Chemical properties of wet depositions at a remote site in Shikoku highland, Japan

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Atmospheric deposition collected from a highland located at a remote area are useful for understanding long distance transport of atmospheric pollution because of less influence from neighboring urban areas. In this study, chemical compositions of wet depositions collected from Mt. Kajigamori (33°45'N 133°45'E), located at a remote area in Shikoku highland, Japan were determined to reveal the chemical properties of pollutants from eastern Asia.

The sampling period was December, 2007 to March, 2013. Wet deposition was collected using customized samplers to avoid contamination during sample collection. Altitude of sampling point was 1400 m. The distance from neighboring urban area was 35 km. Collected samples were filtered by 0.45 μm membrane. Major ions were measured by ion chromatography. Trace metal elements including Cd and Pb were measured by GF-AAS and ICP-MS. Residue on filter was analyzed by XRF and SEM. Fundamental weather data were referred to WINDAS and AMeDAS. Back trajectory analysis was conducted using CGER-METEX.

The average concentrations of Cd and Pb in snow were 0.18 and 3.28 μg/L, whereas the average concentrations in rain were 1.1 μg/L of Cd and 0.47 μg/L of Pb. Both Cd and Pb showed higher concentrations in winter, but a clear correlation between Cd and Pb was not found except for samples in 2013. Comparison with snow collected from domestic and foreign highlands in remote areas, snow samples of Mt. Kajigamori showed relatively large abundance of Pb. Enrichment factors of Cd and Pb normalized by average continental crust were higher than 100, suggesting that Cd and Pb were mainly from anthropogenic source. The Pb/Cd ratio in our samples ranged from 1.3 to 60, and was different from the Pb/Cd ratio of atmospheric depositions in Japanese urban area (28-35). Migration paths of air parcels, which provided Pb-riched samples, were distributed the northeast of China, whereas those for Cd-riched samples passed through the southeast of China.