Seasonal variation of water masses and turbulence structure off the Sanriku Coast

*ikeda masashi[1], Eiji Masunaga[1], Toshi Nagata[2], Sachihiko Itoh[2]

1. ibaraki university , 2. Atmosphere and Ocean Research Institude, The University of Tokyo

Marine environments off the Sanriku Coast are important for oceanic ecosystems and influence fishing grounds in the north pacific. However, details of physical processes associated with marine environment have not been understood well. This study shows observational results off the Sanriku Coast obtained from continuous towing observations using BioUCTD (RINKO-profiler) and a microstructure profiler, VMP-250 (Turbo VMP). The observations were carried out in two seasons, May 5-7 (spring season) and October 8-11 (summer season), 2019. The horizontal resolution of BioUCTD was approximately 1.3 km and roughly 10 times higher than conventional CTD surveys. Details of internal wave and water mass structures were obtained by the BioUCTD towing observations. In observations in spring season, Oyashio Kuroshio mixed water distributed from the surface layer to the bottom layer approximately 0–20 km from the coast and the Oyashio water located below the surface layer in the offshore. The southern limit latitude of Oyashio was the southernmost in the year, the Oyashio dominated in the observation area (62% of the all observed water). The turbulence kinetic energy dissipation rate was high between Oyashio-Kuroshio mixed water and Oyashio water, ε reaching 2.6×10^{-7}W kg^{-1}. In observations in summer season, the Oyashio water accounted only 24% of the total observed water, and six water masses appeared in the observation area (Kuroshio water, Oyashio water, Tsugaru warm current water, cold lower layer water, surface layer water, Oyashio-Kuroshio mixed water). Large amplitude Internal waves were observed between Oyashio-Kuroshio mixed water and Oyashio. Sediment resuspension occurred where strong turbulent mixing were observed (5.7×10^{-8}W kg^{-1}). This study suggests that high-resolution surveys are desired to fully grasp mixing processes associated with water masses and internal waves.

Keywords: Sanriku, mixing, water mass

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