 L/min. We obtained 72 aerosol filters. The element concentrations were determined by the proton-induced X-ray emission method at Nishina Memorial Cyclotron Center.

The water-soluble cations Ca²⁺ and Mg²⁺ in the aerosols were analyzed using an atomic absorption spectrophotometer (Hitachi, Z-6100). The other cations Na⁺, K⁺, and NH₄⁺, and the anions Cl⁻, NO₂⁻, PO₄³⁻, NO₃⁻, and SO₄²⁻ were analyzed using an ion chromatograph (Dionex, DX-500).

The values of the enrichment factor of each element suggested that the sources of Si, Ti, Ca, Fe, Mg, K, and Mn are soil dusts; Na is derived from sea-salt; and Ni, Cu, V, Sr, Rb, Zn, Co, Cl, Pb, S, Mo, Br, and Hg originate from anthropogenic emissions. Using a mass closure model, the mass concentrations of the aerosol components soil particles, soluble ions, and sea-salt particles were calculated to be 5.8, 11.1, and 1.6 µg/m³, respectively. Soil particles and carbon compounds were the main components of aerosols and accounted for about 80% of the total aerosol mass.