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Distribution of major and trace elements in marine sediments deposited next to Doce river discharge after the break of the Mariana tailing dam.

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Besides hosting large mining complexes, the Rio Doce basin is widely exploited for agricultural activities and, industrial supplies. The Rio Doce is one of the main water bodies in the southeast region of Brazil, with an estimated sedimentary load of $11.22x10^6$ tons/year and just only it's sediment transport capacity, associated with the activities along its watershed, justify a deep study at the continent-ocean interface. However, in addition, in November 2015 the collapse of the Fundão tailing dam, a property of the Samarco mining company, described as one of the largest environmental disasters in Brazilian history, mobilized around 55 million m³ of mining waste through the Rio Doce basin. A reddish, fine granulometry mud, composed of silica, hematite, magnetite, manganese oxides and organic matter was transported in the river system through more than 600 km and released in the ocean. In this sense, the present study evaluated the distribution of major and trace elements in six marine sediments located in the discharge zone of the Rio Doce, three in the continental shelf and three in the slope, after the arrival of the mine tailings. The sediments cores M125-39-2, M125-43-2, M125-44-2, M125-49-2, M125-50-2 and M125-55-8 were collected with a multi-corer during the RV Meteor cruise M125. The major and trace metals were determined through the total digestion method (USEPA 3052) and analyzed by an ICP-OES, also were determined the granulometry, total organic carbon (TOC), total nitrogen (TN), $\delta^{13}C$ and $\delta^{15}N$. The core M125-39-2 closer to the discharge zone of the Rio Doce registered the Mariana event. Two distinct events can be suggested in this core, one associated with the deposition of the mining tailings from the dam rupture and the second by the possible subsequent remobilization of these materials under high rainfall conditions, where an increase in Fe, Al, Si, Ti, As, Pb among other elements was recognized. Interpolation of the $\delta^{13}C$ and $\delta^{15}N$ with TOC and TN led to identified two distinct groups in this core, one with a mixed organic matter source (bottom of M125-39-2) and the other with a marine isotopic signature (top of M125-39-2).Also, the granulometric data and the elemental ratios when interpreted together show that the influence of the Rio Doce discharge was predominant to the M125-39-2 core, consistent with an abrupt, localized increase of the terrestrial contribution. The most superficial centimeter of the core, M125-50-2 presented an increase in the concentrations of Fe, Al, Si, K and, Ti, as in the other trace elements concentrations. The proximity to the source area, the patterns of marine

currents and winds in the region were fundamental for the accumulation of major and trace elements from the tailing dam rupture in the core M125-39-2. Finally, organic matter content and the granulometry, despite their secondary role in this study, are factors with some potential that could enhance the adsorption of metals from the ore plume.

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