

## ANNUAL REPORT ON GEOTRACES ACTIVITIES IN AUSTRALIA

May 1st, 2022 to April 30th, 2023

### *New GEOTRACES or GEOTRACES relevant scientific results*

- Dissolved Nd isotope and rare earth element data from the continental margin of East Antarctica published in *Geochimica et Cosmochimica Acta* investigated seawater and authigenic sedimentary phases for the use of Nd isotopes in paleoceanography see Creach et al 2023.
- New paper accepted in *Elementa*, entitled ‘Seasonality of phytoplankton growth by iron and manganese in subantarctic waters’ by Pauline Latour et al., on three separate shipboard bioassay experiments to evaluate the seasonality of iron (Fe) and manganese (Mn) co-limitation of subantarctic phytoplankton growth south of Tasmania.

### *GEOTRACES or GEOTRACES relevant cruises*

- Southern Ocean Time Series 2021: Process study GIPr08 by Elizabeth Shadwick/Zanna Chase, Andrew Bowie (Th, Nd isotopes, [REE], TM aerosols). May 2022 full depth profiles were collected for Th, Nd and REEs.
- Process study GIPr11 to Cape Darnley, East Antarctica (CANYONS) to investigate Antarctic Bottom Water on the RV Investigator in January 2023 was interrupted again (cancelled in 2022 due to COVID19) by a medical evacuation. Unfortunately, only five out of 23 anticipated science days occurred prior to having to return to Australia for the medivac. Two short gravity (Kasten) cores and one long piston core were recovered, however, no surface sediment or dissolved trace metals for new proxy development were collected, and only 3 CTD casts out of a planned 13 were carried out. As such none of the voyage objectives were met and there is no discussion from the Marine National Facility on future opportunities to return to the region.

### *Upcoming voyages*

- MISO voyage Jan-Mar 2024 along I9S line GEOTRACES section GS05 on the *RV Investigator*. Bottle washing and prep continues in the lead up to this voyage.
- *RVS Nuyina* (Australia’s new icebreaker) Jan-Mar 2025 voyage to the Denman Glacier/Shackleton Ice shelf will include trace metal water and water column particulate sampling and some sediment coring.

### *New projects and/or funding*

- *RV Investigator* proposal for ship time in 2025/2026 summer seasons is currently in review for a voyage to the Antarctic margin lead by Dr Linda Armbricht titled “Paleoecological and paleoclimate reconstruction of the Cook Ice Shelf: a genomic approach”. If successful Dr Taryn Noble will apply for a GEOTRACES process study for trace metal and isotopes.
- Australian Research Council Discovery Project DP230100764 to Professor Andrew Bowie; Associate Professor Kerrie Swadling; Dr Lavenia Ratnarajah; Professor Alessandro Tagliabue on quantifying zooplankton iron content and examining its biogeochemical and ecological impact on Southern Ocean productivity.

### ***New GEOTRACES or GEOTRACES-relevant publications (published or in press)***

- Creac'h, L., Noble, T. L., Chase, Z., Charlier, B. L. A., Townsend, A. T., Perez-Tribouillier, H., & Dietz, C. (2023). Unradiogenic reactive phase controls the  $\epsilon\text{Nd}$  of authigenic phosphates in East Antarctic margin sediment. *Geochimica et Cosmochimica Acta*. <https://doi.org/https://doi.org/10.1016/j.gca.2023.01.001>
- Fourquez, M., Janssen, D. J., Conway, T. M., Cabanes, D., Ellwood, M. J., Sieber, M., Hassler, C. (2023). Chasing iron bioavailability in the Southern Ocean: Insights from *Phaeocystis antarctica* and iron speciation. *Science Advances*, 9(26). <https://doi.org/10.1126/sciadv.adf9696>
- Janssen, D. J., Gilliard, D., Rickli, J., Nasemann, P., Koschinsky, A., Hassler, C. S., ... Jaccard, S. L. (2023). Chromium stable isotope distributions in the southwest Pacific Ocean and constraints on hydrothermal input from the Kermadec Arc. *Geochimica et Cosmochimica Acta*, 342, 31 – 44. <https://doi.org/10.1016/j.gca.2022.12.010>
- Lannuzel, D., Fourquez, M., de Jong, J., Tison, J. L., Delille, B., & Schoemann, V. (2023). First report on biological iron uptake in the Antarctic sea-ice environment. *Polar Biology*, 46(4), 339–355. <https://doi.org/10.1007/s00300-023-03127-7>
- Latour, P., Strzepek, R. F., Wuttig, K., Merwe, P., Sam, Eggins, ... Bowie, A. R. (2022). Seasonality of phytoplankton growth limitation by iron and manganese in subantarctic waters.
- Smith, A. J. R., Nelson, T., Ratnarajah, L., Genovese, C., Westwood, K., Holmes, T. M., ... Lannuzel, D. (2022). Identifying potential sources of iron-binding ligands in coastal Antarctic environments and the wider Southern Ocean. *Frontiers in Marine Science*, 9(August), 1–17. <https://doi.org/10.3389/fmars.2022.948772>
- Wang, H., Wang, W., Liu, M., Zhou, H., Ellwood, M. J., Butterfield, D. A., ... Resing, J. A. (2022). Iron ligands and isotopes in hydrothermal plumes over backarc volcanoes in the Northeast Lau Basin, Southwest Pacific Ocean. *Geochimica et Cosmochimica Acta*, 336, 341–352. <https://doi.org/10.1016/j.gca.2022.09.026>

### ***Completed GEOTRACES PhD or Master theses***

- Christopher Nielson (Masters thesis University of Tasmania): “Atmospheric Fe fertilisation of oceans: characterisation of mineral dust sources in Australia” (supervised by Andrew Bowie)
- Lening Wang (Honours thesis University of Tasmania): “Characterizing the Dissolved Lithogenic Inputs to the Southwest Pacific Southern Ocean Using Rare Earth Elements” (supervised by Taryn Noble)
- Layla Creac'h (PhD thesis University of Tasmania): “Evaluation and application of palaeoceanographic proxies at the East Antarctic margin” (supervised by Taryn Noble and Zanna Chase)

### ***GEOTRACES presentations in international conferences***

- Fourquez MA, Stzrepek R, Ellwood M, Hassler C, Cabanes D, Eggins S, Pearce I, Deppeler S, Trull T, Boyd P & Bressac M. Responses of Microbial Residents to New Versus Regenerated Fe in a Cold-Core Eddy (Southern Ocean). *Goldschmidt 2022*

- Lemaitre N, Planquette H, Jeandel C, Ellwood M, Hassler C & Vance D Nickel and Zinc Cycling in the Southern Ocean: Insights from Isotopes. Goldschmidt 2022

Submitted by Taryn Noble (Taryn.Noble@utas.edu.au)