



## **GEMAS - Tin and Tungsten: possible sources of enriched concentrations in soils in European countries**

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Tin and tungsten occur related with magmatic differentiation and can be installed in fissures and veins of magmatic rocks or in the neighbor metasediments. Generally, both elements have low chemical mobility in the superficial environment although effectively mobile in detrital media such as stream sediments and deposited in alluvial soils. The most important tin-tungsten deposits in Europe are in Variscides. From the northern Europe, 985 samples and from southern Europe 1123 samples were collected both in agricultural and grazing lands. Analysis were made of Sn, W, pH, TOC, SiO<sub>2</sub> from the upper 20 and 10 cm of agricultural and grazing soils, respectively. The present study is part of the GEMAS project a joint project of European geochemical mapping between the EuroGeoSurvey Geochemical Expert Group and EuroMetaux. The results show that in general, at the European (continental) scale natural processes are dominant. It is clear the distinction between NE Europe and SW European tin and tungsten concentrations in soils. Tin geometric mean concentrations in the northern Europe is 0.57 mg kg<sup>-1</sup> in agricultural soils and 0.62 mg kg<sup>-1</sup> in grazing land; southern Europe 0.91 mg kg<sup>-1</sup> in agricultural soils and 0.95 mg kg<sup>-1</sup> in grazing land. Tungsten geometric mean concentrations in northern Europe is 0.067 mg kg<sup>-1</sup> in agricultural soils and 0.073 mg kg<sup>-1</sup> in grazing land and in southern Europe is 0.085 mg kg<sup>-1</sup> in agricultural soils and 0.090 mg kg<sup>-1</sup> in grazing land. Limit between north and south is the maximum extent of the last glaciation. Grazing land, undisturbed soils for a period of several years, have higher concentrations of Sn and W than agricultural soils which raises the question that if only natural processes are observed. Parent material seems to be the main source of Sn and W to soil. Sn-W rich Variscan granitic intrusions of Central Iberian Zone, Massif Central, Brittany, Cornwall and Bohemia are reflected in soil concentrations. TOC is higher in northern than in southern soils and SiO<sub>2</sub> is higher in loess sediments region, in the North German-Poland basin and in the Paris basin. Organic matter may immobilise these metals and silica content influences metallic elements concentrations in soils. Natural processes of soil development, land management of agricultural soils and population density all together may be responsible for higher concentrations of W in the soils of Netherlands Germany, Belgium, Switzerland and northeast France which seems not related with Sn-W mineral provinces. Tin and tungsten are enriched in the Precambrian shields compared to the Caledonian shields soils in the northern countries, although in northern countries climatic conditions may play the most important role in these elements concentrations. Tin and tungsten and tin or tungsten alone or in association of precious metals, copper, uranium, niobium, beryllium, titanium altogether were extracted in 650 small or median size mines in Portugal. Except tin in Neves Corvo mine of the Iberian Pyrite Belt the rest of these mines occurred in the Variscides granitic intrusions region. Tin and tungsten concentrations are therefore well reflected in the northern Portugal soils. At the GEMAS density of sampling pollution and local natural phenomena are not reflected in mapping but this important province is well delimited.