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Removal of zinc by sesquioxides in eight clayey soils from Quebec, Canada.

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Trace metal pollution in soils and natural waters is a major environmental concern due to hazardous effects on plants as well as on human and animal health. Phyllosilicates and sesquioxides have great importance for trace metals removal from soil solution and wastewaters. This work aimed at assessing the role of non-silicate amorphous and crystalline sesquioxides in scavenging anthropogenic Zn in eight Gleysolic C horizons from the province of Québec, Canada. These soils had high clay (64.0-78.5%) and low organic matter (0.27-0.55%) contents. Soil samples received Zn at rates of 0 to 30 mg/kg and were incubated for 2 wk, then sequentially extracted to determine Zn fractions as follows: organic matter-Zn, manganese (Mn)-oxide-occluded-Zn, amorphous and crystalline iron (Fe) and aluminium (Al) sesquioxide-Zn, residual-Zn, and the total Zn content in the soil. Zinc in extracts was estimated using atomic absorption spectrophotometry and expressed as the percentage of the amount of sorbed Zn corrected for control (without added Zn). The amount of Zn bound to organic matter was very low (< 0.1%). Manganese oxide-Zn fraction was 5–9%. The amorphous and crystalline Fe and Al sesquioxide-Zn fraction represented 22-30%. The majority of retained Zn was present (54-68%) in the relatively inactive and mineral-bound residual form. This implies that most Zn sorbed by clayey soils was relatively non-exchangeable or immobile under neutral and slightly acidic environment. Although the behaviour of Zn depended mainly on clay content and soil pH, it also appeared to be influenced by non-silicate amorphous and crystalline sesquioxide content. The clayey soils could be used as adsorbents for Zn removal from polluted soil water solutions.