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The Iberian margin: a source of dissolved Rare Earth Elements for the subpolar North Atlantic (GEOVIDE cruise)

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The GEOVIDE cruise (May-June 2014, R/V Pourquoi Pas? GEOTRACES GA01) started from Lisbon, Portugal, to join the south of Greenland and Newfoundland. The goal was to investigate trace elements and their isotopes distributions in the subpolar North Atlantic. Particulate Rare Earth elements, Fe and Mn concentrations revealed resuspension spots on the Iberian slope, the resuspended sediment then spreading toward the open ocean as nepheloid layers [1][2]. From there, outputs of a model of internal tidal waves shown that they are responsible of sediment resuspension, when the circulation explains the spreading of these resuspended sediments in nepheloid layers [3].

The question of the impact of these particulate inputs on the REE dissolved concentrations (DREE) can thus be addressed. To answer, we applied the results of an extended Optimum Multiparameter Analysis (eOMPA) to subtract the water-mass mixing contribution to the measured DREE concentrations. Results show a positive residue affecting the first 1000 m, although more pronounced in the nepheloid layers, indicating DREE inputs in addition to their preformed concentrations. We calculated the required amount and rate of particle dissolution of the resuspended sediment to explain these enrichments. We found that the required particle load at the margin is 10,000 times lower than the main Portuguese river sediment deposit available for resuspension.

These results highlight that margins are an underestimated source of lithogenic elements such as REE, Mn, Fe to the ocean. It also shows that the particle dissolution combined to scavenging can contribute to explain the boundary exchange processes.

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