

227Ac along GEOTRACES Transects in the Deep South Pacific and Preliminary Results for the Arctic

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227Ac (22 yr half life) diffuses from sediment and is mixed vertically and horizontally as it decays, providing a distribution that can be used to infer transport rates for other solutes in the deep ocean. Profiles were collected along US GEOTRACES transects in the South Pacific (EPZT, Fall, 2013; Peru-Tahiti) and in the Arctic (Summer, 2015; Dutch Harbor to North Pole) by pumping water through filter cartridges impregnated with MnO₂, to trap Ac Th, and Ra. Two cartridges were deployed in series to estimate extraction efficiency. Supported activity has been determined through measurement of its 231Pa parent. In the EPZT transect, excess 227Ac profiles indicate several important features that have been interpreted using a 2D numerical model with diffusion and westward advection: 1) Vertical mixing rates decrease as the water column stratification becomes more pronounced; 2) Integrated excess 227Ac in the water column increases with increasing distance from the East Pacific Rise (EPR) due to westward advection above the EPR; 3) Most profiles show elevated activities near 2500-2600 m depth (sigma-theta 27.72), just below the 3He anomaly, indicating a source of 227Ac in the hydrothermal plume that can be traced as far as 152°W. The 227Ac decrease indicates a 1-D horizontal velocity equivalent to about 0.4 cm/s, requiring about 40 years to travel from the EPR to 152°W. Preliminary analysis of results from the Arctic, compared to Pacific transects, indicate far smaller benthic inputs of 227Ac, lower mixing rates near the bottom, and possible inputs from shelf sediments that have mixed into the central Arctic.