Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.16851

Prominent Regions of Enriched ^{228}Ra along the U.S. GEOTRACES Pacific Meridional Transect (GP15)

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The half-life of ^{228}Ra (5.75 years) aligns well with near-surface and near-bottom mixing timescales in the ocean. Because ^{228}Ra is sourced from ^{232}Th decay in sediments, regions of enhanced activity represent water that has recently interacted with sediments, either on the continental margin or ocean bottom. The GP15 transect from Alaska to Tahiti encountered several regions where ^{228}Ra was enriched. In the upper ocean these data follow surface current patterns and pair with earlier measurements of ^{228}Ra and other radionuclides to reveal the origins of these enriched regions (Figure 1). An enriched surface water region on the Alaska margin was sourced locally but did not extend to the Alaskan trench. A large region between 32° and 47° N, 152°W, was sourced from the west by the North Pacific current flowing at speeds of 3-7 cm/s. Another enriched region between 5° and 11° N, 152°W, was also sourced from the west by the North Equatorial Countercurrent. A subsurface enrichment (200-300 m) at 25°N, 152°W, was associated with Subtropical Mode Water. Overall, the inventories of ^{228}Ra in the upper Pacific were an order of magnitude lower than inventories in the Atlantic. In deep waters the primary zone of enrichment was between 27° to 47° N, 152°W (Figure 2). Near-bottom inventories (0 to 100 m above the seabed) for these stations averaged four times greater than the other stations on GP15. The Pacific stations in this enriched region have inventories similar to average Atlantic stations; average inventories at remaining Pacific stations were lower than averaged Atlantic stations. There was one region of enriched ^{223}Ra (half-life = 11.43 days) of hydrothermal origin above the Puna Ridge near Hawaii; but this feature lacked ^{228}Ra enrichment.

Figure 1

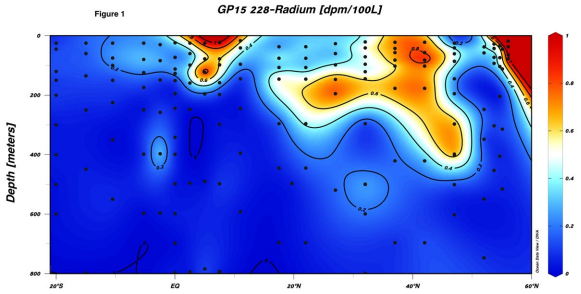

Figure 2 Station ID