Nd concentration and isotopic ratio in the waters of the Pacific Ocean

HIROSHI AMAKAWA, DIA SOTTO ALIBO, KIYOTAKA FUKUGAWA, JING ZHANG, AND YOSHIYUKI NOZAKI

1 Tokyo Metropolitan University, Hachioji, Tokyo, Japan (amakawa@comp.metro-u.ac.jp)
2 Ocean Research Institute, University of Tokyo, Nakano, Tokyo, Japan
3 Toyama University, Toyama, Japan

Four vertical profiles of dissolved Nd concentration and isotopic ratio were determined in the northwest Pacific near the Japanese Islands.

As for the stations in the Kuroshio Current regime (LM2, LM6/11), depth profiles of Nd isotopic ratio is not so smooth. The depth profiles at LM2 (29˚N, 143˚E) and LM6/11 (34˚N, 142˚E) have two minima at ~250m (εNd = -7.4 for LM2, -8.7 for LM6/11) and ~2000m (εNd = -6 - -5) and one maximum around 800 ~ 1000m. The stations in the Oyashio Current regime (LM9, CM5) show less complicated Nd isotopic vertical profiles compared with those in the Kuroshio. Within the depth range of 800 ~ 1000m, LM9 (40˚N, 145˚E) and CM5 (40˚N, 155˚E) show almost same values as those at LM2 and LM6/11, which seems to be due to the influence of the North Pacific Intermediate Water (NPIW) to both the Kuroshio and Oyashio Current regimes. Except for the surface, the profile of CM5 is almost as same as that of the previously reported subarctic site, TPS 47 39-1 (Piepgras and Jacobsen (1988)). On the other hand, below 1000m, LM9, located in the southern edge of the Oyashio Current regime, shows less radiogenic values compared with CM5 and TPS 47 39-1.

The shallow Nd isotopic minimum observed in the Kuroshio Current region is due to the contribution of the North Pacific Tropical Water (NPTW), which might be supplied large amount of the continental derived Nd from the South China Sea or East China Sea. As the samples from the depths of NPTW do not show any characteristic REE patterns, the Nd isotopic ratios are the only indicators for the water mass.

Within the depth range of 1000 to 5000m, the Nd isotopic profile at CM5 shows the slight but clear radiogenic ratios compared with LM stations. This strongly suggests that the limited deep water exchange between CM5 and those at LM stations. The vertical processes might play a key role in the formation of the water mass with high Nd isotopic ratio in the subarctic area.

Overall, the combined Nd isotopic and Nd concentration (REE pattern) study gives the various information on the water circulation and vertical processes in the ocean.

References