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Distribution regularities lead and cadmium in soils of northern landscapes

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The background concentrations of lead and cadmium in soils of the southern part of the Komi Republic have been studied. It is found that the content of lead and cadmium in the soils of accumulative landscapes (depressions, floodplains) is generally higher than that in the soils of eluvial (interfluves) landscapes. Background (unpolluted) soils of the southern districts (Syktyvdinsk, Kortkeross, Sysola, Koigorod, and Priluzskii) of the Komi Republic were studied; their total area reaches 58 100 km2. Acid-soluble forms of metals (Pb, Cd) were determined according to a metrologically tested method with the use of an atomic emission spectrometer with inductively coupled argon plasma (Spectro Ciros, Germany).

The lead concentrations in the A0A1 horizon of the studied soils vary from 6.5 to 40.0 mg/kg. The maximum lead concentrations exceed the minimum lead concentration by six times. Sandy soils have a considerably lower content of lead in comparison with loamy soils. The lead content in the profiles of loamy soils is higher than that in the parent material. Relatively low lead concentrations are typical of the podzols with a coarse texture and a high mobility of lead. The lead content in the soils is weakly correlated with the carbon content ($r = 0.55$), and the clay (<0.001 mm) content ($r = 0.48$).

Cadmium occurs in nature in very low concentrations, as a rule as an admixture in zinc, lead–zinc, and lead–copper–zinc ore deposits. The dispersion of this element in the environment is due to industrial emissions. The uppermost (0–5 cm) soil horizons are enriched with cadmium under the impact of biological factors, and its concentrations in the humus horizons reaches 0.19–0.50 mg/kg in the southern part of the Komi Republic. Accumulative landscapes have maximum cadmium concentrations; eluvial landscapes are depleted of cadmium due to its removal with solid and liquid runoff. The distribution of cadmium in the soil profiles is relatively even with an insignificant maximum in the humus horizons. Illuvial horizons represent a geochemical barrier on the path of cadmium migration down the soil profile. The cadmium content in the studied soils is weakly correlated with the content of clay particles ($r = 0.52$) and carbon ($r = 0.56$).

The results obtained in this study can be used to assess the degree of soil contamination with heavy metals in the polluted areas; they are particularly important in the works on the environmental impact assessment within the studied region and for the choice of test monitoring plots with due account for the natural variability of the soil properties.

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