ANNUAL REPORT ON GEOTRACES ACTIVITIES IN SOUTH KOREA

May 1st, 2024 to April 30th, 2025

New GEOTRACES or GEOTRACES relevant scientific results

- Concentrations of both major and trace elements were analysed by Um et al. (2024) in the surface sediments of Ulleung Basin, East/Japan Sea to investigate the influence of ocean dumping activities on the geochemistry of these metal elements in the study area. High concentrations Cr, Cu, Zn, Sn, Sb, and Pb were observed at the dumping site, which clearly indicated the notable influence of ocean dumping on the behaviors of these elements in the Ulleung Basin area. Other elements were considered to be mainly controlled by the suboxic and anoxic diagenesis processes.

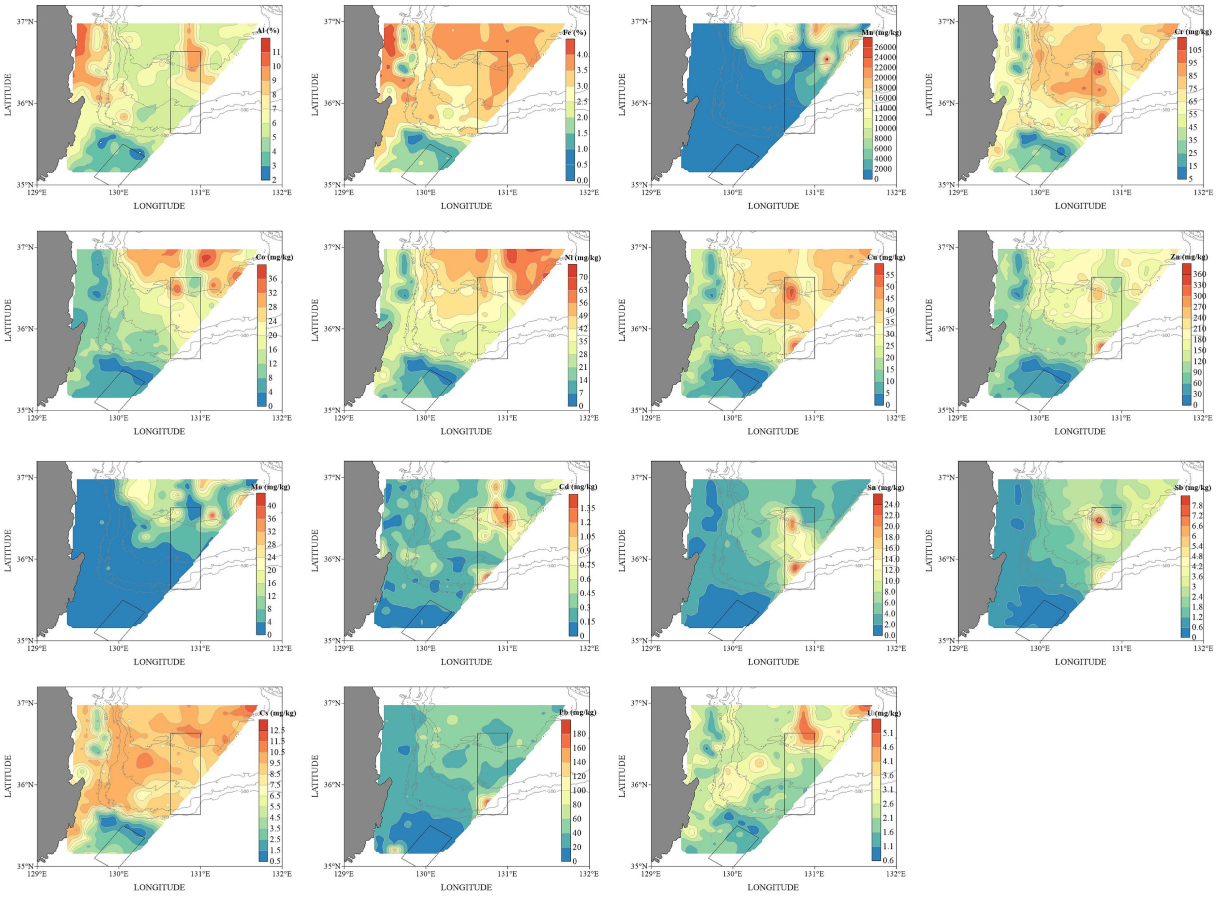

Figure 1. Spatial distributions of the measured geochemical elements.

- Seo & Kim (2025) provided in-depth investigation on the transport of particulate organic carbon (POC) across the shelf to the basin bottom in the East/Japan Sea, using Aluminum (Al) and ^{210}Pb as tracers. The sedimentary budget of ^{210}Pb indicated the limited lateral transport of shelf-derived particulate substances from land to the basin area, where these particulate materials appeared to be generally deposited in the shelf and slope areas. Authors also stated that the conventional way of estimating the sedimentation rate with excess ^{210}Pb in marginal seas where sedimentation rates are lower than 0.15 cm yr^{-1} may cause overestimation (3-8 times) due to intensive vertical mixing. To resolved this problem, authors obtained the POC burial fluxes in the study area with Al mass balance. Results showed that the "Al-derived" POC burial flux values are 4 times lower than those previously reported using the ^{210}Pb dating method. Their findings called for more comprehensive investigations on the oceanic sedimentation rates when using ^{210}Pb and pointed out the feasibility of cross-check with other elements like Al.

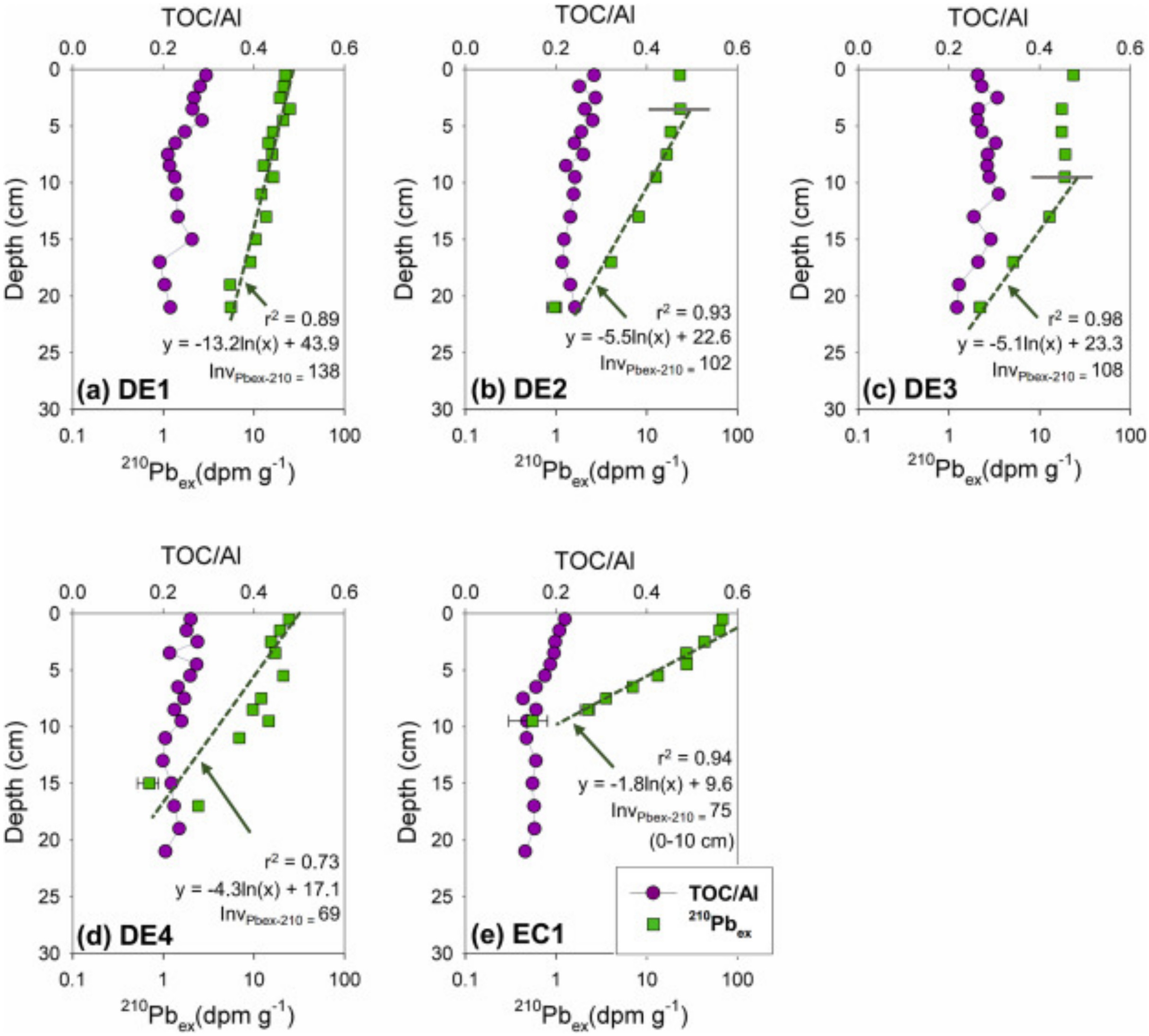

Figure 2. Vertical profiles of TOC/Al ratios and excess ^{210}Pb (^{210}Pb$_{ex}$, ^{210}Pb - ^{226}Ra) in the sediment in (a) DE1, (b) DE2, (c) DE3, (d) DE4, and (e) EC1. The green dashed line and $Inv_{Pbex-210}$ indicate the regression line used to calculate the ^{210}Pb-derived sedimentation rate and inventory of ^{210}Pb$_{ex}$, respectively.

- The activities of ^{137}Cs (half-life: 30.2 years) in seawater, particulate matter, and sediment cores were analysed by Kwon et al. (2025) to investigate the deposition and remobilization of ^{137}Cs in two coastal bays in Korea. Activities of ^{137}Cs in the bay waters showed similar values with remote open ocean, implying limited input of this element. Furthermore, authors reconstructed the deposition history of ^{137}Cs based on the coefficient values obtained in the bay. Authors discovered completely different vertical distribution patterns of ^{137}Cs in sediment cores between measured results and the reconstructed results, although the inventory of ^{137}Cs at each depth showed similar values between the measured results and reconstructed results. This misalignment indicates the post-depositional remobilization of ^{137}Cs within the sediments, related to desorption, diffusion, and adsorption of ^{137}Cs. The authors also cross-checked the sedimentation rates obtained from ^{137}Cs with ^{210}Pb, where the results showed that ^{137}Cs could be considered as one of the chronological tracers in coastal sediments, yet careful interpretation is required.

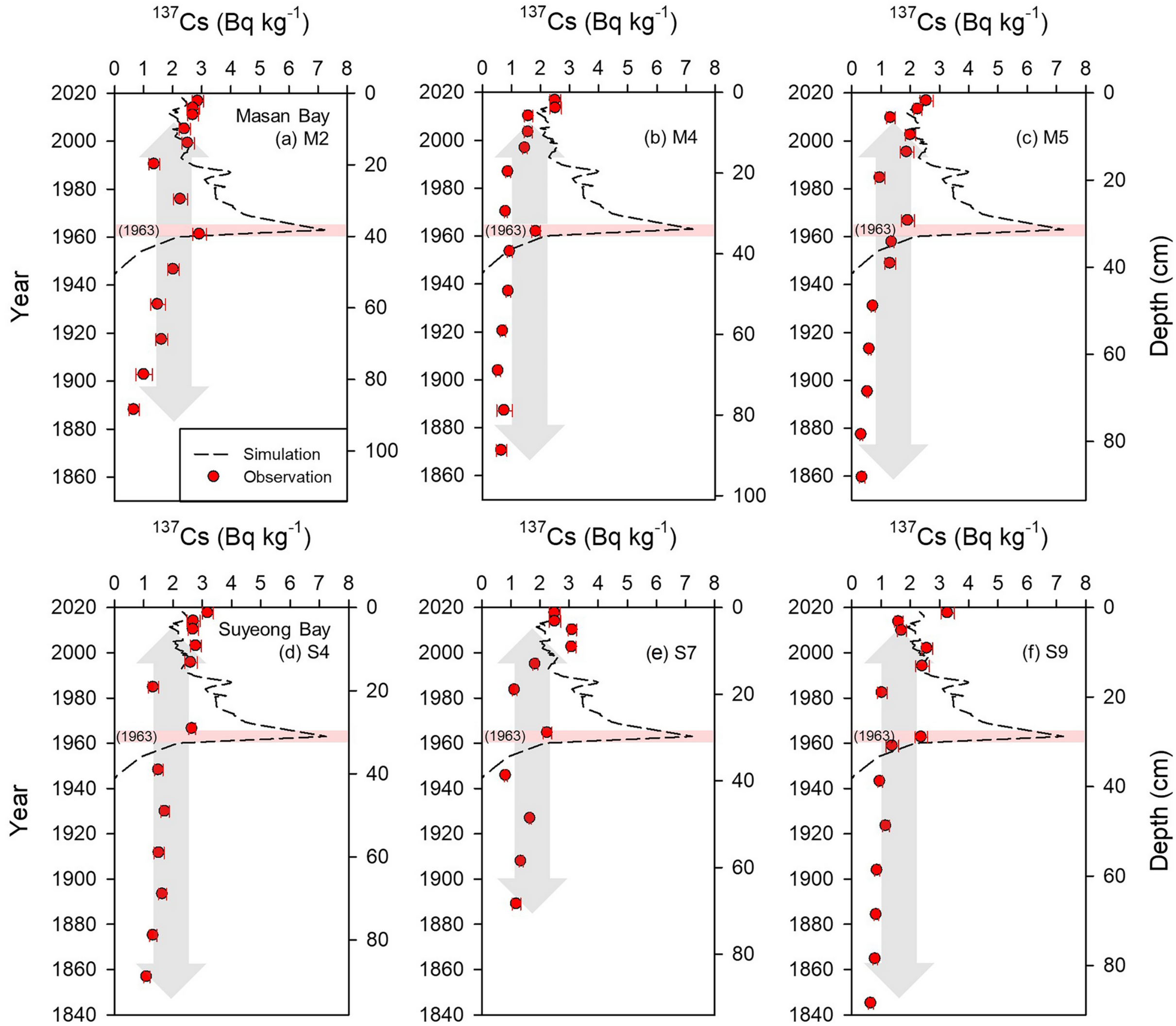

Figure 3. Time-based depth profiles of ^{137}Cs activities in the sediment cores from a–c Masan Bay and d–f Suyeong Bay, Korea. Black dashed line indicates the reconstructed ^{137}Cs activities by multiplying the ^{137}Cs activity in the corresponding-year seawaters of the East China Sea by the average K_d value in Suyeong Bay, with an appropriate decay correction. Solid arrows denote the mobility directions of ^{137}Cs in the sediments

- The impact of estuary dams on the behaviors of rare earth elements (REEs) in the Nakdong River Estuary, Busan, Korea was investigated by Kim et al. (2025). The authors conducted sampling in two seasons (winter season: February, 2021 and summer season: July, 2021). In the upstream area of the dam, concentrations of REEs were found to be higher in summer season than those in winter season (611 ± 79 pM > 349 ± 22 pM), while both seasons showed similar concentration levels in the downstream area (403 ± 76 pM in summer and 370 ± 79 pM in winter). Thus, authors claimed that the distribution and behavior of the dissolved

REEs showed different trends depending on the element and season. Yet, lower concentrations of light- and middle-REEs were discovered in the upstream area comparing with those in the downstream area when the dam had been closed for around 6 months, which suggested significant removal of these elements by particles, indicated by the Ce anomalies ($Ce/_{SN}/Ce_{SN}*$). Overall, authors claimed that long-term monitoring on the REE behaviors in this region is required to clarify the influence of dam system on the behaviors of REEs in this estuary.

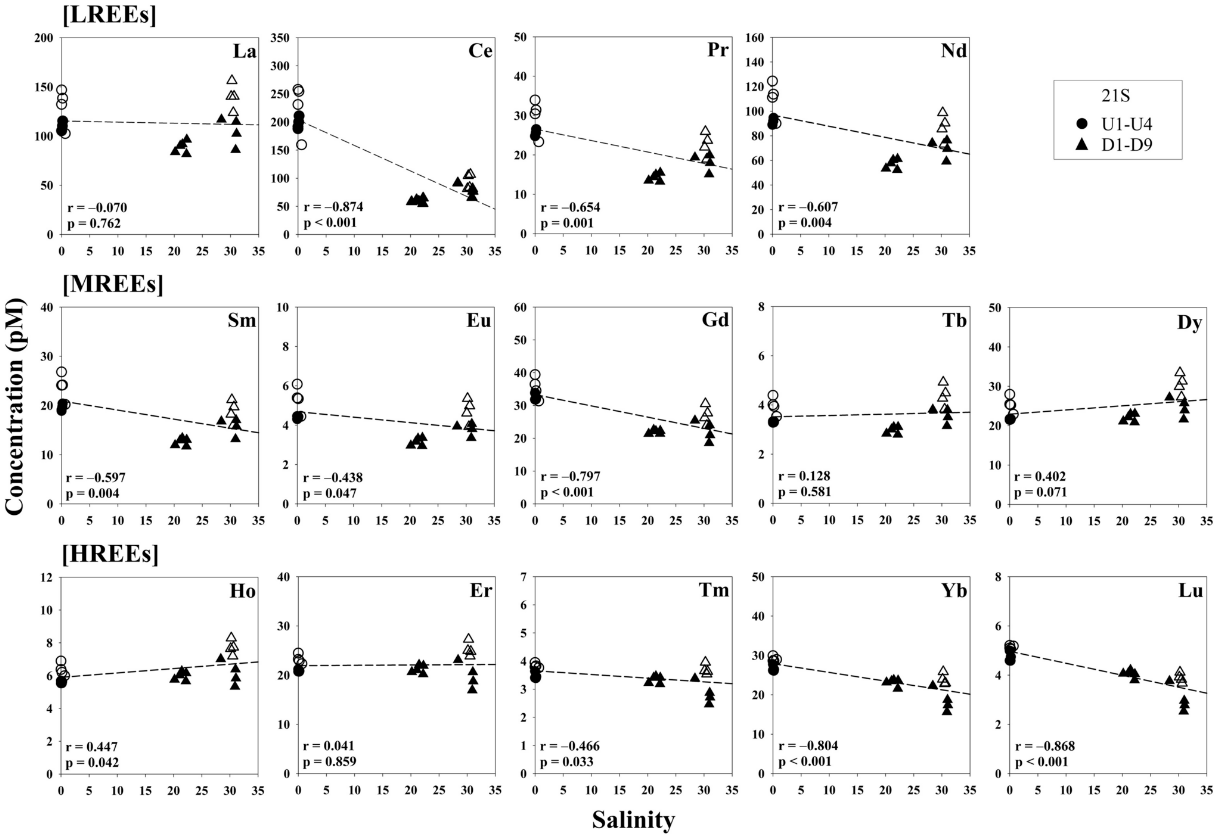

Figure 4. Plots of dissolved REE concentrations versus salinity obtained in summer (21S). Circles and triangles represent data from sampling sites upstream (U1–U4) and downstream (D1–D9) of the estuary dam, respectively. Filled symbols indicate surface water samples, whereas open symbols indicate bottom water samples. The dashed black lines indicate linear regression lines.

GEOTRACES or GEOTRACES relevant cruises

New projects and/or funding

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GEOTRACES workshops and meetings organised

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Outreach activities conducted (please list any outreach/educational material available that could be shared through the GEOTRACES web site) *(We are particularly interested in recordings from webinars from GEOTRACES research)*

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Other GEOTRACES activities

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New GEOTRACES or GEOTRACES-relevant publications (published or in press) *(If possible, please identify those publications acknowledging SCOR funding)*

Kim, J., Lim, I., Kim, J., Sim, H., Seo, H., & Kim, T. (2025). Contrasting Seasonal Behaviors of Dissolved Rare Earth Elements and Anthropogenic Gadolinium in the Estuary Dam System. *Estuaries and Coasts*, *48*(3), 71. https://doi.org/10.1007/s12237-025-01504-5

Kwon, H. K., Park, J., Kim, Y.-I., & Kim, G. (2025). ^{137}Cs Distribution Coefficients in Seawater, Sedimentation Rates, and Remobilization in Sediment Cores from Masan Bay and Suyeong Bay, Korea. *Ocean Science Journal*, *60*(1), 9. https://doi.org/10.1007/s12601-024-00186-7

Seo, H., & Kim, G. (2025). Tracing cross-shelf transport and accumulation of particulate organic carbon in the continental margin bottom sediments using Aluminum and ^{210}Pb. *Marine Chemistry*, *271*, 104530. https://doi.org/https://doi.org/10.1016/j.marchem.2025.104530

Um, I. K., Choi, M. S., Han, S. Y., Choi, S., & Yang, D. (2024). Revisiting elemental geochemistry in surface sediments of the Ulleung Basin, East/Japan Sea: Signals from ocean dumping materials. *Marine Pollution Bulletin*, *206*, 116747. https://doi.org/https://doi.org/10.1016/j.marpolbul.2024.116747

Please indicate if there is any forthcoming or planned GEOTRACES special issue publication

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Completed GEOTRACES PhD or Master theses *(please include the URL link to the pdf file of the thesis, if available)*

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GEOTRACES presentations in international conferences

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