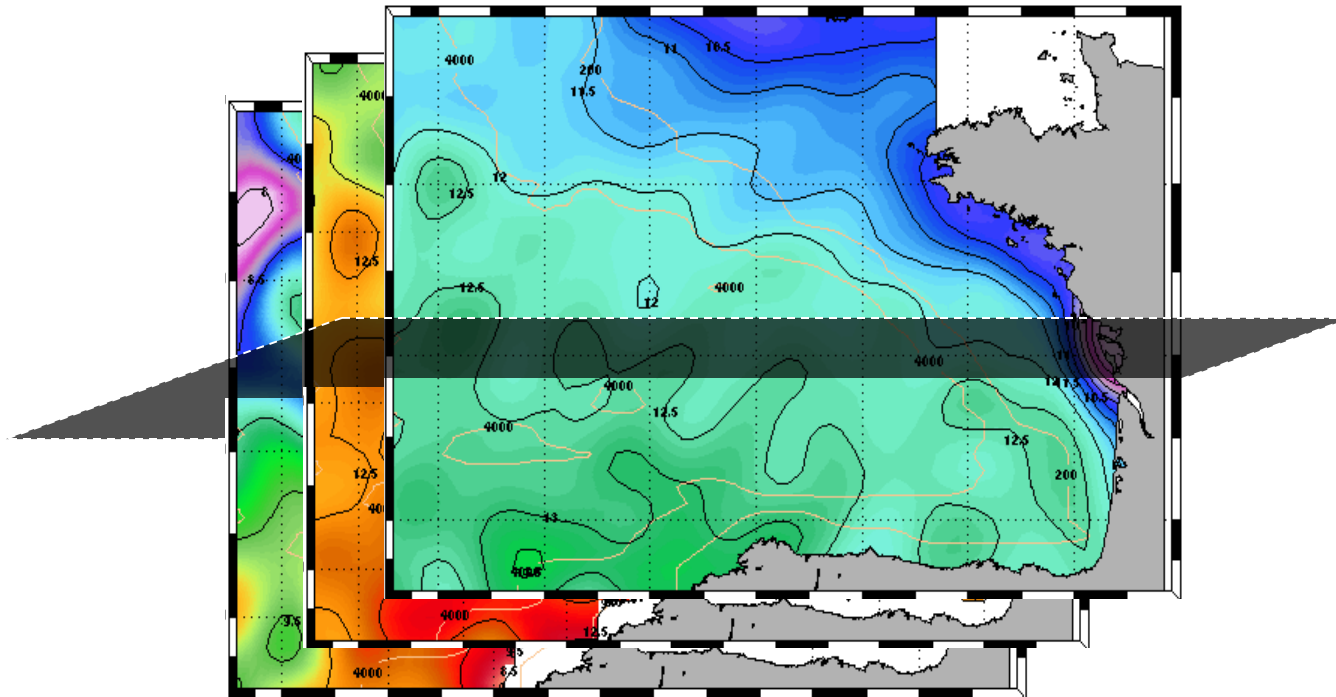


# Climatologie du golfe de Gascogne BoByClim



*Frédéric Vandermeirsch, Romain Charraudeau*

*Armel Bonnat, Michel Fichaut, Catherine Maillard, Fabienne Gaillard, Emmanuelle Autret et al.*



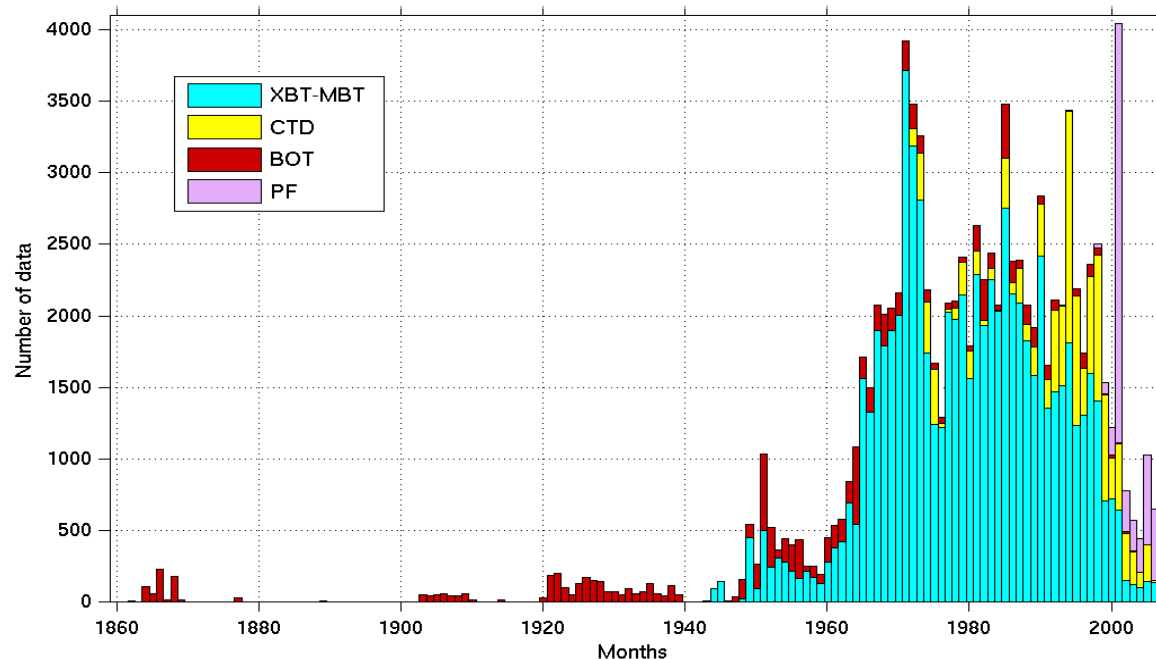
# Base de données in situ

- ✓ **Paramètres** : *Température et salinité*
- ✓ **Zone géographique** : *50°N – 43°N / 15°W – 1°W*
- ✓ **Période temporelle** : *1862 to 2004 (mis à jour 2009)*
- ✓ **Type de mesure** : *Bottles, CTD, MBT, XBT, profilers, buoys*
- ✓ **Numérisation** : *5700 profils de 1963 à 1974*

## ✓ Origine des données :

- 46 % *Service Hydrographique de la Marine (SHOM),*
- 35% *World Data Center A (WDCA),*
- 17% *IFREMER (SISMER),*
- 1% *United Kingdom Hydrographic Office (UKHO),*
- 1% *Marine Environmental Data Service (MEDS)*

## Répartition temporelle par type de données



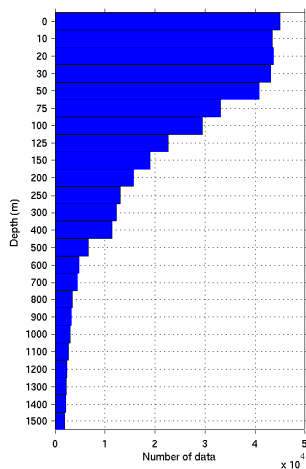
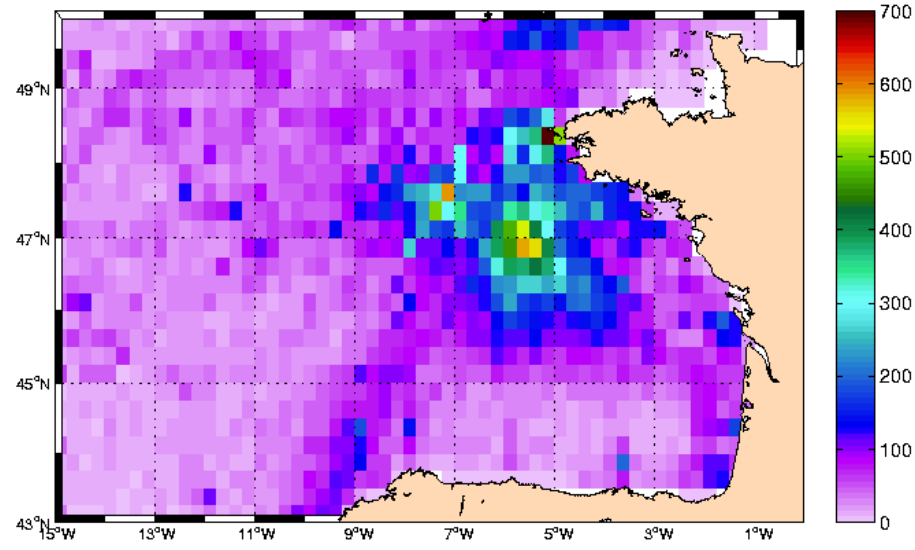
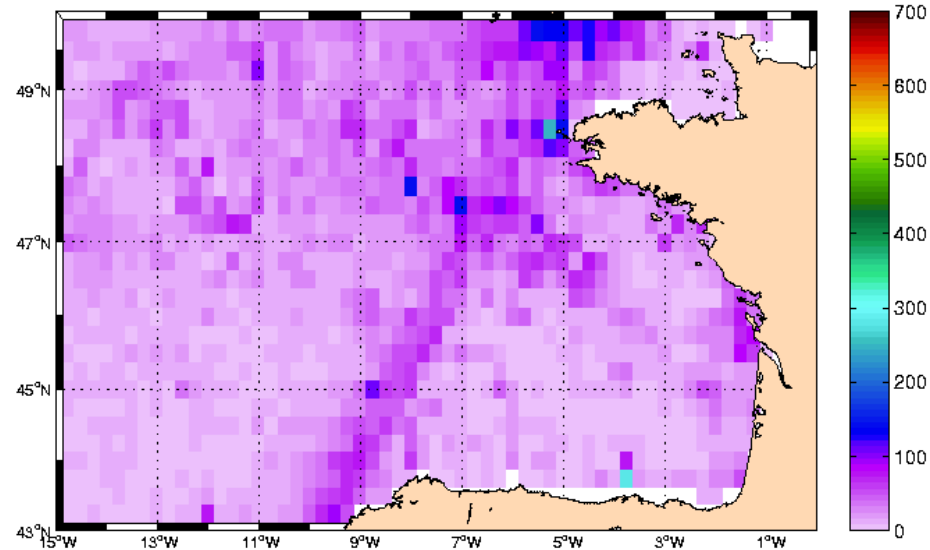
Data type	Number of profiles
Bottles	13682
CTD	11423
MBT	22616
XBT	51533
Profilers	969
Buoys	2938
TOTAL	103161

# Distribution spatiale des données

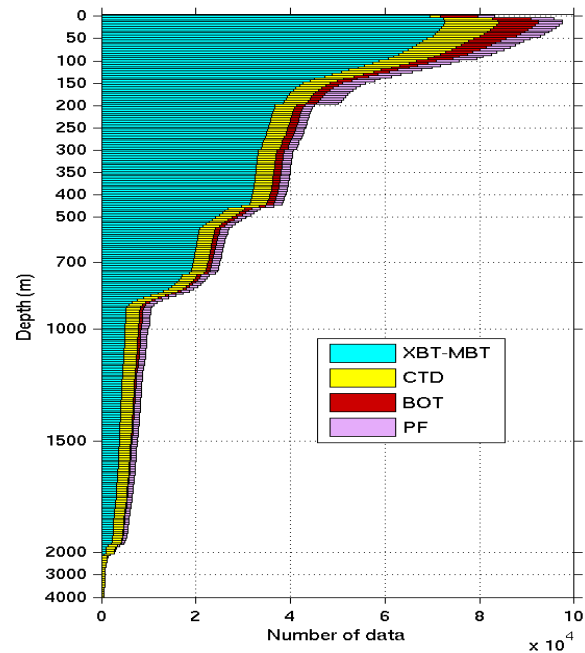
## Densité de données de température à 10 m pour WOA2001 et Bobyclim

0.25 – 10m somme des dd sur 12 mois – Nbre de données = 43502

0.1 – 10m somme des dd sur 12 mois – Nbre de données = 94434



**Distribution verticale  
des données**

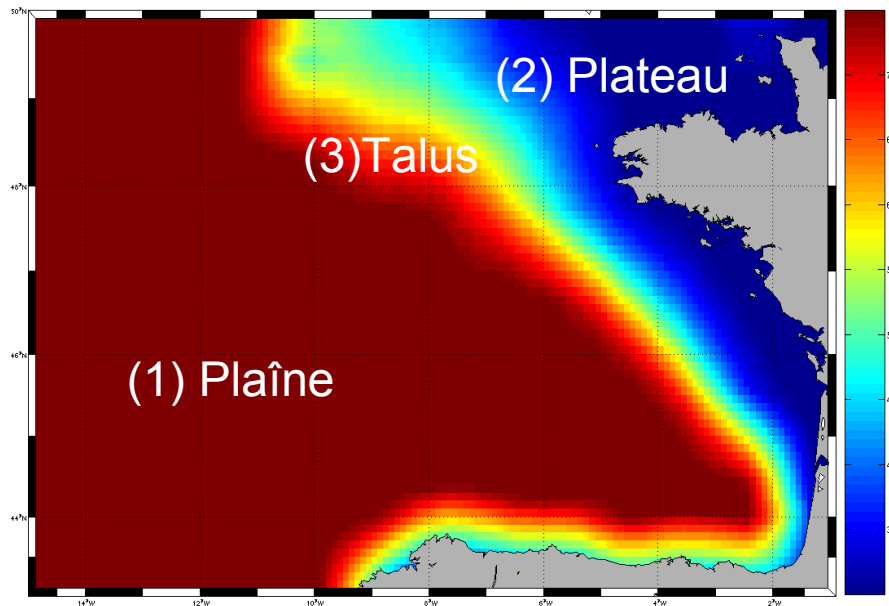


# Méthode d'interpolation - Contraintes

Analyse optimale Bretherton & al, 1976 and Autret & Gaillard, 2004.

Rayon d'influence variable fonction des échelles physique rencontré :

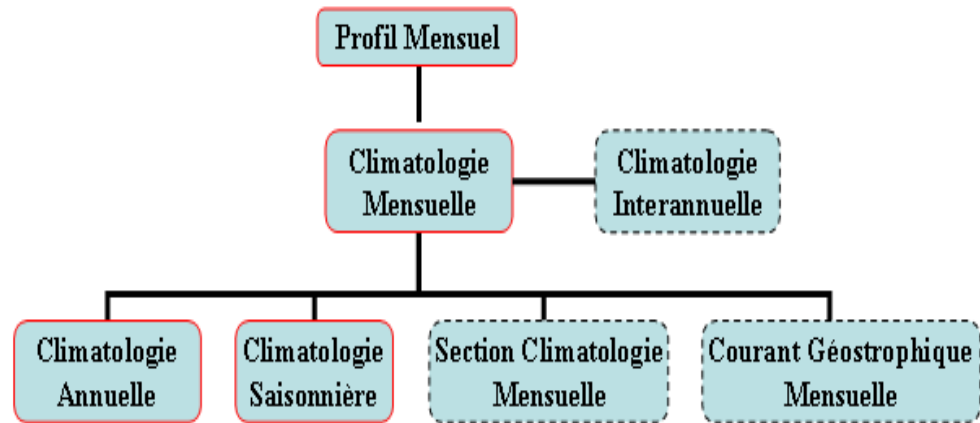
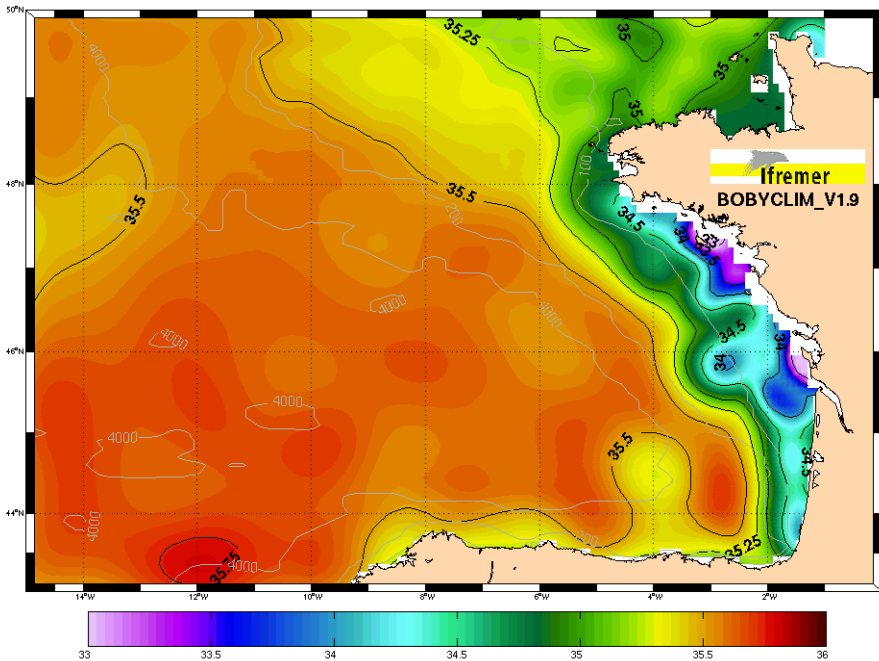
- (1) Grand rayon d'influence pour la plaine abyssale (75 km)
- (2) Petit rayon d'influence sur le plateau (30km)
- (3) Rayon d'influence intermédiaire fonction de la bathymétrie



# Configuration de l'analyse optimale

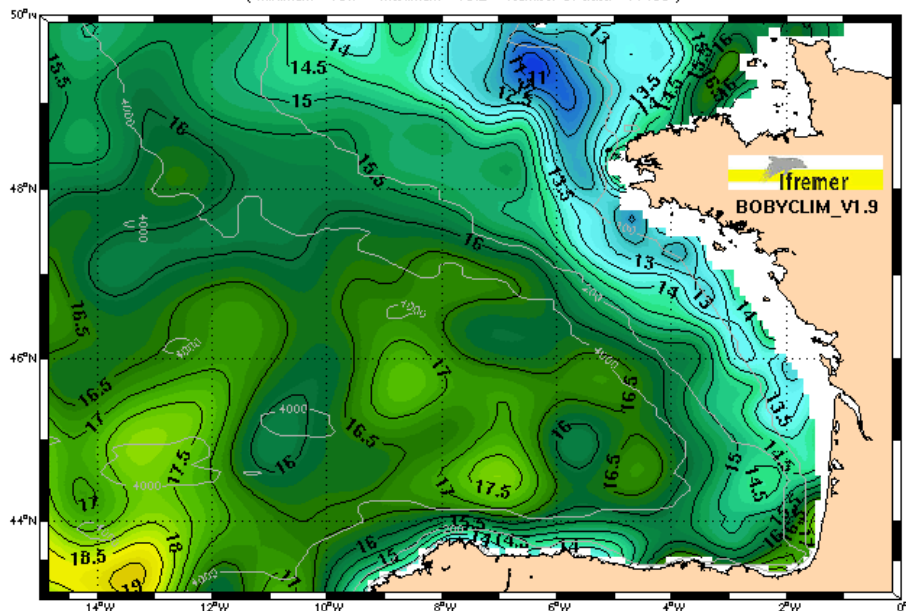
- **Résolution spatiale** : distribuée à 0.4 degré. En cours de valorisation 0.1 °
- **261 niveaux standards** : [0 : 5 : 400] et [410 : 10 : 2000] et [2100 : 100 : 4000]

Salinity - May - Depth 5 m  
( Minimum = 31.7 - Maximum = 35.8 - Number of data = 2258 )



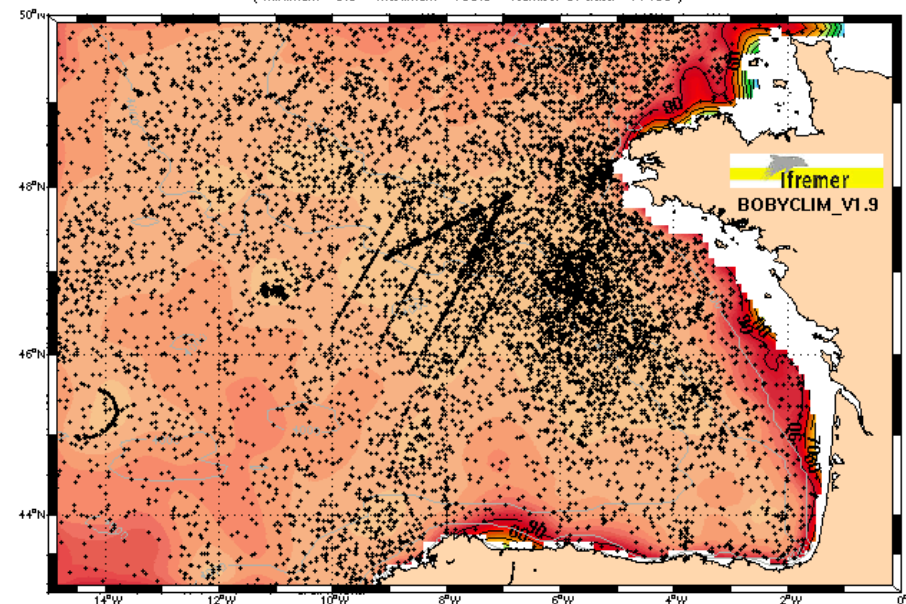
Temperature (Degrees Celsius) - September - Depth 0 m

( Minimum = 10.7 - Maximum = 19.2 - Number of data = 11456 )



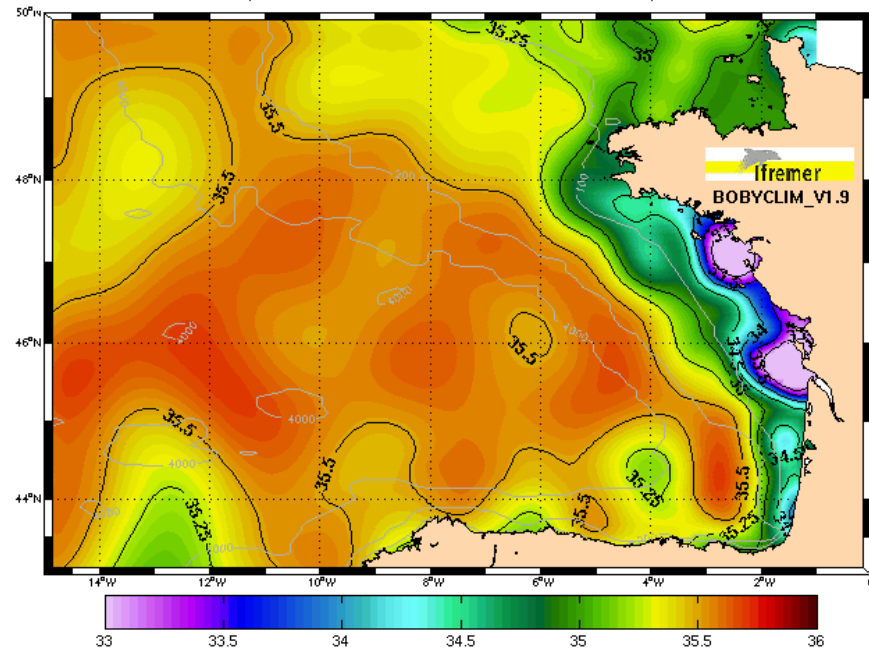
Temperature - Confidence in the estimation - September - Depth 40 m

( Minimum = 9.8 - Maximum = 100.0 - Number of data = 11456 )



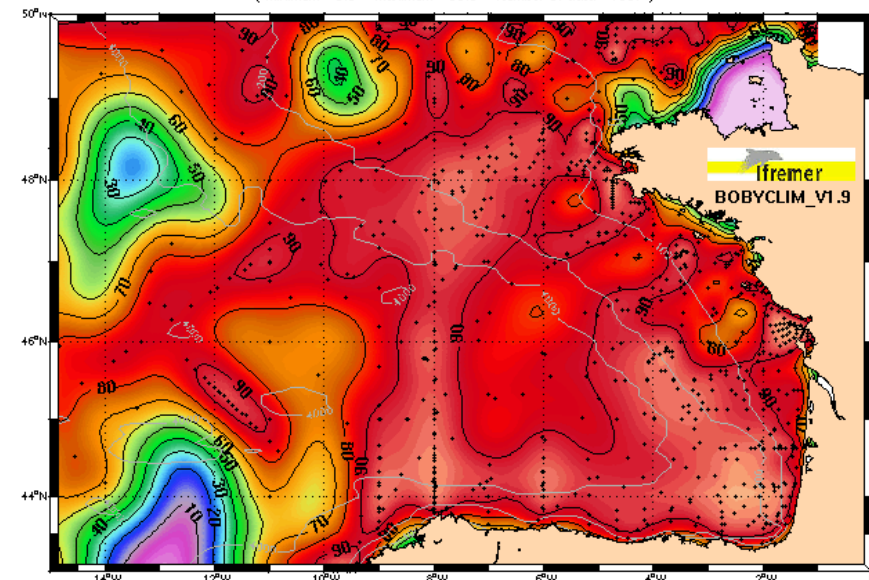
Salinity - May - Depth 0 m

( Minimum = 31.6 - Maximum = 35.7 - Number of data = 1057 )

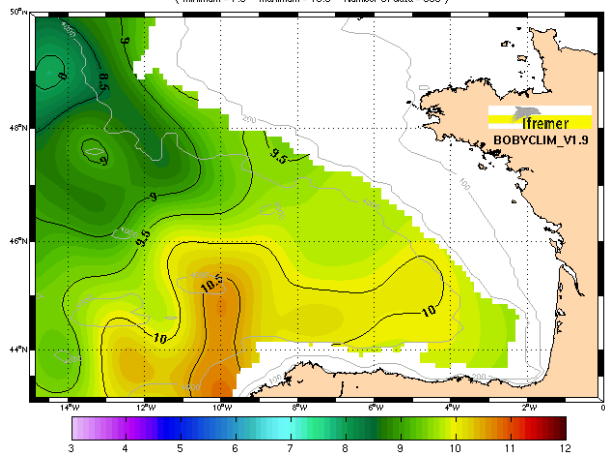


Salinity - Confidence in the estimation - May - Depth 0 m

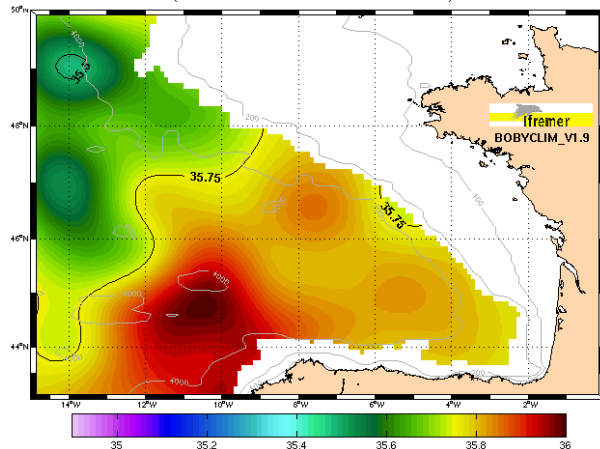
( Minimum = 0.0 - Maximum = 99.0 - Number of data = 1057 )



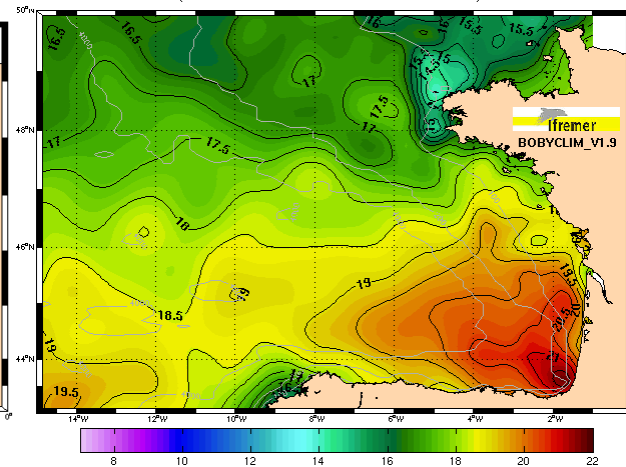
Temperature (Degrees Celsius) - January - Depth 1000 m  
( Minimum = 7.9 - Maximum = 10.8 - Number of data = 395 )



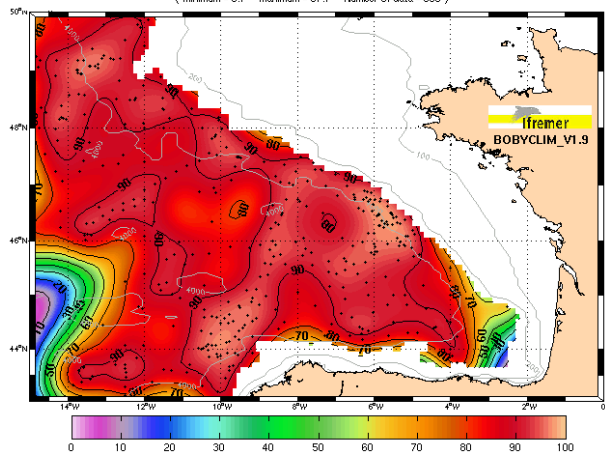
Salinity - January - Depth 1000 m  
( Minimum = 35.5 - Maximum = 36.0 - Number of data = 142 )



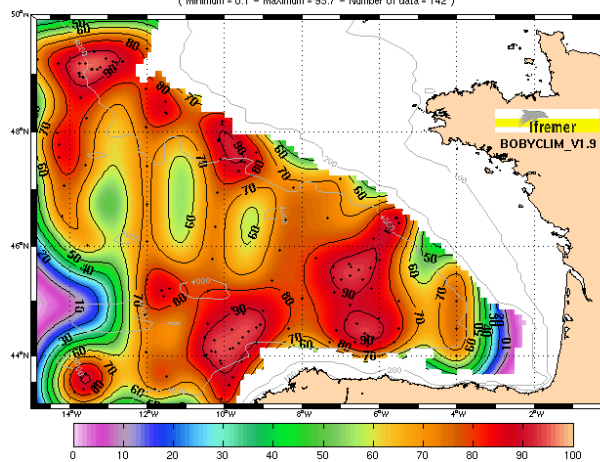
Temperature (Degrees Celsius) - summer - Depth 0 m  
( Minimum = 14.0 - Maximum = 21.7 - Number of data = 25424 )



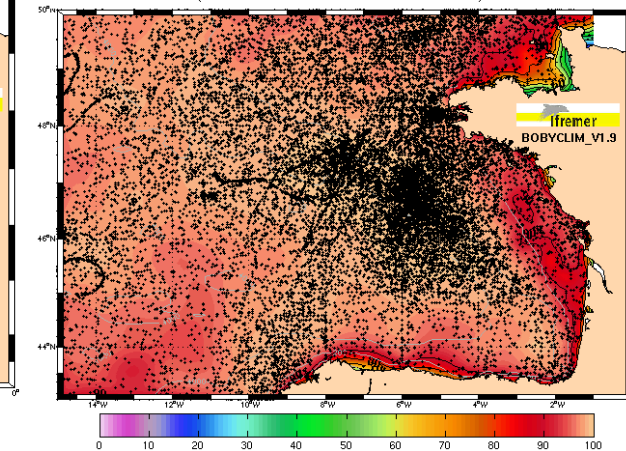
Temperature - Confidence in the estimation - January - Depth 1000 m  
( Minimum = 0.7 - Maximum = 97.7 - Number of data = 395 )



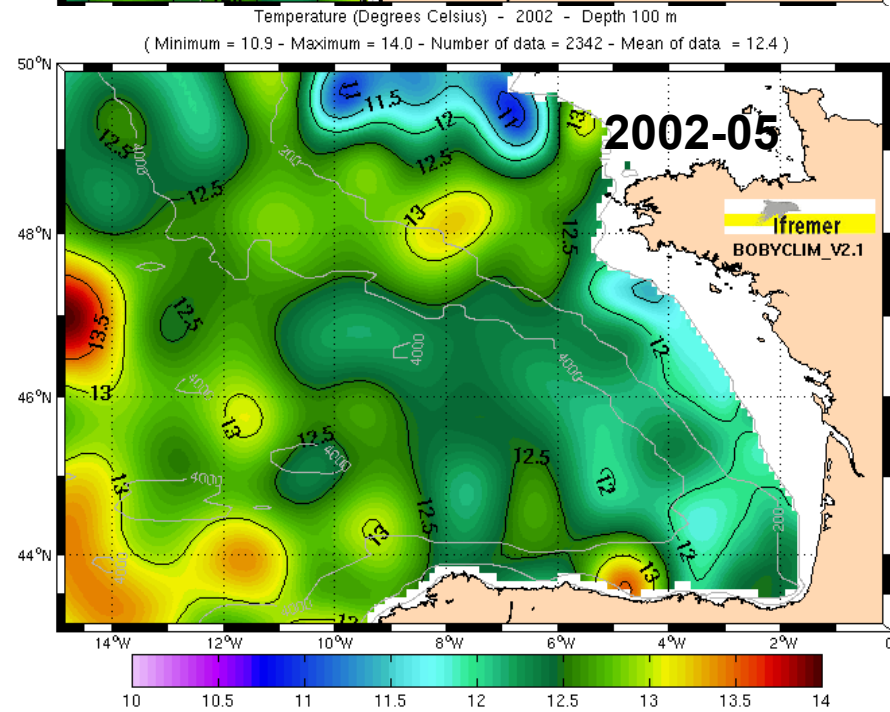
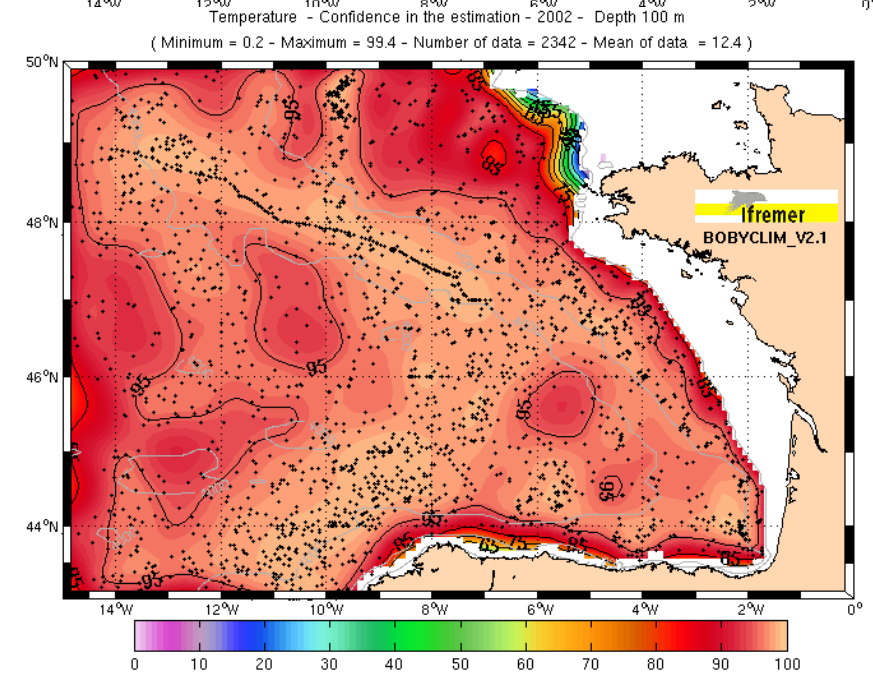
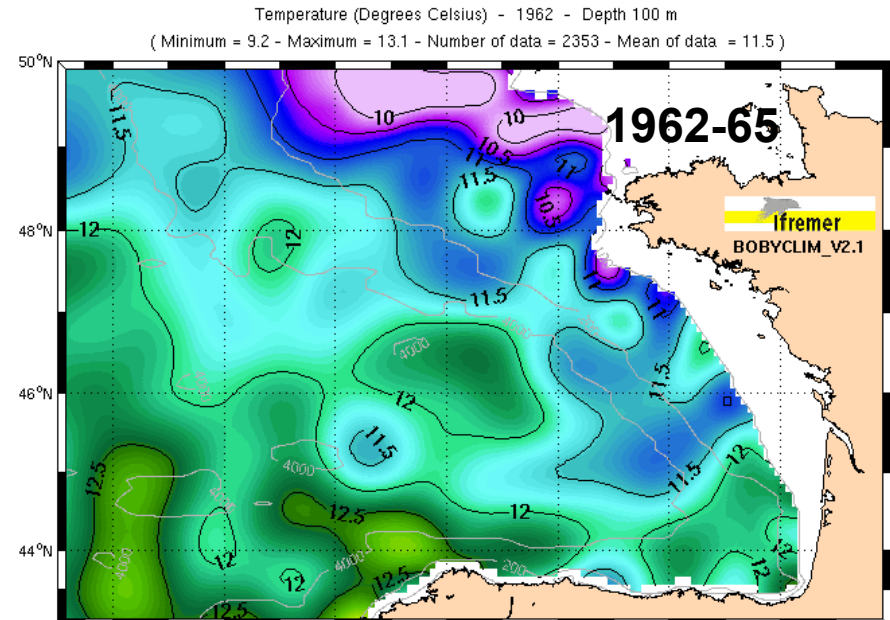
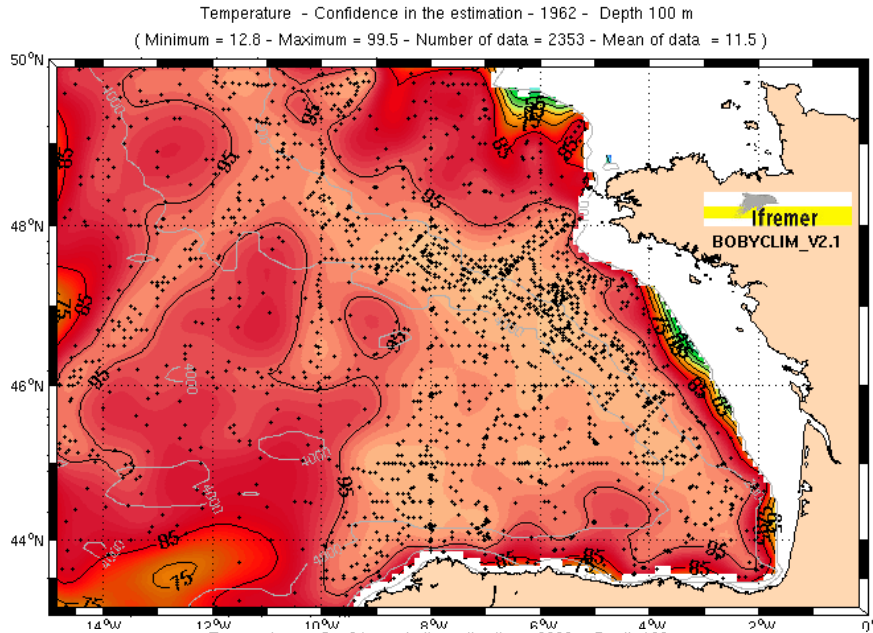
Salinity - Confidence in the estimation - January - Depth 1000 m  
( Minimum = 0.1 - Maximum = 95.7 - Number of data = 142 )



Temperature - Confidence in the estimation - summer - Depth 0 m  
( Minimum = 0.0 - Maximum = 99.8 - Number of data = 25424 )



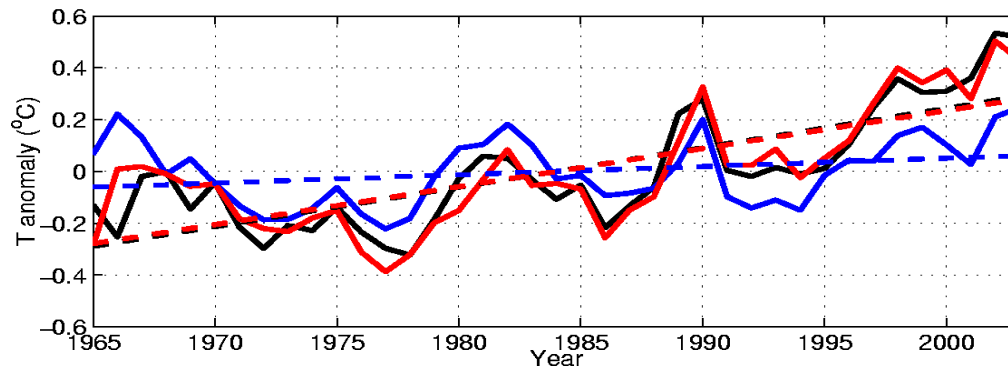
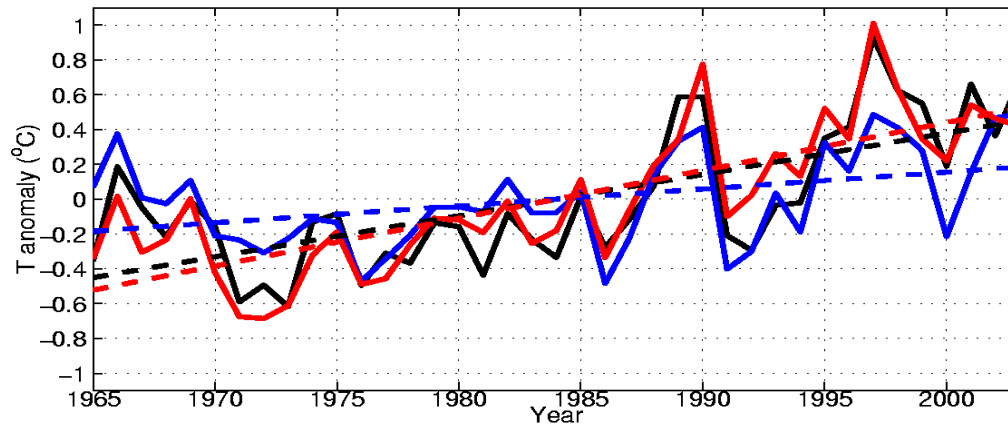
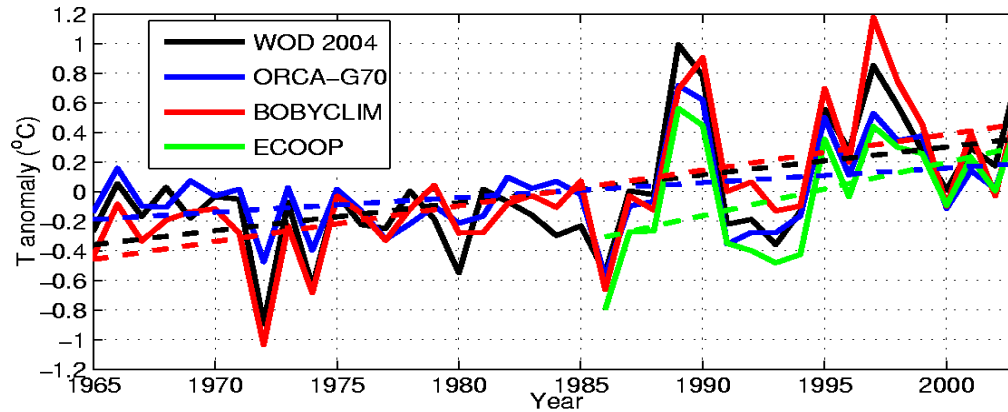
# Température à 100 m





# Comparison (1965-2003)

CSR, Michel et al, 2009



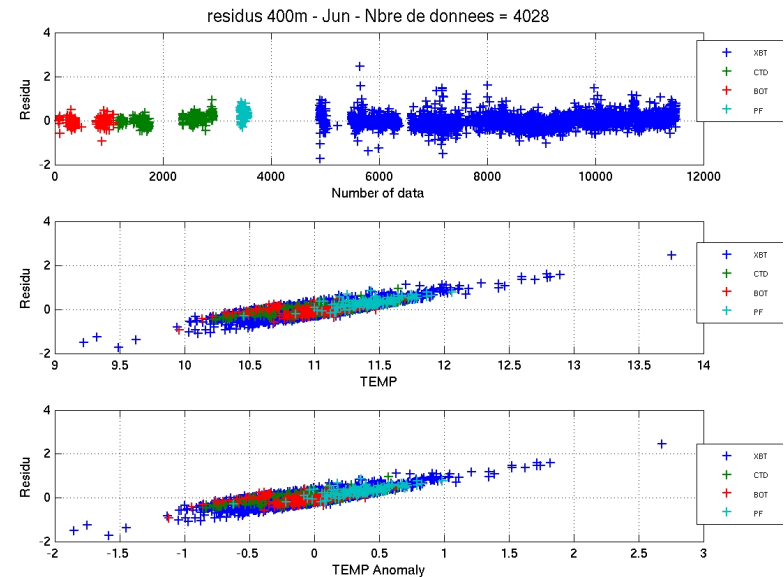
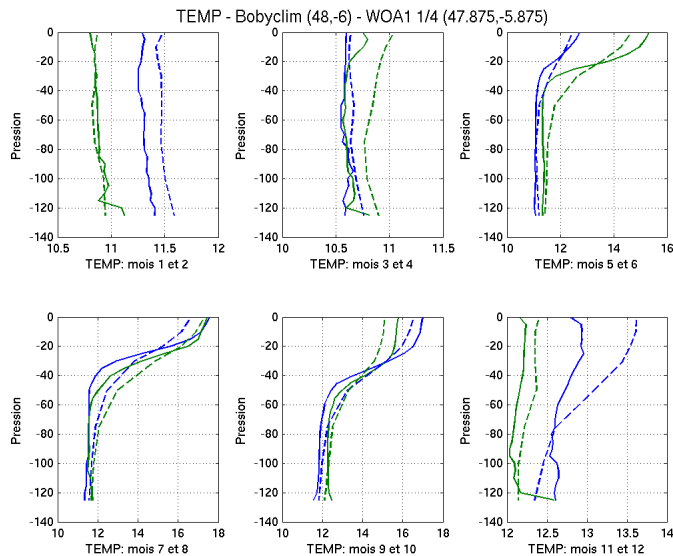
# Résumé

Nouvelle version en 2009

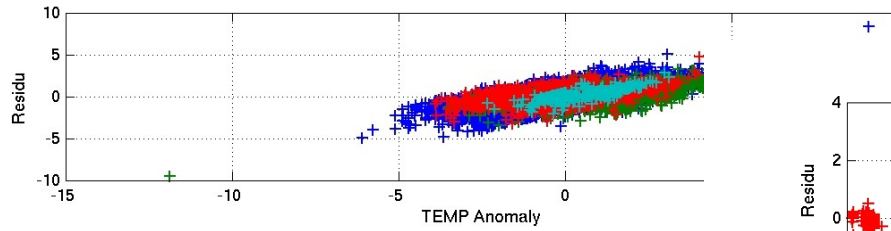
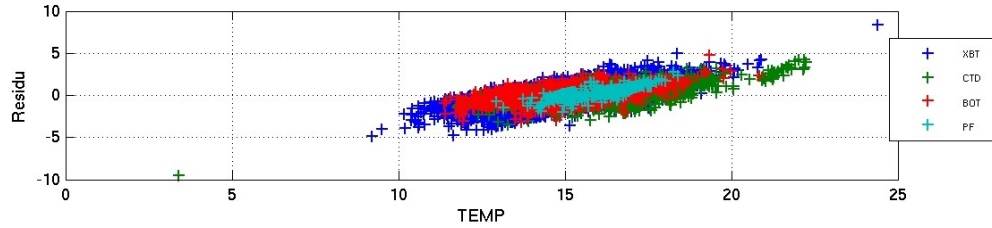
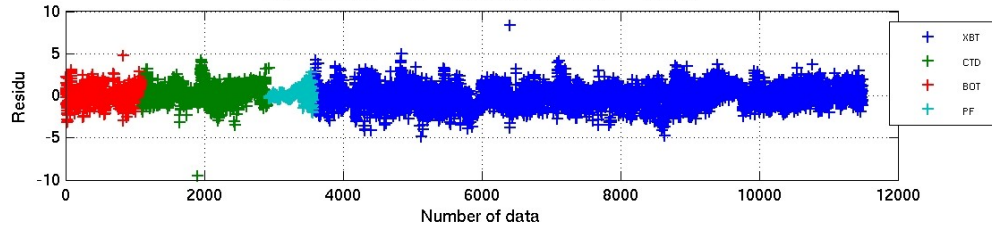
<http://www.ifremer.fr/climatologie-gascogne>

## Limitations - Corrections

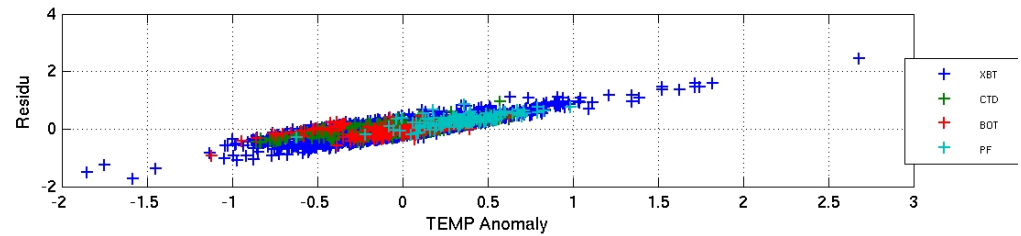
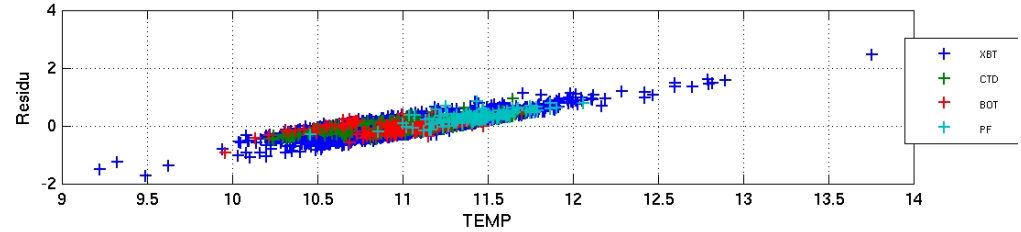
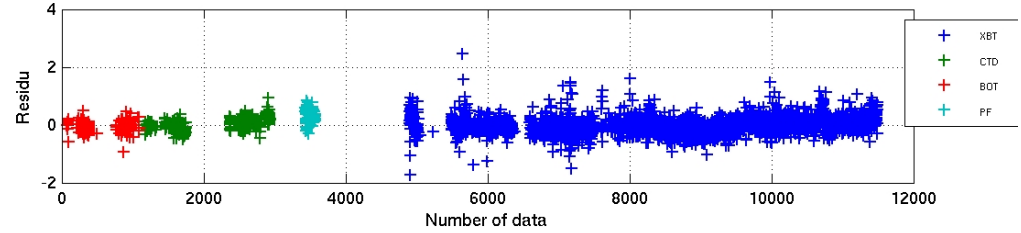
- Anomalie sur la verticale : profondeur maximale de certain profil
- Couverture spatiale et temporelle insuffisante en salinité
- Introduction de la bathy, cohérence avec le mask de surface
- Problème de vitesse de chute des XBT : analyse des résidus
- Comparaison quantitative avec WOA2001



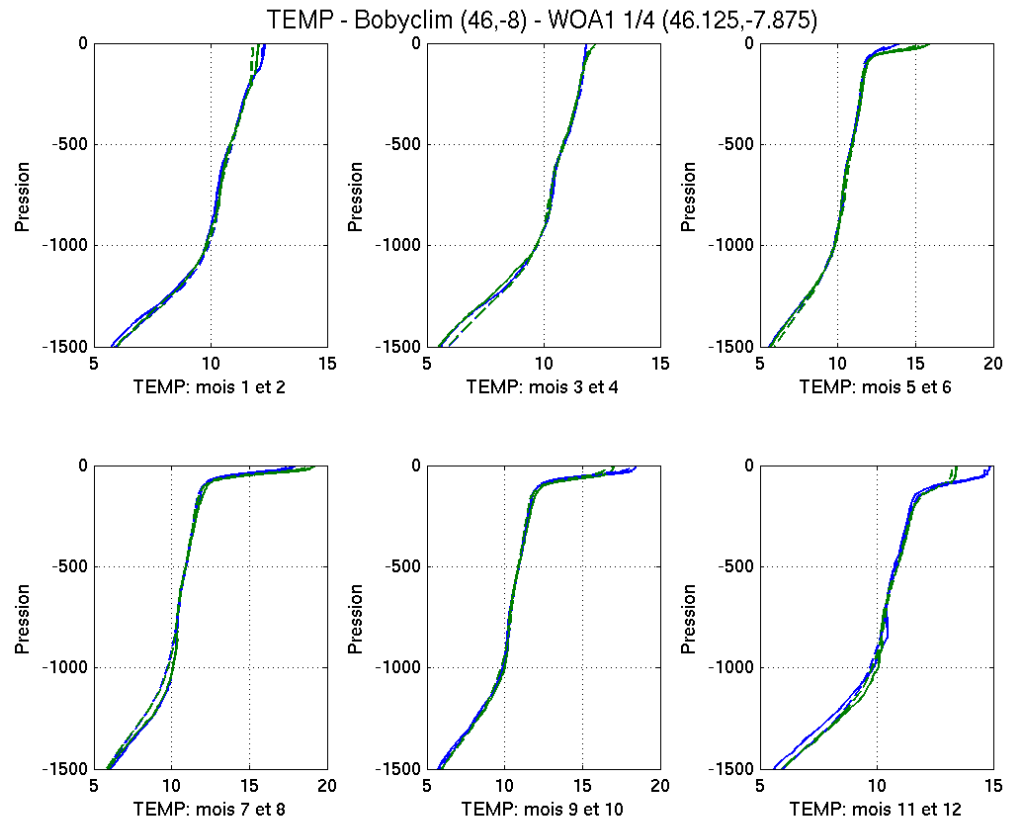
residus 5m - Jun - Nbre de donnees = 10780



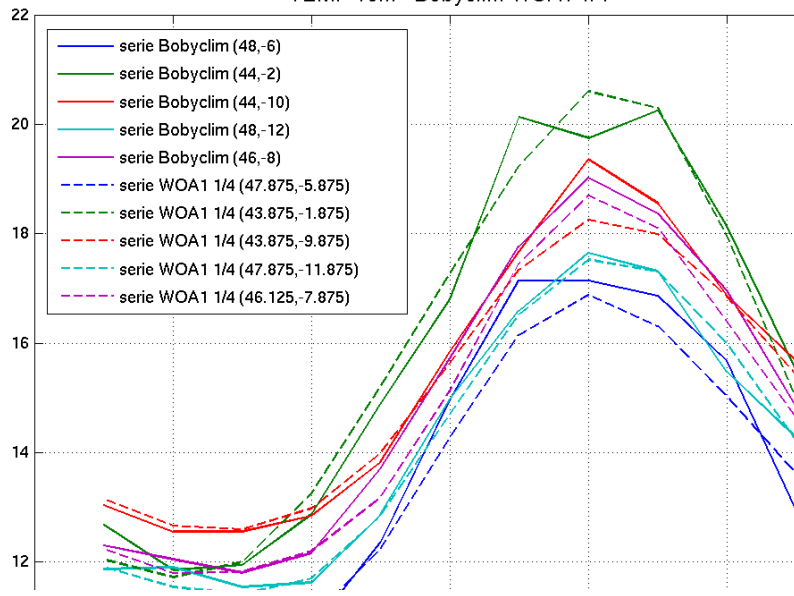
residus 400m - Jun - Nbre de donnees = 4028



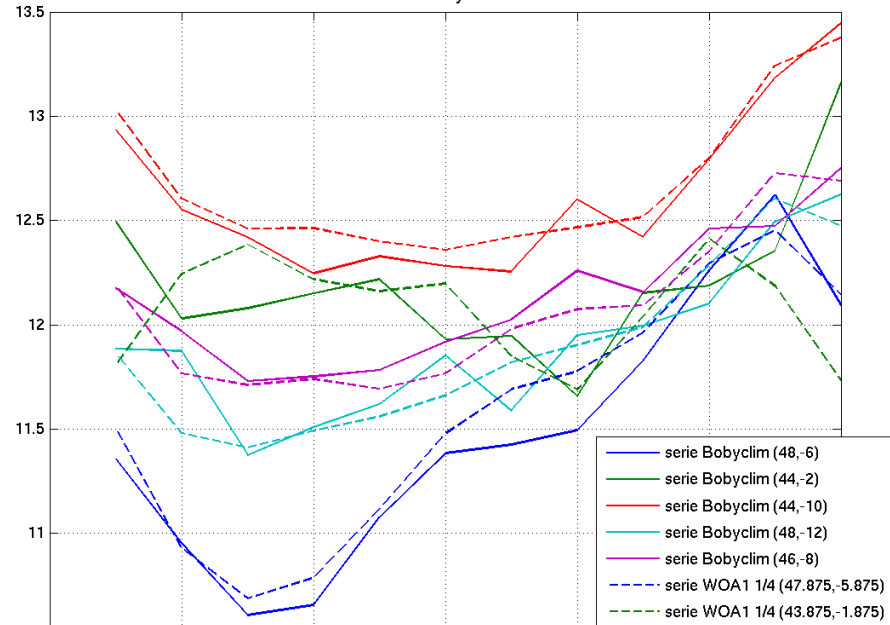
# Comparaison avec d'autres climatologies



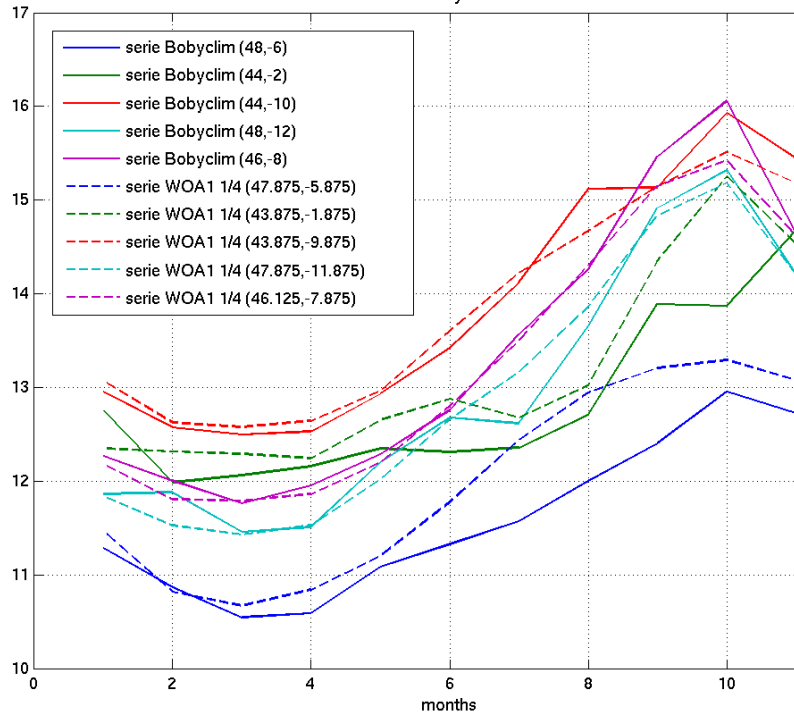
TEMP 10m - Bobyclim-WOA1 1/4



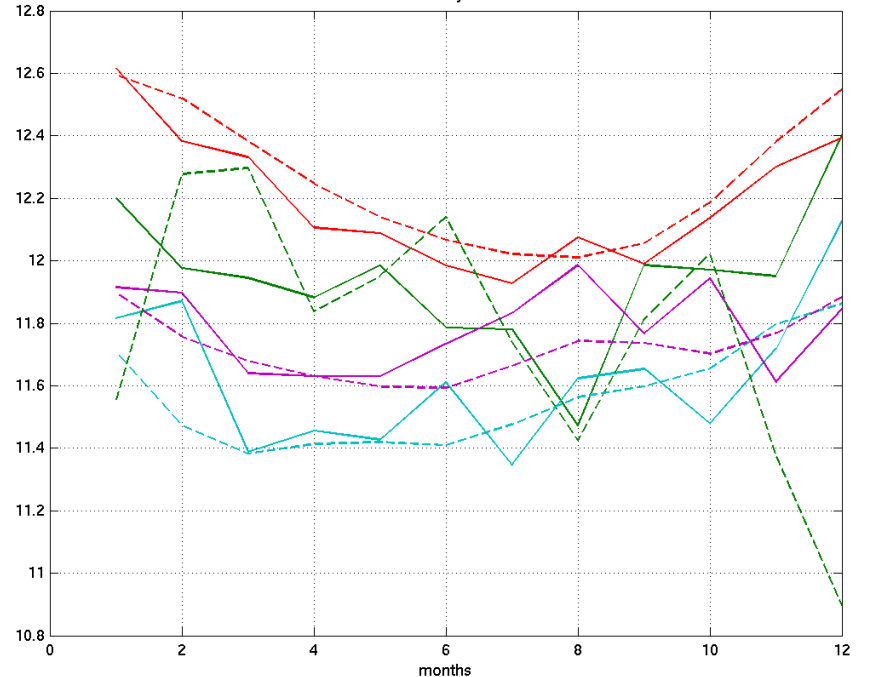
TEMP 100m - Bobyclim-WOA1 1/4



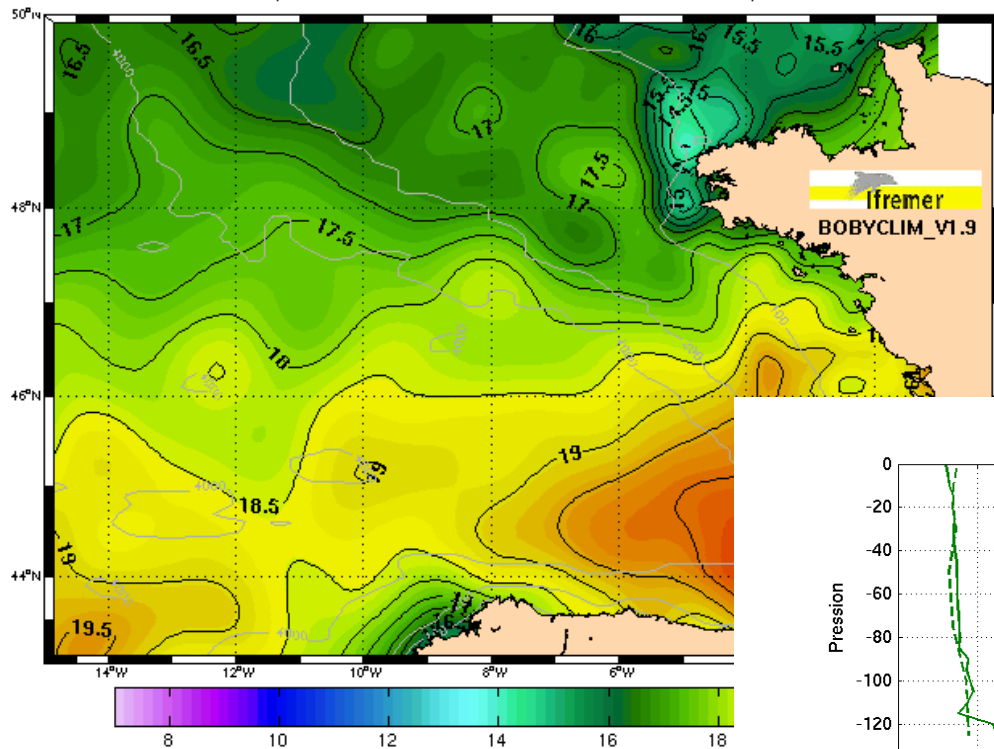
TEMP 50m - Bobyclim-WOA1 1/4



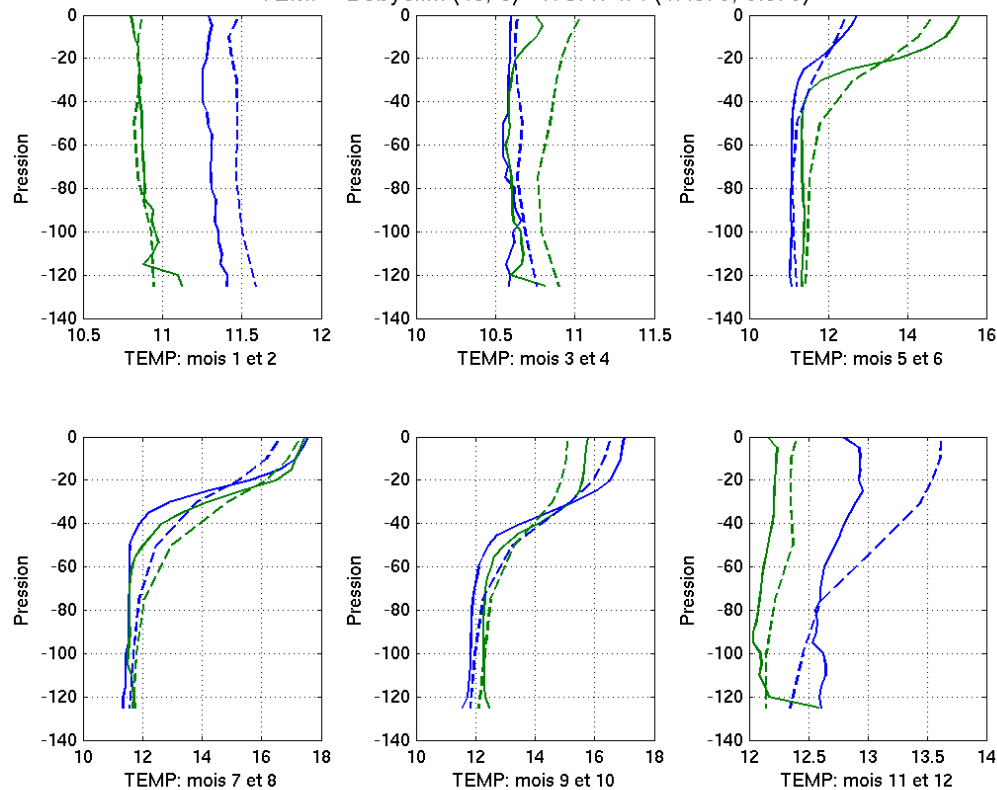
TEMP 150m - Bobyclim-WOA1 1/4



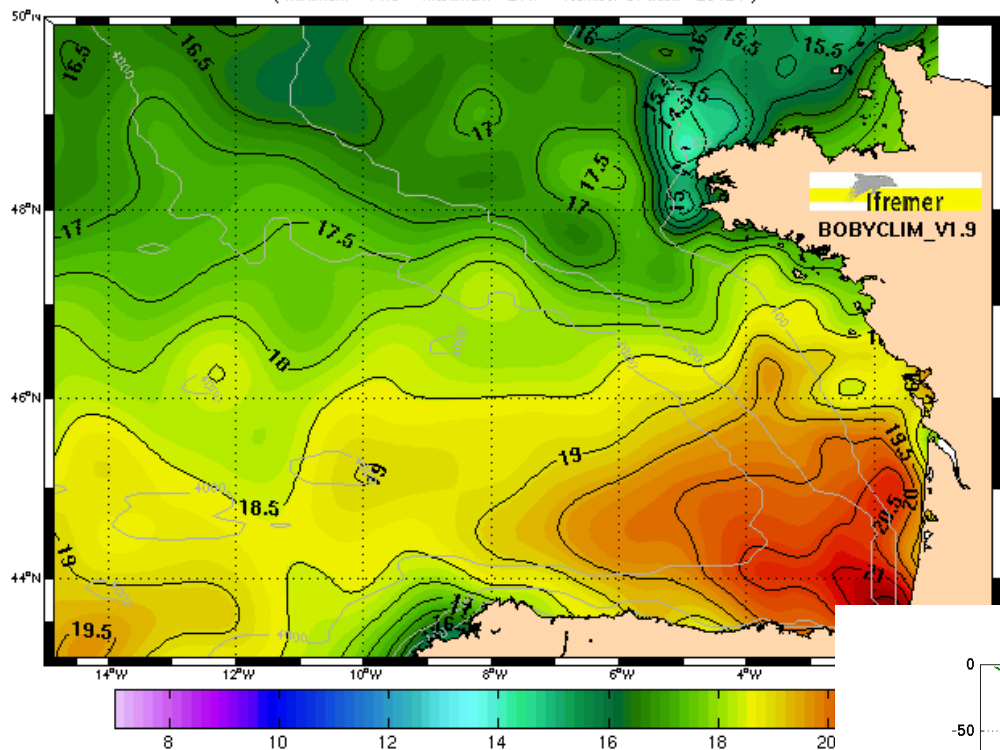
Temperature (Degrees Celsius) - summer - Depth 0 m  
( Minimum = 14.0 - Maximum = 21.7 - Number of data = 25424 )



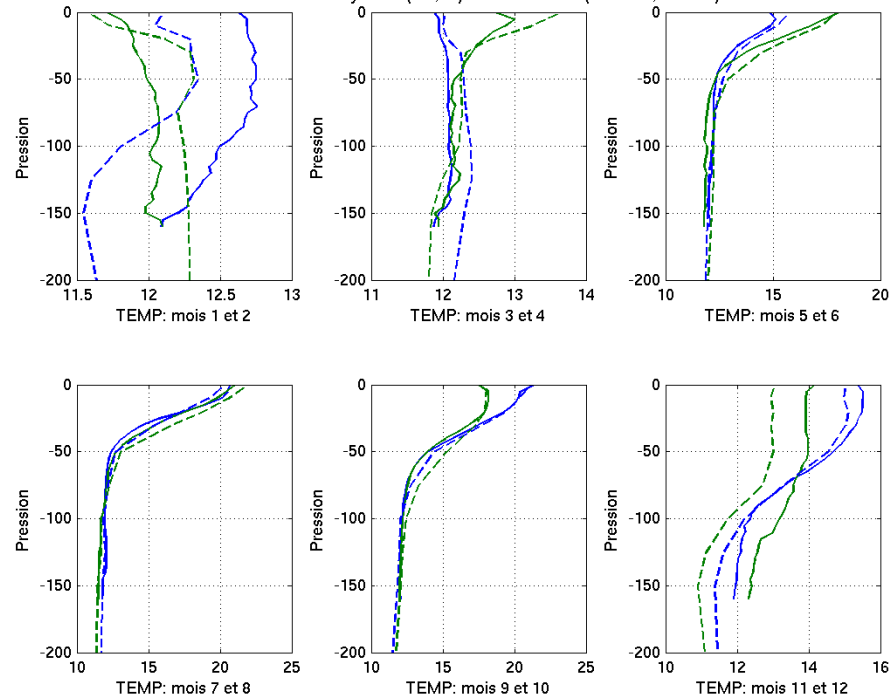
TEMP - Bobyclim (48,-6) - WOA1 1/4 (47.875,-5.875)



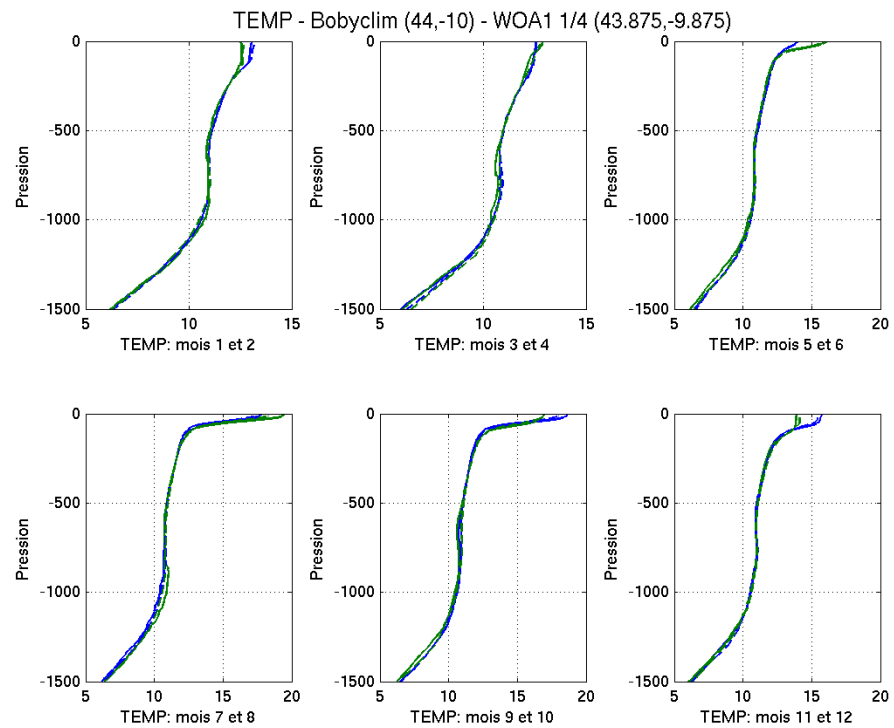
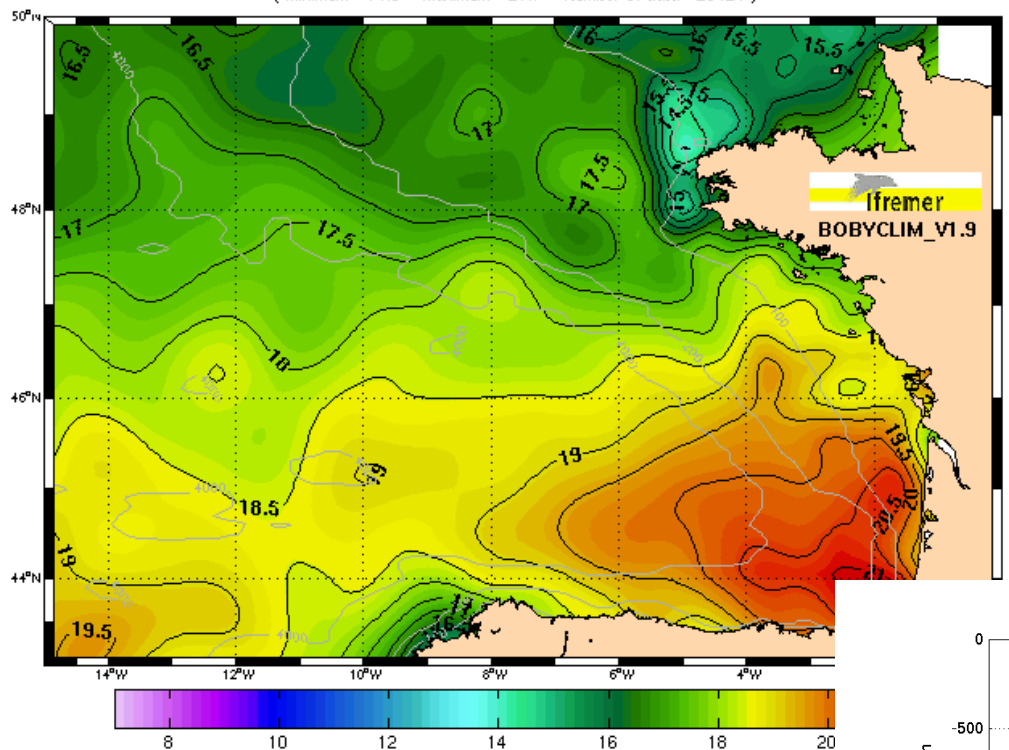
Temperature (Degrees Celsius) - summer - Depth 0 m  
( Minimum = 14.0 - Maximum = 21.7 - Number of data = 25424 )



TEMP - Bobyclim (44,-2) - WOA1 1/4 (43.875,-1.875)

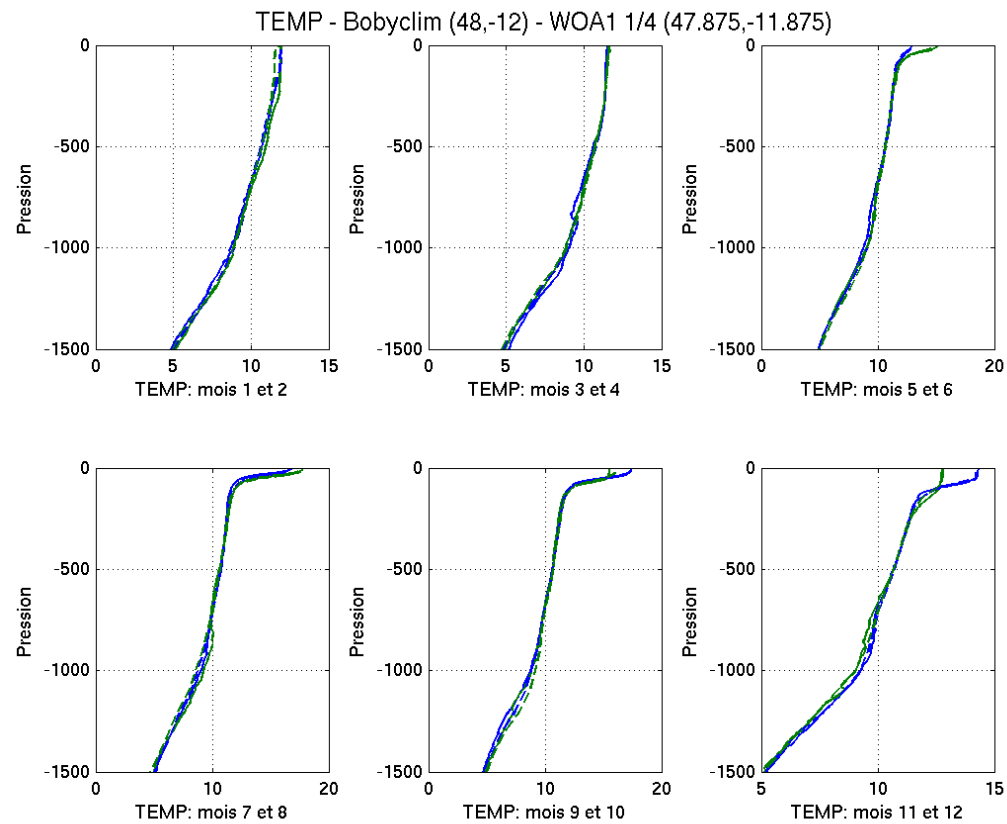
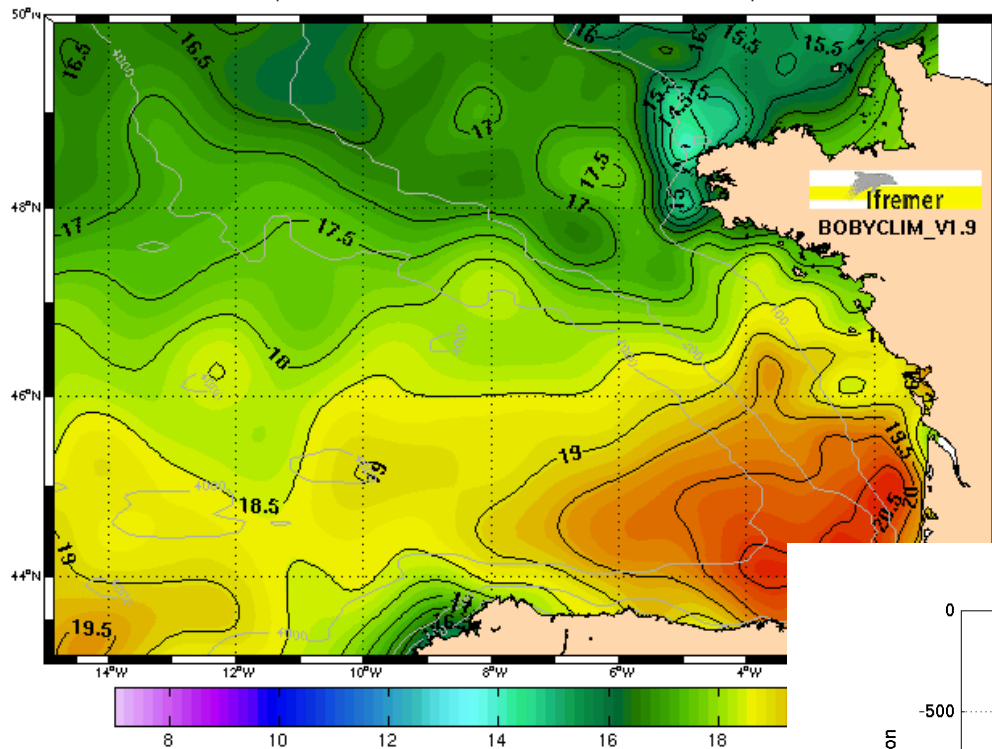


Temperature (Degrees Celsius) - summer - Depth 0 m  
( Minimum = 14.0 - Maximum = 21.7 - Number of data = 25424 )

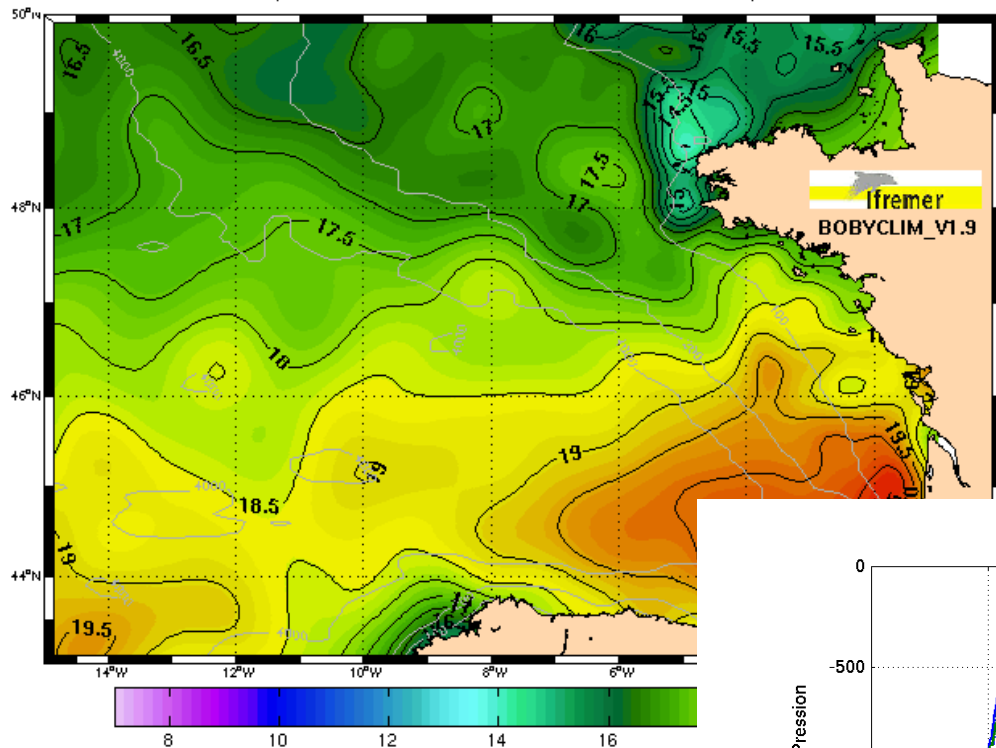




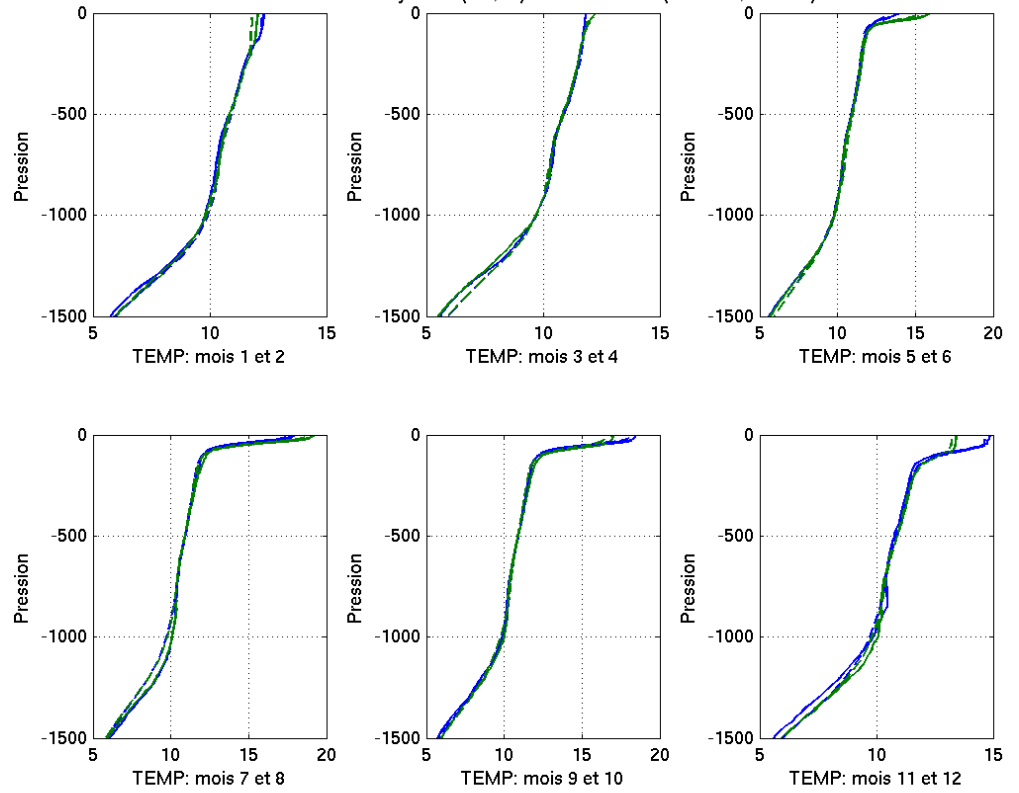
Temperature (Degrees Celsius) - summer - Depth 0 m  
( Minimum = 14.0 - Maximum = 21.7 - Number of data = 25424 )



Temperature (Degrees Celsius) - summer - Depth 0 m  
( Minimum = 14.0 - Maximum = 21.7 - Number of data = 25424 )



TEMP - Bobyclim (46,-8) - WOA1 1/4 (46.125,-7.875)





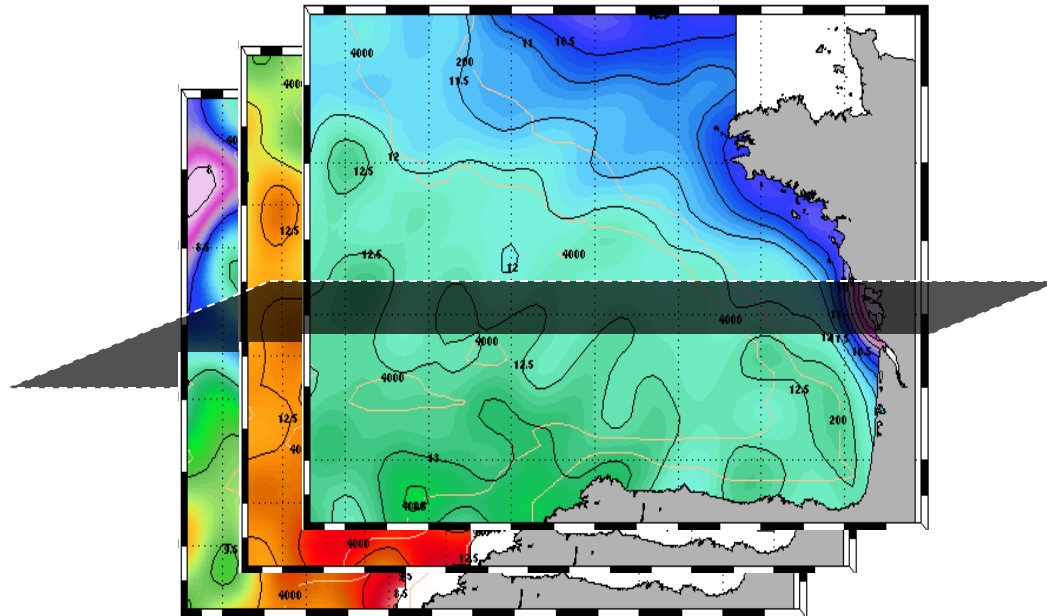
# Réalisation d'une climatologie mensuelle

## Bobyclim - Bay of Biscay Climatology

**Objectif** : évolution mensuelle spatialisée de la température et de la salinité de la surface au fond à partir des données hydrologiques.

**Format numérique disponible** : sur une grille 3D,  $0.1^\circ \times 0.1^\circ$ , 261 niveaux

<http://www.ifremer.fr/climatologie-gascogne>



Ifremer

# Méthode d'interpolation : analyse optimale

The method used to compute the map is the optimal estimation as exposed by Bretherton & al, 1976 and Autret & Gaillard, 2004.

$$x^a = x^f + C_{ao} (C_o + R)^{-1} d$$

- ✓  $x^a$  is the resulting temperature field or salinity field
- ✓ The solution is resolved as an anomaly field relative to a monthly climatology of profiles  $x^f$ .
- ✓ All the data are converted to anomaly  $d$  relative to  $x^f$ .
- ✓ The covariance matrices  $C_{ao}$  et  $C_o$  are constructing using the gaussian structure functions in space including the  $R$  data noise
- ✓ The method allows to obtain confidence maps for each analysis. These confidence maps give information on the reliability of the result.

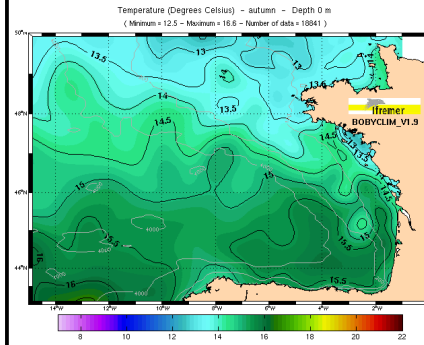
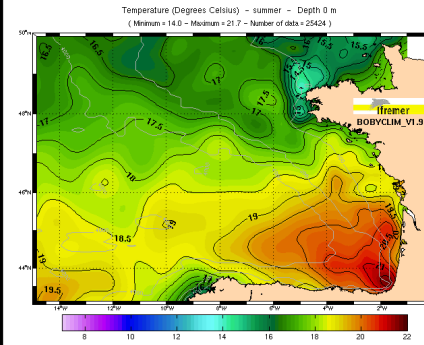
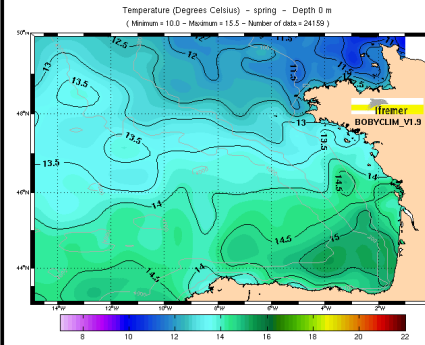
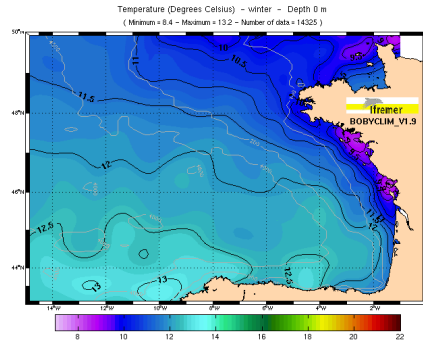
# Hiver

# Printemps

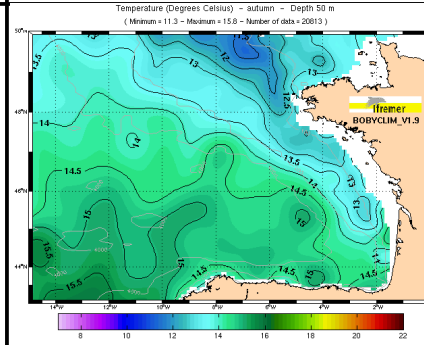
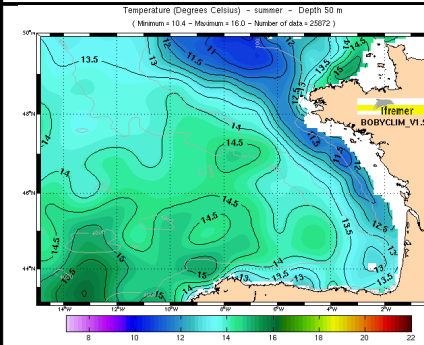
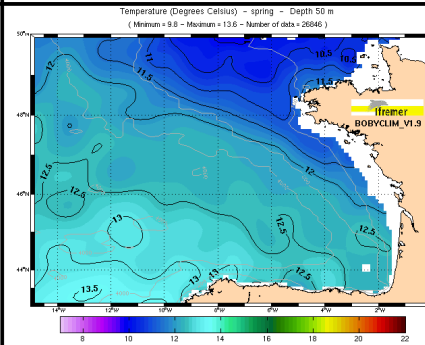
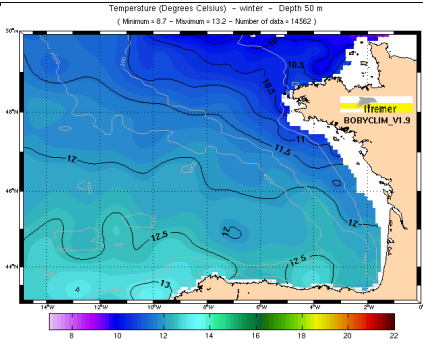
# Ete

# Automne

0 m



50 m



200 m

