

## ANNUAL REPORT ON GEOTRACES ACTIVITIES IN AUSTRALIA

May 1st, 2023 to April 30th, 2024

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

- Yaojia Sun (ANU) has submitted a manuscript for publication detailing strontium cycling in the Southern Ocean. Specifically, she has used dissolved strontium concentrations from the Southern Ocean water samples and strontium export fluxes from sediment traps to assess particulate organic carbon export associated with Acantharia. She found that there is a coincidence in the strontium export flux with the second peak of POC export implying a potential association of Acantharia biomass with summertime productivity. The results suggest that Acantharia can contribute up to 7% of the POC export flux. Samples for this study came from two Geotraces voyages in 2018 and 2020.
- Yaojia Sun (ANU) has submitted a second manuscript for publication detailing calcium concentration changes from subantarctic and polar waters. While previous studies have noted discrepancies between the relative changes in total alkalinity and calcium concentrations, she found a strong correlation between nutrient-corrected total alkalinity and calcium concentrations in the Southern Ocean, suggesting they are controlled by calcium carbonate production and dissolution. Samples for this study came from SOLACE Geotraces voyage in 2020

### *GEOTRACES or GEOTRACES relevant cruises*

- MISO Jan-Mar 2024 (GS05). Samples collected:
  - TM rosette: trace metals; Cu isotopes; Cd, Fe, Zn isotopes; Pb isotopes; U isotopes; Cu ligands; Fe ligands; Siderophores; Ca and Mg; Total Hg
  - CTD rosette: N isotopes; REE; Radiogenic isotopes [Th, Nd]
  - In situ pumps: particulate trace metals; labile particle trace metals; trace metal isotopes; radiogenic isotopes; Fe mineralogy; CHN
  - Rainwater sampler: trace metals; soluble ions
  - Aerosol sampling manifold: trace metals; soluble ions.

### *New projects and/or funding*

- First science voyage on the *RVS Nuyina* planned for late Feb to early April 2025 to the Denman Glacier, East Antarctica supported by the Australian Centre for Excellence in Antarctic Science. The voyage is largely focused on continental shelf oceanography, with some limited B in BGC due to the late timing. ANU and UTas teams are preparing for 25 trace metal rosette, 6 insitu pump deployments and some sediment kasten coring and multicoring.

### *Other GEOTRACES activities*

- Data submitted to the IDP2025:
- Dissolved  $^{230}\text{Th}$  and  $^{232}\text{Th}$  isotopes southern SR3 transect, collected during IN2018\_V01 voyage in 2018

- Dissolved trace metal concentrations and isotope values for iron and zinc from the SOLACE voyage in 2020
- Dissolved strontium concentrations for the SOLACE voyage and the SR3 voyage in 2018

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

- Weis, J. *et al.* One-third of Southern Ocean productivity is supported by dust deposition. *Nature* **629**, 603–608 (2024).
- Latour, P. *et al.* Characterization of a Southern Ocean deep chlorophyll maximum: Response of phytoplankton to light, iron, and manganese enrichment. *Limnology and Oceanography Letters* **9** (2), 145-154 (2024)
- Trail, CD. *et al.* Mechanistic constraints on the drivers of Southern Ocean meridional iron distributions between Tasmania and Antarctica. *Global Biogeochemical Cycles* **38** (3), e2023GB007856 (2024)
- Aflenzer H. *et al.* Effect of dissolved iron (II) and temperature on growth of the Southern Ocean phytoplankton species *Fragilariopsis cylindrus* and *Phaeocystis antarctica*. *Polar Biology* **46** (11), 1163-1173 (2023)

***GEOTRACES presentations in international conferences***

- *Microbial Competition for Iron Determines its Availability to the Ferrous Wheel*, R Strzepek, P Latour, MJ Ellwood, PW Boyd, 2024 Ocean Sciences Meeting

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