

Contribution of the coarse-mode nitrate to nitrogen deposition

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Atmospheric deposition of fixed nitrogen species to the earth's surface is an important source for bioavailable nitrogen both in aquatic and terrestrial ecosystems. In order to characterize deposition processes of these nitrogen species, observations of the fixed nitrogen species in the size-segregated aerosols, gas phase, and wet deposition were conducted at an urban site in Kofu, Japan. Dry deposition amounts of these species were estimated with an inferential method by using their atmospheric concentrations and meteorological parameters. Here we report a large contribution of nitrate in the coarse-mode aerosols, especially in the aerosols with the diameters larger than 10 μm (PM>10), to the nitrogen deposition.

Chemical composition of the PM>10 was similar to the coarse-mode aerosols with diameters of 2-10 μm (PM10-2) as summarized in Table 1, although mass concentration of the PM>10 was five times lower than that of the PM10-2. Figure 1 shows the calculated dry deposition amounts of nitrate in the aerosols. Despite lower concentrations of nitrate in the PM>10, its contribution to dry deposition was comparable with that of the PM10-2. Coarse-mode nitrate including the PM10-2 and PM>10 have a large contribution to the nitrogen deposition via dry processes, which would be comparable with dry deposition of gaseous nitric acid. The present result suggests that nitrate in the PM>10 should be taken into account when we discuss the atmospheric nitrogen deposition.

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Table 1. Concentrations of ionic species in the aerosols with $d < 2 \mu\text{m}$ (PM2), PM10-2, and PM>10

	PM2	PM10-2	PM>10
Cl ⁻	0.01	0.03	0.03
NO ₃ ⁻	0.58	0.65	0.11
SO ₄ ²⁻	2.29	0.41	0.06
Na ⁺	0.03	0.16	0.03
NH ₄ ⁺	0.86	0.10	0.00
K ⁺	0.06	0.03	0.00
Mg ²⁺	0.00	0.03	0.01
Ca ²⁺	0.05	0.09	0.04

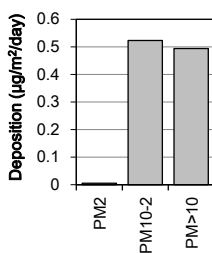


Figure 1. Calculated dry deposition amounts of nitrate in the aerosols