

CONFÉRENCE

TIC et mer: nouveaux défis et solutions

Les technologies de l'information au service de la recherche marine

Gérer des bases de données de plus en plus grandes et complexes

Partage et interactions de bases de données

Méthodes de fouille et d'analyse

9H45: ACCUEIL

10H00-16H00: PRÉSENTATIONS

MATHIAS HERBERTS, JEAN-FRANÇOIS PIOLLÉ,
STÉPHANIE MAHÉVAS, GUILLAUME MAZE,
THOMAS LOUBRIEU, GILBERT MAUDIRE,
PHILIPPE LENCA, RONAN FABLET

16H00: TABLE RONDE AVEC RENÉ GARELLO

Guillaume Maze
(Ifremer)

*“Structure verticale
océanique”*

26 Novembre 2013, Ifremer, Brest



<http://wwz.ifremer.fr/bigdata>

Analyse de la structure verticale océanique à partir des données Argo

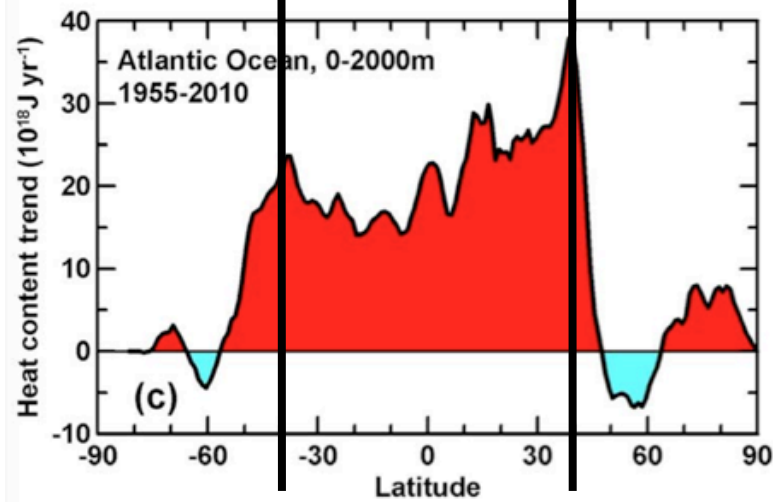
Guillaume Maze (LPO)

Conférence "TIC et mer", 26 novembre 2013, Brest

Contexte scientifique

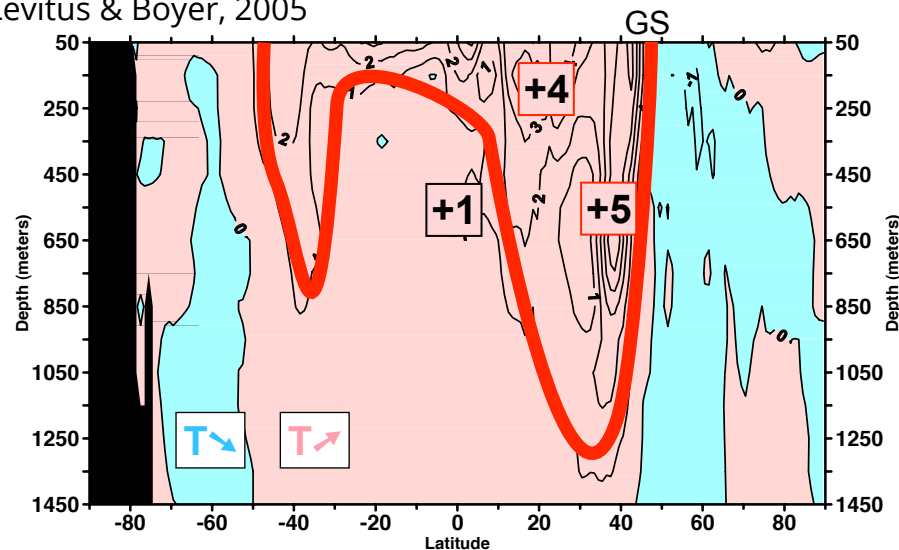
Observed trend in Oceanic heat content (0-2000m, zonal average)

Levitus et al, 2012

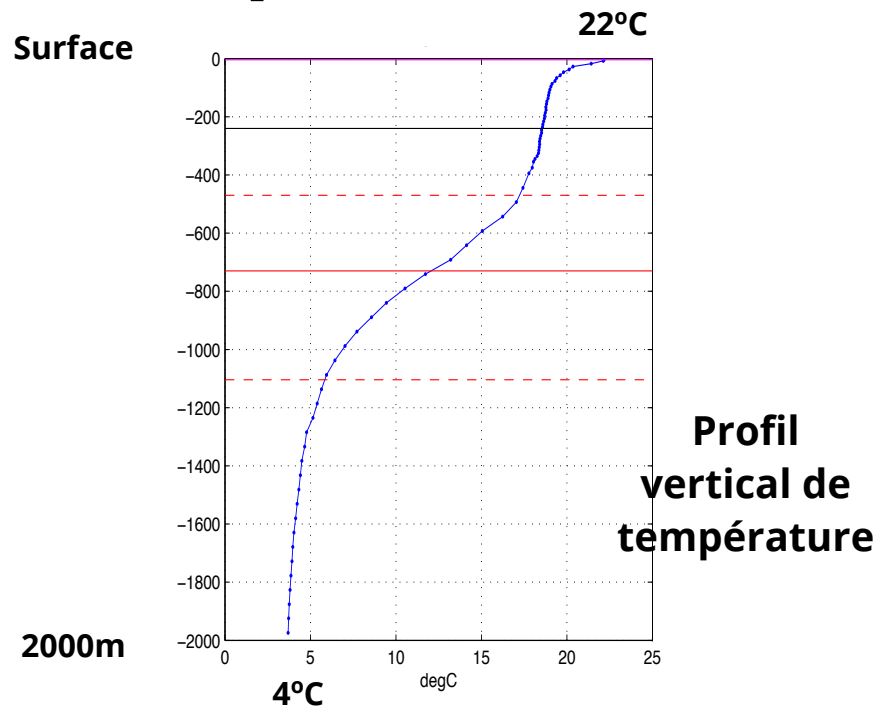


Observed trend in Oceanic heat content (Atlantic, 1955-2003)

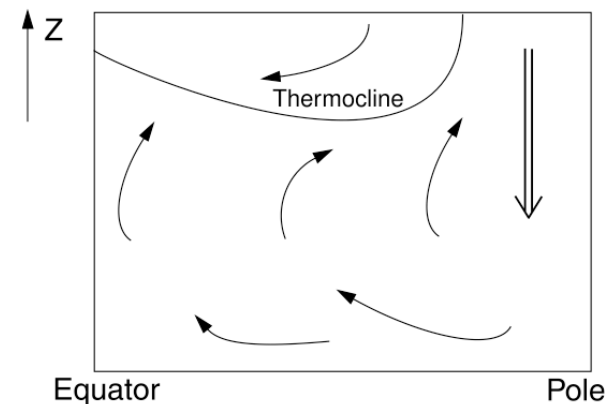
Levitus & Boyer, 2005



Surface



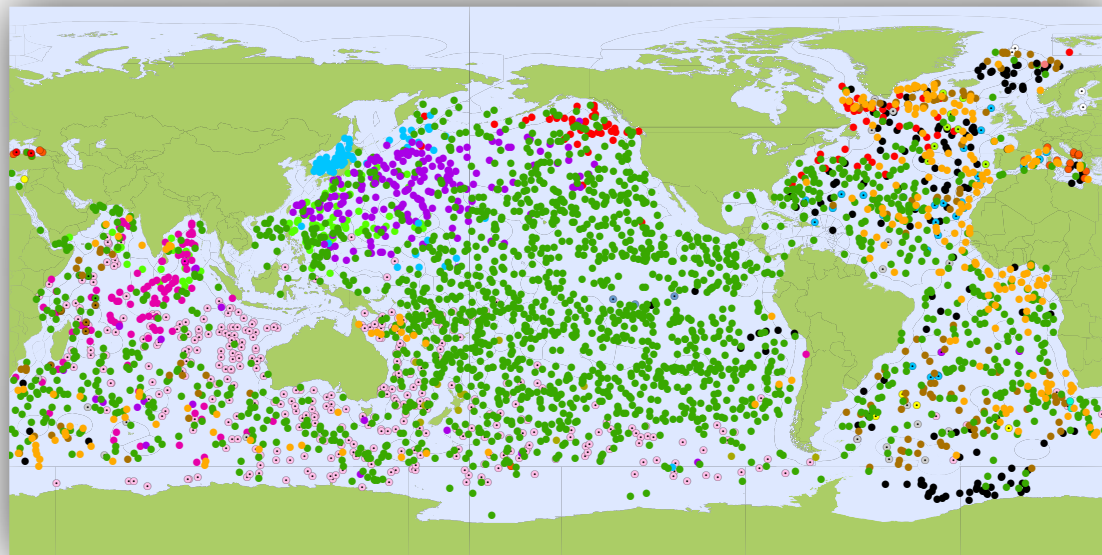
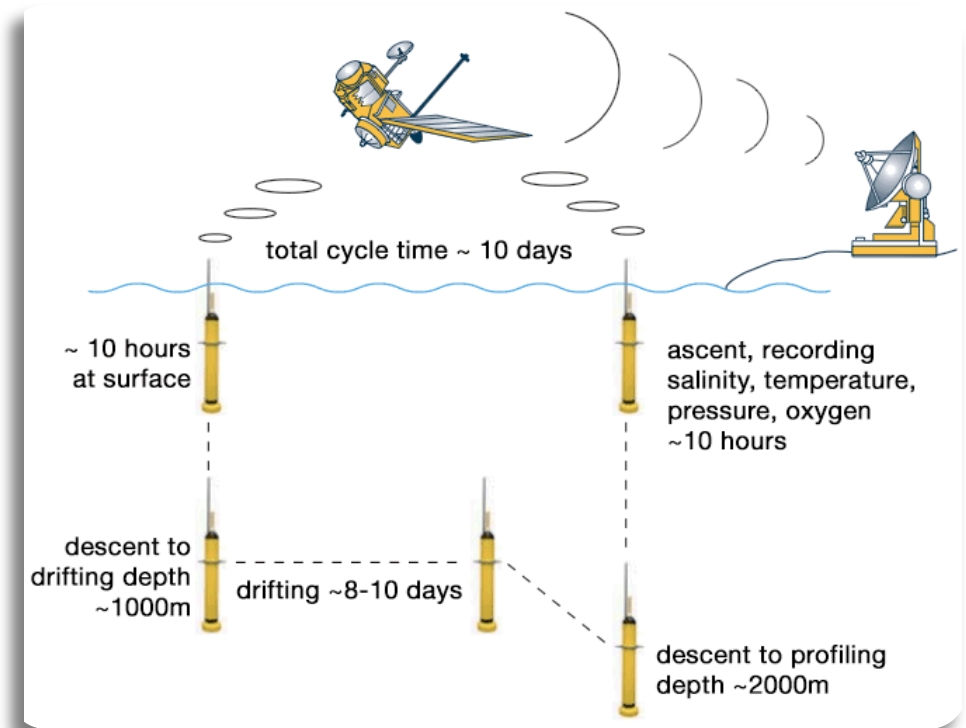
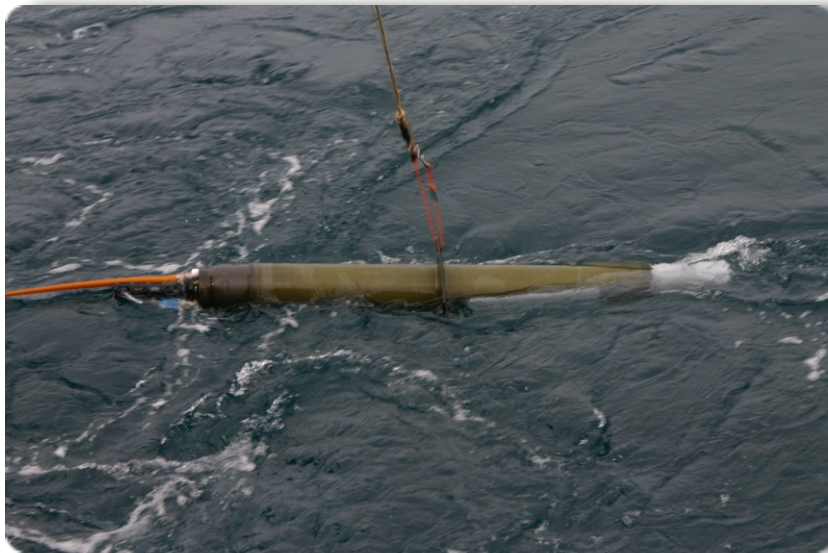
*Assimilation des signaux climatiques
contrainte par la structure
de la thermocline principale*



Vallis, 2005

Le système d'observation in-situ Argo

3



3606 Floats

ARGENTINA (4)	CANADA (83)	FRANCE (256)	IRELAND (10)	SOUTH KOREA (86)	NEW ZEALAND (12)	SRI LANKA (1)
AUSTRALIA (389)	CHINA (85)	GABON (1)	ITALY (19)	LEBANON (1)	NORWAY (2)	TURKEY (2)
BRAZIL (2)	ECUADOR (3)	GERMANY (166)	JAPAN (208)	MAURITIUS (6)	SOUTH AFRICA (2)	UNITED KINGDOM (132)
BULGARIA (3)	FINLAND (5)	INDIA (103)	KENYA (3)	NETHERLANDS (20)	SPAIN (29)	UNITED STATES (1 973)

September 2013

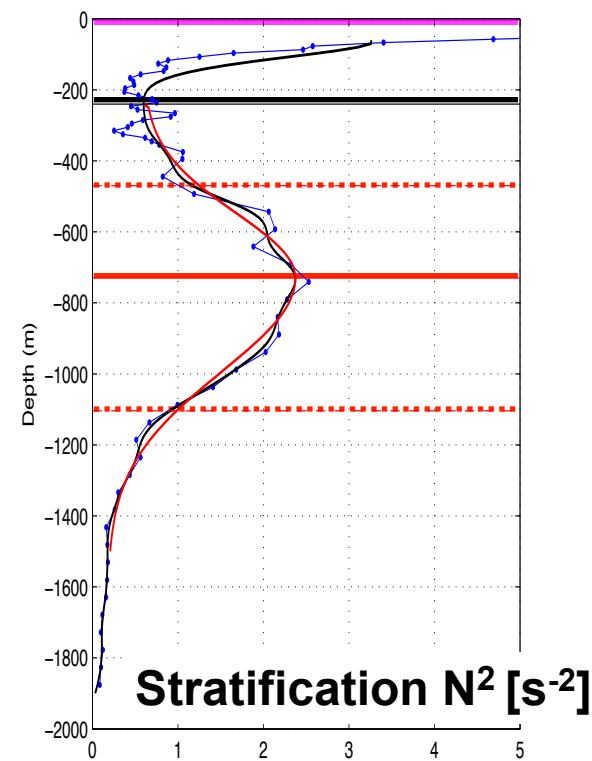
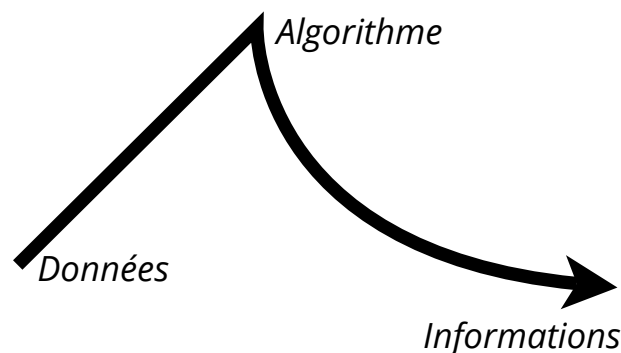
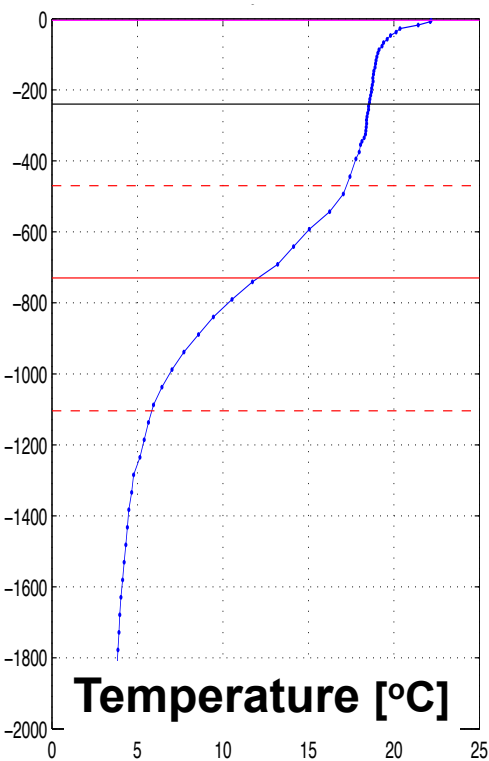


27 pays
1.2 millions de profils

Diagnostic (algorithme)

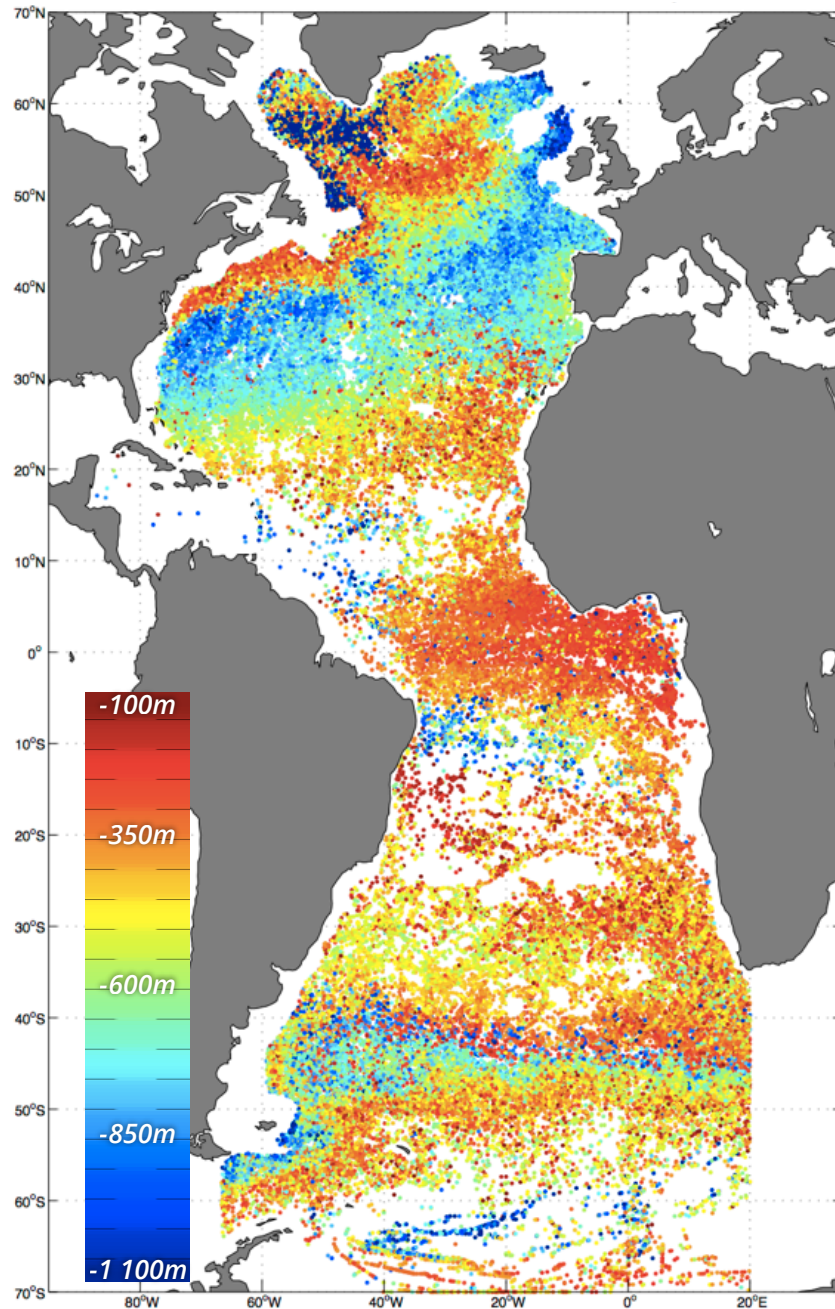
Standard set of parameters

What we do:	What do we get:
Interpolate on a regular grid	
'Cut' profile below the mixed layer	Mixed Layer Depth
Smooth profile (scale>50m)	
Find N^2 minimum in the top 300 or 500m	Mode water' depth (1 st inflection)
Find N^2 maximum below	Main thermocline depth
Fit 2 Gaussian curves above and below	Main thermocline thickness (asymmetric description)
Compute QC metrics	QC flag
Apply a decision tree	Adjusted set of parameters or Final results

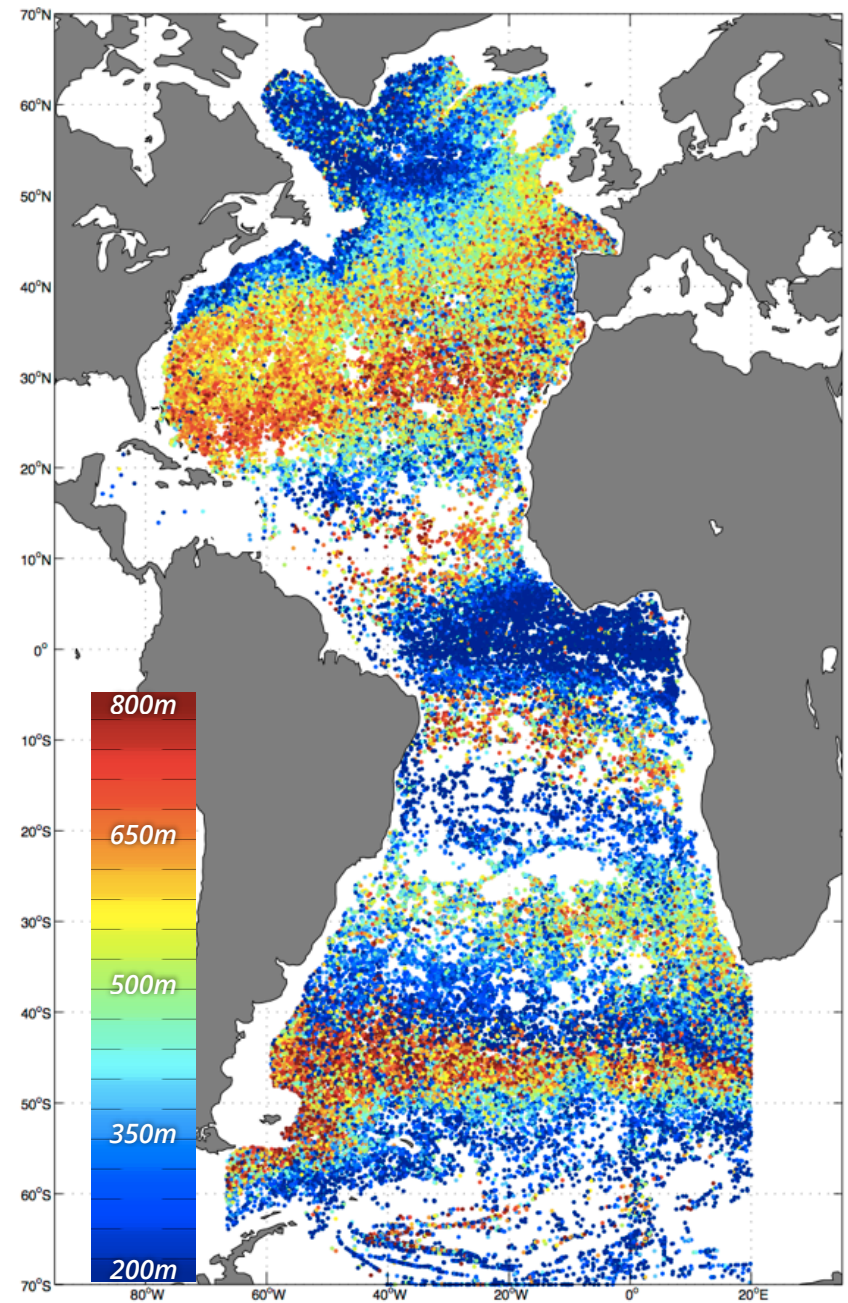


Résultats

Pycnocline Depth



Pycnocline Thickness



92,799 profiles with QC=1

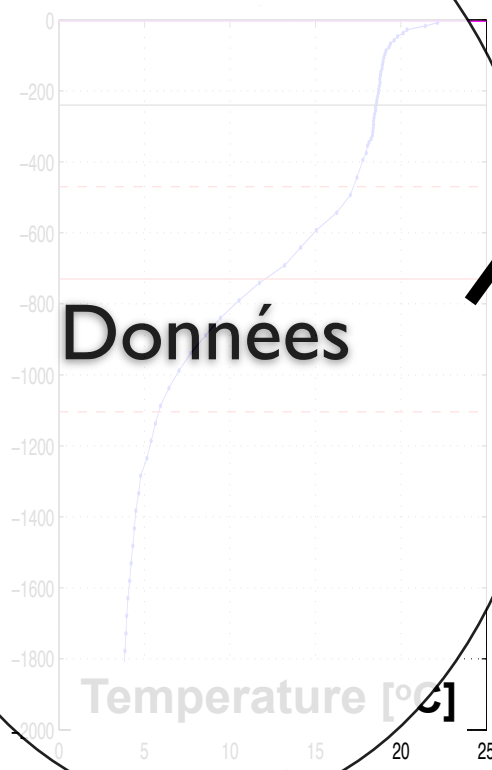
Problème: Développement Algorithme

Standard set of parameters

What we do:	What do we get:
Interpolate on a regular grid	
'Cut' profile below the mixed layer	Mixed Layer Depth
Smooth profile (scale>50m)	
Find N^2 minimum in the top 300 or 500m	Mixed Layer Depth (1 st inflection)
Find N^2 maximum below	Main thermocline depth
Fit 2 Gaussian curves above and below	Main thermocline thickness (asymmetric description)
Compute QC metrics	QC flag
Apply a decision tree	Adjusted set of parameters or Final results

Algorithme

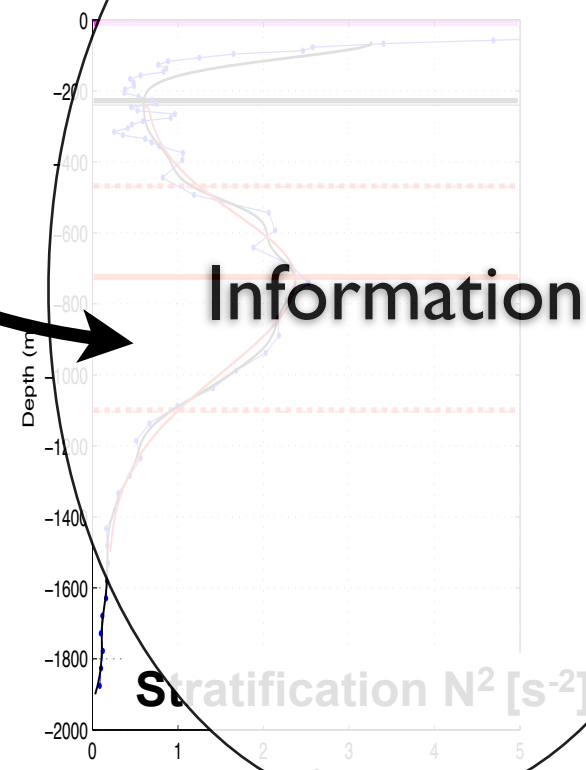
Données



I/O

Calcul

Information



Problème: Développement Algorithme

Standard set of parameters

What we do:	What do we get:
Interpolate on a regular grid	
'Cut' profile below the mixed layer	Mixed Layer Depth
Smooth profile (scale > 50m)	
Find N^2 minimum in the top 300 or 500m	Depth of maximum N^2 (1 st inflection)
Find N^2 maximum below	Main thermocline depth
Fit 2 Gaussian curves above and below	Main thermocline thickness (symmetric description)
Compute QC metrics	QC flag
Apply a decision tree	Adjusted set of parameters or final results

Algorithme

**Visu
Clustering
Expertise**

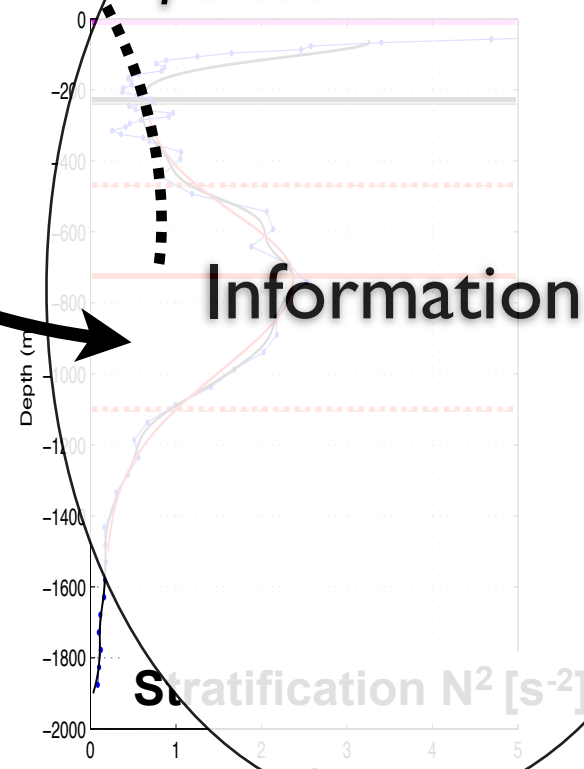
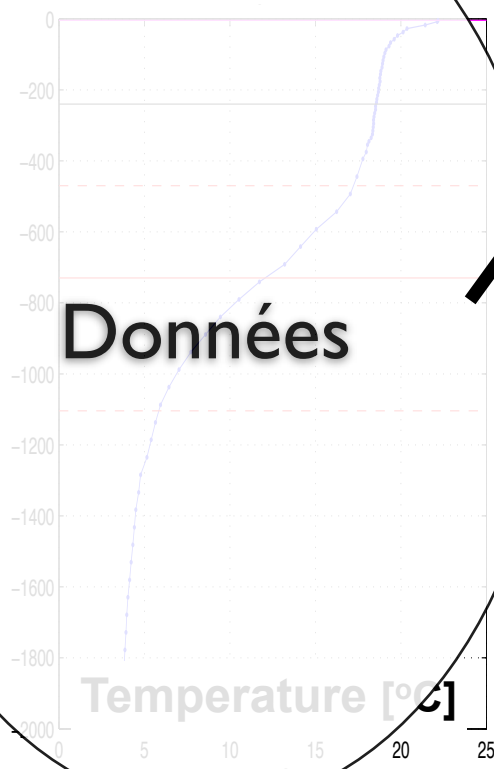
I/O

Calcul

Données

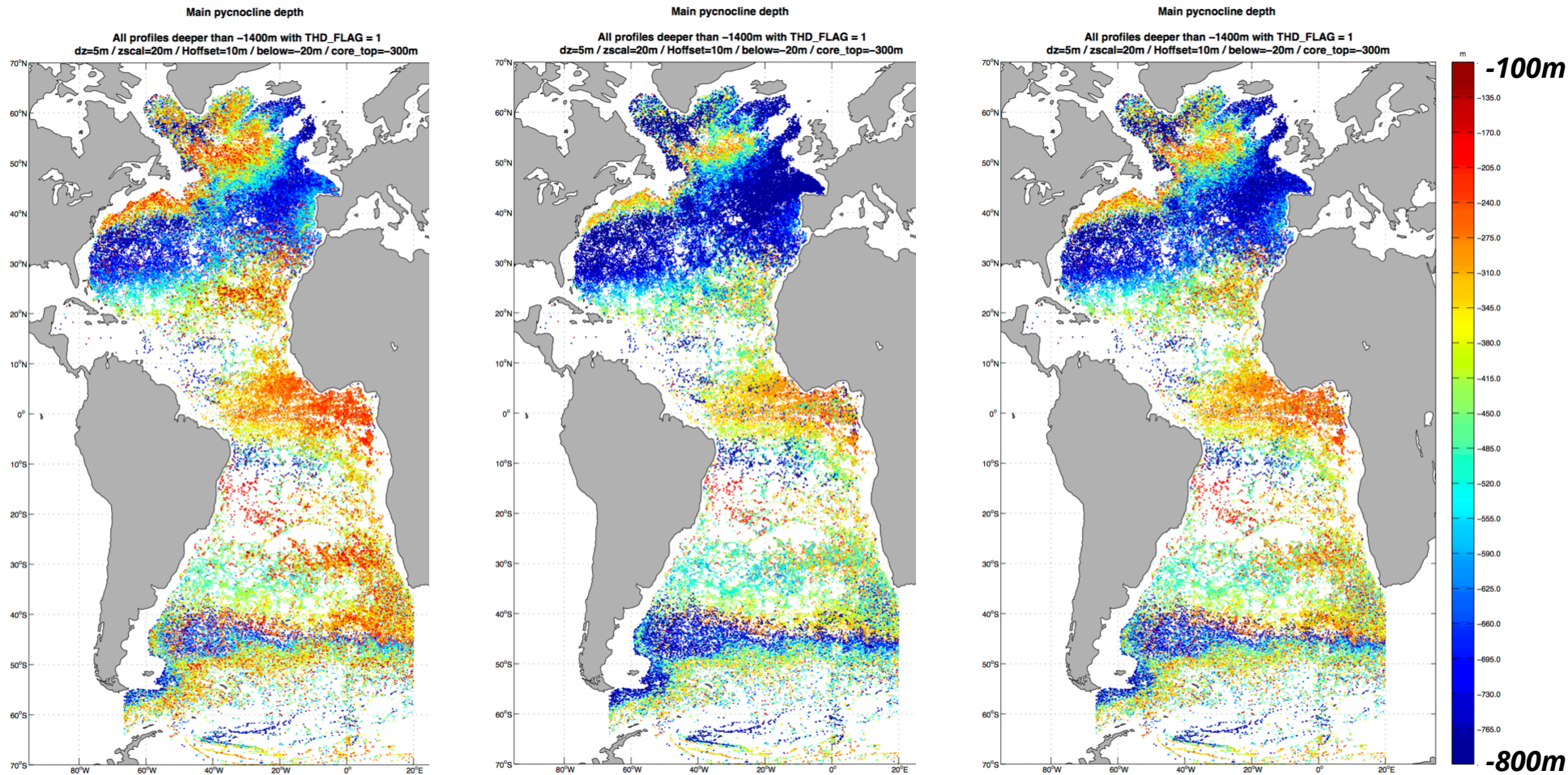
Information

*1 profil: facile
> 10⁶ profils: hard !*



Problème: Visualisation

93,000 points sur une même carte:



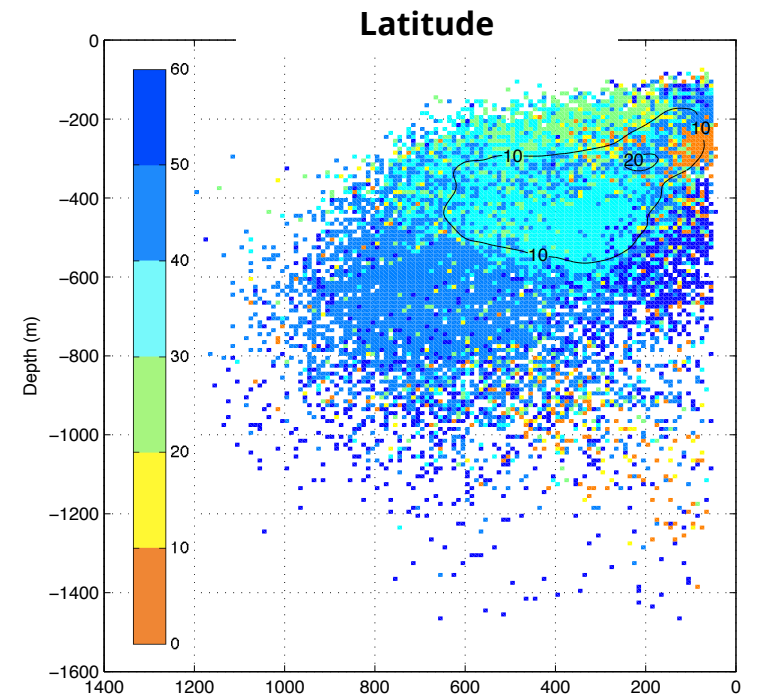
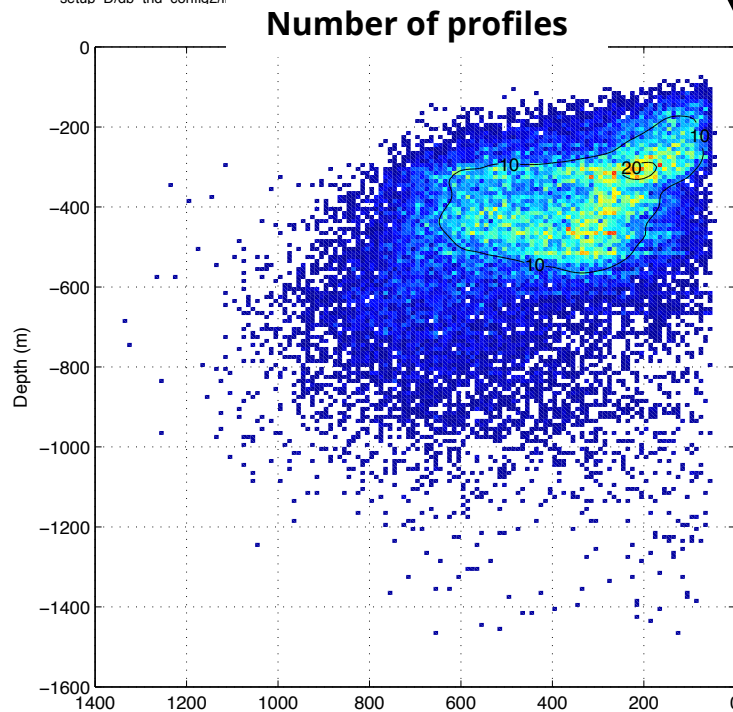
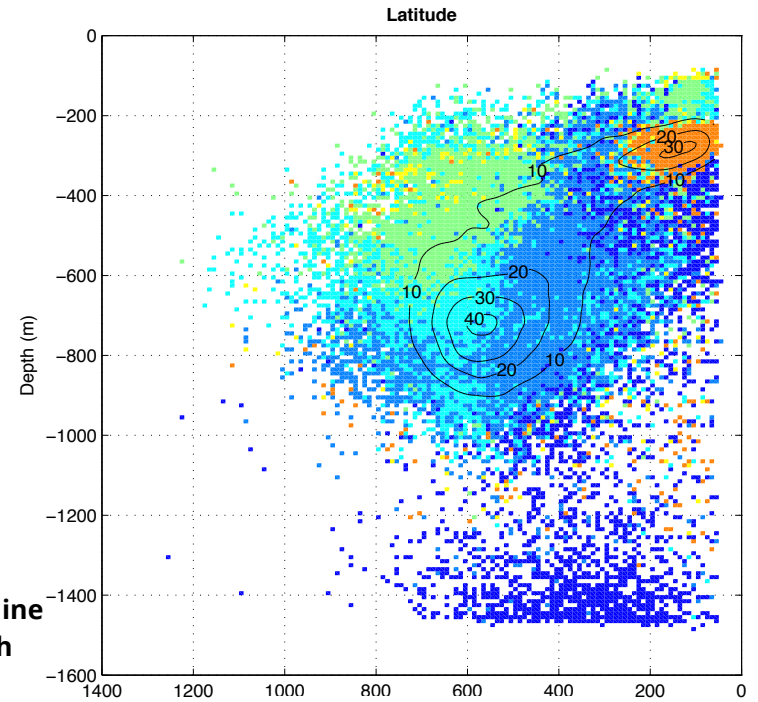
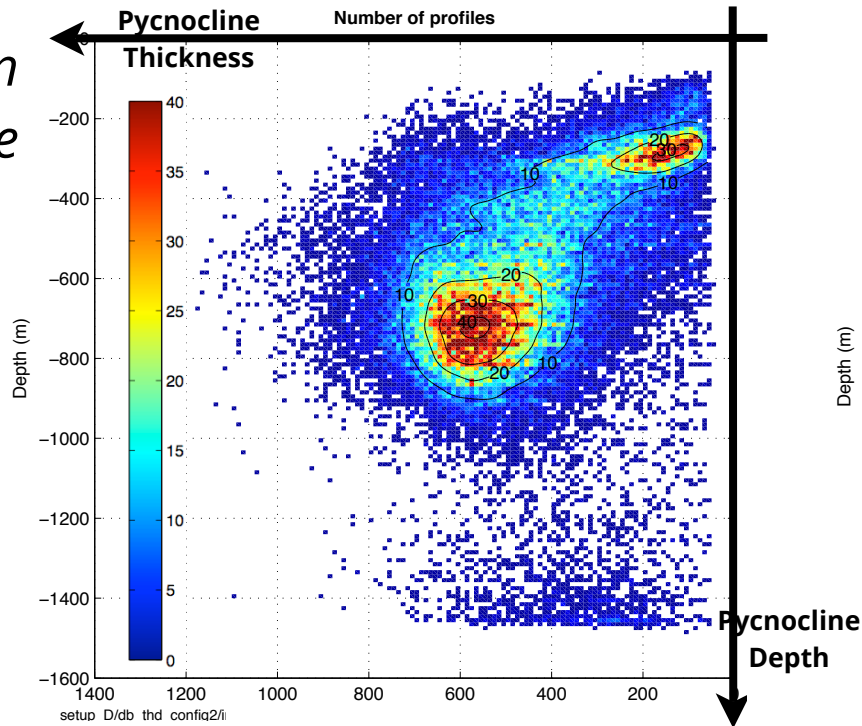
Décroissant

Croissant

Random

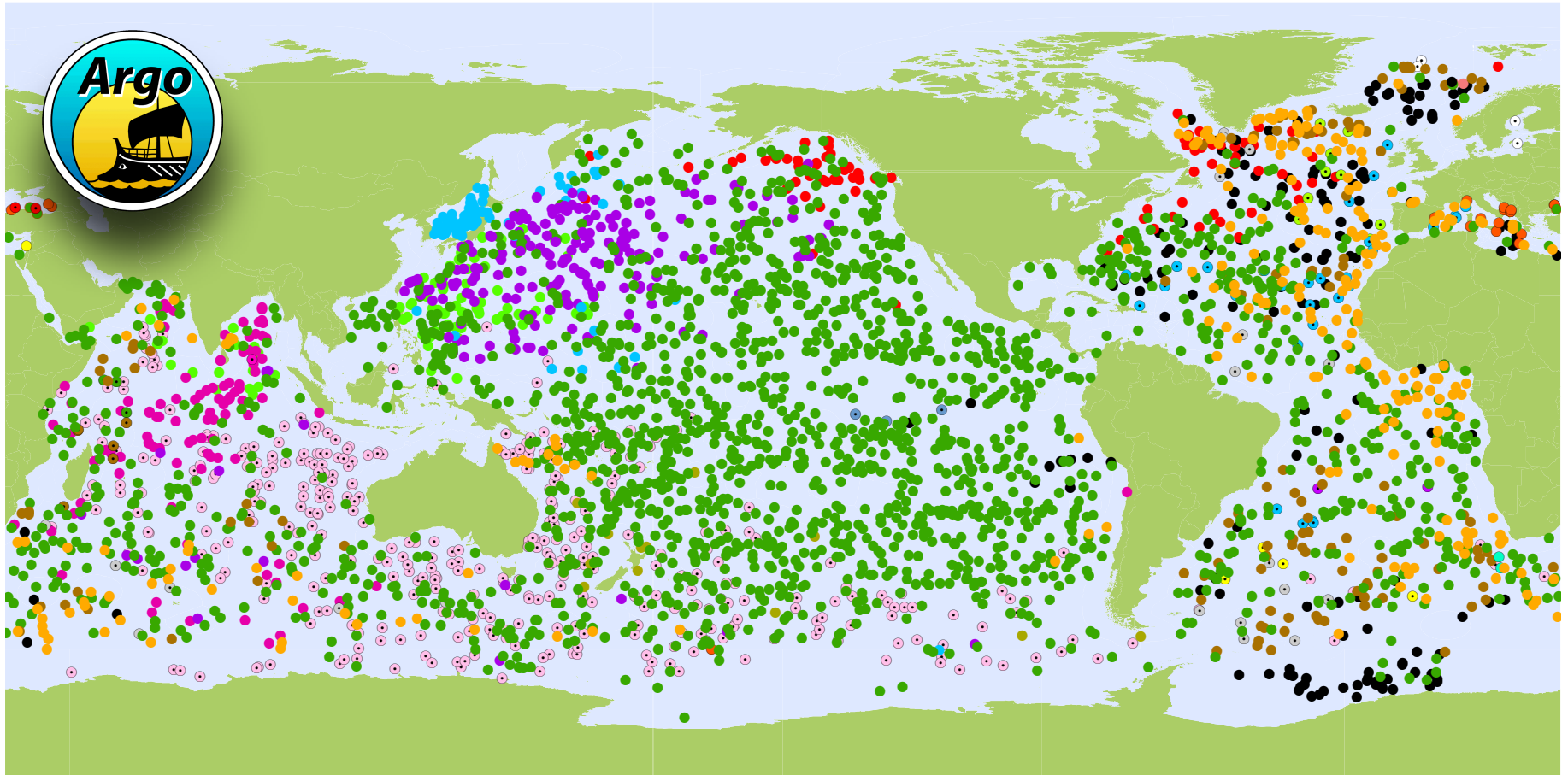
Problèmes: clustering + 2D

Northern hemisphere



Southern hemisphere

Argo data



3606 Floats

● ARGENTINA (4)	● CANADA (83)	● FRANCE (256)	● IRELAND (10)	● SOUTH KOREA (86)	● NEW ZEALAND (12)	● SRI LANKA (1)
● AUSTRALIA (389)	● CHINA (85)	● GABON (1)	● ITALY (19)	● LEBANON (1)	● NORWAY (2)	● TURKEY (2)
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September 2013

3600 flotteurs renvoyant 1 profil tous les 10 jours

o(11 000) nouveaux profils par mois

o(370) nouveaux profils par jour

o(15) nouveaux profils par heure

1 nouveau profil toutes les 4 minutes

Argo data

- ☐ Volume: $o(30G)$
- ☒ Fragmentation: 1,2 millions de fichiers netcdf
- ☐ Variété
- ☐ Dispersion
- ☐ Vélacité
- ☐ Véracité

+ Novel Argo Obs. Sys.
= Très rapidement :

- ☒ Volume: $o(T)$
- ☒ Fragmentation: plusieurs millions de fichiers
- ☐ Variété
- ☐ Dispersion
- ☐ Vélacité
- ☒ Véracité: (Man power ~ constant pour QC)