The Generation Process of the Bottom Intrusion in the Bungo Channel

*Kana Maetani[1], Akihiko Morimoto[2], Xinyu Guo[2], Toru Miyama[3]

1. Graduate School of Science and Engineering, Ehime University, 2. Center for Marine Environmental Studies, Ehime University, 3. Japan Agency for Marine-Earth Science and Technology

Introduction

The Bungo Channel is one of the two channels that connect to the Pacific Ocean and the Seto Inland Sea, and located between Kyushu and Shikoku Islands. Marine environment in the Bungo Channel is strongly influenced by the disturbances from open ocean. It is known that a cold-water intrusion from open sea, called a “Bottom Intrusion”, occurs in the lower layer from summer to autumn (Kaneda *et al.,* 2002). Since the Bottom Intrusion is difficult to observe because of its occurrence position, generation mechanism and intrusion process of the Bottom Intrusion have not been revealed yet. However, recently the Bottom Intrusion has been reproduced in numerical models with high resolution and high accuracy. Therefore, there is a possibility that we can figure out its three-dimensional structure and generation processes by analyzing model outputs. However, there is a possibility that the Bottom Intrusion and the intrusion of the cold-water in the numerical model do not have the same mechanism in real ocean. At first, we compare model output and observed data that derived from a mooring system at the central part of the Bungo Channel. After conforming reproduction of the model in terms of the Bottom Intrusion, we analyze the model output to understand the intrusion process of cold-water into the Bungo Channel.

Data

The observation data used in this study were measured by ADCP (Acoustic Doppler Current Profiler), thermometer and salinometer that were moored at the central part of the Bungo Channel, from 6 July to 17 October, 2016. We also used a model output of JCOPE-T-NEDO that is developed by JAMSTEC.

Results and Discussion

We analyzed two cases of the Bottom Intrusion that occurred 14 August and 10 September in 2016 because variations in current velocity and water temperature in the model consist well with those in observation. In these two cases, the cold-water mass was supplied to the shelf slope nearby N32.72°, E132.45°, and was crossed the 200m isobath by the anticlockwise flow in the shelf slope. As a result, a density gradient between the cold-water mass and relatively light water in the Bungo Channel was generated. The density gradient makes a northeastward density driven current in the lower layer in the Bungo Channel, and the current advects the cold-water mass into the Bungo Channel.

Furthermore, it is found from observation data that there is a case that northward flow became stronger in not lower layer but middle layer. When the northward flows became stronger in middle layer, a northeast flow also developed in northwestern part of the Bungo Channel. When strong northward flow occurred in the middle layer, water temperature in the central part of the Bungo Channel was not always dropped. This might be because the water mass transported by the strong northward flow in the middle layer came from shallower depth in the shelf edge compared with the case of Bottom Intrusion. However, the reason why velocity increased at middle layer is not clear at the moment, so that proceeding analysis is needed in addition to the Bottom Intrusion.

Keywords: Bottom Intrusion, Bungo Channel, continental shelf