ANNUAL REPORT ON GEOTRACES ACTIVITIES IN UK

May 1st, 2024 to April 30th, 2025

New GEOTRACES or GEOTRACES relevant scientific results

Nitrogen Fixation in the Arctic Ocean (process study GApr19)- new trace metal results showing cycling of Fe and Mn in the Barents sea examining sources from sea-ice (Fe 0.23-4.08 nmol/kg Mn 3.55-7.33 nmol/kg), glaciers supply from Svalbard (Fe 3.19 nmol/kg, Mn 102 nmol.kg) and sedimentary inputs (Fe up to 10 nmol/kg; Mn 33.6 nmol/kg) and the role of these in primary production. Excellent correlations with Fe and Mn with 18O from glacier melt showing glacier inputs and that we sampled within the subglacial plume in close proximity (~0.5 km) to the marine terminating glacier. In areas with high Fe see increased nitrogen fixation. Iron and Nitrogen co-limitation from experiments in the Atlantic waters of the Barents sea but Atlantification is predicted to increase in the future in Barents Sea so potential for more Fe limitation.

GEOTRACES or GEOTRACES relevant cruises

- NERC Pushing the Frontiers SiCLING project expeditions to Ny-Ålesund and Rothera Research Station.
    - https://www.bas.ac.uk/data/our-data/publication/sicling-ny-alesund-fieldwork-report-15th-29th-july-2024/
- Two BIOCARBON process study cruises to the Iceland basin in 2024.

New projects and/or funding

- New £4M Large grant funded on the role of iron and manganese in Southern Ocean ecosystems (PI: Alessandro Tagliabue, University of Liverpool) with cruise planned on the RRS Sir David Attenborough in Jan-Feb 2026.
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GEOTRACES workshops and meetings organised

- None

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)*

Over 3 evenings from 19 – 21 May, a team of 5 MSc and PhD students from Imperial College London organized a Planet Earth themed science-outreach event under the global Pint of Science 2025 Festival. Pint of Science is a non-profit organization that aims to connect the general public with the scientific community, with a focus on being informal, broadly accessible, and fun for scientists and non-scientists alike. The event was held at the White Hart Brew Pub in central London and featured 6 speakers ranging from early career scientists to established scientific leaders and industry experts, discussing topics often closely related to GEOTRACES activities, such as ecology, climate change, and sustainability. The venue was fully packed on most evenings, with over 100 people in attendance overall.

Link to the event pages:
https://pintofscience.co.uk/event/wings-and-windmills
https://pintofscience.co.uk/event/from-studio-to-south-pole
https://pintofscience.co.uk/event/down-to-earth-earthworms-and-the-power-of-dirt

Other GEOTRACES activities

- None

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

*Ana Aguilar-Islas, Hélène Planquette, Maeve C Lohan, Walter Geibert, Gregory Cutter Intercalibration: A Cornerstone of the Success of the GEOTRACES Program. Oceanography 10.5670/oceanog.2024.404

*Shelley, R. U., Baker, A. R., Thomas, M., and Murphy, S.: Aerosol trace element solubility and deposition fluxes over the Mediterranean Sea and Black Sea basins, Biogeosciences, 22, 585–600, https://doi.org/10.5194/bg-22-585-2025, 2025.

Jones, R.L., Hawkings, J.R., Meredith, M.P., Lohan, M.C., Moore, O., Sherrel, R.M., Fitzsimions, J.N., Kazemian, M., Araki, T., Kaulichm B. and Annett, A.L. (20205) Antarctic glaciers export carbon-stabilised iron(II)-rich particles to the surface Southern Ocean. Nature communications https://doi.org/10.1038/s41467-025-59981-y

Coet, A., Bastos, C. Lechelon, M., Hawley, R., Lohan, M.C., Ronceray, P., Hopkins, J.E., Mahaffey, C. and Benavides, M. (2025). Dynamics of diazotroph particle colonization in the Arctic Ocean. ISME https://doi.org/10.1093/ismejo/wraf098

Griffiths, A., Lambelet, M., Crocket, K., Abell, R., Coles, B.J., Kreissig, K., Porter, D., Nitsche, F.O., Rehkämper, M., van de Flierdt, T., 2024. Neodymium isotope composition and rare earth element distribution of East Antarctic continental shelf and deep waters. Chem. Geol. 653, 122039. doi.org/10.1016/j.chemgeo.2024.122039.

Huang, Y., Jia, Z., Xu, H., Kreissig, K., Coles, B.J., Rehkämper, M., Moore, R.E.T., 2025. Efficient Cd separation protocols for high-precision cadmium isotope analyses of diverse samples by double spike MC-ICP-MS. Talanta 285, 127296. doi.org/10.1016/j.talanta.2024.127296.

Olivelli, A., Paul, M., Xu, H., Kreissig, K., Coles, B.J., Moore, R.E.T., Bridgestock, L., Rijkenberg, M., Middag, R., Lohan, M.C., Weiss, D.J., Rehkämper, M., van de Flierdt, T., 2024. Vertical transport of anthropogenic lead by reversible scavenging in the South Atlantic Ocean. Earth Planet. Sci. Lett. 646, 118980. doi.org/10.1016/j.epsl.2024.118980.

Olivelli, A., Arcucci, R., Rehkämper, M., van de Flierdt, T., 2025. Mapping the global distribution of lead and its isotopes in seawater with explainable machine learning. Earth Syst. Sci. Data Discuss. 2025, 1-36. doi.org/10.5194/essd-2025-17.

Hoffman, C. L., Monreal, P. J., Albers, J. B., Lough, A. J. M., Santoro, A. E., Mellett, T., Buck, K. N., Tagliabue, Alessandro, Lohan, M. C., Resing, J. A., and Bundy, R. M.: Microbial strong organic-ligand production is tightly coupled to iron in hydrothermal plumes, *Biogeosciences*, 21, 5233–5246, https://doi.org/10.5194/bg-21-5233-2024, 2024.

Tagliabue, Alessandro* and T Weber*, Novel insights into trace metal cycling from biogeochemical models, *Oceanography,* 10.5670/oceanog.2024.418 . 2024.

Anugerahanti, P., and Alessandro Tagliabue, Response of Southern Ocean Resource Stress in a Changing Climate, *Geophysical Research Letters*, *51*(10), doi:10.1029/2023gl107870. 2024

Hendry, K. R., Sales de Freitas, F., Arndt, S., Beaton, A., Friberg, L., Hatton, J. E., ... & Woodward, E. M. S. (2025). Insights into silicon cycling from ice sheet to coastal ocean from isotope geochemistry. *Communications earth & environment*, *6*(1), 305.

Ng, H. C., Hendry, K. R., Ward, R., Woodward, E. M. S., Leng, M. J., Pickering, R. A., & Krause, J. W. (2024). Detrital input sustains diatom production off a glaciated Arctic coast. *Geophysical Research Letters*, *51*(12), e2024GL108324.

Wang, T., Ng, H. C., Hatton, J. E., Hammond, S. J., Woodward, E. M. S., Meire, L., & Hendry, K. R. (2024). Silicon isotopes reveal the impact of fjordic processes on the transport of reactive silicon from glaciers to coastal regions. *Chemical Geology*, *670*, 122403.

G. Portlock, H. Whitby and P. Salaün, Distribution and behaviour of reduced sulfur substances in the oligotrophic and hydrothermal waters of the Western Tropical South Pacific, Frontiers in Marine Science 2024 Vol. 11

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

- None

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

Olivelli, A. (2025). Environmental Pollution as a Marine Tracer: Measuring and Modelling Anthropogenic Lead in the Ocean [PhD thesis, Imperial College London]. *(no doi/url awarded yet)*

GEOTRACES presentations in international conferences

Olivelli, A., Arcucci, R., Rehkämper, M., and van de Flierdt, T. Mapping the global distribution of lead and its isotopes in seawater with explainable machine learning. EGU 2025, Vienna (Austria). Poster.

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