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GEMAS: Geochemical Distribution of Cadmium in European Soil

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Cadmium concentrations are reported for the <2 mm fraction of soil samples from agricultural (Ap, 0-20 cm, N=2108) and grazing land (Gr, 0-10 cm, N=2024) covering 33 European countries, and 5.6 million km2 at a sample density of 1 sample per 2500 km2 in two different extractions, i.e. aqua regia and mobile metal ion (MMI®) and determined by ICP-MS.
The median value of Cd in aqua regia extraction is 0.181 mg/kg in the Ap and 0.202 mg/kg in the Gr samples.The regional Cd distribution in the Ap and Gr samples appears similar. The pattern dominating the Cd maps is the southern limit of the last glaciation, as well as the clay content in the European agricultural soil.
In Scandinavia, a relationship to the Caledonian structural lineaments can be recognised in the distribution pattern; in eastern Europe, it is the boundary between Palaeozoic cover and Mesozoic platform sediments that stands out. The data for the aqua regia extraction establish the natural geochemical background of Cd concentrations in European agricultural and grazing land soil; they demonstrate the existence of two major natural background regimes, a northern and a southern European, seperated by the Trans-European Suture Zone.
Most of the Cd anomalies in European agricultural and grazing land soil can be linked to geological (parent material and mineralisation) sources. In several areas, the natural anomaly pattern is overprinted by anthropogenic emissions from old mining, and the ore processing and metal industries in the same region. For a more detailed separation of geogenic and anthropogenic anomalous Cd concentrations, higher density geochemical mapping or a multivariate statistical data analysis are needed. Only a few Cd anomalies could be attributed to predominantly anthropogenic sources, such as urbanisation and use of fertilisers.
The median value of Cd in the mobile metal ion (MMI®) extraction of Ap soil samples is 0.054 mg/kg. The Cd distribution pattern of MMI® extracts shows a zone of relatively high values throughout central Europe, which can be linked to agricultural land use (input of Cd via fertlisers).