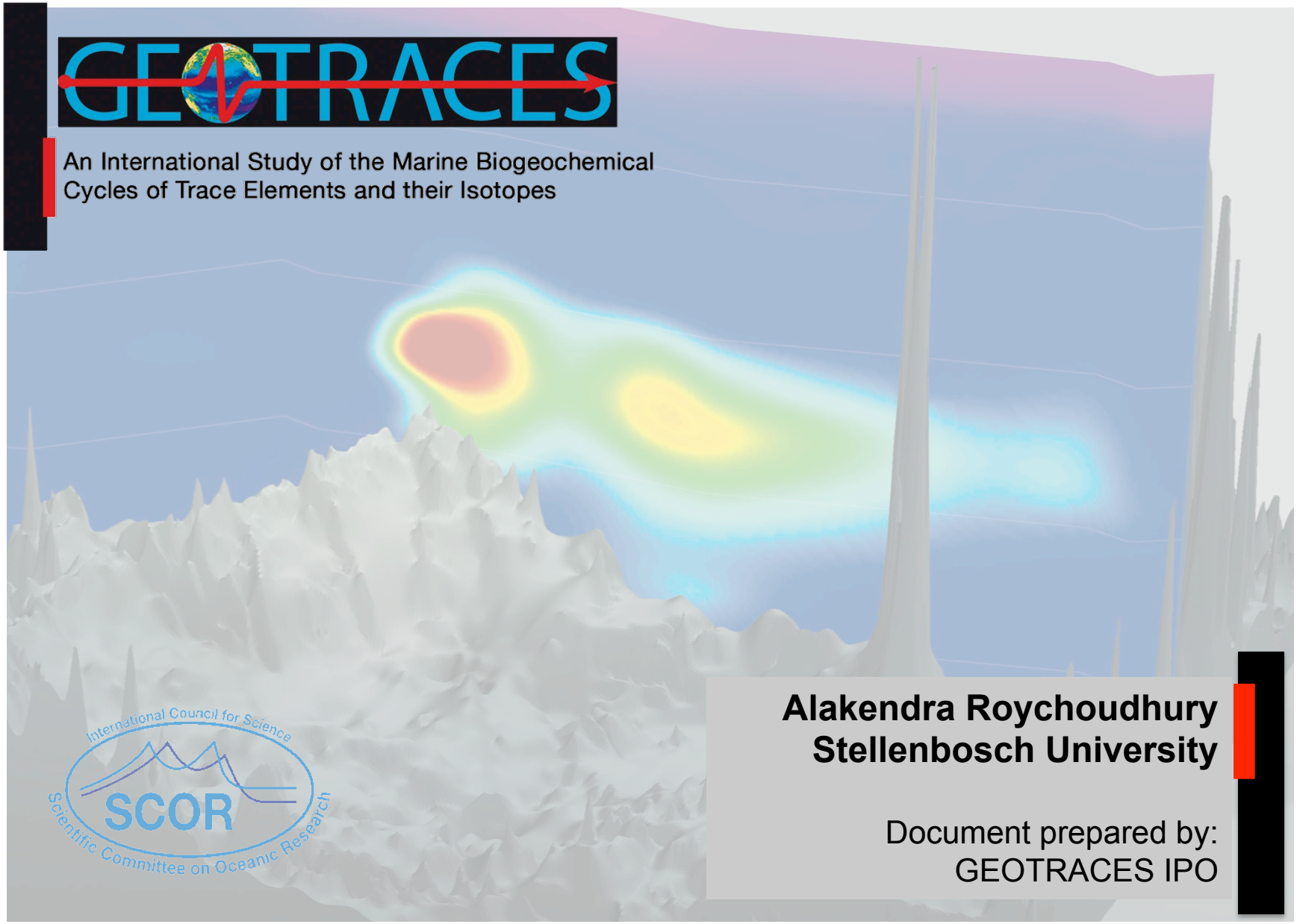

GEOTRACES

An International Study of the Marine Biogeochemical Cycles of Trace Elements and their Isotopes

International Council for Science
SCOR
Scientific Committee on Oceanic Research

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Stellenbosch University

Document prepared by:
GEOTRACES IPO

1. GEOTRACES International Programme

- Co-chairs: **Reiner Schlitzer** (AWI, Germany)
  Phoebe Lam (University of California, Santa Cruz, USA)

- **GEOTRACES** is an international programme which aims to improve the understanding of **biogeochemical cycles** and **large-scale distribution** of **trace elements and their isotopes** in the marine environment

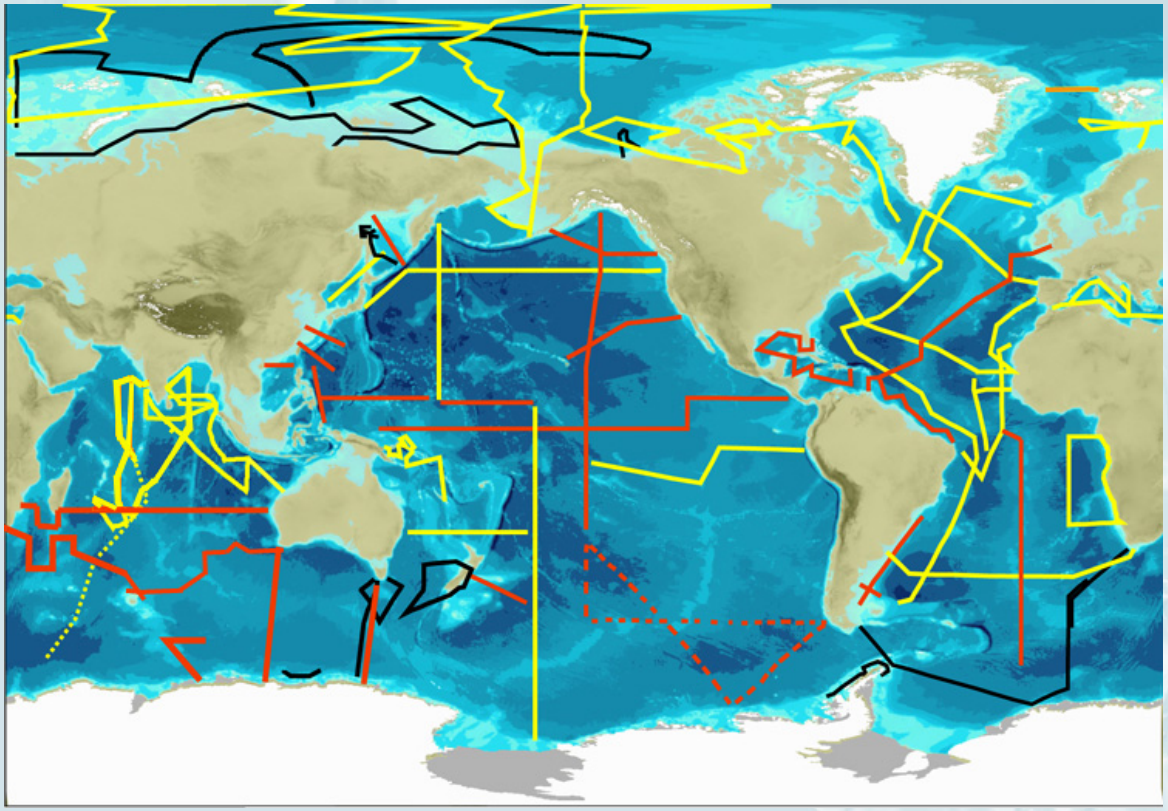
- **Scientists** from approximately **35 nations** have been involved in the programme, which is designed to **study all major ocean basins** over the next decade

- GEOTRACES **Science Plan** (2006)

- Second **Intermediate Data Product (IDP2017)** released in August 2017 (Goldschmidt 2017, Paris, France). First intermediate data product released in 2014.

2. Status of GEOTRACES Field Programme

98 cruises (35 GEOTRACES Section cruises) completed



GEOTRACES Sections

In red:
Planned Sections

In yellow:
Completed Sections

In black:
Sections completed as GEOTRACES contribution to the IPY

2… GEOTRACES Process Studies/Compliant Data

The programme also endorses a number of studies that focus on particular regions or processes - **GEOTRACES Process Studies**

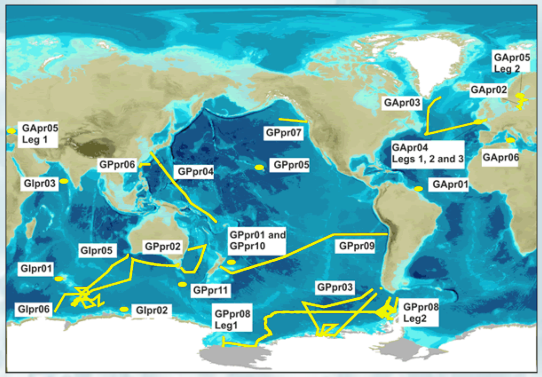
And it also collates appropriately intercalibrated trace element and isotope data from other cruises as **GEOTRACES compliant data**

-> Must meet defined criteria (available on GEOTRACES website) and be approved by the GEOTRACES SSC

*** Process Studies: 27 studies – 41 cruises completed**

4 new Process Studies completed since last year
From: Brazil, France, South−Africa and UK

*** Compliant data from 9 cruises**



Process Studies completed in Sept. 2016

3. GEOTRACES Intermediate Data Product

Just released!!!

Intermediate Data Product 2017
(**Goldschmidt 2017**, 16 August, Paris, France)

GEOTRACES
INTERMEDIATE DATA PRODUCT 2017

A USB card containing the eGEOTRACES Atlas was distributed to all participants during the release event.

GEOTRACES

4. GEOTRACES Publications to date

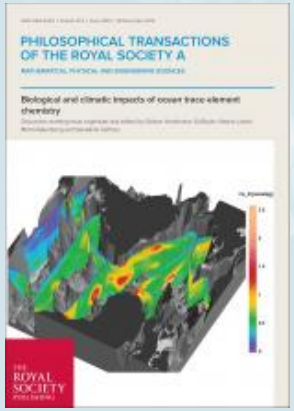
886 Papers

database available on-line:
http://www.geotraces.org/library-88/scientific-publications/peer-reviewed-papers

During the reporting period:
208 new papers published, **5** in ***Nature*** and **2** in ***PNAS*** journals

Published!

Special issue from the GEOTRACES-Royal Society coupled meeting and workshop to synthesis GEOTRACES findings (7–10 December 2015, UK)



It summarises knowledge and identify areas for future work relating to chemical fluxes at the four ocean boundaries - with the atmosphere, the continents, sediments, and mid-ocean-ridges.

Philosophical Transactions of the Royal Society A
(28 November 2016; volume 374, issue 2081)
Biological and climatic impacts of ocean trace element chemistry

4... New database of GEOTRACES publications

Available on-line. Includes an **advanced search tool**!

Willing to know the list of GEOTRACES publications for a specific GEOTRACES cruise? Per author? Per year? Per parameter? All this is now possible and much more!

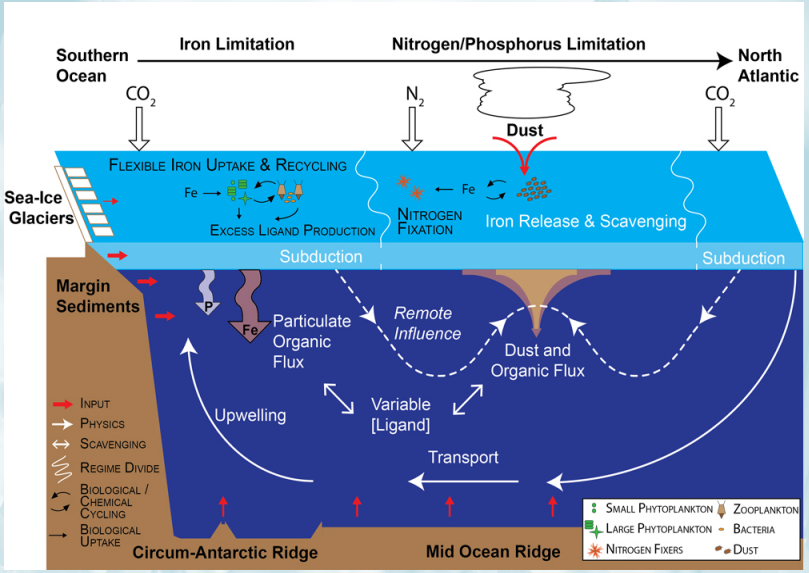
http://www.geotraces.org/library-88/scientific-publications/peer-reviewed-papers

5. GEOTRACES Science Highlights: Examples

Changing the paradigm on the oceanic iron cycle

Extensive review on the recent findings on iron (Fe) cycle in the ocean

- Full understanding of any marine ecosystem cannot neglect micronutrients
- Fe oceanic sources are multiple, and supply from continental margins extends far beyond coastal zone while Fe inputs from hydrothermal activity were observed in all the oceans
- Cycling of organic iron-complexing ligands is a crucial component of the ocean iron cycle
- Phytoplankton can exhibit substantial variations in their iron stoichiometry...



Tagliabue, A., Bowie, A. R., Boyd, P. W., Buck, K. N., Johnson, K. S., & Saito, M. A. (2017). The integral role of iron in ocean biogeochemistry. Nature, 543(7643), 51–59. DOI: http://dx.doi.org/10.1038/nature21058

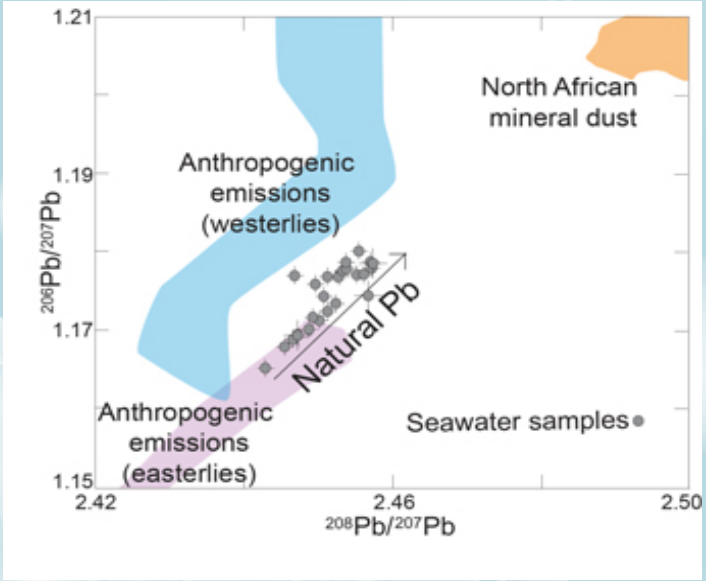
5... GEOTRACES Science Highlights: Examples

Testament of the efficiency of environmental policies

Measured lead concentrations and isotopes along the GEOTRACES sections GA02 and GA06, reveal for the first time that natural lead can be detected again in the surface water of the North Atlantic

Significant proportions of up to 30–50% of natural Pb, derived from mineral dust, are observed in Atlantic surface waters off the Sahara

This clearly reflects the success of the global effort to reduce anthropogenic Pb emissions



Bridgestock, L., van de Flierdt, T., Rehkämper, M., Paul, M., Middag, R., Milne, A., Lohan, M.C., Baker, A.R., Chance, R., Khondoker, R., Strekopytov, S., Humphreys-Williams, E., Achterberg, E.P., Rijkenberg, M.J.A., Gerringa, L. J.A., de Baar, H. J. W. (2016). Return of naturally sourced Pb to Atlantic surface waters. Nature Communications, 7, 12921. DOI: http://dx.doi.org/10.1038/ncomms12921

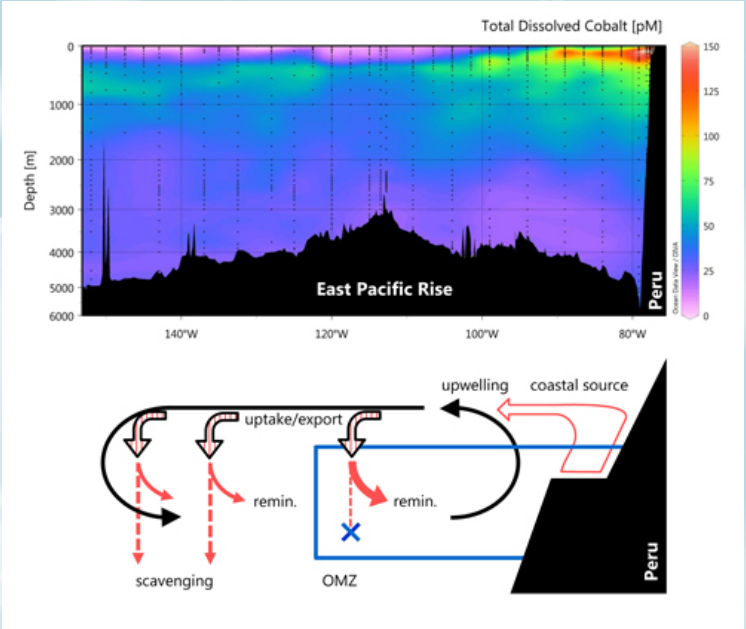
5... GEOTRACES Science Highlights: Examples

Oxygen biogeochemistry exerts a strong influence on cobalt cycling

The distribution of dissolved cobalt (DCo) and labile cobalt (LCo) along US East Pacific Zonal Transect (GP16) is closely tied to the oxygen minimum zone. It also shows:

(1) elevated concentrations of LCo are generated by input from coastal sources and reduced scavenging at low oxygen; (2) atmospheric deposition and hydrothermal vents along the East Pacific Rise are contrastingly minor sources of cobalt; (3) high cobalt waters are further upwelled and advected offshore; (4) phytoplankton export returns cobalt to low-oxygen water masses underneath

These processes result in covariation of DCo with oxygen and phosphates (figure)



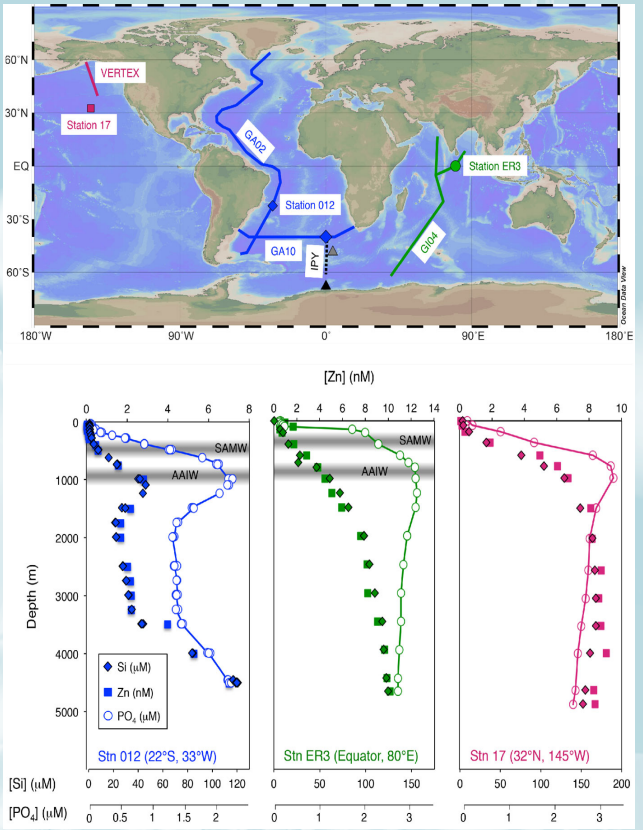
Hawco, N. J., Ohnemus, D. C., Resing, J. A., Twining, B. S., & Saito, M. A. (2016). A dissolved cobalt plume in the oxygen minimum zone of the eastern tropical South Pacific. Biogeosciences, 13(20), 5697–5717. DOI: http://dx.doi.org/10.5194/bg-13-5697-2016

5... GEOTRACES Science Highlights: Examples

The coupled zinc-silicon cycle paradox illuminated

Vance and co-workers infer that the oceanic zinc distribution is the result of the interaction between the specific uptake stoichiometry in Southern Ocean surface waters and the physical circulation through the Southern Ocean hub

This work emphasizes how the consideration of 1-D cycling only can bias the understanding of (macro and micro) nutrient behaviours, and therefore their paleo-applications, although 1-D cycling may also play an important role in Zn cycling

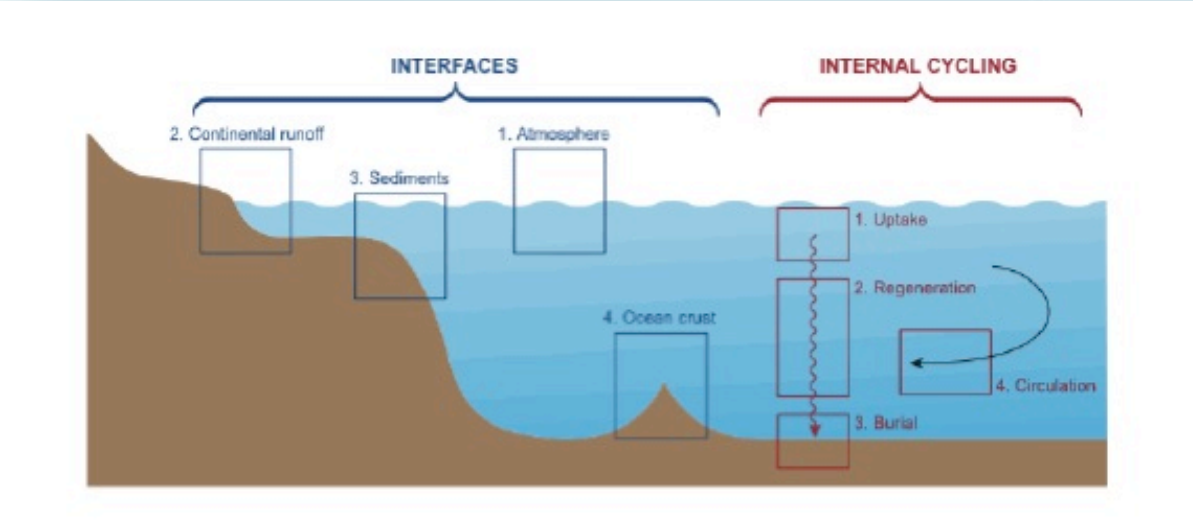


Vance, D., Little, S. H., de Souza, G. F., Khatiwala, S., Lohan, M. C., & Middag, R. (2017). Silicon and zinc biogeochemical cycles coupled through the Southern Ocean. Nature Geoscience. DOI: http://dx.doi.org/10.1038/ngeo2890

6. GEOTRACES Synthesis Strategy

3-pronged synthesis

covering **main scientific goals** of GEOTRACES



1- Supply and removal of TEI at ocean interfaces	*2- Internal cycling of TEIs within the ocean*	*3- Geochemical tracers as paleoceanographic proxies*
2 Royal Society Scientific Meetings **7-10 December 2015**	Joint GEOTRACES Ocean Carbon and Biogeochemistry (**OCB**) programme Workshop **1-4 August 2016**	Exploring partnership with the Past Global Changes project (**PAGES**) for a joint workshop **Forthcoming in 2018!**

7. GEOTRACES Meetings in 2017

2017	
January 2017	Monday 16 January 2017 - Wednesday 18 January 2017 East Asia GEOTRACES Workshop : GEOTRACES Scientific Workshops Monday 23 January 2017 - Thursday 26 January 2017 GEOTRACES Standards and Intercalibration Committee Meeting : GEOTRACES Meetings
February 2017	Tuesday 07 February 2017 GEOTRACES Standards and Intercalibration Committee and Data Management Committee co-chairs Meeting : GEOTRACES Meetings Sunday 26 February 2017 Arctic-GEOTRACES Early Career Researcher Networking Event (ASLO 2017) : GEOTRACES Scientific Workshops
March 2017	Monday 20 March 2017 GEOTRACES Standards and Intercalibration Committee Meeting : GEOTRACES Meetings
April 2017	Monday 24 April 2017 GEOTRACES Standards and Intercalibration Committee Meeting : GEOTRACES Meetings Wednesday 26 April 2017 GEOTRACES Standards and Intercalibration Committee and Data Management Committee co-chairs Meeting : GEOTRACES Meetings
August 2017	Wednesday 16 August 2017 Public release of GEOTRACES Intermediate Data Product 2017 : GEOTRACES Meetings Sunday 20 August 2017 - Saturday 26 August 2017 GEOTRACES Summer School : GEOTRACES Training Activities
September 2017	Saturday 16 September 2017 - Sunday 17 September 2017 2017 GEOTRACES Data Management Committee Meeting : GEOTRACES Meetings Monday 18 September 2017 - Wednesday 20 September 2017 2017 GEOTRACES Scientific Steering Committee Meeting : GEOTRACES Meetings

8. First GEOTRACES Summer School

- Very successful GEOTRACES Summer School held in Brest, France, between the 20th and 26th August 2017
- 60 students and 20 world-leading international scientists
- Supported by the LabexMER and SCOR. Many thanks!

9. *New* Outreach and Educational Resources

- **GEOTRACES eNewsletter Special Issue – Discovery Digest:**

  New type of eNewsletter introduced this year in complement to the bi-monthly eNewsletter. First issue published in March devoted to recent discoveries in the oceanic cycle of iron.

  http://www.geotraces.org/outreach/geotraces-enewsletter/listid-12/mailid-768-geotraces-discovery-digest

- **New video** presenting the GEOTRACES International Programme: https://youtu.be/3_pC_2eeAtA

- **Children's Book -** Narrated photographic book of the US Expedition to the North Pole: http://www.healycruisebook.com

Discover more at: GEOTRACES Outreach webpage
http://www.geotraces.org/outreach

Thank you very much!

International Coordination:

GEOTRACES International Project Office
(LEGOS-OMP, Toulouse, France)

Catherine Jeandel (Scientific Director)
Elena Masferrer Dodas (Executive Officer)

Data Management:

GEOTRACES Data Assembly Centre (BODC, Liverpool)

www.geotraces.org

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