4,500-YEAR-OLD MINING POLLUTION IN SOUTHWESTERN SPAIN: LONG-TERM IMPLICATIONS FOR MODERN MINING POLLUTION

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Abstract

The Tinto river drains the Rio Tinto mining district, which comprises the world's largest known massive sulfide deposits; these orebodies have been mined from the third millenium BC to the present. The Tinto river is strongly acidic (pH, 1.5–2.5); during flood events, it transports a sandy material, including abundant detrital pyrite grains. A core drilled in the Holocene sediments of the Tinto estuary allows for investigation of recent and historical mining pollution. Two anomalous horizons have been recognized (0–1.3 m; 3–4 m). Both are characterized by very high metal content (100 times over the background) and by the presence of abundant clastic pyrite grains. The metal association (Pb, Ba, As, Cu, Zn, Sn, Tl, Cd, Ag, Hg, Au) is typical of that of the Rio Tinto pyritic ore. The upper horizon corresponds to the modern mining activity; the lower horizon has been dated at 2530 BC (^{14}C AMS calibrated age).

We show here that active mining occurred early (Copper Age) in the Rio Tinto area, resulting in a watershed-scale metal contamination. We also show that anthropogenic input of metals may be accumulated and immobilized during thousands of years in estuarine sediments.