From Patagonia to Kerguelen dust transport

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Sponsors and acknowledgements

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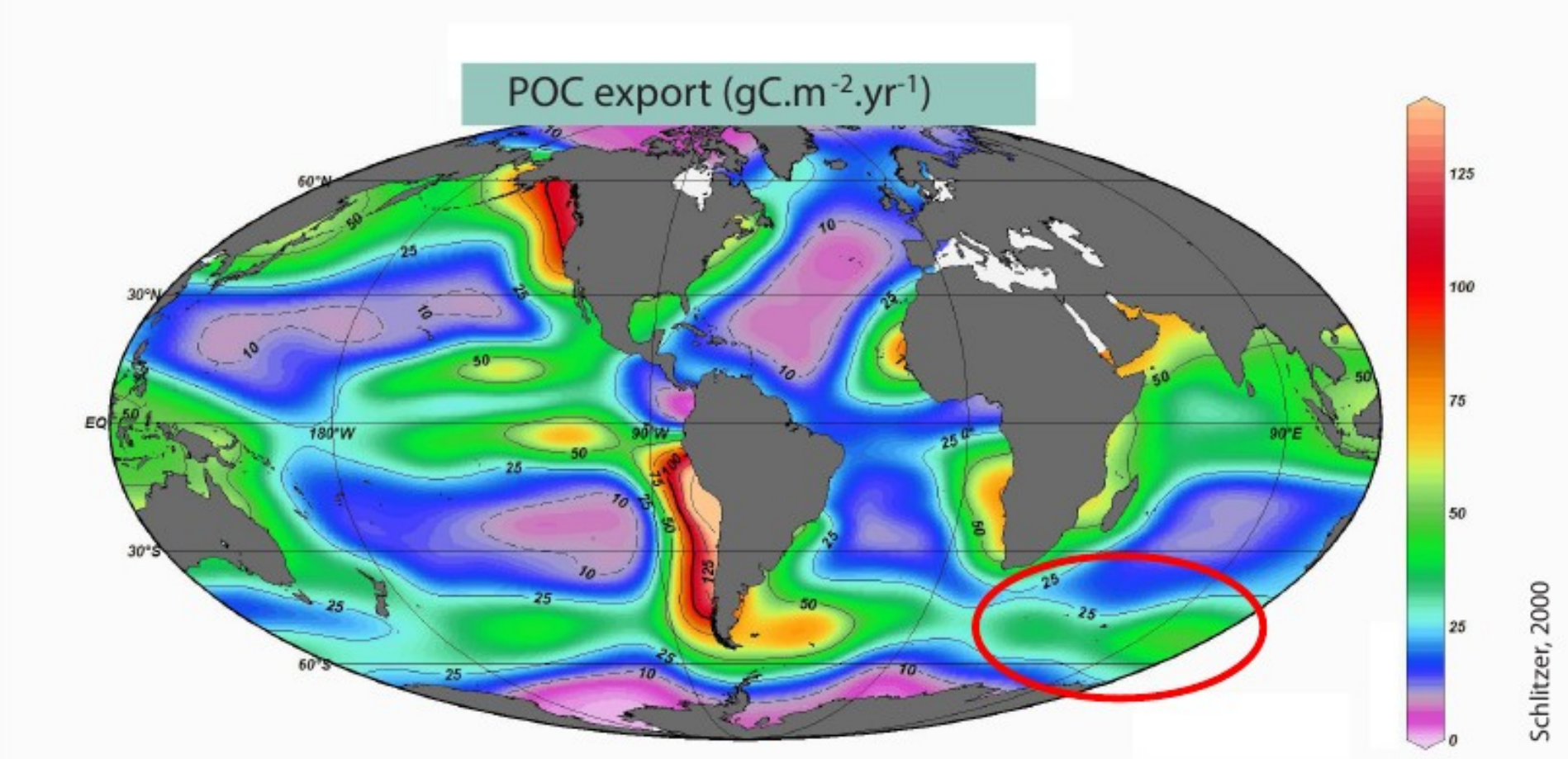
Context of the studies

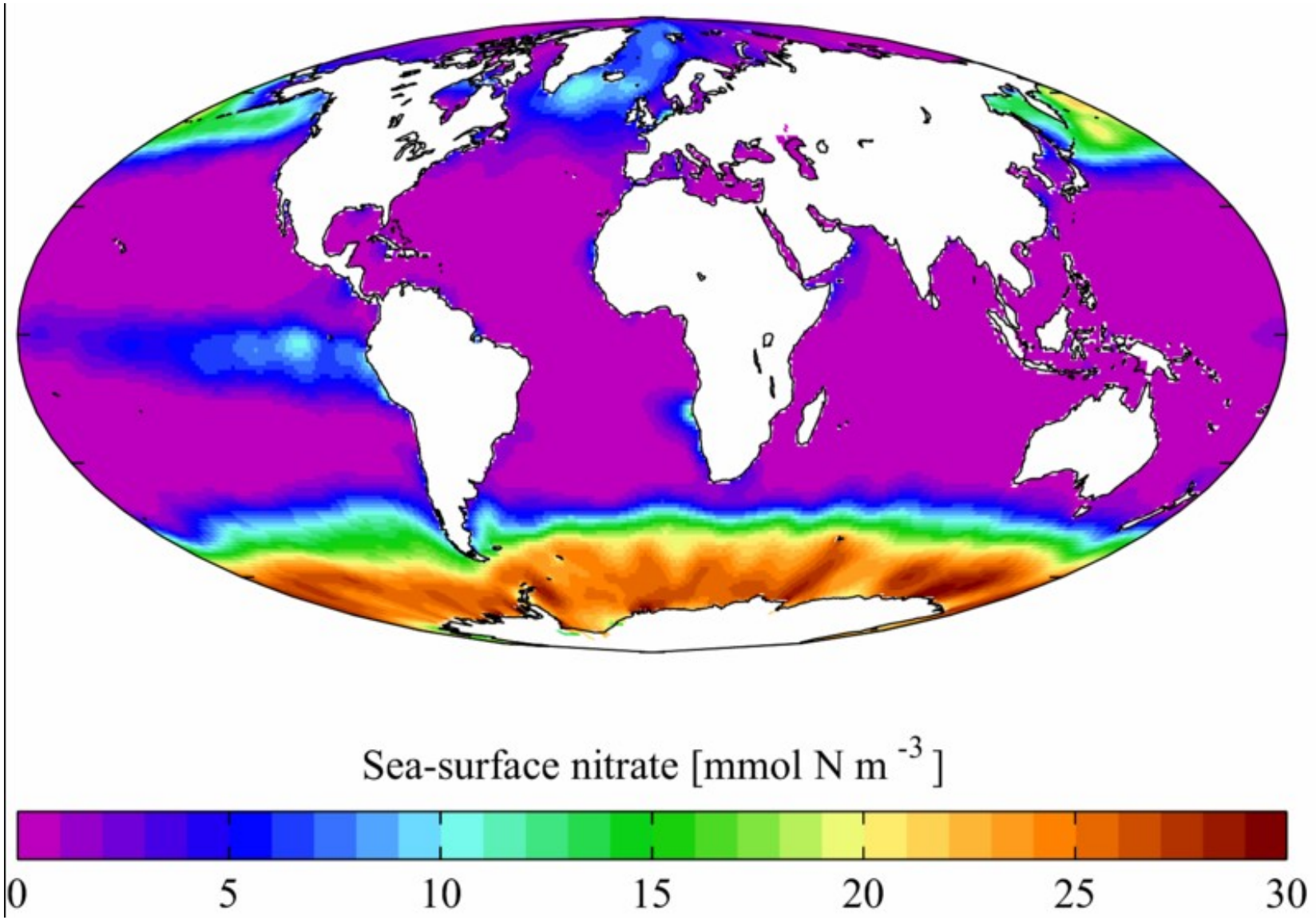
- SOLAS endorsed FLATOCOA (Flux ATmosphérique d'Origine Continentale sur l'Océan Austral) program (field measurements)
- Time schedule
  - Field experiments 2009-2010
  - Lab experiments 2006-2014

Carbon biological pump

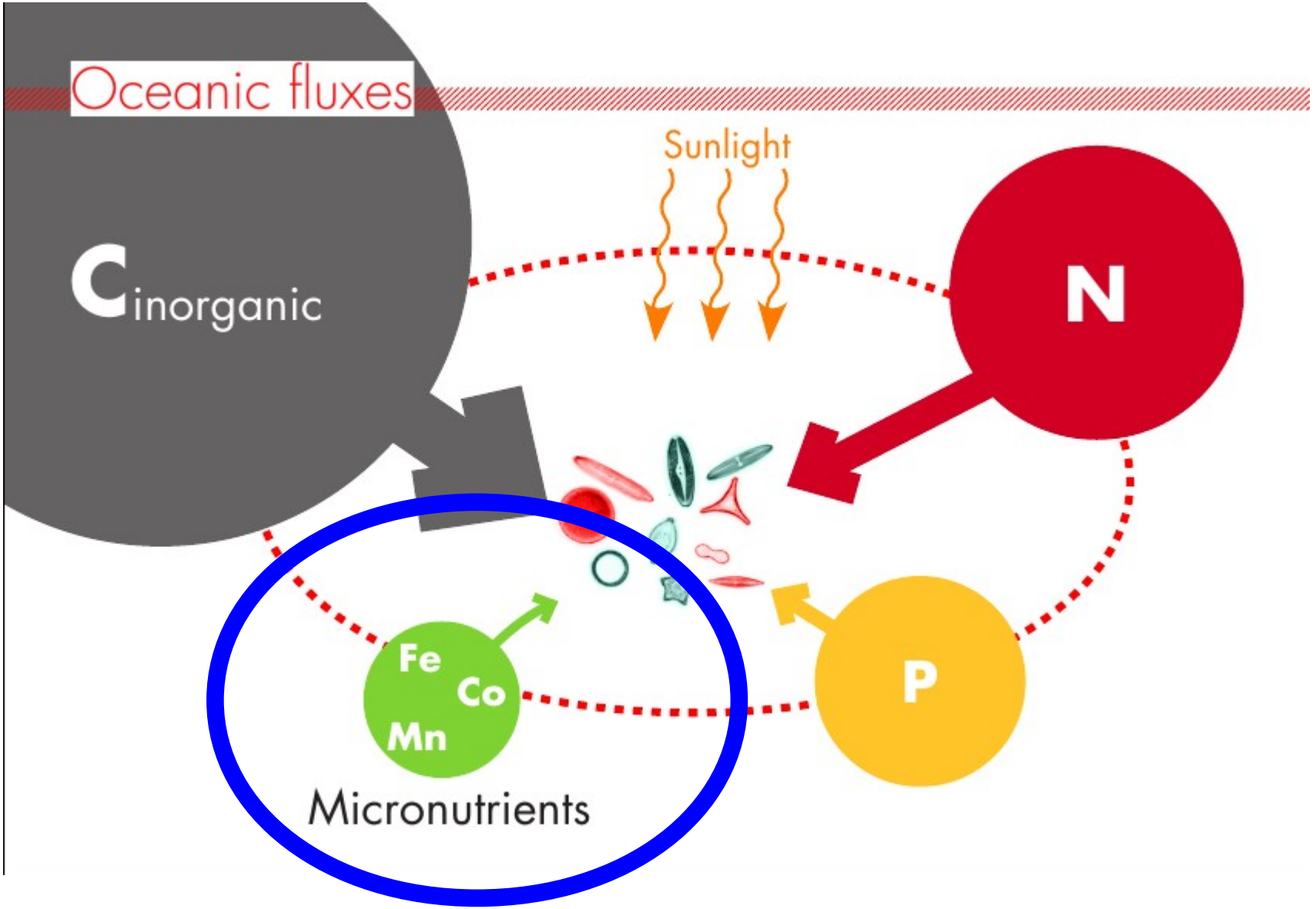


La zone océanique sub-antarctique est un puits net de dioxyde de carbone atmosphérique

HNLC: bioavailable N

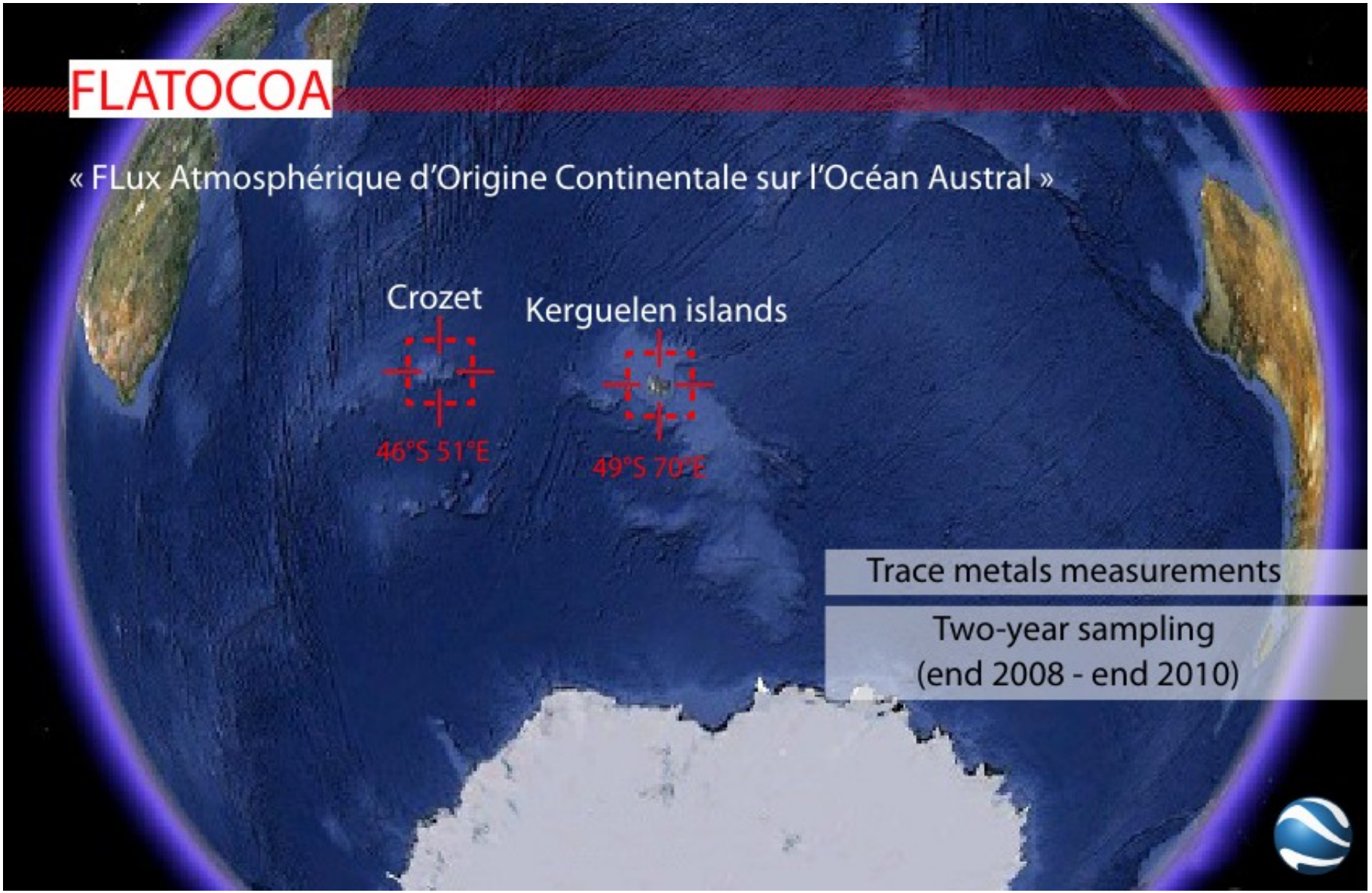


Photosynthesys

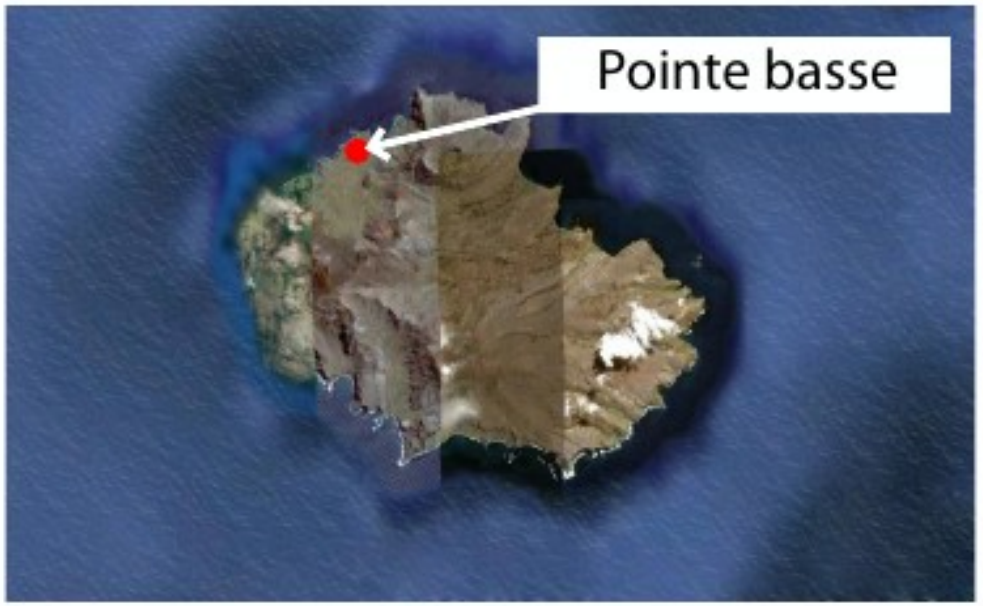


Limitation?

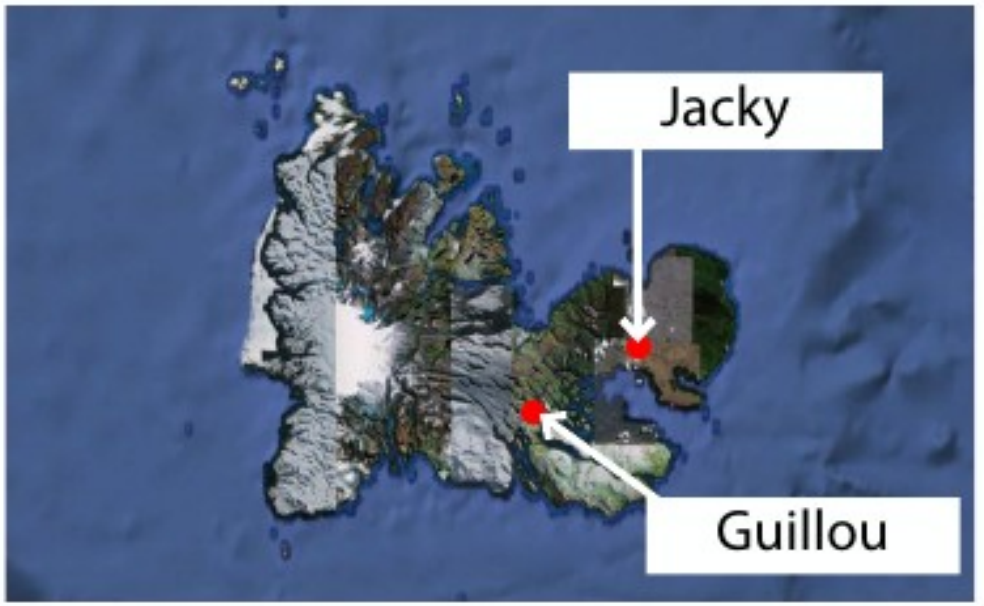
Crozet et Kerguelen



Localisation des sites

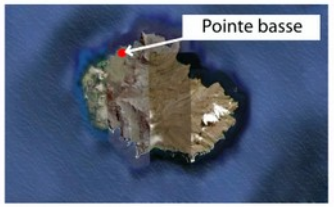


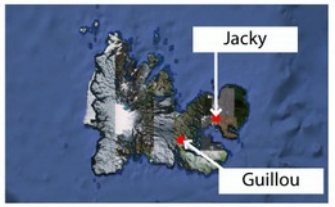
Crozet



Kerguelen

Deposition sampling

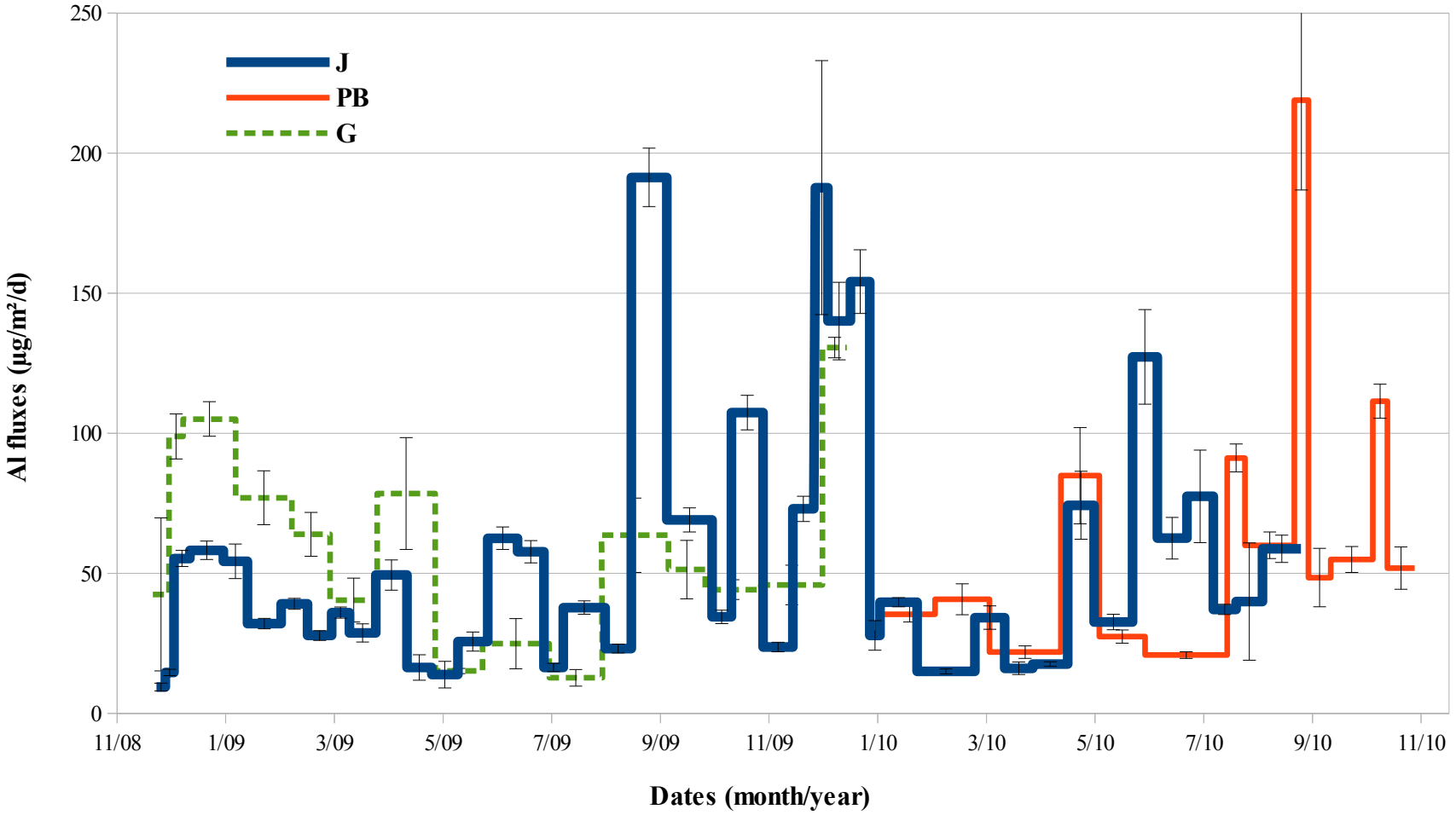




Pointe basse (possession Island, Crozet): 1 sample each month, 2010

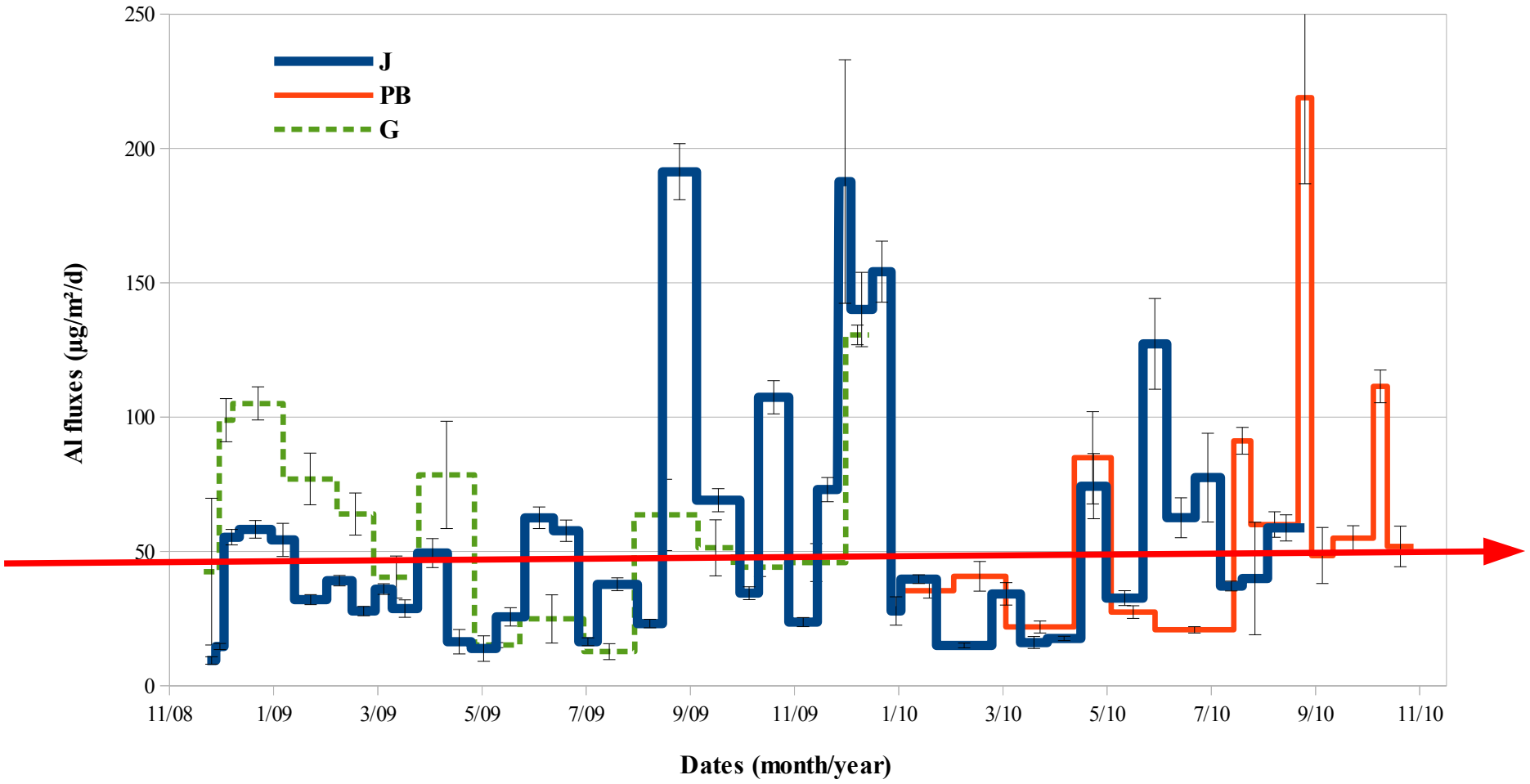
Sampling protocol

Deposition Flux



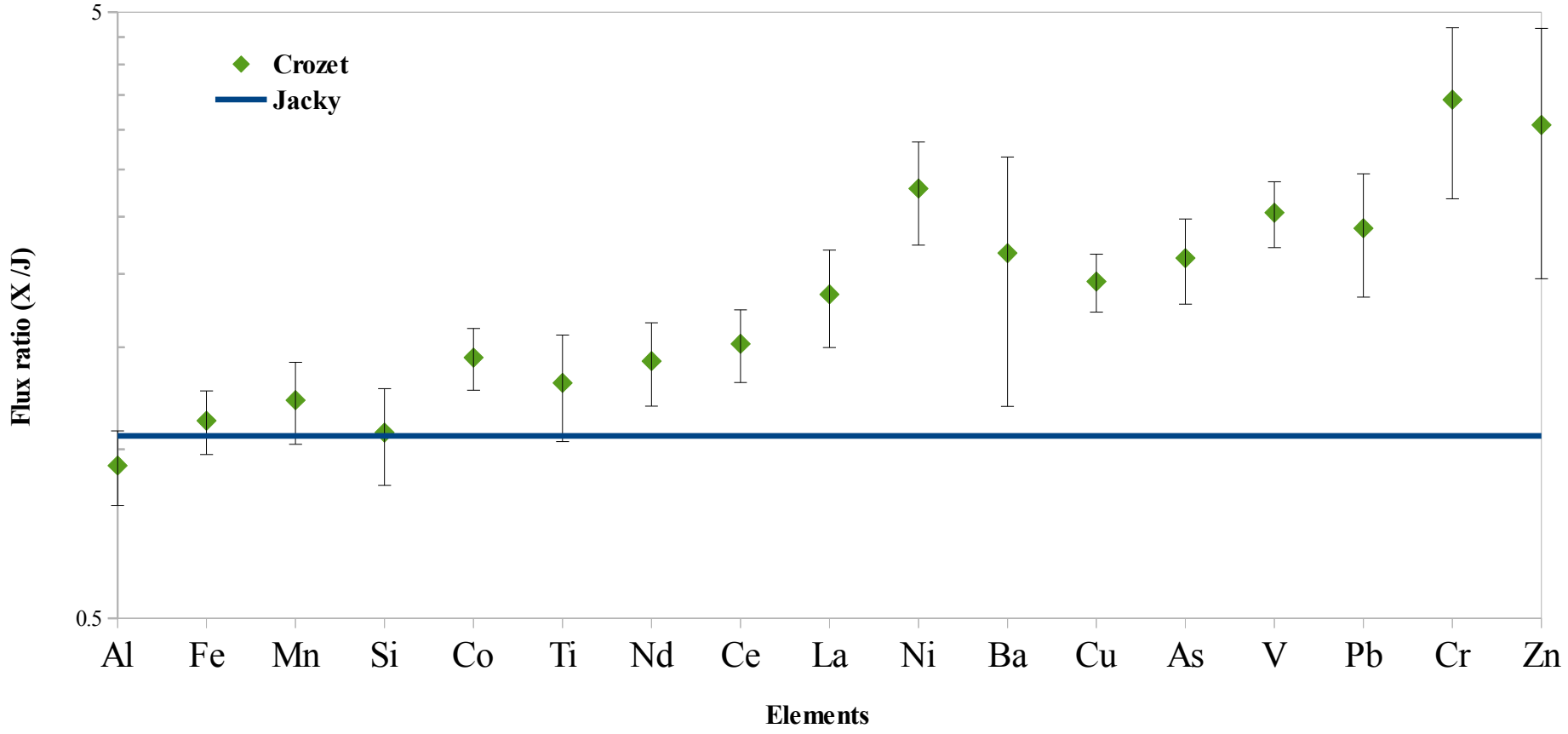
Heimburger et al. 2013, *Global Biogeochemical Cycles*

Deposition Flux



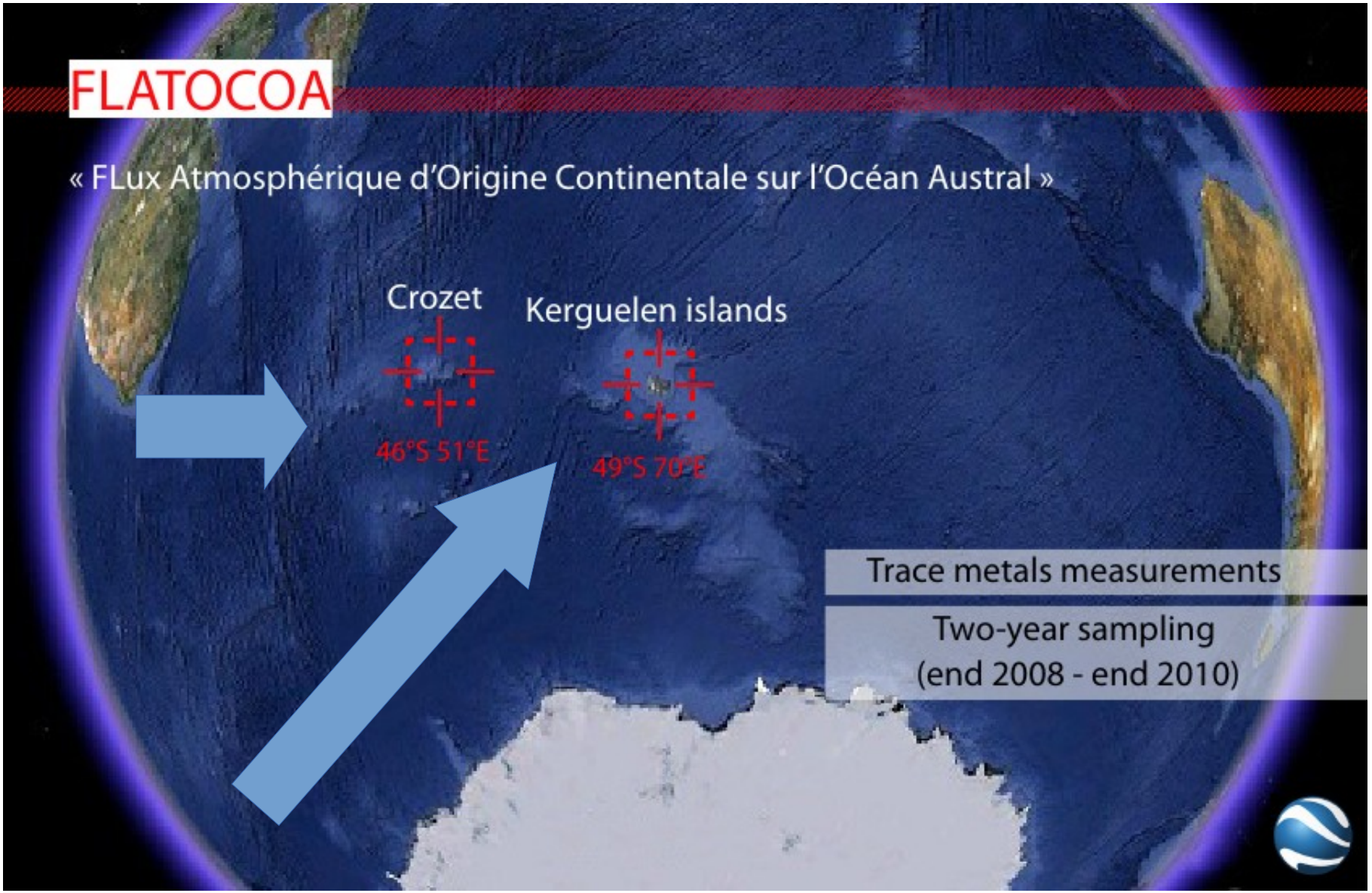
Deposition flux 50 time higher than calculated from aerosol measurements and previously published

Deposition chemical composition variation

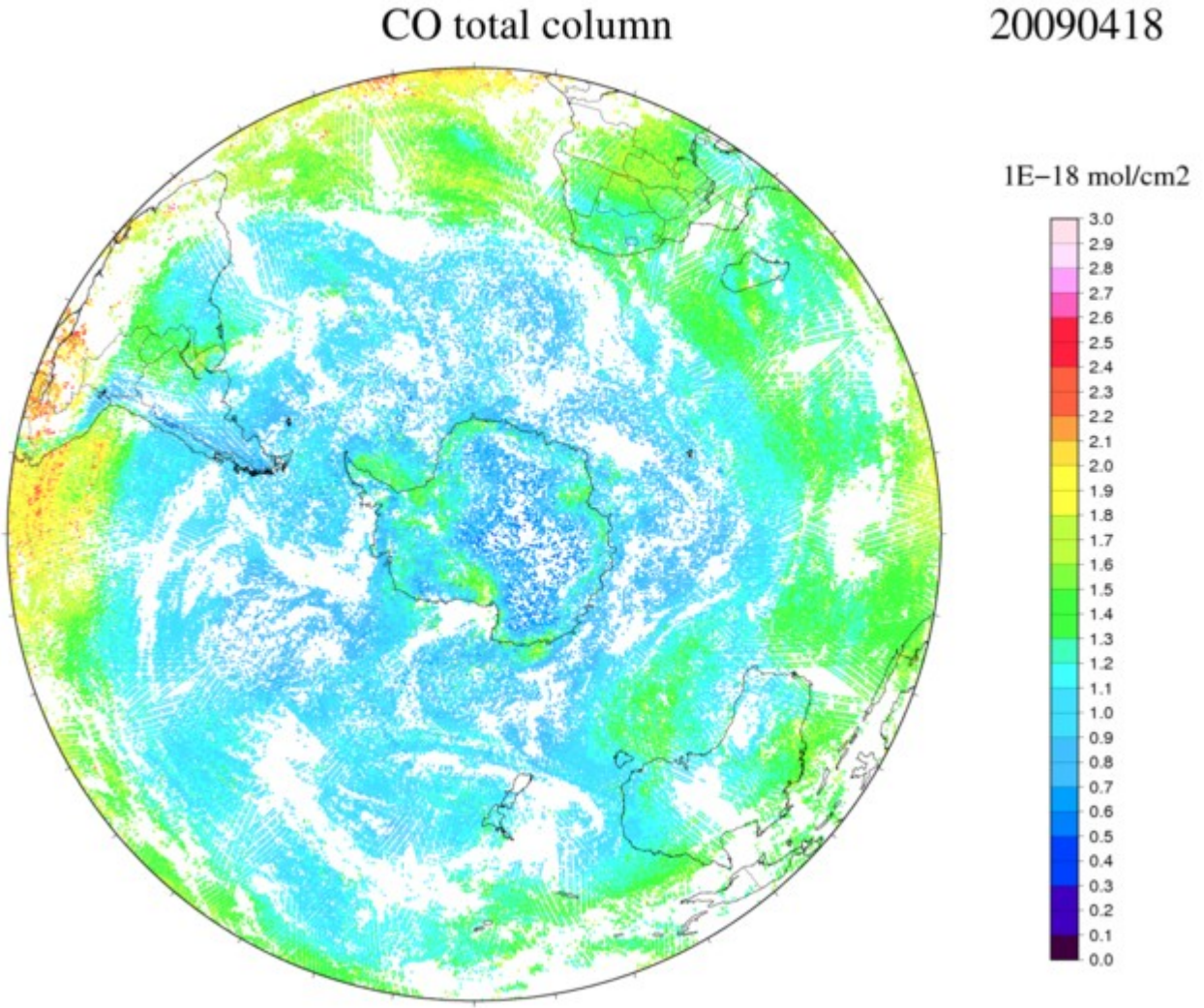


Why did chemical composition vary?

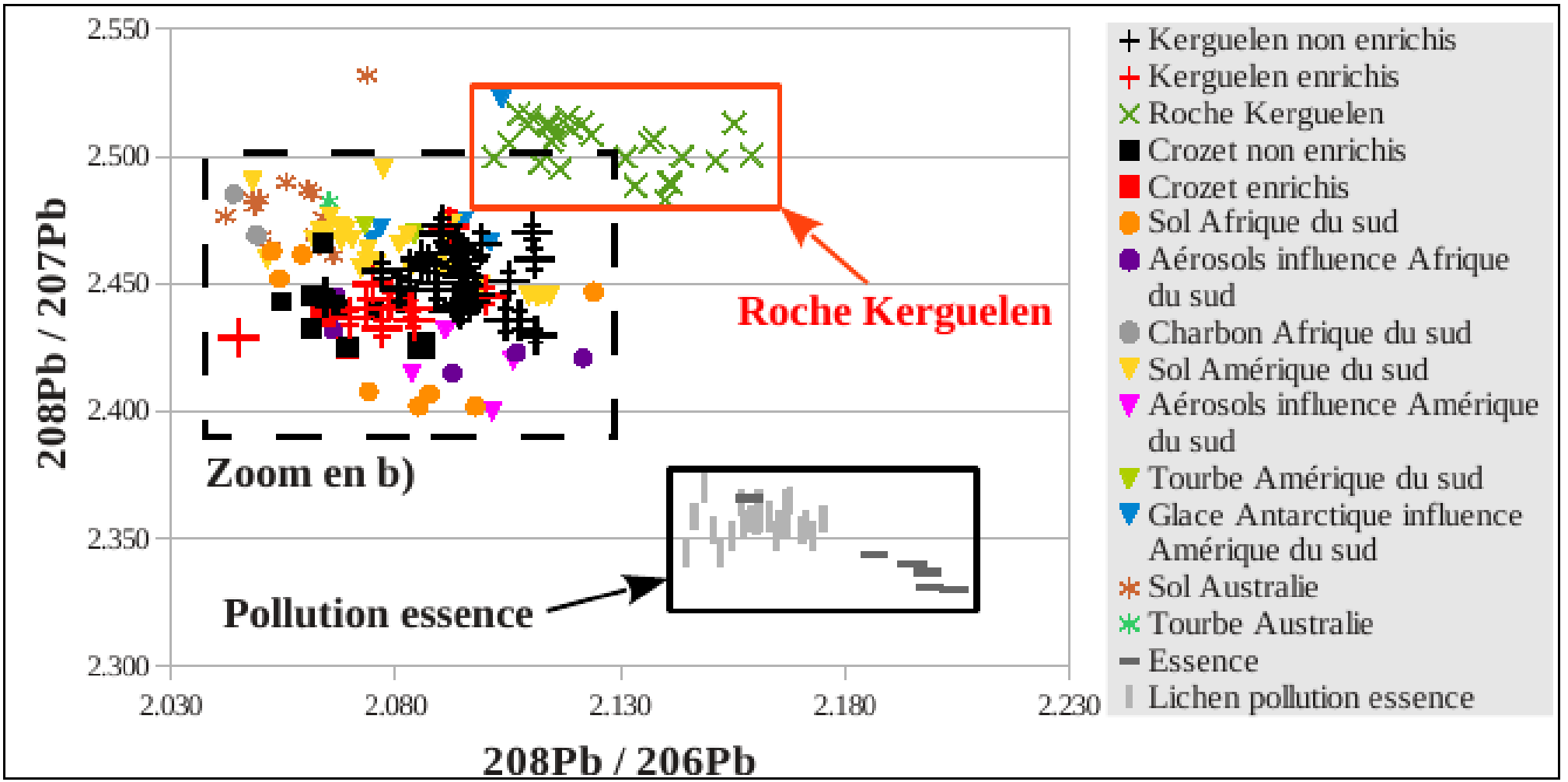
Sources


FLATOCOA
« FLux Atmosphérique d'Origine Continentale sur l'Océan Austral »
Crozet
Kerguelen islands
46°S 51°E
49°S 70°E
Trace metals measurements
Two-year sampling
(end 2008 - end 2010)

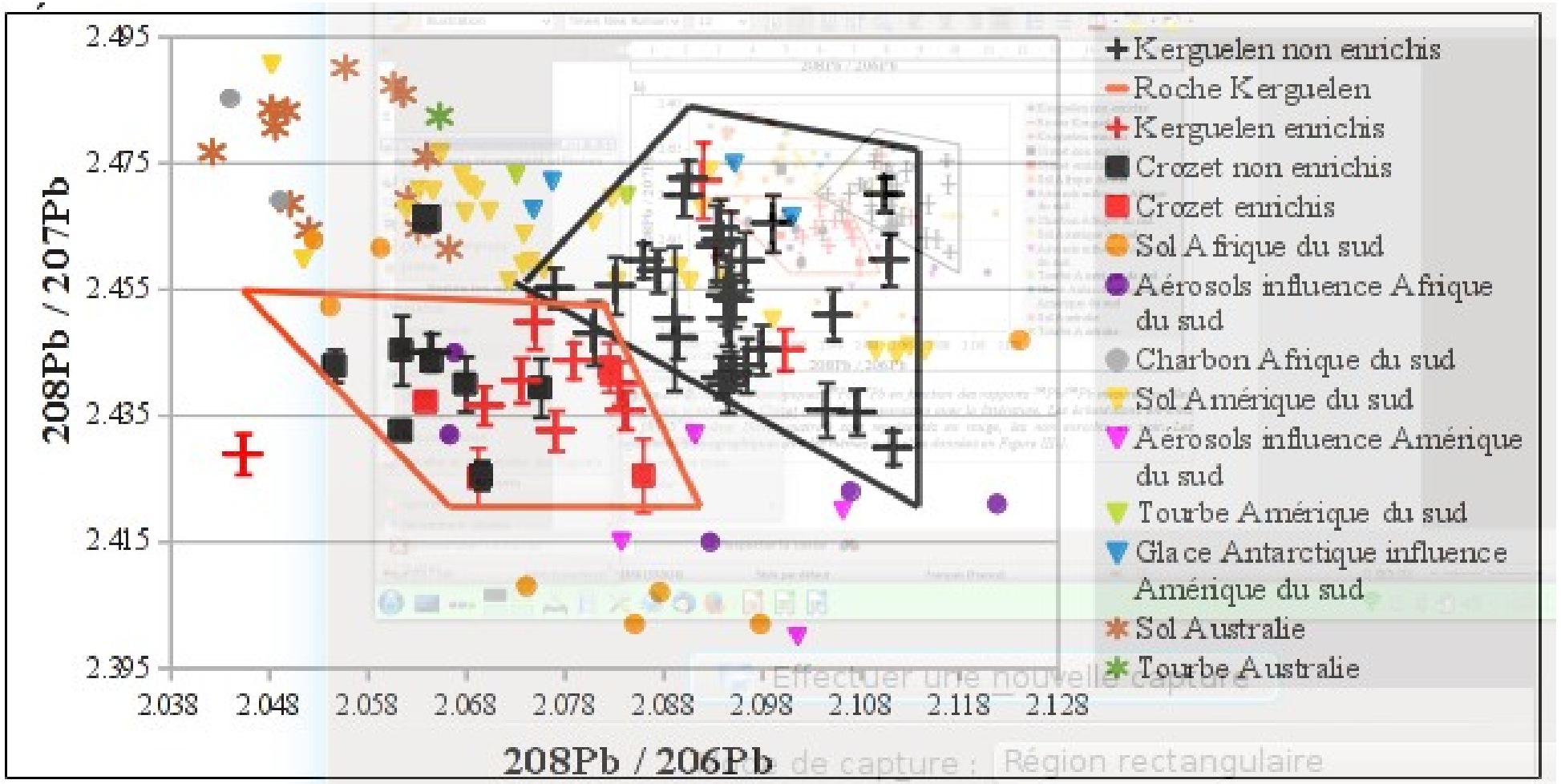
CO as proxy


CO total column
20090418
1E−18 mol/cm2
3.0
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0

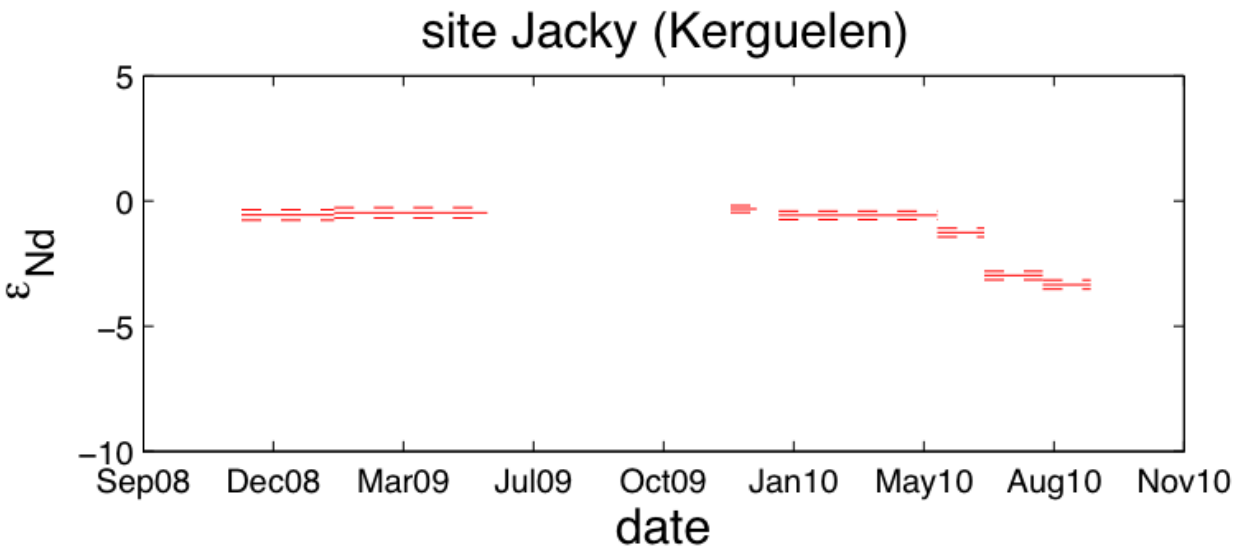
Lead

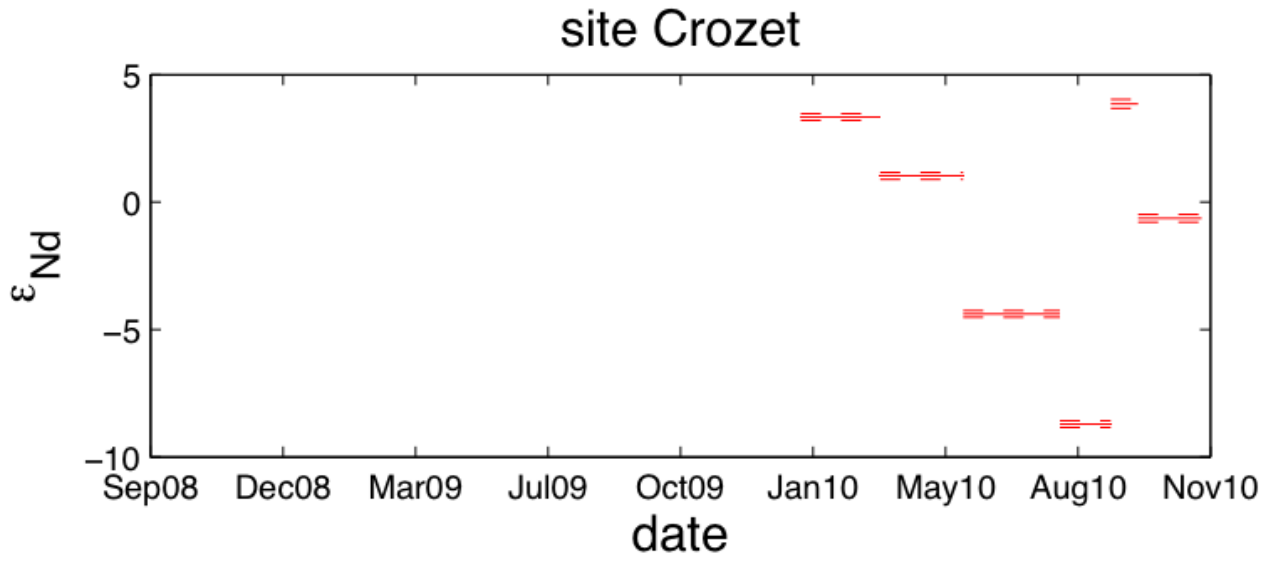

2.550
2.500
2.450
2.400
2.350
2.300
208Pb / 207Pb
2.030
2.080
2.130
2.180
2.230
208Pb / 206Pb
Roche Kerguelen
Zoom en b)
Pollution essence
Kerguelen non enrichis
Kerguelen enrichis
Roche Kerguelen
Crozet non enrichis
Crozet enrichis
Sol Afrique du sud
Aérosols influence Afrique du sud
Charbon Afrique du sud
Sol Amérique du sud
Aérosols influence Amérique du sud
Tourbe Amérique du sud
Glace Antarctique influence Amérique du sud
Sol Australie
Tourbe Australie
Essence
Lichen pollution essence

Lead

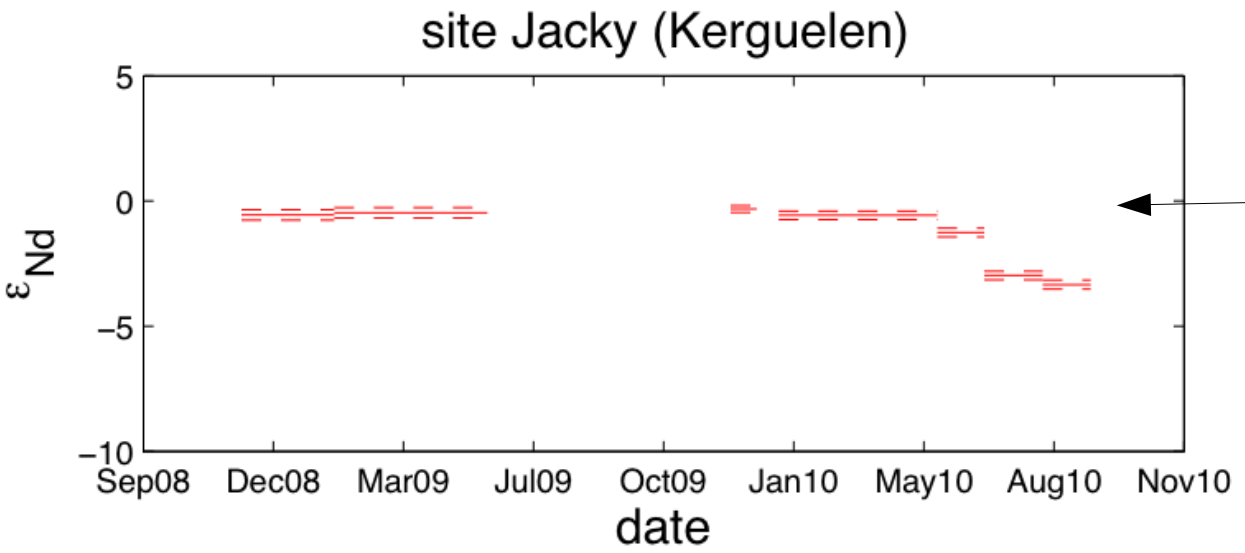

2.495
2.475
2.455
2.435
2.415
2.395
208Pb / 207Pb
2.038
2.048
2.058
2.068
2.078
2.088
2.098
2.108
2.118
2.128
208Pb / 206Pb
Kerguelen non enrichis
Roche Kerguelen
Kerguelen enrichis
Crozet non enrichis
Crozet enrichis
Sol Afrique du sud
Aérosols influence Afrique du sud
Charbon Afrique du sud
Sol Amérique du sud
Aérosols influence Amérique du sud
Tourbe Amérique du sud
Glace Antarctique influence Amérique du sud
Sol Australie
Tourbe Australie

Néodyme

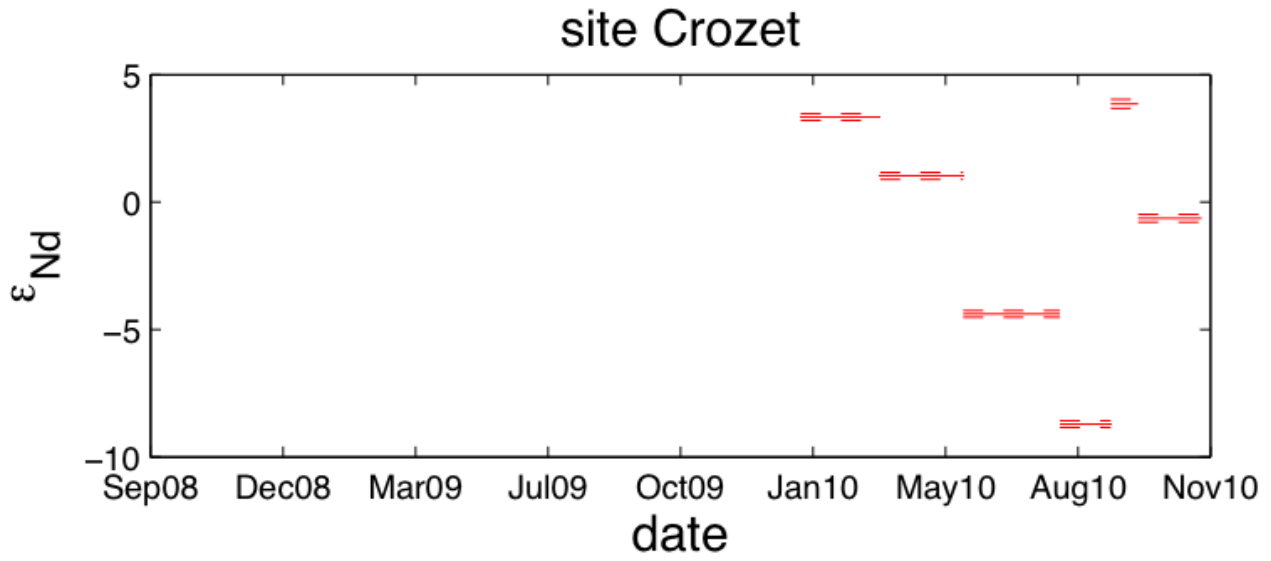

site Jacky (Kerguelen)
5
0
−5
−10
ε_{Nd}
Sep08
Dec08
Mar09
Jul09
Oct09
Jan10
May10
Aug10
Nov10
date


site Crozet
5
0
−5
−10
ε_{Nd}
Sep08
Dec08
Mar09
Jul09
Oct09
Jan10
May10
Aug10
Nov10
date

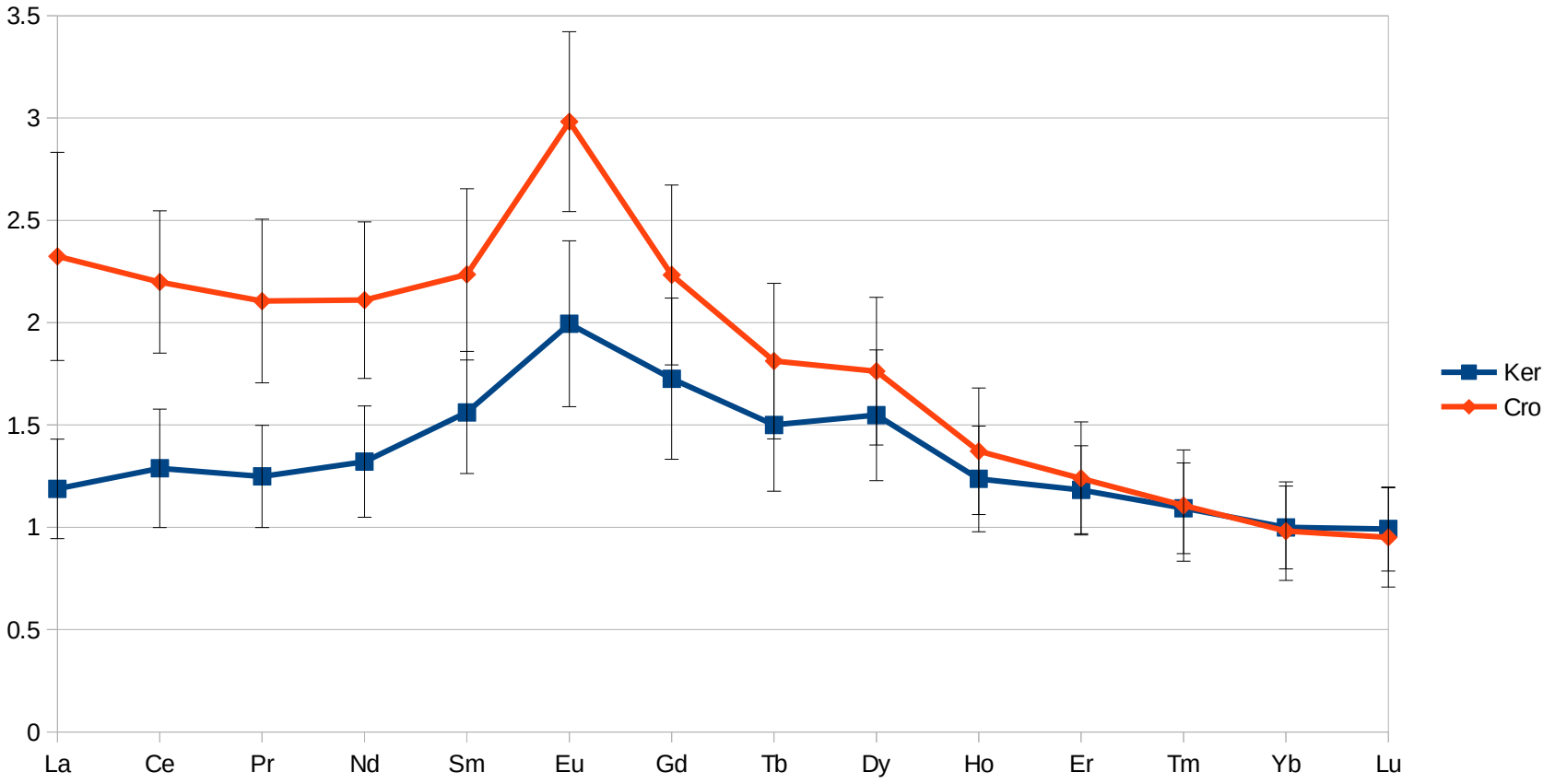
Néodyme



Patagonia



REE ratio profiles



Ratio on surface Earth Crust

Conclusion

- During winter, when Patagonian emission is low and storm are strong, dust is coming probably from Southern Africa and Patagonia, mixed
- During other periods, Patagonia regularly feed Kerguelen, while Crozet is subjected to more variable sources
- A better knowledge of source signature is required (isotopes and REE)