Time series of Pu-239+240 water profiles in the western and central North Pacific

Masatoshi Yamada[1]; Jian Zheng[2]; Tatsuo Aono[1]

[1] Nakaminato Laboratory for Marine Radioecology, NIRS; [2] NIRS

The plutonium isotopes,Pu-239 (half-life: 24,400 y) and Pu-240 (half-life: 6,580 y), have been mainly delivered to the Pacific Ocean by global fallout as a result of release from atmospheric nuclear weapons testing, which took place mostly during the 1950s and early 1960s. The maximum annual deposition of Pu-239+240 occurred in 1963. The second input of Pu-239+240 to the Pacific Ocean was derived from nuclear weapons tests at the Pacific Proving Grounds at Bikini and Enewetak Atolls. A number of studies have been made on the water column distributions of Pu-239+240 in the North Pacific. The concentrations of Pu-239+240 increased to a maximum value at around 500 - 800 m depth and then decreased with depth. The concentrations and water column distributions of Pu-239+240 should change with time. One of the objectives of R/V Hakuho Maru cruise in 2000 (The Bootes Expedition) was to re-visit some of the GEOSECS stations. The comparison with previous data can be used to develop the Pu-239+240 time series in the water column.

Seawater samples were collected at Stns. BO-1 (GEOSECS-222), BO-3 (GEOSECS-212), and BO-4 (GEOSECS-235) in the western and central North Pacific during the KH-00-3 cruise. The profiles of Pu-239+240 in water column from three stations showed nearly the same variation with depth. The sub-surface maximum values decreased by a factor of 2 - 3 over 27 years from 1973 to 2000. The Pu-239+240 concentrations below 1000 m at these stations did not change significantly over 27 years. Water-column inventory of Pu-239+240 at Stn. BO-1 (GEOSECS-222) decreased from 93 (in 1973) to 77 (in 2000) MBq/km2. This value is approximately two times higher than that of the global fallout input at the latitude of 30 - 40 N.