

**ANNUAL REPORT ON GEOTRACES ACTIVITIES IN BELGIUM**  
JUNE 2013 – JUNE 2014

***Meetings***

- Carnat G., Zhou J., Tison J.-L., Delille B., Goossens T., Schoemann V., and T.Papakyriakou. Biological and physical controls on DMS,P dynamics in ice-shelf-influenced fast ice, IGS International Symposium on Sea Ice in a Changing Environment, Hobart, Tasmania, Australia, 10-14 March 2014.
- Cavagna A.-J., K. Westwood, A. Roukaerts, D. Lannuzel, K. Meiners, F. Fripiat and F. Dehairs, Primary Production SIPEX 2 field tests: 14C and 13C-methods comparison, International Symposium on Sea Ice in a Changing Environment, Hobart, Tasmania, Australia, 10–14 March 2014.
- Dehairs F., T. Trull, A.-J. Cavagna, F. Planchon and F. Fripiat, Nitrate isotopic composition in the Kerguelen area (Southern Ocean), Ocean Sciences 2014, Feb. 23-28, 2014, Honolulu, Hawaii.
- Delille B., Haskell T., Champenois W., Heinesch B., Zhou J., Schoemann V., Carnat G., Fripiat F., Goossens T., Moreau S., Vancoppenolle M., Vivier F., Lourenço, A. and J.-L. Tison. Year Round survey of Ocean-Sea Ice-Air Exchanges – the YROSLAE survey, IGS International Symposium on Sea Ice in a Changing Environment, Hobart, Tasmania, Australia, 10-14 March 2014.
- Fonseca Batista D. and F. Dehairs, Fixed-nitrogen and atmospheric N<sub>2</sub> contribution to biological productivity in the eastern Atlantic Ocean, Ocean Sciences 2014, Feb. 23-28, 2014, Honolulu, Hawaii.
- Fripiat, F., D.M. Sigman, and J.-L. Tison, Nitrogen biogeochemical dynamics in Antarctic pack ice as reflected in the nitrogen isotopes, International Symposium on Sea Ice in a Changing Environment, Hobart, Tasmania, Australia, 10–14 March 2014.
- Hassler, C., Norman, L., Schoemann, V. Influence of Australian desert dust on marine iron chemistry and bioavailability to phytoplankton. DUST 2014 International Conference on Atmospheric Dust, Castellaneta Marina (TA), Italy, 1-6 June 2014
- Lemaitre N., H. Planquette, A. Bowie, T. Trull, F. Dehairs, Biogenic silica (BSi) and trace elements, Fe, Zn, Cu, Cd, Mn, Co, P, surca export fluxes near Kerguelen Island, Southern Ocean, Ocean Sciences 2014, Feb. 23-28, 2014, Honolulu, Hawaii.
- Li X., R. Mathieu, N. Roevros, F. Dehairs and L. Chou (2014) Combined Effects of pCO<sub>2</sub> and Dust Deposition on Diatom *Chaetoceros socialis*. 6th International SOLAS Summer School, 23 August - 2 September 2013, Xiamen, China, Poster and Oral presentations.
- Li X., N. Roevros, F. Dehairs and L. Chou (2014) Response of diatom *Chaetoceros socialis* to a changing climate and dust deposition: role of iron. IMBER Open Science Conference "Future Oceans" 2014, 23-27 June 2014, Bergen, Norway. Poster.
- Planchon F., D. Ballas\*, A.-J. Cavagna, T. Trull and F. Dehairs, Fe fertilization and carbon export production: the natural laboratory of the Kerguelen Island, Southern Ocean, Ocean Sciences 2014, Feb. 23-28, 2014, Honolulu, Hawaii.
- Roukaerts A., Cavagna\* A.-J. and F. Dehairs, Nutrient uptake and primary production in East Antarctic sea-ice (SIPEX II results), International Symposium on Sea Ice in a Changing Environment, Hobart, Tasmania, Australia, 10–14 March 2014.
- Roukaerts A., Cavagna A.-J. and F. Dehairs, Nitrate isotopic signatures ( $\delta^{15}\text{N-NO}_3^-$  and  $\delta^{18}\text{O-NO}_3^-$ ) in East Antarctic sea-ice and the underlying water column (SIPEX II results), International Symposium on Sea Ice in a Changing Environment, Hobart, Tasmania, Australia, 10–14 March 2014.

- Schoemann, V., de Jong, J.T.M., Tison, J.-L., Haskell, T., de Baar, H., Champenois, W., Zhou, J., Carnat, G., Fripiat, F., Goossens, T., Moreau, S. and B. Delille. Dust as a source of bio-essential trace elements for coastal sea ice in McMurdo Sound, Antarctica. DUST 2014 International Conference on Atmospheric Dust, Castellaneta Marina (TA), Italy, 1-6 June 2014
- Schoemann V., de Jong J.T.M., Tison J.-L., Haskell T., de Baar H., Champenois W., Zhou J., Carnat G., Fripiat F., Goossens T., Moreau S. and B. Delille. Land-fast sea ice of McMurdo Sound as a source of bio-essential trace metals for primary productivity in the Ross Sea, Antarctica, IGS International Symposium on Sea Ice in a Changing Environment, Hobart, Tasmania, Australia, 10-14 March 2014.
- Tison J.-L., Delille B., Dieckmann G., de Jong J., Janssens J., Rintala J., Luthanen A. M., Gussone N., Uhlig C , Nomura D., Schoemann V., Zhou J., Carnat G., Fripiat F. Snow cover and short-term synoptic events drive biogeochemical dynamics in winter Weddell Sea pack ice (AWECS cruise - June to August 2013), EGU General Assembly, Vienna, Austria, 27 April-2 May 2014.
- Tison J.-L., Delille B., Dieckmann G., de Jong J., Janssens J., Rintala J., Luthanen A. M., Gussone N., Uhlig C , Nomura D., Schoemann V., Zhou J., Carnat G., Fripiat F. Snow cover and short-term synoptic events drive biogeochemical dynamics in winter Weddell Sea pack ice (AWECS cruise - June to August 2013), IGS International Symposium on Sea Ice in a Changing Environment, Hobart, Tasmania, Australia, 10-14 March 2014.
- Vanderstraeten, A., Bonneville, S., Mattielli, N., Schoemann, V., Flament, P., Deboudt, K., Grob ty, B., De Vleeschouwer, F., Le Roux, G., Gier , R., Tison, J.-L. and V. Debaille. Dust Deposition in Snow from Northeast Antarctica: Mineralogical, Morphological and Chemical Characterisation, SEGH Conference, Newcastle, UK, 30 June-4 July 2014.

### ***Cruises***

- Antarctic Winter Ecosystem & Climate Study ANT XXIX/6 (AWECS): 8 Jun-12 Aug 2013, Weddell Sea sector, *RV Polarstern*; trace metals (e.g. Fe, Cu, Zn, Mn, Cd) and isotopes (Fe, Zn) in sea ice, brines and seawater.
- Belgica 2014/14 (21-30 May 2014): Bay of Biscay and Iberian Margin; nitrogen uptake and cycling; significance of N<sub>2</sub> fixation; nitrate isotopic composition; Role of iron.
- GEOVIDE (13 May – 30 June 2014): An international GEOTRACES study along the OVIDE section in the North Atlantic and in the Labrador Sea.
- ARK-XXVIII/3 (July 2014, *RV Polarstern*): Central Arctic (Eurasian basin), Nitrate  $\delta^{15}\text{N}$  and  $\delta^{18}\text{O}$
- Swedish-Russian-US Arctic Ocean investigation of climate-cryosphere-carbon interactions (July-August 2014, *RV Oden*): Arctic across-slope sections over the East-Siberian and Laptev shelves; Nitrate  $\delta^{15}\text{N}$  and  $\delta^{18}\text{O}$ .

### ***New funding***

- Belgian Science Policy, Science for Sustainable Development programme: Ecosystem Responses to global Change: A multi-scale approach in the Southern Ocean (vERSO); 2013-2018.
- LI Xuefeng (PhD grant). The marine iron biogeochemistry under a changing climate: impact on the phytoplankton and the diazotroph communities. PhD thesis, starting the academic year 2013-2014, under joint supervision between the Universit  Libre de Bruxelles (ULB-DSTE) and the Vrije Universiteit Brussel (VUB), financed by the FNRS (Aspirant grant). Promoter at ULB: L. Chou, co-promoter at VUB: F. Dehairs.

### ***New results***

- Trace metals concentrations (Fe, Ni, Cu, Zn, Pb, Al, Mn and Cd) in snow, seawater, brines and sea ice in the Central Arctic (IceArc, Aug.-Oct 2012) and in McMurdo Sound (YROSIAE, Nov.-Dec 2011).
- Organic complexation of Fe (ligand concentration and conditional binding constant) in sea ice and seawater in Central Arctic (IceArc, Aug.-Oct 2012).
- Nitrate is mainly regenerated in spring sea ice with nitrification
- Mechanistic understanding of the nitrogen biogeochemical dynamics in productive sea ice (assimilation, convective supply, remineralisation including nitrification).
- Spring sea ice primary production evolves from new to regenerated production
- Sea ice processes alone are unlikely to explain the  $\delta^{15}\text{N}$  variation in the Antarctic sediments
- Significant contribution of surface nitrification to nitrate assimilation in an iron fertilized bloom of the Southern Ocean (Kerguelen Plateau)

### ***Relevant publications***

- Carnat, G., J. Zhou, T. Papakyriakou, B. Delille, T. Goossens, T. Haskell, V. Schoemann, F. Fripiat, J.-M. Rintala and J.-L. Tison, 2014. Physical and biological controls on DMS, DMSP dynamics in ice-shelf influenced fast ice during a winter-spring and a spring-summer transitions. *Journal of Geophysical Research- Oceans* 04/2014, doi:10.1002/2013JC00938.
- Cossa D., M. Harmelin-Vivien, C. Mellon-Duval, V. Loizeau, B. Averty, S. Crochet, L. Chou and J.-F. Cadiou, 2012. Influences of bioavailability, trophic position, and growth on methylmercury in hakes (*Merluccius merluccius*) from Northwestern Mediterranean and Northeastern Atlantic. *Environ. Sci. Technol.*, 46, 4885-4893. DOI: 10.1021/es204269w.
- De Jong JTM, V. Schoemann, N., Maricq, N., Mattielli, P., Langhorne, T., Haskell and J.L., Tison, 2013. Iron in land-fast sea ice of McMurdo Sound derived from sediment resuspension and wind-blown dust attributes to primary productivity in the Ross Sea, Antarctica. *Marine Chemistry*, 157, 24-40, doi:10.1016/j.marchem.2013.07.001.
- Delille B., M. Vancoppenolle, N. X. Geilfus, B. Tilbrook, D. Lannuzel, V. Schoemann, S. Becquevort, G. Carnat, A.V. Borges, D. Delille, C. Lancelot, L. Chou, G. S. Dieckmann, and J.-L. Tison, (in revision). Southern Ocean CO<sub>2</sub> sink: the contribution of the marine cryosphere. *Journal of Geophysical Research - Oceans*.
- Fripiat F., D.M. Sigman, S.E Fawcett, P.A. Rafter, M.A. Weigand, and J.-L. Tison, 2014. New insights into sea ice nitrogen biogeochemical dynamics from the nitrogen isotopes, *Global Biogeochemical Cycles*, 28, 115–130, doi:10.1002/2013GB004729.
- Fripiat F., J.-L. Tison, L. André, D. Notz, and B. Delille, 2013. Biogenic silica recycling in sea ice inferred from Si-isotopes: Constraints from winter Arctic winter first-year sea ice, *Biogeochemistry*, doi 10.1007/s10533-013-9911-8.
- Gledhill M, C.S. Hassler and V. Schoemann, 2013. The environmental bioinorganic chemistry of aquatic microbial organisms. *Frontiers in Microbiology*, 4, 100. doi: 10.3389/fmicb.2013.00100.
- Lannuzel, D., V. Schoemann, I. Dumont, M. Content, J. de Jong, J.-L. Tison, B. Delille, and S. Becquevort, 2013. Effect of melting Antarctic sea ice on the fate of microbial communities studied in microcosms. *Polar Biology*, 36, 1483-1497, doi: 10.1007/s00300-013-13-1368-7.
- Schmidt S., J. Harlay, A.V. Borges, S. Groom, B. Delille, N. Roevros, S. Christodoulou and L. Chou, 2013. Particle export during a bloom of *Emiliana huxleyi* in the North-Western Bay of Biscay, *Journal of Marine Systems*, 109-110, 182-190, doi: 10.1016/j.jmarsys.2011.12.005.

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