Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.16283

Quantifying the origins of low-oxygen bottom waters and the influence of tidal effect on the outer shelf of the East China Sea using multiple tracers

WENJIE DENG[1], JING ZHANG[1], SITENG ZHU[1], KEIJI HORIKAWA[1] AND TAKAHIRO ENDOH[2]

[1]University of Toyama
[2]Kyushu University
Presenting Author: dwj940109@gmail.com

The East China Sea (ECS) is one of the largest marginal seas and has high rates of primary productivity as well as a large low-oxygen area, and the hypoxic phenomenon in the ECS is significantly threatening downstream ecosystems. Because the outer shelf of ECS is a necessary pathway for the Kuroshio, and the Kuroshio may further transport the water from the outer shelf to the Japan Sea and the northwest Pacific Ocean, exerting additional influences on downstream areas. The outer shelf of the ECS plays a crucial hub role in connecting its upstream (Changjiang River and inner/middle shelf) and downstream areas. Hence, researching the low-oxygen waters of the outer shelf of the ECS is very important and urgent.

This study systemically researched the low-oxygen bottom water on the outer shelf of the ECS by using multi-tracers. Heavy rare earth elements (HREEs) along with potential temperature and salinity data, are used to quantify the contributions from various water masses to low-oxygen waters, and the interaction between low-oxygen water and Kuroshio water. Additional tracers such as $\delta^{34}S$ and ^{226}Ra, were also utilized to further verify the reliability of our estimation. Assisted by a mixing model, we found that the low-oxygen water was dominated by Kuroshio Subsurface Water (81±3%), and its transport from inner/middle shelf to the outer shelf was proved. Furthermore, the low-oxygen water on the outer shelf was also confirmed to be transportable to the Kuroshio area (34-82% DIN and 35-83% DIP). Nutrient contribution from low-oxygen water on the outer shelf is primarily attributable to water mass contribution, followed by organic matter remineralization (~17% DIN and ~24% DIP). Moreover, the spring tide as a controlling factor, was found to significantly enhance the contribution of pore water to low-oxygen water (increase by ~70%). Our findings can provide a significantly valuable reference to the study on other marginal seas under the assistance of further observations and simulation models.