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Nickel, Cobalt, Chromium and Copper in agricultural and grazing land soils of Europe

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In the framework of the GEMAS (Geochemical Mapping of Agricultural and Grazing Land Soils) project, concentrations of Ni, Co, Cu and Cr were determined for the whole available dataset (2218 samples of agricultural soil and 2127 samples of grazing land soil) covering a total area of 5.6 million sq km all over Europe.
The distribution pattern of Ni in the European soils (both agricultural and grazing land soils) shows the highest concentrations in correspondence with the Mediterranean area (especially in Greece, the Balcan Peninsula and NW Italy) with average values generally ranging between 40 mg/kg and 140 mg/kg and anomalous areas characterized by peaks higher than 2400 mg/kg.
Concentrations between 10 mg/kg and 40 mg/kg characterize Continental Europe north of Alps and, partly, the Scandinavian countries. Lower concentrations (< 10 mg/kg) occurs near the Trans-European Suture Zone, one of the main tectonic borders in Europe, and they are limited on the south by the maximum extent limit of the last glaciation.
Cobalt and Cr show distribution patterns similar to Ni in both agricultural and grazing land soils. The maximum concentration peaks of Cobalt and Cr rise up to respectively 126 mg/kg and 696 mg/kg in agricultural soils and up to 255 mg/kg and 577 mg/kg in grazing land soils.
Copper distribution in the soils collected across Europe, although has a general correspondence with the patterns of Ni, Co, Cr, shows some peculiarities. Specifically, Cu is characterized by high concentration values (up to 395 mg/kg in agricultural soils and 373 mg/kg in Grazing land soils) also in correspondence with the Roman Comagmatic Province and the south western coast of France characterized by a wide spread of vineyards.