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Thorium and other trace elements in soils from Catalonia (Spain)

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A study was conducted to determine the total contents (XRF) of Th and Ba, Ce,Cu, Ga, Ni, Pb, Rb, Sn, Sr, V, Y, Zn and Zr in soils from Catalonia, NE Spain, and to establish relationships between heavy metals and some soil properties. A total of 94 samples (47 soil plots) were collected from topsoils and subsurface soils in the main soil types. The median concentrations (mg kg^{-1}) obtained were Th 7 (range 3-15.5 mg kg^{-1}), Ba 412 (range 113-954 mg kg^{-1}), Ce 55 (13-107 mg kg^{-1}), Cu 19.4 (5-91 mg kg^{-1}), Ga 12.5 (5-21.7 mg kg^{-1}), Ni 24 (7-56.5 mg kg^{-1}), Pb 25 (9-100 mg kg^{-1}), Rb 79 (34-140 mg kg^{-1}), Sn 2 (1-8 mg kg^{-1}), Sr 102 (43-401 mg kg^{-1}), V 68.5 (22-170 mg kg^{-1}), Y 20 (7-41.5 mg kg^{-1}), Zn 66 (20-137 mg kg^{-1}), and Zr 156 (40-417 mg kg^{-1}). The concentrations of Th were similar to those given by other authors from different countries of the Mediterranean regions. In terms of soil properties, the results of this study suggest that, in these soils, Th and trace element adsorption and retention are influenced by several properties such as clay minerals and pH. Almost all element concentrations were positively correlated with clay content and negatively correlated with carbonates. The very strong positive correlations between Th, Y, V, Ni, V, Ga and Ce point to their natural origin.