SOUTHERN OCEAN AND CLIMATE
FIELD STUDIES WITH INNOVATIVE TOOLS

OBSERVATOIRE
OCÉANOLOGIQUE
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1882

Hydrodynamics and biogeochemical characteristics of the Kerguelen Plateau

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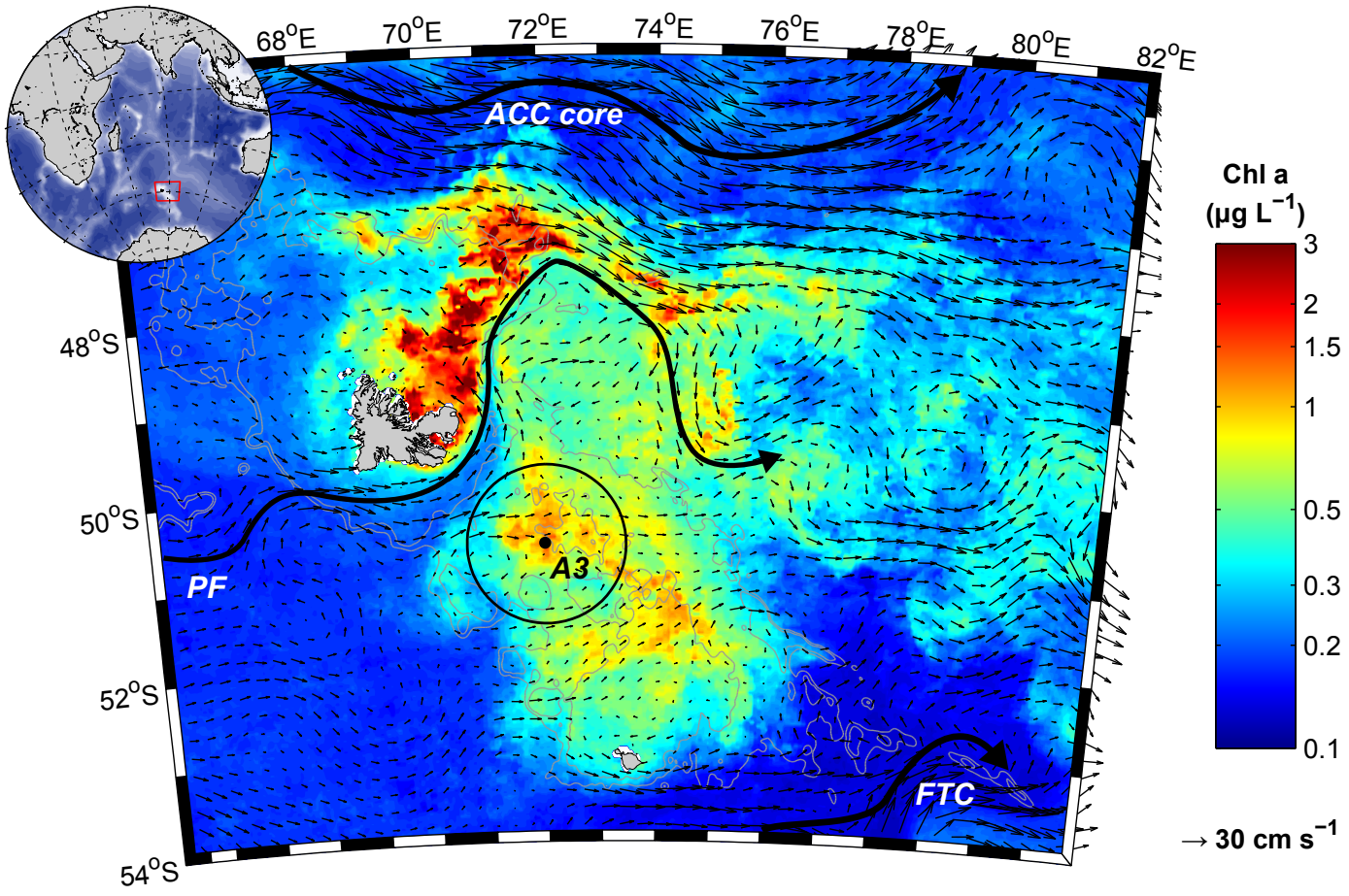
Ph.D. student, supervised by **Stéphane Blain** and **Ian Salter**

SOCLIM meeting

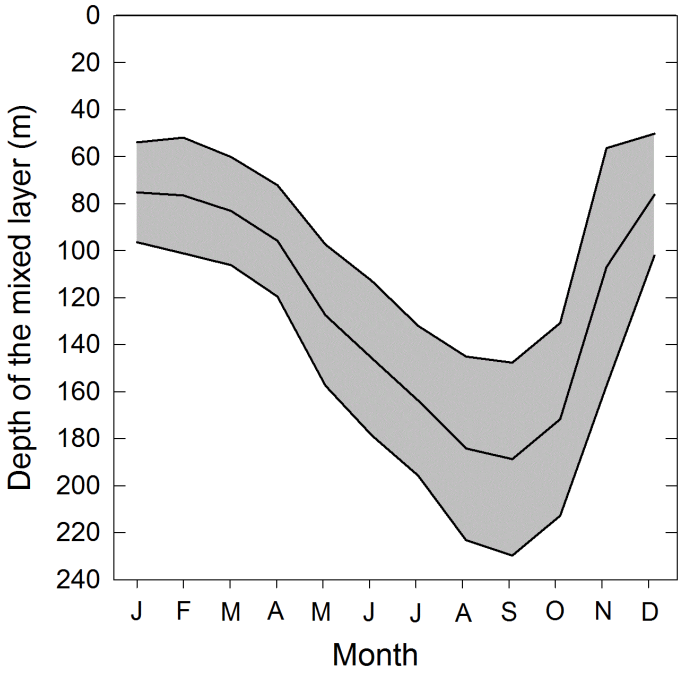
30 October 2014

Hydrological characteristics



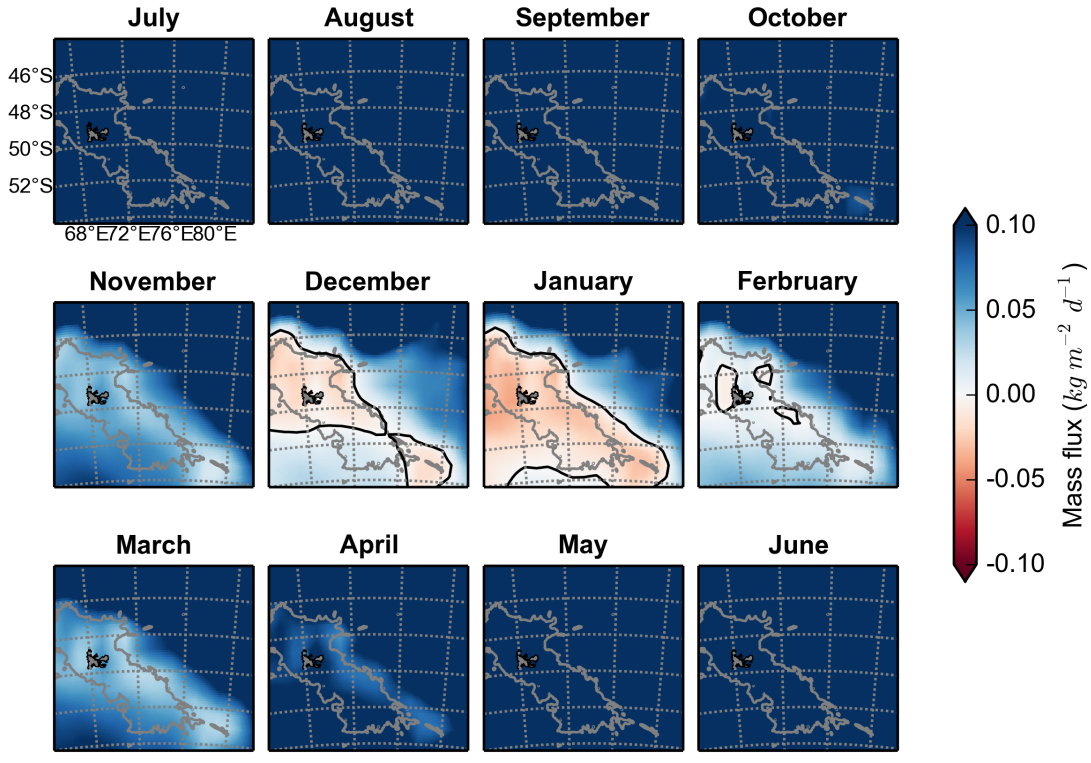
ACC core : 150 Sv - **PF** : 6 Sv - **FTC** : 43 Sv

Hydrological characteristics



Argo, ship and eleph. seal climatology

property of J.B. Sallée

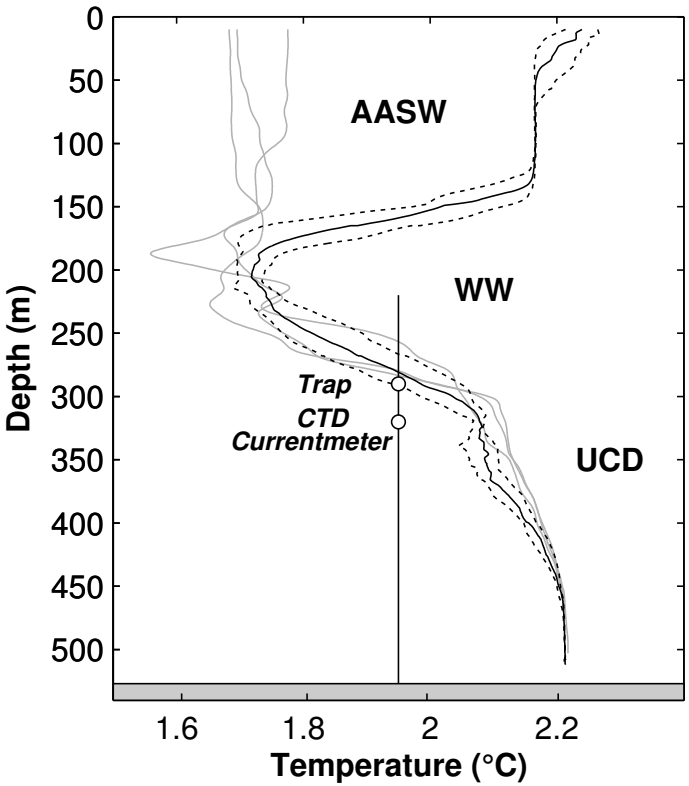


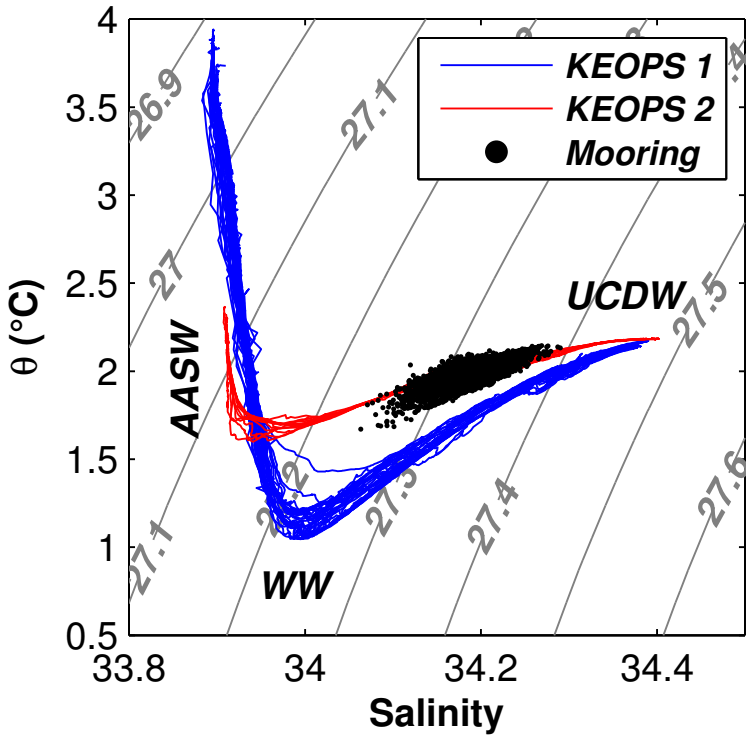
1997-2013 climatology calculated from ECMWF ERA-interim fluxes

MLD amplitude : 60 - 220 m

Stratification : November - February

Hydrological characteristics



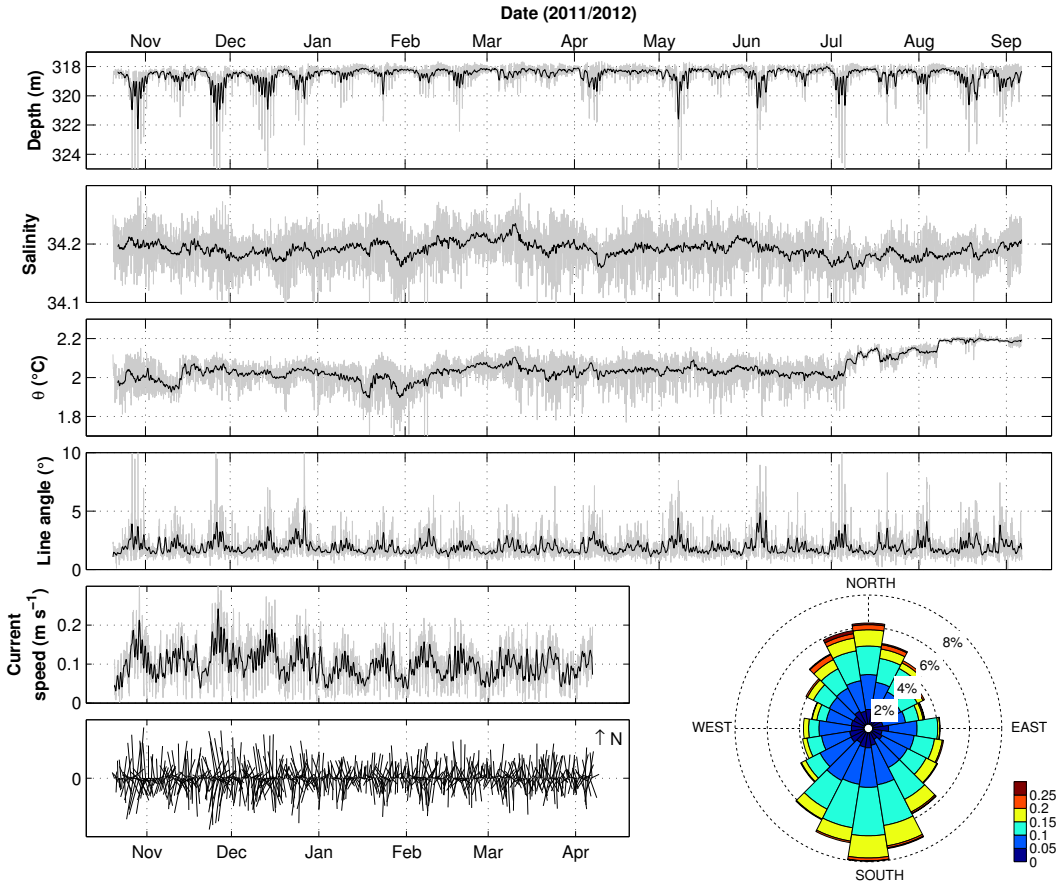


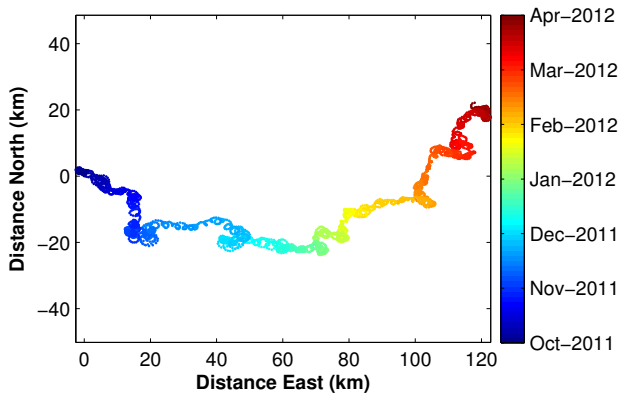
AASW : Antarctic Surface Water

WW : Winter Water

UCDW : Upper Circumpolar Deep Water

Hydrological characteristics

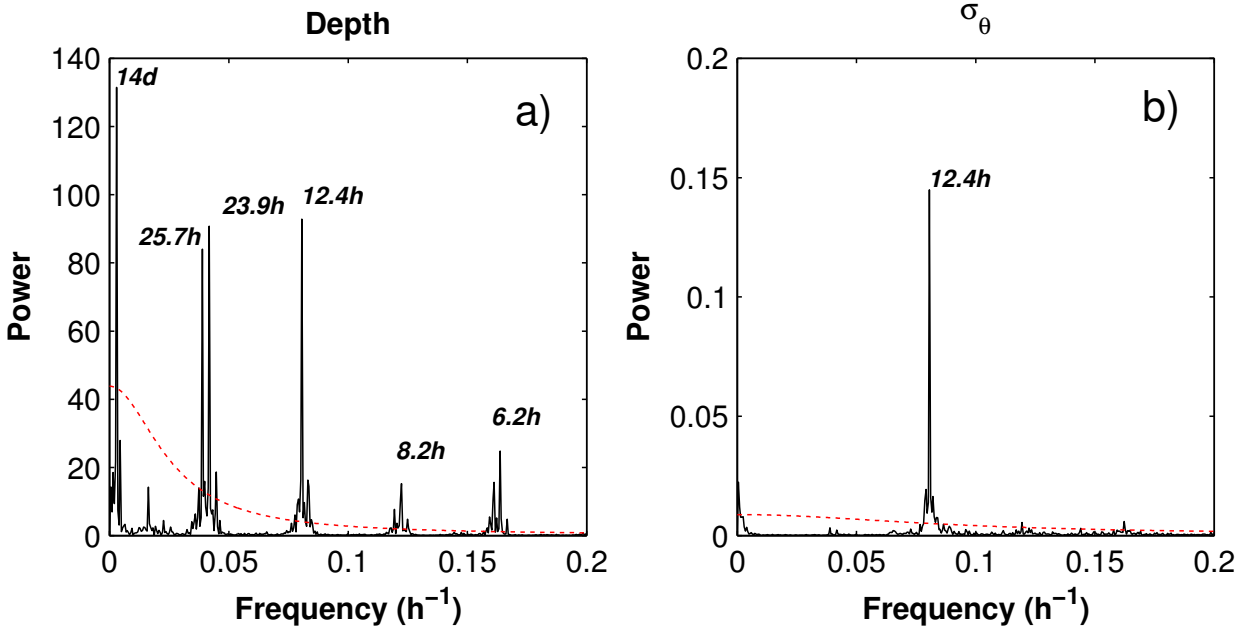


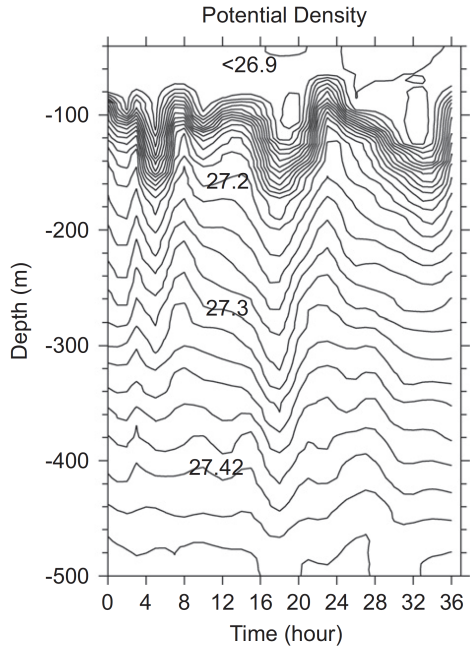


Flow (319 m) $\sim$ 10 cm/s

Tidal-driven, 120 km in 6 months ($>$ bloom timescale)

Hydrological characteristics

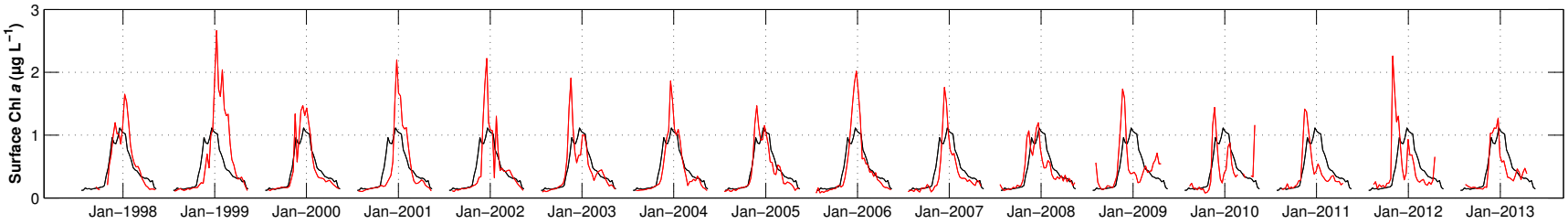




Park et al., 2008

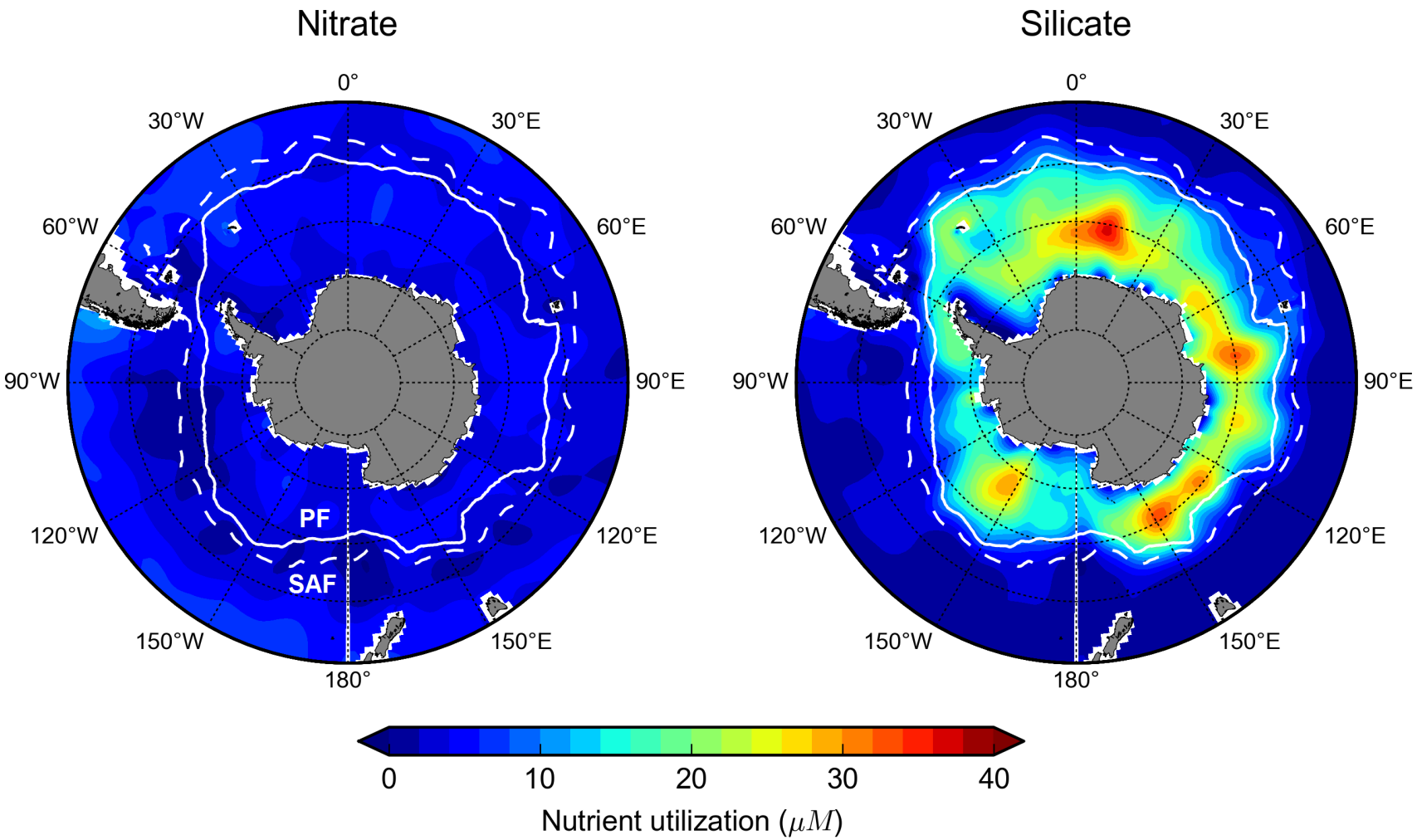
Isopycnals dispacements : M2 (12.4h) period, 50 m amplitude

Biogeochemical caracteristics



1997-2013 GlobColour time serie (SeaWIFs, MERIS, MODIS)
Apparition of **d**ouble surface Chl *a* peaks in 2009

Biogeochemical caracteristics



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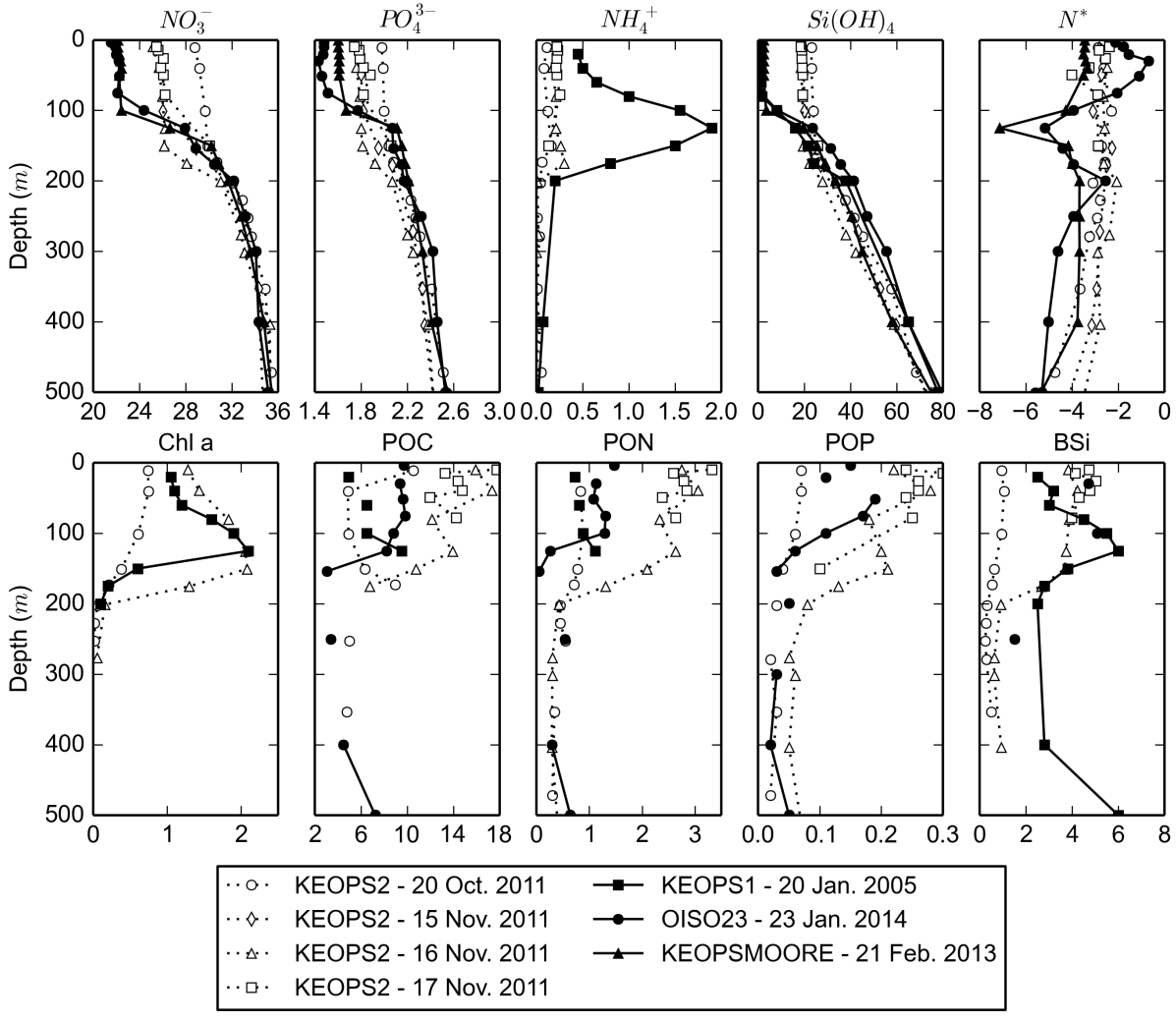
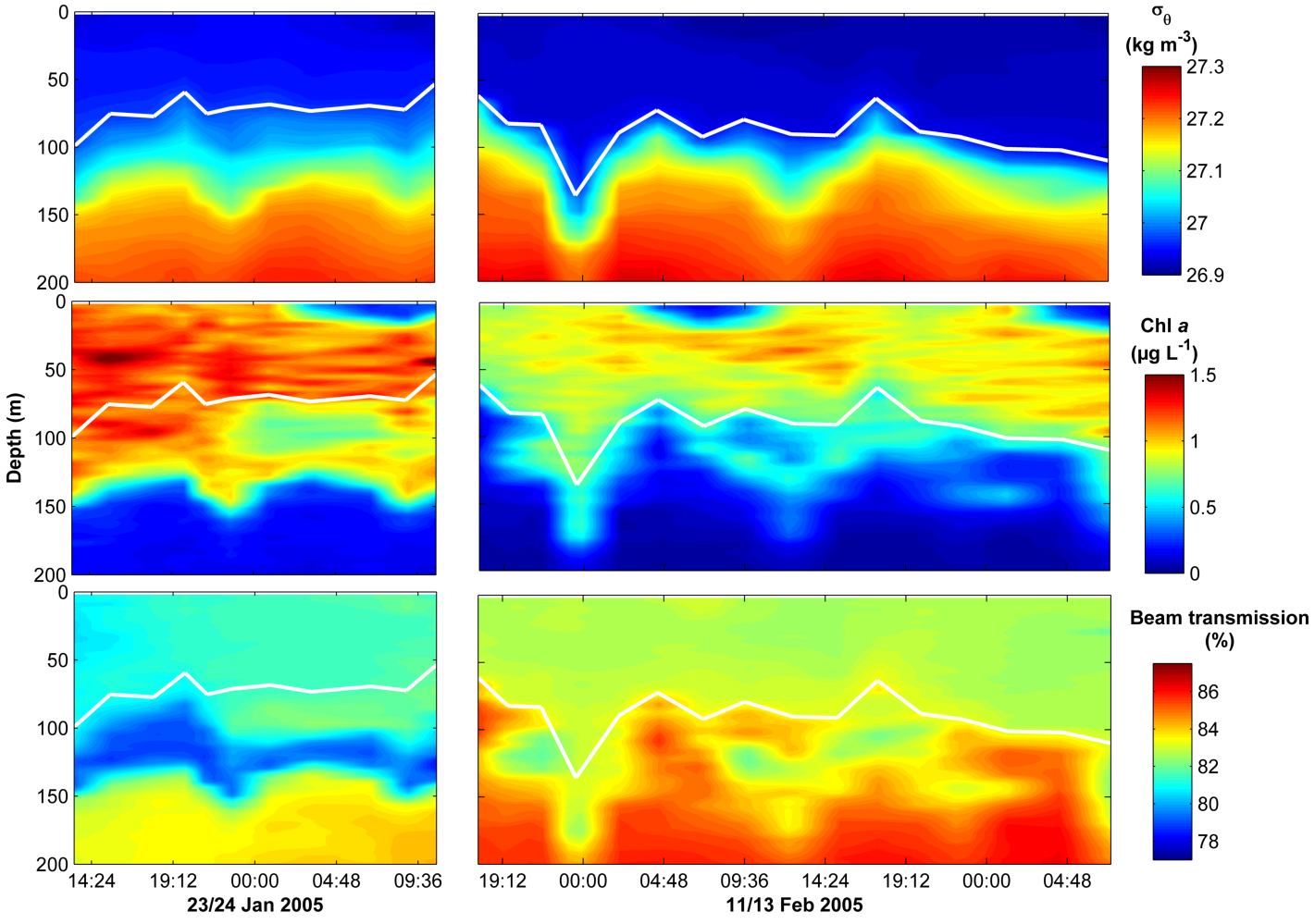


$Si(OH)_4$ utilization

Chl a and **BSi** accumulation in pycnocline in summer, N^* signature

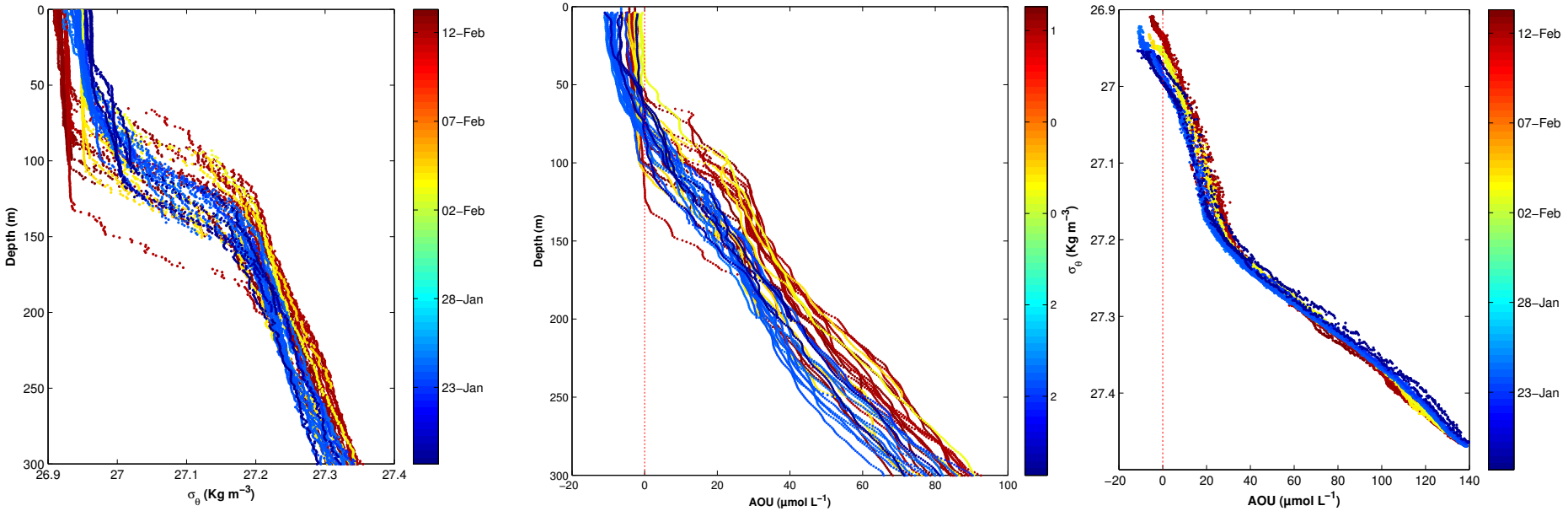
Biogeochemical characteristics



KEOPS1 time serie.

SCM : accumulation or production ?

Biogeochemical characteristics

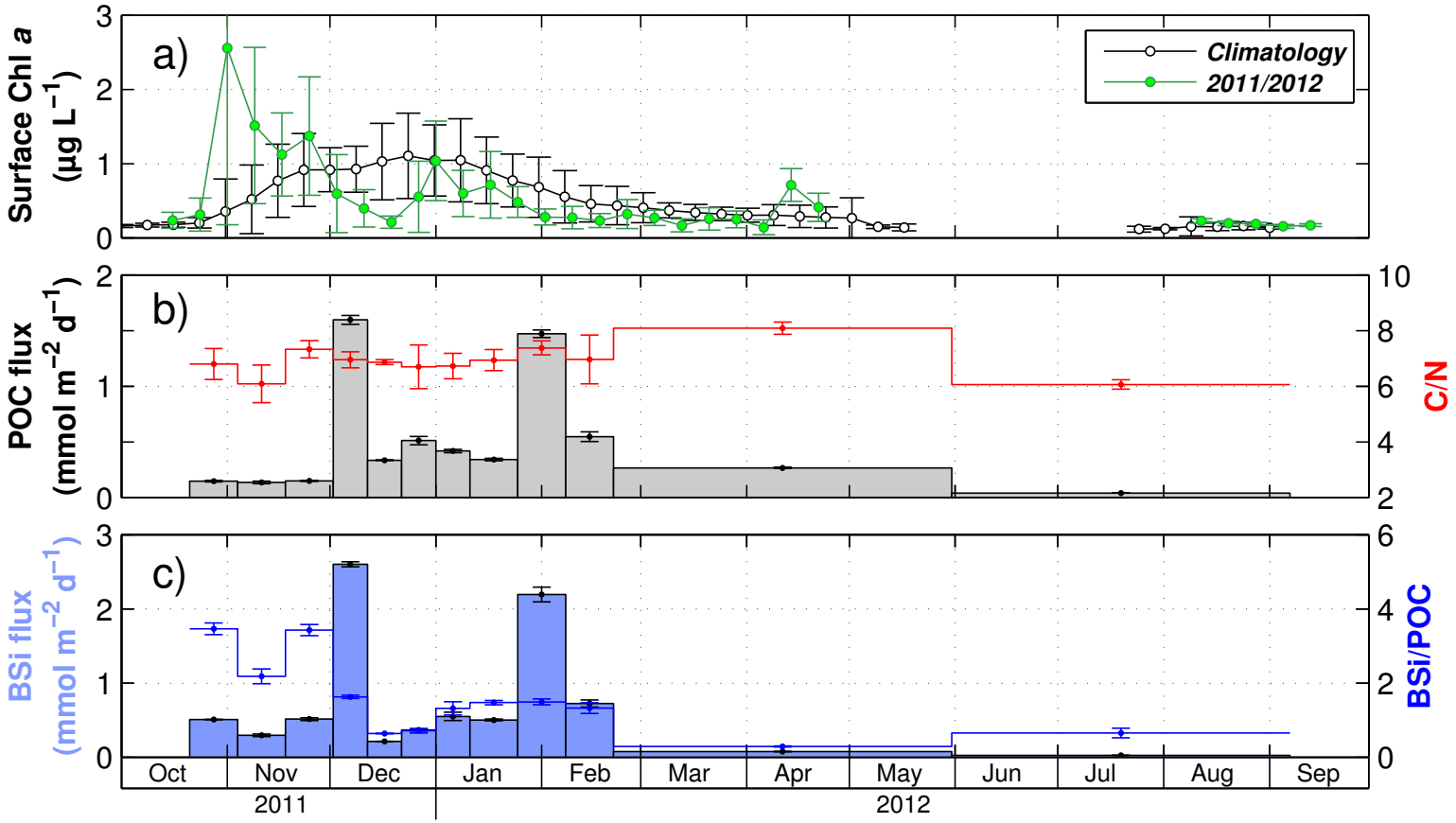


AOU in the SCM layer : 10 μM in 1 month $\rightarrow$ 0.33 $\mu M\ d^{-1}$

Bacterial respiration at 150 m January 2005 : 0.4 ± 0.1 $\mu MC\ d^{-1}$

Obernosterer et al., 2008

Biogeochemical characteristics



Sediment trap at 289 m.

NCP = 6.6 *mol* m^2 y^{-1}, annual **POC export** = 0.1 *mol* m^2 y^{-1}

High Biomass, Low Export zone ?

Summary

Hydrology

- MLD : 60 - 220m
- stratification : Nov. - Feb.
- weak circulation (< 10 cm/s)
- $\sim$ 120 km in 6 months (300m)
- internal waves, isopycnals displacements (50 m, 12.4h)

Biogeochemistery

- Double Chl *a* peaks ?
- $Si(OH)_4$ utilization 24 $\rightarrow$ 1 μM
- SCM in summer w/ large diatom
- HBLE : high C transfer to higher trophic levels
- resting spore formation

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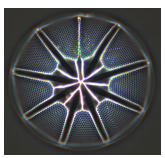
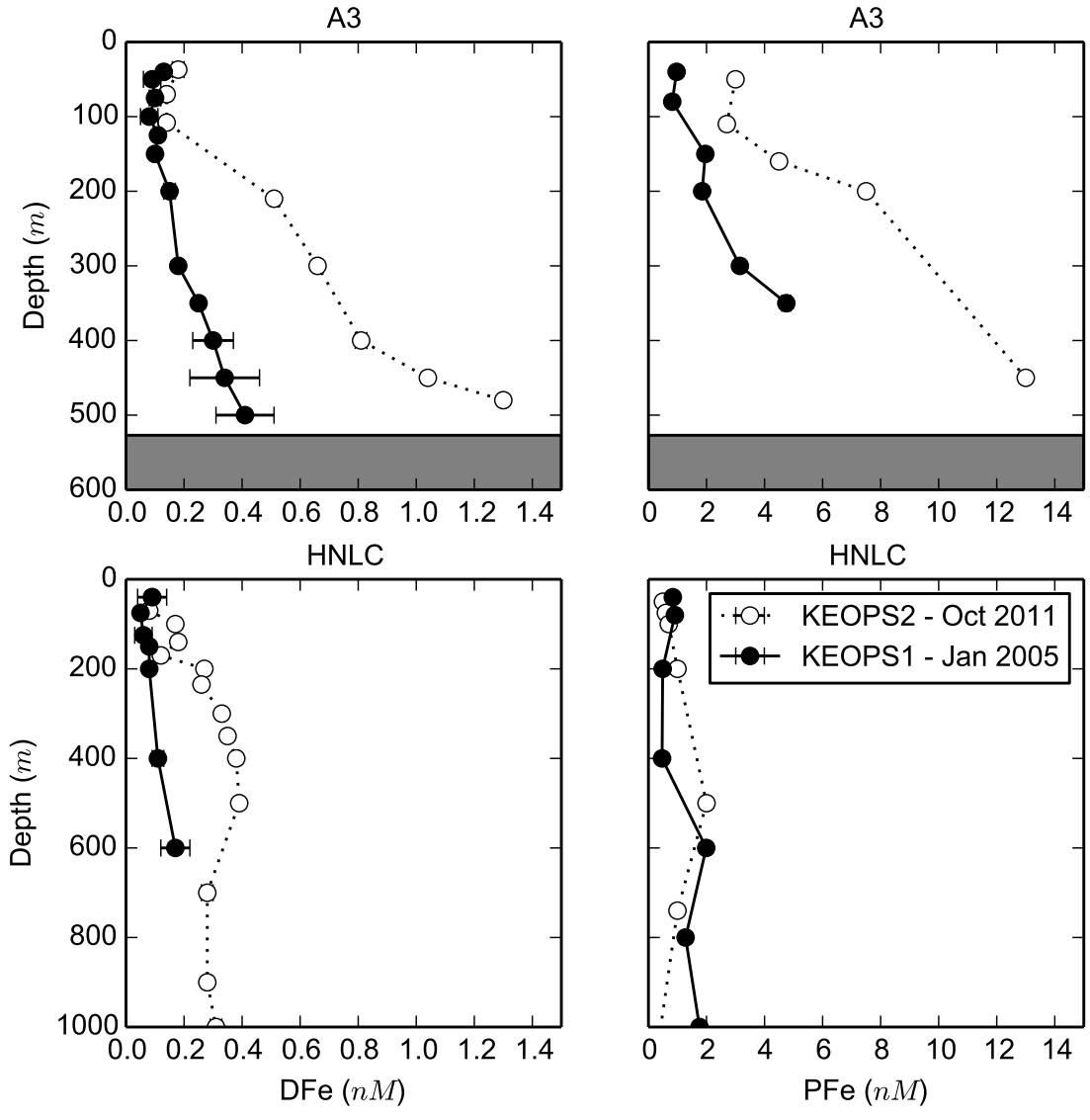


Thank you for your attention

Biogeochemical characteristics



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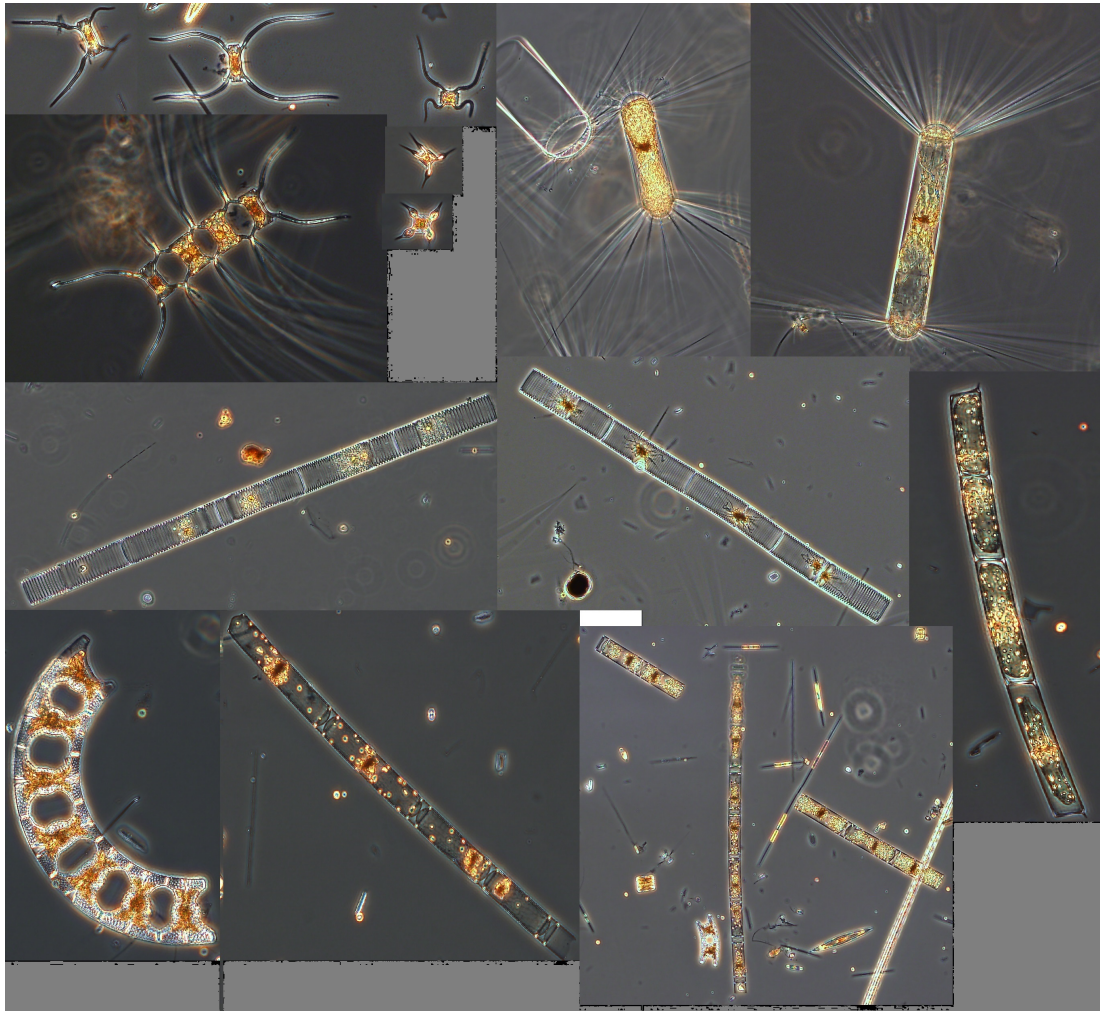
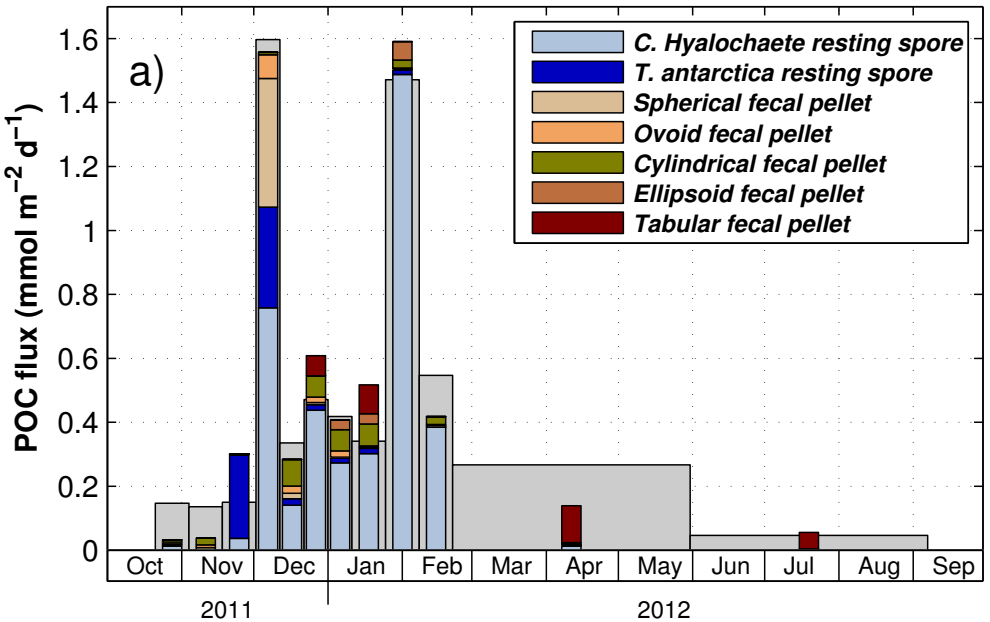
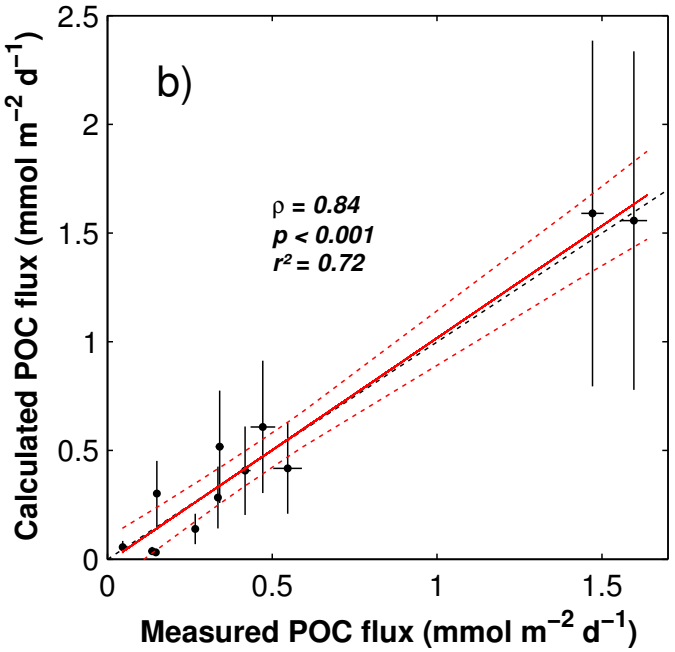


Large diatoms of the **SCM** (January 2014)

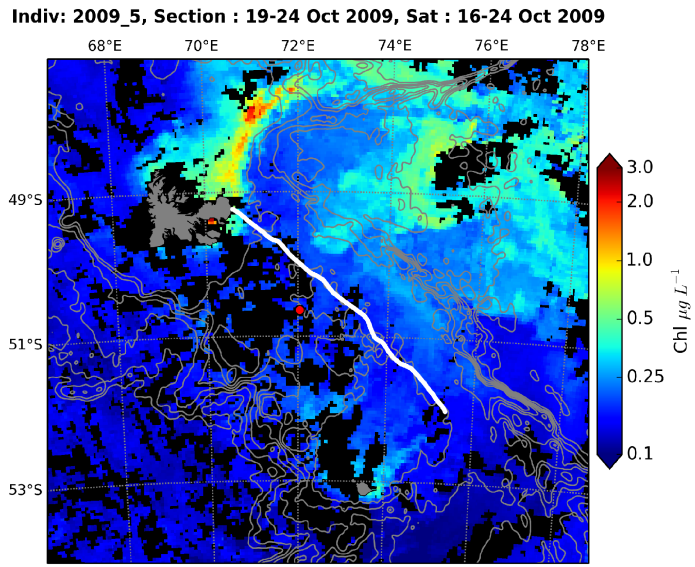
Biogeochemical characteristics

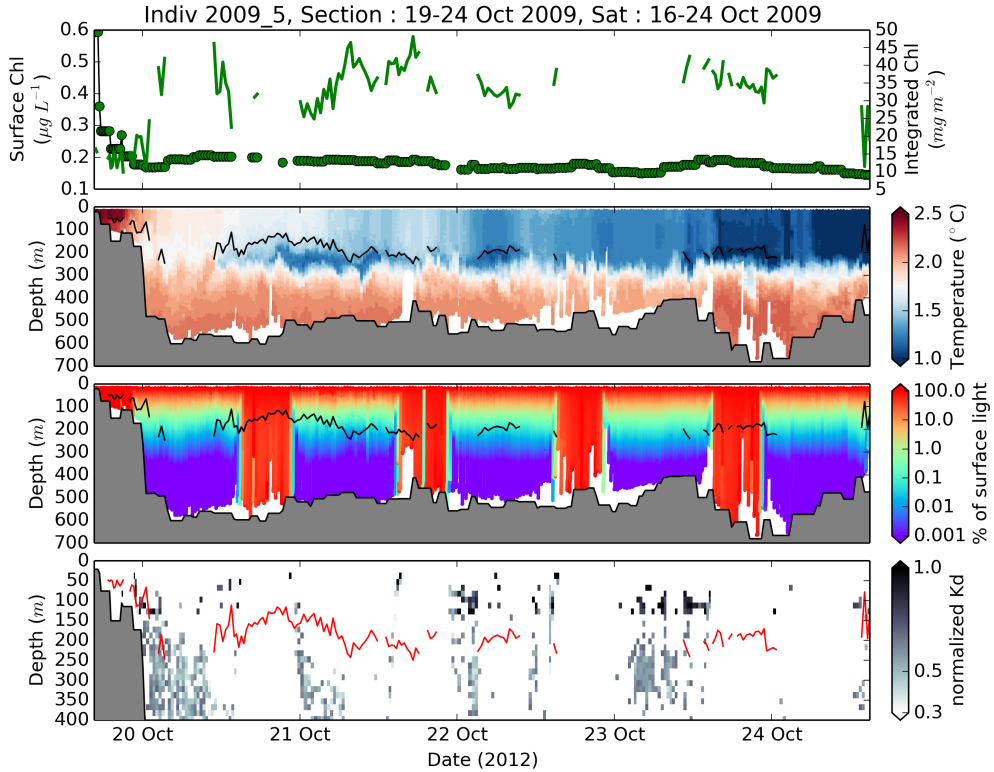




Resting spore formation drives $>$ 60% of POC fluxes
Triggered by $Si(OH)_4$ limitation ?

Light attenuation over the Kerguelen Plateau





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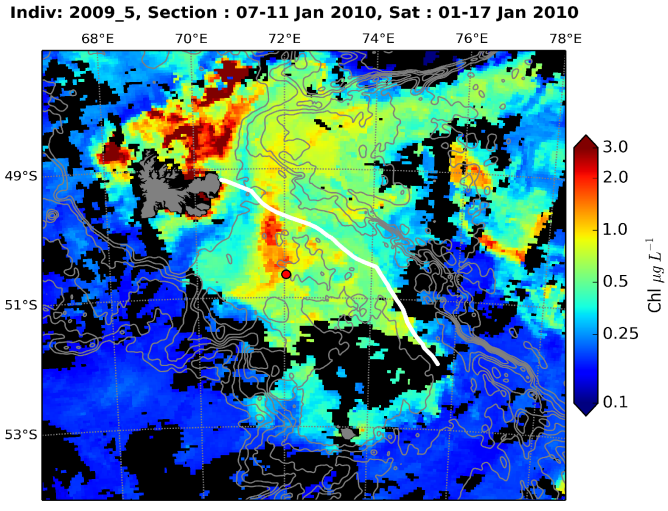

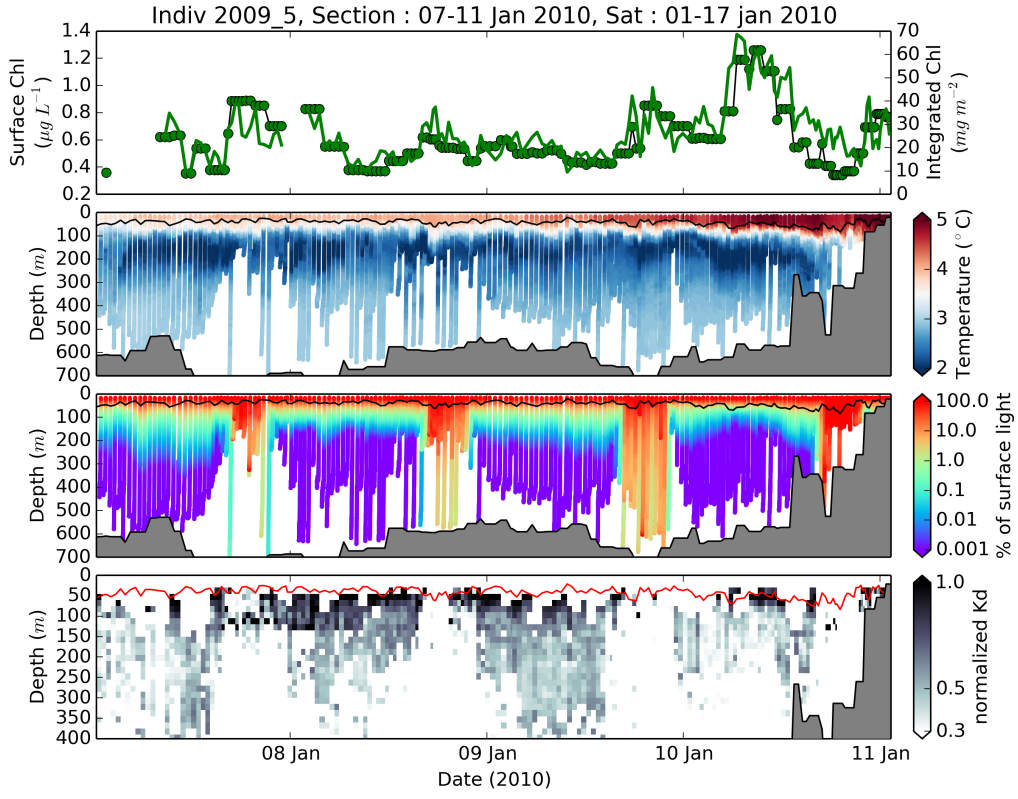

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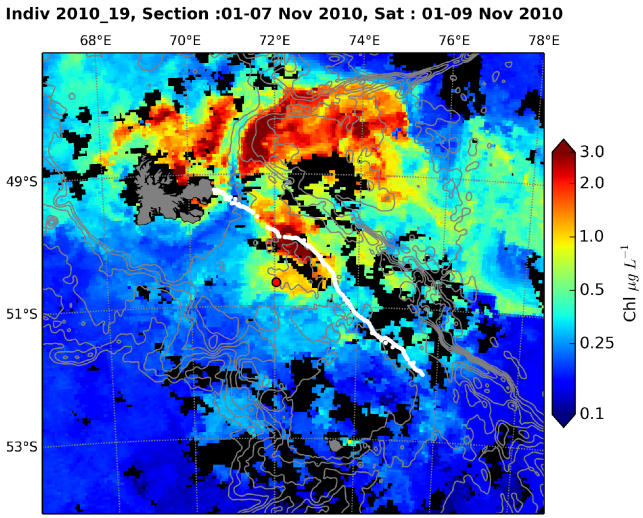

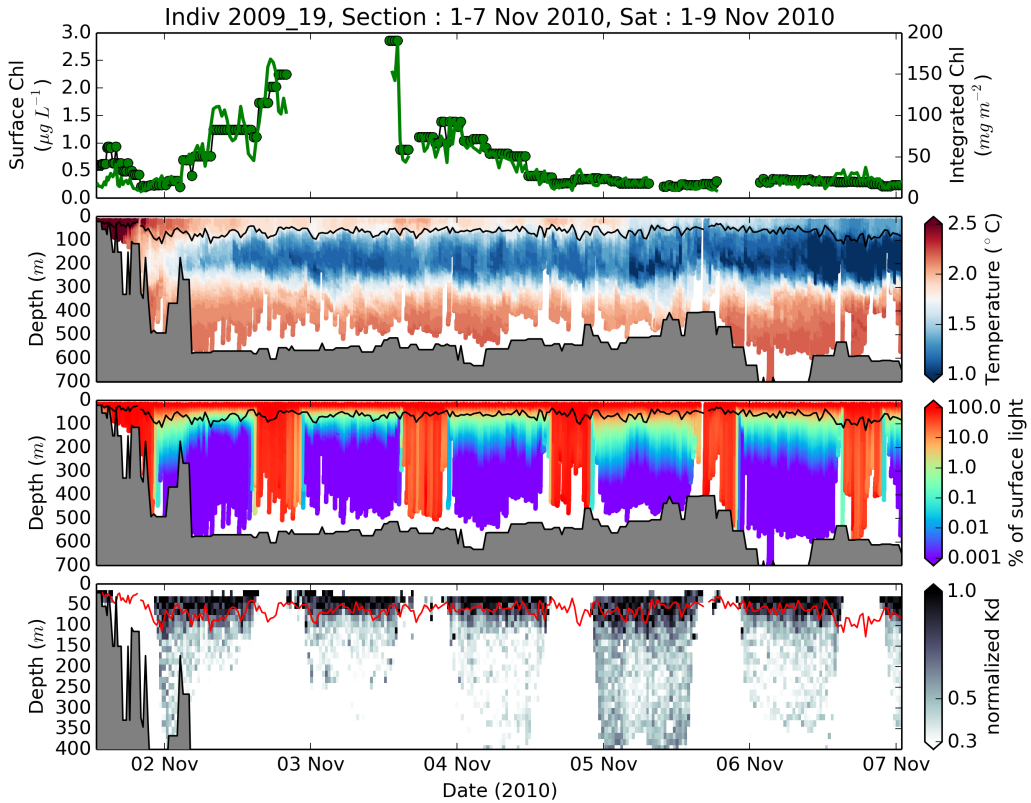

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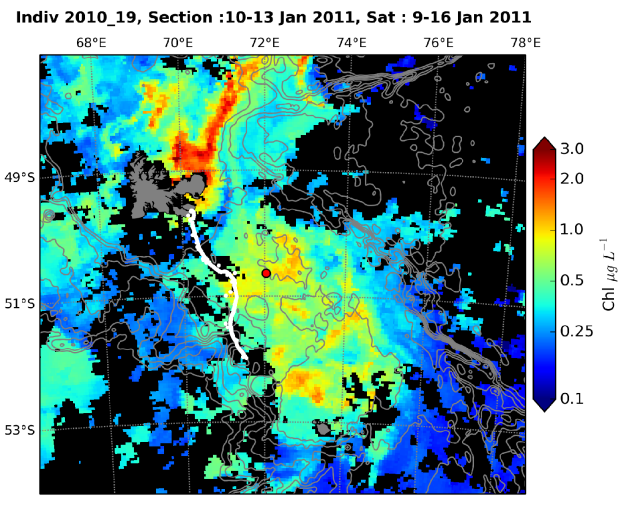

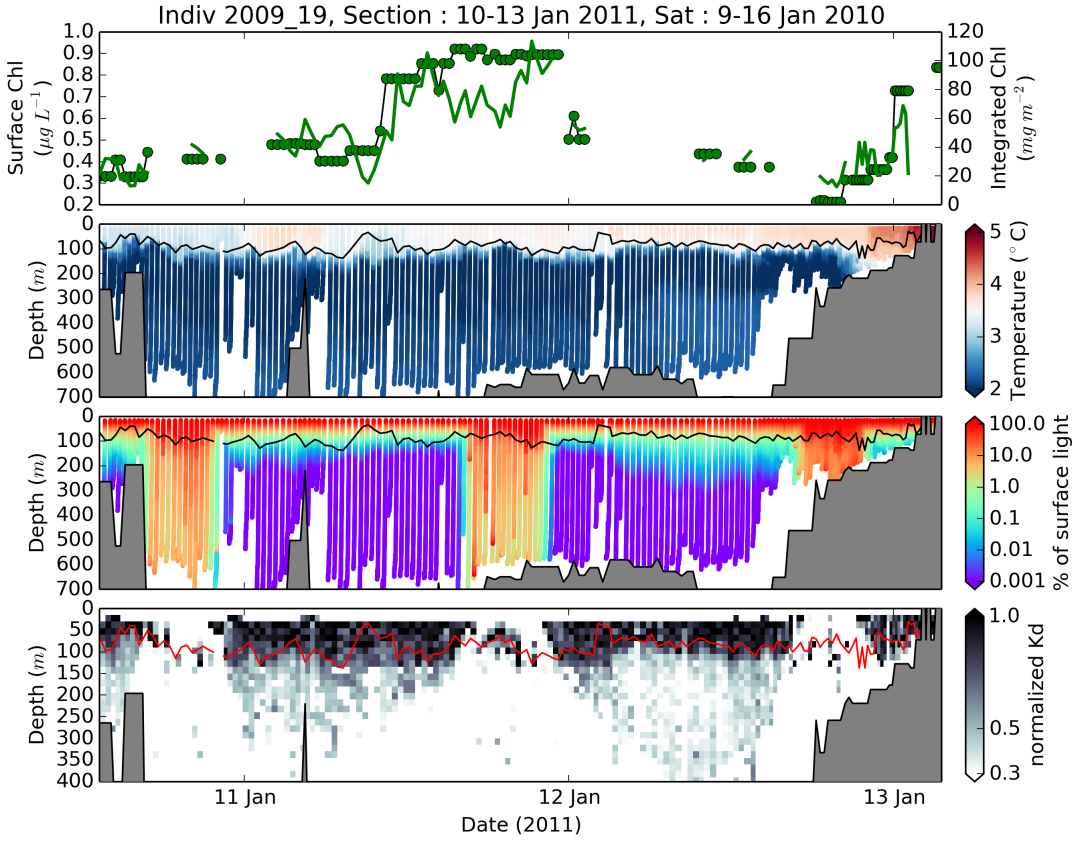

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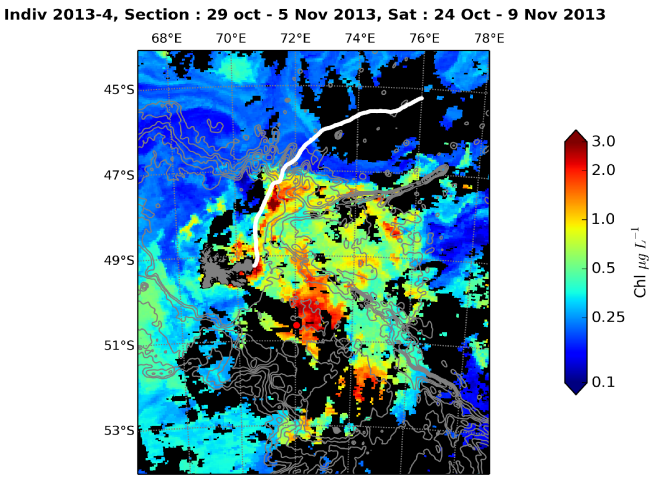

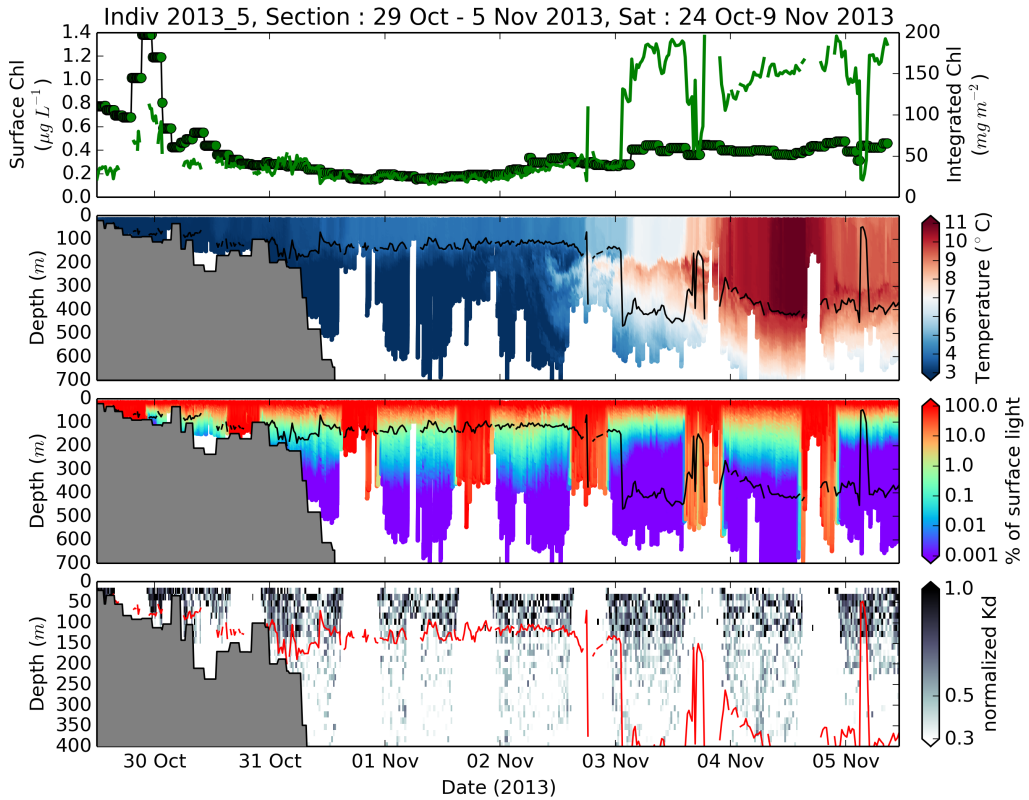

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