REE behaviour in acid mine drainage conditions in the Ríos Tinto and Odiel (Iberian Pyrite Belt, SW Spain)

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The Ríos Tinto and Odiel constitues one of the most extreme cases of acid mine drainage in the word and they are considered as the origin of one of the most important heavy metal discharge to the world's oceans.

In the Odiel river, the uppermost waters are clean and show geochemical parameters (pH, C, TDS, ORP, etc) typical of non-contaminated waters. The Río Tinto river shows acidic conditions from the headwaters down to the discharge into the sea. Total disolved REE contents in both rivers increases suddenly at pH values below 2.5 reaching values as high as 16000 μg/L, being lower than 1000 mg/L at pH higher than 2.5. Most enriched NASC-normalized REE patterns in Río Tinto show a negative Eu anomaly, this being progressively reduced as waters are diluted downstream and element precipitation or coprecipitation occurs. In the Río Odiel this slight negative Eu anomaly is mantained downstream which suggest that this feature is a proxy of the succesive AMD inputs. This Eu negative anomaly indicate that REE pattern are inherited from the massive sulfide or the waste rock. Another characteristic of the REE patterns of the Rios Tinto and Odiel is a MREE enrichment typical of waters related to AMD. Hypothesis to explain this include: acid leaching/dissolution of MREE-bearing amorphous iron oxyhydroxides [1]; fractionation by surface/solution reactions between MREE-enriched minerals and acid waters [2]; stabilization and coagulation by colloidal material [3]; combined action of different mechanisms [4]. To these, the possibility of disolving minerals with contrasting REE fractionation patterns should be considered.

[1] Johannesson and Zhou, 1999. [2] .Sholkovitz, 1995. [3] Elderfield *et al.*, 1990. [4] Perez López *et al.*, 2010.

Geochemical profiles to study the last deglaciation and its impact on rivers

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The last deglaciation is fascinating for climatologists as it allows to study first-order climate changes that accompanied the retreat of the large Laurentide and Fennoscandian ice-sheets [1, 3]. Between 21000 and 6000 years before present, the climate system experienced a complete reorganization of all its compartments, e.g. atmosphere, oceans, lakes and rivers together with their associated ecosystems and biogeochemical cycles.

Linking records of the last deglaciation on land and in oceans requires accurate dating and comparison of different geological archives. A complementary way is to measure geochemical tracers of terrestrial and marine origins in the very same sediments raised in coastal environments.

Paleoclimate records at a particular location witness the successive phases of the last deglaciation. These various events, pauses and accelerations, have been known for many years (famous events such as Heinrich #1, Bolling, MWP1A, Allerod, Younger Dryas...), but it is only recently that geochemistry has provided analytical techniques allowing to produce high-resolution time series of various proxies based on elemental ratios (e.g. [2, 8]), organic compounds (e.g. [4, 5]) or stable and radiogenic isotopes measured in different sediment fractions: detrital, biogenic, authigenic phases or even interstitial waters (e.g. [6]).

To illustrate this growing research field, I will review what we know about deglacial sea level based on tropical corals and then go on to consider the associated changes in a few selected records from coastal zones, past river mouths or marginal seas (e.g. [4-9]). The aim is to illustrate the complex linkage between sea level rise, paleoclimatic changes and the reactivation of rivers during the last deglaciation.

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