

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN FRANCE

May 1st, 2016 to April 30th, 2017

New scientific results

1- Global seawater ϵNd database was updated and combined with other tracers as hydrography parameters (temperature, salinity, nutrients, oxygen) and dissolved carbon-14 (^{14}C) and $\delta^{13}\text{C}$ (Tachikawa et al., 2017, Fig. 3).

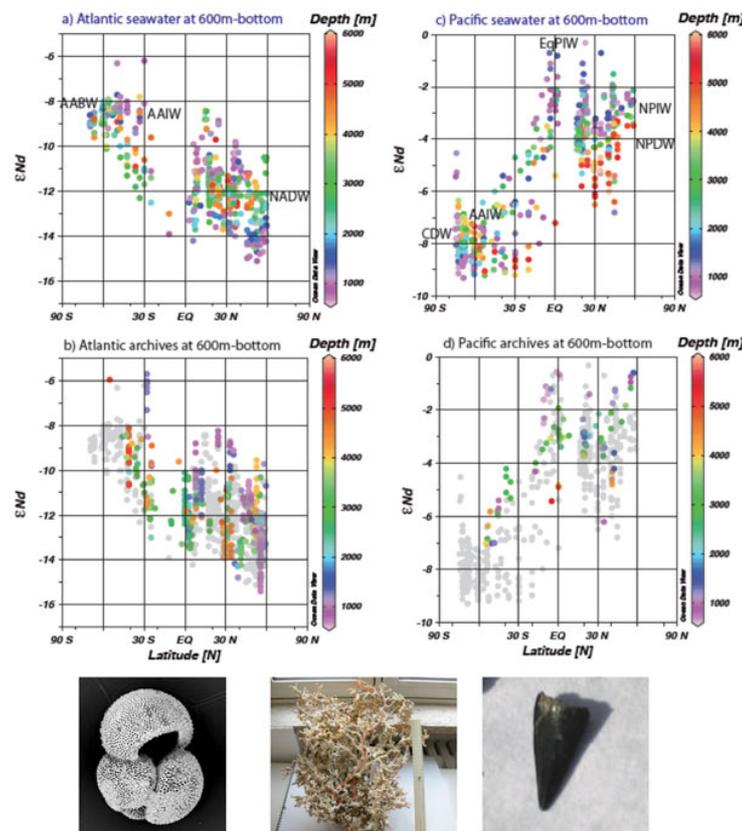


Figure 3. Tachikawa et al. (2017). Major latitudinal trends of seawater (a and c) and archive (b and d, and pictures below) ϵNd values in the Atlantic and Atlantic sector of the Southern Ocean (a and b) and Pacific and Pacific sector of the Southern Ocean (c and d) at ≥ 600 m. Major water masses are indicated. The grey dots on archive figures show seawater values. All the figures were created using Ocean Data View (ODV, Schlitzer, 2017).

The database contains also sedimentary authigenic and biogenic carbonate ϵNd values from the Holocene. It allows drawing the following general schemes:

- At water depths ≥ 1500 m, large-scale water mass mixing is a primary control of deep water ϵNd distribution.
- At ≥ 200 m, basin-scale seawater temperature-salinity- ϵNd diagrams demonstrate the isotopic evolution of different water masses.

- At 600–1500 m water depths, the relationships are weaker. Basin-scale seawater vertical ϵNd profiles demonstrate larger variability.
- At surface and subsurface depths, suggesting local/regional detrital influence at shallower water depths.
- Empirical equations were established to predict the main, largescale, deepwater ϵNd trends from hydrography parameters revealing that continental influence on seawater and archive ϵNd is observed mainly within 1000 km from the continents.
- Seawater and archive ϵNd values present clear latitudinal trends in the Atlantic and Pacific Oceans at water depths ≥ 600 m: this reinforces the potentiality of Nd isotopes to distinguish between northern/southern sourced water contributions at intermediate and deep water depths in the present and past ocean.

2- Dulaquais et al. (2017) proposed the first comprehensive study of cobalt behaviour in the Mediterranean Sea. This work was conducted in the framework of MedBlack GEOTRACES cruise (GA04N).

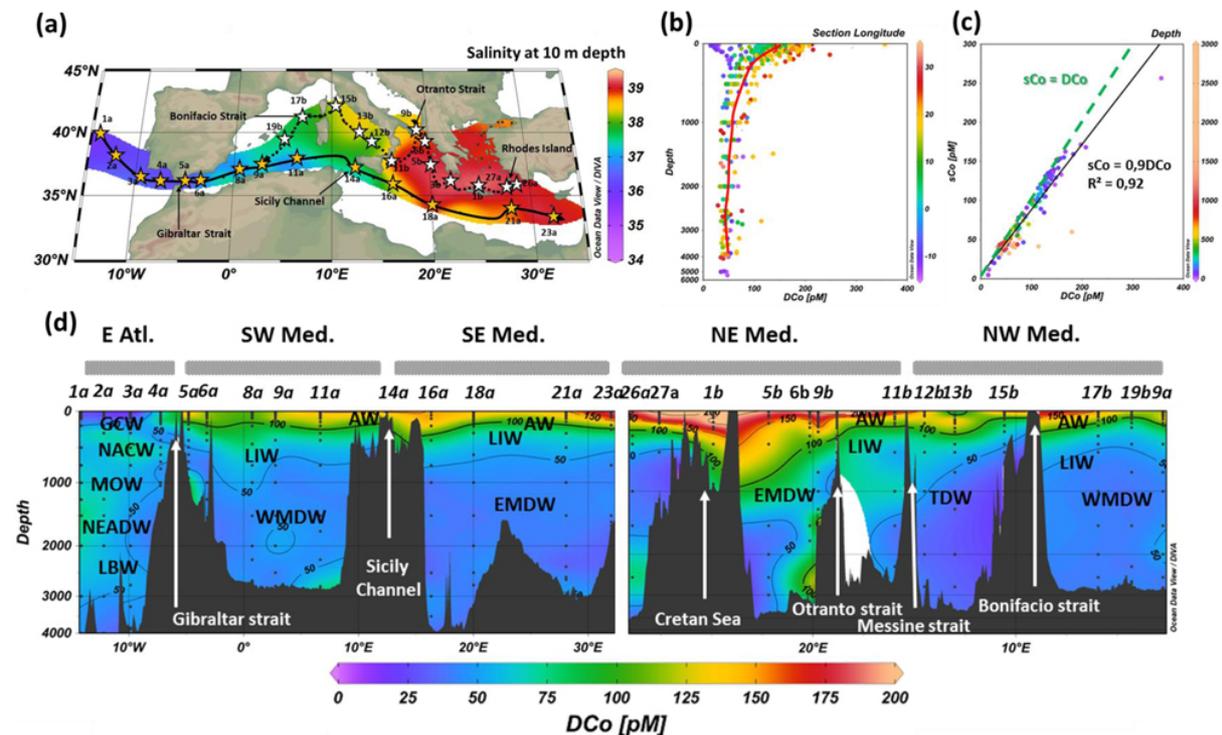


Figure 4. Distribution and partitioning of dissolved cobalt (DCo) in the (Dulaquais et al., 2017). DCo concentrations along the GA04N section (a) and a scavenged like profile in all the different sub-basins of the Mediterranean Sea (b). In the Mediterranean Sea, DCo was almost entirely composed of soluble cobalt (sCo), the colloids representing only 10% of the DCo pool (c). Resulting from high recycling rate and its stabilization under a soluble form, surface DCo concentrations increased eastward with ageing of surface waters (d). Differently accumulation of DCo by remineralization in the intermediate water was not discernable (d) and surprisingly the zonal distribution of DCo in the deep sea showed homogenous concentrations (d). These features were related to scavenging rates depth dependents and of different magnitude in the two Mediterranean basins as well as to the fast Mediterranean circulation that homogenize concentrations in the deep sea. Figures were made using ODV (Schlitzer, 2017).

Dulaquais et al. (2017) measured the following cobalt (Co) fractions: soluble ($sCo < 0.02 \mu\text{m}$), dissolved ($DCo < 0.2 \mu\text{m}$), colloidal (cCo , as DCo minus sCo), and particulate ($pCo > 0.2 \mu\text{m}$) (Fig. 2). While soluble Co is the predominant form (90%) of the dissolved Co in the Mediterranean Sea, colloidal Co and particulate Co show a close distribution, yielding the authors to suspect a biogeochemical link between these two fractions. More striking is the scavenged-like profile observed everywhere, with up to 350 nM dissolved Co concentrations in the surface waters dropping to 45 nM at depth. Such behaviour results from several mechanisms. High-surface Co inputs at Gibraltar Strait are horizontally transported by the Mediterranean circulation, surface dissolved Co is stabilized in a soluble form and biogenic particulate Co is very rapidly regenerated: all these processes concur to the accumulation of dissolved Co in the surface layers. Conversely, low particulate Co export, low remineralization of biogenic particulate Co at depth, and removal of dissolved Co by scavenging prevented its accumulation in the intermediate and deep sea.

3- Trace element concentrations were determined in dry (aerosols) and wet (precipitation) deposition samples from the North Atlantic, north of 40°N , during the GEOVIDE cruise (GEOTRACES cruise GA01) in May/June 2014 (Shelley et al., 2017). Atmospheric aerosol loading in the study region was low ($\sim 2\text{--}500 \text{ ng m}^{-3}$) throughout the cruise, as inferred from the very low aerosol Ti concentrations determined ($0.0084\text{--}1.9 \text{ ng m}^{-3}$). Wet deposition appeared to be of roughly equal or greater importance than dry deposition to the total depositional flux of TEs, which is consistent with other regions of the Atlantic Ocean outside of the influence of the Saharan plume.

During this study, TE flux estimates were derived from two different techniques: (1) the traditional approach of summed wet and dry deposition TE fluxes, using concentration data, precipitation rates, and dry deposition velocities and, (2) using the inventory of the cosmogenic radioisotope beryllium-7 (^7Be) in the upper ocean as a proxy for atmospheric deposition. The use of the low-background gamma spectrometers at the LAFARA underground laboratory allowed us to quantify ^7Be activities as deep as 150 m depth (Fig. 3). These two approaches yielded TE flux estimates that were in excellent agreement (within one standard deviation) for about half of the TEs under investigation. However, for the remaining TEs, differences between the flux estimates ranged from two to forty times, with the traditional approach generally being the higher of the two estimates. Therefore, factors that may contribute to this variation, such as differences in the timescale of integration and selection of representative deposition velocities and precipitation rates, are discussed. Our results suggest that the ^7Be approach continues to show promise in this application, particularly in regions where precipitation samples cannot be routinely collected.

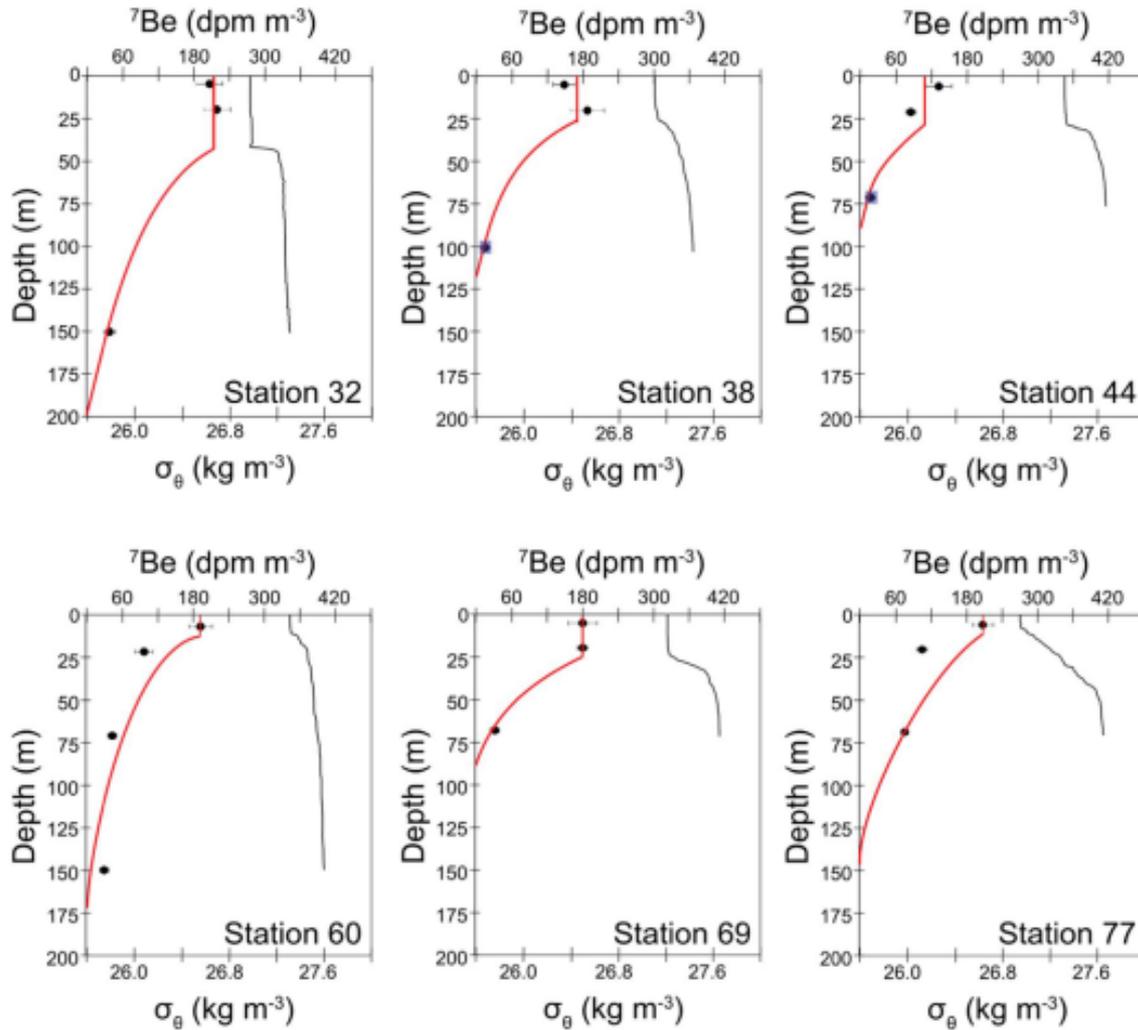


Figure 5. Concentration profiles (black dots), integrated inventory of ^7Be (red continuous line) in the water column and potential density anomaly (σ_θ , black continuous line) for all stations sampled during the GEOVIDE cruise (Shelley et al., 2017).

4- The first inter-calibration study of the stable silicon isotope composition of dissolved silicic acid in seawater, $\text{d}^{30}\text{Si}(\text{OH})_4$, is presented as a contribution to the international GEOTRACES program (Grasse et al., 2017, Fig. 6). Eleven laboratories from seven countries (including two French labs) analyzed two seawater samples from the North Pacific subtropical gyre (Station ALOHA) collected at 300 m and at 1000 m water depth. Sampling depths were chosen to obtain samples with a relatively low ($9 \mu\text{M}$, 300 m) and a relatively high ($113 \mu\text{M}$, 1000 m) silicic acid concentration as sample preparation differs for low- and high concentration samples. Data for the 1000 m water sample were not normally distributed so the median was used to represent the central tendency for the two samples. Median $\text{d}^{30}\text{Si}(\text{OH})_4$ values of $+1.66\text{‰}$ for the low-concentration sample and $+1.25\text{‰}$ for the high-concentration sample were obtained. Agreement among laboratories was overall considered very good; however, small but statistically significant differences among the mean isotope values obtained by different laboratories were detected, likely reflecting inter-laboratory differences in chemical preparation including preconcentration and purification methods together with different volumes of seawater analyzed, and the use of different mass spectrometers including the Neptune MC-ICP-MS (Thermo Fisher™, Germany), the Nu

Plasma MC-ICP-MS (Nu Instruments™, Wrexham, UK), and the Finnigan™ (now Thermo Fisher™, Germany) MAT 252 IRMS. Future studies analyzing $\delta^{30}\text{Si}(\text{OH})_4$ in seawater should also analyze and report values for these same two reference waters in order to facilitate comparison of data generated among and within laboratories over time.

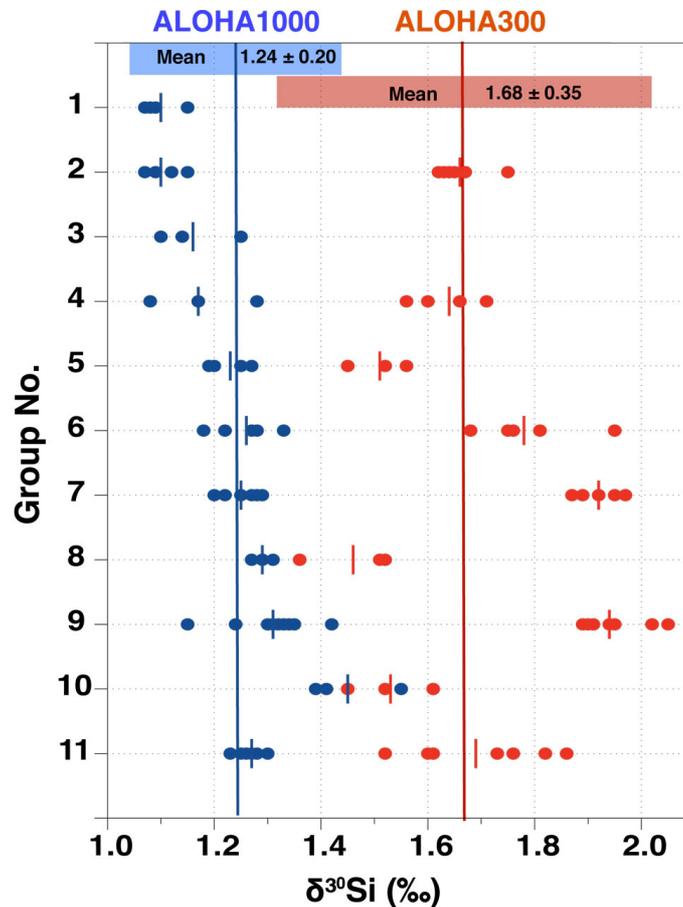


Figure 6. $\delta^{30}\text{Si}(\text{OH})_4$ results from all groups for ALOHA300 (red circles) and ALOHA1000 (blue circles). The vertical lines indicate the mean value of all measurements for ALOHA1000 (blue) and for ALOHA300 (red). The data points represent the individual $\delta^{30}\text{Si}(\text{OH})_4$ values for Si isotopes measurements. Short vertical solid lines are the means obtained by individual laboratories for the two samples. Uncertainty in the mean for all measurements (2 s.d.) is indicated by the horizontal bars at the top of the figure (modified from Grasse et al. 2017).

5- A massive diatom-bloom is observed annually in the surface waters of the naturally Fe-fertilized Kerguelen Plateau (Southern Ocean). In the Closset et al. (2016) study, silicon isotopic signatures ($\delta^{30}\text{Si}$) of silicic acid (DSi) and suspended biogenic silica (BSi) were investigated in the whole water column with an unprecedented spatial resolution in this region, during the KEOPS-2 experiment (spring 2011). We used $\delta^{30}\text{Si}$ measurements to track the silicon sources that fuel the bloom, and investigated the seasonal evolution of Si biogeochemical cycle in the iron fertilized area. We compared the results from a HNLC reference station with stations characterized by different degrees of iron enrichment and bloom conditions. Dissolved and particulate $\delta^{30}\text{Si}$ signatures were generally highly variable in the upper 500 m, reflecting the effect of the intense silicon utilization in spring, while they were quite homogeneous in deeper waters. The Si-isotopic and mass balance identified a unique Winter Water (WW) Si-source for the iron-fertilized area originating from the southeastern Kerguelen Plateau and spreading northward. However, when reaching a

retroflexion of the Polar Front (PF), the $\delta^{30}\text{Si}$ composition of WW silicic acid pool was getting progressively heavier. This would result from sequential diapycnal and isopycnal mixings between these initial WW and mixed layer (ML) water masses, highlighting the strong circulation of surface waters that defined this zone. When comparing the results from the two KEOPS expeditions, the relationship between DSi depletion, BSi production and their isotopic composition appears decoupled in the iron fertilized area. This seasonal decoupling could help to explain the low apparent fractionation factor observed here in the ML at the end of summer. Taking into account these considerations, we refined the seasonal net BSi production in ML of the iron-fertilized area to $3.0 \pm 0.3 \text{ mol Si m}^{-2}\text{y}^{-1}$, which was exclusively sustained by surface water phytoplankton populations. These insights confirm that the isotopic composition of dissolved and particulate silicon is a promising tool to improve our understanding on the Si-biogeochemical cycle since the isotopic and mass balance allows resolving the processes involved i.e. uptake, dissolution, mixing.

6- Dissolved/particle interaction with lithogenic particles dominates the release of dissolved Fe in the deep water masses of the Atlantic sector of the Southern Ocean (Bonus/Goodhope cruise, Abadie et al. 2017, Fig. 7)

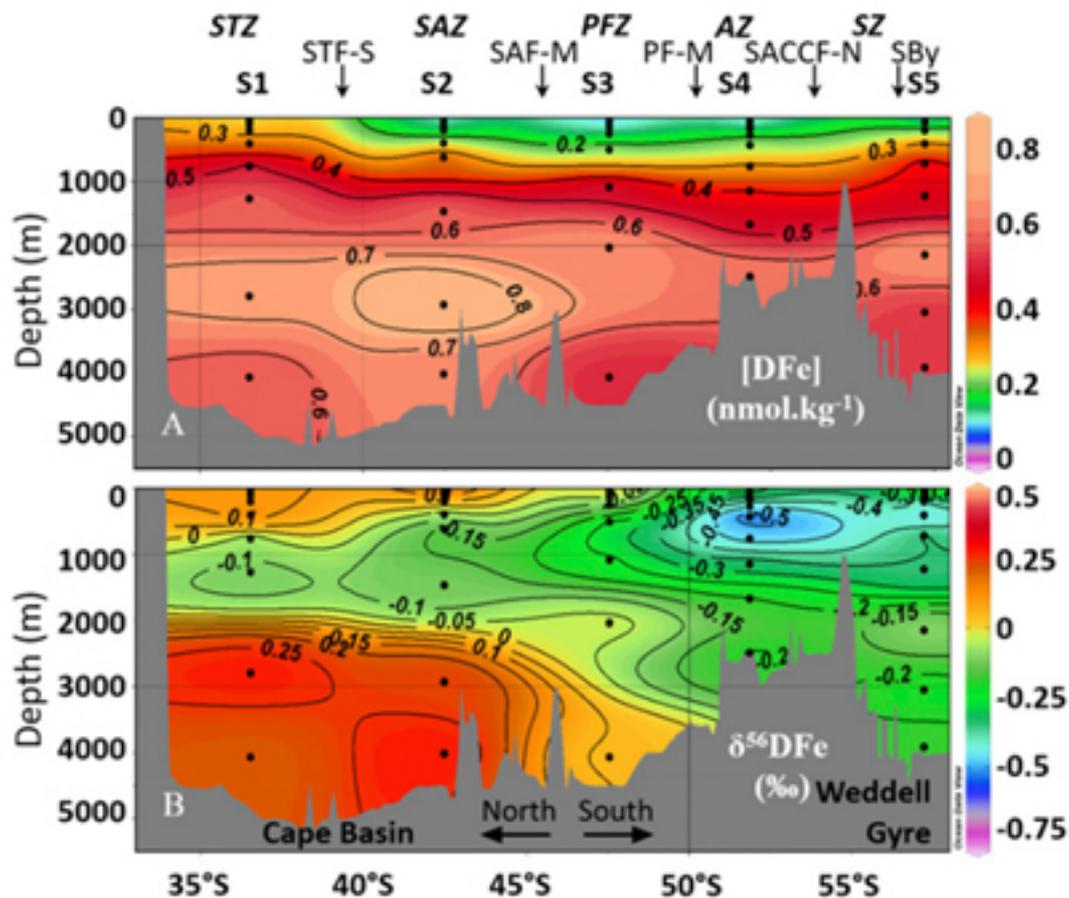


Figure 7. Abadie et al. (2017). Section of (A) dissolved Fe (DFe, in nmol kg^{-1}) and (B) DFe isotopic composition ($\delta^{56}\text{Fe}$ relative to IRMM-14 in per mil) of seawater samples taken during the Bonus-GoodHope cruise (Feb.-March 2008). Figure was made using ODV (Schlitzer, 2017).

7- Dissolved neodymium (Nd) isotopic composition (expressed as ϵNd) has been analyzed for 82 seawater samples collected from 13 stations stretching from the Alboran Sea to the Iceland Basin (Dubois-Dauphin et al., in press). The distribution of the ϵNd values of water

masses was thus investigated for the first time along the western European margin in order to explore whether the water masses flowing in the eastern subpolar and subtropical Atlantic reveal distinct isotopic patterns. In the northeast Atlantic, the North Atlantic Current surface water located in the inter-gyre region (north of 46°N) displays ϵNd values of between -14.0 ± 0.3 and -15.1 ± 0.3 , reflecting the subpolar gyre signature. Along the western European margin, ϵNd values of surface water decrease toward the north (from -10.4 ± 1.6 to -13.7 ± 1.0) in agreement with the gradual mixing between subtropical and subpolar water. At intermediate depth, ϵNd values decrease from -9.9 ± 0.4 within the Gulf of Cádiz to -12.1 ± 0.3 within the Porcupine Seabight, indicating a strong dilution of the MSW with subpolar water. Within the Rockall Trough and the Iceland Basin, the more negative ϵNd values at mid-depth ($< -13.5 \pm 0.3$) indicate that the MSW has no influence, even during periods of low NAO index.

8- Dissolved REEs and Y concentrations of six seawater stations (MONOPOL Cruise) located along the 89°E meridian (from 17°N to 8°N) in the Bay of Bengal have been investigated in order to estimate the relative importance of dissolved and lithogenic particles from the Ganges-Brahmapoutra river inputs, and bottom sediment releases, on the dissolved REE concentration distributions, and the residence time of dissolved REEs in the Bay of Bengal (Yu et al., 2017).

9- In the Mediterranean Sea, generally low ^{231}Pa concentrations were found due to the short water residence time (Fig. 8). The impact of deep water formation was highlighted by low concentrations of ^{231}Pa concentrations particularly in the eastern basin.

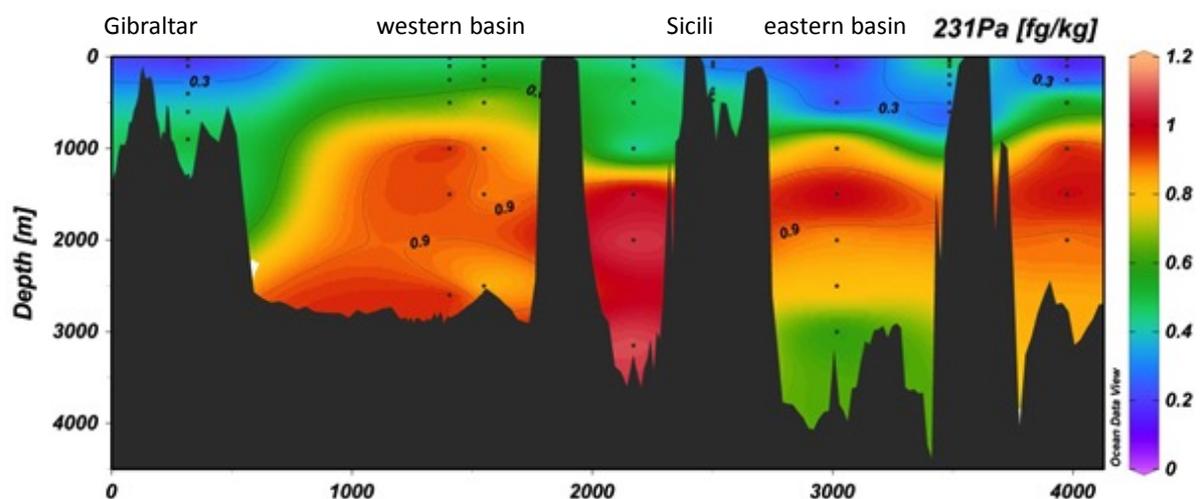


Figure 8. Distribution of ^{231}Pa along the MedSeA GA04S section (Gdaniec et al., unpublished). Figure was made using ODV (Schlitzer, 2017).

10- The abundance and composition of particulate organic carbon (POC) is critical for the removal of numerous trace elements by scavenging (Aumont et al., 2017, Fig. 9). Observations and laboratory experiments have shown that POC is composed of numerous organic compounds with very different reactivities. Yet, this variable reactivity of POC has never been extensively considered in modeling studies. Here, we introduced in the global ocean biogeochemical model NEMO-PISCES a description of the variable composition of POC based on the theoretical Reactivity Continuum Model proposed by Boudreau and

Ruddick (1991). We show that accounting for a variable lability of POC increases POC concentrations in the ocean's interior by one to two orders of magnitude due to a better preservation of small slowly sinking particles. Furthermore, the carbon flux that reaches the sediments is increased by more than a factor of two, which is in better agreement with global estimates of the sediment oxygen demand. The impact on the major macro-nutrients (nitrate and phosphate) remains modest. However, iron (Fe) distribution is strongly altered, especially in the upper mesopelagic zone as a result of more intense scavenging: Vertical gradients of Fe are milder in the upper ocean which appears to be closer to observations.

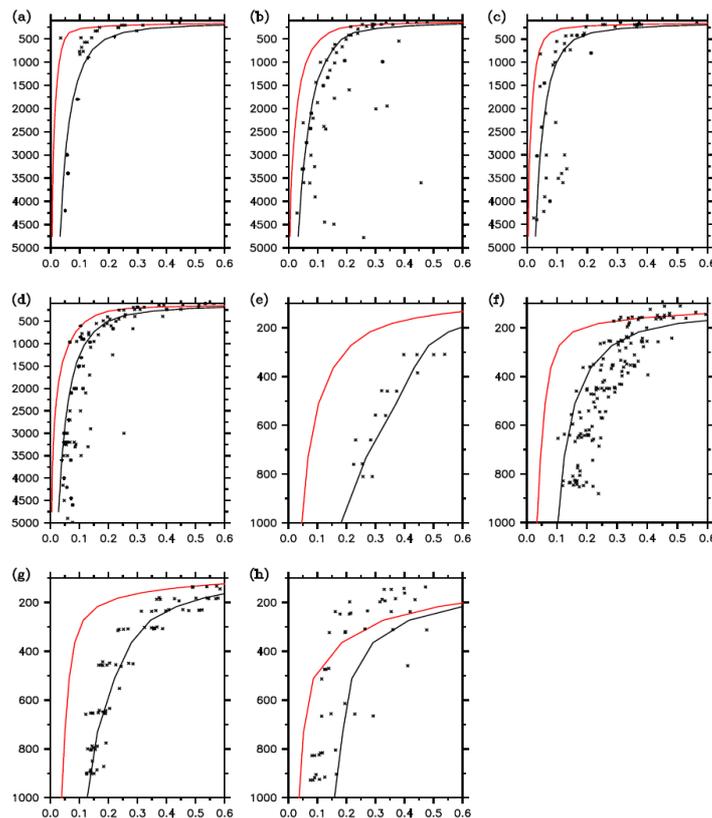


Figure 9. From Aumont et al. (2017). Modelled and observed total POC concentrations (μM) in different regions of the ocean: (a) western, (b) oligotrophic and (c) eastern North Atlantic Ocean, (d) Hawaii region, (e) northwest, (f) northeast, (g) central and (h) southern Pacific Ocean. The continuous lines are concentrations averaged over the region: without (in red) and with the reactive continuum parameterization (in black). The black speckles are observations in the respective regions from Druffel et al. (1992); Lam et al. (2011, 2015b).

11- An extensive compilation of published neodymium (Nd) concentrations and isotopic compositions (Nd IC) has been realized in order to establish a new high resolution database of the distribution of these parameters for all the Mediterranean margins (Ayache et al., 2016, Fig. 10). Data were extracted from different kinds of samples: river solid discharge deposited on the shelf, sedimentary material collected on the margin or geological material outcropping above or close to a margin. Additional analyses of surface sediments were done, in order to improve this dataset in key areas (e.g Sicilian strait). This new geological map has been used to perform a high resolution regional oceanic simulation (NEMO-MED12 $1/12^\circ$ of horizontal resolution) of Nd IC in the Mediterranean Sea (Fig. 11).

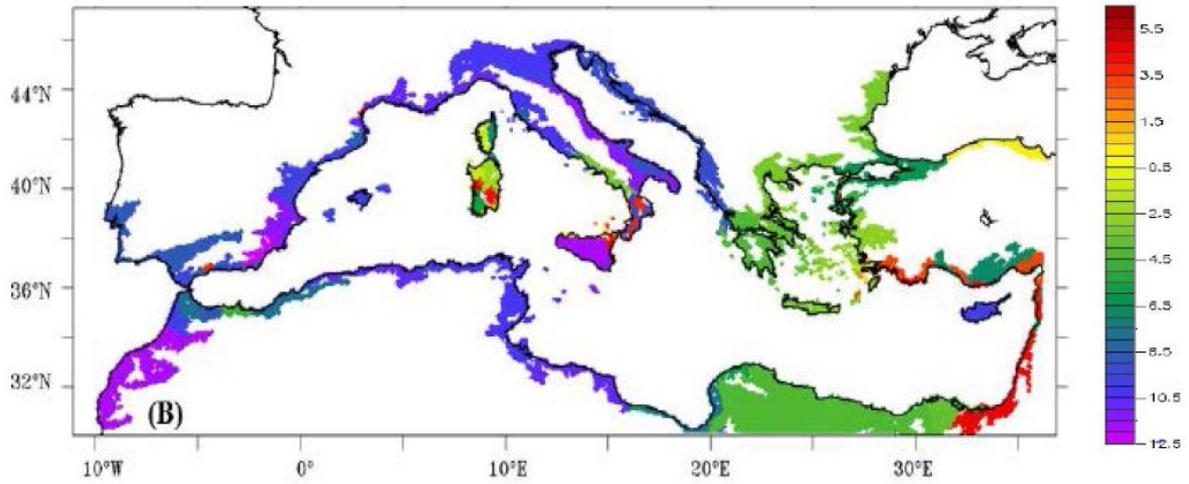


Figure 10. High resolution map of the Nd isotopic signature of all the margins surrounding the Mediterranean Sea (Ayache et al., 2016).

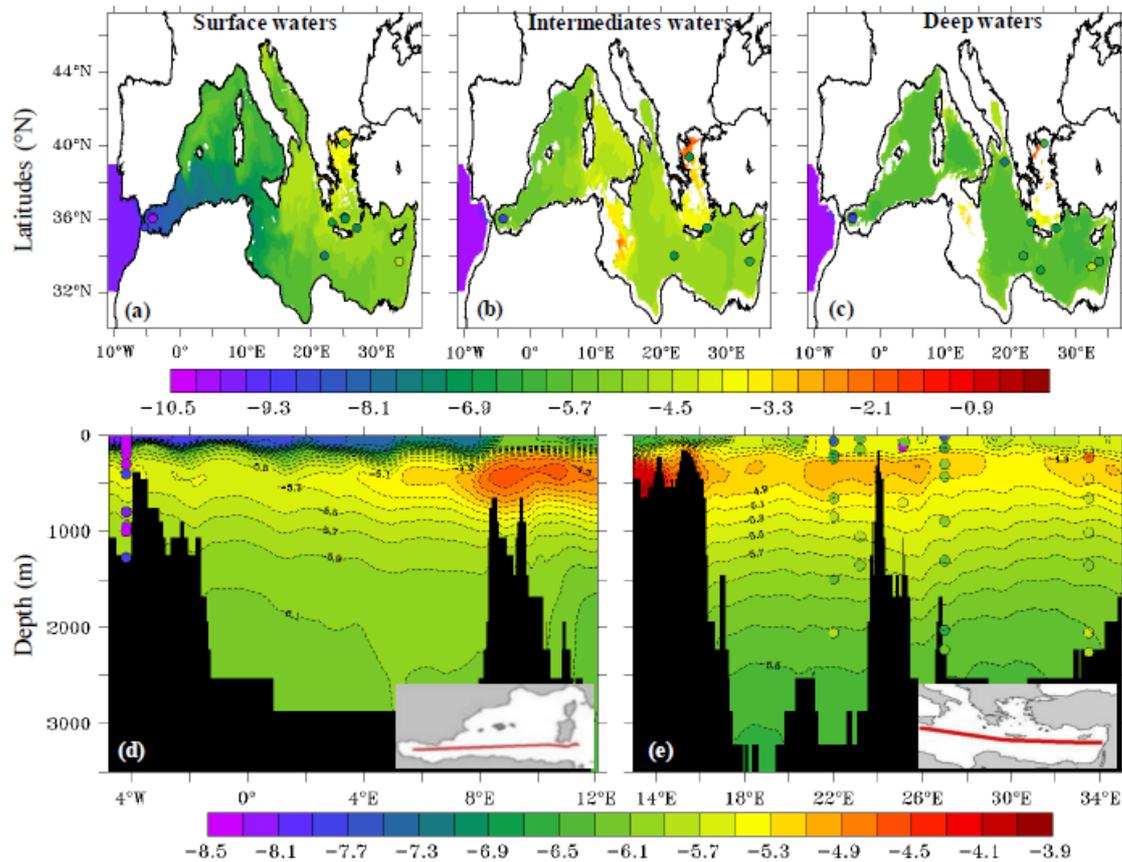


Figure 11. Ayache et al. (2016). Simulated Nd isotopic composition. Upper panel: horizontal maps for surface waters (a), intermediate waters (b), and deep waters (c). Lower panel E-W section in WMed (d), and EMed (e), whereas color-filled dots represent in situ observations (Tachikawa et al., 2004).

The Boundary Exchange (BE) parameterization was performed via a relaxing term toward the isotopic composition of the margin and was the only source considered in this study. The model correctly simulates the main features of the Nd distribution with a well identified

signature of the main Mediterranean water masses, and a realistic East-West gradient in the surface waters. This reinforces the preceding conclusions on BE as an important process in the Nd oceanic cycle. Nevertheless the comparison with the available data the Med Sea reveals that this approach simulates too radiogenic values in the surface and intermediate waters (especially in the EMed). This bias could reflect that dust and river inputs are not simulated so far, although they could be important sources of Nd in the Mediterranean Sea and can have locally a significant impact on ϵNd distribution.

12- We combined new GEOTRACES observations (GA02) and global modelling to give a first assessment of the main sources and redistribution of Mn throughout the ocean (van Hulst et al., 2017). We simulated the distribution of dissolved Mn using the global-scale circulation model (NEMO-PISCES, Fig. 12). The simulation includes simple parameterisations to account for the sources, processes and sinks of Mn in the ocean. Oxidation and (photo)reduction, aggregation and settling, as well as biological uptake and remineralisation by plankton are included in the model. Our model provides, together with the observations, the following insights: The most important sources for the upper ocean are sediments, dust, and, more locally, rivers, whereas hydrothermal vents are the most important in the deep ocean. The observed sharp hydrothermal signals are produced by assuming both a strong source and a strong removal of Mn near hydrothermal vents. The high surface concentrations of manganese are caused by the combination of photoreduction and sources contributing to the upper ocean.

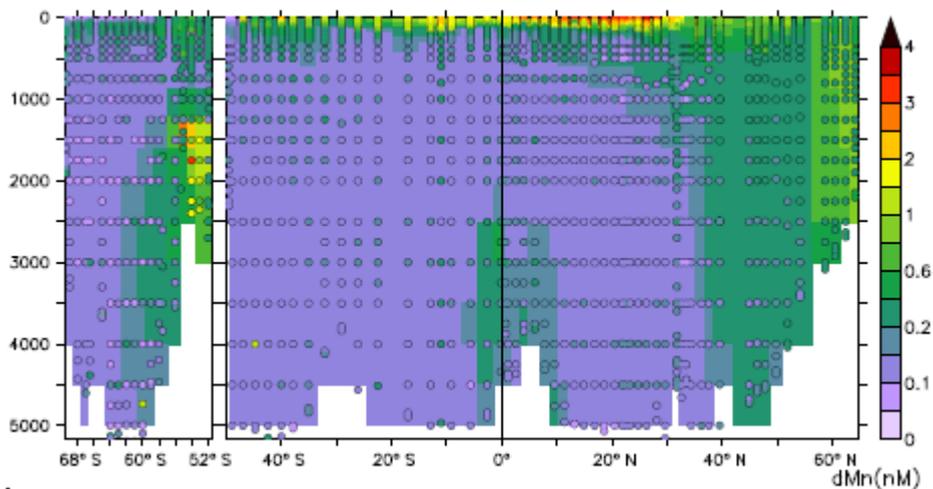


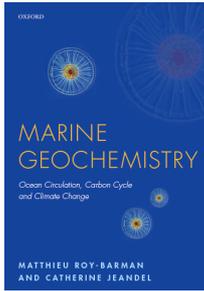
Figure 12. van Hulst et al. (2017). Simulated Dissolved Mn (nM) at the Zero-Meridian section component of the GIPY5 dataset, and the west Atlantic GA02 GEOTRACES transects Observations are presented as colored dots.

New publications (published or in press)

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- Aumont O., van Hulst M. M. P., Roy-Barman M., Dutay J.-C., Éthé C. and Gehlen M. (2017) A reactivity continuum of particulate organic matter in a global ocean biogeochemical model. Biogeosciences, in press.
- Ayache, M., Dutay, J.-C., Arsouze, T., Révillon, S., Beuvier, J., and Jeandel, C.: High-resolution neodymium characterization along the Mediterranean margins and modelling of ϵNd distribution in the Mediterranean basins, Biogeosciences, 13, 5259-5276, doi:10.5194/bg-13-5259-2016, 2016.
- Behrens M. K., Muratli J., Pradoux C., Wu Y. Z., Boning P., Brumsack H. J., Goldstein S. L., Haley B., Jeandel C., Paffrath R., Pena L. D., Schnetger B., Pahnke K. (2016). Rapid and precise analysis of rare earth elements in small volumes of seawater - Method and intercomparison. Marine Chemistry, 186, 110-120.
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- Closset I., D. Cardinal, F. Thil, M. Rembauville, S. Blain, 2016. Unveiling the Si cycle using isotopes in an iron fertilized zone of the Southern Ocean: from mixed layer supply to export. Biogeosciences, 13, 6049-6066.
- Conway T., John S. G., Lacan F. 2016. Intercomparison of dissolved iron isotope profiles from reoccupation of three GEOTRACES stations in the Atlantic Ocean. Marine Chemistry doi:10.1016/j.marchem.2016.04.007.
- Dubois-Dauphin Q., Colin C., Bonneau L., Montagna P., Wu Q., Van Rooij D., Reverdin G., Douville E., Thil F., Waldner A., Frank N. (in press), Fingerprinting Northeast Atlantic water masses using Neodymium isotopes, GCA.
- Dubois-Dauphin Q., Bonneau L., Colin C., Montero-Serrano J.C., Montagna P., Blamart D., Hebbeln D., Van Rooij D., Pons-Branchu E., Hemsing F., Wefing A.M., Frank N. (2016). South Atlantic intermediate water advances into the North-east Atlantic with reduced Atlantic meridional overturning circulation during the last glacial period. Geochemistry Geophysics Geosystems, 17(6):2236-2353

- Dulaquais, G., Planquette, H., L'Helguen, S., Rijkenberg, M. J. A., & Boye, M. (2017). The biogeochemistry of cobalt in the Mediterranean Sea. *Global Biogeochemical Cycles*, 31(2), 377–399. DOI: 10.1002/2016GB005478
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- Tachikawa K., Arsouze T., Bayon G., Bory A., Colin C., Dutay J.-C., Frank N., Giraud X, T Gourlan A.T., Jeandel C., Lacan F., Meynadier L., Montagna P., Piotrowski A.M., Plancherel Y., Pucéat E., Roy-Barman M., Waelbroeck C. 2017. The large-scale evolution of neodymium isotopic composition in the global modern and Holocene ocean revealed from seawater and archive data. *Chemical Geology*, doi:10.1016/j.chemgeo.2017.03.018.
- Yu, Z., Colin, C., Douville E., Meynadier, L., Duchamp-Alphonse, S., Sepulcre, S., Wan S., Song, L., Wu, Q., Xu, Z., Bassinot, F. (2017). Yttrium and Rare Earth Elements partitioning in seawaters from the Bay of Bengal; *Geochemistry, Geophysics, Geosystems*, doi:10.1002/2016GC006749
- van Hulten, M., Middag, R., Dutay, J. C., de Baar, H., Roy-Barman, M., Gehlen, M., & Sterl, A. (2017). Manganese in the West Atlantic Ocean in the context of the first global ocean circulation model of manganese. *Biogeosciences*, 14(5), 1123.

Other publications



- M. Roy-Barman and C. Jeandel (2016). *Marine Geochemistry*. Oxford University Press.

Cruises

- Several short cruises conducted in the coastal seas along the French Mediterranean coastline (MED-SGD project, ANR-15-CE01-0004; PI: P. van Beek)
- HERMINE (N/O Pourquoi Pas? 12/03/2017-29/04/2017). One scientist from LEMAR (Hannah Whitby), one from the University of Liverpool (Arthur Gourain), and one for the University of Tasmania (Thomas Holmes) were on board.
- MINGULAY-ROCKALL: 80 seawater samples (10 l) have been collected in June 2016 in the Rokall Trough and on the Celtic margin.

New projects and/or funding

- KINETICS (LEFE/ECCO, INSU/CNRS funding). This project aims at establishing the kinetics of the release of chemical species from the sediments, with a focus on Si and Ni isotopes.
- SWINGS: South West Indian GEOTRACES Section. Letter of Intent submitted April 3rd, the main project is currently under writing.
- MED-SGD (ANR-15-CE01-0004) is funded between 2016 and 2019. The aim of the MED-SGD project is to study the fluxes of chemical species associated with SGD, Submarine Groundwater Discharge, and released into the coastal seas (Western Mediterranean Sea)
- SINDIA: Silicon Cycle along the land to ocean continuum in India (INSU, EC2CO-LEFE)

PhD theses

- Since the 9 of March 2017, we are welcoming Viet Pham who will do his PhD thesis on the REE and Nd isotopes collected as part of PANDORA (GP12). He will be in LEGOS until March 2020.
- Lise Artigue started a PhD in October 2016, on Fe isotopes in the KEOPS and PANDORA cruises, under the supervision of F. Lacan
- Emilie Le Roy is currently a PhD student at LEGOS under the supervision of F. Lacan and P. van Beek (2016-2018). She studies the distribution of natural radionuclides along the GA01-GEOTRACES section in the N-Atlantic.

- Simon Bejannin is currently a PhD student at LEGOS under the supervision of P. van Beek (2016-2018). He studies the fluxes of chemical elements associated with SGD, Submarine Groundwater Discharge and transferred to the coastal seas.
- Mangalaa K.R., 2016. Silicon biogeochemical cycle along the land to ocean continuum: Focus on Indian monsoonal estuaries. Université Pierre et Marie Curie Paris VI, 2016. English. 237pp.
- Houda Beghoura, PhD, Modelling the role of sedimentary particulate Fe (2016-2019), supervised by Thomas Gorgues (LOPS) and H el ene Planquette (LEMAR)
- Quentin Dubois-Dauphin – Restitution de l’hydrologie de l’Atlantique Nord-Est et de la M editerran ee occidentale depuis la derni ere p eriod e glaciaire  a partir de la composition isotopique du n eodyme mesur ee dans l’eau de mer et les coraux d’eau froide. Th ese de l’Universit e de Paris-Sacaly. Supervision: C. Colin (100 %). Allocataire MEN. Defended the 3rd of June 2016, mention tr es honorable.

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- Benetti, M. G. Reverdin, N.P. Holliday, J. Olafsson, P. Lherminier, G. Sarthou, Laura de Steur, A. E. Sveinbj rnsd ottir, S. Torres-Valdes, E. Tynan, I. Yashayaev., Freshwater exports from Arctic to the Labrador and Greenland shelf and slope, 2017, EGU Meeting, European Geosciences Union, Vienna (Austria), 23-28 April.
- Le Roy E., Sanial V., Charette M., Henderson P., Jacquet S., Garcia-Ibanez M., Perez F., Lherminier P., Souhaut M., Jeandel C., Lacan F., van Beek P. Radium-226 and barium as tracers of water masses in the North Atlantic (GA01-GEOTRACES). EGU, Vienna, Austria. April 2017.
- Le Roy E., Sanial V., Charette M., Henderson P., Souhaut M., Lacan F., van Beek P. Radium isotopes (^{226}Ra & ^{228}Ra) along the GEOVIDE transect in the North Atlantic (GEOTRACES GA01). Radium and Radon as environmental tracers, VI international Ra-Rn meeting, Girona (Spain), July 2016. Poster.
- Lemaitre, F. Planchon, H. Planquette, F. Dehairs, L. Monin, L. Andr e, M. Leermarkers, D. Fonseca-Batista, A. Roukaerts, C. Mourgues, D. Verstraeten, M. Castrillejo, Y. Tang, C. Jeandel, V. Sanial, R. Sauz ede, L. Foliot Carbon export fluxes along the GEOVIDE transect in the North Atlantic (GEOTRACES – GA01) EGU, Vienna, Austria. April 2016.
- Michael S.M, Joseph A Resing, Catherine Jeandel and Francois Lacan, Aluminum and Manganese Distributions in the Solomon Sea: Results from the 2012 PANDORA Cruise AGU San Francisco, 2016, POSTER
- Shelley R., Sarthou G., Tymen G., Losno R., Tito de Morais L., Benhra A., and Zohra Bouthir F., 2016, A case study of aerosol trace element deposition to Moroccan coastal waters, European Aerosol Conferences, Tours, 4-9 September

- van Beek P., Tamborski J., Bejannin S., Souhaut M., Garcia-Orellana J., Stieglitz T., Claude C., Olivier R., Lacan F., Crispi O., Pujo-Pay M., Conan P., Caparros J., Guéneuguès A., Monnin C., Seidel J.-L., Anschutz P. Estimating groundwater discharge in the coastal lagoons of La Palme and Salses-Leucate along the French Mediterranean coastline by using radium isotopes. EGU, Vienna, Austria. April 2017.
- Yu, Z., Colin, C., Douville, Duchamp-Alphonse, S., Sepulcre, S., Bassinot, F., Seasonal distribution of dissolved neodymium concentrations and ϵNd in the Bay of Bengal. ICP12 Utrecht, 29 August -2 Sept 2016.

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- Dubois-Dauphin Q., Montagna P., Siani G., Douville E., Wienberg C., Hebbeln D., Liu Z., Kallel N., Dapoigny A., Revel M., Pons-Branchu E., Colin C. (2016) Hydrological variations of the intermediate water masses of the western Mediterranean Sea during the past 20 ka inferred from neodymium isotopic composition in foraminifera and cold-water corals. Journées scientifiques Climat et Impacts 15 et 16 Novembre 2016 Université Paris-Sud, Orsay, Poster.
- Planquette, H. et al., LEFE-CYBER: 16-17 June 2016, EPOC, Bordeaux. Exploring the role of particles in trace element cycling in the central Arctic Ocean (TRANSARC II cruise).
- Yu Z. Colin C., Douville E., Meynadier L., Duchamp-Alphonse S., Sépulcre S., Wan S., Song L., Wu Q., Xu Z., Bassinot F. (2016) Yttrium and rare earth element partitioning in seawaters from the Bay of Bengal : new insights into the influence of river inputs. Journées scientifiques Climat et Impacts 15 et 16 Novembre 2016 Université Paris-Sud, Orsay, Oral.

Outreach activities

- Oral presentation about trace elements and isotopes and the ocean and visit of the LEGOS clean lab for high school teachers. May 2016, Toulouse.
- Communications about the Abadie et al. PNAS 2017 paper on Toulouse University, CNRS, Observatoire Midi Pyrenees website and LEGOS websites.

Other activities

- In the context of the LMI ICEMASA, LEMAR hosted a post-graduate student from South Africa, Natasha van Horsten (CSIR, Cape Town and Stellenbosch University, Stellenbosch, supervision: Dr T. Mtshali, Dr P. Monteiro, Dr A. Roychoudhury). During her 3 month stay (Sept.-Nov 2016), she was trained on the FIA for Fe(III) measurements in seawater, and analysed samples from South African cruises in the Atlantic sector of the Southern Ocean (winter and summer cruises). These results will help to better understand the seasonal variability of the Fe reservoirs in this HLNC area. Natasha van Horsten will start a PhD (2017-2020), co-supervised by T. Mtshali/A. Roychoudhury (CSIR/Univ Stellenbosch, South Africa) - E. Bucciarelli/G. Sarthou/H. Planquette (LEMAR, Univ. Brest, France).
- Organization of the first GEOTRACES Summer School. We received more than 110 applications and selected 60 participants (<https://geotraceschool.sciencesconf.org/>).

- The special issue related to the GEOVIDE project is now open in Biogeosciences. Around 20 articles are planned to be submitted. Guest editors are: Gideon Henderson, Maeve Lohan, Laurent Bopp, Catherine Jeandel, and Gilles Reverdin.

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