Different removal behaviors of polonium and lead in the ocean

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We measured naturally occurring radioactive isotopes, ^{210}Pb and ^{210}Po, in the southern sea of Korea and the East Sea (Sea of Japan) in November 2003 and May 2004, respectively. The southern sea of Korea lies on the continental shelf (maximum water depth of ~120 m), but the East Sea is a large marginal sea (mean water depth of 1350 m). Total activities of ^{210}Pb and ^{210}Po were in the range of 9 - 61 dpm/100L and 7 - 31 dpm/100L, respectively, in the upper 0 - 50 m water column. On the basis of a scavenging model, in the southern sea of Korea, the residence time (140 days) of total ^{210}Pb was much shorter than those (330 days) in the East Sea, while the residence time (630 days) of total ^{210}Po was much longer than those (490 days) in the East Sea. If water mass transport and chemical scavenging are considered together in this region, where the water passes through the continental shelf from the East China Sea to the East Sea, ^{210}Po displays the net inputs from bottom sediments in the continental shelf, while ^{210}Pb is more effectively removed to bottom sediments. Our results suggest that ocean boundary could be the net source for Po, proxy for Se and Te, while it is the net sink for Pb and most other particle reactive trace metals and radionuclides.