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Influence of the physicochemical characteristics of Japanese forest soils on their retention of heavy metals

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Heavy metals are continuously and widely deposited from the atmosphere on Japanese forest ecosystems. Forest soils contain a large proportion of heavy metals that are anthropogenic and geogenic in origin. Several studies report that these metals are retained for a long time in forest floors and soils due to their strong affinity to organic and inorganic matter, and suggest that they risk having a chronic influence on organisms and could pollute stream water and groundwater eventually. For this reason, determining the behavior of heavy metals in forest soils is important to assess their influence. The retention of heavy metals in forest soil is considerably influenced by the latter's physicochemical characteristics: specifically, the content and the nature of their organic and mineral matter and the properties of the relevant metals.

The objective of this study was to determine the vertical distribution of lead, cadmium, copper, and zinc concentrations and their chemical forms bound to forest soils. Sequential extraction was employed to assess their retention in Japanese forest soils with different physicochemical characteristics.

This study was conducted in three forest areas in Japan. Thirteen soil samples from the horizons of two volcanic soil profiles and twenty-seven soil samples from the horizons of four non-volcanic soil profiles were used. The soils are classified as Brown Forest Soils.

In the surface soils of volcanic soil profiles, the concentrations of Pb, Cd, and Zn were higher than in other layers due to the soils' very high soil organic matter and

clay mineral content. In contrast, these patterns were not evident in the non-volcanic soil profiles. However, the chemical forms of Pb, Cd, Cu, and Zn in both soil types were in different apportionment pattern for each metal and profile. The distributions of exchangeable and weak-acid soluble fractions of Pb were rarely found in the whole layers in the volcanic soils, which may prevent Pb from migrating downward a long distance