Scavenging of thorium and protactinium by particles from the East Pacific Rise hydrothermal plume

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Concentrations of dissolved ^{230}Th, ^{231}Pa and ^{232}Th measured along the US GEOTRACES Eastern Pacific Zonal Transect between Peru and Tahiti illustrate the enhanced scavenging of trace elements by particles derived from the hydrothermal plume that spreads westward from the East Pacific Rise (EPR). Concentrations of dissolved ^{230}Th and ^{230}Th increase linearly with depth in the upper 2 km of the water column, consistent with their removal by reversible scavenging. The intensity of scavenging by plume particles is quantified by comparing the predicted (extrapolated) concentration of dissolved ^{230}Th at the core depth of the plume (30 to 35 fg/kg) with measured concentrations. Within the core of the plume, measured concentrations of dissolved ^{230}Th are 8 fg/kg at a distance of approx. 1200 km to the west of the EPR, and 12 fg/kg at a distance approx. 2500 km to the west of the ridge, much less than the predicted value. Measured concentrations of particulate ^{230}Th and ^{231}Pa represent only a few percent of the total, so concentration minima in the profiles of dissolved ^{230}Th and ^{231}Pa reflect removal from the water column, not simply the transfer of Th and Pa from solution onto suspended particles. Particles derived from the EPR plume potentially impact the scavenging and removal of many trace elements from the deep ocean over a broad area of the eastern tropical South Pacific.