The influence of porewater geochemistry on benthic fluxes of dissolved trace elements

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A complete study on dissolved trace elements concentrations and processes in the interstitial waters of a Galician coastal system (Vigo Ria) is presented. Pore waters contained between 1.7-23.2 nM for cobalt (Co), 1.5-131 nM for copper (Cu), 19.5-159 nM for nickel (Ni), 0.02-19.3 nM for lead (Pb), 5.4-260 nM for vanadium (V) and 0.2-241 nM for zinc (Zn). The profiles of these metals were affected by the redox processes monitored by means of manganese (Mn) and iron (Fe) levels and pH values in the pore waters. Cu and V presented higher levels in the oxic- superficial layers, by degradation of organic matter, and decreased with depth. Co and Ni followed the chemistry of Mn and were absent in surface oxic layers increasing their levels in the manganese reduction zone. Lead and Zn showed very irregular profiles because they are not as redox sensitive as Ni or Co and their complexing capacity with organic material is not as active as the Cu case. The overlying waters oscillated between 0.7-2.1 nM for Co, 5.5-50.5 nM for Cu, 4.6-10 nM for Ni, 1.4-9.1 for Pb, 5.7-28.5 nM for V and 14.6-66.5 nM for Zn. Using the Fick´s first law of diffusion, benthic fluxes have been estimated. Dissolved trace metal fluxes oscillated between 0.03-0.24 nmol cm^{-2} y^{-1} for Co, -0.02-1.11 nmol cm^{-2} y^{-1} for Cu, 0.16-1.70 nmol cm^{-2} y^{-1} for Ni, -0.14-0.03 nmol cm^{-2} y^{-1} for Pb, 1.52-4.35 nmol cm^{-2} y^{-1} for V and -0.37-0.90 nmol cm^{-2} y^{-1} for Zn.. This work has demonstrated that the redox geochemistry and diagenetic processes of the sediments and pore waters take control over the benthic fluxes.

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Integrated investigation on petroleum biodegradation

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Oil in variable degrees of preservation, having the same source and similar levels of thermal evolution, and water samples were collected at different depths in a field from the Campos Basin. Oils were analyzed by GC, GC-MS, GC-MS-MS and $d^{13}C$. Indigenous microbial communities were identified in oil and formation water after enrichment, isolation and sequencing of their 16S rRNA genes, as well as by means of cultivation-independent techniques (16S rRNA gene libraries). Results have shown: new biomarker proxies for biodegradation, *e.g.*, hopanoic methyl esters with C^{32} ßßR biologic isomer [1] and 3-alkyl-steranoid series [2], genetic material of aerobic and anaerobic microbiota in oil and water [3,4], and suggestion of aerobic and anaerobic microbiota lifecycles in the same oil reservoir within different geological times based on natural samples and *in vitro* oil biodegradation experiments [5].

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