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Implication of transport processes on the grain-size specific distribution of radiogenic isotopes Nd, Sr and Pb in marine sediments

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Radiogenic isotopes like Nd, Sr, and Pb are powerful provenance tracers in lithogenic materials. Their compositions are unique to the lithology and the age of formation of the source rocks. Moreover, these radiogenic isotopes are characterised by long-lived decay systems and negligible mass and chemical fractionation. Thus, their conservative nature is used to determine the provenance of lithic grains. Winds and rivers introduce lithic components (and their radiogenic isotopes) into marine sediments. Mineralogical sorting might occur during aeolian, riverine, and subsequent marine transport, affecting the fate of minerals within a specific size range. Thus, mixed contributions of distinct-sized lithic grains from different sources to the bulk sediment is likely. However, we hypothesize such diverse contributions are blurred in bulk sediments, potentially resulting in biases of provenance information. In this study, we explore the influence of hydrodynamically-driven mineralogical sorting on the Nd, Sr, and Pb signals derived from the lithic fraction of bulk and size-fractionated sediments and analyse this information in terms of provenance and transport pathways. We analysed 13 core-top sediments in the South-Southwest Iberian Margin off the coast of Portugal in the Atlantic Ocean. Additionally, 5 downcore samples from sediment core SHAK06-5K retrieved from the study area were also used. We fractionated the bulk sediments into clay (0-2 μm), fine silt (2-10 μm), coarse silt (10-63 μm) and sand (>63 μm) grain-size classes. An aliquot of each fraction was then analysed for radiogenic isotopes and radiocarbon ages of organic carbon. Grain-size minerals enrichment or depletion of radiogenic isotopes compared to bulk sediments are evaluated in terms of differences in transport mechanisms, degree of chemical weathering, and differences in source areas. Radiocarbon ages further detail on the transport processes. This information is in turn used to interpret changes in the radiogenic isotope signals of downcore sediments. Our findings are used to advance our understanding of the controls and fate of Nd, Sr, and Pb in marine sediments.