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Long-term metal flux and concentration behaviour in an AMD affected catchment.

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Historical mining practices in the UK used rivers to dispose of unwanted waste, contaminating river sediments and creating secondary sources of contaminants (Hudson-Edwards, 2003; Macklin *et al.*, 2006). This waste was transported downstream and deposited into coastal zones, including estuaries (Lewin, *et al.,* 1977). Coastal zones are susceptible to erosion, a process which can be exacerbated by climate change, due to a range of processes including: rising sea levels and an increased frequency of extreme weather events (Pirrie *et al.*, 2003; van der Perk, 2014). It is therefore vital to accurately understand the behaviour of such contaminants when exposed to different hydrogeochemical conditions, including their interaction with seawater.

This study has investigated the sources, fluxes, transport mechanisms and geochemical behaviour of metal(loids) in the estuary at Restronguet Creek (Carnon River) over 12 months. Aqueous metal(oid) concentrations in the catchment highlight the impact of metal mining remains, despite its cessation several decades ago. Total fluxes into the estuary were found to range from 307-742 kg/mnth Cu, 1280-3320 kg/mnth Zn and 183-354 kg/mnth As.

The highest metal(loid) fluxes were recorded in February, due to heavy rainfall and storm events, but the highest metal(loid) concentrations were found in April which was not expected. The transportation of these metal(loid) was likely retarded by sorption onto riverine sedimentary minerals (such as iron (hydr)oxides) with remobilisation possibly via erosion/reductive dissolution. Cationic species (such as Cu) showed differential geochemical behaviour to anions (such as As) due to a range of processes related to such sorption/desorption reactions.

It is anticipated that, by improving our fundamental understanding of mine waste behaviour and transport into the coastal zone, this project will contribute to the development of future mine waste management practices in such delicate environments.