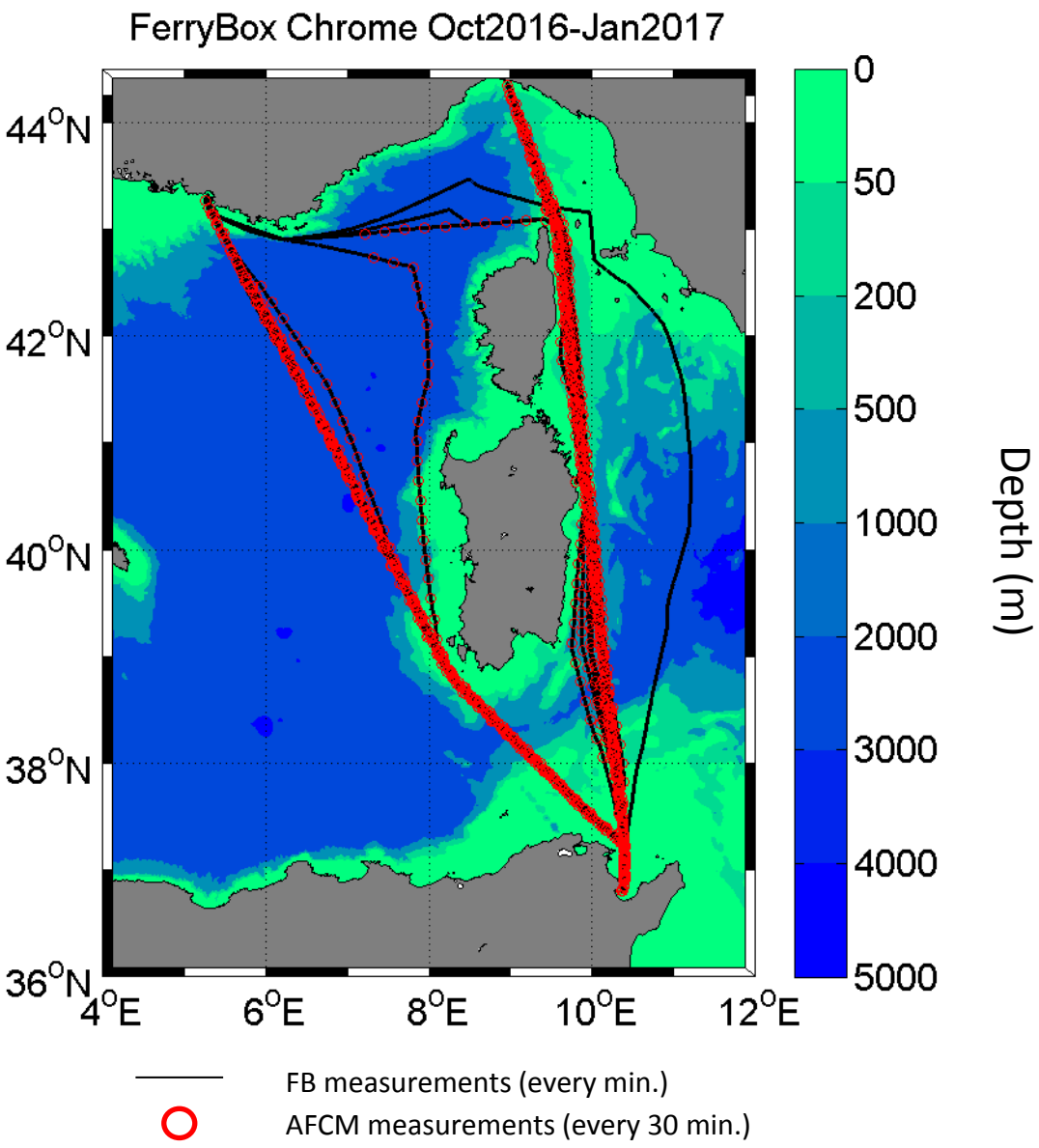
Overview of the FerryBox deployment during the CHROME project

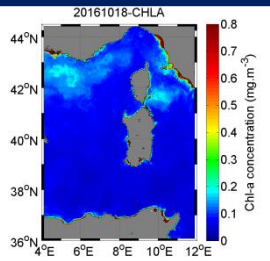
- **32 crossings with quality checked (QC) high frequency Automated Flow CytoMetry (AFCM) data together with SST, SSS and fluorescence data acquired every minute from the INSTM FerryBox (FB) installed on the CTN C/F Carthage.**
- **From Oct. 2016 to Jan. 2017**
- **1 AFCM analysis every 30 min. – 30-35 AFCM analyses per crossing.**
- **1091 QC AFCM analyses performed.**



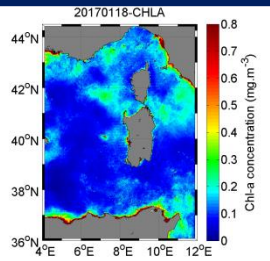
SST : Sea Surface Temperature
SSS : Sea Surface Salinity

Satellite and Modelled Data

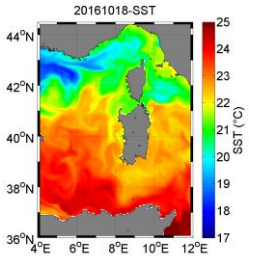
Chl-a



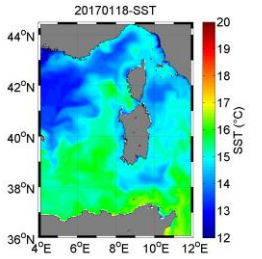
18/10/16 – 18/1/17
1/day



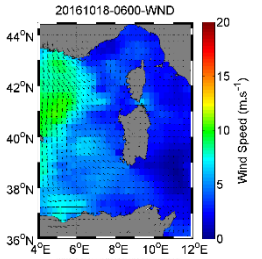
SST



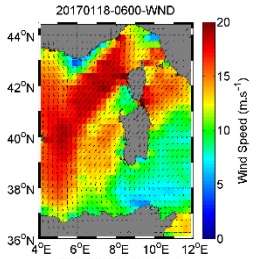
18/10/16 – 18/1/17
1/day



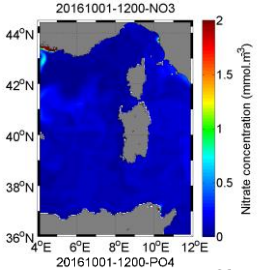
Wind Speed & Direction



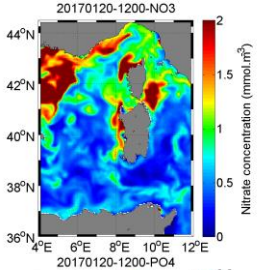
18/10/16 – 18/1/17
4/day



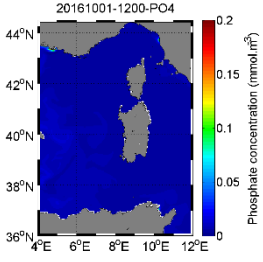
Nitrate



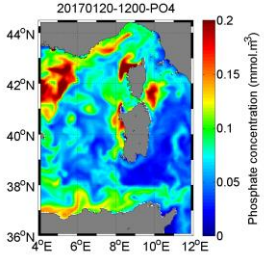
1/10/16 – 20/1/17
1/day



Phosphate

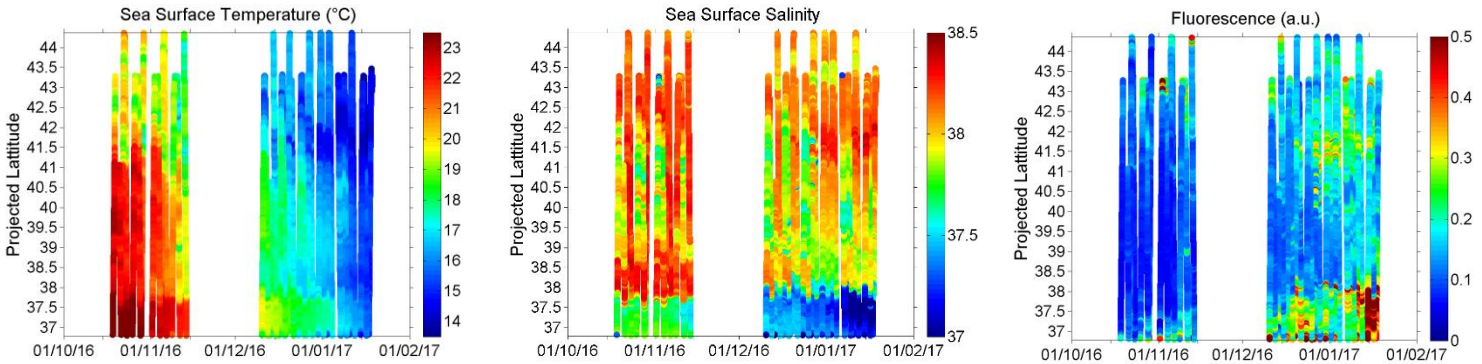


1/10/16 – 20/1/17
1/day



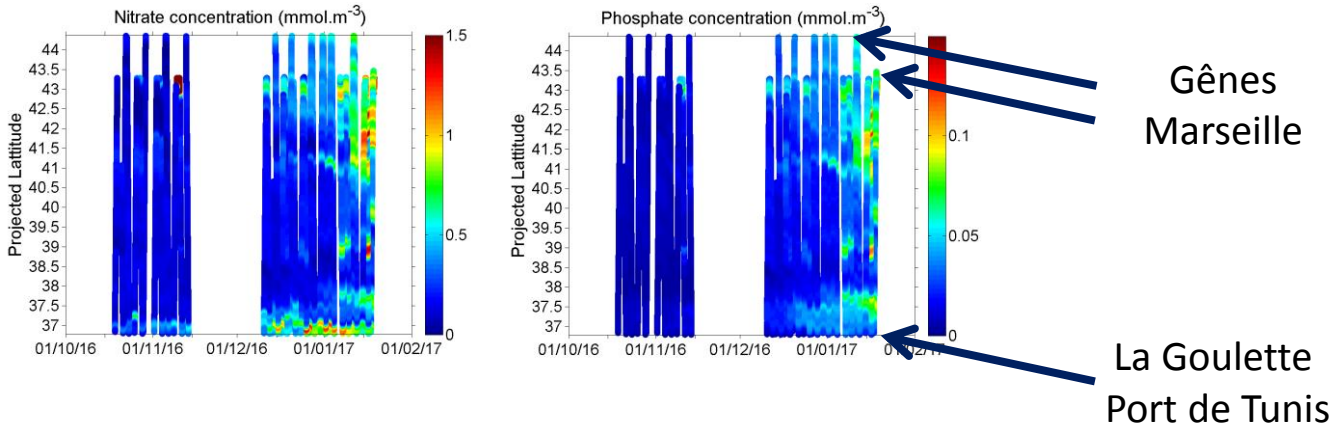
In-Situ FB data + Model data extracted along the ship track

In-Situ FB data



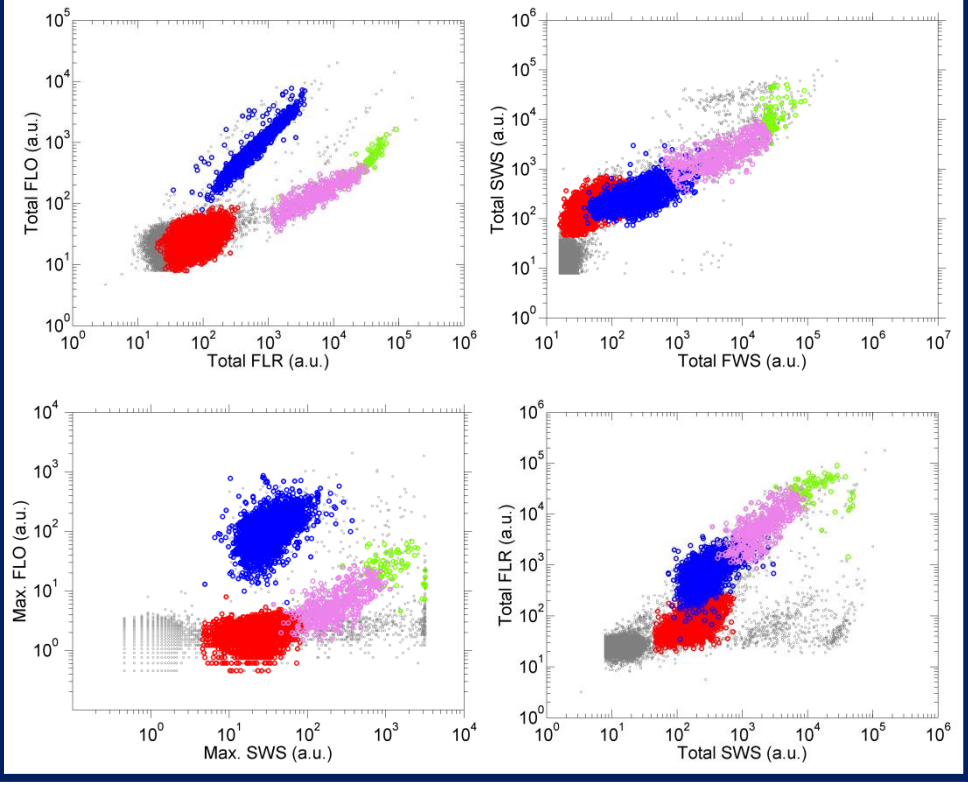
+

Model data

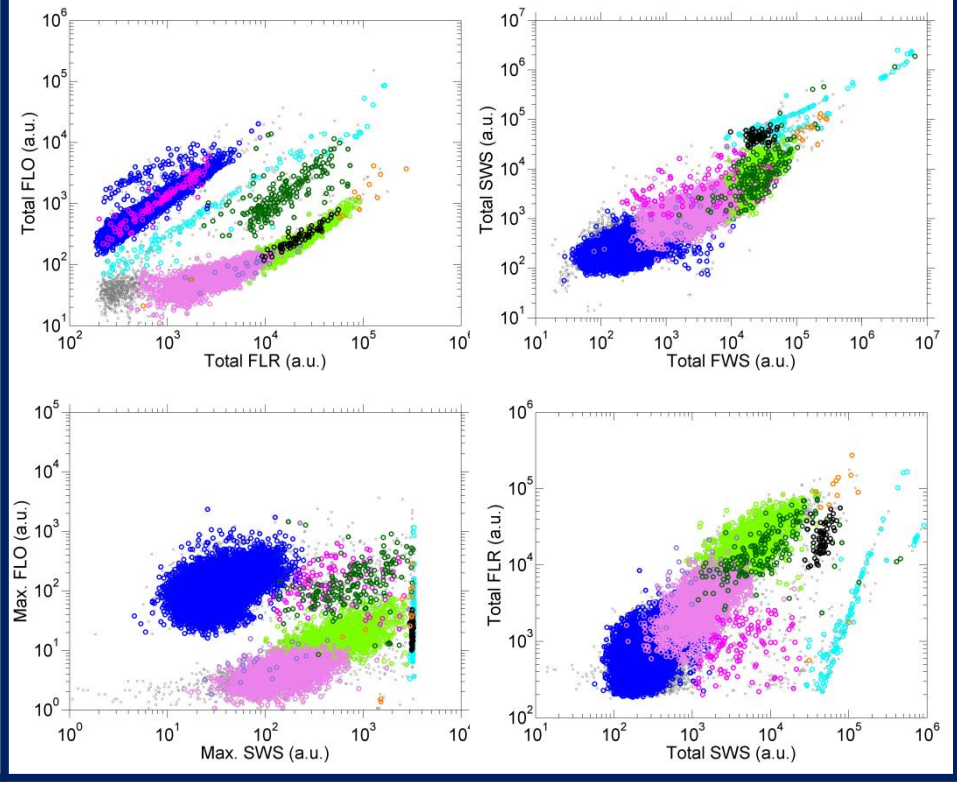


In-Situ FB data + model data extracted along the ship track

FLR6



FLR30

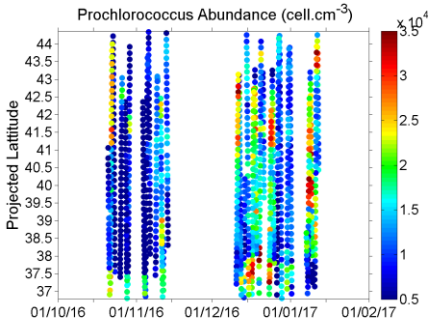


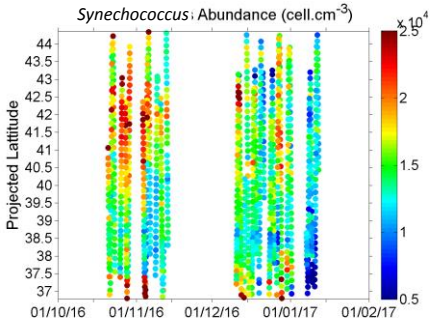
Prochlorococcus – Synechococcus
PicoEuk – PicoEuk High FLR – PicoEuk High FLO
NanoEuk – NanoEuk High FLO – NanoEuk High SWS
MicroEuk
Shit

9 Phytoplankton groups identified from 2 sensitivity (trigger) levels FLR6 and FLR30

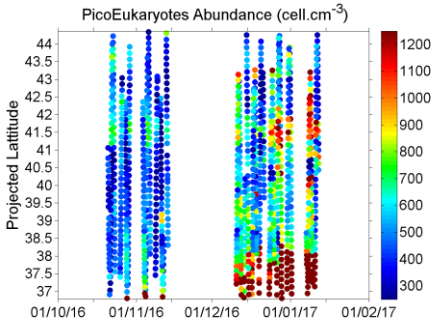
Distribution of Phytoplankton Groups Abundances

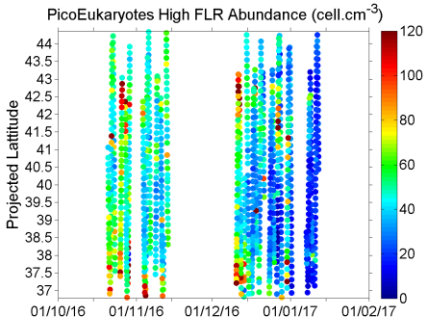
PicoCyanobacteria

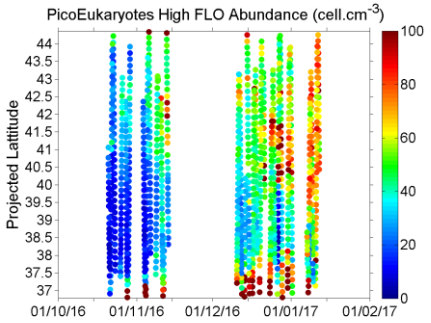




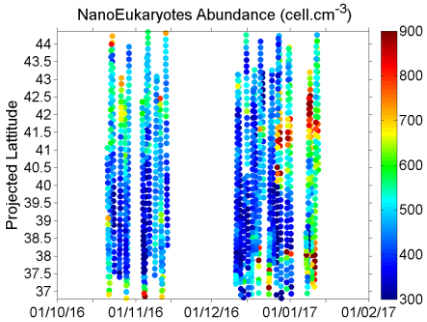
PicoEukaryotes

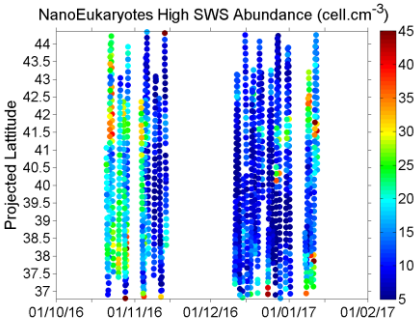


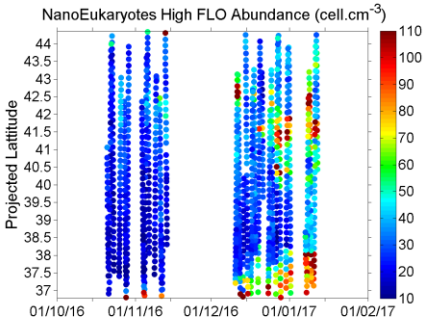




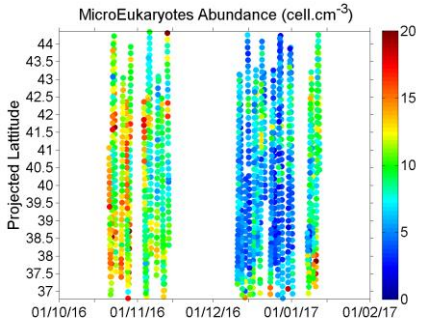
NanoEukaryotes



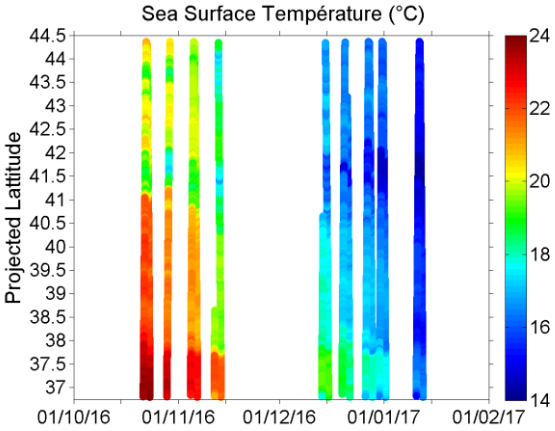


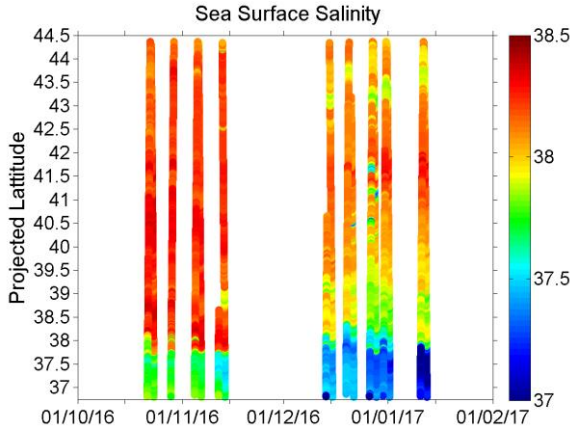


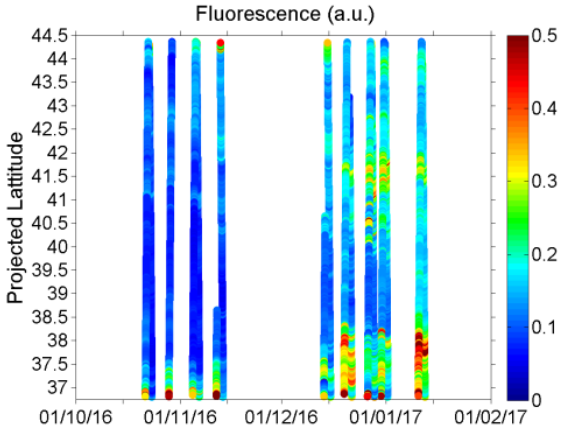
MicroEukaryotes

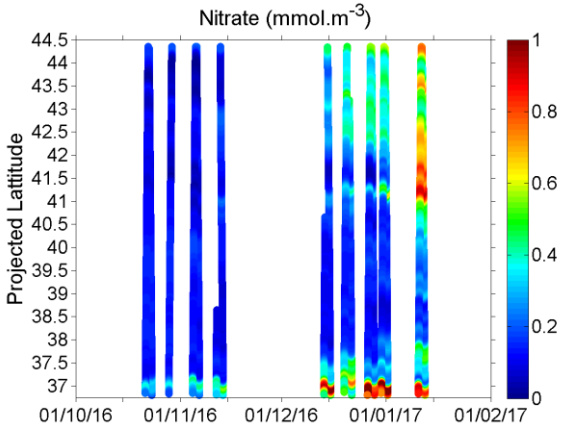


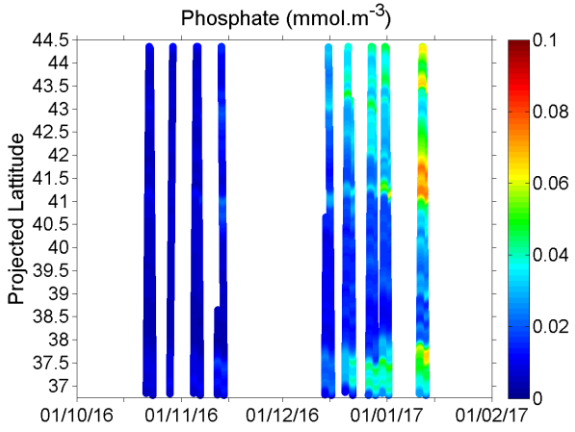
Gênes – Goulette (Tunis)



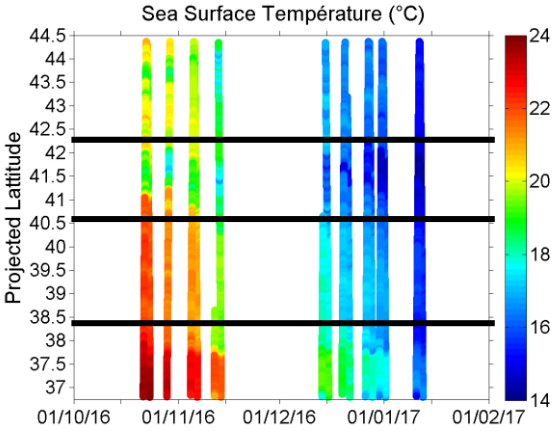


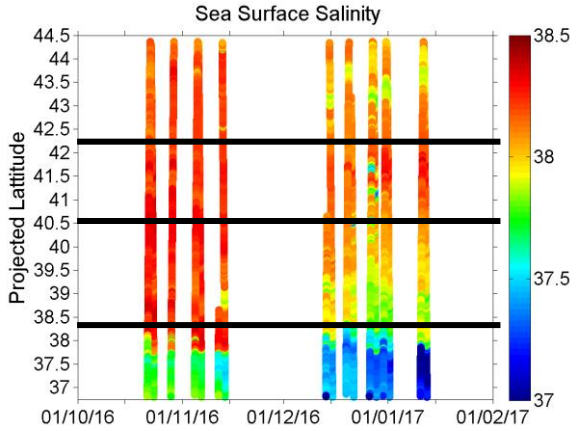


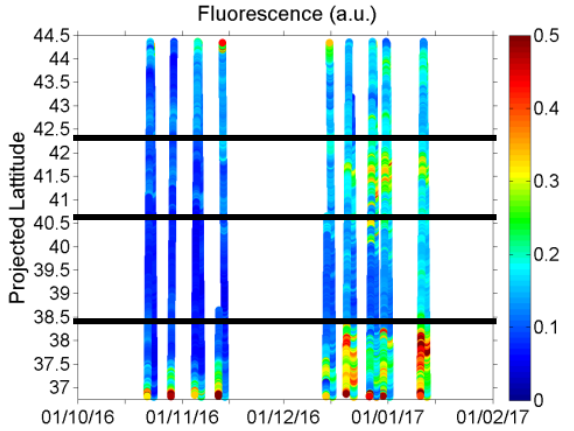


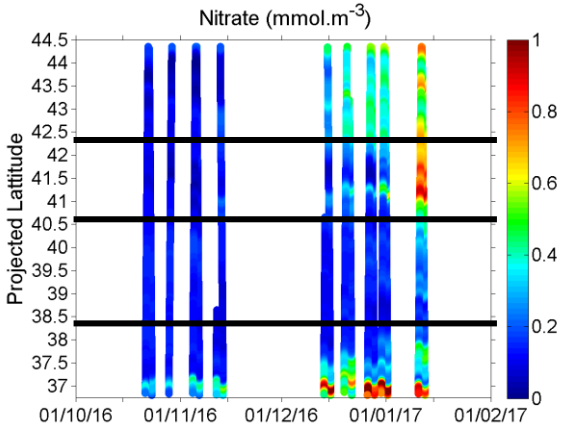


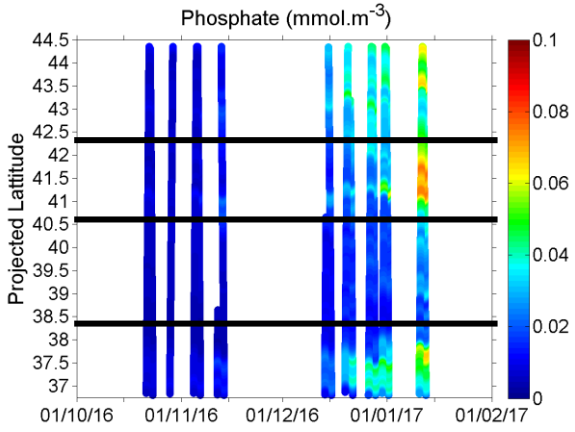
Gênes – Goulette (Tunis)







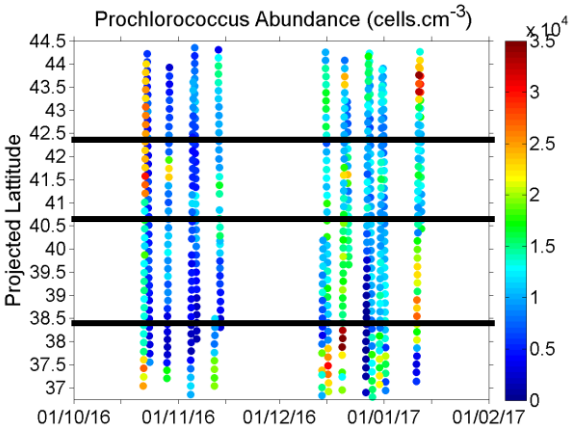


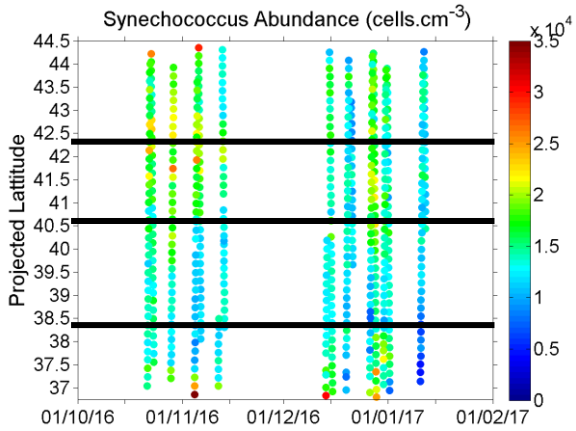


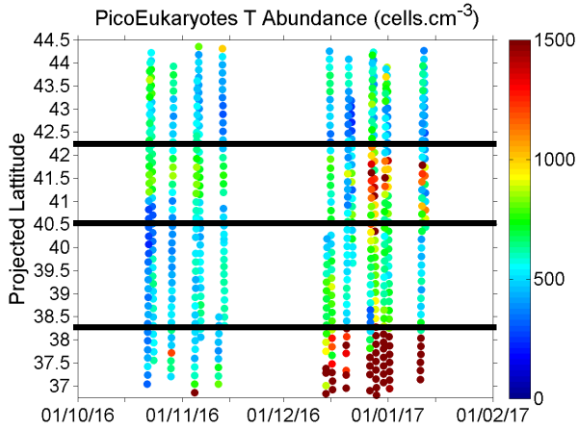
Division en 4 zones basée sur les observations (in-situ + modèle) et les connaissances de la zone.

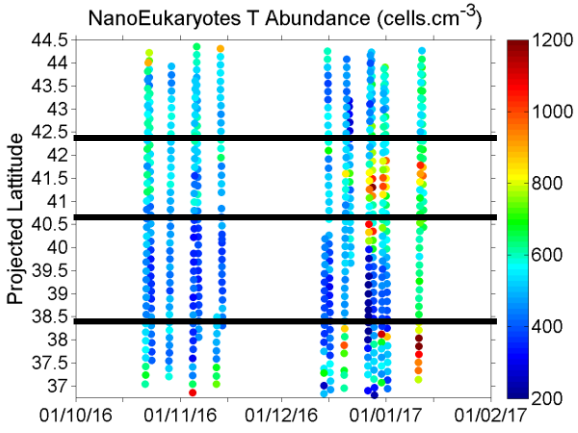
→ Méthode “Cervelle Marrec”

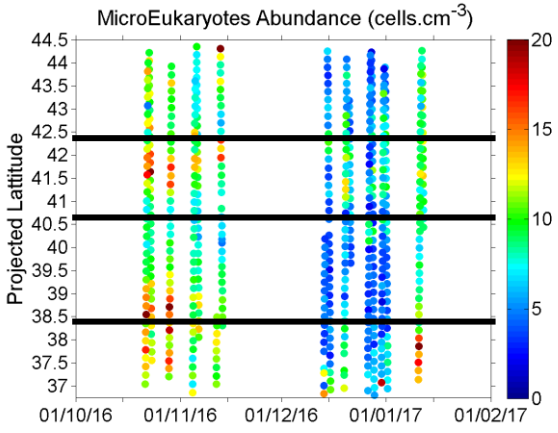
Gênes – Goulette (Tunis)







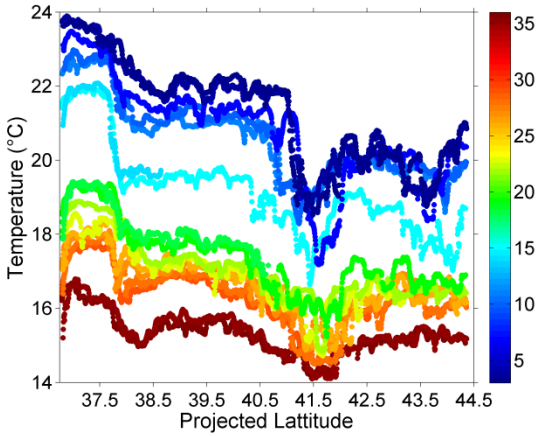


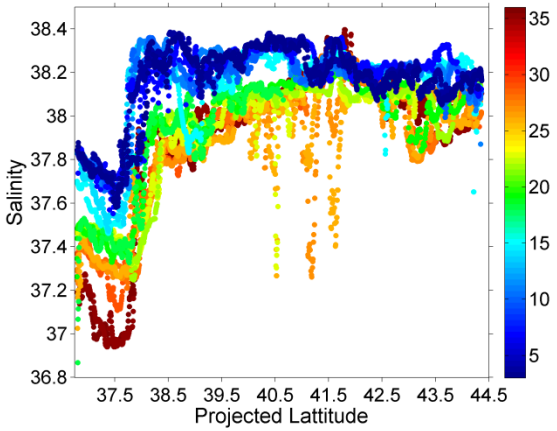


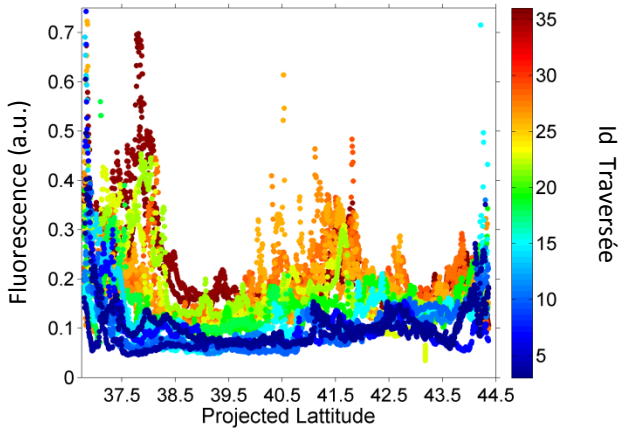
Lorsque appliquée aux abondances des 5 principaux groupes phytoplanctoniques, certains patterns propres aux distributions semblent apparaitre.

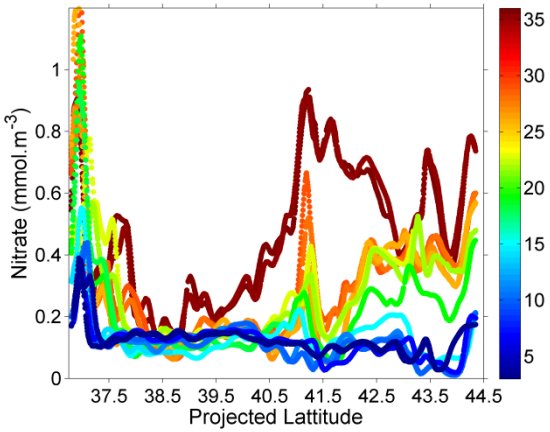
Gênes – Goulette (Tunis)

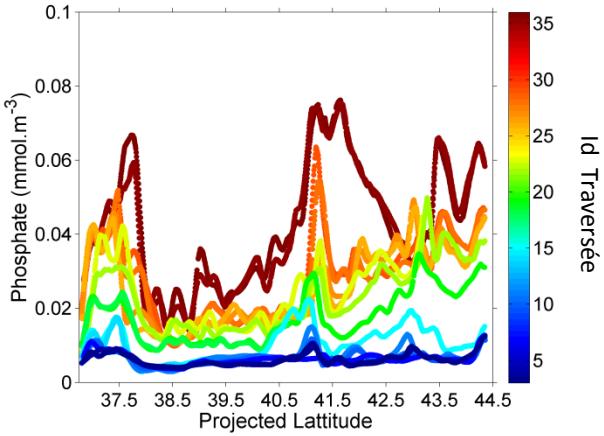
Avec un autre type de représentation graphique:

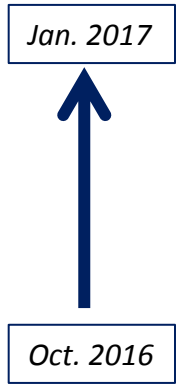






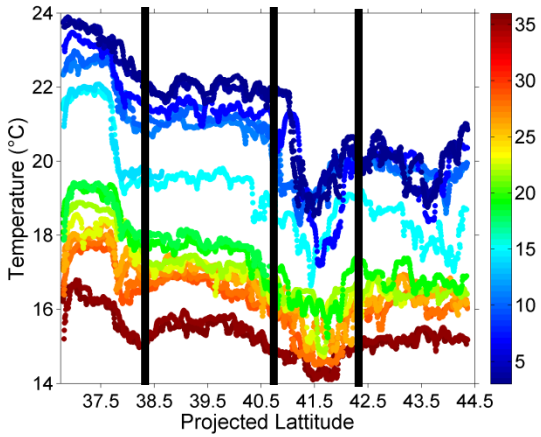


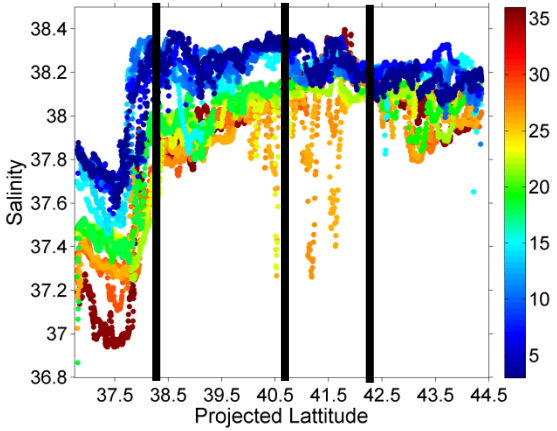


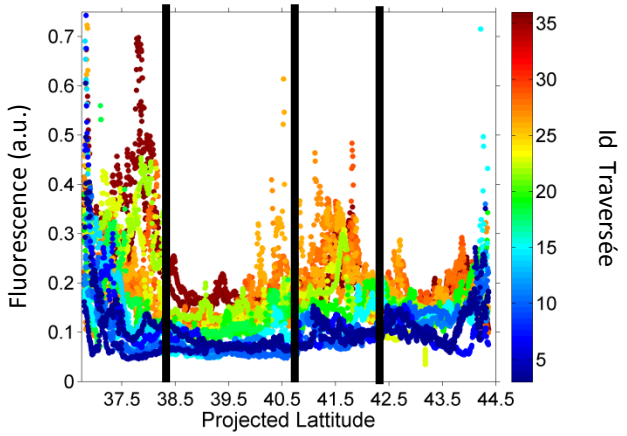


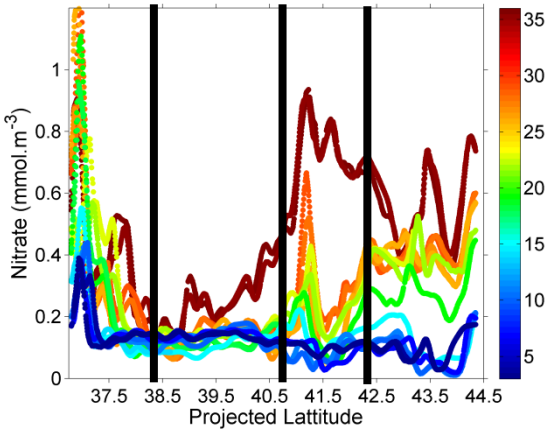
Gênes – Goulette (Tunis)

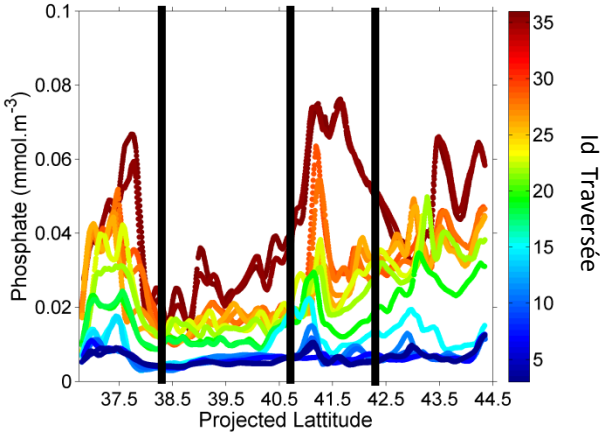
Et en superposant les délimitations précédemment établies avec les données in-situ + modèle:









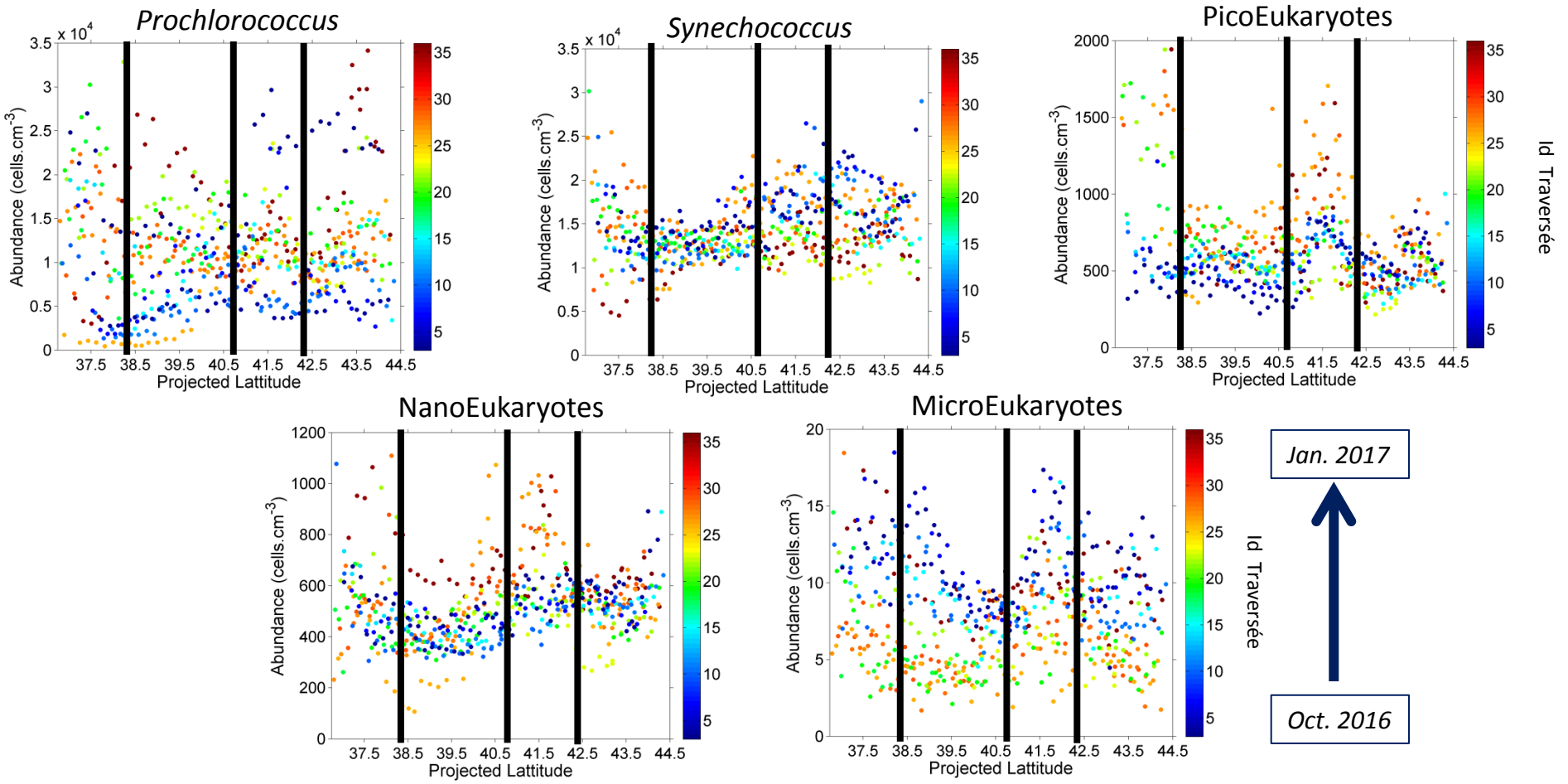


Jan. 2017

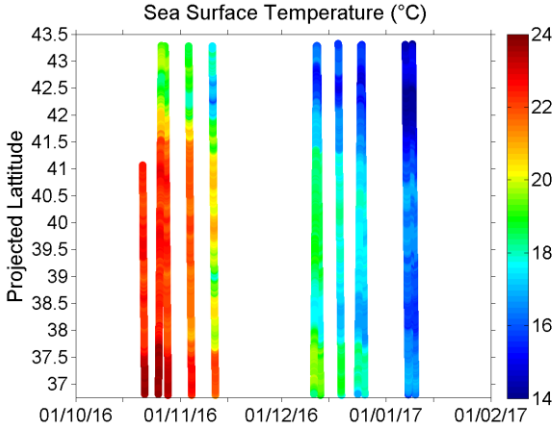
Oct. 2016

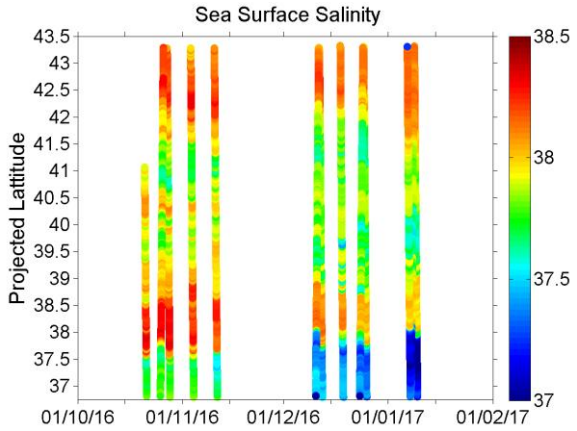
Gênes – Goulette (Tunis)

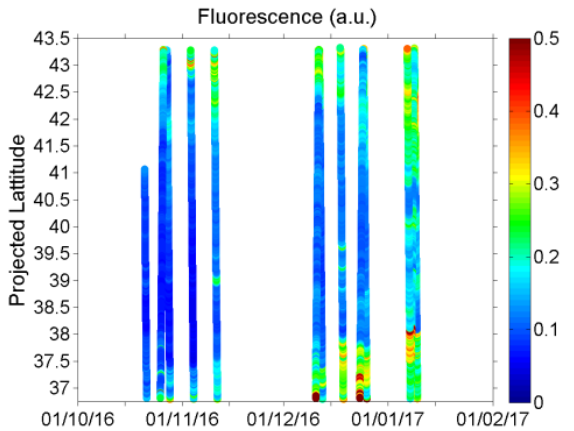
Et en superposant les délimitations précédemment établies avec les abondances:

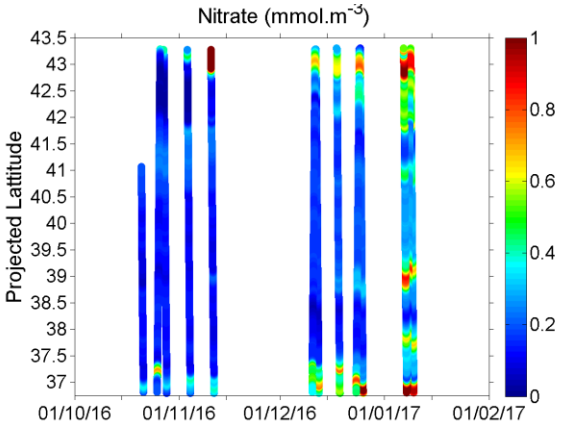


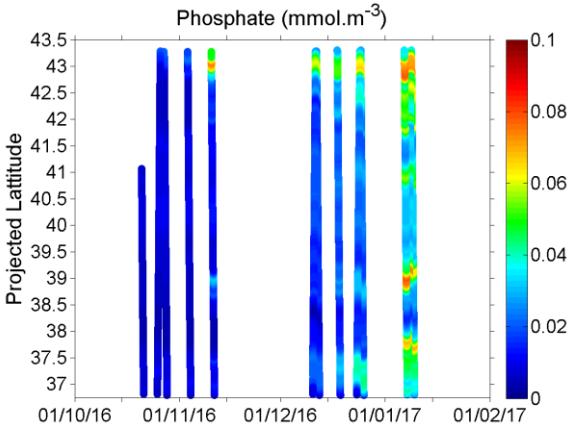
Marseille – Goulette (Tunis)



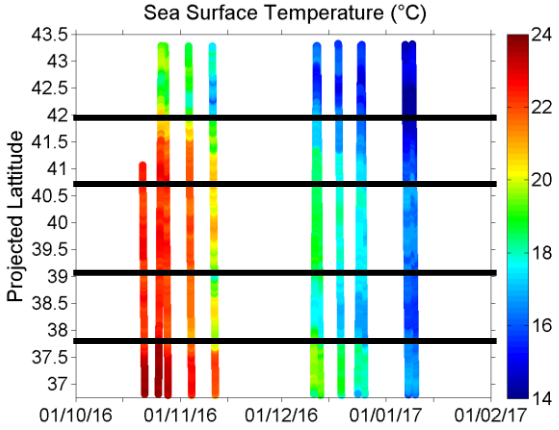


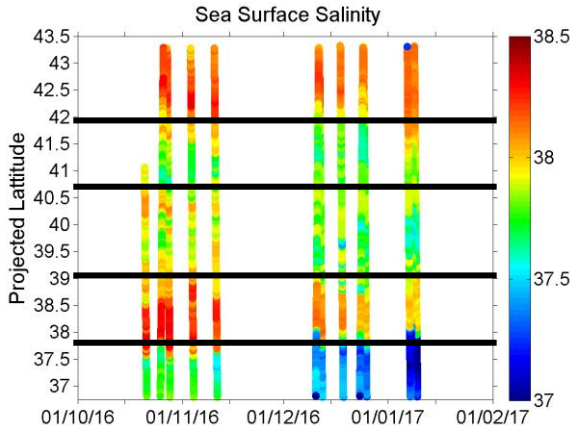


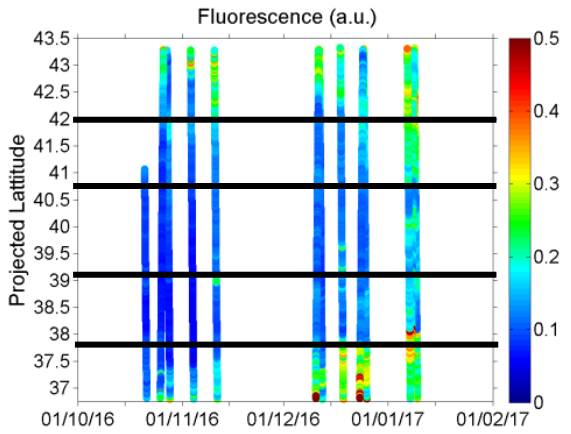


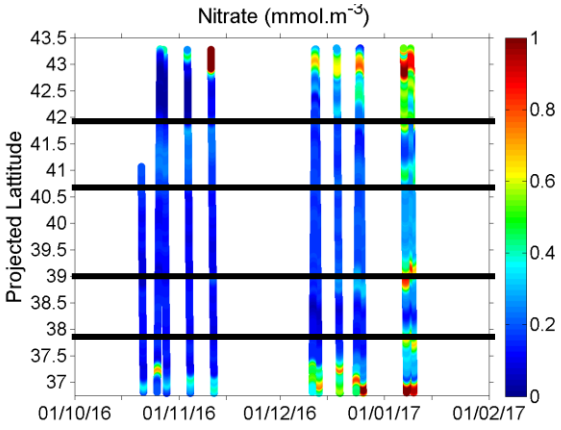


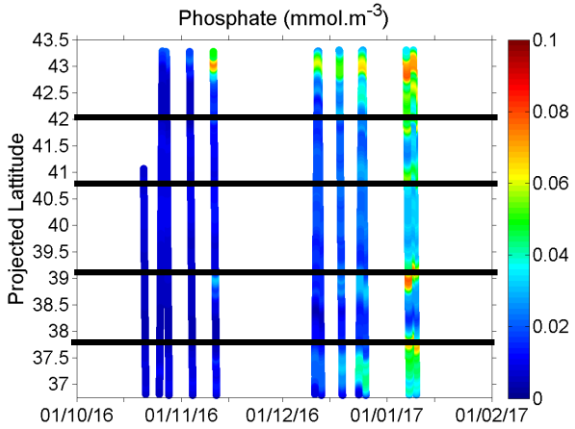
Marseille – Goulette (Tunis)







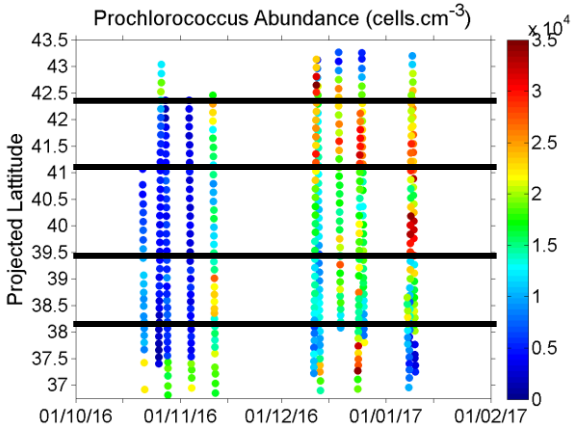


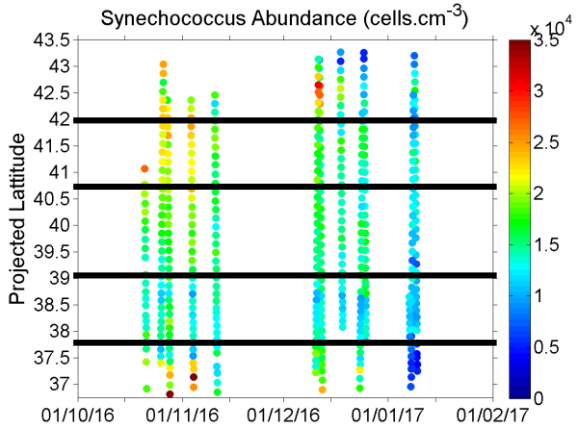


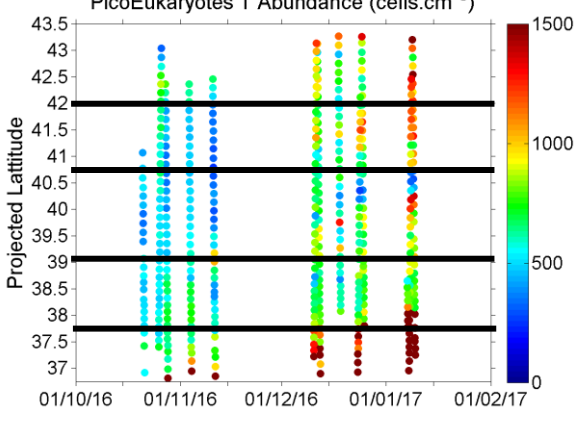
Division en 5 zones basée sur les observations (in-situ + modèle) et les connaissances de la zone.

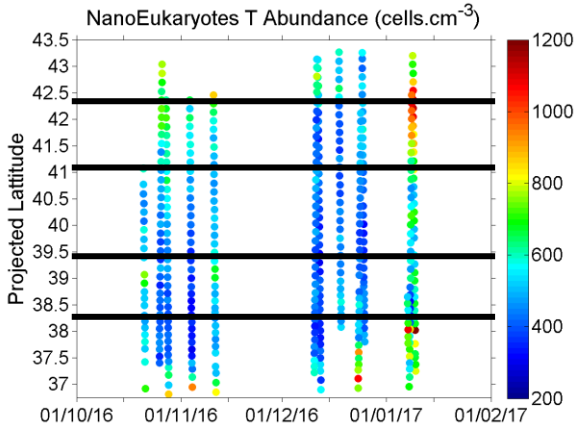
→ Méthode “Cervelle Marrec”

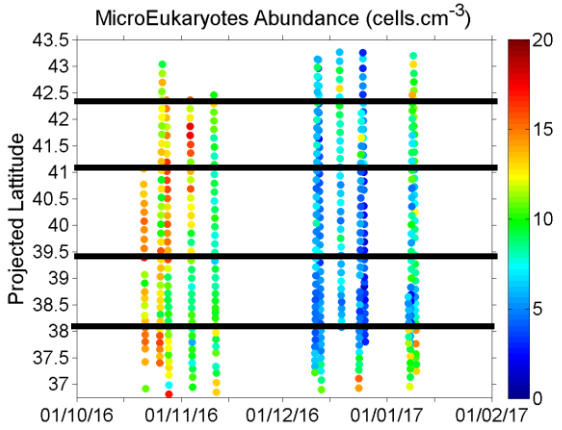
Marseille – Goulette (Tunis)







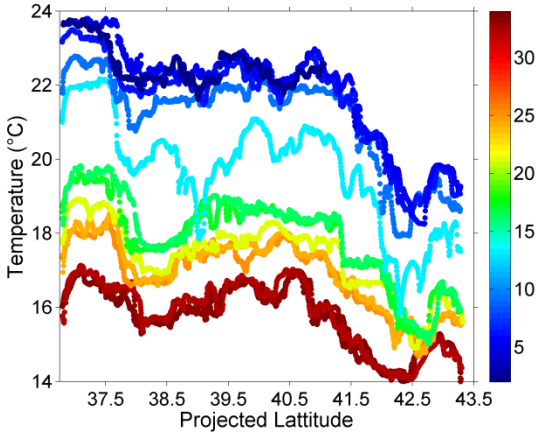


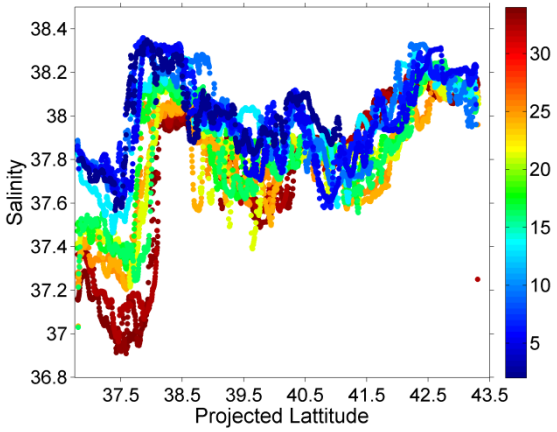


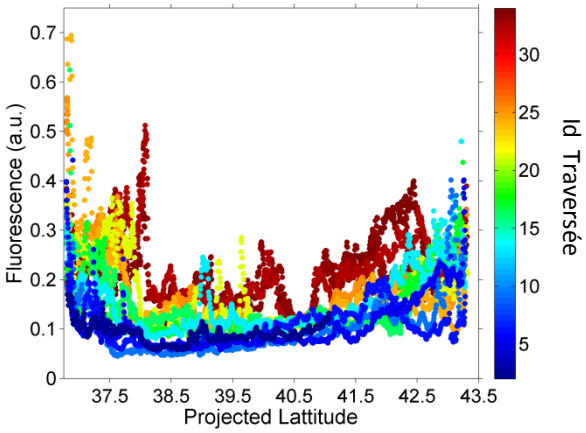
Lorsque appliquée aux abondances des 5 principaux groupes phytoplanctoniques, les patterns propres aux distributions plus difficiles à distinguer.

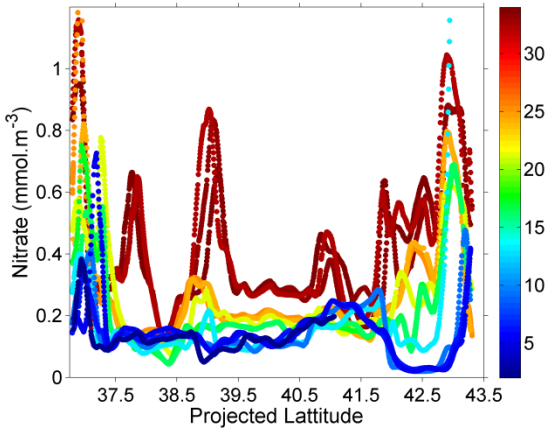
Marseille – Goulette (Tunis)

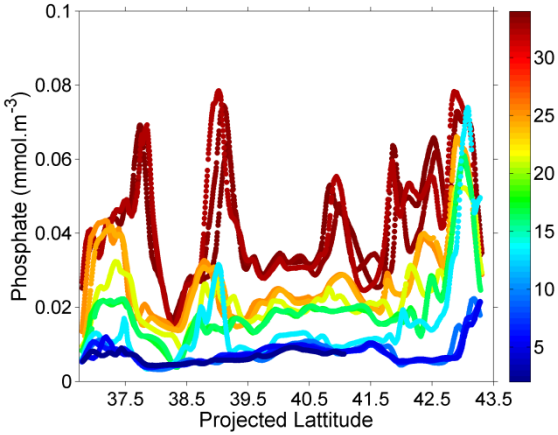
Avec un autre type de représentation graphique:









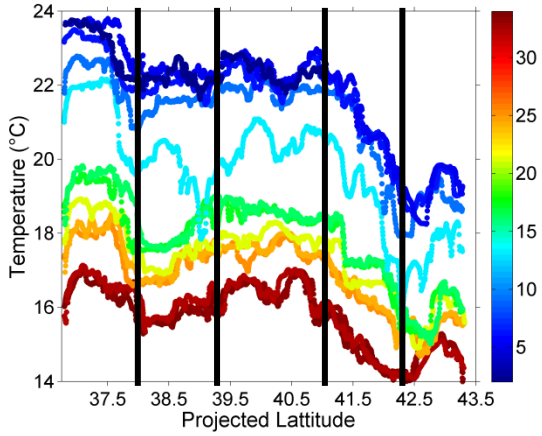


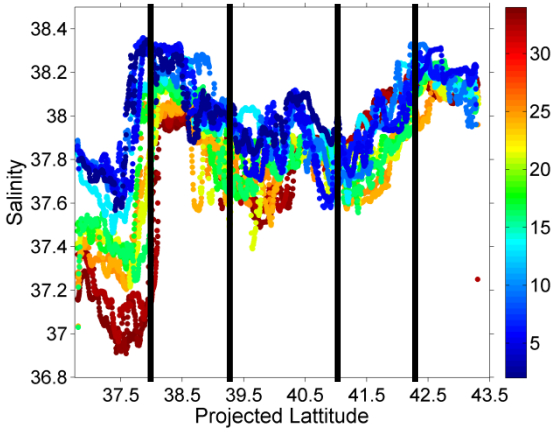
Jan. 2017

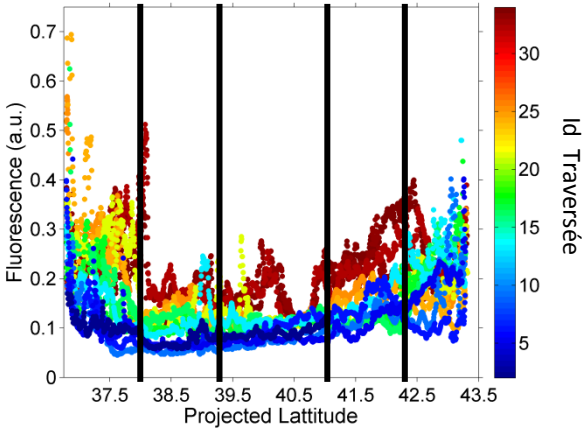
Oct. 2016

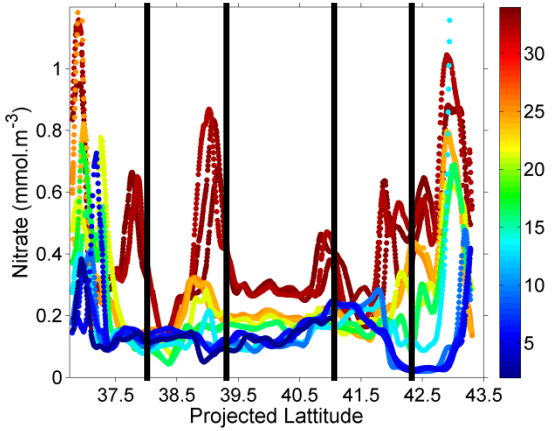
Marseille – Goulette (Tunis)

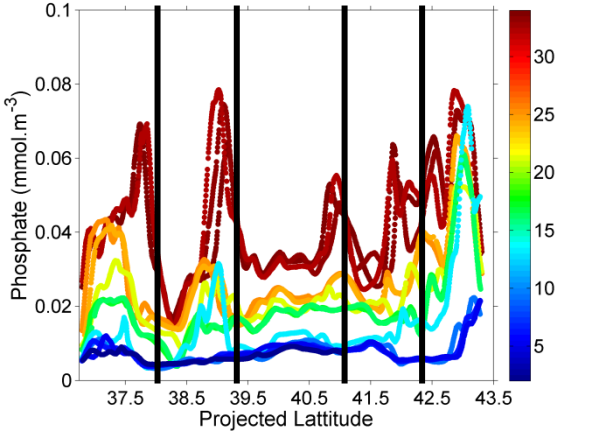
Et en superposant les délimitations précédement établies avec les données in-situ + modèle:

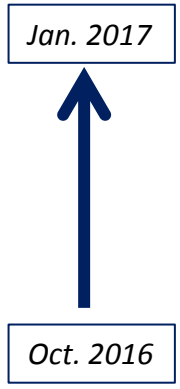






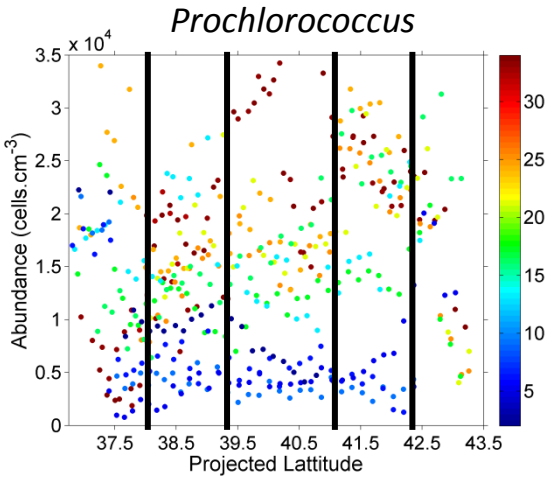


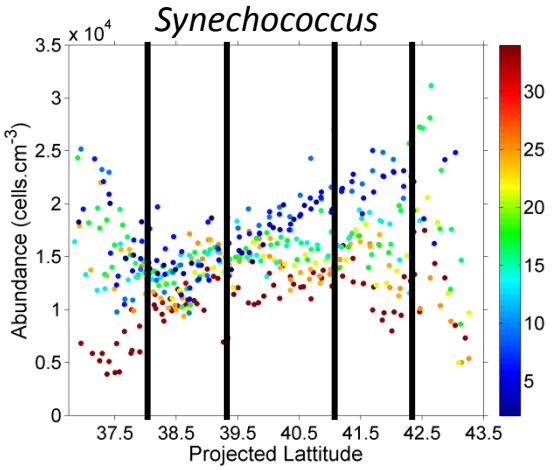


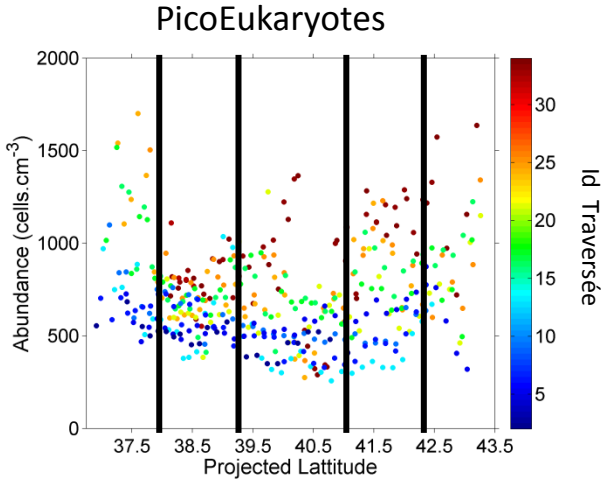


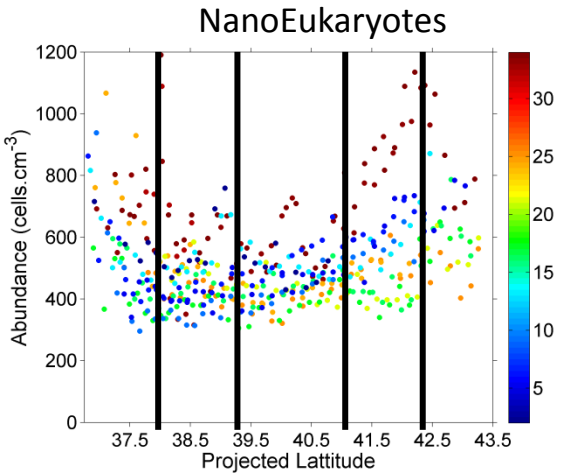
Marseille – Goulette (Tunis)

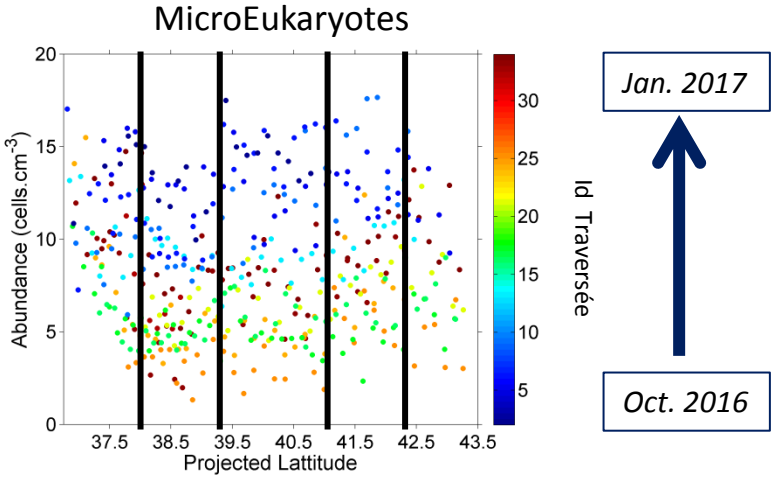
Et en superposant les délimitations précédement établies avec les abondances:











En résumé

- Il semble qu'il soit possible de séparer l'ensemble des traversées de chaque type (MAR-GOU & GEN-GOU) en plusieurs provinces hydrographiques en se basant sur les mesures in-situ de SST, SSS et Fluorescence (+ éventuellement les données extraites des modèles).

- GEN-GOU et MAR-GOU respectivement divisées en 4 et 5 zones en se basant sur les observations et mon point de vue personnel.
- →vérifier statistiquement ces nombres de division pour chaque type de trajet?

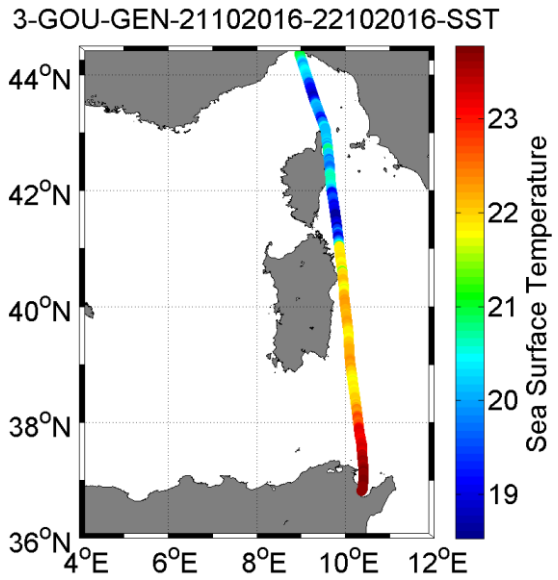
- Pour GEN-GOU, il semble que les délimitations ainsi effectuées soient cohérentes avec la distribution de certain groupes phytoplanctonnique (Pico & Nano).
- Moins évident sur MAR-GOU même si certains patterns semblent apparaitres (e.g. Pico & Nano).

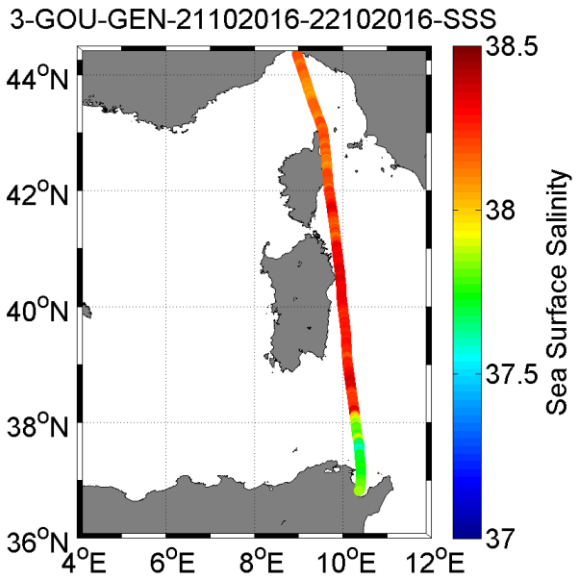
- Pour l'instant c'est essentiellement la variabilité spatialle qui est considérée. Quid de la variabilité temporelle?

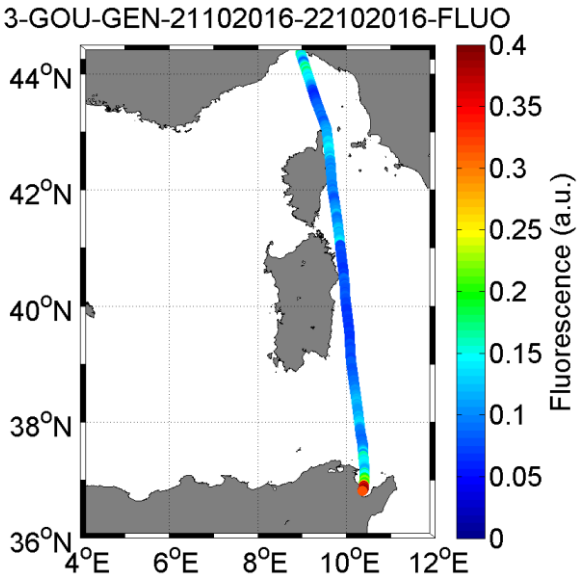
Test k-means contraint par la latitude – GEN-GOU

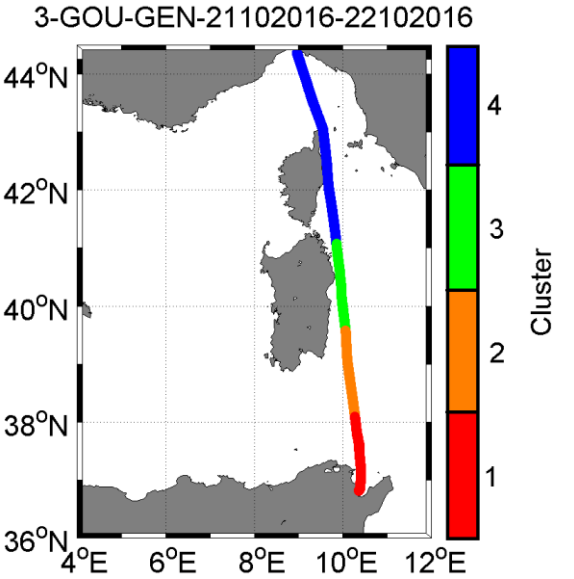
K-means = *f* (LAT, SST, SSS, FLUO)
K=4
Traversée par traversée.

En ayant conscience des limites de cette approche et de son non-sens statistiques.



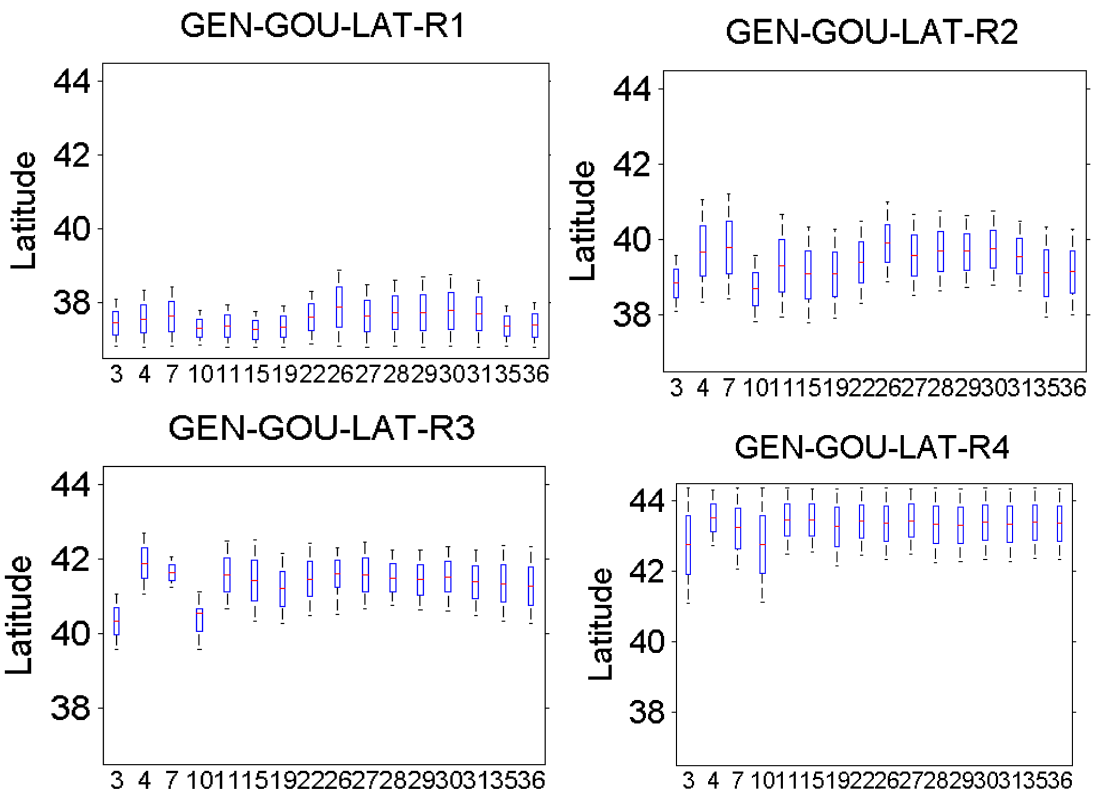




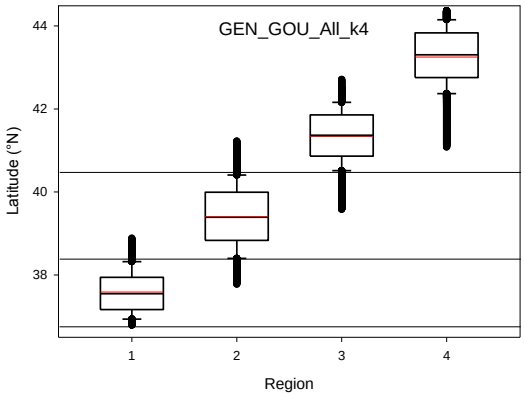


Test k-means contraint par la latitude – GEN-GOU

Variabilité des limites de chaque région au cours du temps, en terme de latitude.
(Crossing Id en abcisse = Oct. 2016 → Jan. 2017)

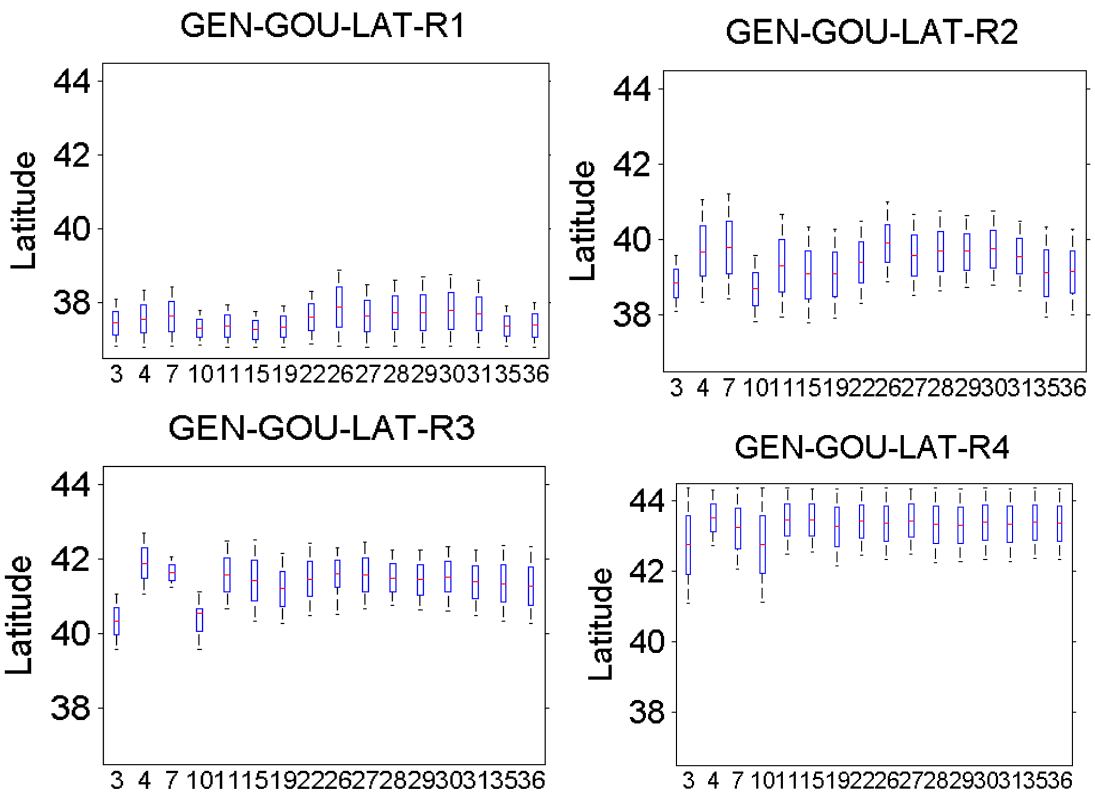


Ditributions des latitudes de chaque région en rassemblant toutes les latitudes de chaque traversée.

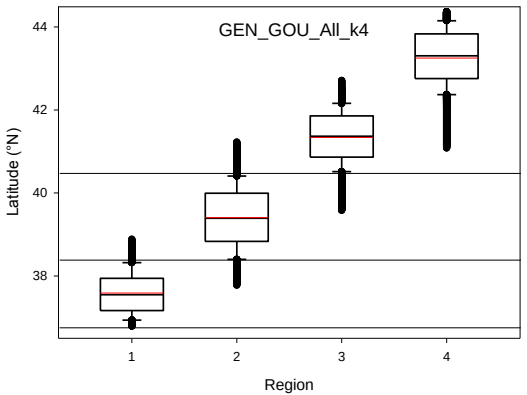


Test k-means contraint par la latitude – GEN-GOU

Variabilité des limites de chaque région au cours du temps, en terme de latitude.
(Crossing Id en abcisse = Oct. 2016 → Jan. 2017)



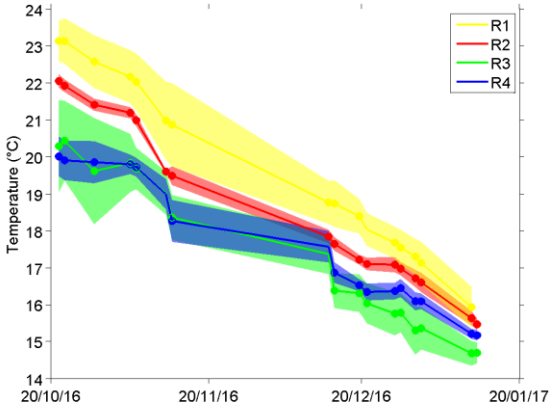
Ditributions des latitudes de chaque région en rassemblant toutes les latitudes de chaque traversée.



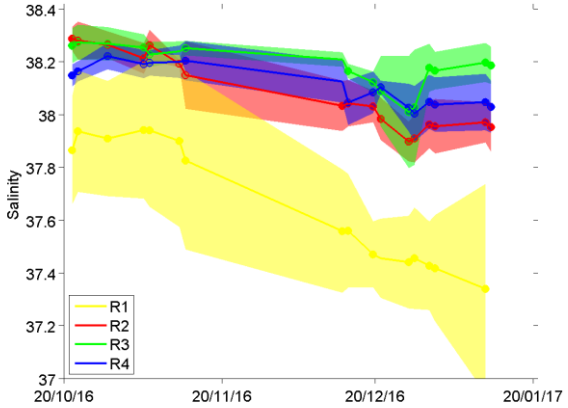
Les délimitations moyennes ainsi obtenues sont semblable à celles basées sur les observations.

Test k-means contraint par la latitude – GEN-GOU

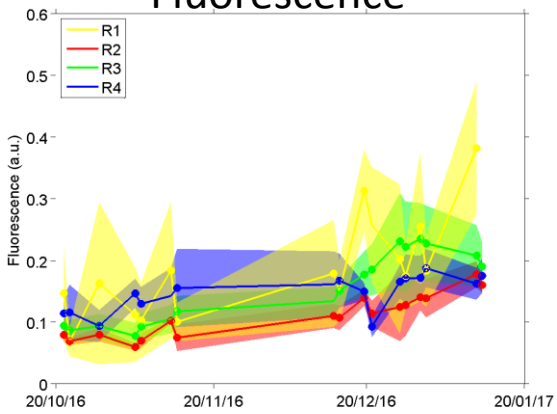
SST



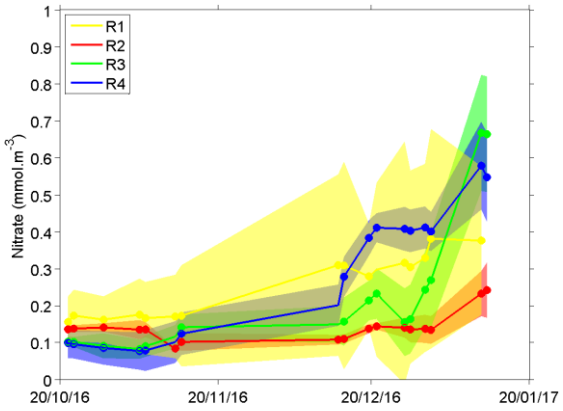
SSS



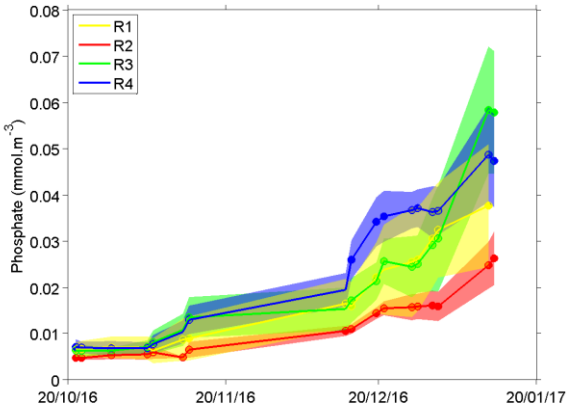
Fluorescence



Nitrate

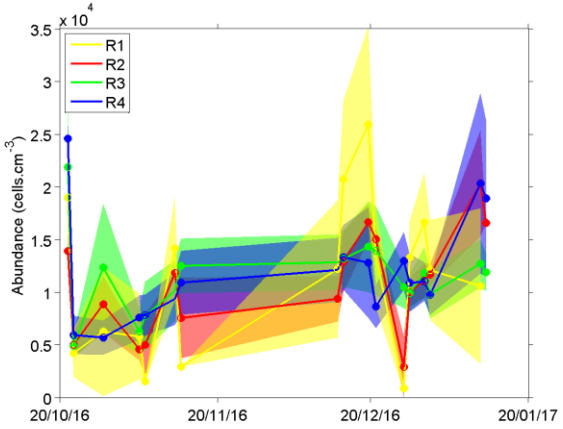


Phosphate

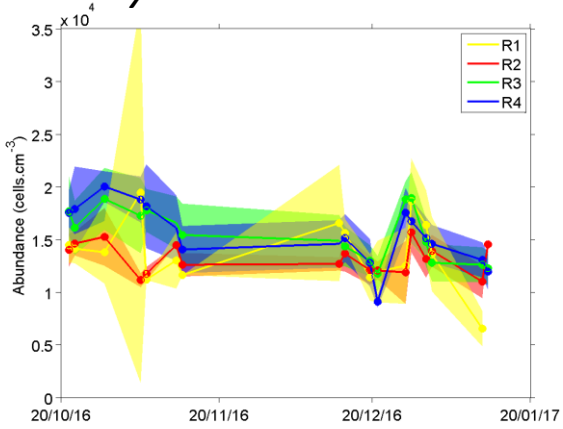


Test k-means contraint par la latitude – GEN-GOU

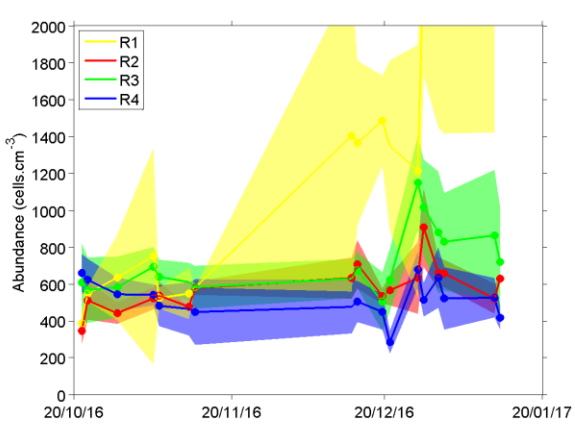
Prochlorococcus



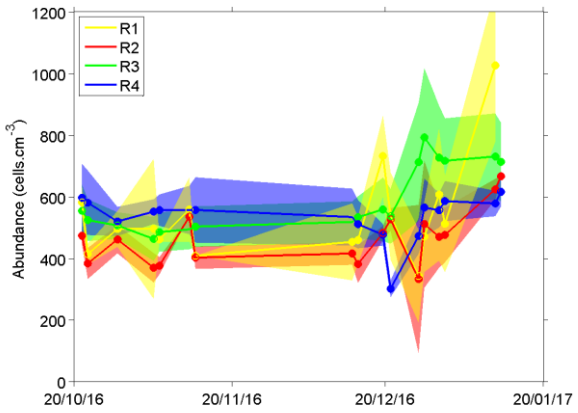
Synechococcus



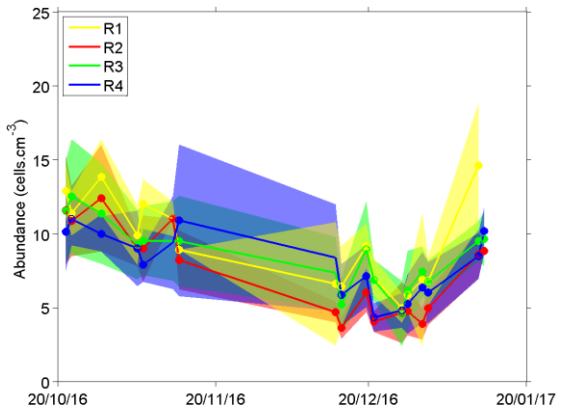
Pico



Nano

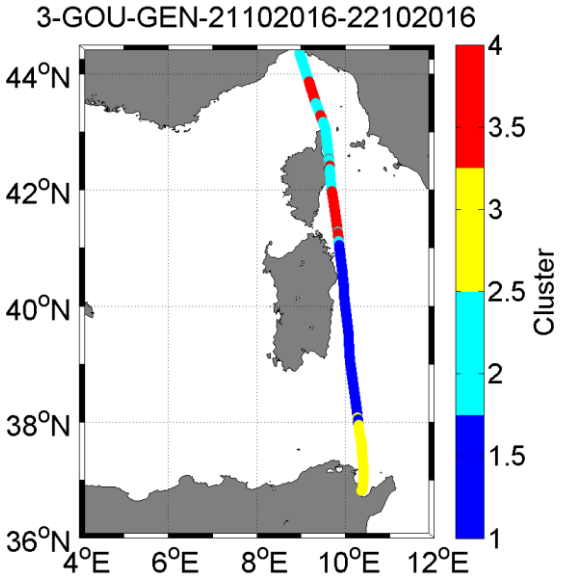


Micro

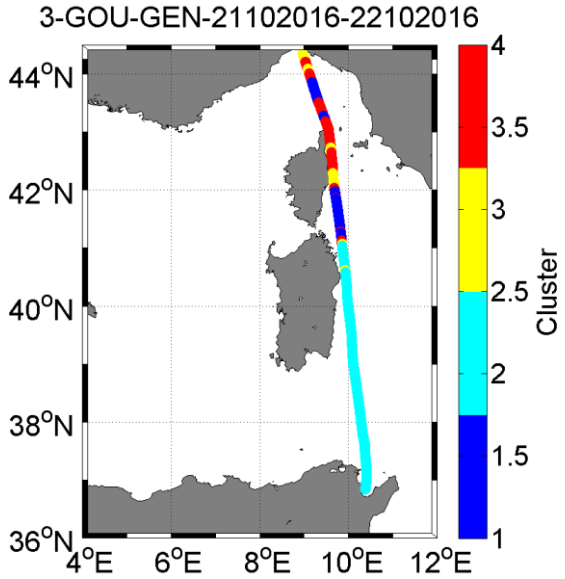


Test k-means sans la latitude – GEN-GOU

K-means = *f* (SST, SSS, FLUO)
K=4
Traversée par traversée.

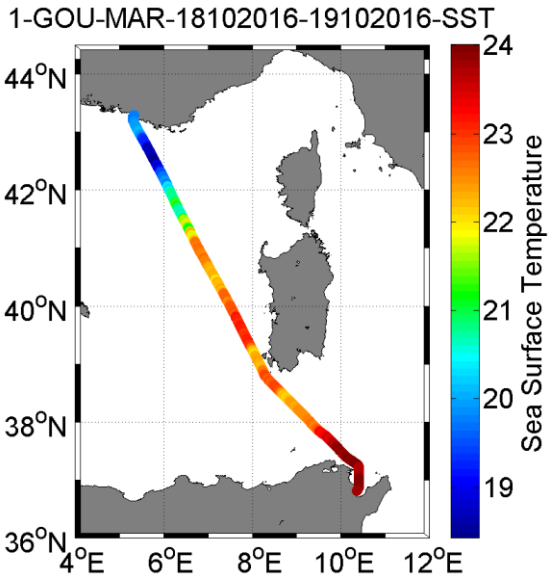


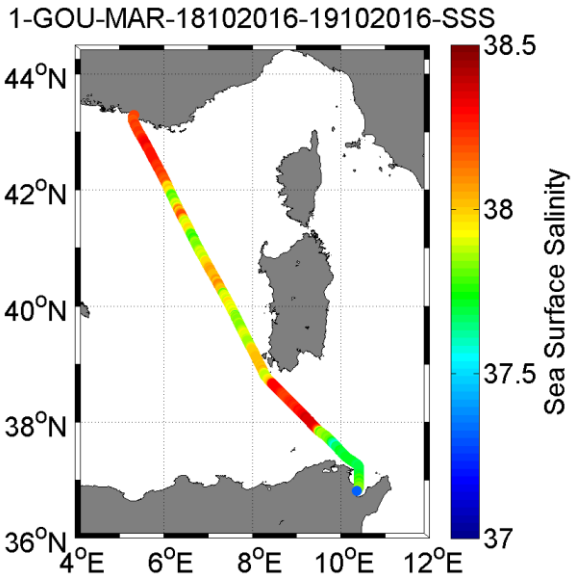
K-means = *f* (SST, SSS, FLUO, NO3, PO4)
K=4
Traversée par traversée.

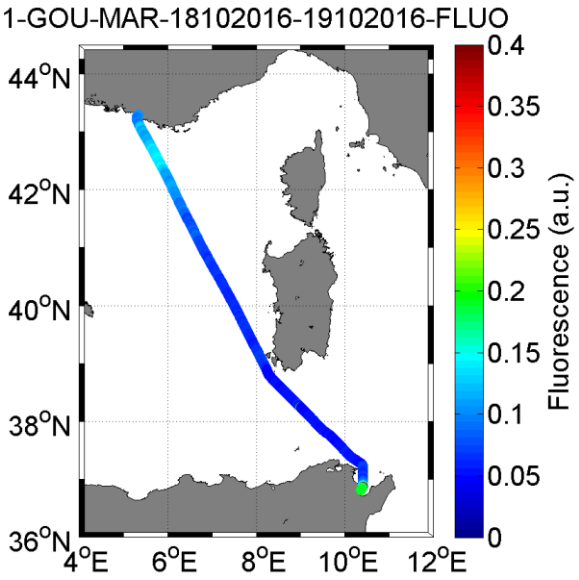


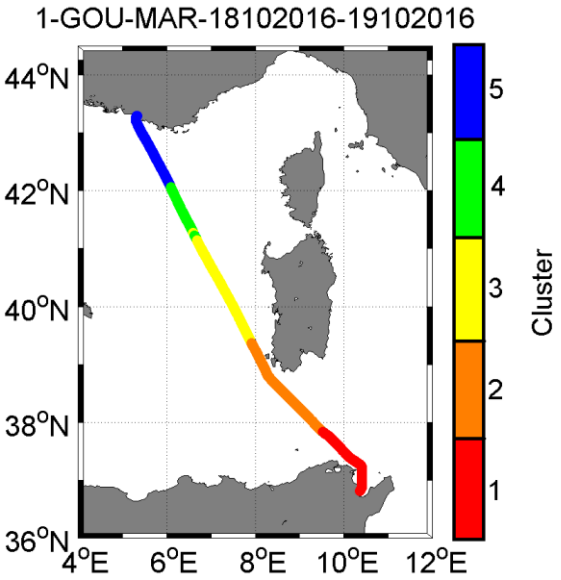
Test k-means contraint par la latitude – MAR-GOU

K-means = *f* (LAT, SST, SSS, FLUO)
K=5
Traversée par traversée.



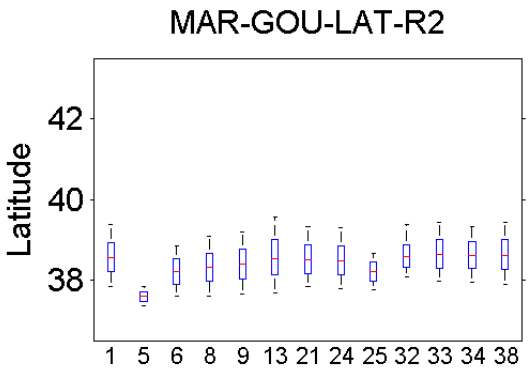


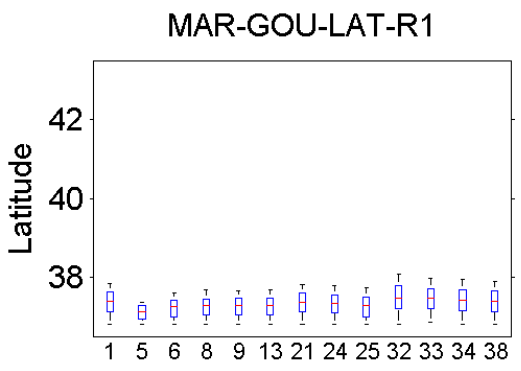


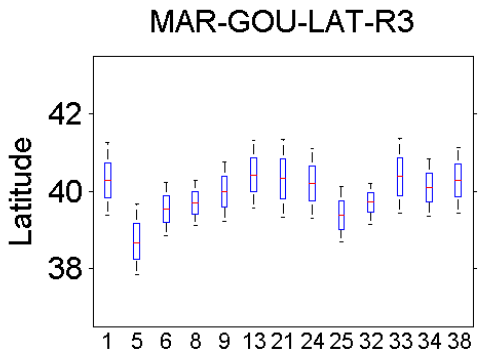


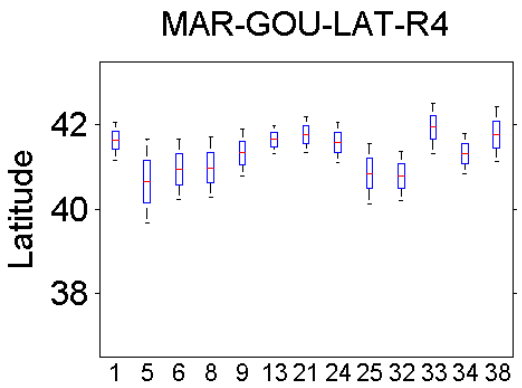
Test k-means contraint par la latitude – MAR-GOU

Variabilité des limites de chaque région au cours du temps, en terme de latitude.
(Crossing Id en abcisse = Oct. 2016 → Jan. 2017)

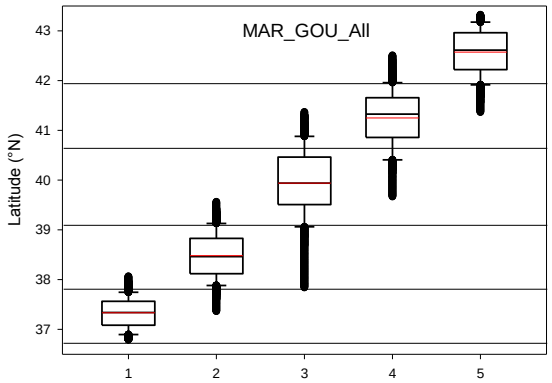


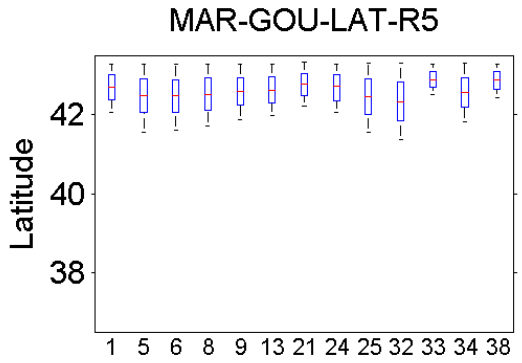






Ditributions des latitudes de chaque région en rassemblant toutes les latitudes de chaque traversée.

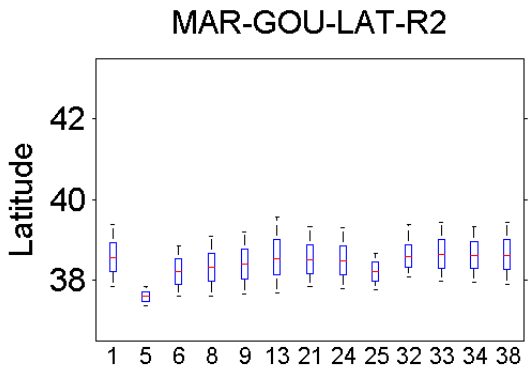


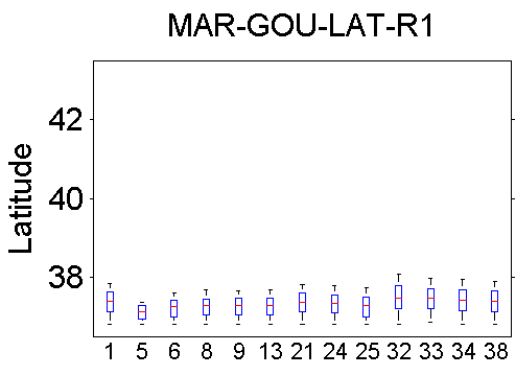


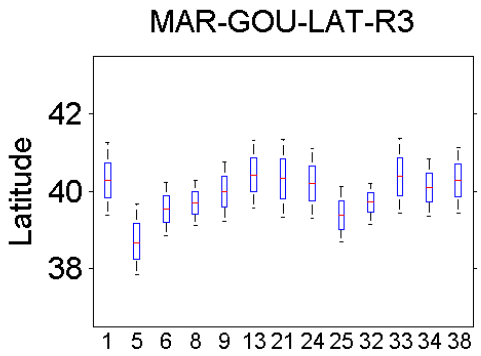
Test k-means contraint par la latitude – MAR-GOU

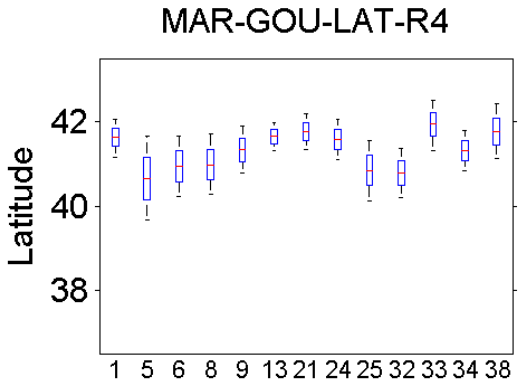
Variabilité des limites de chaque région au cours du temps, en terme de latitude.
(Crossing Id en abcisse = Oct. 2016 → Jan. 2017)

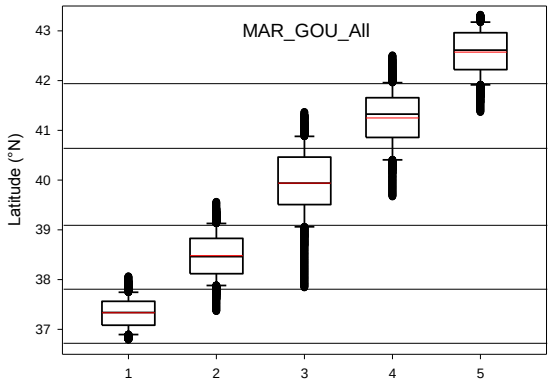
Les délimitations moyennes ainsi obtenues sont semblable à celles basées sur les observations.

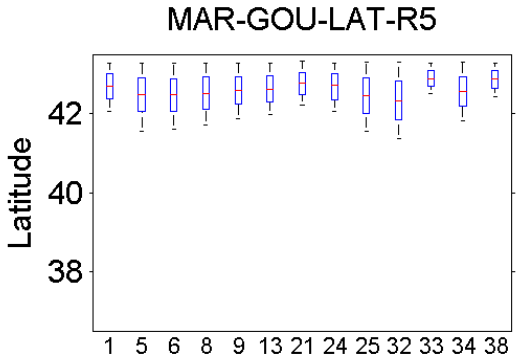






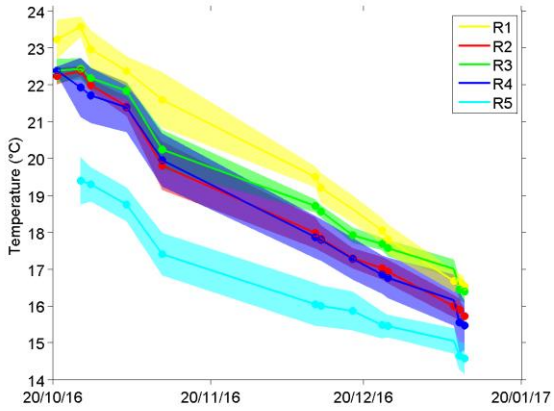




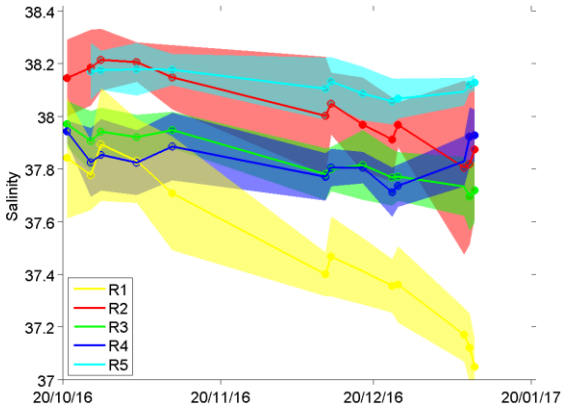


Test k-means contraint par la latitude – MAR-GOU

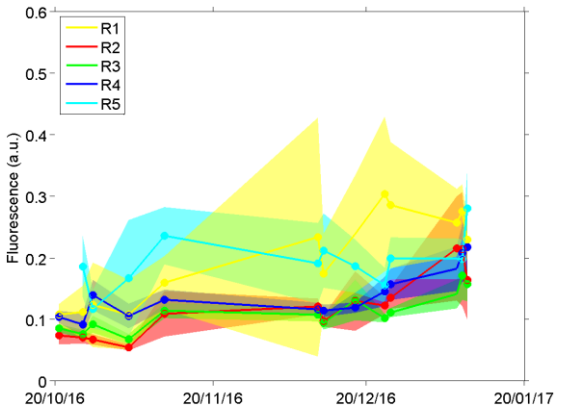
SST



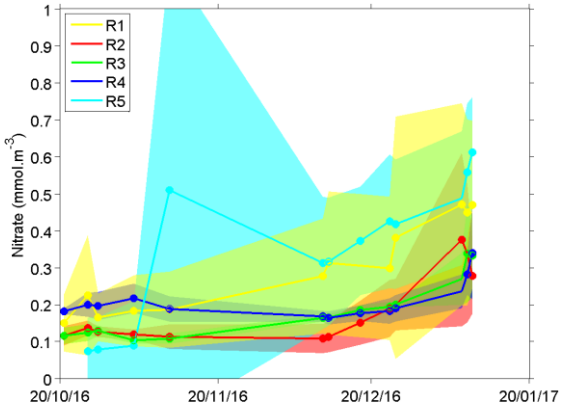
SSS



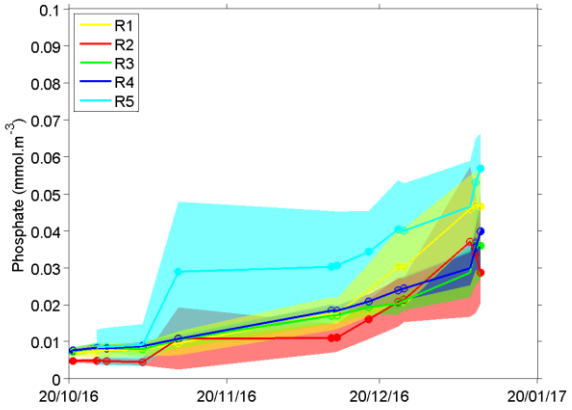
Fluorescence



Nitrate

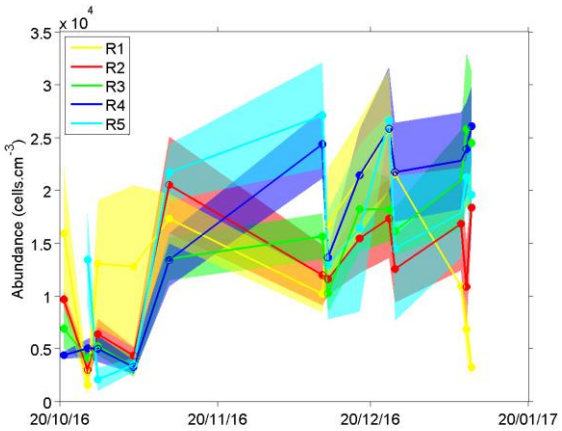


Phosphate

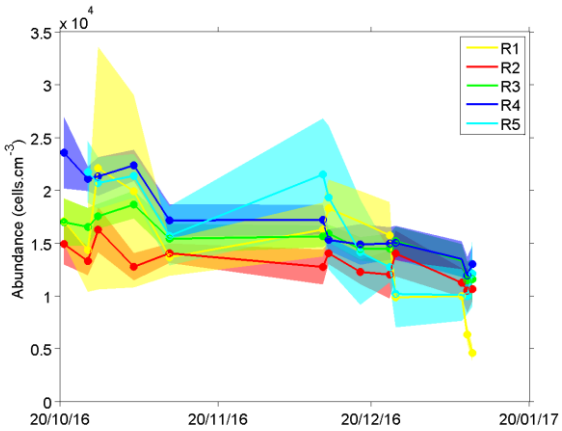


Test k-means contraint par la latitude – MAR-GOU

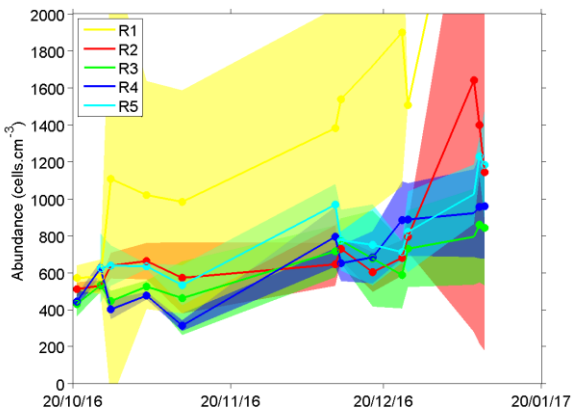
Prochlorococcus



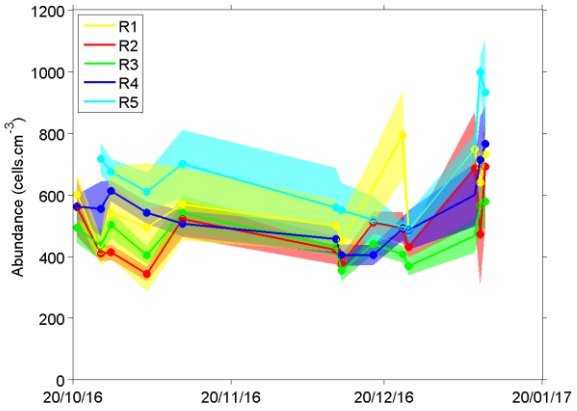
Synechococcus



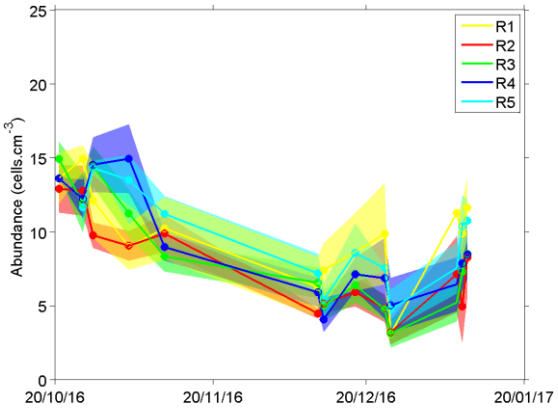
Pico



Nano

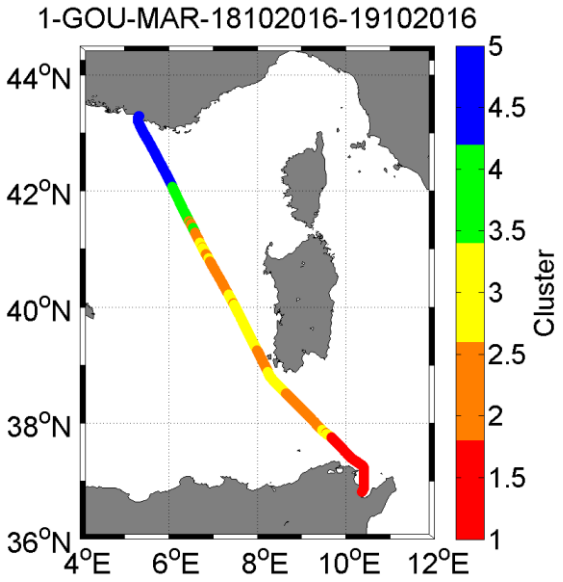


Micro

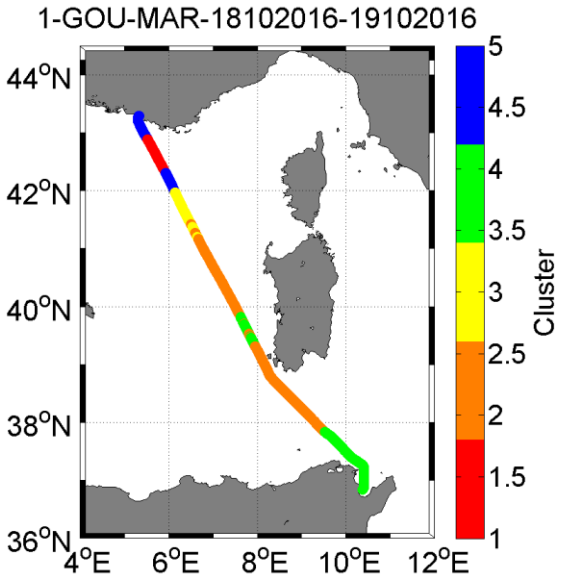


Test k-means sans la latitude – MAR-GOU

K-means = *f* (SST, SSS, FLUO)
K=5
Traversée par traversée.



K-means = *f* (SST, SSS, FLUO, NO3, PO4)
K=5
Traversée par traversée.



Conclusion

- C’est un premier aperçu des résultats obtenus durant le projet CHROME.
- Afin d’étudier plus facilement ce gros set de données étendu tant spatialement que temporellement, ça peut être judicieux de diviser notre zone d’étude en différentes provinces hydrographiques.
- De telles provinces semblent apparaître avec une délimitation basée sur la latitude.
- Un clustering de type k-means pourrait être une des solutions à adopter.
- Cependant, sans contraindre ce clustering sans le forcer par la latitude les résultats sont assez hétérogènes et ne vont pas vraiment dans le sens de mes observations initiales.
- De plus il reste à justifier statistiquement en combien de zones diviser notre zone d’étude.
- D’autres analyses multivariées semblent nécessaire à effectuer (AFC, ACM, …).
- Etant loin d’être un expert en statistiques, un regard extérieur est plus que le bienvenu. Ces premiers résultats devraient vous permettre de mieux appréhender le set de données obtenu lors du projet CHROME.