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Sources of pollution in the soils of the city of Huelva (SW of the Iberian Peninsula)

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The city of Huelva is situated in the southwest of Iberian Peninsula, in the southern part of the Iberian Pyrite Belt, one of the oldest and the most important sulphide mining districts in the World with original reserves exciding 1700 Mt and a mining history more than 4500 years old. A large industrial complex associated with the production of raw materials derived from mining industry is also located close to the city, and is supposed to be and important source of pollutants for the environment. Most of the pollutant associated to the industrial complex are produced as atmospheric emissions and subsequently transported to the surrounding soils. Beside the mining and industrial activities, intensive agriculture in the area is another potential source of pollutants to the nearby soils.

The objective of this study is to show the degree of pollution of the soils in the city of Huelva and to infer the different pollution sources. The analysis of the elements distribution using a geographic information system show high values for metals and metalloids as Cu, Pb, As, Ag, Cd, Zn and Hg, and great variability of concentration for some elements: As (1.7-2065.7), Cu (5.27->10000), Pb (7.22-5469), Zn (13.7-4706.7) and Hg (0.009-18.181 ppm). Factor analysis has allowed us to distinguish two main sources of pollutants: mining-industrial activities and intensive agriculture, the former being much more important than the latter. The higher factor scores of element association of F1 (Pb, Zn, As, Cu, Hg, Au, Ag, Cd, S, U, Ti, Fe, Co, ...) are mostly related to the industrial complex, and extreme values (> 1.5) also occur in correspondence with the old mineral harbour of the Tharsis mining company. The factor score F2 (Al, Sc, Ga, Cr, Ni, V, Be, K, Th, Zr, Mg, La, Mn, Ba, Fe, Sr, Ca, Co, Rb) is mainly controlled by geogenic sources, although the higher factor scores (> 0.5) could be related to intense agricultural activities.