Across the sediment-water interface: a diagenetic perspective on pore water benthic flux estimates for neodymium

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The neodymium isotope composition (ε_{Nd}) of seawater is a common tracer of ocean circulation. In paleoceanographic applications, the ε_{Nd} recovered from operationally defined authigenic phases is assumed to reflect the overlying bottom water ε_{Nd}. However, uncertainties in the neodymium budget of the global ocean and in the processes governing the ε_{Nd} distribution within sedimentary authigenic phases hamper the use of the ε_{Nd} tracer. We determined sediment composition, pore fluid rare earth element (REE) concentrations, and ε_{Nd} in near-surface sediments characterized by varying composition across a range of water depths. REE concentrations enrichments in shallow subsurface pore fluids are up to two orders of magnitude higher than REE concentrations in overlying seawater. These pore fluid enrichments imply that REEs released during early diagenesis represent a potentially large sedimentary source of REEs to the ocean's water column and that these sedimentary processes may influence any authigenic ε_{Nd} signature initially recorded in the sediments. Specifically, our results show that the pore fluid ε_{Nd} is not equivalent to the bottom water ε_{Nd} highlighting the need to understand the relative importance of the pore fluid influence on the authigenic records in order to reconstruct past bottom water values. Here, I present pore fluid rare earth element data supporting a benthic source of neodymium in the modern ocean along with ε_{Nd}, bulk chemical composition, and spatially resolved mineral associations to better characterize the magnitude and spatial extent of the benthic flux.