

Water mass analysis using rare earth elements of shelf water in the East China Sea: contribution of Kuroshio Intermediate Water.

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To understand the origins and mixing of complicated water masses, as well as the contributions and nutrient supply via these various water masses in the East China Sea (ECS), a research cruise was conducted in the summer 2004. Water mass sources are defined by multiple tracers, including salinity and Rare Earth Elements (REE), etc. These sources include mixed shelf water (MSW, highest heavy REE concentration), Kuroshio surface water (KSW, highest temperature), Kuroshio tropical water (KTW, highest salinity), and Kuroshio intermediate water (KIW, highest nutrient content). High-nutrient water was identified in the middle shelf (bottom 100-130 m) and considered a mixture of MSW, KTW and KIW. The mixing ratios of three water sources are calculated using both conventional tracers (salinity and potential temperature) and four HREEs with the least squares method. Comparable results were obtained using these two datasets, suggesting HREEs, like temperature and salinity, are conservative comparing with water mass residence time and act as useful tracers to characterize the various water masses. The estimated KIW accounts for 26-55% of the middle shelf bottom water in the northernmost research area, while the proportion of $\text{NO}_3 + \text{NO}_2$ from KIW is 55-81% and that of phosphate is 58-90%. This indicates that KIW is the major nutrient source in the bottom water of the middle ECS shelf.

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