First measurement of ^{236}U concentration in the Arctic seawater in 2022 at the MALT, The University of Tokyo

Takeyasu Yamagata[1], Quiyu Yang[2], Yuanzhi Qi[1], Miwako Toya[1], Yuichiro Kumamoto[3] and Hiroyuki Matsuzaki[1]

[1] *Micro Analysis Laboratory, Tandem accelerator, The University Museum, The University of Tokyo*
2-11-16 Yayoi, Bunkyo-ku, Tokyo 113-0032, Japan
[2] *School of Engineering, The University of Tokyo*
7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, Japan
[3] *Japan Agency for Marine Science and Technology*
2-15 Natsusima-cho, Yokosuka-shi, Kanagawa 237-0061, Japan

Corresponding to: yamagata@um.u-tokyo.ac.jp

Anthropogenic nuclide ^{236}U (Half-life 2.34 x 10^7 years) and ^{129}I (Half-life 1.57 x 10^7 years) are produced by neutron capture on ^{235}U and fission reaction, respectively, mainly in the nuclear fuel burning and the nuclear bomb testing. The ^{236}U and ^{129}I in the Arctic Ocean are provided by nuclear-reprocessing plants such as the Sellafield and La Hague. Since the Annual discharges and the ratio of $^{129}I/^{236}U$ from the nuclear reprocessing plants are different, the concentration of ^{129}I, ^{236}U, and the ratio of $^{129}I/^{236}U$ are novel tracers for the transit time of the Arctic Ocean circulation [1].

We developed a new ^{236}U-AMS with the time-of-flight detector system at the MALT, The University of Tokyo [2]. To improve sensitivity and decrease background by increasing the extract beam intensity, the sample preparation procedures for the Iron-Uranium co-precipitation ratio and the mixed Nb powder ratio were optimized.

The seawater samples were collected in the Chukchi Sea and the Beaufort Sea during the MR22-06C cruise of R/V Mirai, JAMSTEC between 12th August and 29th September 2022. The two depth profiles, stations 14 and 26 of the ^{236}U concentration were obtained from surface to bottom, 2000 m at St. 14 and 3000 m at St. 26. The surface concentrations were 10 x 10^6 atoms kg^{-1}. The concentrations around 100 m depth with the water mass from the Pacific were (5 to 7) x 10^{-7} atoms kg^{-1}. The concentrations between 200 m and 800 m with the water mass from the Atlantic were 15 x 10^6 atoms kg^{-1} at St. 14 and (20 to 30) x 10^6 atoms kg^{-1} at St. 26. The ratios of $^{129}I/^{236}U$ between 200m and 800 m were 100 at St. 14 and 150 at St. 26 corresponding to 26 and 28 years from the Atlantic Ocean to these stations, respectively.

[1] Zheng et al. (2022) *Nucl. Engine. and Thech.*, **54**(12), pp. 4636 – 4643.
[2] Casacuberta et al. (2018) *Jour. Geophys. Res: Ocean*, **123**, pp. 6909 – 6921.