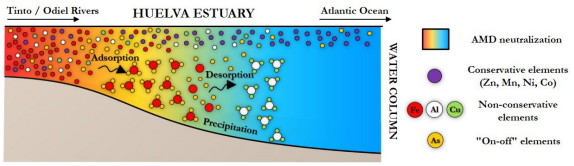
Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.25366



Temporal dynamics of contaminants in an estuarine system affected by acidmine drainage discharges

EVGENIA MARIA PAPASLIOTI[1], MANOLIS GIAMPOURAS[1], LAURA SÁNCHEZ LÓPEZ[2], M. DOLORES BASALLOTE[3], RÉMI FREYDIER[4], CARLOS R. CÁNOVAS[5] AND RAFAEL PÉREZ-LÓPEZ[5]

[1]University of Huelva

[2]Department of Earth Sciences & Research Center on Natural Resources, Health and the Environment, University of Huelva, Campus 'El Carmen', 21071, Huelva, Spain

[3]Institute of Marine Sciences of Andalusia (ICMAN-CSIC)

[4]HydroSciences Montpellier, Université de Montpellier, CNRS, IRD

[5]Department of Earth Sciences & Research Center on Natural Resources, Health and the Environment. University of Huelva, Campus 'El Carmen', 21071, Huelva, Spain

The estuary of Huelva is constituted by the common mouth of the Odiel and Tinto rivers, which are extreme cases of acid mine drainage contamination due to the Iberian Pyrite Belt, the world's largest sulfide mineral province. As such, the studied system has been world-famous as one of the most heavy-metal contaminated estuaries in the world [1]. The drained acidic waters are subjected to seawater mixing and thus, to dilution and precipitation processes that drive the load of contaminants entering the oceanic environment [2]. Our research [3] reports the distribution of major metal(loid)s present in the highly acidic waters across the entire Tinto and Odiel estuarine systems as they are subjected to acid mine drainage neutralization, until reaching the ocean. We present datasets divided in low- and high-flow periods, corresponding to dry/warm and wet/cold seasons, respectively [3]. Iron and Al were almost entirely removed from solution with pH increase at both periods due to their precipitation as schwertmannite and basaluminite, respectively. These mineral phases also, controlled the behavior of As, Cu and Pb, which were removed from solution, with >90 % of their concentration ending up in the particulate phase due to sorption processes. However, at pH >7, As returned entirely to the dissolved phase at both sampled seasons because of desorption, similarly to Cu at the low-flow period. On the other hand, Zn, Cd, Mn, Co and Ni behaved conservatively, with null partitioning to any sorption processes during estuarine mixing. Consequently, they entered the oceanic environment mostly mobilized, along with As and part of Cu, highlighting the contribution of the studied estuarine system to the total contamination of the Atlantic Ocean.

[1] Sainz et al. (2004), Environment International 30 (4), 557–566. [2] Pérez-López et al. (2023), Marine Pollution Bulletin 187, 114491. [3] Papaslioti et al. (2024), Science of the Total Environment, 947, 174683.