MERCATOR OCEAN
OCEAN FORECASTERS

Evaluation de la configuration globale Mercator Océan à partir des données Bio-Argo

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COPERNICUS
MARINE ENVIRONMENT MONITORING SERVICE

European Union Programme

Copernicus
Europe's eyes on Earth

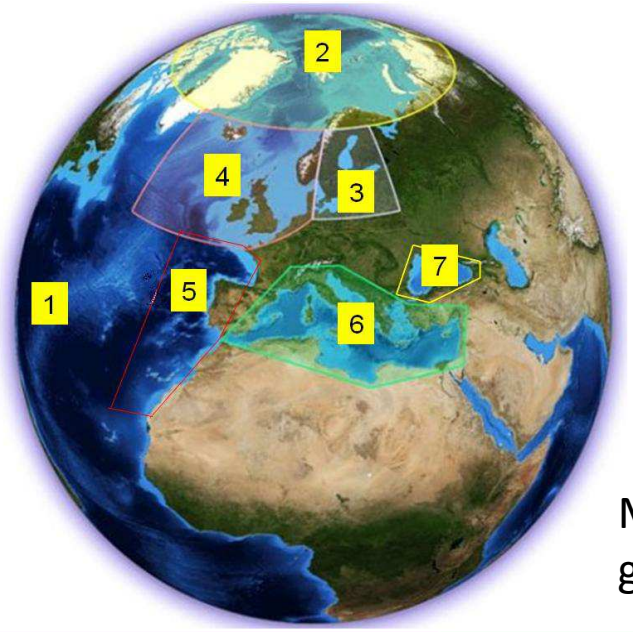
MERCATOR OCEAN
OCEAN FORECASTERS
Entrusted entity by mandate of the European Commission

Copernicus Marine Service

Programme Européen
d'Observation et de Surveillance de la Terre

Copernicus Marine Service coordonné par Mercator Ocean

Mission: décrire l'état physique et biogéochimique de tous les océans du globe en surface comme en profondeur



→ Observations satellites et in-situ

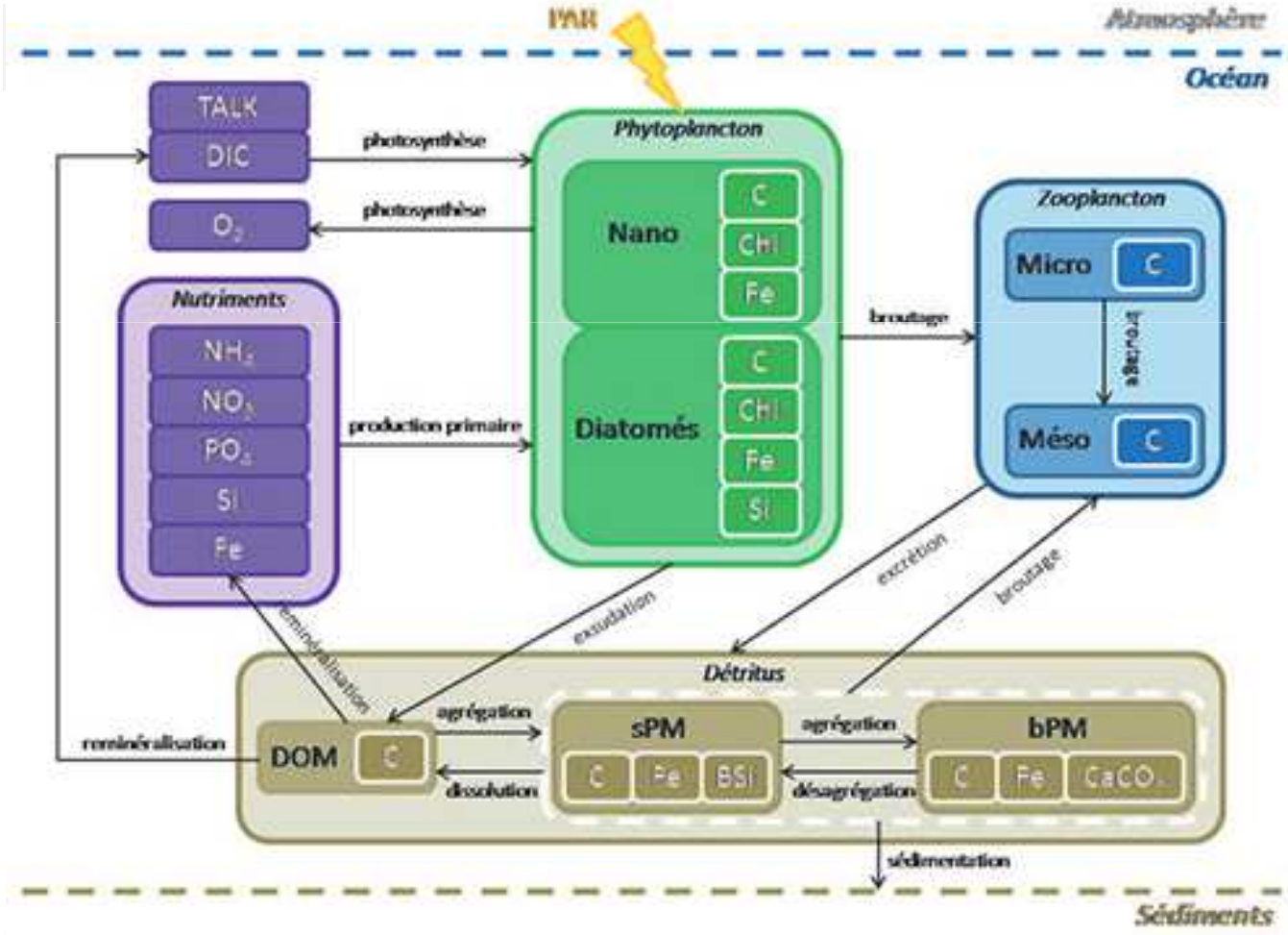
→ Simulations interannuelles et temps réel

Océan découpé : océan global
+ 6 mers européennes

Mercator Ocean : en charge des simulations de l'océan global

Le modèle de biogéochimie

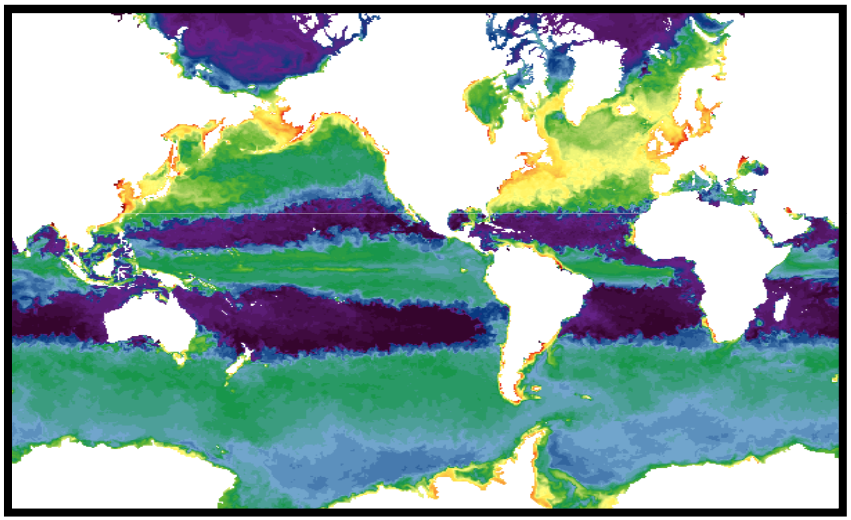
PISCES



- 24 variables pronostiques
- Modèle Redfieldien (C/N/P contant)
- rapports C/Chl, C/Fe, C/Si variables
- Pas de rétroaction de PISCES vers OPA-NEMO

La simulation Globale ¼°

Mercator-Vert
Green Grog



GLOBAL
¼°

Simulation BIOMER

- NEMO3.2
- **Résolution spatiale: ¼°**
- **50 niveaux verticaux** (de 1m à la surface à 450m au fond)
- **Conditions initiales: WOA et GLODAP**
- **2007 → temps réel**
- Couplage « offline » entre OPA-NEMO et PISCES
- **Forçage océanique: PSY3 ¼° journalier**

avec assimilation de données SST, SLA et in situ T et S

- Forçages atmosphériques: analyses opérationnelles ECMWF bulk CORE
- Carbone anthropique (Masarie and Tans, 1995)
- **Sorties: moyennes hebdomadaires (hindcast, nowcast, forecast)**

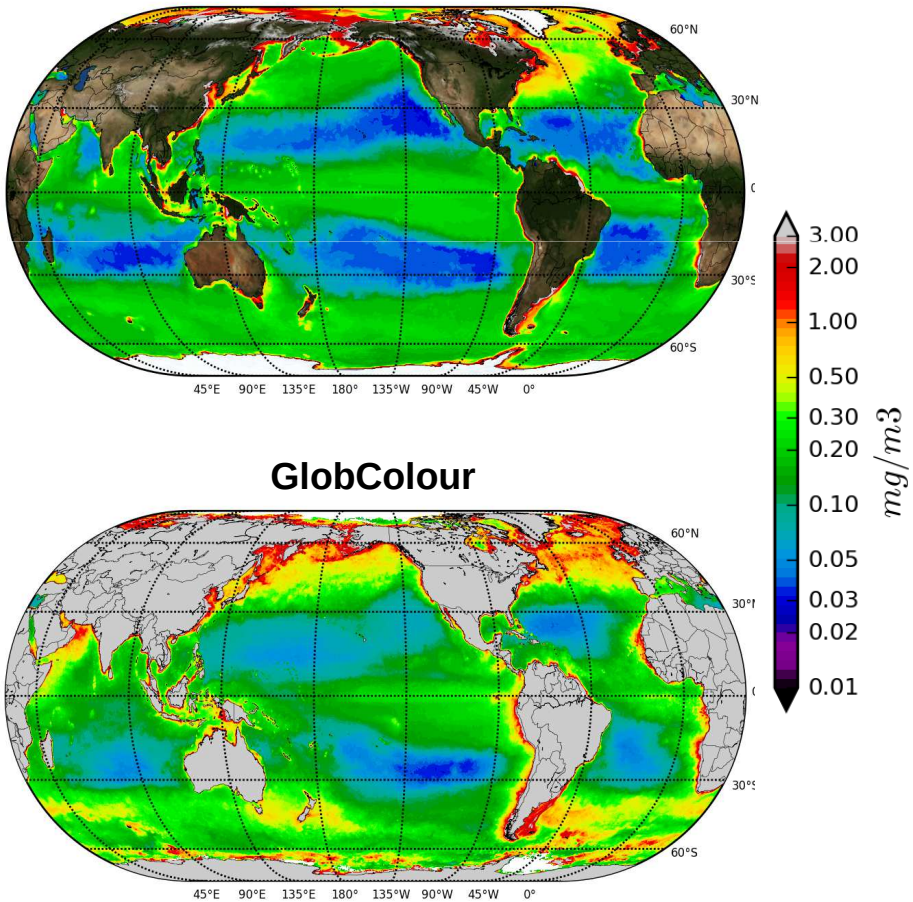
Comparaison à Bio-Argo:
de 01/2012 à 08/2016

La simulation Globale ¼°

Moyenne annuelle de surface pour l'année 2015

Chlorophylle (mg Chl m^{-3})

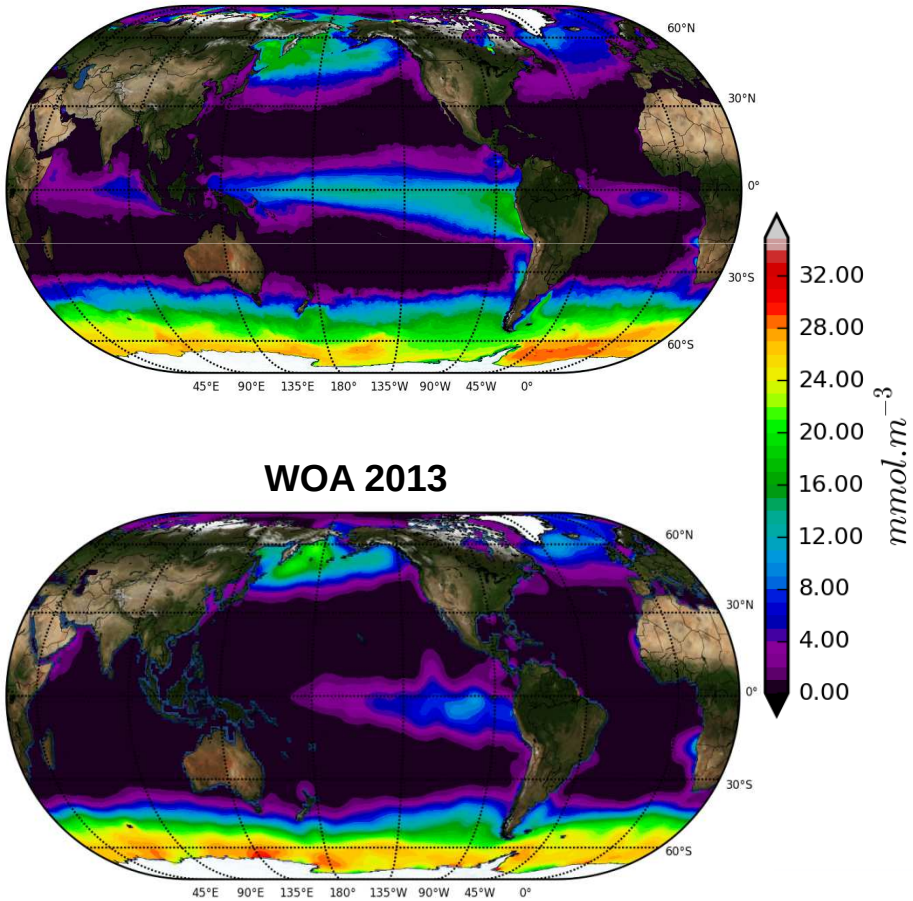
BIOMER



GlobColour

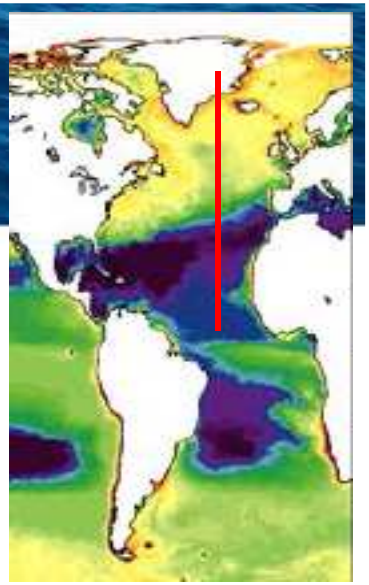
Nitrate (mmol N m^{-3})

BIOMER



WOA 2013

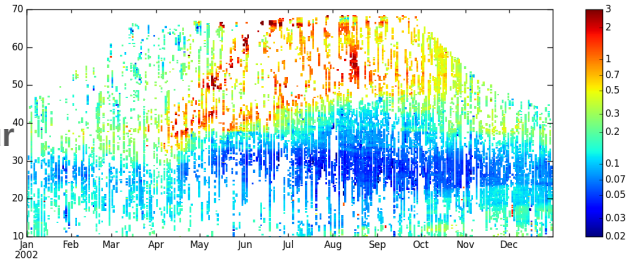
La simulation Globale ¼°



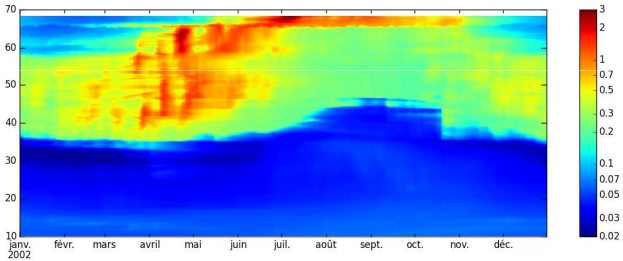
Cycle saisonnier de l'Atlantique Nord

2002

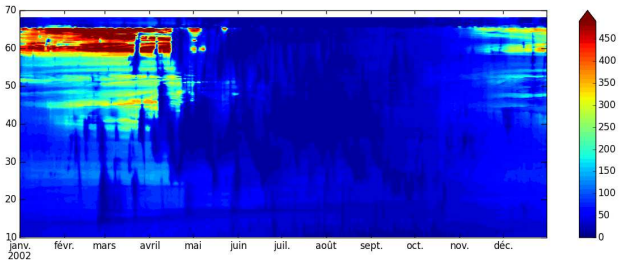
Choro Globcolour Daily



Chloro Model Daily



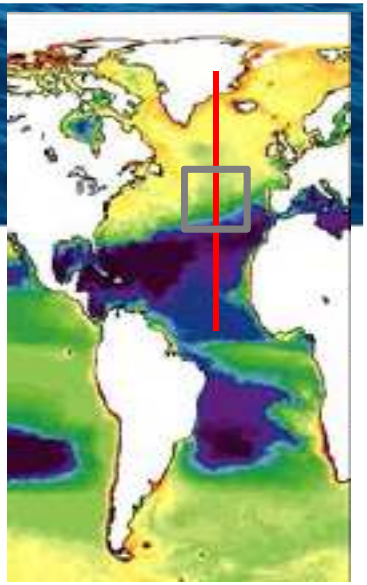
MLD Model Daily



Cycle saisonnier :

- Bloom principal au printemps lorsque la MLD remonte (limitation par la lumière)
- Restratification: processus non continu, succession de restratification / approfondissements → le phytoplancton réagit instantanément
- En été, MLD très peu profonde, faible production primaire
- Bloom secondaire en automne, lorsque la MLD s'approfondie (limitation par les nutriments)

La simulation Globale ¼°



Cycle saisonnier de l'Atlantique Nord

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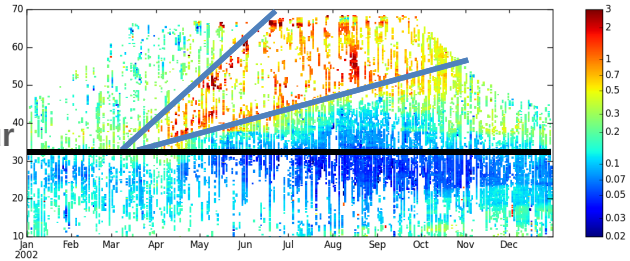
Choro Globcolour Daily



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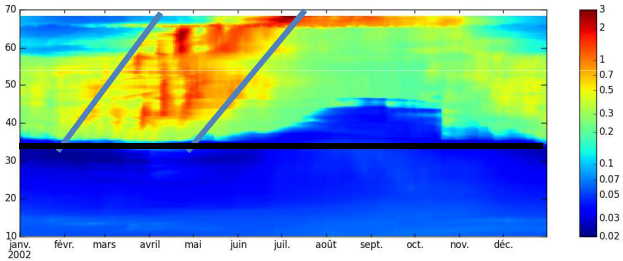
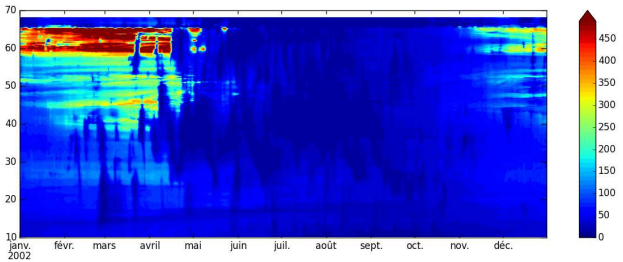


MLD Model Daily

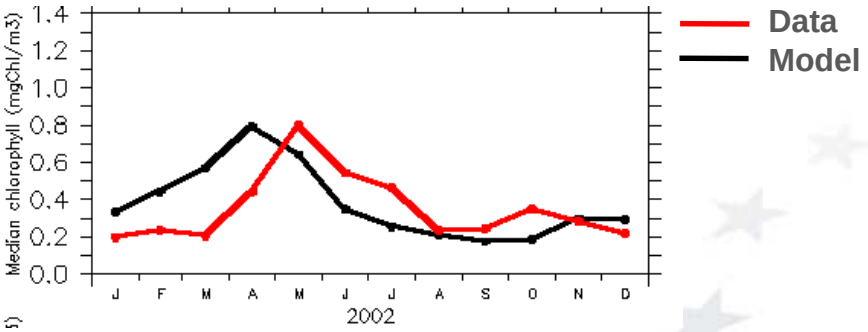


Dans le modèle :

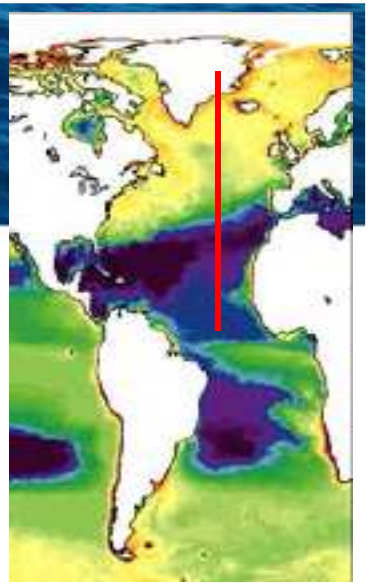
- Trop peu de chlorophylle dans le gyre oligotrophe

- Le bloom - démarre trop tôt (1 mois en avance)
  - se propage trop vite vers les hautes latitudes
  - ne persiste pas assez en été

Médiane - 2002

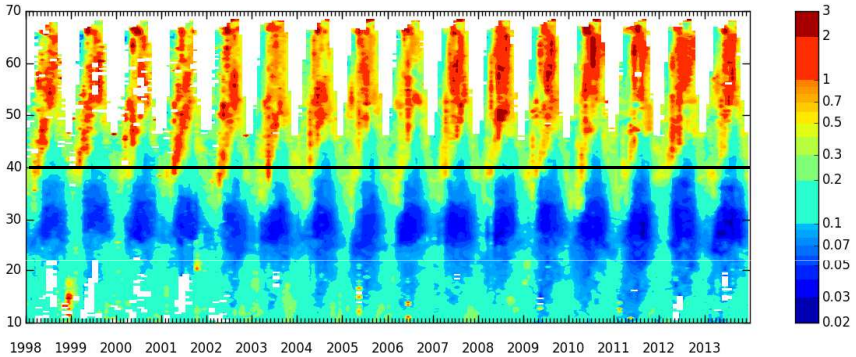


La simulation Globale ¼°



Variabilité interannuelle du bloom de l'Atlantique Nord

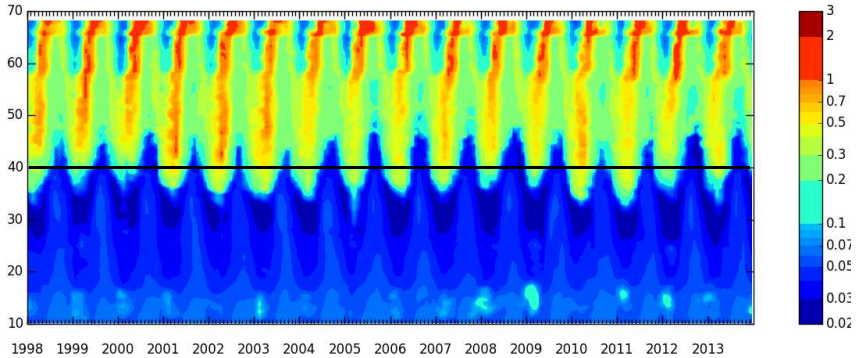
Chloro Globcolour Monthly

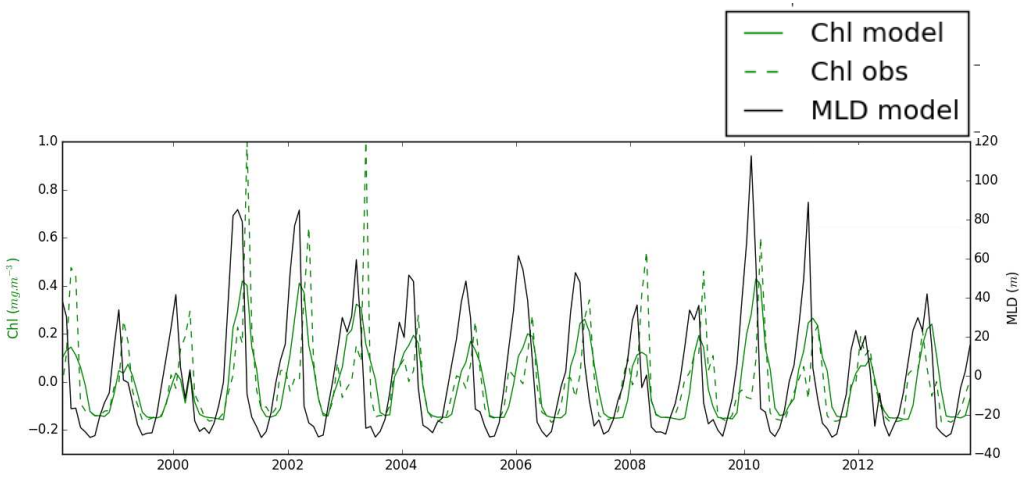


- Forte variabilité interannuelle
- Démarrage + au Sud en:
  2001-2002
  2010-2011

→ dû à la variabilité dans l'approfondissement de la MLD en hiver

Chloro Model Monthly

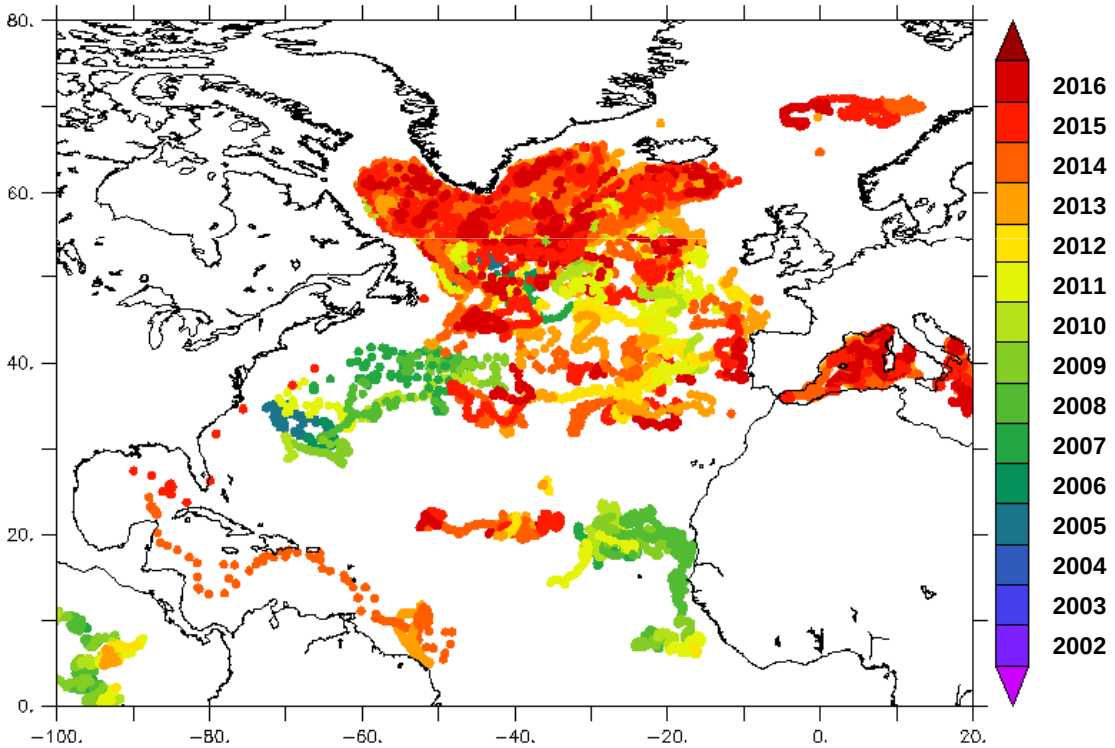




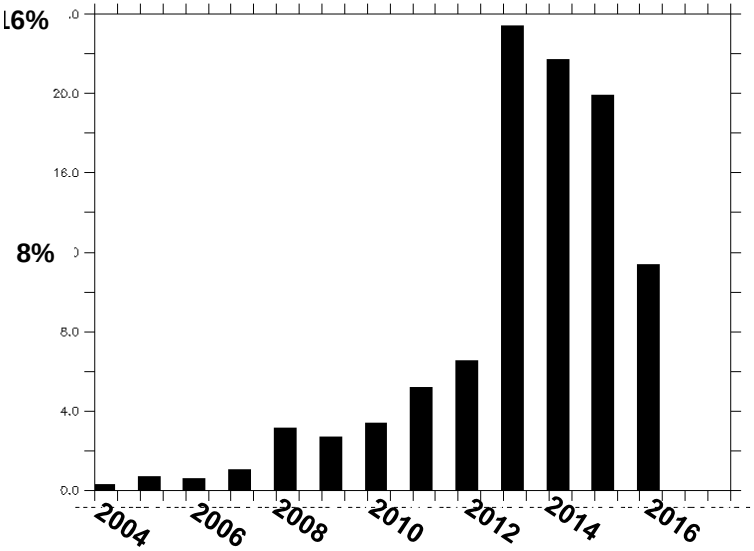
Données Bio-Argo

Atlantique Nord

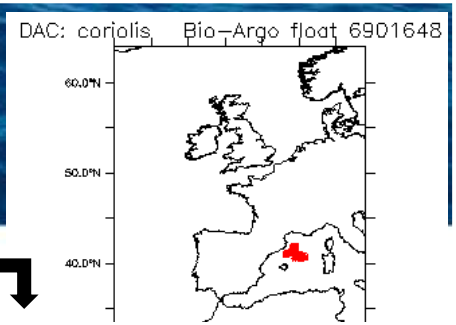
Position et Années des profils



Répartition temporelle (%) des profils verticaux pour le Global

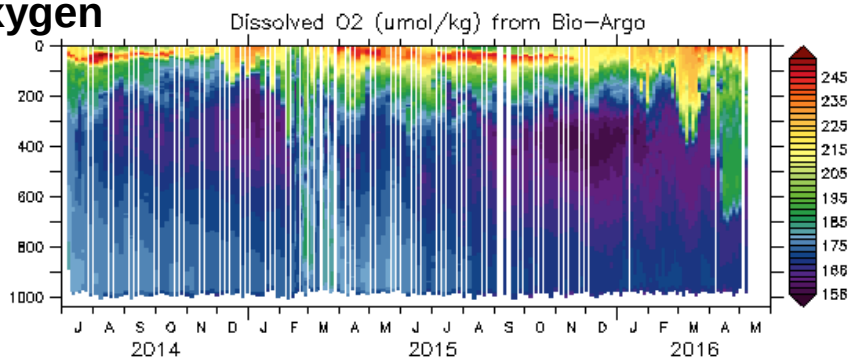


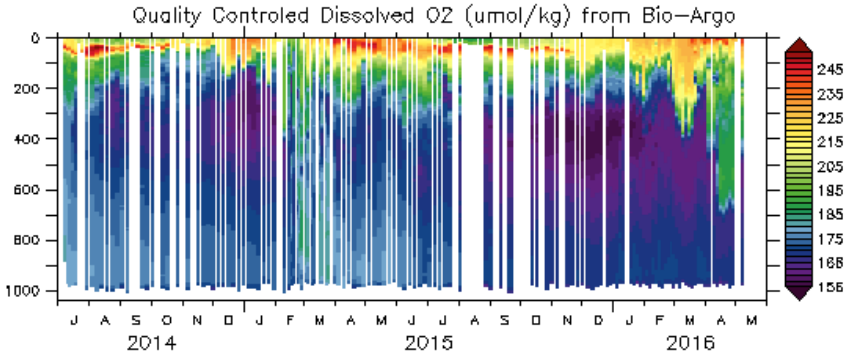
Données Bio-Argo



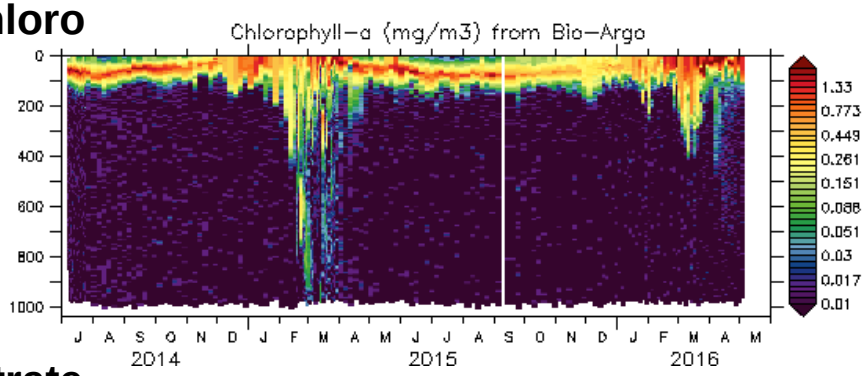
Après Contrôle Qualité

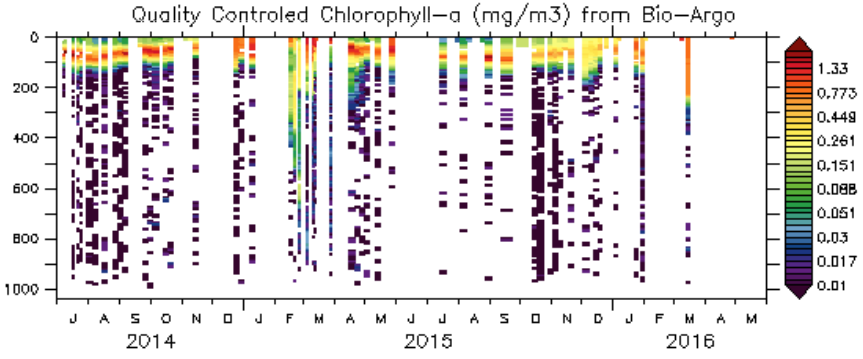
Oxygen



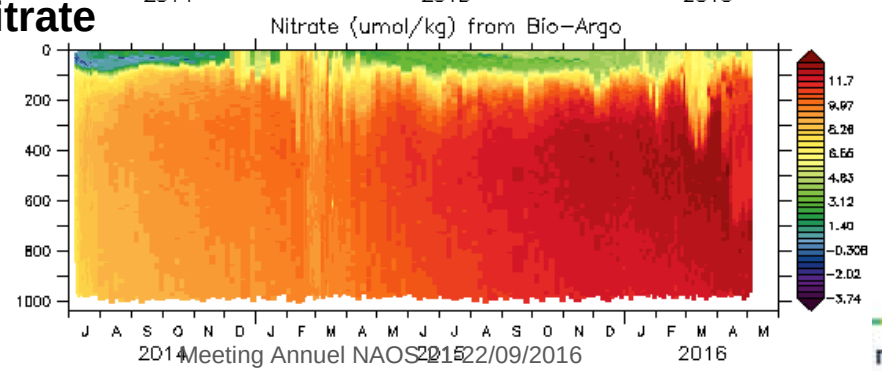


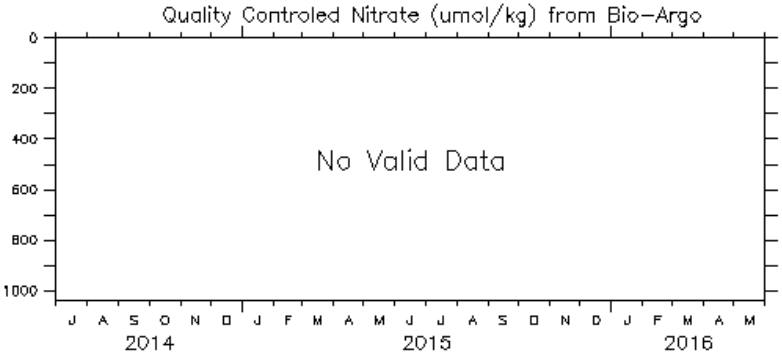
Chloro



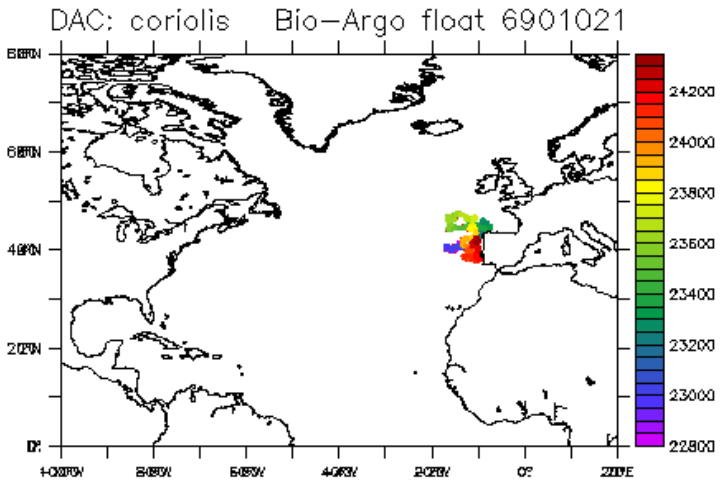


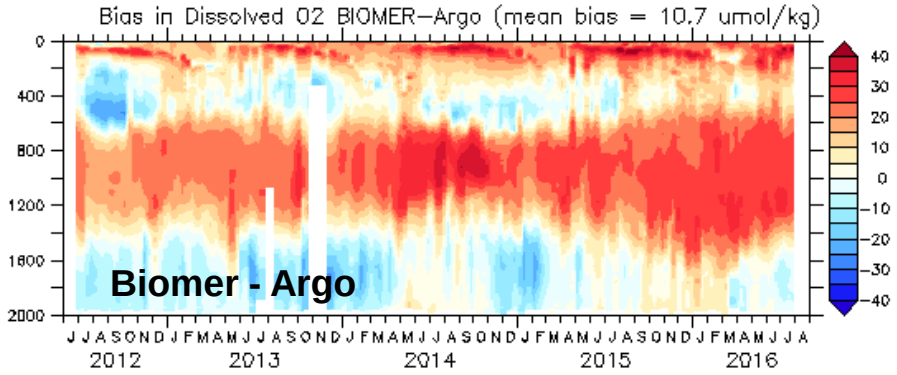
Nitrate

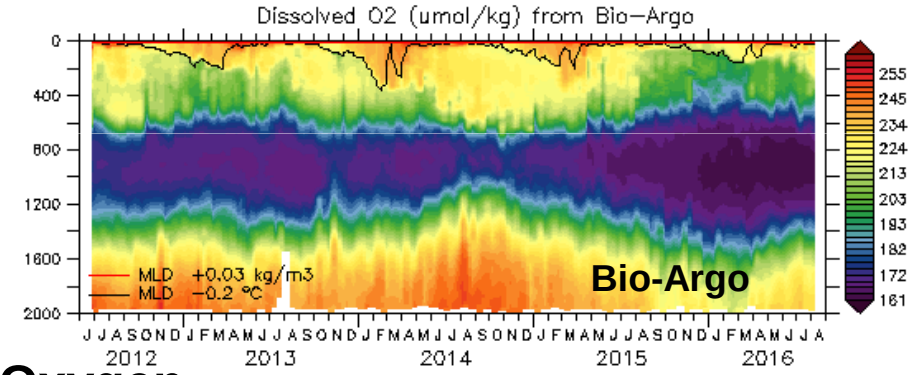




ıparaison ARGO vs BIOMER







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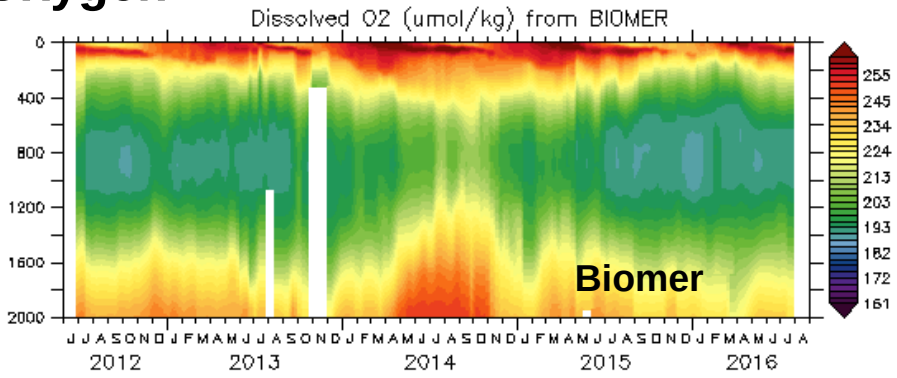

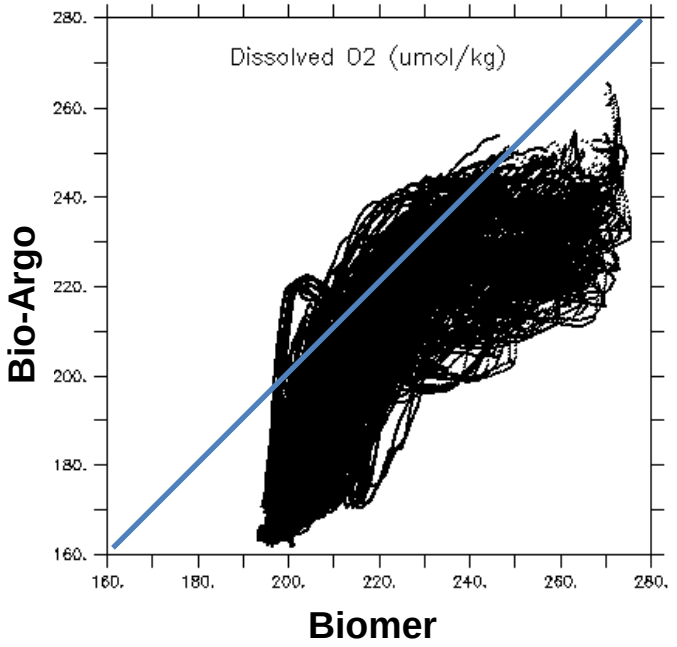

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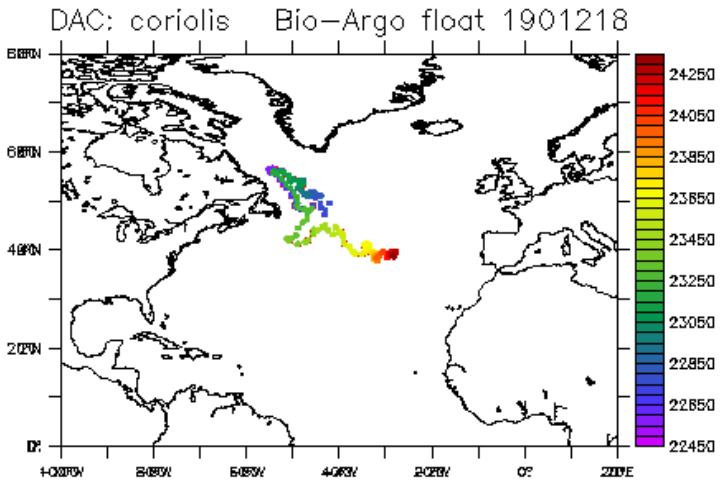

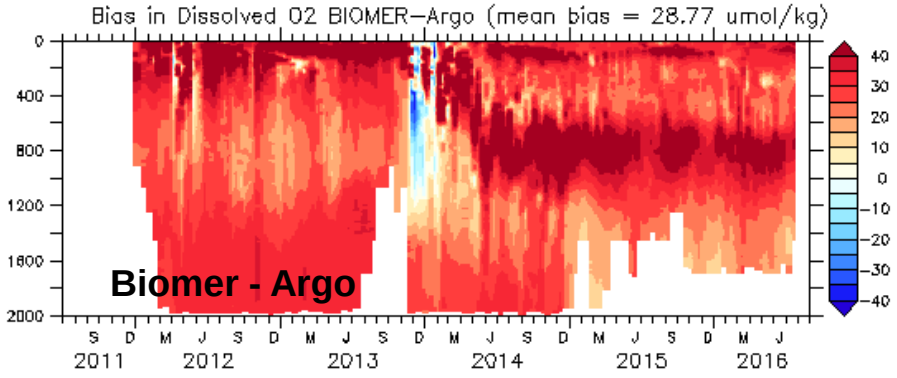

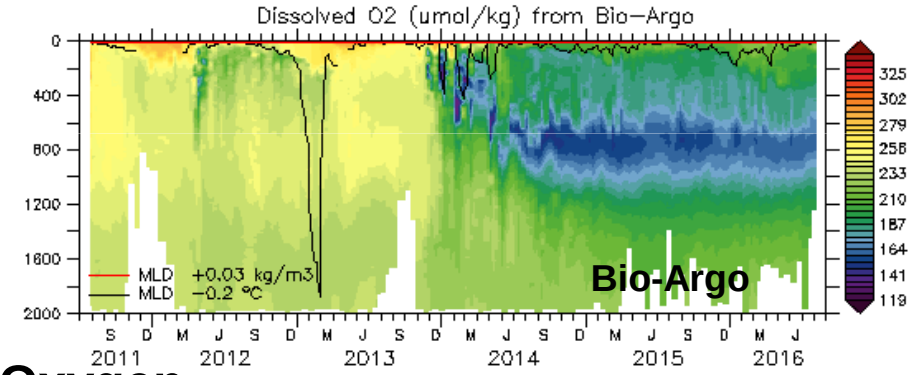

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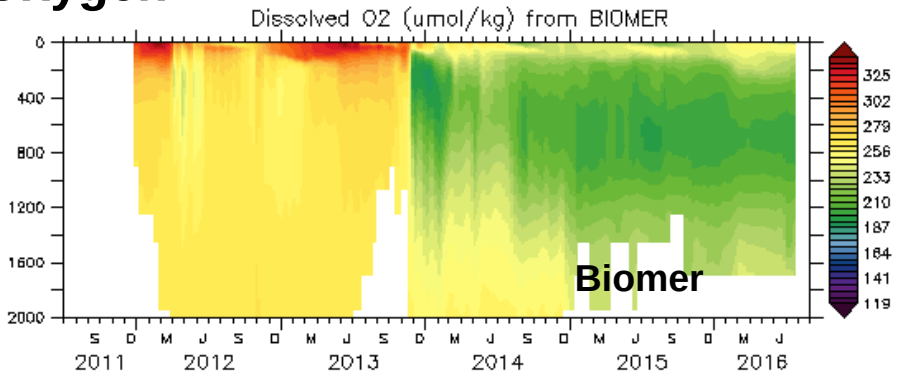

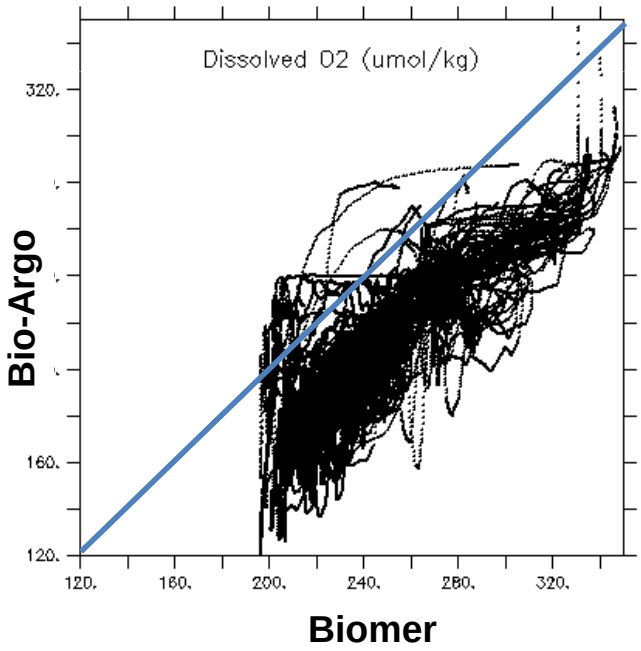

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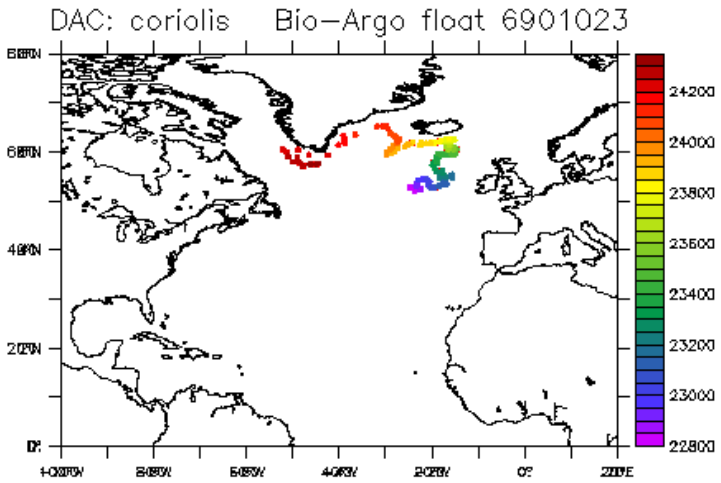

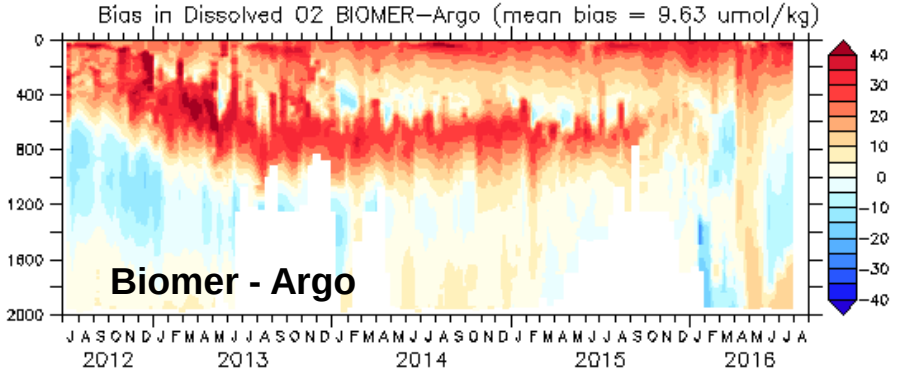

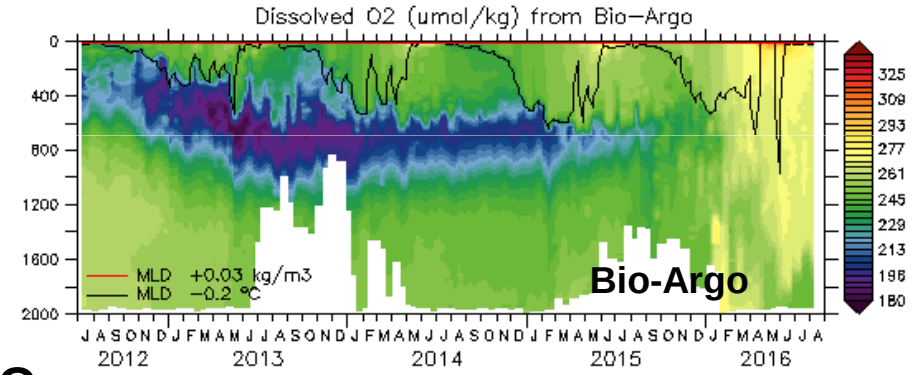

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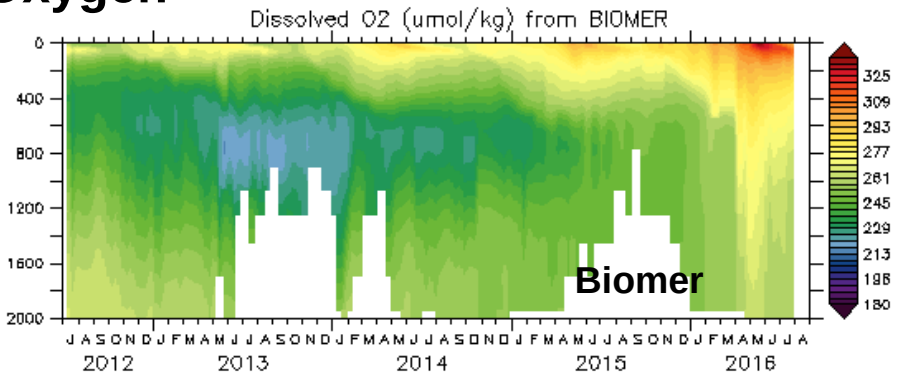

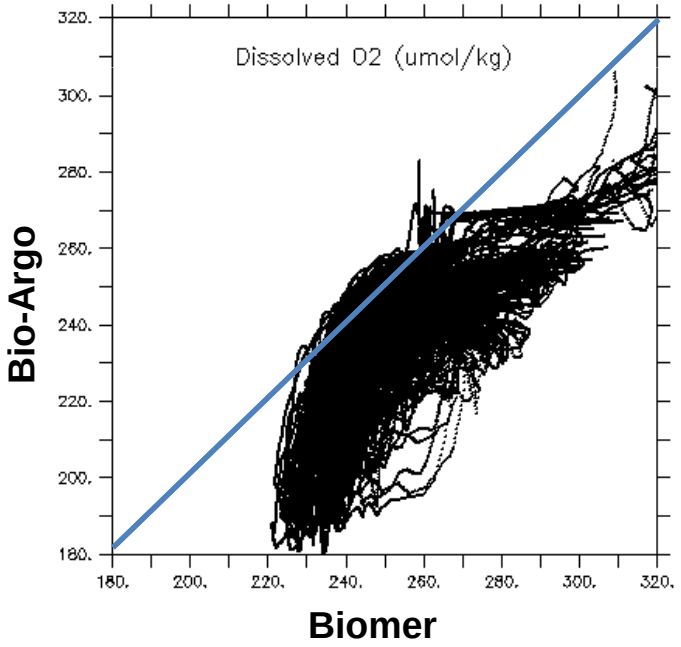

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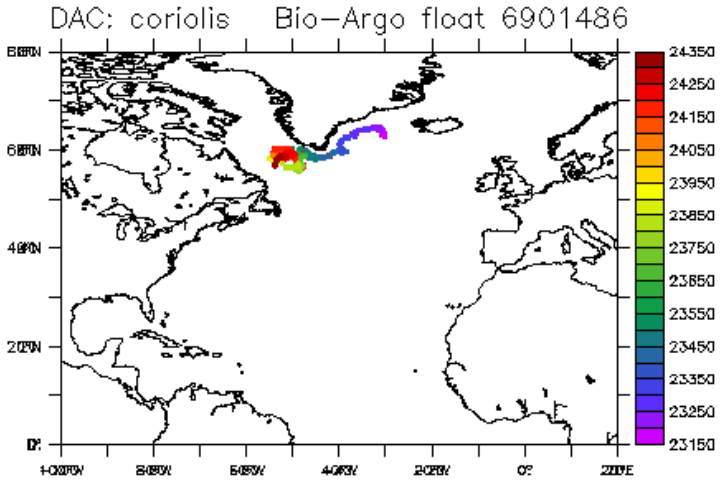

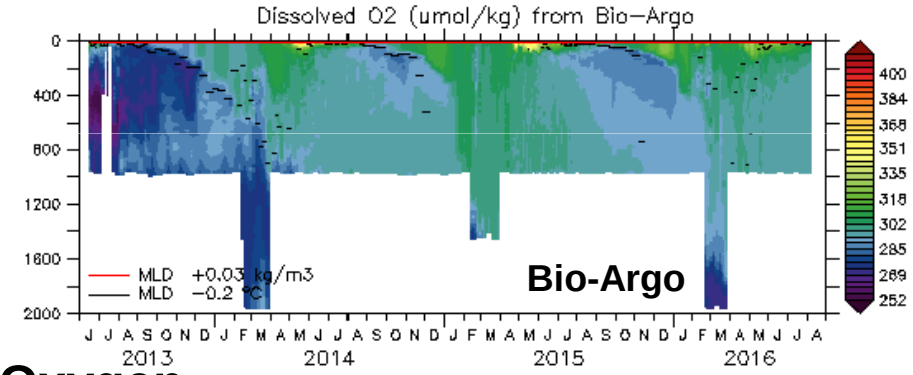

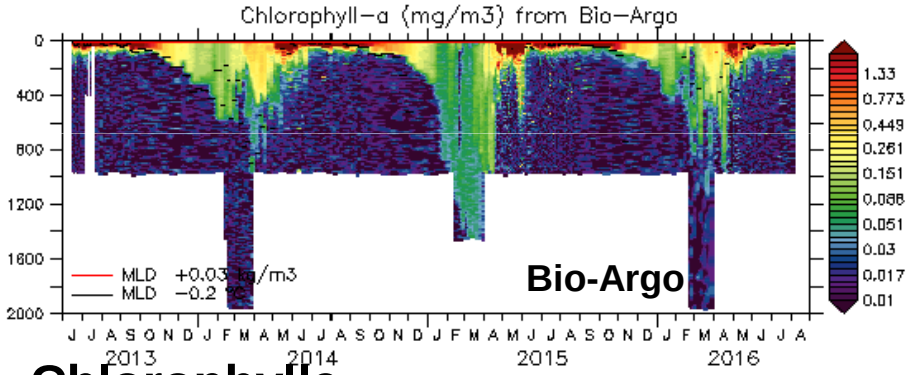

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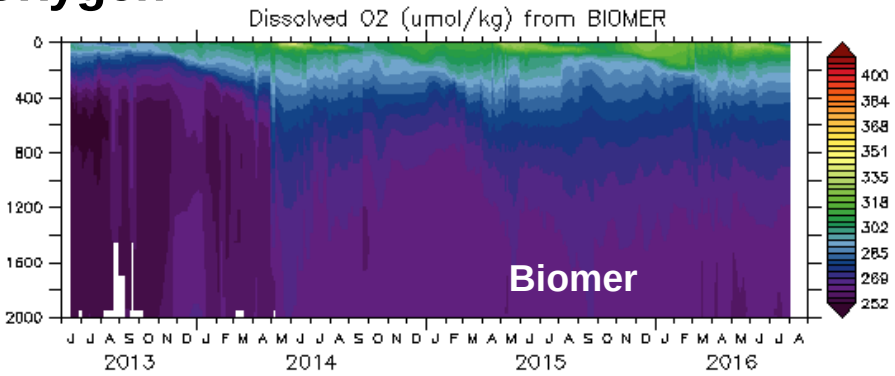
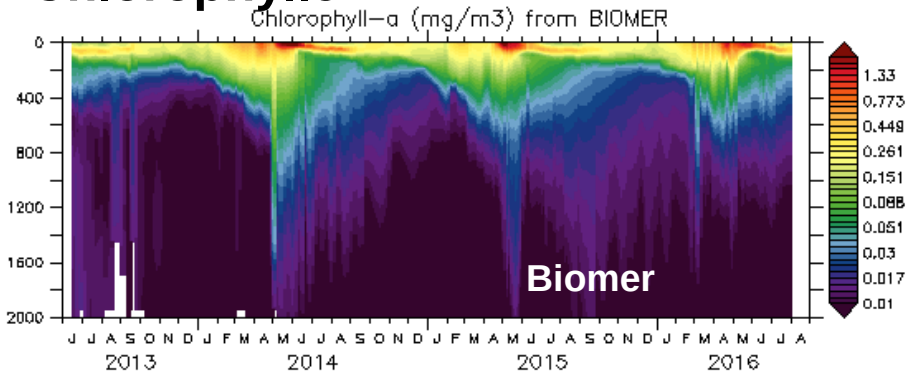
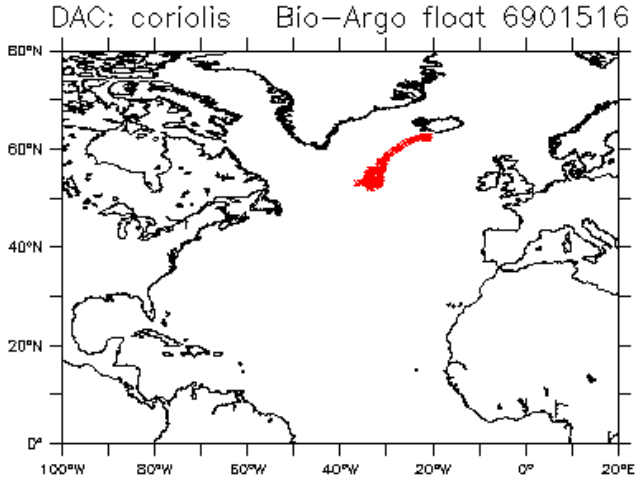
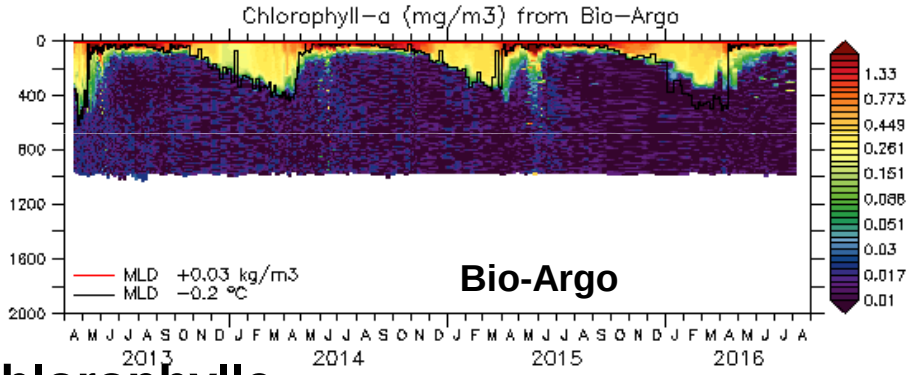


Chlorophylle

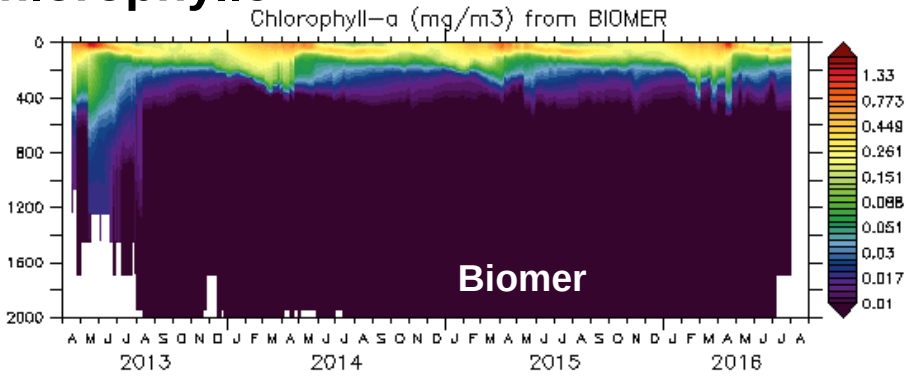


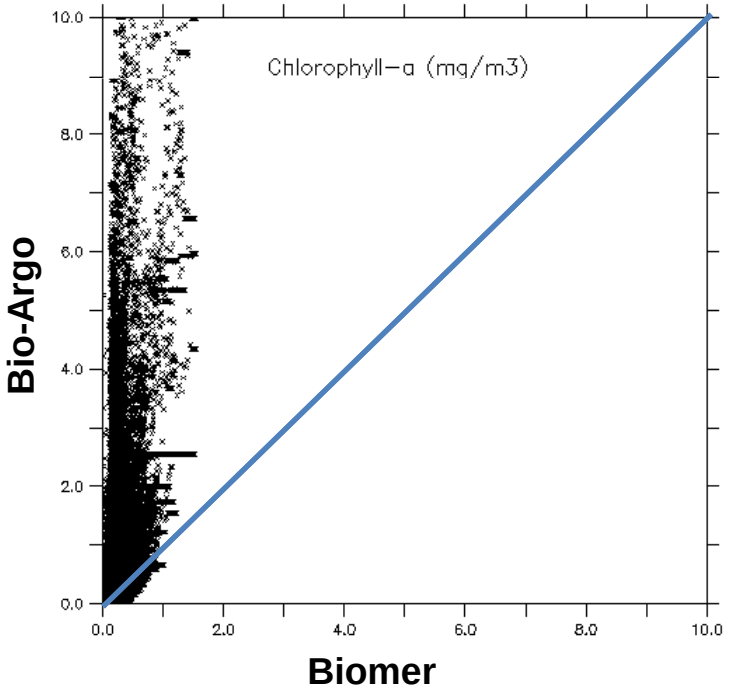
Comparaison ARGO vs BIOMER



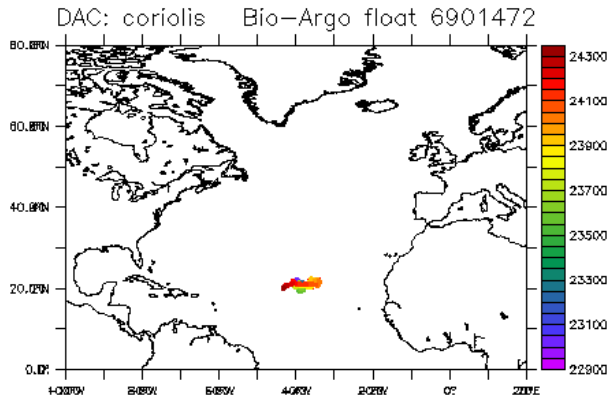


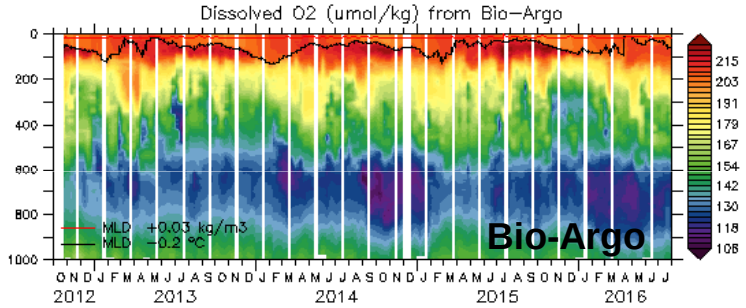
Chlorophylle



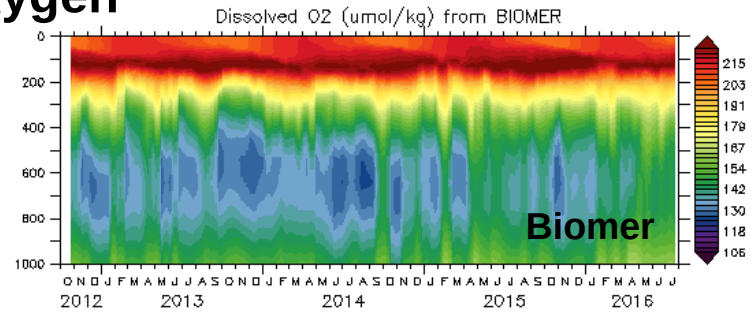


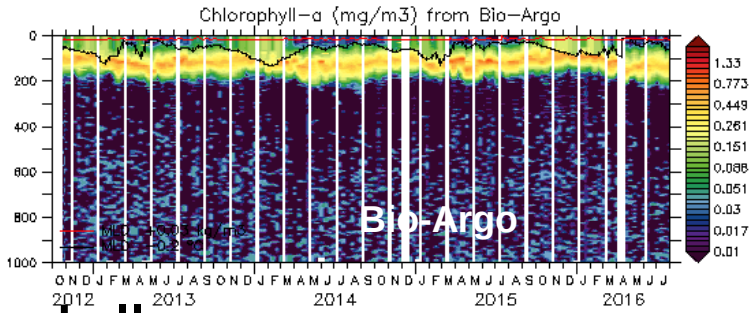
Comparaison ARGO vs BIOMER



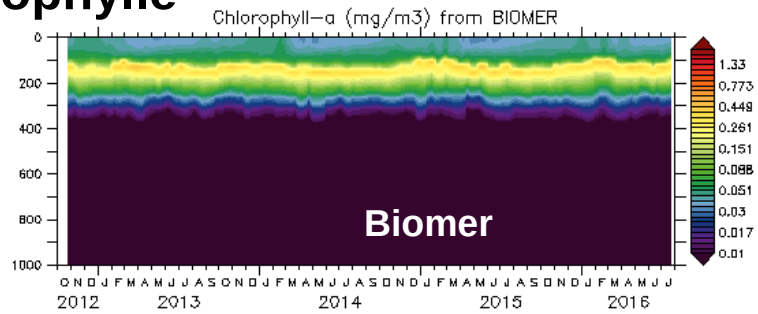


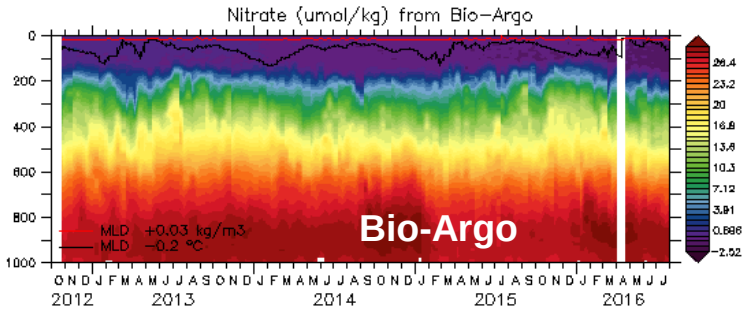
Oxygen



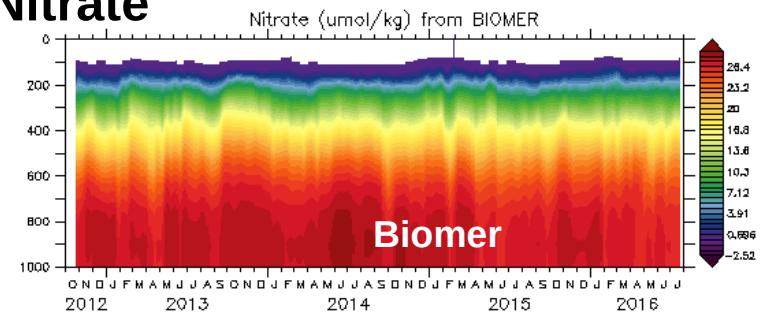


Chlorophylle





Nitrate



Conclusion et Perspectives

Comparaison Bio-Argo / Modèle global

BIOMER est globalement + oxygéné

- **en surface: thermodynamique ou photosynthèse ?**
- **en profondeur: masse d'eau ou reminéralisation ?**
- **1 max d'O_2 sous la surface, pas toujours dans Bio-Argo**

Chloro: 1 déphasage aux hautes latitudes + max de sub-surface en été
gyre subtropical: max trop profond

Produit couleur de l'eau satellite → vision de surface
Données Bio-Argo → vision verticale

Comparer:
- couche de mélange
- couche euphotique
- Deep Chloro Maximum
- Nitracline
→ Compréhension des des mécanismes couplés physique/BGC
→ ajuster les paramètres de PISCES (ex: pislope)