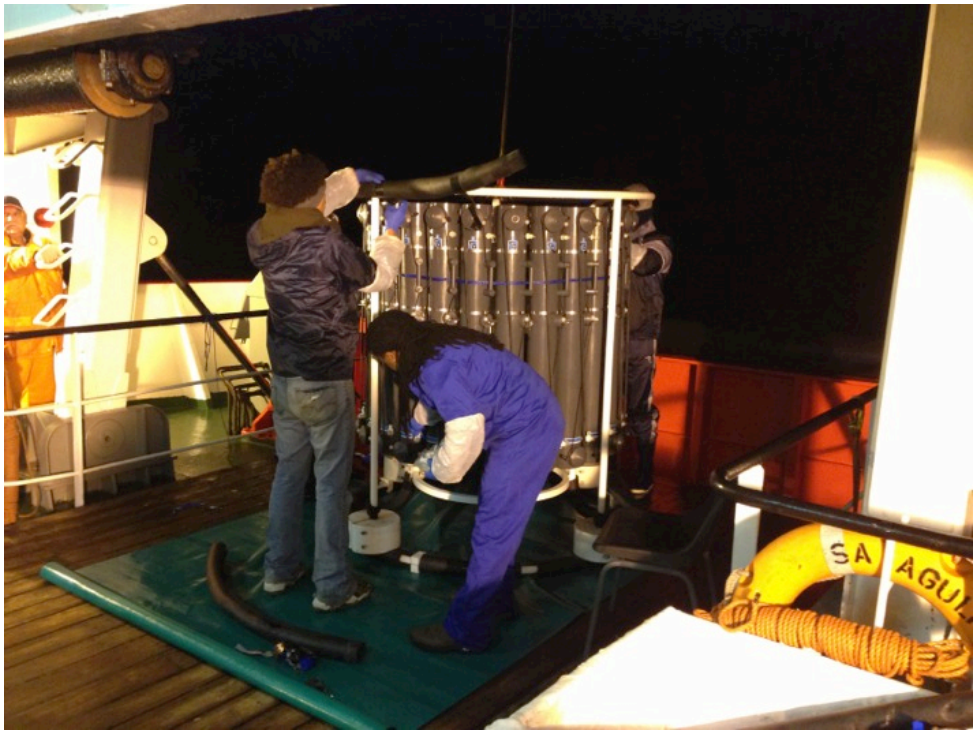
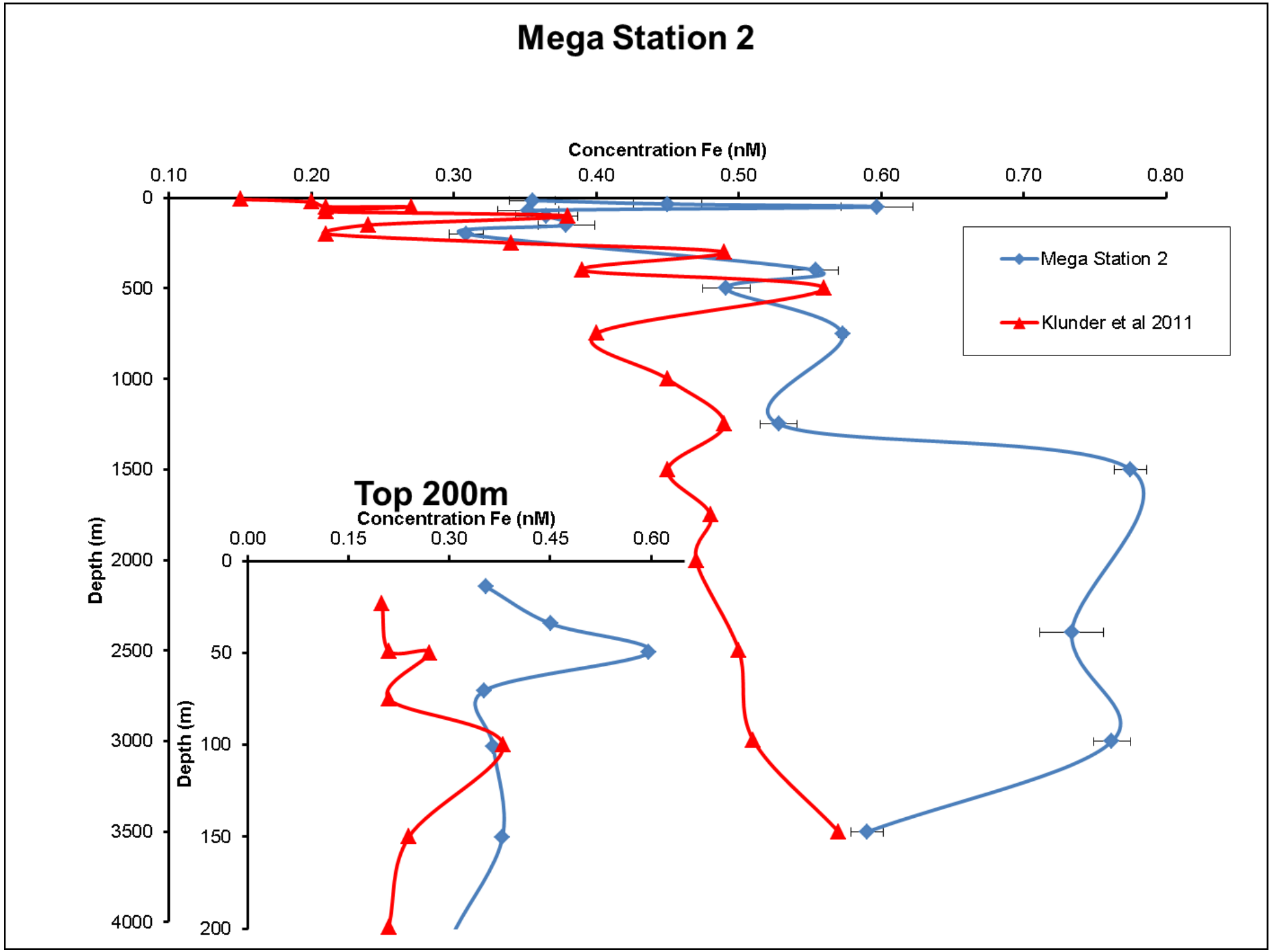
GEOTRACES – SOUTH AFRICA

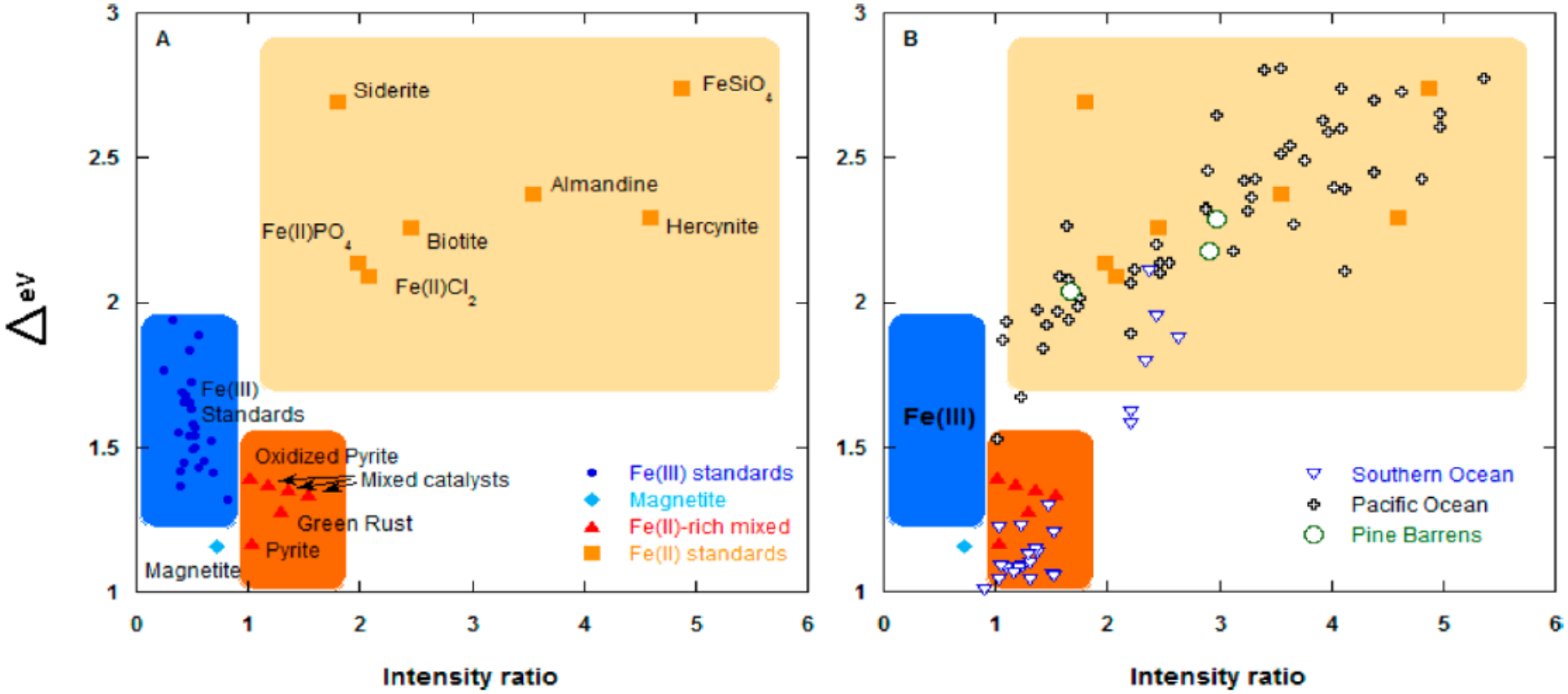
ALAKENDRA N ROYCHOUDHURY
University of Stellenbsoch,

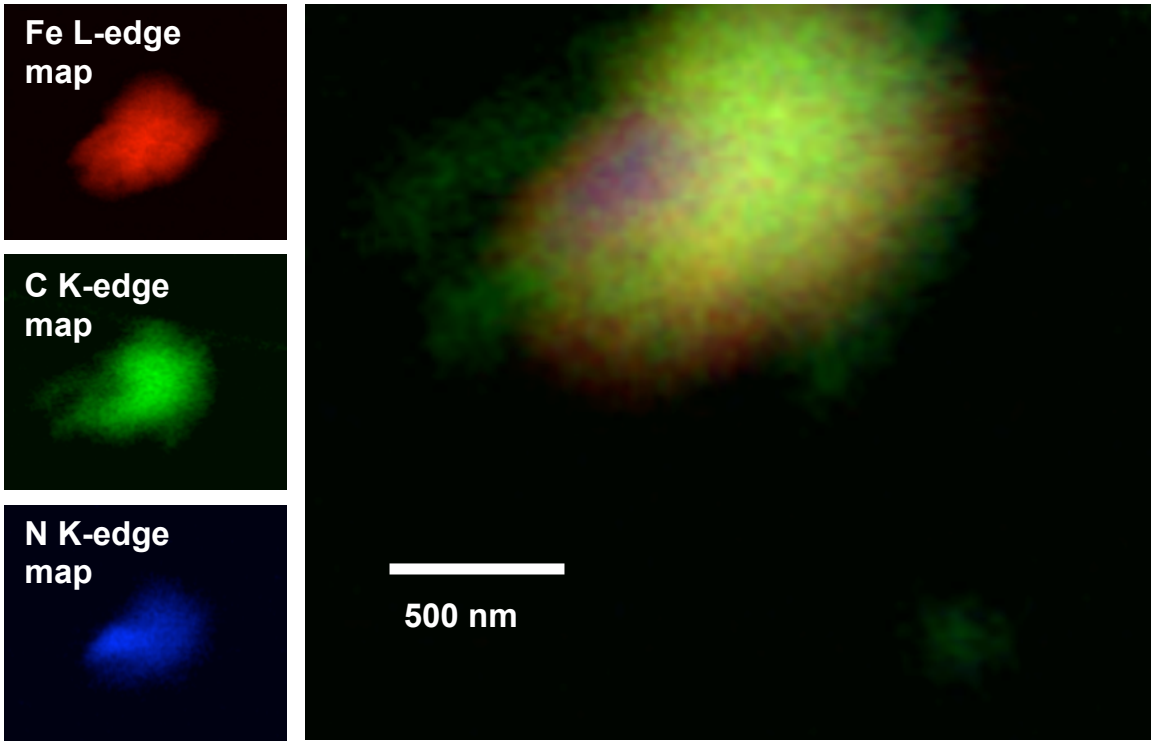
Clean lab and Sampling facilities



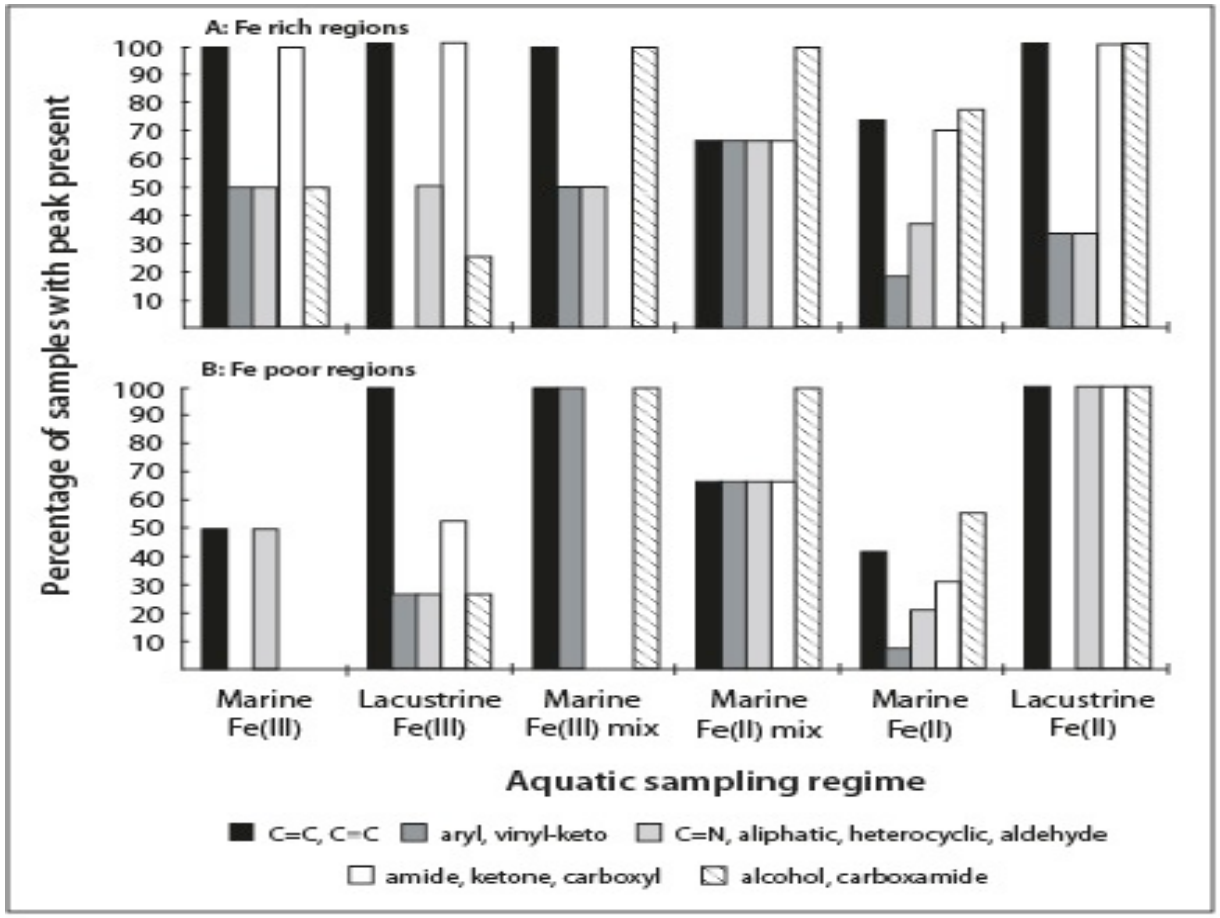

Mega Station 2
Concentration Fe (nM)
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0
500
1000
1500
2000
2500
3000
3500
4000
Depth (m)
Mega Station 2
Klunder et al 2011
Top 200m
Concentration Fe (nM)
0.00
0.15
0.30
0.45
0.60
0
50
100
150
200
Depth (m)

Particle Analyses

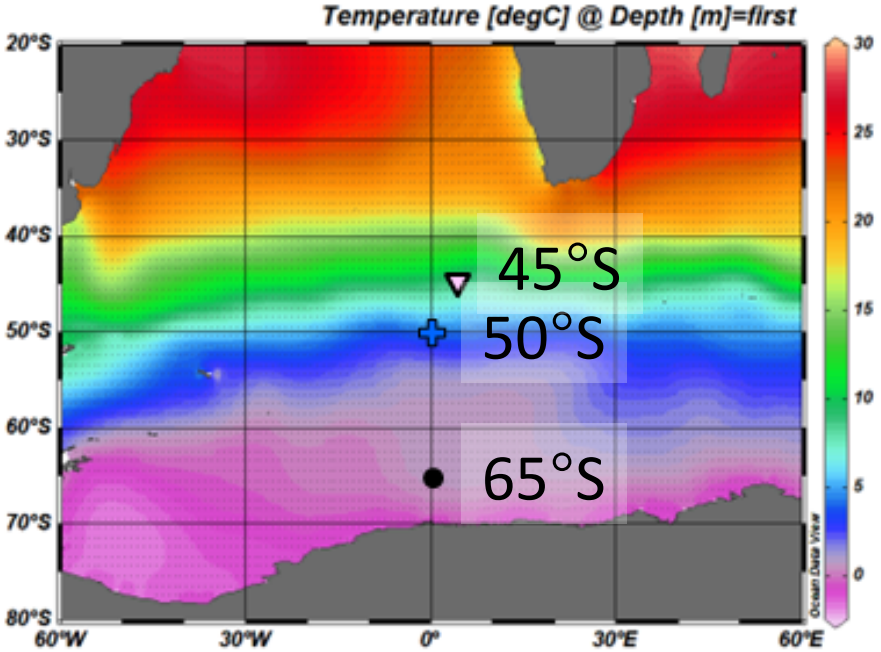




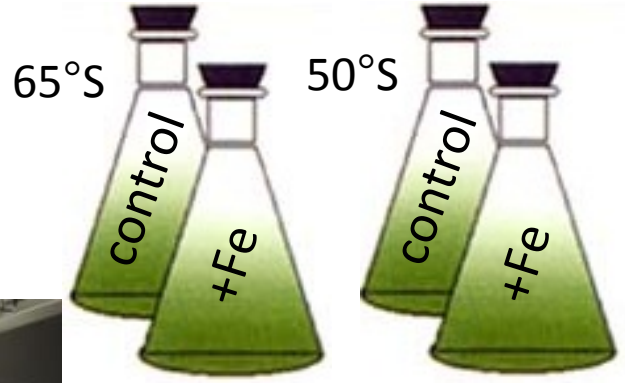
Red-Green-Blue composite map of x-ray absorption at the Fe L-edge, C K-edge and N K-edge highlighting the association between an Fe(II) rich particle with organic carbon and nitrogen moieties.

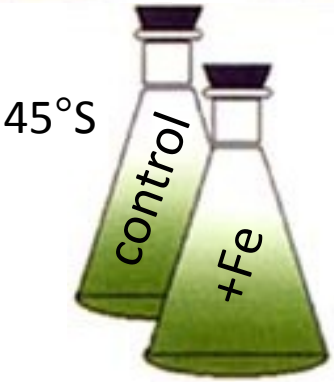


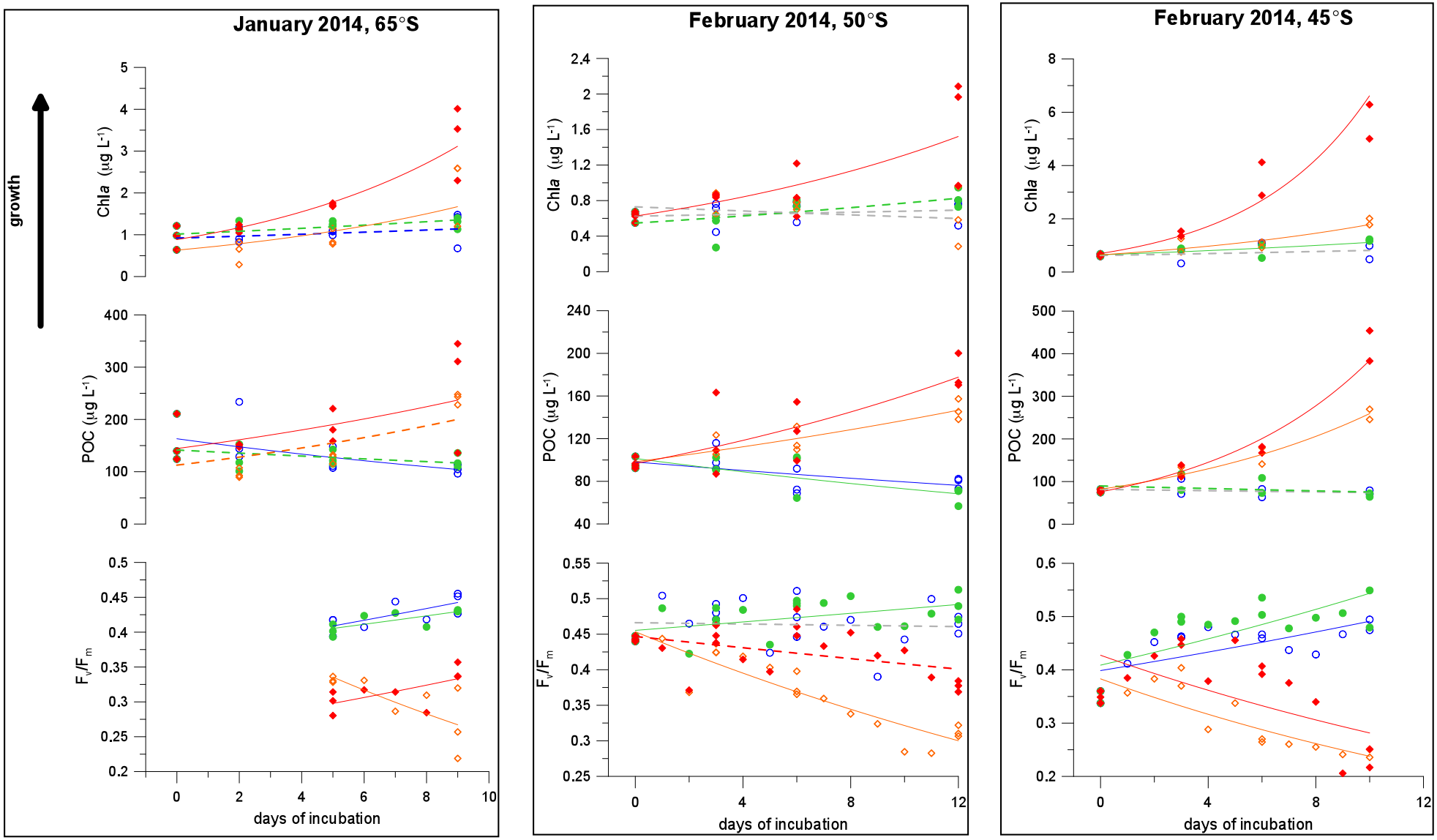
Frequency of each set of organic functional groups as found in association with Fe-rich particulates of varying chemistry and sampling location.

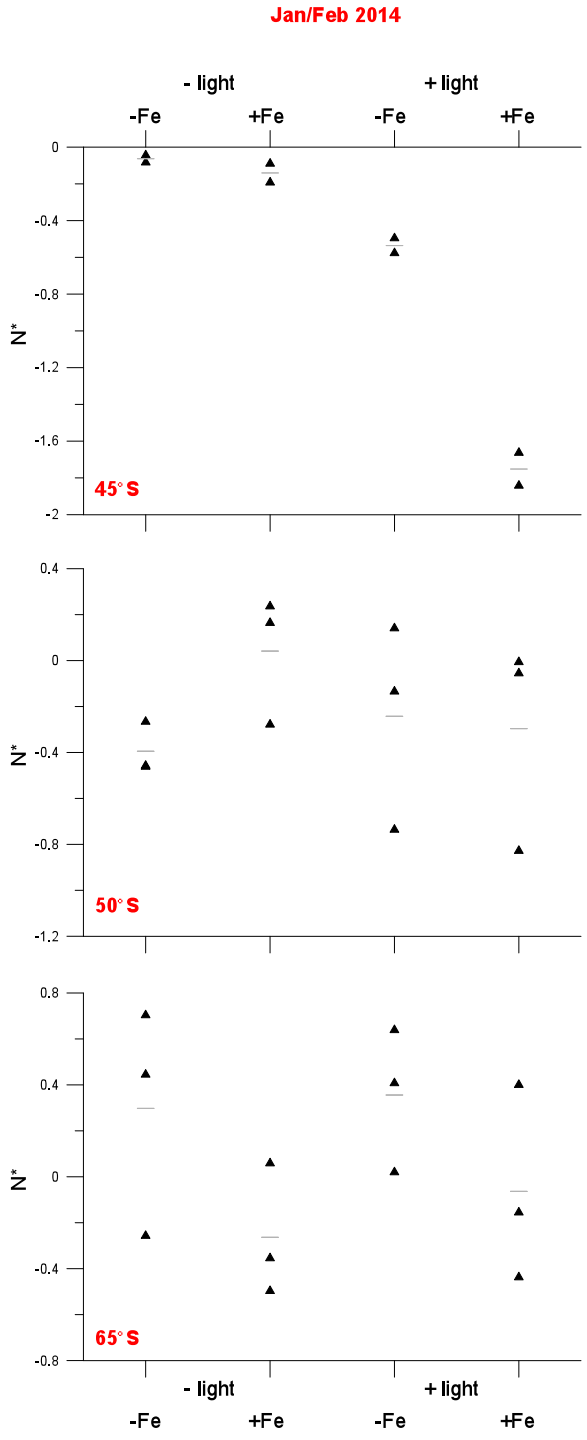


Incubations 2014






January 2014, 65°S
February 2014, 50°S
February 2014, 45°S
growth
Chla (µg L-1)
POC (µg L-1)
Fv/Fm
days of incubation
low light low Fe
low light +Fe
high light low Fe
high light +Fe
R2 >0.4 "strong change"
0.1 > R2 <0.4 "weak change"
R2 <0.1 "no change"



$\Delta NO_3 > \Delta SiO_4$
N uptake > Si uptake

Nitrate and silicic acid uptake at end of incubation,
i.e. $\Delta = [T_{end}]-[T_0]$ in [µM day^{-1}]

$N^* = \Delta NO_3 - \Delta Si(OH)_4$

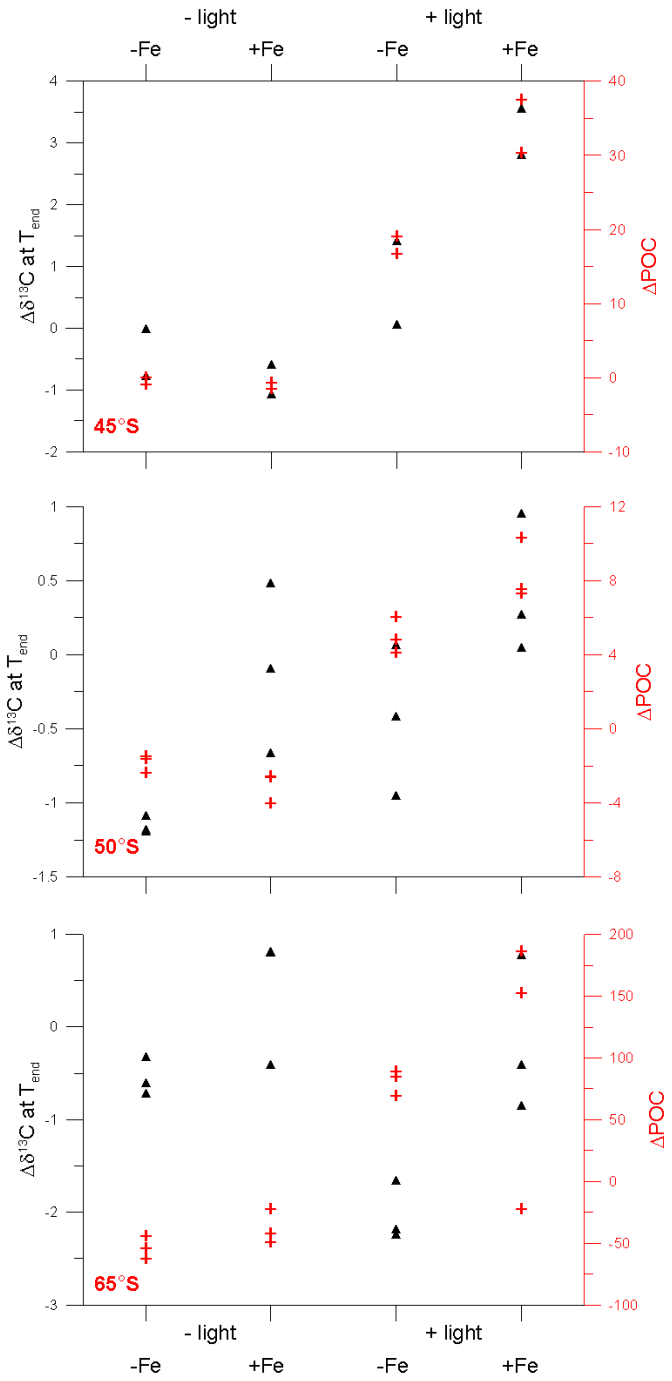
In high light conditions:
Silicic acid vs Nitrate uptake rate ratio lower after iron fertilization at 45°S and 65°S
→ less silicic acid used
→ more available for export to lower latitudes (?)

▲ triplicates
— average

Jan/Feb 2014

higher $\delta^{13}C_{POC}$ after incubation
particulate $^{13}C/^{12}C$ at end > $^{13}C/^{12}C$ at initial
^{13}C incorporation > ^{12}C incorporation

lower $\delta^{13}C_{POC}$ after incubation
particulate $^{13}C/^{12}C$ at end < $^{13}C/^{12}C$ at initial
^{13}C incorporation < ^{12}C incorporation



higher POC conc. after incubation
= growth

lower POC conc. after incubation
= death

▲ $\Delta(\delta^{13}C_{POC})$
\+ Δ[POC]

Change in particulate $\delta^{13}C$ and POC conc. after incubation,
i.e. $\Delta\delta^{13}C = (\delta^{13}C@T_{end}) - (\delta^{13}C@T_0)$
$\Delta POC = [POC@T_{end}] - [POC@T_0]$

- iron fertilization → ↑^{13}C incorporation and ↑$\delta^{13}C_{POC}$
- apparently not only related to changes in productivity

Knowledge dissemination

Publications

- Bjorn P. Von der Heyden, Emily J. Hauser, Bhoopesh Mishra, Gustavo A. Martinez, Andrew R. Bowie, Tolek Tyliszczak, Thato N. Mtshali, Alakendra N. Roychoudhury, Satish C.B. Myneni (2014) Ubiquitous presence of Fe(II) in aquatic colloids and its association with organic carbon. *Environmental Science & Technology, Letters,* dx.doi.org/10.1021/ez500164v
- Ho SL, Mollenhauer Ga, Fietz S, Martínez-Garcia A, Lamy F, Rueda G, Schipper K, Méheust M, Rosell-Melé A, Stein R, and Tiedemann Appraisal of TEX86 and TEX86L thermometries in subpolar and polar regions. Geochimica et Cosmochimica Acta, 131, 213–226, 2014 http://dx.doi.org/10.1016/j.gca.2014.01.001
- Knies J, Cabedo-Sanz P, Belt ST, Baranwal S, **Fietz** S, Rosell-Melé A, The emergence of modern sea ice cover in the Arctic Ocean. *Submitted to Nature Communications*
- Fietz S, Prahl FG, Moraleda N & Rosell-Melé A Eolian transport of glycerol dialkyl glycerol tetraethers with dust from north-west Africa Organic Geochemistry 64, 112–118, 2013 http://dx.doi.org/10.1016/j.orggeochem.2013.09.009
- Huguet C, Fietz S & Rosell-Melé A Global distribution patterns of hydroxy glycerol dialkyl glycerol tetraethers Organic Geochemistry, 57, 107-118, 2013**.** http://dx.doi.org/10.1016/j.orggeochem.2013.01.010
- Fietz S, Huguet C, Rueda G, Hambach B & Rosell-Melé A Hydroxylated isoprenoidal GDGTs in the Nordic Seas. Marine Chemistry, 152, 1-10, 2013 http://dx.doi.org/10.1016/j.marchem.2013.02.007
- Rueda G, Fietz S & Rosell-Melé A Coupling of air and sea temperatures in the Fram Strait during the last 2000 Years. The Holocene, 23, 692–698, 2013**.** doi: 10.1177/0959683612470177
- M Smith and A. N. Roychoudhury (2013) Mobilization of iron from rocks in a fractured aquifer: Lithological and geochemical controls. *Applied Geochemistry*. V31, pp 171-186, DOI: 10.1016/j.apgeochem.2013.01.002
- Coleen L. Moloney, Sean Fennessy, Mark J. Gibbons, Alakendra Roychoudhury, Frank A. Shillington, Bjorn P. von der Heyden, Kate Watermeyer (2013) What is the evidence for offshore marine ecosystem 1 change in South Africa? *African Journal of Marine Science,* 35(3), pp 427-448. DOI: 10.2989/1814232X.2013.836135
- Treasure, A.M., Moloney, C.L., Bester, M.N., McQuaid, C.D., Findlay, K.P., Best, P.B., Cowan, D.A., de Bruyn, P.J.N., Dorrington, R.A., Fagereng, A., Froneman, P.W., Grantham, G.H., Hunt, B.P.V., Meiklejohn, K.I., Pakhomov, E.A., Roychoudhury, A.N., Ryan, P.G., Smith, V.R., Chown, S.L. and Ansorge, I.J. (2013) South African research in the Southern Ocean: new opportunities but serious challenges. *South African Journal of Science*. V109, pp 1-4, DOI 10.1590/sajs.2013/a009

Conferences

- B.P. von der Heyden, A.N. Roychoudhury and S.C.B. Myneni (2013) Quantification and speciation study of the marine solid-phase iron pool. 23rd Annual V M Goldschmidt Conference, Florence, Italy, August 25 –31, 2013

- **Theses**

PhD
Bjorn von der Heyden: Distribution and characterization of marine iron-rich particles

MSc
Raimund Rentel: Development and implementation of a Flow-Injection Analyser with chemiluminescence for detection of sub-nanomolar Fe in Seawater.

- **Funding**

2 NRF Proposals funded
5 NRF Proposals submitted

- **Other News**

Roychoudhury attended the IIOE-2 workshop for the East African regions in Mauritius and presented GEOTRACES program and the possibility of involvement in IIOE initiatives.