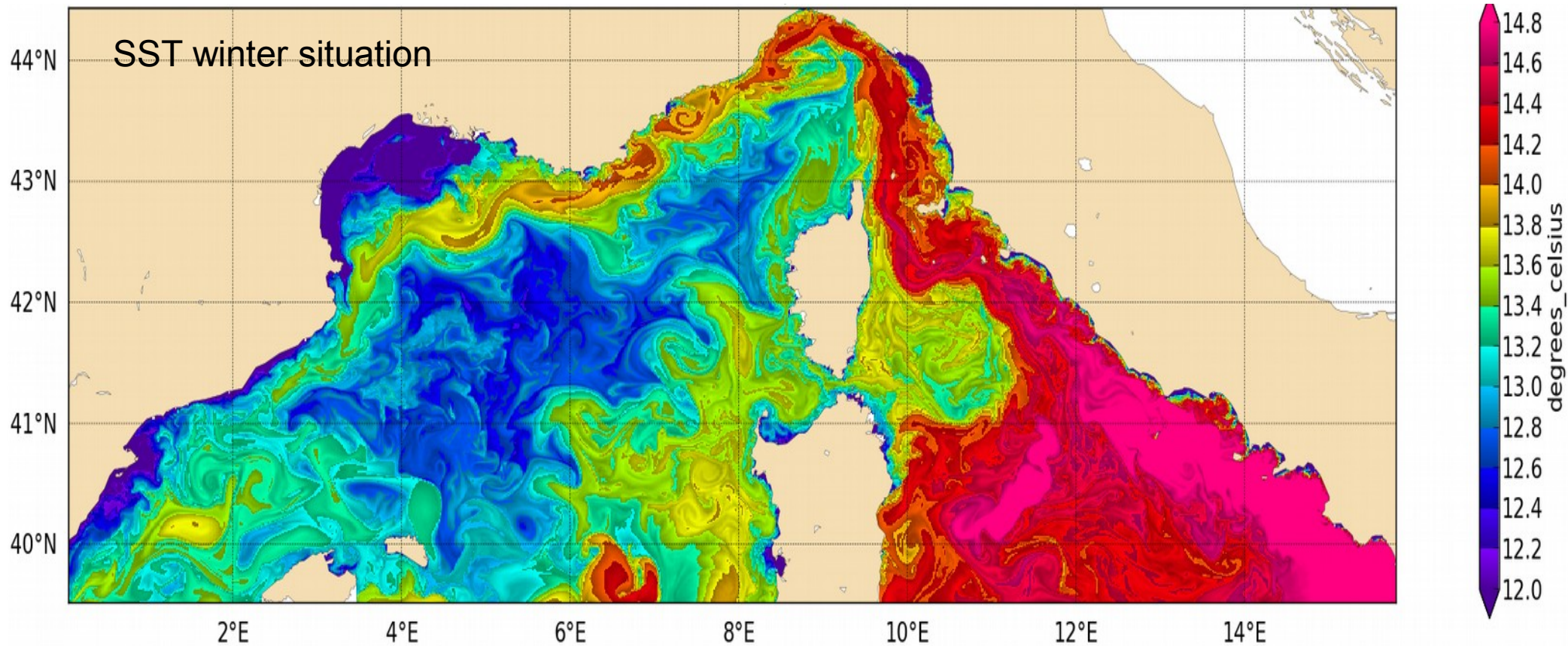
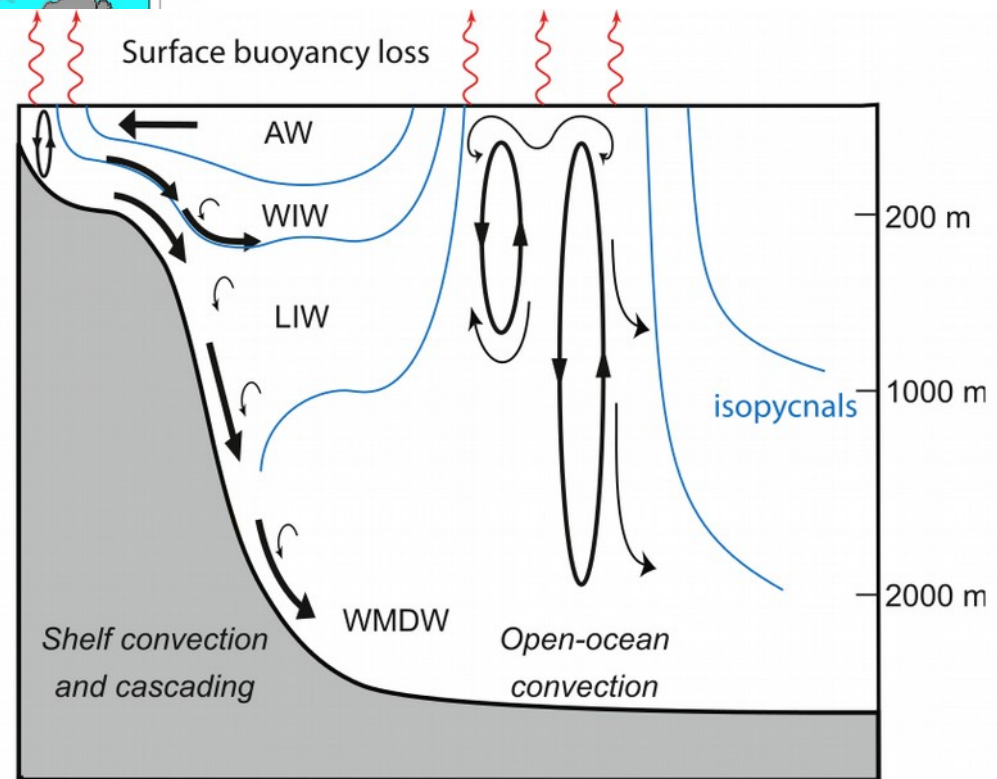
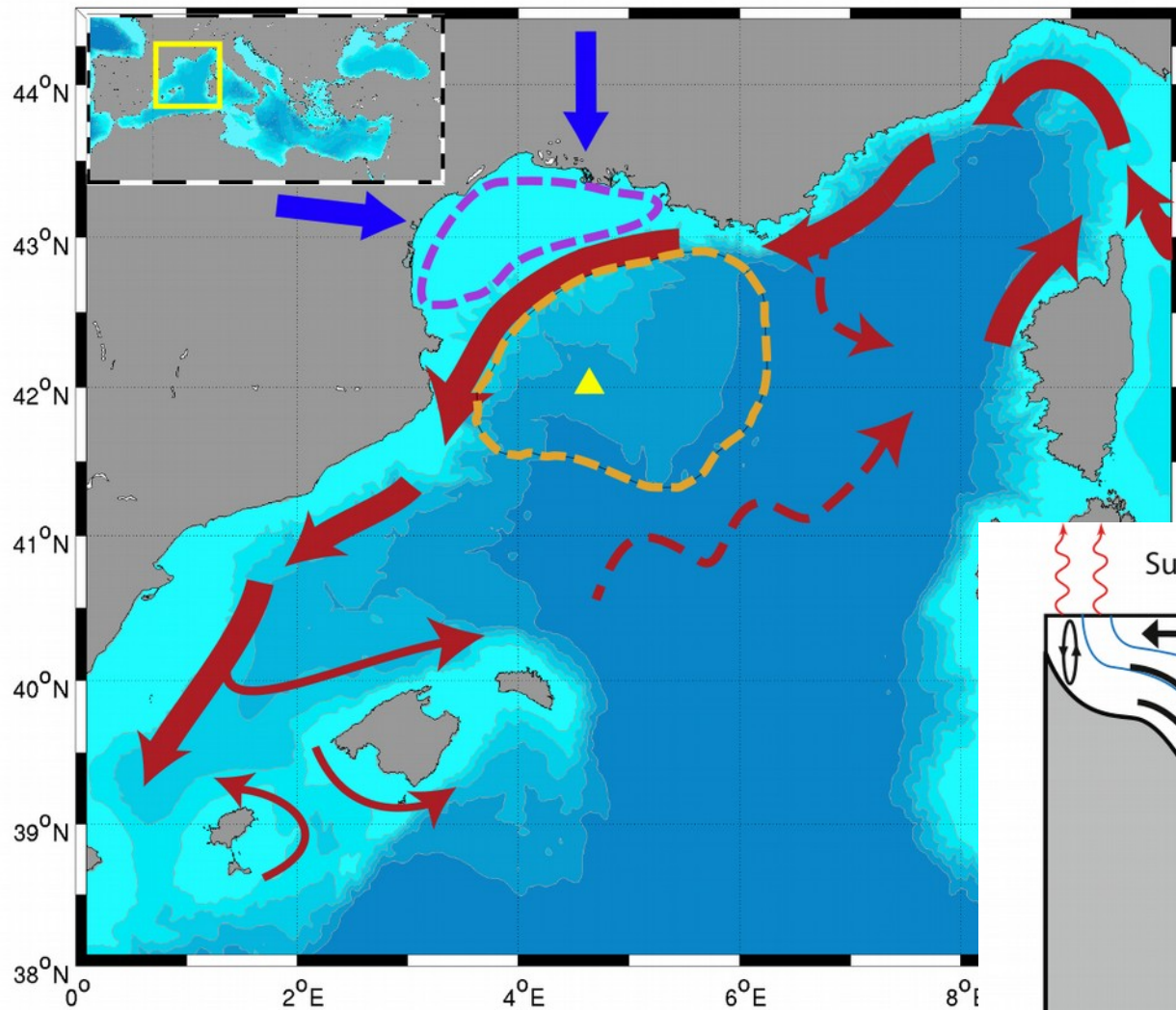


DATARMOR
Modèle Côtier :
Processus
meso-échelles et sous meso-échelles
Pierre Garreau



Ifremer Centre de Brest
Pierre.garreau@ifremer.fr

La convection dans le golfe du Lion



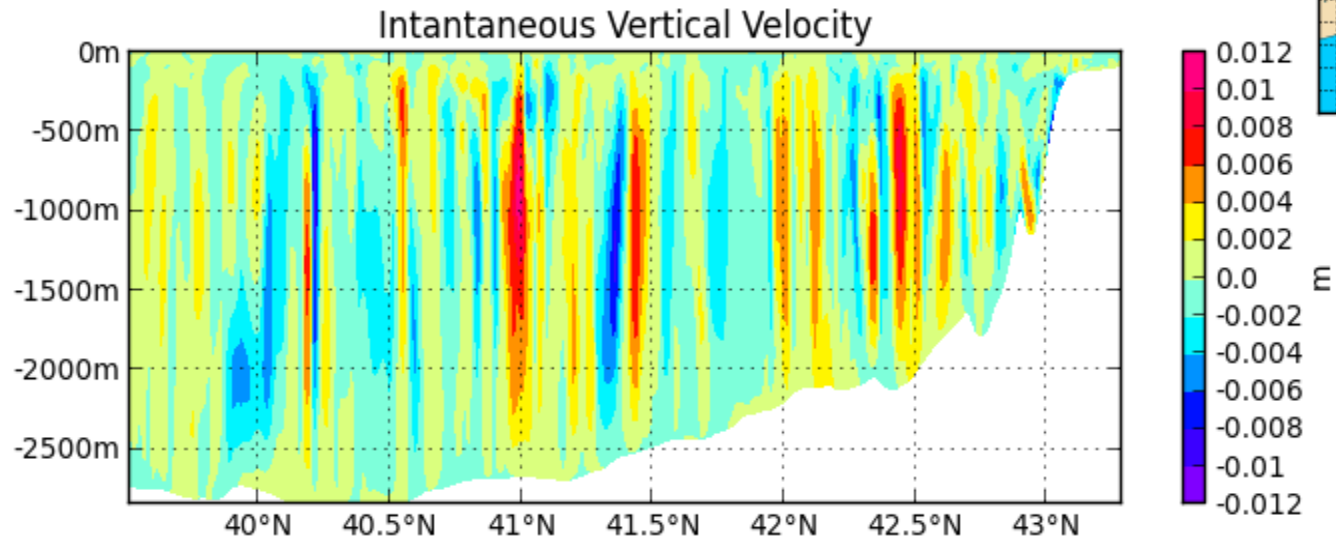
Emprunt : Loic Houpert

La vitesse verticale est rarement examinée dans les modèles

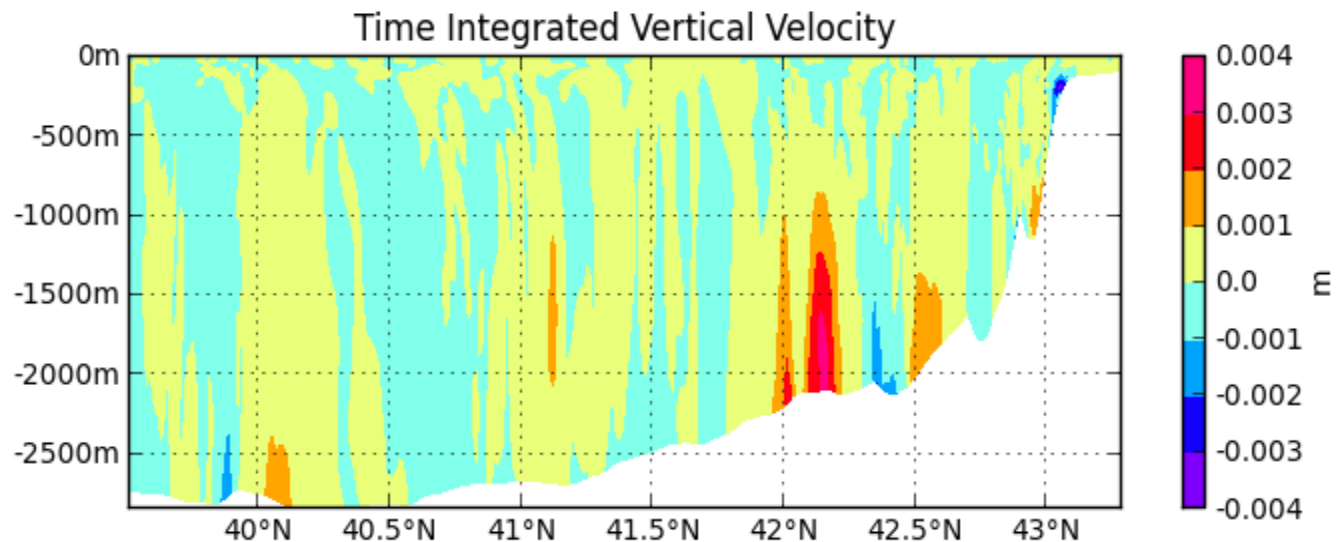
- W est une variable diagnostique (pression hydrostatique)
- W n'est pas une variable utilisée en coordonnées sigma
- W est souvent bruitée
- La convection est simulée par :
 - Un mélange vertical augmenté
 - En cas d'instabilité statique la colonne d'eau est mélangée artificiellement

Modélisation de la vitesse verticale dans un modèle

Internal waves
0.01 cm/s
Sometimes
more in case
of waves
addition.



Interaction of
horizontal current
with bottom slope
0.003 M/s



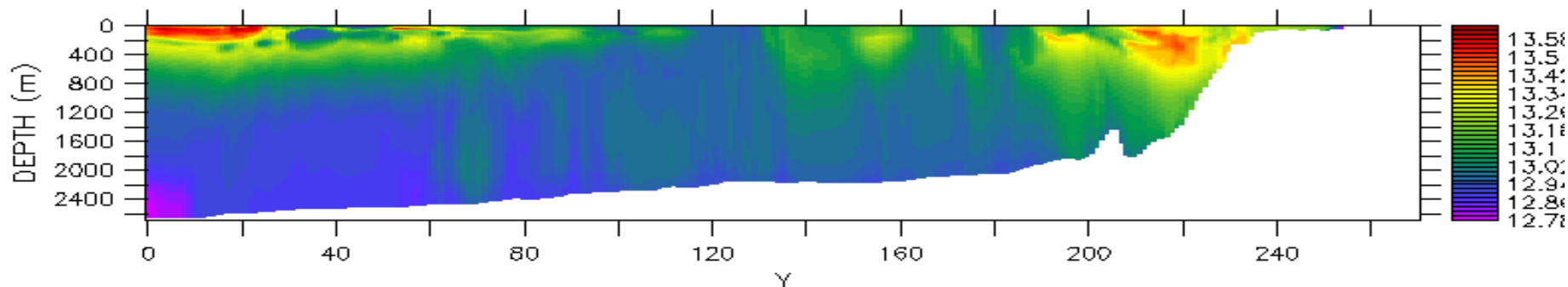
Vitesse verticale pendant un événement de convection

FERRET Ver. 6.7
NOAA/PMEL TMAP
19-MAY-2015 10:28:53

X : 0
TIME : 23-FEB-2013 12:00

DATA SET: w_i_160_SIMED-V10.03

MENORSG60



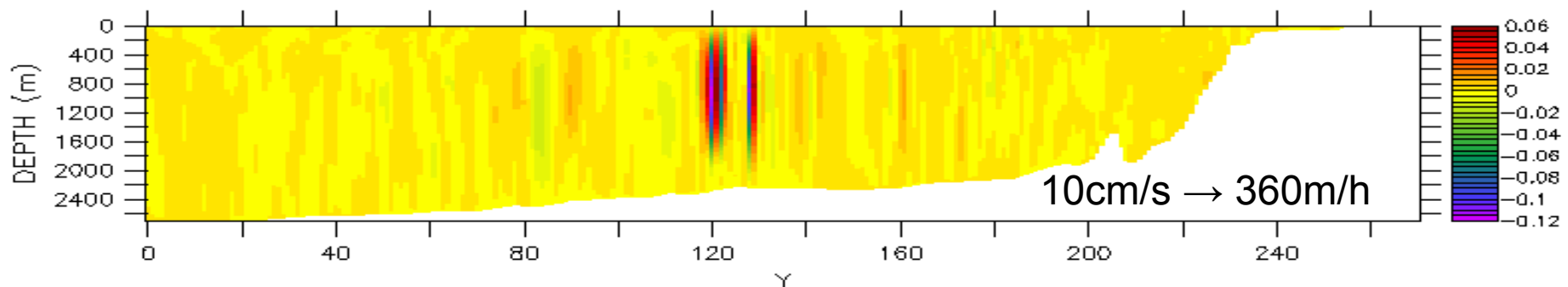
temperature (DEG C)

FERRET Ver. 6.7
NOAA/PMEL TMAP
19-MAY-2015 10:27:54

X : 0
TIME : 23-FEB-2013 12:00

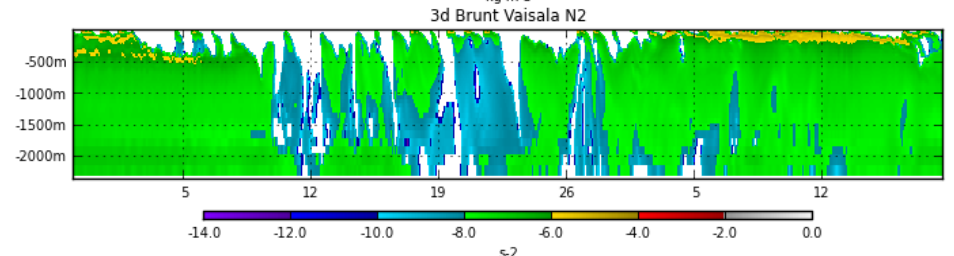
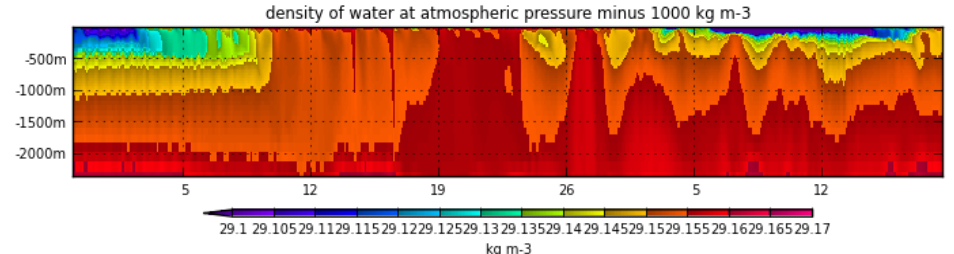
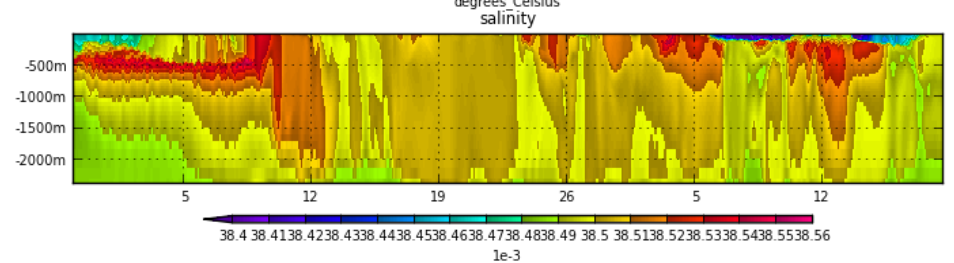
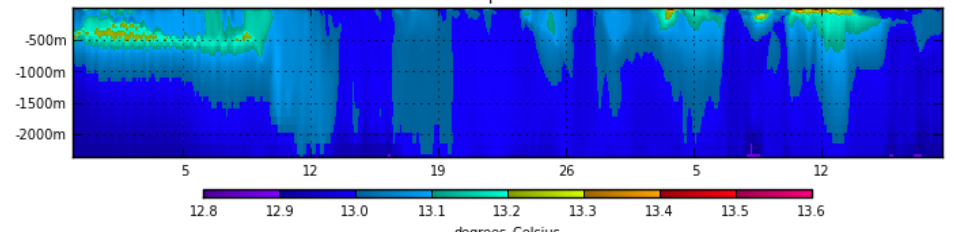
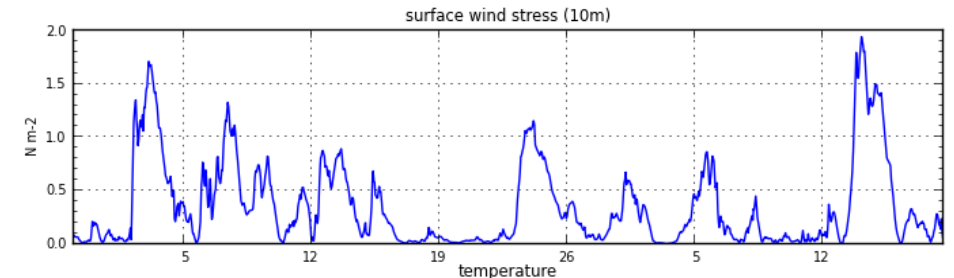
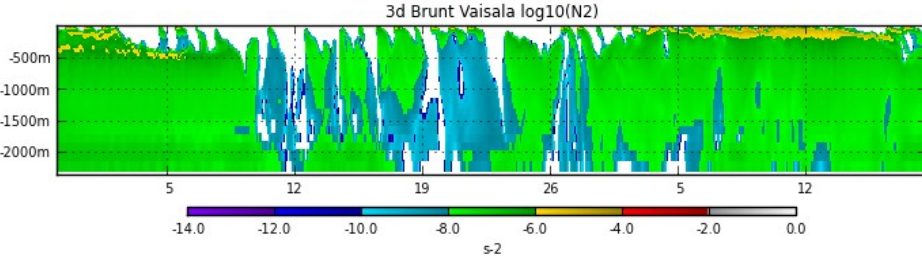
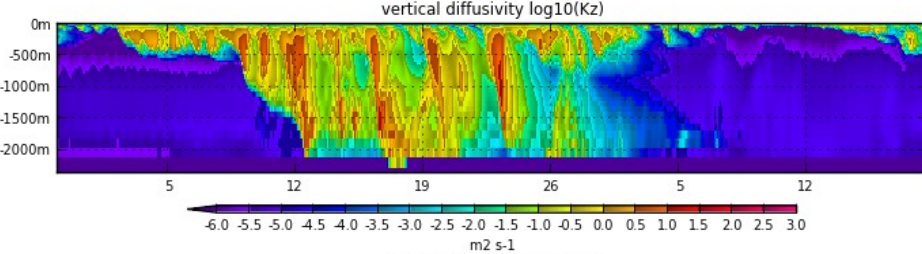
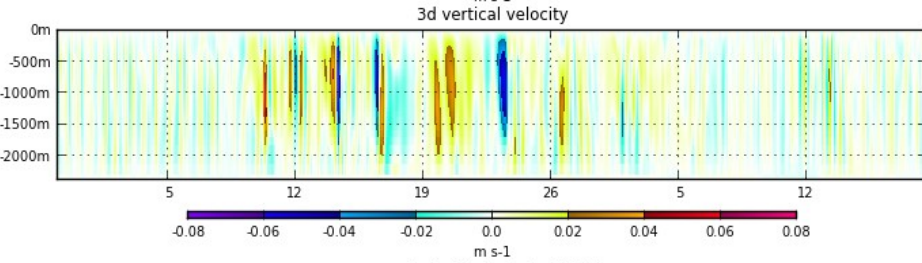
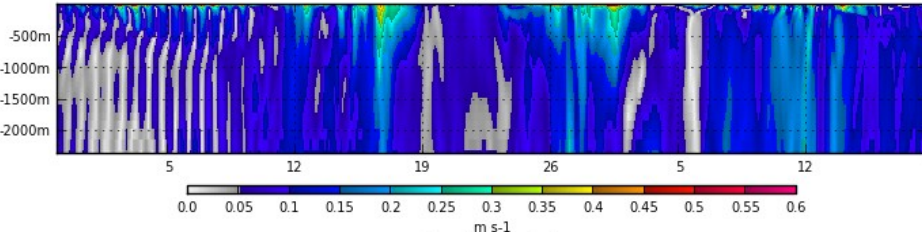
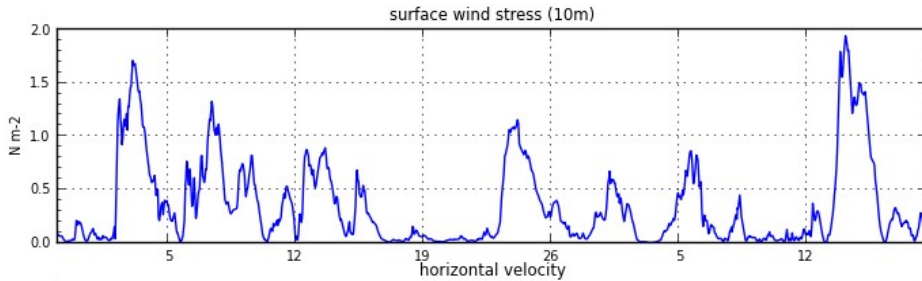
DATA SET: w_i_160_SIMED-V10.03

MENORSG60

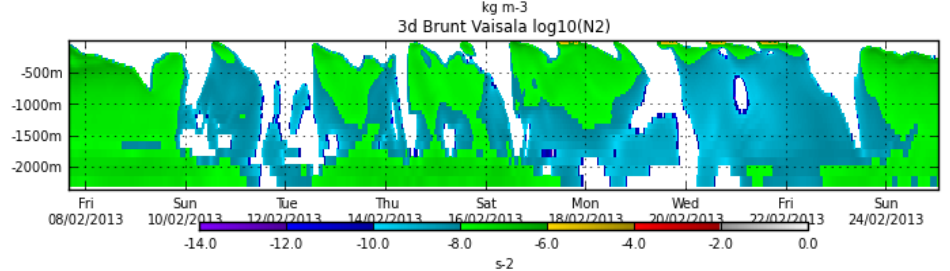
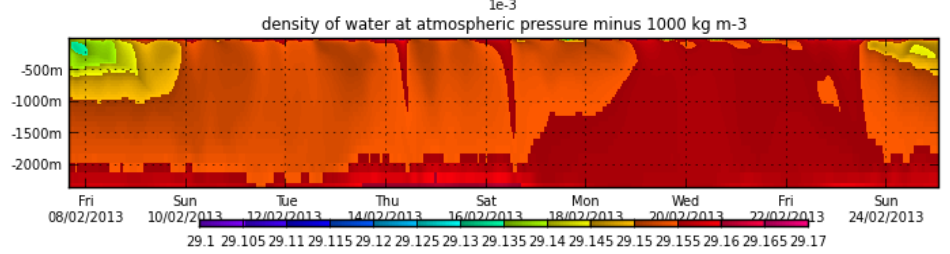
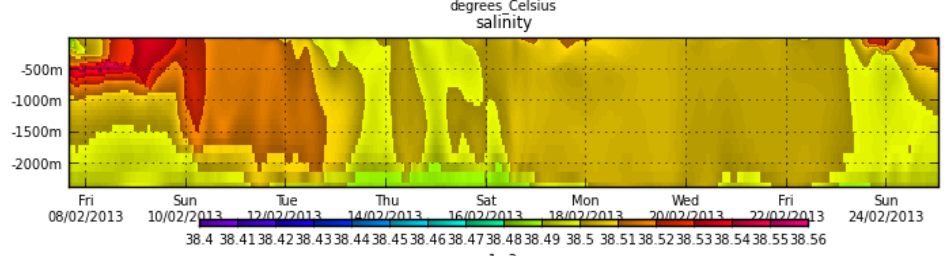
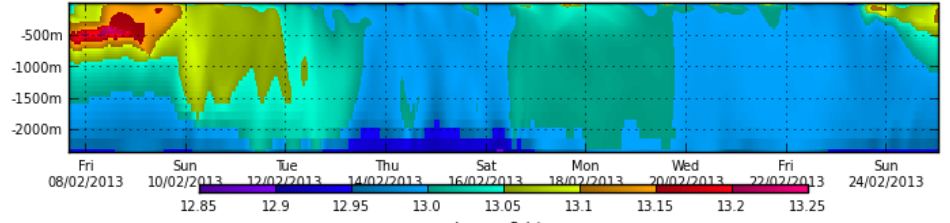
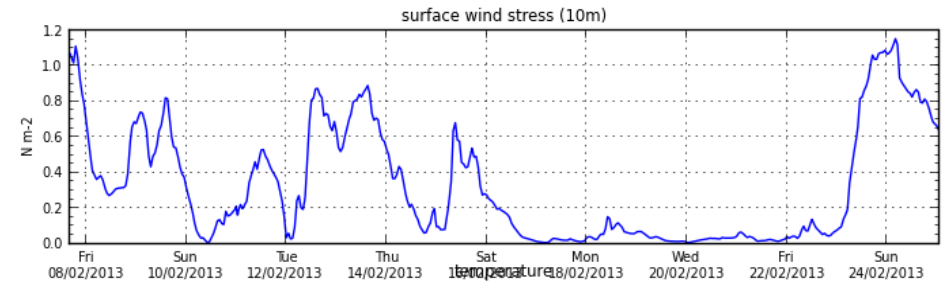
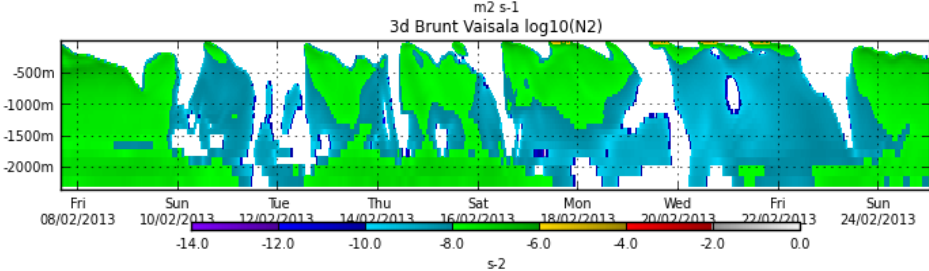
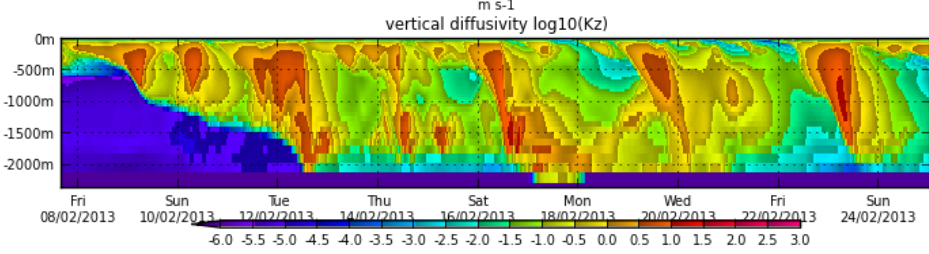
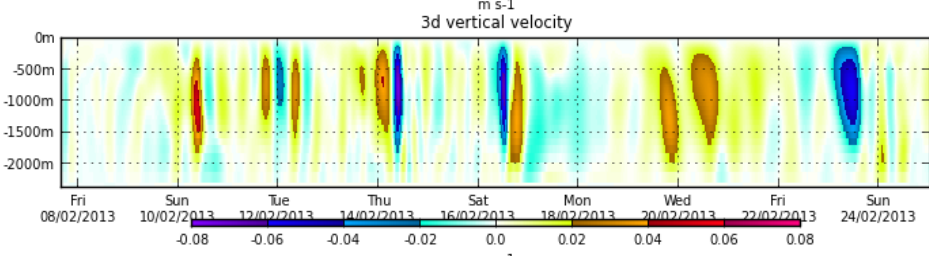
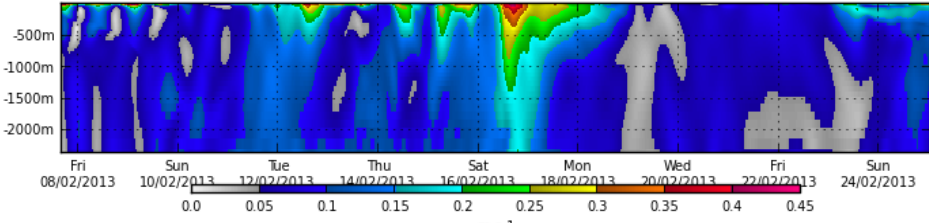
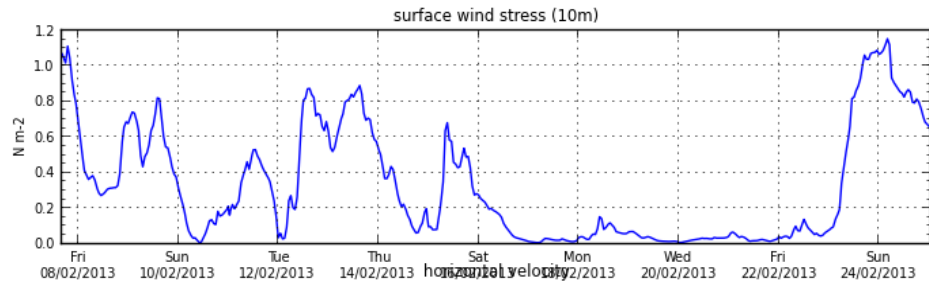


Vitesse verticale

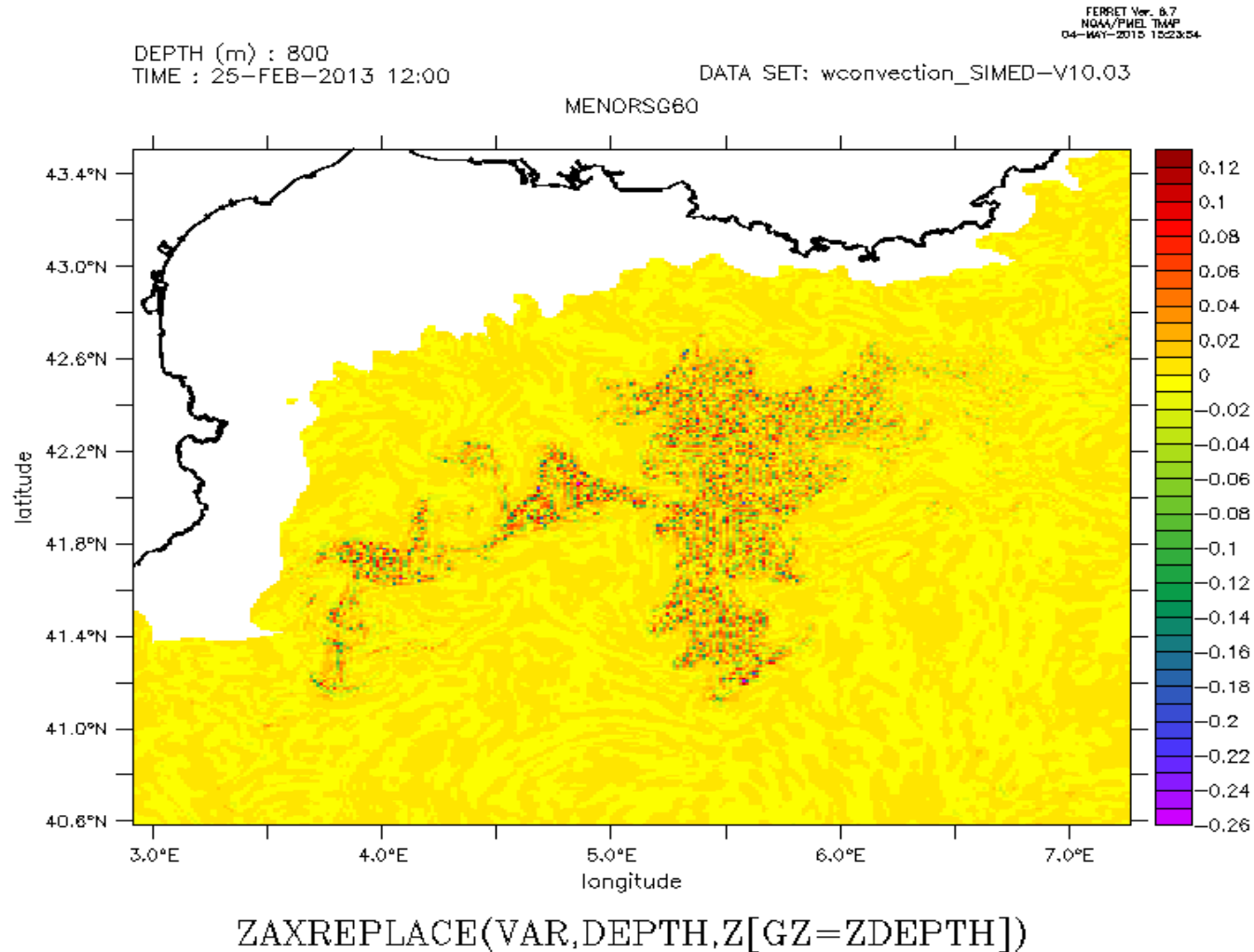
Vitesse Verticale au Mouillage Lion



Vitesse Verticale au Mouillage Lion focus sur la convection



Vitesse Verticale durant un épisode violent de convection



→ Modèle non-hydrostatique

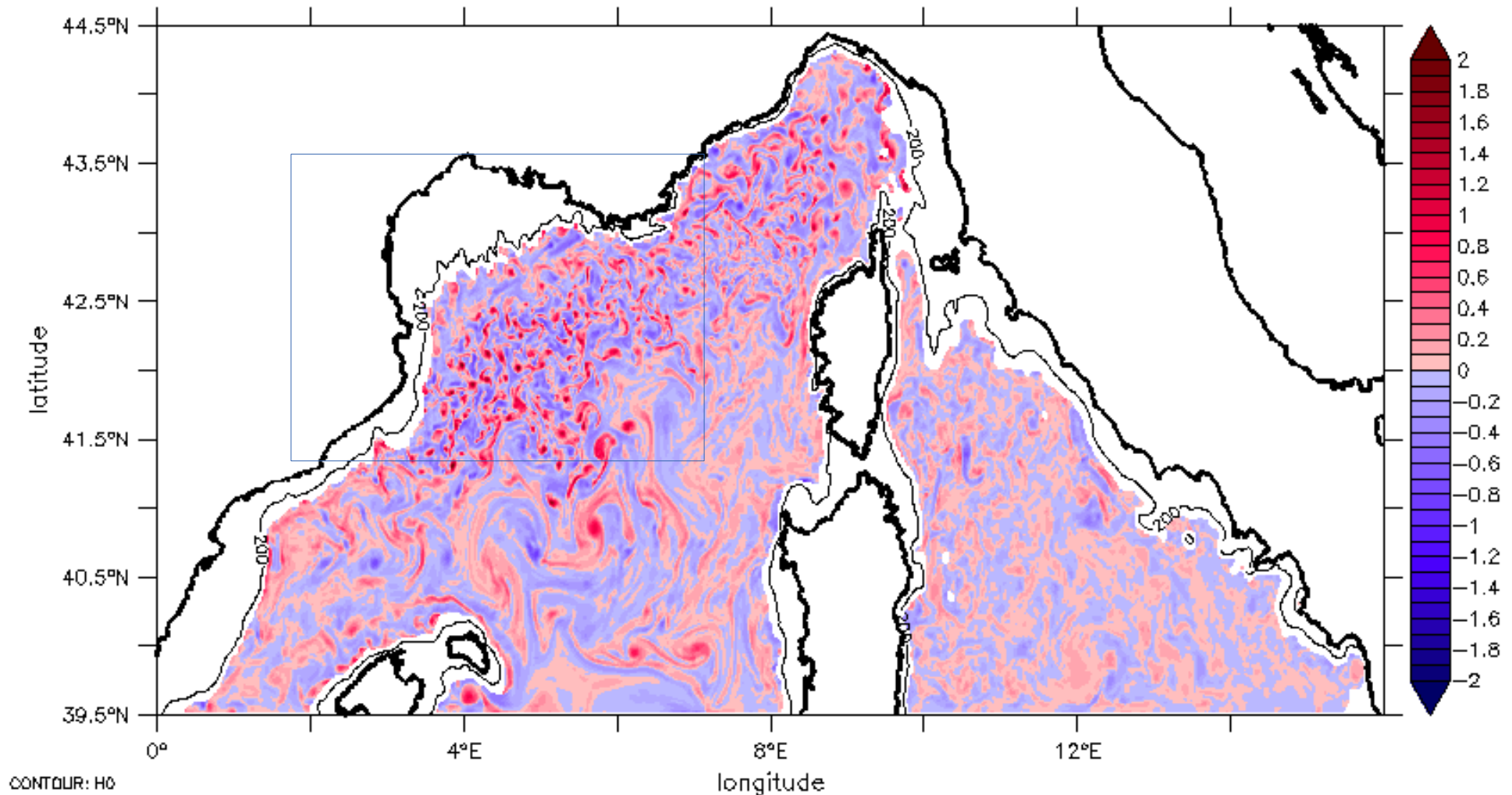
Vorticité Relative après un événement violent de convection

FERRET Ver. 6.7
NOAA/PMEL TRIP
18-SEP-2013 14:00:01

DEPTH (m) : 400
TIME : 01-MAR-2013 00:00

DATA SET: chomps_SIMED-V10.03_20130301T000000Z

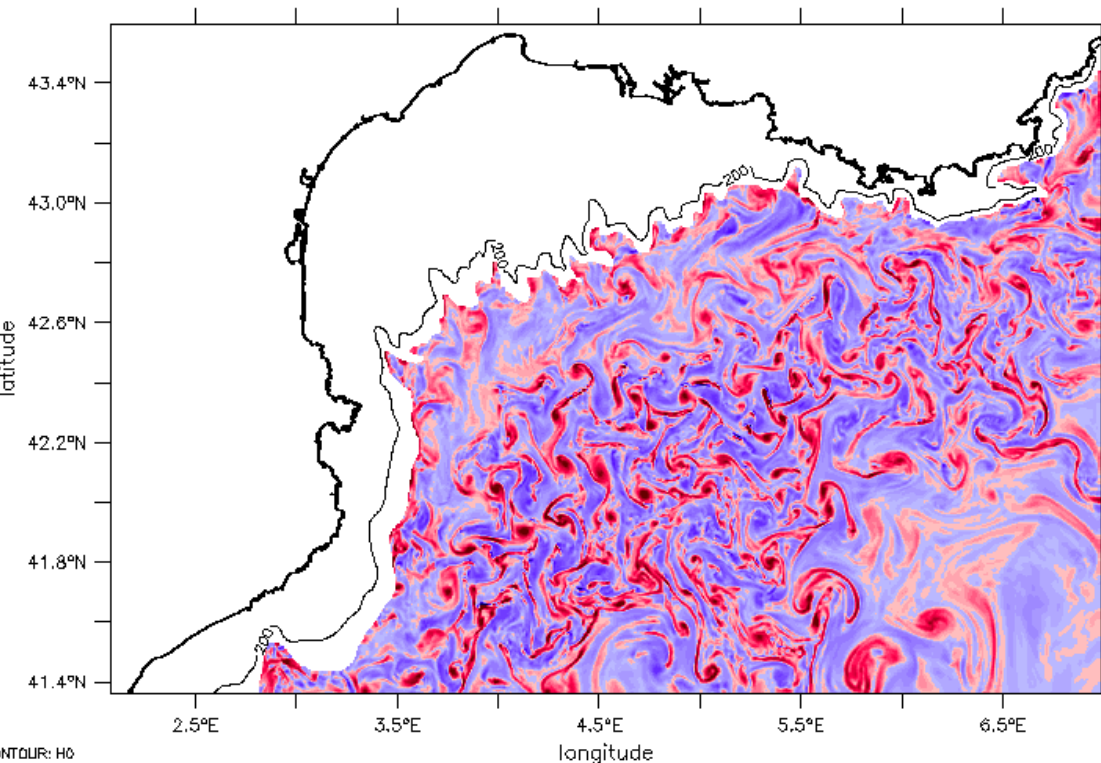
MENORSG60



La convection continue après l'événement de convection

DEPTH (m) : 400
 TIME : 01-MAR-2013 00:00
 DATA SET: chomps1_64_SIMED-V10.03_20130301T000000Z
 MENORSG60

FERRET Ver. 8.7
 NOAA/PMEL TRIP
 18-SEP-2015 14:50:09



Vorticité à 400m
 'vorticity/f'

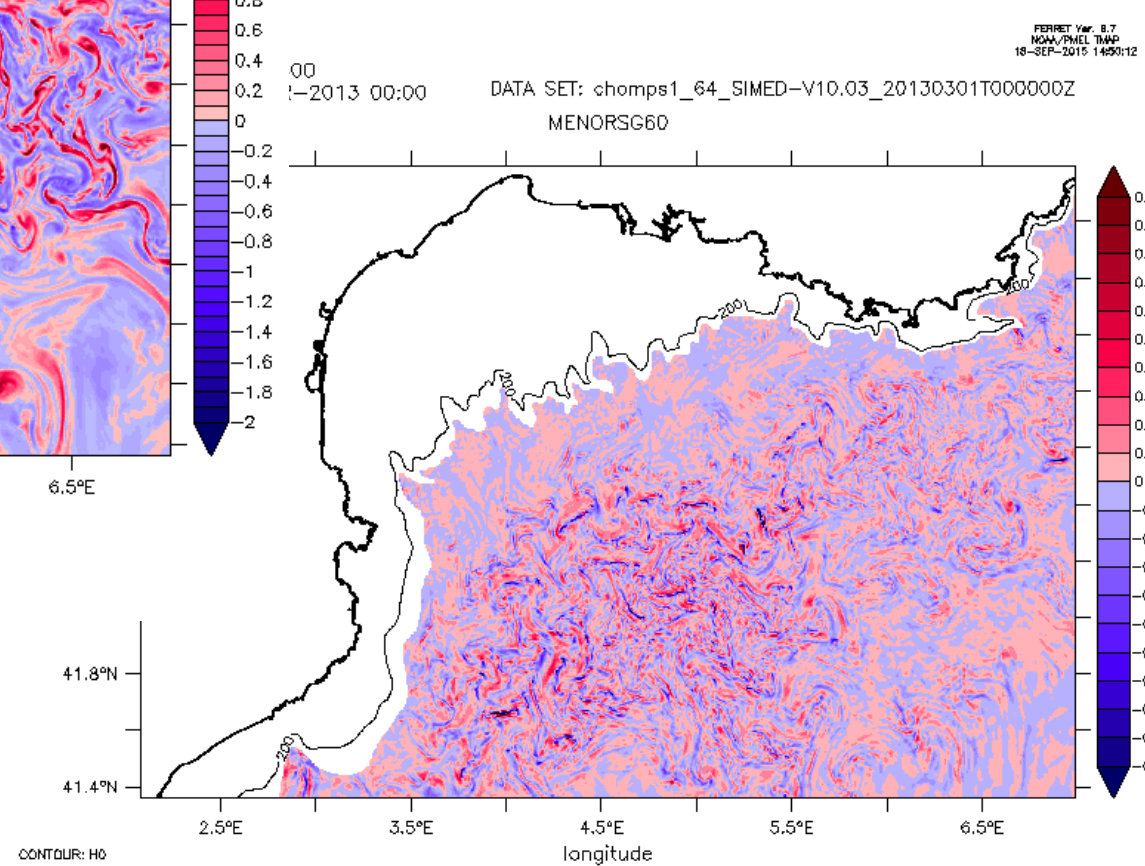


Anti-cyclone



cyclone

↑
 ↓
 Vitesse verticale à 400m



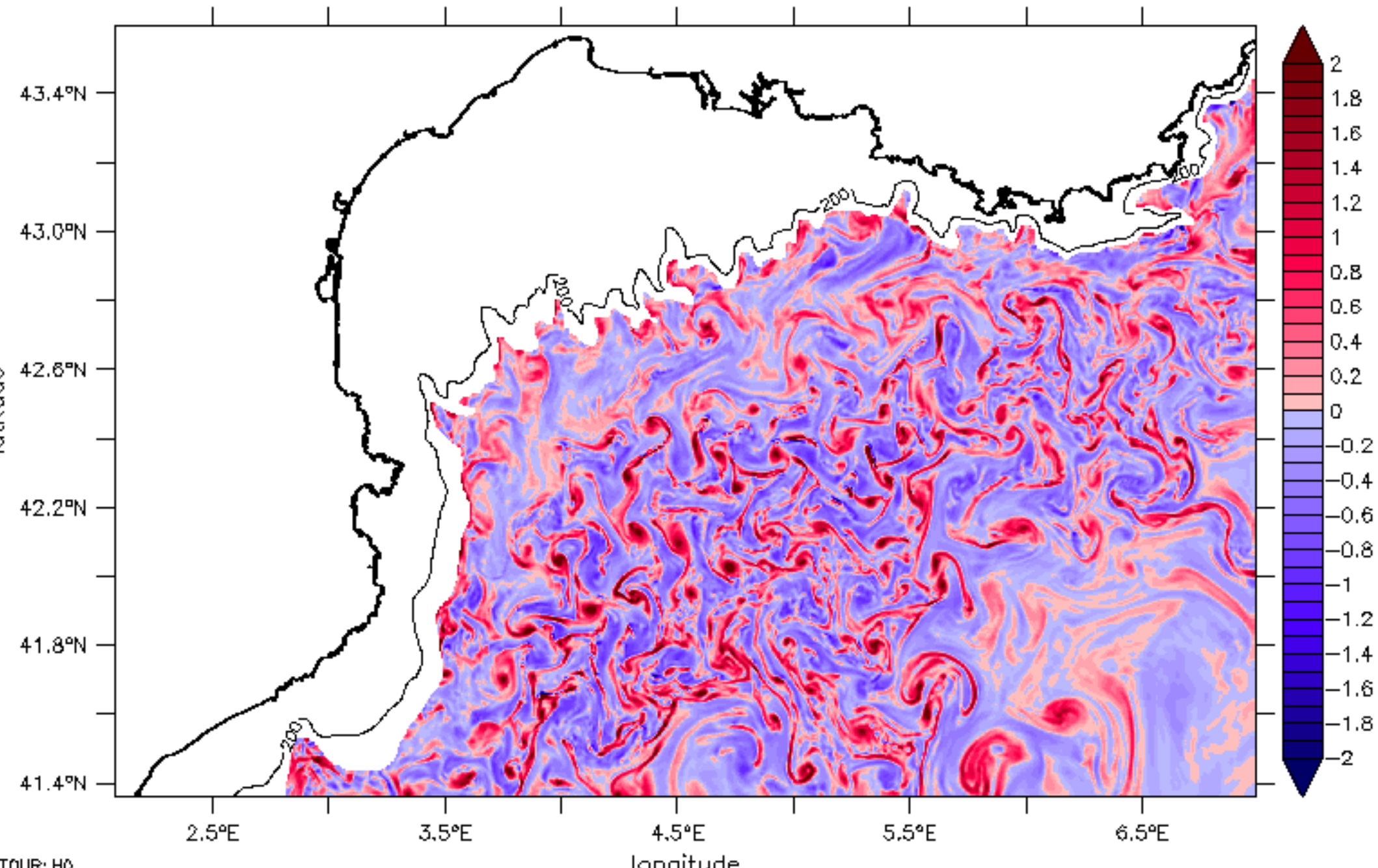
'vertical velocity m/s'

FERRET Ver. 8.7
 NOAA/PMEL TRIP
 18-SEP-2015 14:50:12

DEPTH (m) : 400
TIME : 01-MAR-2013 00:00

DATA SET: chomps1_64_SIMED-V10.03_20130301T000000Z

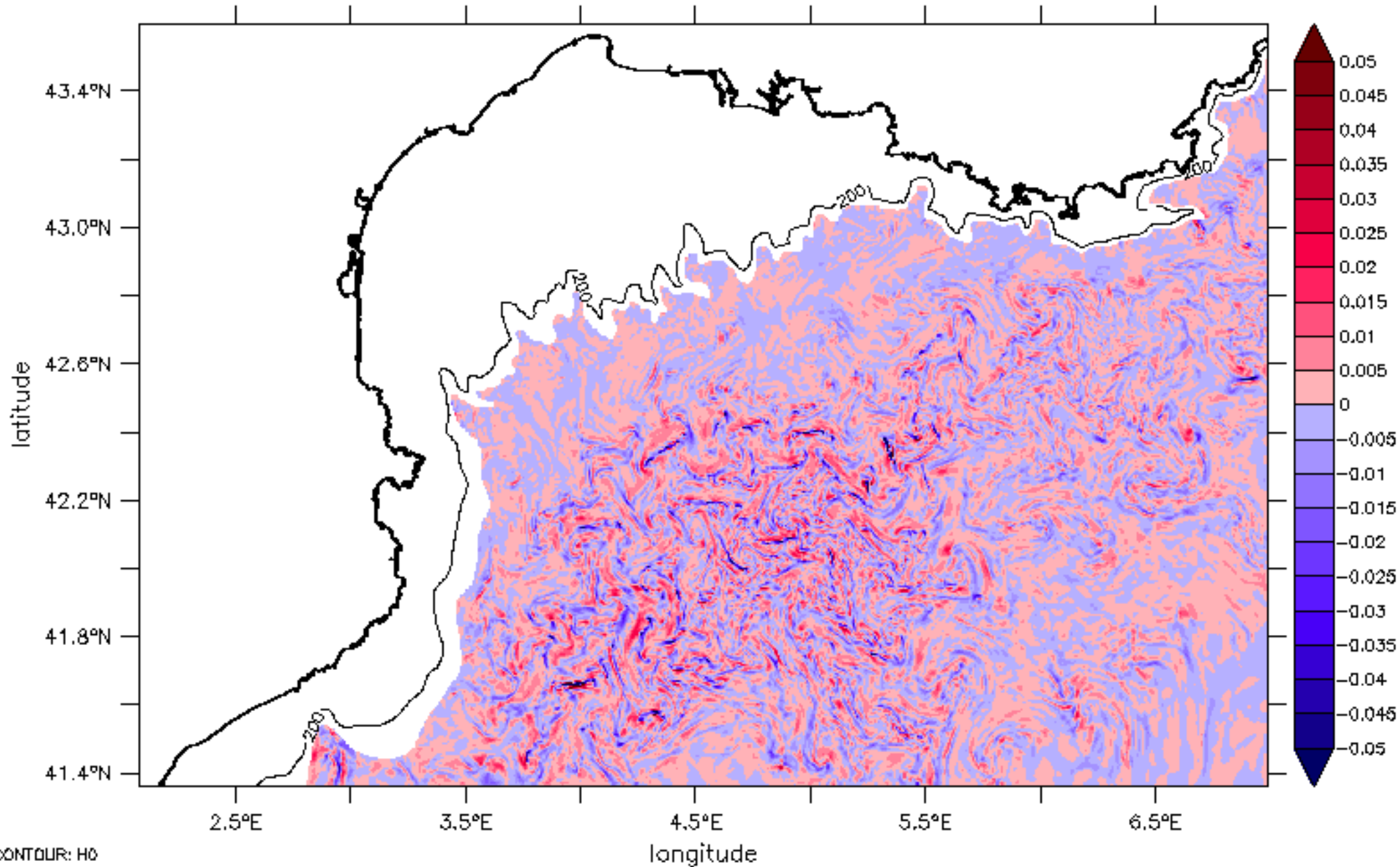
MENORSG60



DEPTH (m) : 400
TIME : 01-MAR-2013 00:00

DATA SET: chomps1_64_SIMED-V10.03_20130301T000000Z

MENORSG60



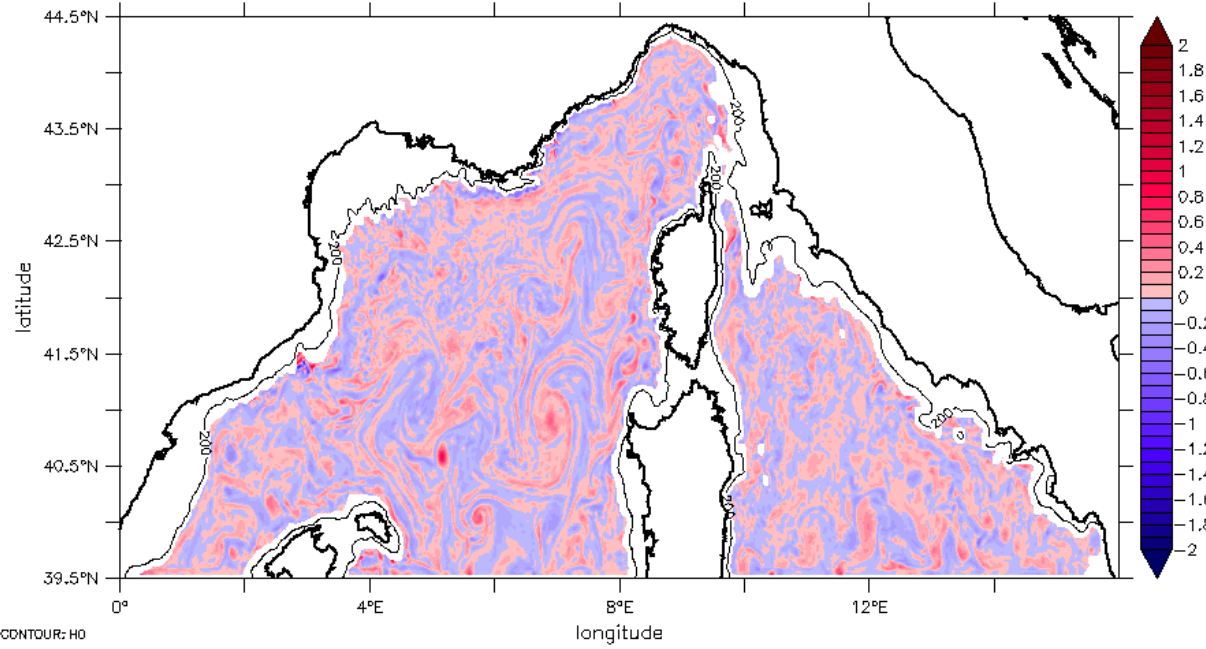
CONTOUR: H0

'vertical velocity m/s'

DEPTH (m) : 400
TIME : 01-JAN-2013 00:00

DATA SET: chomps_SIMED-V10.03_20130101T000000Z
MENORSG60

FERRET Ver. 6.7
NOAA/PNEM TRAP
20-SEP-2010 20:58:28



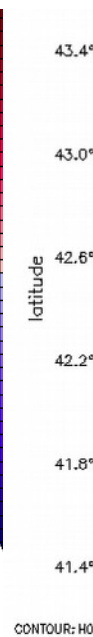
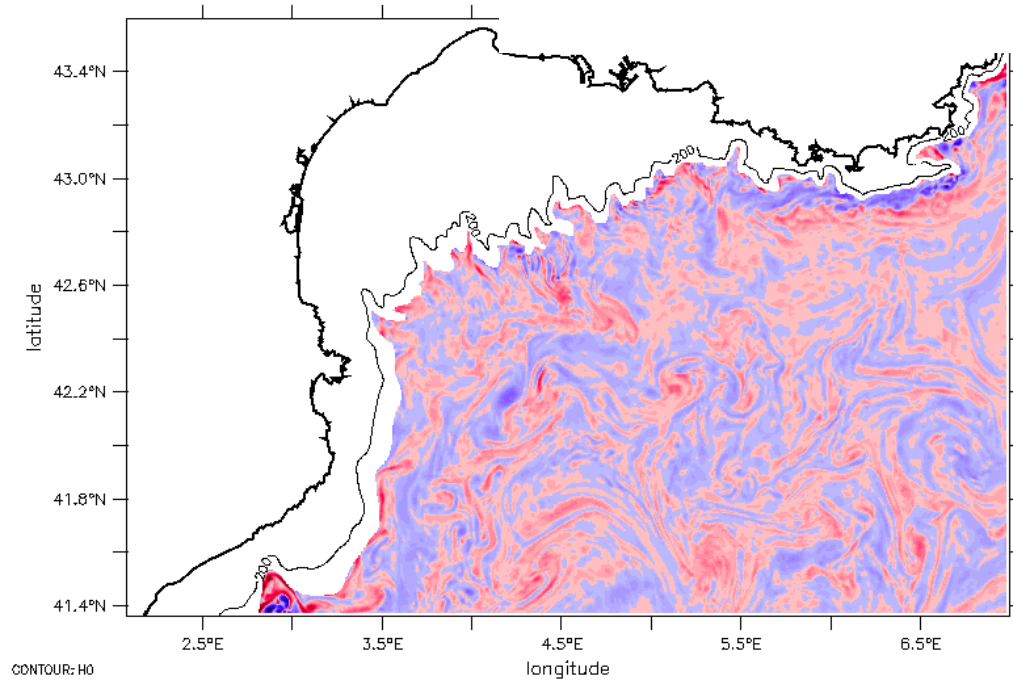
DEPTH (m) : 400
TIME : 01-JAN-2013 00:00

DATA CONTOUR: HO

FERRET Ver. 6.7
NOAA/PNEM TRAP
20-SEP-2010 21:00:08

)-V10.03_20130101T000000Z

'vorticity/f'



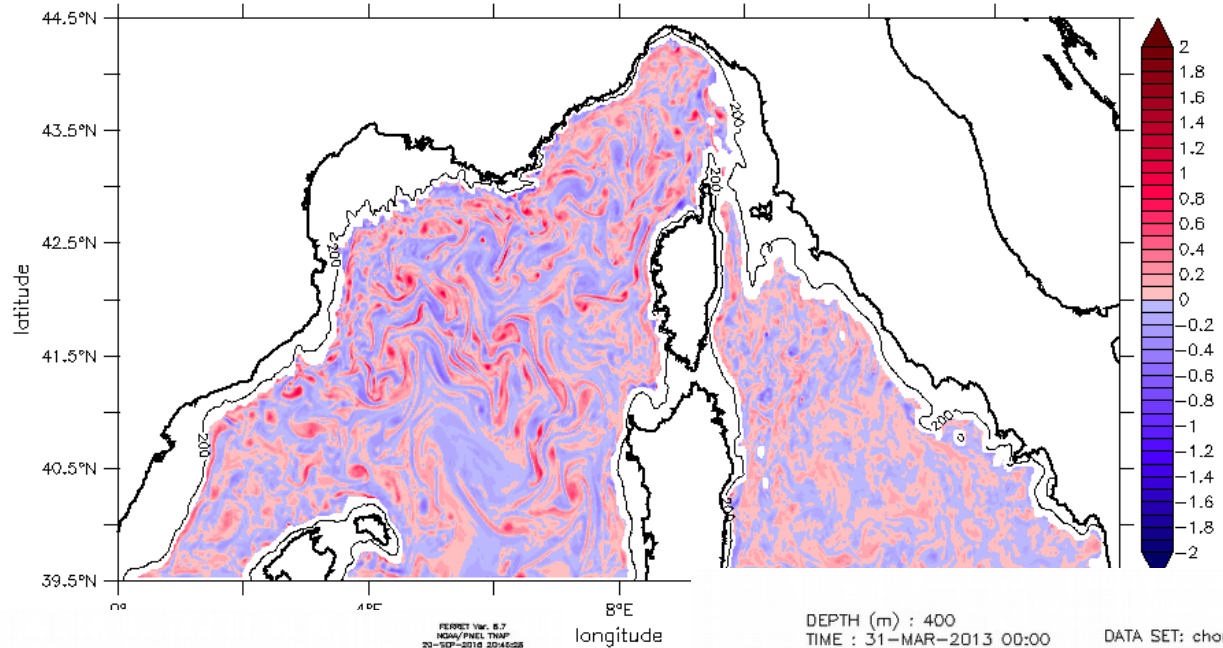
'vorticity/f'

'vertical velocity m/s'

DEPTH (m) : 400
TIME : 31-MAR-2013 00:00

DATA SET: chomps_SIMED-V10.03_20130331T000000Z
MENORSG60

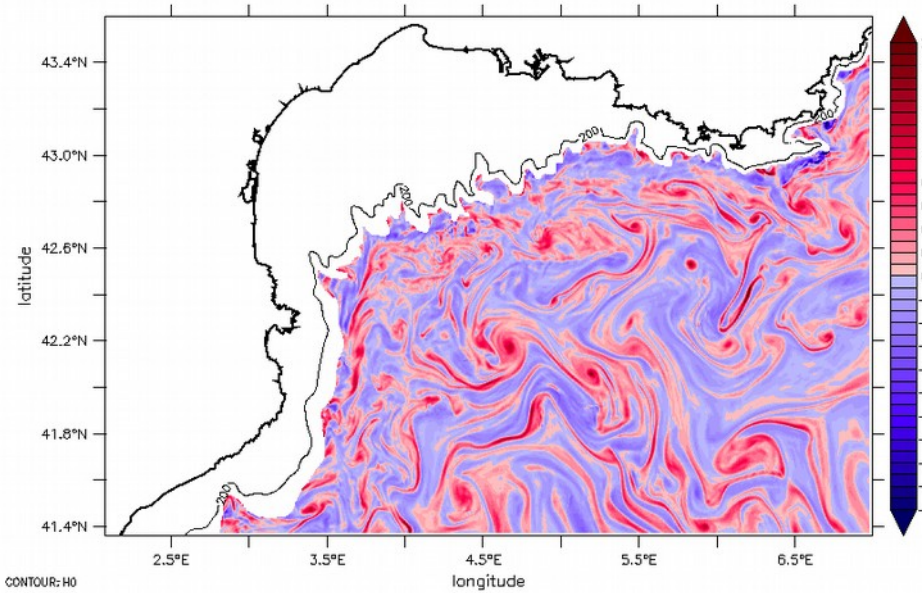
FERRET Ver. 6.7
NOAA/PMEL TRAP
20-SEP-2016 20:45:33



DEPTH (m) : 400
TIME : 31-MAR-2013 00:00

DATA SET: chomps1_64_SIMED-V10.03_20130331T000000Z
MENORSG60

FERRET Ver. 6.7
NOAA/PMEL TRAP
20-SEP-2016 20:45:33



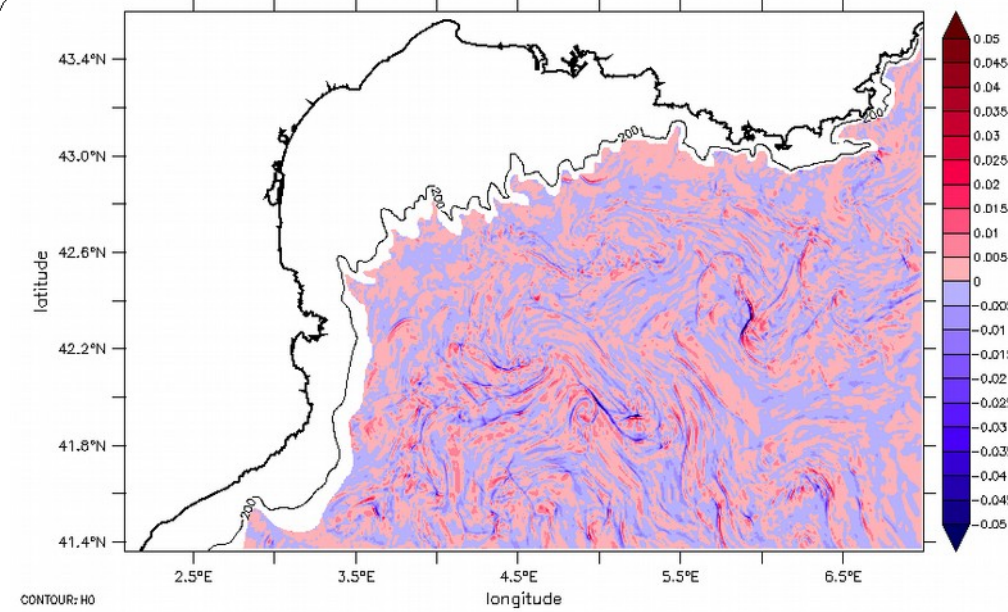
CONTOUR: HO

'vorticity/f'

DEPTH (m) : 400
TIME : 31-MAR-2013 00:00

DATA SET: chomps1_64_SIMED-V10.03_20130331T000000Z
MENORSG60

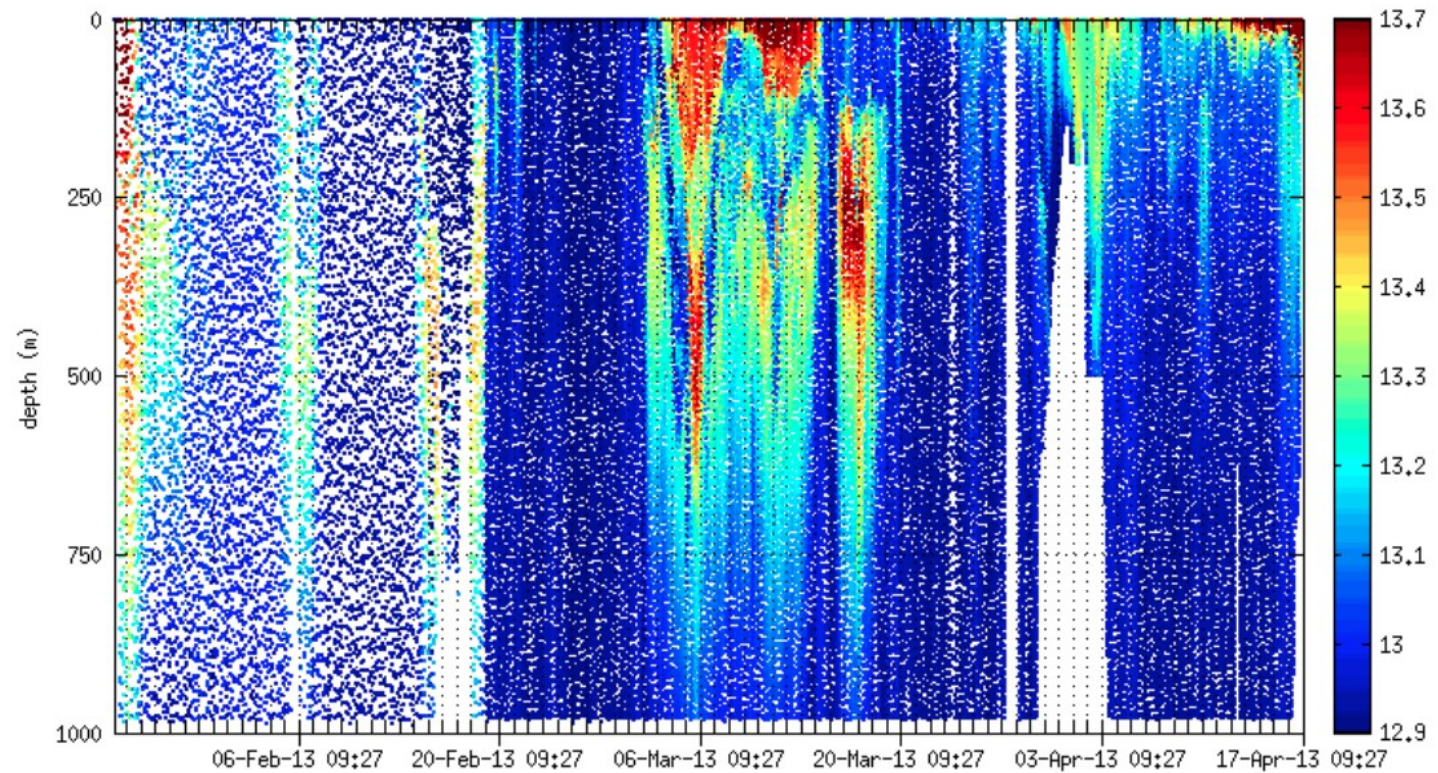
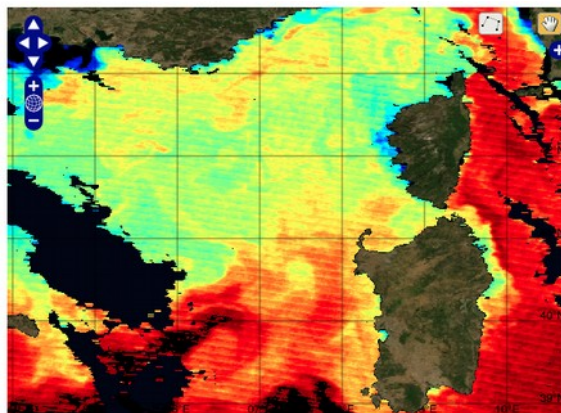
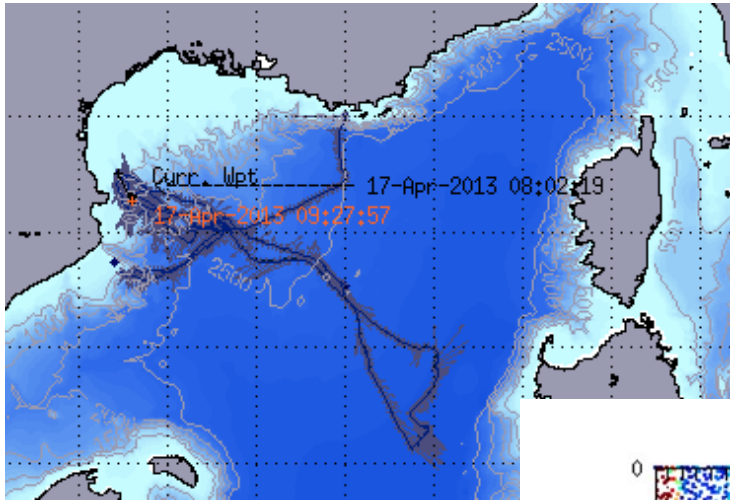
FERRET Ver. 6.7
NOAA/PMEL TRAP
20-SEP-2016 20:47:47



CONTOUR: HO

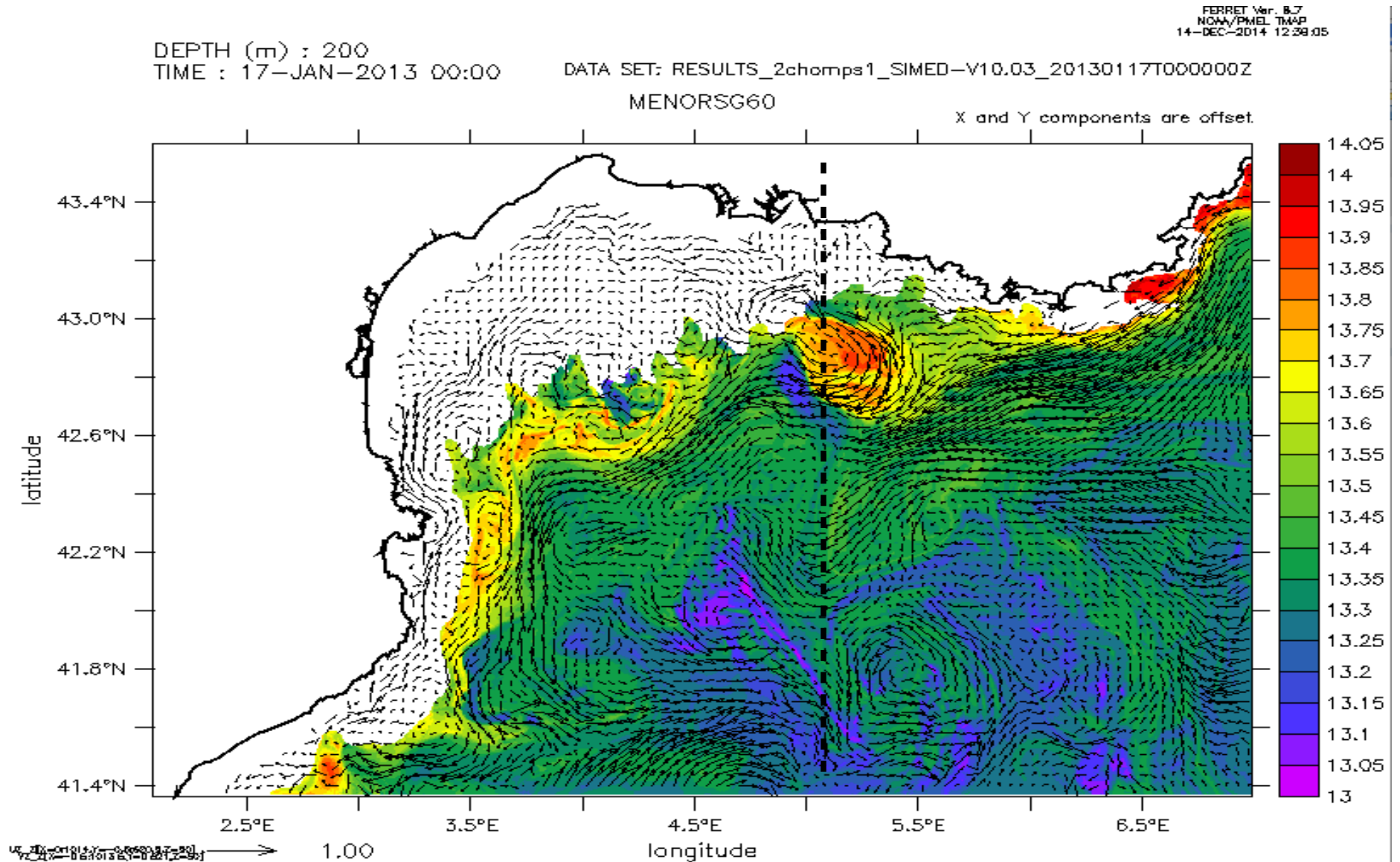
'vertical velocity m/s'

Interaction avec les structures Meso-echelle (HYMEX)

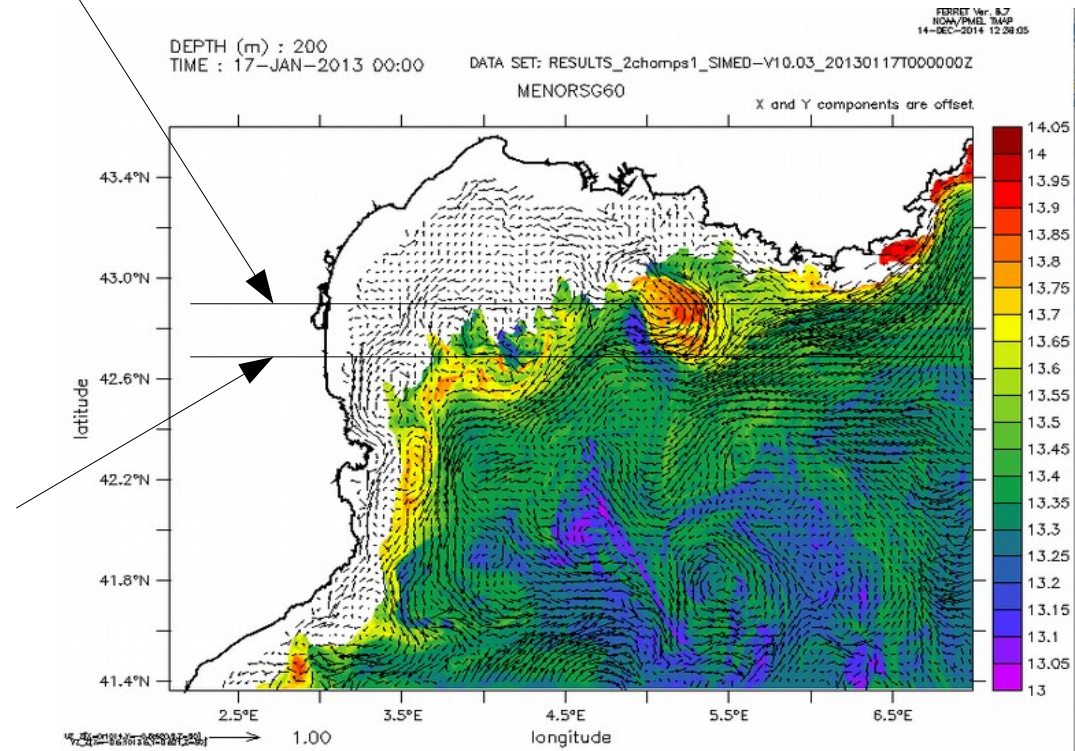
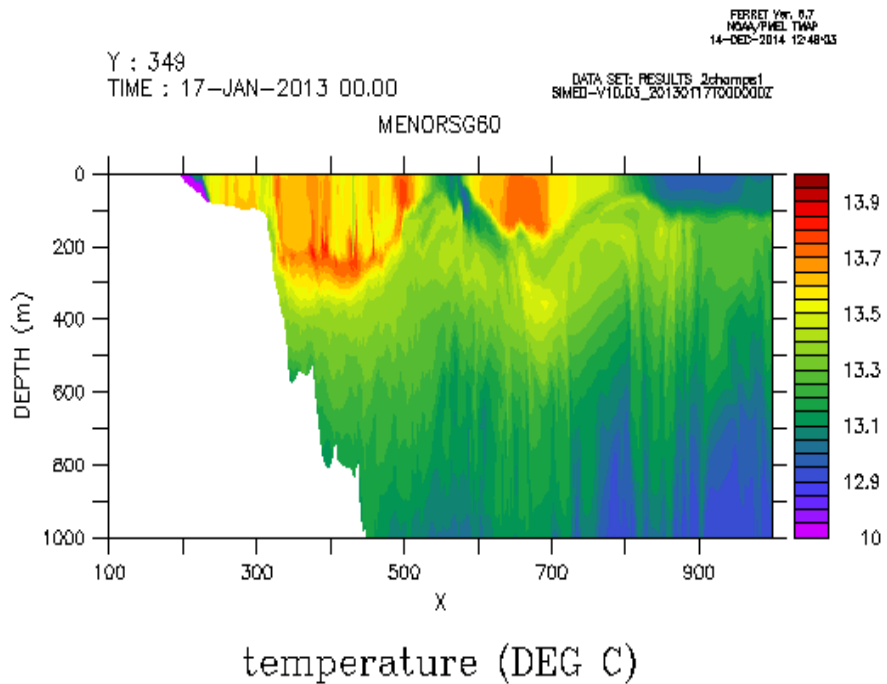
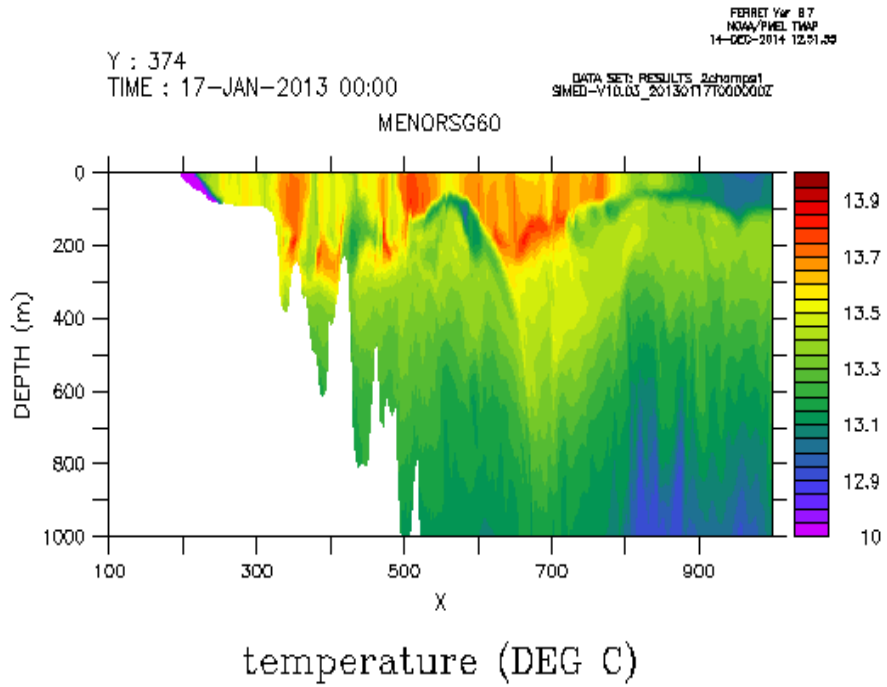


Interaction avec les structures Meso-echelle

température à 200m current à 50m



Cross section

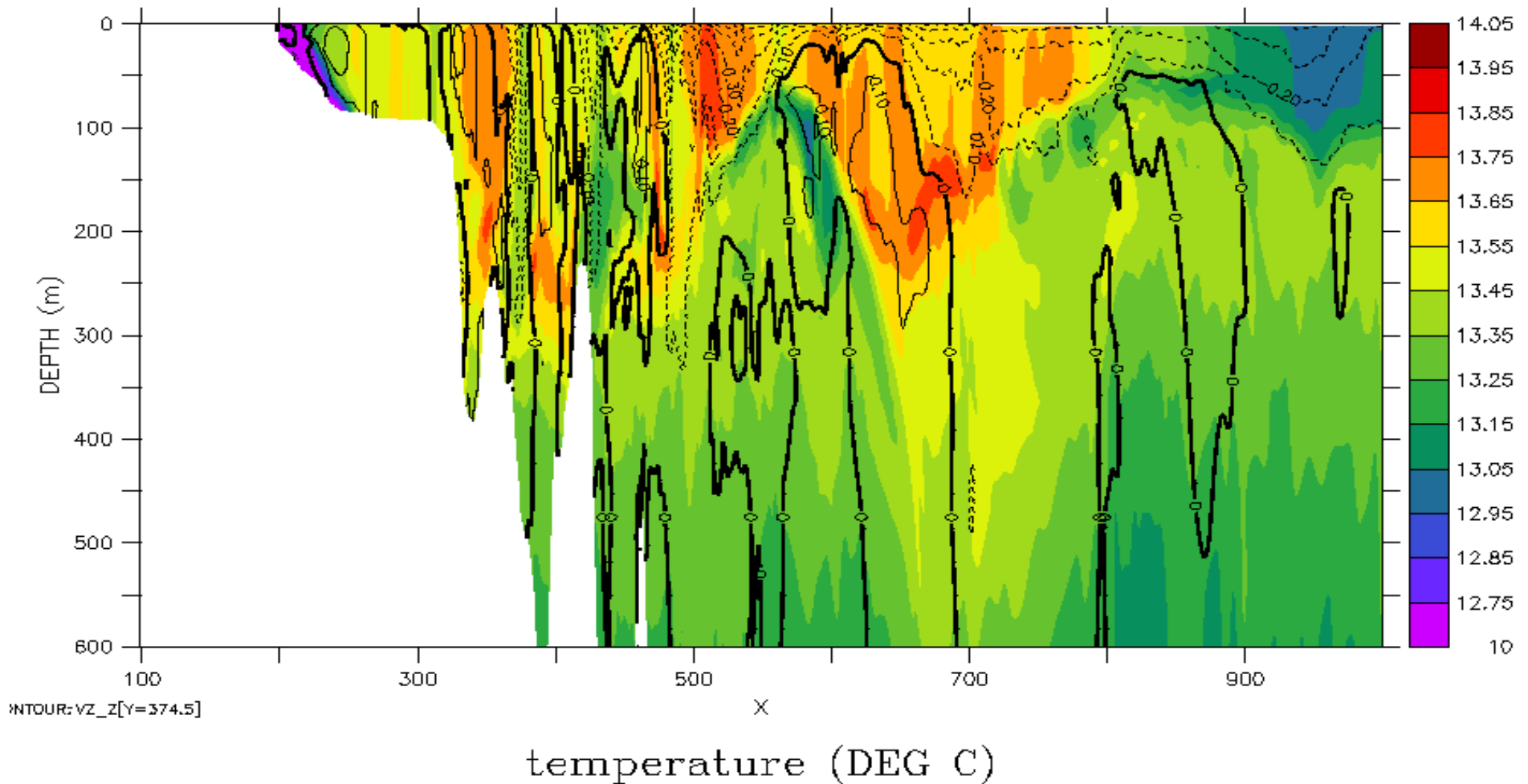


Température / courant méridien

NOAA/PMEL TMAP
14-DEC-2014 13:03:14

Y : 374
TIME : 17-JAN-2013 00:00

DATA SET: RESULTS_2champs1_SIMED-V10.D3_20130117T000000Z
MENORSG60

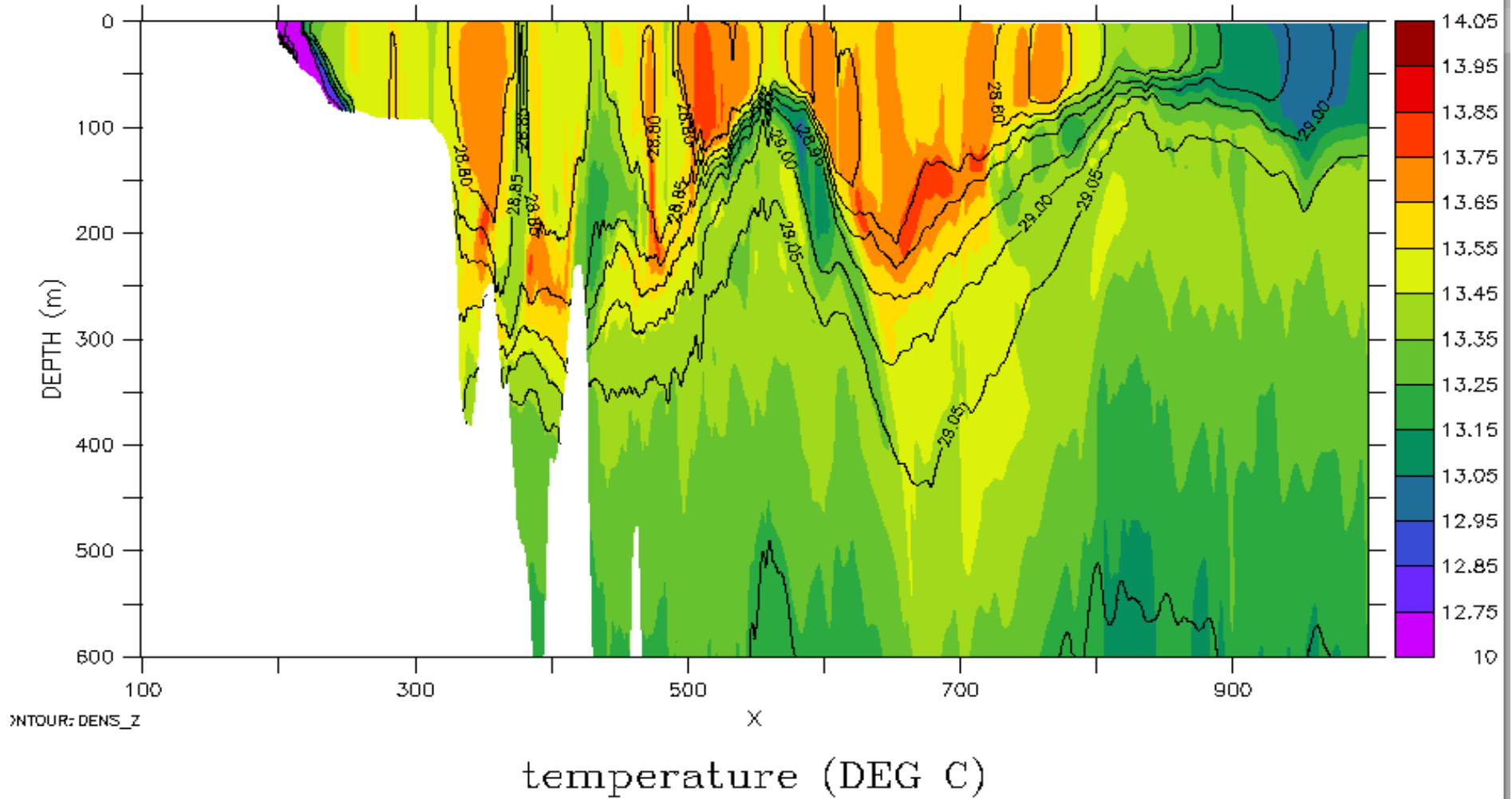


Température / densité

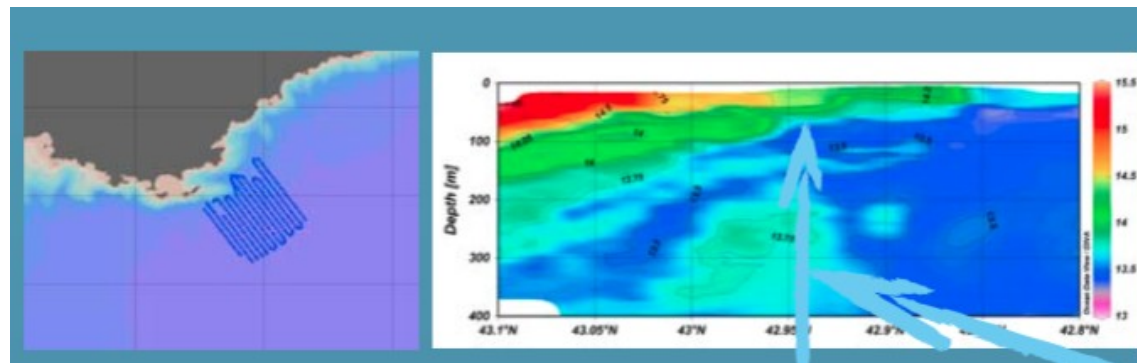
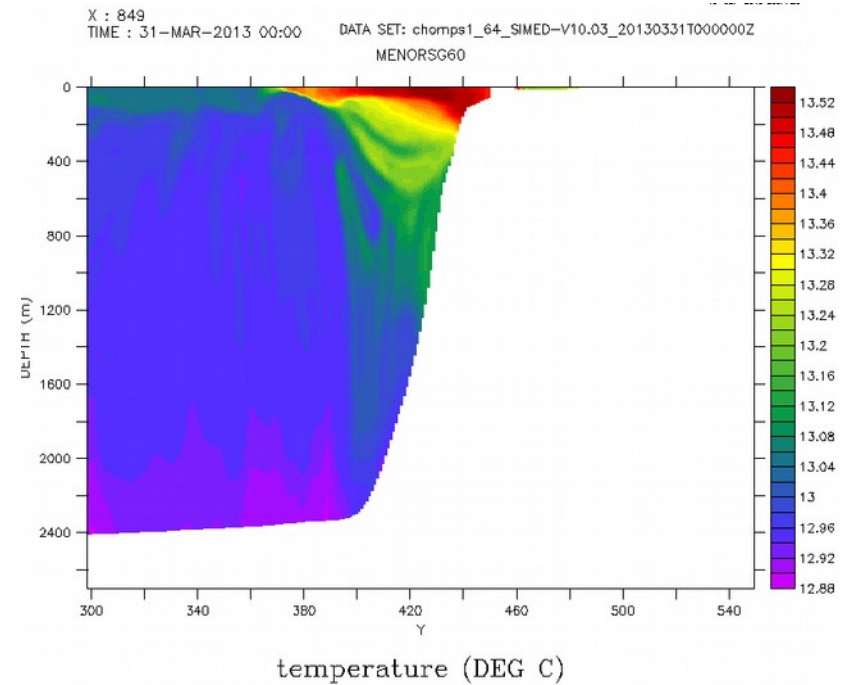
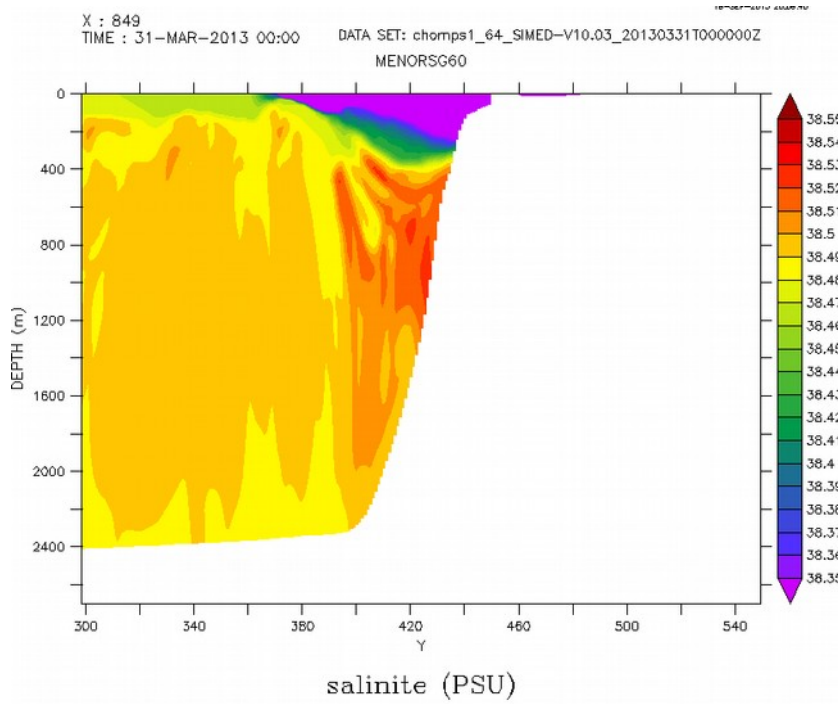
NOAA/PNEL TMAP
14-DEC-2014 13:01.03

Y : 374
TIME : 17-JAN-2013 00:00

DATA SET: RESULTS_2champs1_SIMED-V10.03_20130117T000000Z
MENORSG60

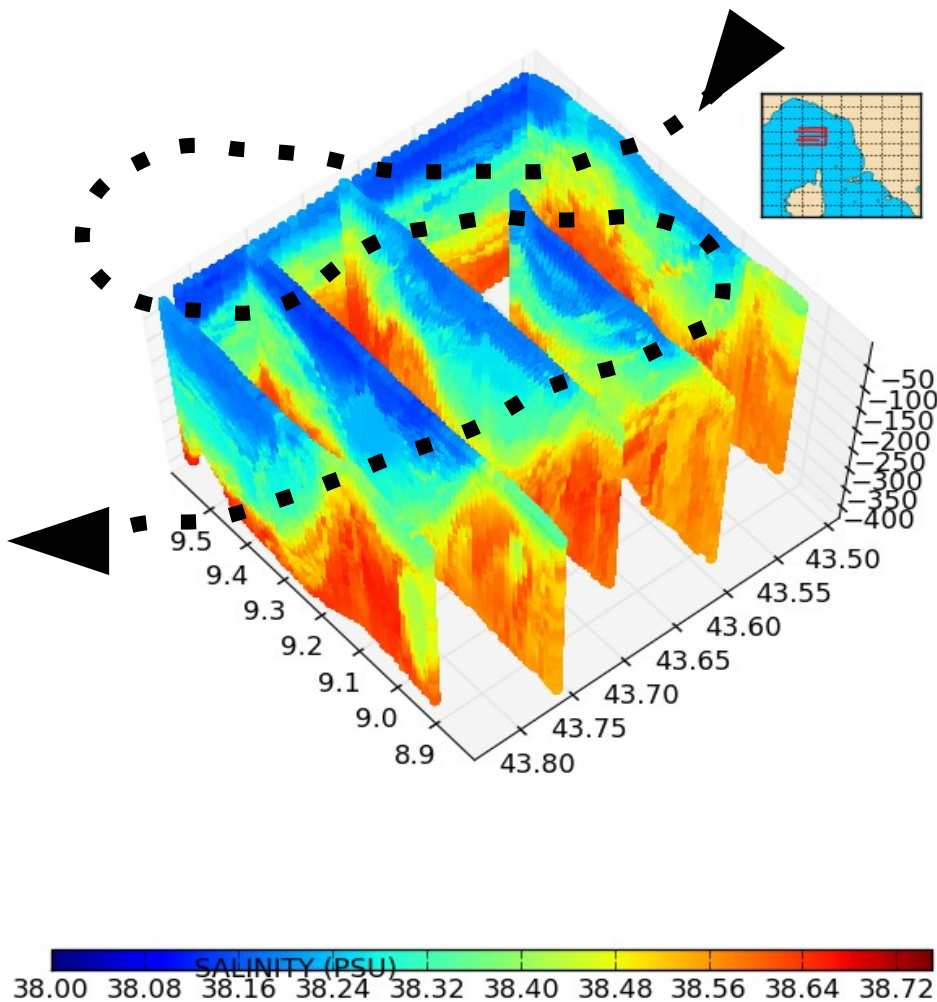


Subduction ou mélange sous le courant Nord ?

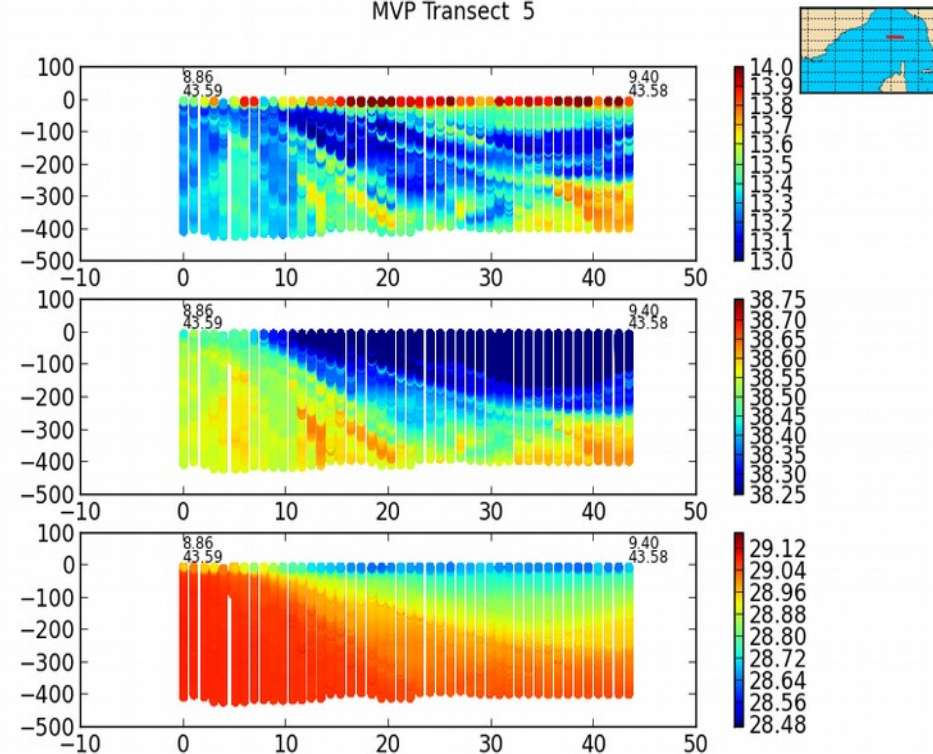


Mesure in-situ : Campgne PROTEVS 2015

Mélange par les structures mesochelles



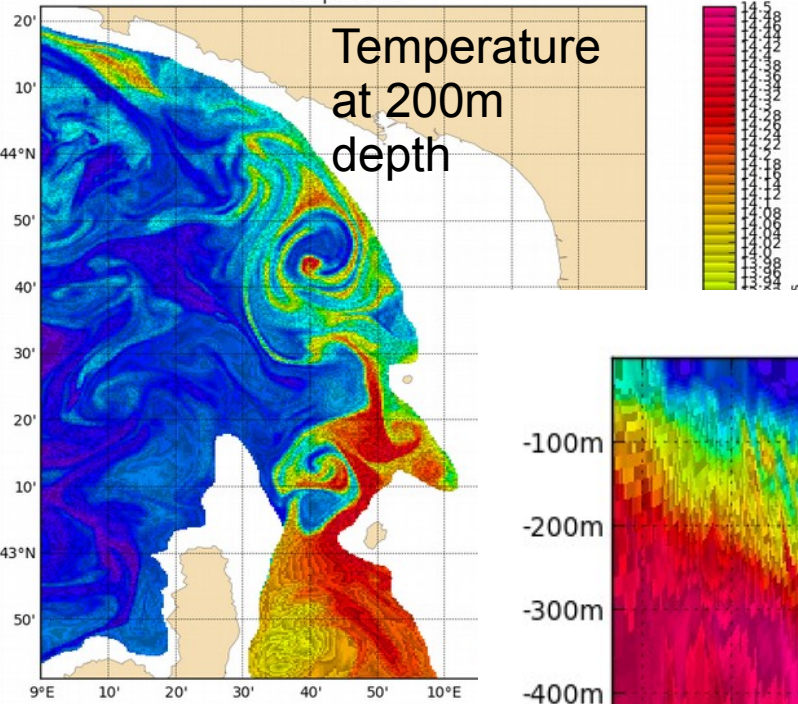
MVP Transect 5



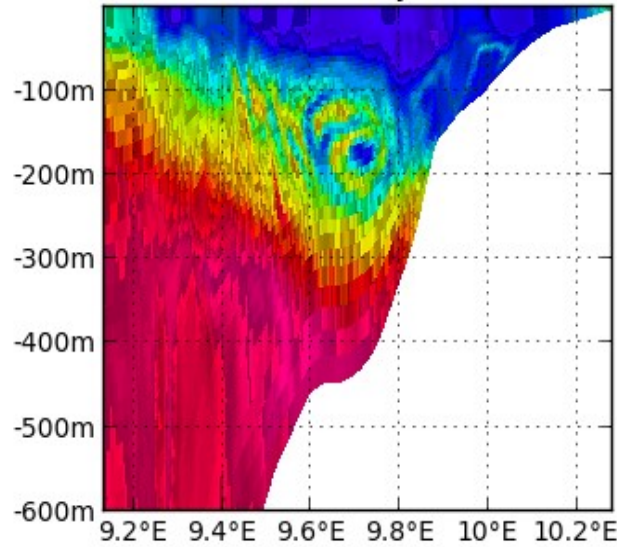
Mélange par les structures mesochelles

temperature

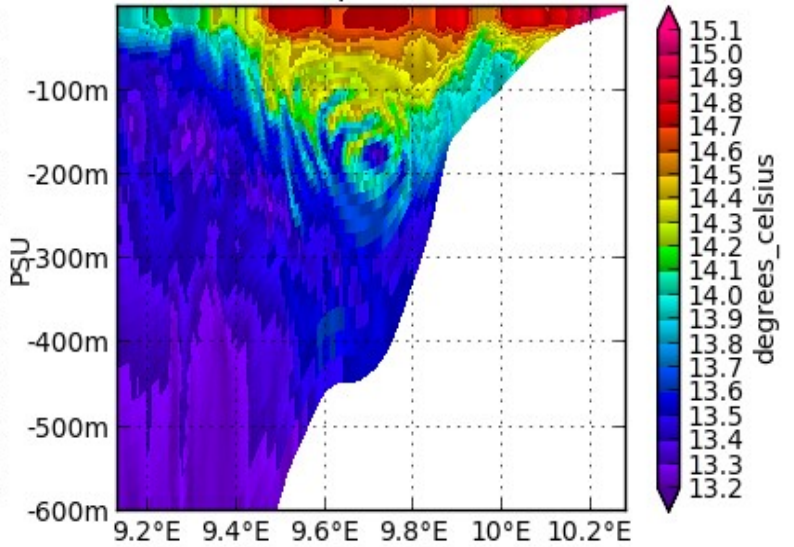
Temperature
at 200m
depth



Salinity

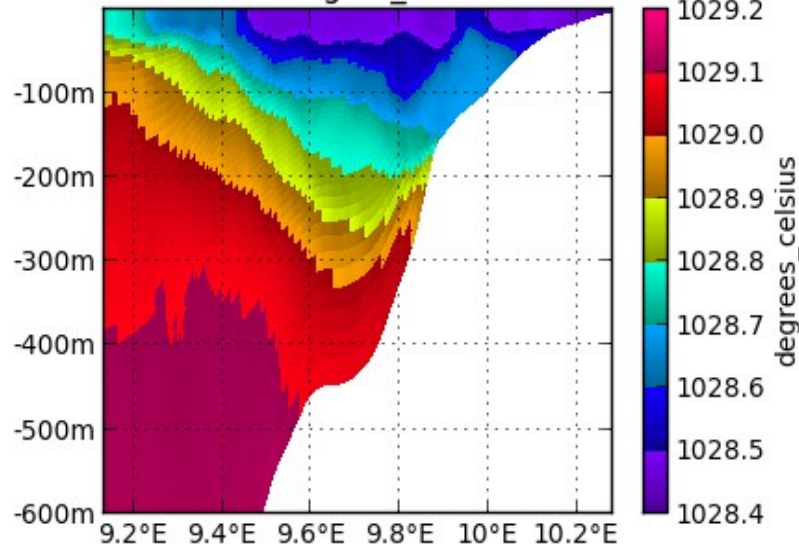


Temperature

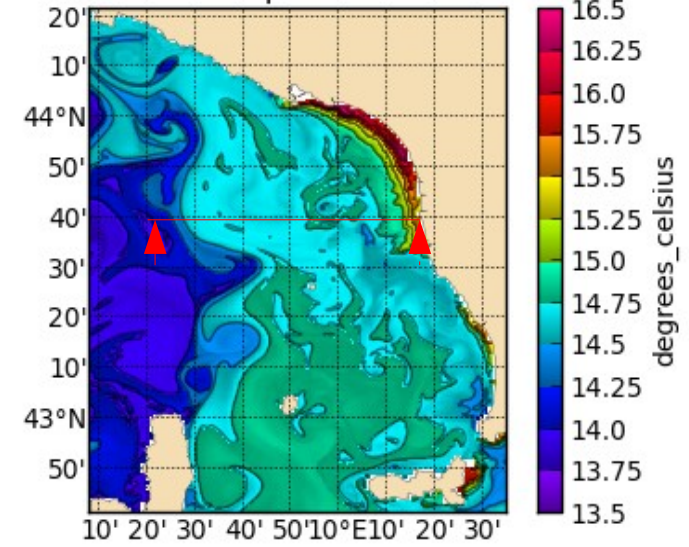


End of Winter 2012

sigma_t



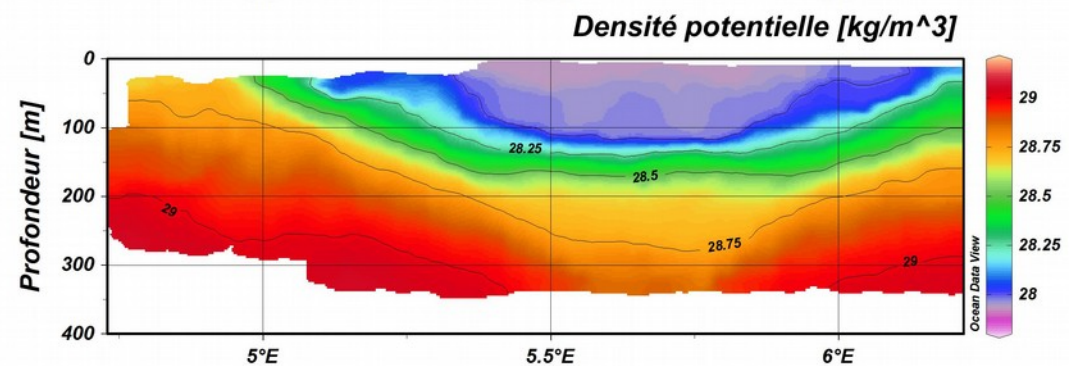
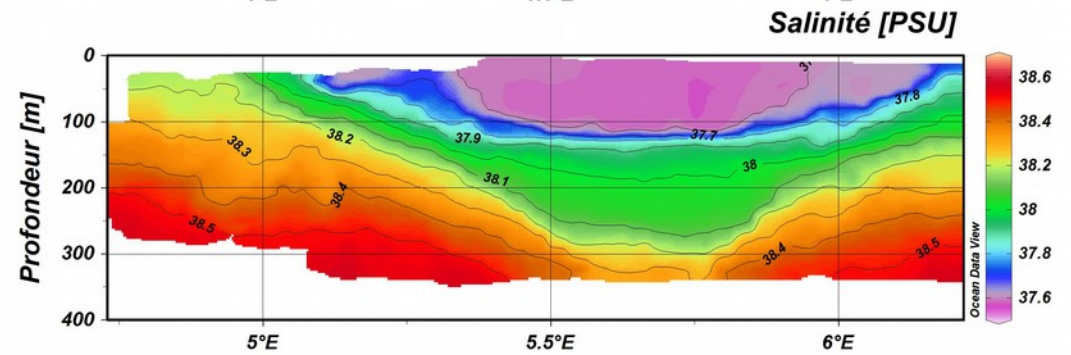
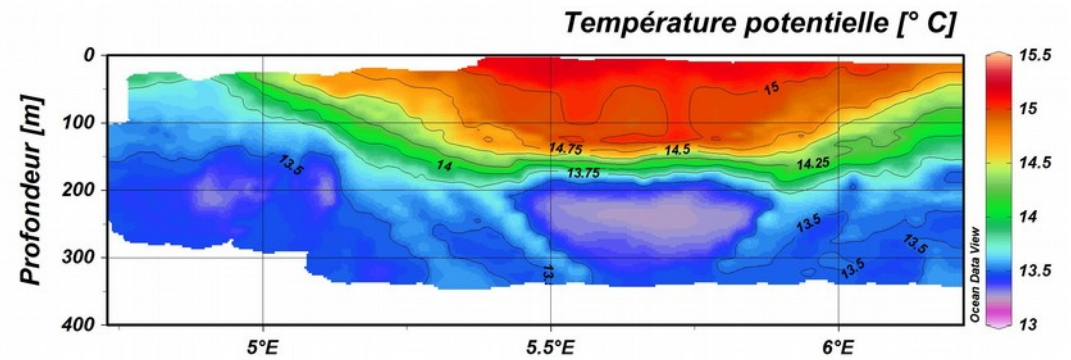
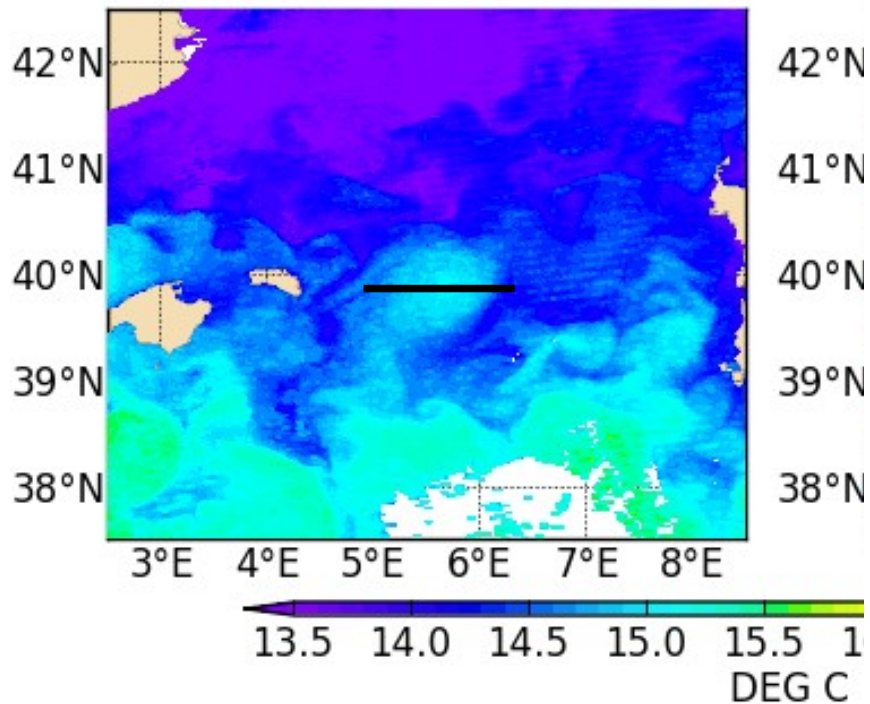
Temperature



Observation / Campagne Protevs_med2016 (Shom)



2016-03-25



Conclusion

- La vitesse verticale devient accessible dans les modèles
- La prochaine étape est une résolution explicite de la vitesse verticale « Modèle Non-hydrostatique »
→ CROCCO
- La dynamique sous-mesoéchelle apparaît dans les modèles aux équations primitives

L'augmentation de la résolution n'a pas qu'un effet « cosmetique » :

Elle permet un accès à une autre physique