Goldschmidt 2000
September 3rd–8th, 2000
Oxford, UK.

Journal of Conference Abstracts
Volume 5(2), 1109

Large Particle Flux of Plutonium on the Continental Slope of the East China Sea

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The anthropogenic radionuclides, ^{239}Pu (half-life=2.44 x 10^4 year) and ^{240}Pu (half-life=6.58 x 10^3 year), have been added to the surface oceans mainly as a consequence of atmospheric nuclear weapon testing, which took place mostly during the 1950s and early 1960s. Plutonium is a reactive element, which is adsorbed by particles in seawater and scavenged from the water column. The East China Sea is a representative marginal sea located in the western Northwest Pacific. It is known to be an area of high biological productivity in which large amounts of nutrients and related substances are supplied from the continent through rivers and the atmosphere. The marginal sea is the transit area between the continent and the ocean. It is important to investigate the transport process of plutonium for such a highly productive coastal sea. The aims of this study were to measure the activities of $^{239+240}$Pu in settling particles collected in the East China Sea continental slope by using time-series sediment traps and to discuss the transport process of plutonium on the East China Sea continental margin. Time-series sediment traps (PARFLUX Mark 7 G-21) were deployed on the continental slope (28-40.86N, 127-04.47E, water depth, 604 m) in the fall of 1995. Two sediment traps were deployed at depths of 502 m and 30 m above the bottom (574 m). The sampling interval was 12 hours from 26 October 1995 to 4 November 1995. The analytical procedure for plutonium was essentially the same as that described by Anderson and Fleer (1982). The activities of $^{239+240}$Pu were determined with alpha spectrometers (Tennelec TC-256) equipped with passivated ion implanted silicon detectors (IPC-500-100-19-EM) and a multichannel analyser (Tennelec PCA-M). The chemical yields of Pu were determined by using a ^{242}Pu yield monitor. The total mass fluxes showed large variations, which ranged from 0.55 to 12.93 g/m^2/day at 502 m depth and 1.07 to 14.69 g/m^2/day at 574 m depth. There was a clear tendency for total mass fluxes from the shelf edge to slope to increase with depth (Yamada and Aono, 1999), with an especially large increase near-bottom. There was little variation in $^{239+240}$Pu activities in spite of large variations of the total mass fluxes. The $^{239+240}$Pu activities ranged from 2.8 to 3.7 mBq/g at 502 m depth and 2.9 to 4.2 mBq/g at 574 m depth and were higher than that from the shelf edge (Yamada and Aono, 1999). The $^{239+240}$Pu fluxes showed large variations, which ranged from 4.2 to 37.4 mBq/m^2/day at 502 m depth and 3.6 to 44.9 mBq/m^2/day at 574 m depth, similar to the trend of the total mass fluxes. The $^{239+240}$Pu fluxes in the East China Sea continental slope were approximately an order of magnitude higher than those in the Panama Basin (Livingston and Anderson, 1983), North Pacific off central California (Fowler et al., 1983), and Sargasso Sea (Bacon et al., 1985). Furthermore, a significant strong correlation (r=0.973) was observed between $^{239+240}$Pu flux and total mass flux. This is due to the fact that the $^{239+240}$Pu flux variation is largely controlled by mass flux variations. Iseki et al. (1999) have reported that large total mass flux variations on the East China Sea continental margin was related to an internal tide, which often developed from the shelf edge to the mid-slope. The large fluxes of $^{239+240}$Pu may be attributable to lateral transport of particles that slide down on the continental slope nepheloid layer.

Anderson RF & Fleer AP, *Anal.Chem.*, **54**, 1142-1147, (1982).
Bacon MP, Huh CA, Fleer AP & Deuser WG, *Deep-Sea Res.*, **32**, 227-296, (1985).
Fowler SW, Ballestra S, Rosa JL & Fukai R, *Deep-Sea Res*, **30**, 1221-1233, (1983).
Iseki K, Okamura K & Kiyomoto Y, *In: Land-Sea Link in Asia, STA&GSJ*, 13-17, (1999).
Livingston HD & Anderson RF, *Nature*, **303**, 228-231, (1983).
Yamada M & Aono T, *In: Marine pollution, IAEA*, 381-382, (1999).