

Temporal assessment of As spatial distribution in soils in the vicinity of Panasqueira mining area (Portugal)

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The Panasqueira hydrothermal mineralization (central Portugal) hosted by metasediments with quartz veins rich in ferberite, is the biggest Sn-W deposit of the Western Europe, and has been in operation since 1896 to present. The economic exploitation has been focused on wolframite, cassiterite and chalcopyrite. The mining and beneficiation processes produce arsenic-rich mine wastes contained in several tailing ponds (~2 Mm³) and impoundments (~10,5 Mm³). These tailings and impoundments are exposed to atmospheric conditions leading to the formation of AMD leaches due to water percolation.

The first soil campaign (75 samples) was carried on in 2004. Several elements showed high contents, being As one of the most concerning due to a maximum of 831 mg kg⁻¹, 24 times higher than local background.

The second soil campaign (64 samples) was carried on in 2010, at two depths: (A) superficial soil - anthropogenic influence and (B) at 15cm depth – geogenic influence. Arsenic maximum content in A soil is similar to the one found in 2004 – 708.7 mg.kg⁻¹ – while the B soil presents a maximum of 350.4 mg.kg⁻¹. However, median values are very similar 77.1 and 68.3 mg.kg⁻¹. The enrichment index discloses that the contamination is much higher in A than in B soil samples. Contamination factor reveals that for both depths the study area is considered very high contaminated.

The two temporal scenarios show that, on a superficial analysis, As in soil did not decreased in time being still retained. Comparing the two depths A soils revealed to be more contaminated, probably due to wind action and surface water drainage.

Soils are very prone to contamination from hydrological sources and also from atmospheric sources, however when soils are the receptor of tailings drainage coming from metal mining and smelting this waste disposal causes a major impact on soils, posing serious environmental concerns.