

Water mass structure and analysis using rare earth element in the Western North Pacific

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Western North Pacific has many important systems of material transport and circulation, such as mixing of warm current and cold current, formation of North Pacific Intermediate Water from the subarctic area, eddy and large-scale upwelling etc. This study aims to clarify the water mass structure in Western North Pacific by chemical analysis and physical data.

Samples and datasets used in this study were collected from KH-10-02 and KH-11-07 cruises. Salinity, temperature, DO and fluorescence data were collected by CTD, the DO and nutrients samples were measured on-board by automatic titration. The rare earth element samples were filtered by 0.2 μ m membrane filter after collection and acidified to pH 1.5 by hydrochloride acid in clean booth immediately, then extracted by NOBIAS PA1 chelate resin (Hitachi High-Tech) and measured by ICP-MS (Element 2, Thermo Fisher Scientific and iCAP-Q, Agilent) in a cleanroom on land.

Based on the T-S diagram and REEs pattern of the 165E line (20N to 50N), We classified the source of water mass into Kuroshio Surface Water (KSW), Pacific Subarctic Upper Water (PSUW), North Pacific Deep Water (NPDW). Analysis of the abundance ratios of these lumps revealed that KSW dominates low latitudes (20 to 40N) and PSUW dominates high latitudes (45 to 50N) in shallow layers (200 m). At high latitudes (45 to 50 N), the existence ratio of NPDW is higher than low latitude (20 to 40 N), which is thought to be the effect of strong vertical mixing near the Kuril Islands and Aleutian Islands. In the deep layer (6000 m), the inflow of water mass with properties different from those of KSW, PSUW and NPDW was confirmed in the high latitude zone (45 to 50N) by the result of rare earth element analysis and nutrient data. It is expected to be a water mass originating from the Sea of Okhotsk from other data set. In the future, we will evaluate the detailed structure of the water mass including the Sea of Okhotsk and other coastal waters by further measurement.

Keywords: Western North Pacific, Rare earth elements, Water mass analysis