

## 【Introduction】

The East China Sea (ECS) has a vast continental shelf. The formation of shelf water is affected by fluvial input from the land and the open ocean. The Kuroshio flows along its margins. The purpose of this study is to clarify the material transport between the shelf and its surroundings.

This research is divided into two parts. (1) Qualification and quantification of the transport of the water masses from the shelf area of the East China Sea to the Kuroshio and the Sea of Japan using various trace element composition and isotope ratios; (2) Reproduction of mass transport route using a numerical model.

We aim to construct a synergistic research system between the model and the observation by adding more information (obtained from the results of the model) to make new observations and feeding back the obtained results to the model again.

## 【Material and Method】

Samples and datasets were collected in the continental shelf edge of the East China Sea. The salinity, temperature, DO and fluorescence data were collected by CTD. Rare Earth Element (REEs) samples were pre-concentrated and analyzed in University of Toyama. Cs samples were treated and measured at Kanazawa University. Nutrients samples were frozen on board and measured by automatic analyzer at Ehime University.

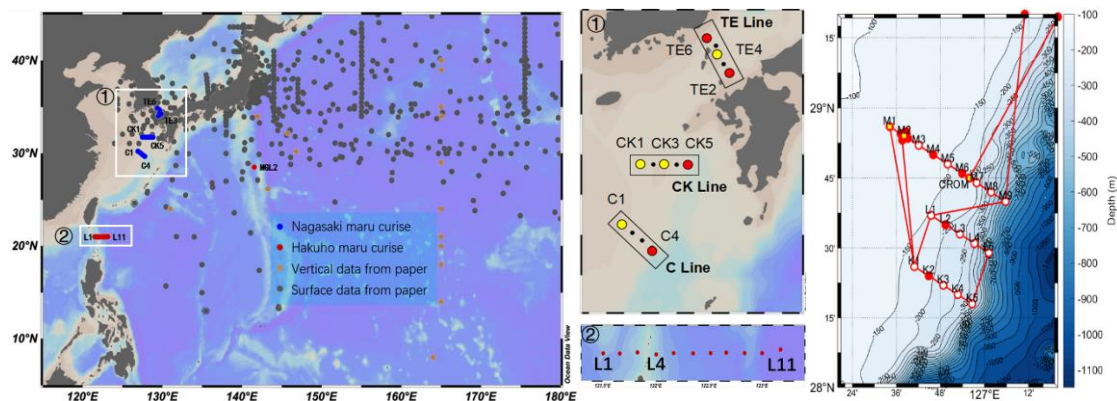


Fig 1: Stations in NN464 cruise and KH-17-5 cruise (left), and the NS33 cruise (right).

## 【Results and Discussion】

Result I: REEs as tracer

Table 1 shows the fractions of three water masses using different sets of tracers. The simulated fractions by four Heavy REEs (HREEs) have good agreement with the results using salinity and

	MSW	KTW	KIW
	%		
Tracers: temp and salinity			
Average	1	56 ± 17	43 ± 18
Tracers: four HREEs			
Average	2	59 ± 17	39 ± 17

Table Mixing ratios of MSW, KTW and KIW using salinity and potential temperature, as well as four heavy rare earth elements (Zhang et al., 2018).

potential temperature, suggesting HREEs are suitable and conservative water mass tracers. Physical mixing is the dominant control on HREE distributions over remineralization. On the NS33 cruise, the REEs samples were collected. The REEs will be used as a tracer to qualify and quantify the material transport between the East China Sea and the Kuroshio using similar method.

#### Result II: Visualization and quantification of transport of subsurface water in Northwest Pacific

The  $^{137}\text{Cs}$  from the Fukushima Daiichi Nuclear Power Plant accident was used as a reliable tracer, making it possible to visualize and quantify the mesoscale ocean mixing and material exchange. We traced the distribution of subsurface water and quantified several diffusion processes using  $^{137}\text{Cs}$  and traditional potential density anomaly. Though the depth gradually decreases from the ocean to the continental shelf, the existence of Upper Kuroshio Intermediate Water (UKIW) in the Tsushima strait can still be confirmed. The DIN contribution from the UKIW to the west Tsushima Current and the entire Tsushima section was quantified, and the result indicated that the significant DIN contribution from the UKIW cannot be ignored.

**【conference presentation】**

1. Siteng J. Zhu, Jing Zhang\*, Shota Kambayashi, Takeshi Matsuno, Eisuke Tsutsumi, Shigenobu Takeda, Seiya Nagao, Hiroshi Inoue, Hiroshi Ogawa, Ichiro Yasuda.  
From the Luzon Strait to the Tsushima Strait: Water masses and nutrient transports approached using  $^{137}\text{Cs}$ .  
2019JpGU meeting in Makuhari Messe, Chiba, Japan, May 2019.
2. Siteng J. Zhu, Jing Zhang\*, Shota Kambayashi, Takeshi Matsuno, Eisuke Tsutsumi, Shigenobu Takeda, Seiya Nagao, Mutsuo Inoue, Katsumi Takayama, Hiroshi Ogawa, Ichiro Yasuda.  
Transport of the upper Kuroshio Intermediate Water from Northwest Pacific to the Sea of Japan: using  $^{137}\text{Cs}$  as a tracer.  
2019 JOS meeting, Toyama, Japan, August 2019.
3. 野口忠輝, 張勁\*, Wenkai Guan, Bingzhang Chen, Meixun Zhao, Yuanli Zhu, 石坂丞二, 松野健, 安田一郎.  
Influence of Atmospheric Nutrient Deposition and Phytoplankton Species Composition in the Western North Pacific Subtropical Area in Winter.  
SOLAS Open Science Conference 2019, Sapporo, Japan, March 2019
4. 野口忠輝, 張勁\*, Wenkai Guan, Bingzhang Chen, Meixun Zhao, Yuanli Zhu, 石坂丞二, 松野健, 安田一郎.  
Atmospheric Nitrogen Deposition on the Sub-Tropic NWPO and Its Impact.  
2019年度日本海洋学会秋季大会、富山、2019年9月.
5. 野口忠輝, 張勁, Wenkai Guan, Bingzhang Chen, Meixun Zhao, Yuanli Zhu, 石坂丞二, 松野健, 安田一郎.  
大気由来微量元素の供給と海洋表層基礎生産に対する影響評価.  
2019年度 日本地球化学会、東京、2019年9月.