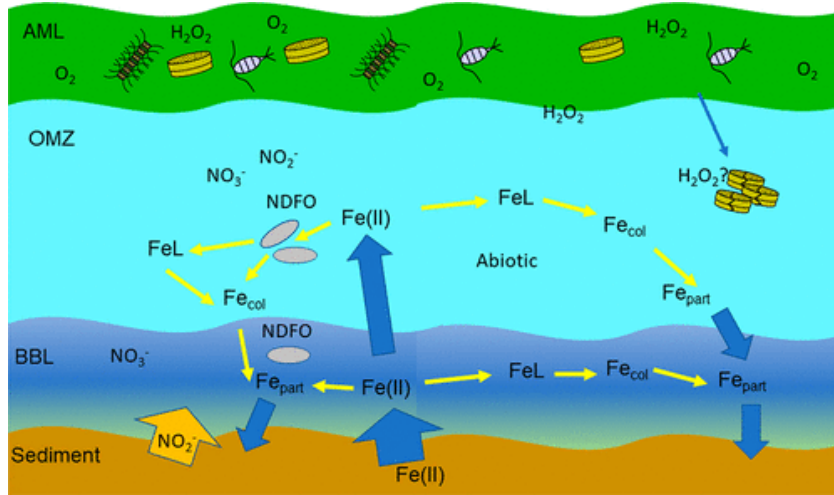


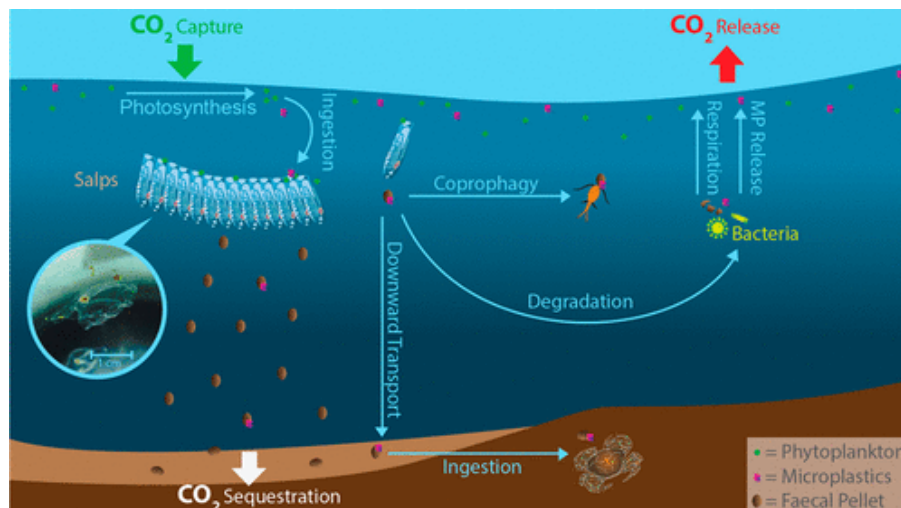
ANNUAL REPORT ON GEOTRACES ACTIVITIES IN IRELAND

April 1st, 2018 to March 31st, 2019

New scientific results



- During the reporting period, new works were published by Irish researchers with international GEOTRACES colleagues on the cycling of Fe(II) in the Peruvian Oxygen Minimum Zone (OMZ). Schlosser et al (2018) showed how Fe(II) fluxes were greatly increased from the sediments when sulfide was present. A further study by Croot et al. (2019) combined high resolution measurements of Fe(II) and H₂O₂ in the water column and close to the sediment/water interface with modelling of Fe(II) fluxes from the sediment (based on earlier models using radon) to determine in situ oxidation rates. These rates were then compared to the known oxidizers in the water column and suggests that nitrate-dependent anaerobic Fe(II) oxidizing (NDFO) bacteria are the main oxidizers of Fe(II). H₂O₂ was also found to be at low but detectable levels in the OMZ.



New work on the fate of microplastics in the Ocean is being undertaken at NUI Galway and links to GEOTRACES work through the potential for microplastics to act as vectors for TEIs in the marine environment. Wieczorek et al. (2018) showed that microplastics were present in deep sea fish from the northwest Atlantic, this paper had significant media

attention and over 50,000 views on the Frontiers website over its first 2 weeks online. A follow up paper, Wieczorek et al. (2019) examined the influence of microplastic on salp pellet sinking rates. Studies are continuing on the influence of microplastics on the cycling of TEIs.

Cruises

- Biogeochemical (Nutrients) and optical measurements (CDOM/FDOM) during Western European Shelf Pelagic Acoustic Survey (WESPAS). Expedition on the Celtic Explorer (9 June - 24 July, 2018, CE18009 & CE18010, Galway to Galway). (iCrag project)
- *Upcoming expedition* - Polarstern PS120 Prof. Peter Croot will again participate as an at sea POGO lecturer on the upcoming South North Atlantic (SoNoAT) training school onboard the RV Polarstern from Port Stanley in the Falklands to Bremerhaven, Germany to take place in June 2019. During this training school Prof Croot will run the physical oceanography program and also introduce the students to the work of GEOTRACES scientists and the GEOTRACES IDP.
- *Upcoming expedition*: Indian Ocean GO-SHIP expedition on the RV Mirai (Dec 2019 – Feb 2020). Prof. Peter Croot will take part in this expedition through a piggyback project hosted by JAMSTEC to look at urea and Ni cycling in this region.

New projects and/or funding

- EPA (Ireland) – A new 4 year project entitled Physico-chemical Cycling of Nutrients and Carbon in Marine Transitional Zones (NUTS&BOLTS) began on February 1st 2019 (PI's Prof. Peter Croot, Dr Rachel Cave, Dr Tiernan Henry and Dr Dagmar Stengel, all at NUI Galway). This project has 4 main research themes: (i) Fluvial derived elemental fluxes along the Irish coast (including many key GEOTRACES TEIs). (ii) Nutrient controls on primary productivity in transitional marine waters. (iii) Bio-optics of transitional marine waters. (iv) Production and consumption of climate relevant gases in transitional marine waters.

GEOTRACES workshops and meetings organised

- There were no GEOTRACES specific workshops run in Ireland during the reporting period. However, at the first annual SCOR Ireland meeting (Dec 4, 2018) held at the National University of Ireland, Galway, Irish marine researchers were presented with an overview of GEOTRACES activities in Ireland and internationally.

Outreach activities conducted

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

Other GEOTRACES activities

- Synchrotron work on marine particles collected across the South Pacific Gyre during Sonne expedition SO245 (2015/2016) at ALS in Berkeley, USA.

New GEOTRACES publications (published or in press)

- Croot, P.L., Heller, M.I., Wuttig, K., 2019. Redox Processes Impacting the Flux of Iron(II) from Shelf Sediments to the OMZ along the Peruvian Shelf. *ACS Earth and Space Chemistry*.
- Echeveste, P., Croot, P., von Dassow, P., 2018. Differences in the sensitivity to Cu and ligand production of coastal vs offshore strains of *Emiliania huxleyi*. *Science of The Total Environment* 625, 1673-1680.
- Petermann, E., Knöller, K., Rocha, C., Scholten, J., Stollberg, R., Weiß, H., Schubert, M., 2018. Coupling End-Member Mixing Analysis and Isotope Mass Balancing (^{222}Rn) for Differentiation of Fresh and Recirculated Submarine Groundwater Discharge Into Knysna Estuary, South Africa. *Journal of Geophysical Research: Oceans* 123, 952-970.
- Schlitzer, R., Anderson, R.F., Dodas, E.M., Lohan, M., Geibert, W., Tagliabue, A., Bowie, A., Jeandel, C., Maldonado, M.T., Landing, W.M., Cockwell, D., Abadie, C., Abouchami, W., Achterberg, E.P., Agather, A., Aguliar-Islas, A., van Aken, H.M., Andersen, M., Archer, C., Auro, M., de Baar, H.J., Baars, O., Baker, A.R., Bakker, K., Basak, C., Baskaran, M., Bates, N.R., Bauch, D., van Beek, P., Behrens, M.K., Black, E., Bluhm, K., Bopp, L., Bouman, H., Bowman, K., Bown, J., Boyd, P., Boye, M., Boyle, E.A., Branellec, P., Bridgestock, L., Brissebrat, G., Browning, T., Bruland, K.W., Brumsack, H.-J., Brzezinski, M., Buck, C.S., Buck, K.N., Buesseler, K., Bull, A., Butler, E., Cai, P., Mor, P.C., Cardinal, D., Carlson, C., Carrasco, G., Casacuberta, N., Casciotti, K.L., Castrillejo, M., Chamizo, E., Chance, R., Charette, M.A., Chaves, J.E., Cheng, H., Chever, F., Christl, M., Church, T.M., Closset, I., Colman, A., Conway, T.M., Cossa, D., Croot, P., Cullen, J.T., Cutter, G.A., Daniels, C., Dehairs, F., Deng, F., Dieu, H.T., Duggan, B., Dulaquais, G., Dumousseaud, C., Echevoyen-Sanz, Y., Edwards, R.L., Ellwood, M., Fahrback, E., Fitzsimmons, J.N., Russell Flegal, A., Fleisher, M.Q., van de Flierdt, T., Frank, M., Friedrich, J., Fripiat, F., Fröllje, H., Galer, S.J.G., Gamo, T., Ganeshram, R.S., Garcia-Orellana, J., Garcia-Solsona, E., Gault-Ringold, M., George, E., Gerringa, L.J.A., Gilbert, M., Godoy, J.M., Goldstein, S.L., Gonzalez, S.R., Grissom, K., Hammerschmidt, C., Hartman, A., Hassler, C.S., Hathorne, E.C., Hatta, M., Hawco, N., Hayes, C.T., Heimbürger, L.-E., Helgoe, J., Heller, M., Henderson, G.M., Henderson, P.B., van Heuven, S., Ho, P., Horner, T.J., Hsieh, Y.-T., Huang, K.-F., Humphreys, M.P., Isshiki, K., Jacquot, J.E., Janssen, D.J., Jenkins, W.J., John, S., Jones, E.M., Jones, J.L., Kadko, D.C., Kayser, R., Kenna, T.C., Khondoker, R., Kim, T., Kipp, L., Klar, J.K., Klunder, M., Kretschmer, S., Kumamoto, Y., Laan, P., Labatut, M., Lacan, F., Lam, P.J., Lambelet, M., Lamborg, C.H., Le Moigne, F.A.C., Le Roy, E., Lechtenfeld, O.J., Lee, J.-M., Lherminier, P., Little, S., López-Lora, M., Lu, Y., Masque, P., Mawji, E., McClain, C.R., Measures, C., Mehic, S., Barraqueta, J.-L.M., van der Merwe, P., Middag, R., Mieruch, S., Milne, A., Minami, T., Moffett, J.W., Moncoiffe, G., Moore, W.S., Morris, P.J., Morton, P.L., Nakaguchi, Y., Nakayama, N., Niedermiller, J., Nishioka, J., Nishiuchi, A., Noble, A., Obata, H., Ober, S., Ohnemus, D.C., van Ooijen, J., O'Sullivan, J., Owens, S., Pahnke, K., Paul, M., Pavia, F., Pena, L.D., Peters, B., Planchon, F., Planquette, H., Pradoux, C., Puigcorbé, V., Quay, P., Queroue, F., Radic, A., Rauschenberg, S., Rehkämper, M., Rember, R., Remenyi, T., Resing, J.A., Rickli, J., Rigaud, S., Rijkenberg, M.J.A., Rintoul, S., Robinson, L.F., Roca-Martí, M., Rodellas, V., Roeske, T., Rolison, J.M., Rosenberg, M., Roshan, S., Rutgers van der Loeff, M.M., Ryabenko, E., Saito, M.A., Salt, L.A., Sanial, V., Sarthou, G., Schallenberg, C., Schauer,

- U., Scher, H., Schlosser, C., Schnetger, B., Scott, P., Sedwick, P.N., Semiletov, I., Shelley, R., Sherrell, R.M., Shiller, A.M., Sigman, D.M., Singh, S.K., Slagter, H.A., Slater, E., Smethie, W.M., Snaith, H., Sohrin, Y., Sohst, B., Sonke, J.E., Speich, S., Steinfeldt, R., Stewart, G., Stichel, T., Stirling, C.H., Stutsman, J., Swarr, G.J., Swift, J.H., Thomas, A., Thorne, K., Till, C.P., Till, R., Townsend, A.T., Townsend, E., Tuerena, R., Twining, B.S., Vance, D., Velazquez, S., Venchiarutti, C., Villa-Alfageme, M., Vivancos, S.M., Voelker, A.H.L., Wake, B., Warner, M.J., Watson, R., van Weerlee, E., Alexandra Weigand, M., Weinstein, Y., Weiss, D., Wisotzki, A., Woodward, E.M.S., Wu, J., Wu, Y., Wuttig, K., Wyatt, N., Xiang, Y., Xie, R.C., Xue, Z., Yoshikawa, H., Zhang, J., Zhang, P., Zhao, Y., Zheng, L., Zheng, X.-Y., Zieringer, M., Zimmer, L.A., Ziveri, P., Zunino, P., Zurbrugg, C., 2018. The GEOTRACES Intermediate Data Product 2017. *Chemical Geology*.
- Schlosser, C., Streu, P., Frank, M., Lavik, G., Croot, P.L., Dengler, M., Achterberg, E.P., 2018. H₂S events in the Peruvian oxygen minimum zone facilitate enhanced dissolved Fe concentrations. *Scientific Reports* 8, 12642.
 - Wicczorek, A.M., Croot, P.L., Lombard, F., Sheahan, J.N., Doyle, T.K., 2019. Microplastic Ingestion by Gelatinous Zooplankton May Lower Efficiency of the Biological Pump. *Environmental Science & Technology*. AOP
 - Wicczorek, A.M., Morrison, L., Croot, P.L., Allcock, A.L., MacLoughlin, E., Savard, O., Brownlow, H., Doyle, T.K., 2018. Frequency of Microplastics in Mesopelagic Fishes from the Northwest Atlantic. *Frontiers in Marine Science* 5.

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