Behavior of REE in superficial saline waters: a peculiar example in South-Central Sicily

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Weathering of evaporite rocks and related mine waste material, strongly affects the geochemistry of superficial waters (Na and Cl dominated) in a catchment basin of South-Central Sicily affected by wide range of salinity (3.6 <TDS< 231.6 g l^{-1}). REE concentrations were investigated in April and October 2016 (the end of the rainiest and driest period respectively): total REE concentrations (0.14 <ΣREE< 2.6 nmol l^{-1}) are partially influenced by different salinity, as demostrated by a negative correlation with the TDS values, observed only in October. Hence, it is not found any correlation between high salinity levels and total REE concentrations. On the contrary REE distributions are dependant to seasonal variations, as evidenced by different patterns normalised to PAAS: April distributions show increasing pattern from La to Lu (HREE enrichment) in almost all samples. In October we found both HREE and MREE enrichments (bulge effect).

The uniformity of the REE distributions in the rainy period is probably due to the capacity of the river flux to make homogeneus the fluvial system; in the driest one, the lack of a considerable flux, splits the system into smaller portions with different REE distributions. Therefore REE distribution is driven by multiple sources and this hypothesis is supported by several studies assigning HREE enrichment to dissolutiuon of carbonates [1] and kainite rocks [2]; while, the bulge effect agrees with the dissolution of chloride [2] and sulphate minerals [3] as gypsum and halite. Furthermore, a Gd anomaly is observed and plotting the Mg/Ca molar ratio as a function of the Gd amplitude, we found two different trends: a group of waters where Gd anomaly increases when Mg/Ca ratio is constant and another where Gd anomaly is constant when Mg/Ca ratio increases.

[1] Elderfield, (1990), Geochim. Cosmochim. Acta 54, 071-991. [2] Censi et al. (2017), Chem. Geol. 453, 80-91. [3] Toulkeridis et al. (1998), Chem. Geol. 145, 61-71.