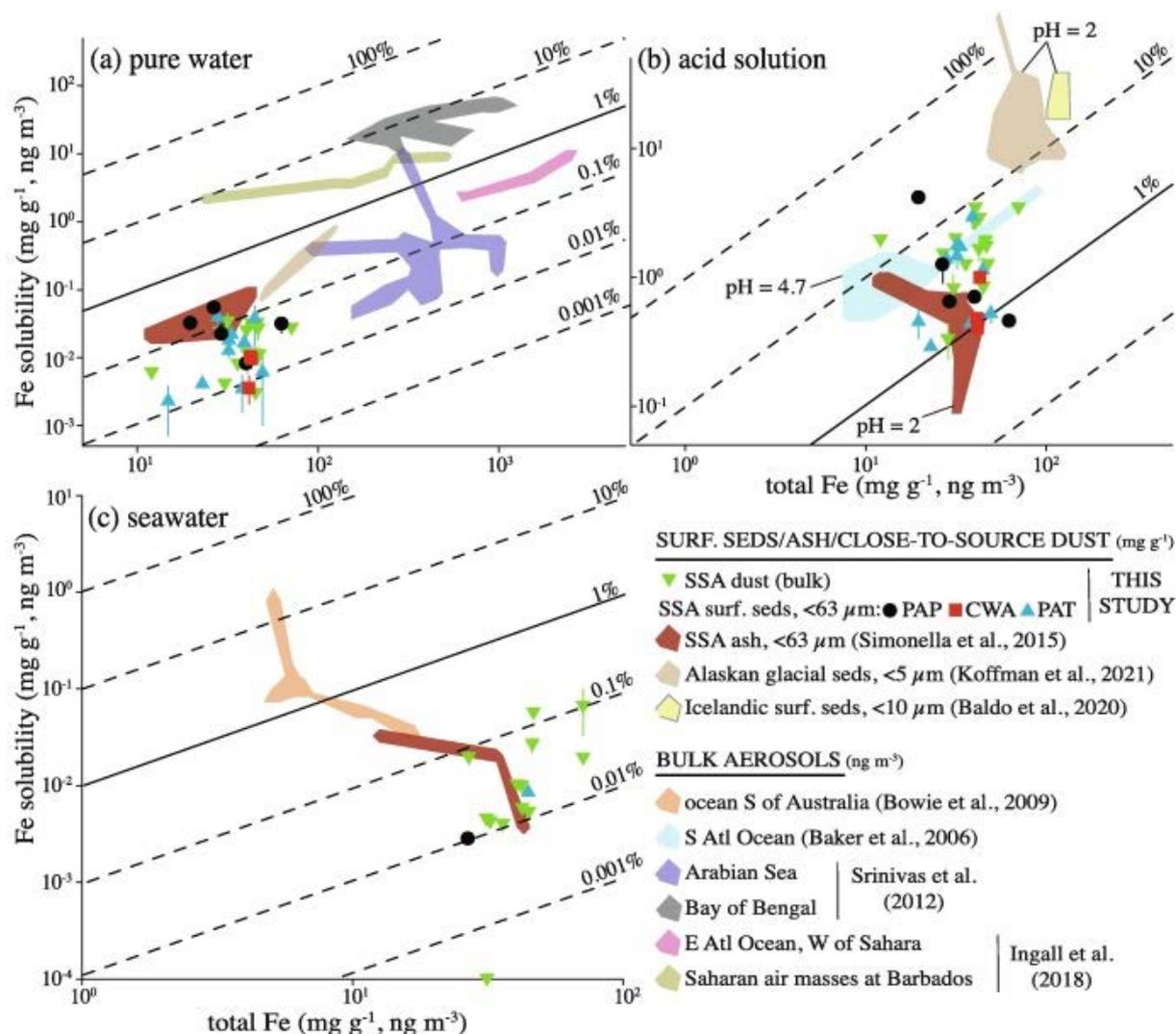


ANNUAL REPORT ON GEOTRACES ACTIVITIES IN IRELAND

May 1st, 2022 to April 30th, 2023

New GEOTRACES or GEOTRACES relevant scientific results



Simonella et al. Low source-inherited iron solubility limits fertilization potential of South American dust. *Geochimica et Cosmochimica Acta* 335, 272-283. (2022).

Where atmospheric processing is weak due to low anthropogenic emissions, fertilization of iron-limited oceans by non-volcanic mineral dust aerosols strongly depends on iron solubility at the sources. Southern South America (SSA) is a pristine environment and the main dust supplier to the southern oceans, the most sensitive to iron fertilization. Thus, the present-day lack of SSA dust fertilization of the southern oceans is hypothesized to reflect low source-inherited iron bioavailability. However, a dearth of geochemical studies on SSA dust prevents testing this hypothesis. To remedy this, we conducted the first systematic sampling of SSA dust sources. Iron leaching experiments showed fractional solubilities of close-to-source dust (bulk) and dust-emitting surface sediments ($<63 \mu\text{m}$) in pure water ($0.05 \pm 0.05\%$), seawater ($0.03 \pm 0.04\%$) and 1% nitric acid ($5 \pm 6\%$) that imply a low mass-normalized fertilization potential of SSA dust compared to dust from other regions. Based on grain size, size-resolved mineralogy, elemental chemistry and iron speciation determinations, we found that variability

in labile iron is enhanced by high clay contents, small grain size and higher proportions of paramagnetic versus non-paramagnetic iron, irrespective of oxidation state. The independence of the most labile, water-soluble iron on grain size and its strong negative correlation to the Chemical Index of Alteration may imply that we currently underestimate the role of coarse glaciogenic dust as a supplier of bioavailable iron during drier-than-present ice ages when continental chemical weathering was reduced, and during which enhanced supply of dust-borne bioavailable iron to the southern oceans is observed.

GEOTRACES or GEOTRACES relevant cruises

- PS132 – Prof. Peter Croot was chief teacher on the *P.S. Polarstern* (30 Aug – 29 Sep, 2022, 30 days at sea, Bremerhaven to Cape Town). NoSoAT POGO Training expedition (including introducing students to SOLAS and GEOTRACES related work in the Open Ocean) .

New projects and/or funding

- A new SEAL AA500 nutrient analyzer funded in the 2nd phase of the Irish Centre for research in Applied Geoscience (iCRAG2) was installed at the University of Galway in October 2022 and is now available to Irish researchers on a cost share basis.

GEOTRACES workshops and meetings organized

- There were no GEOTRACES specific workshops run in Ireland during the reporting period.

Outreach activities conducted

- There were no specific GEOTRACES outreach activities conducted during the reporting period.

Other GEOTRACES activities

- Prof. Croot is a member of the Chemical Speciation Group – Joint Committee on the Properties of Seawater (2023-present).
- Prof. Croot attended the United Nations Ocean Conference, held in Lisbon, Portugal (27 June -1 July, 2022).
- Prof. Croot attended the GESAMP WG38 International Workshop – Potential role of atmospheric deposition in driving ocean productivity in the Southwest Indian Ocean. Gqeberha, South Africa. October 4-7, 2022.
- Prof. Croot is an associate member of SCOR Working Group 167 - Reducing Uncertainty in Soluble aerosol Trace Element Deposition (RUSTED) (2022 – present).

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

- Boswell, Z., Verga, J.U., Mackle, J., Guerrero-Vazquez, K., Thomas, O.P., J., C., Wolf, B.J., Choo, Y.M., Croot, P., Hamann, M.T., Hardiman, G., 2023. In-Silico Approaches for the Screening and Discovery of Broad-Spectrum Marine Natural Product Antiviral Agents Against Coronaviruses. . *Infect Drug Resist.* 16, 2321-2338.

- Calvo-Martin, E., Teira, E., Álvarez-Salgado, X.A., Rocha, C., Jiang, S., Justel-Díez, M., Ibánhez, J.S.P., 2022. On the hidden diversity and niche specialization of the microbial realm of subterranean estuaries. *Environmental Microbiology* 24, 5859-5881.
- Ibánhez, J.S.P., Álvarez-Salgado, X.A., Rocha, C., 2023. Radon prevalence in domestic water in the Ría de Vigo coastal basin (NW Iberian Peninsula). *Environmental Science and Pollution Research* 30, 69927-69940.
- Rocha, C., Jiang, S., Ibánhez, J.S.P., Yang, Q., Mazi, K., Koussis, A.D., 2022. The effects of subterranean estuary dynamics on nutrient resource ratio availability to microphytobenthos in a coastal lagoon. *Science of The Total Environment* 851, 157522.
- Simonella, L.E., Cosentino, N.J., Montes, M.L., Croot, P.L., Palomeque, M.E., Gaiero, D.M., 2022. Low source-inherited iron solubility limits fertilization potential of South American dust. *Geochimica et Cosmochimica Acta* 335, 272-283.
- Xu, H., Croot, P., Zhang, C., 2022. Exploration of the spatially varying relationships between lead and aluminium concentrations in the topsoil of northern half of Ireland using Geographically Weighted Pearson Correlation Coefficient. *Geoderma* 409, 115640.

Completed GEOTRACES PhD or Master theses

- No GEOTRACES related PhD or Master theses were completed during the reporting period.

GEOTRACES presentations in international conferences

- Prof. Croot presented on shipboard training activities (including those related to GEOTRACES) at the GESAMP WG38 International Workshop – Potential role of atmospheric deposition in driving ocean productivity in the Southwest Indian Ocean. Gqeberha, South Africa. October 4-7, 2022.

Submitted by Prof. Peter Croot (peter.croot@nuigalway.ie).