

Apports des séries temporelles à haute résolution de SST et SSS dans les zones côtières (Marseille, Algérie)

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DT INSU / La Seyne

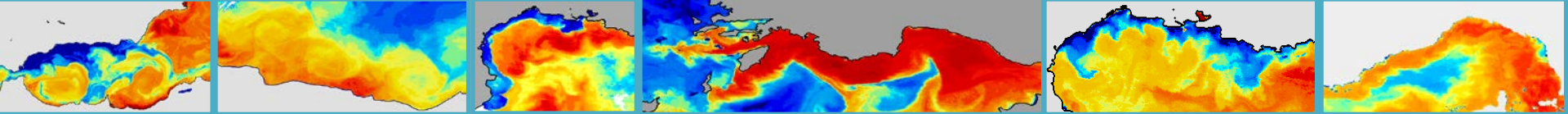
TRANSMED Requirements

- no involvement of the crew (short routes /duration ~1-2 days+ lack of laboratories in some areas) => **system fully autonomous**
- ship assigned to an other route with (ultra) short notice => **portable system**
- economical and geographic context => **low cost**
- **network** => run several routes simultaneously => 1 system with modular design, interchangeable
- **data quality** => reliability, data control in (near-) real time
- support this effort on the **long term** (>10 years) => system time- and cost-efficient, maintenance minimized



www.hymex.org





No system on shelf by 2005 (SeaKeepers trials failed)

Solution: simple stupid* LOW COST and AUTONOMOUS system (T S only) : TRANSMED

designed by COM/LOB/LOPB/MIO

with technical support from DT INSU

with financial support from CIESM and from 2010 from HyMeX/MISTRALS

**: for systems not simple stupid: see multiparametric systems used in northern seas (www.ferryboxes.org)*



TRANSMED



NETWORK

SBE 38

SBE 45



Ethernet

=> no distance limitation between modules
=> possibility to add extra channels/sensors (not implemented yet)

www.ifremer.fr/transmed

Please fill the form below to consult graphics:

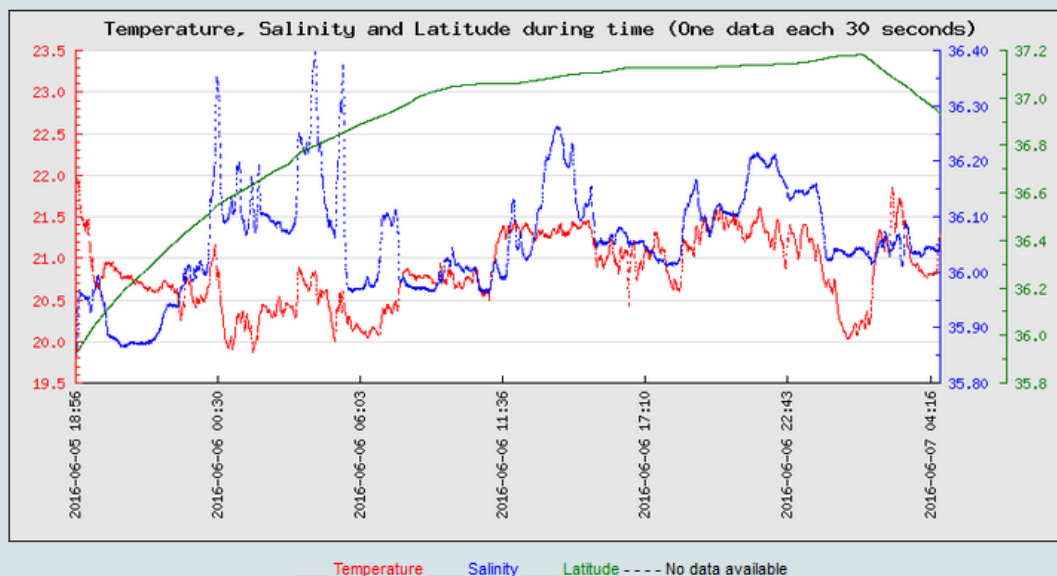
Ship: Cap Camarat

Level: 1

Beginning date

Ending date

Search

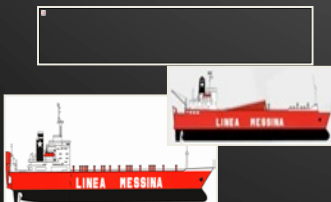
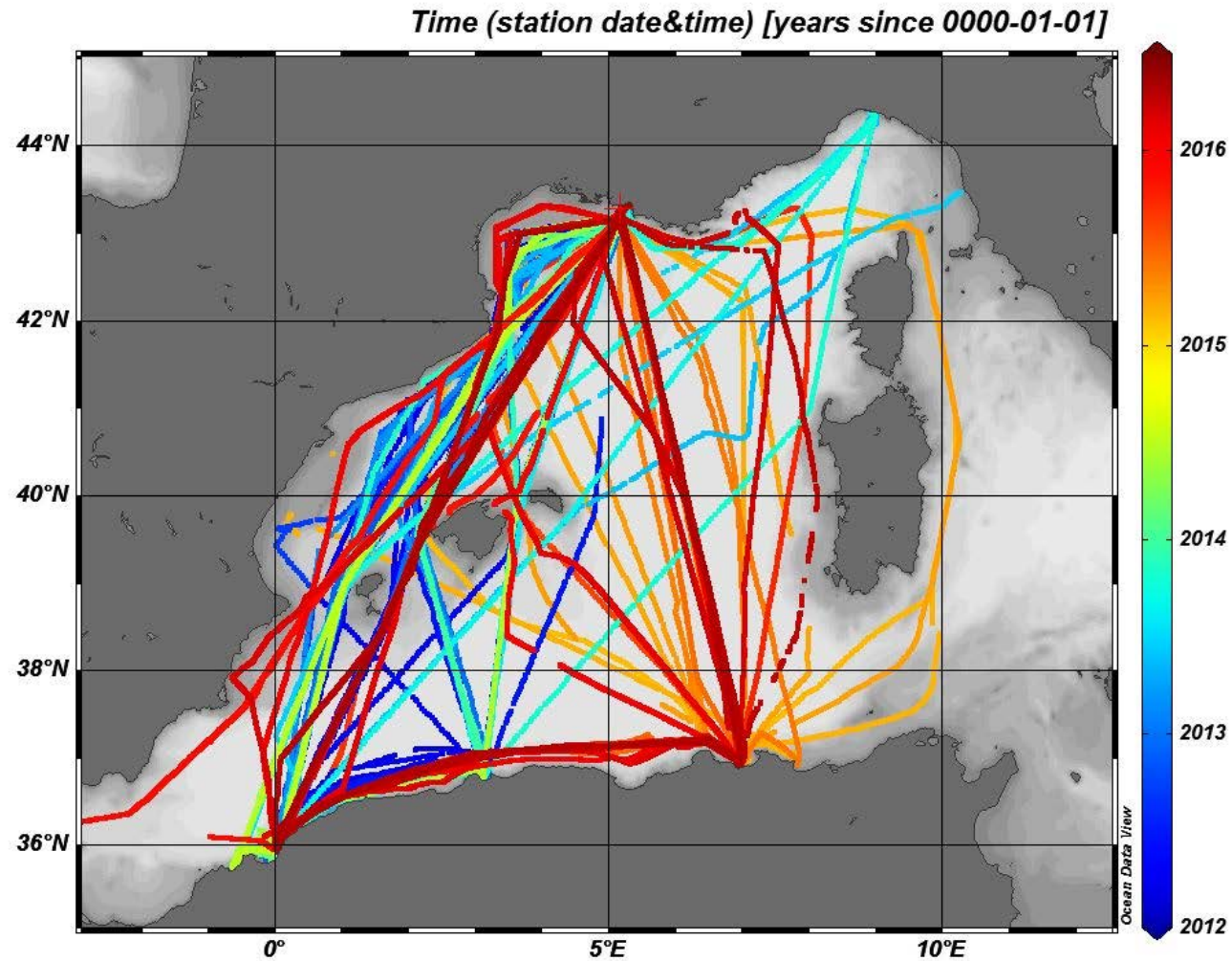
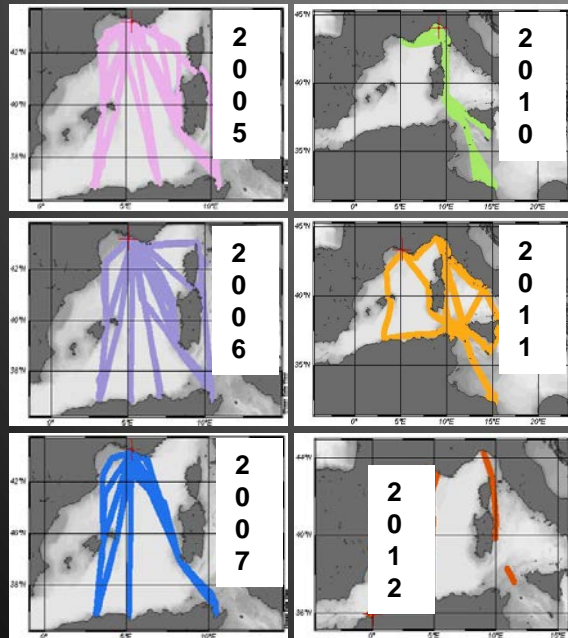


NB: SSS off
(QC=2)

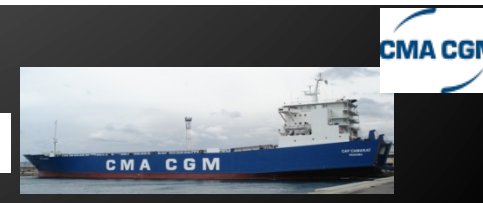
Transit Cap Camarat
Mostaganem -> Skikda
5-7 /06/2016



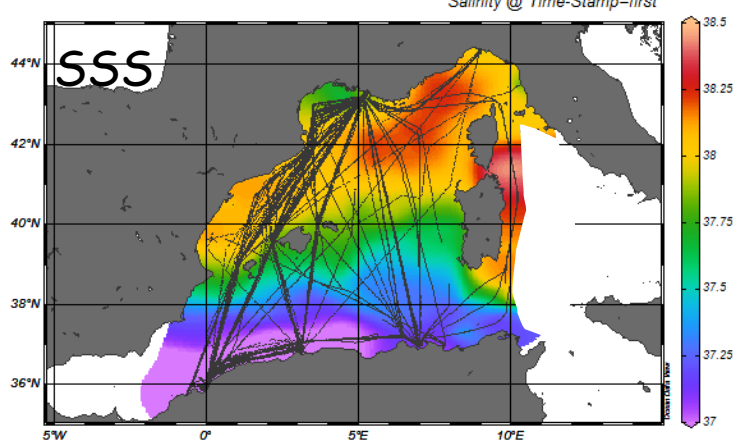
Distribution spatio-temporelle des données TRANSMED



Marfret Niolon (2012-2014)



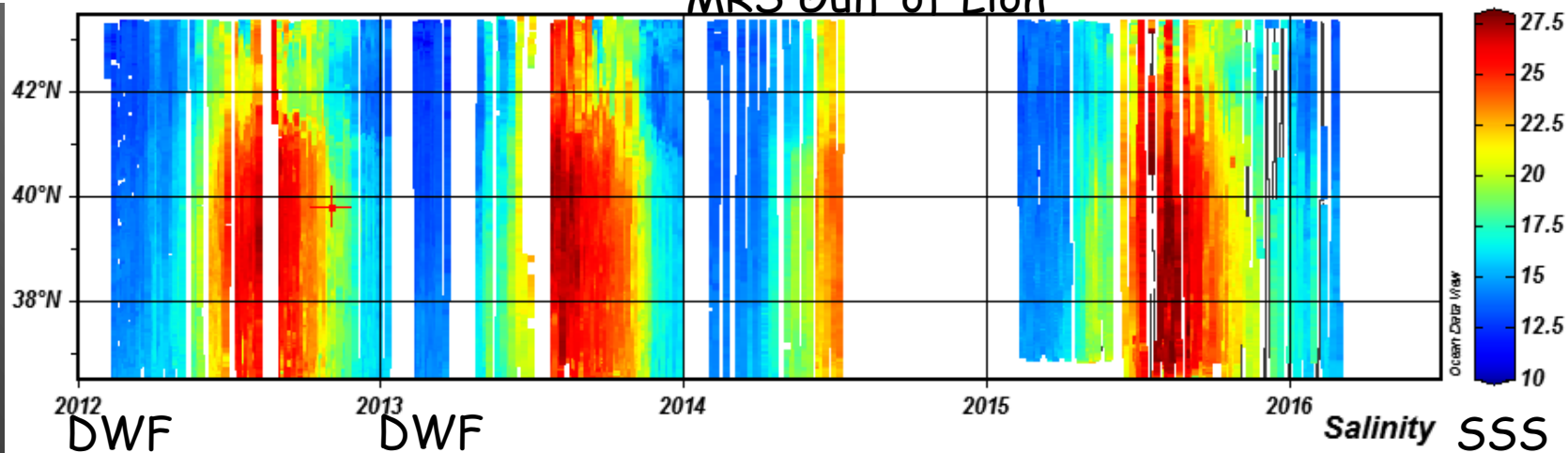
Cap Camarat (2015-?)



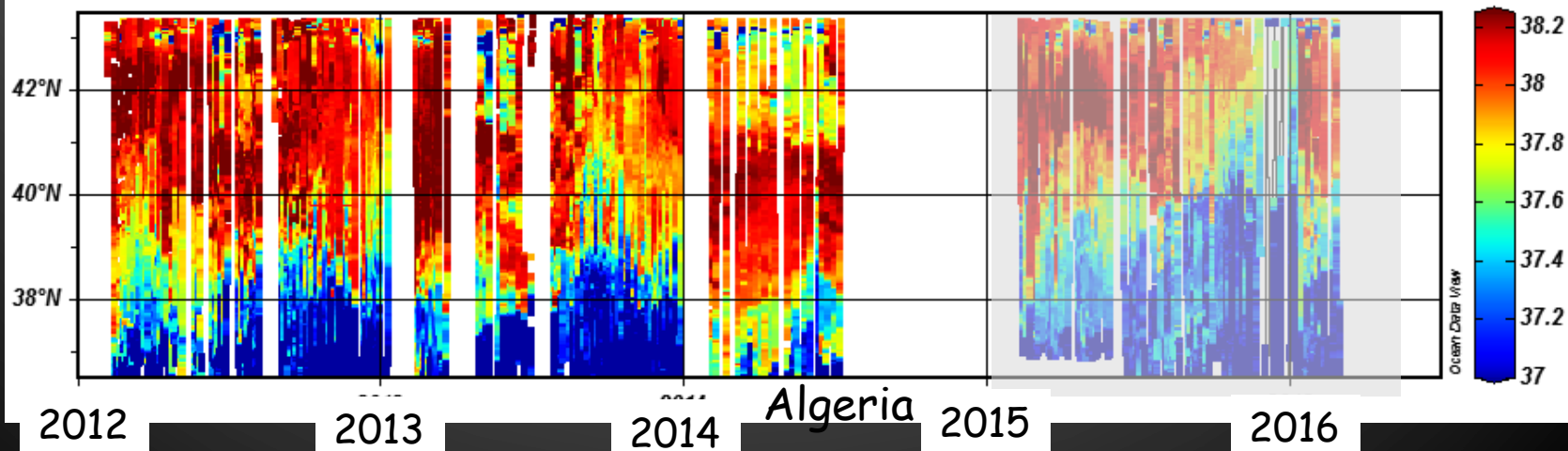
MRS Gulf of Lion

Temperature SST

latitude



Salinity SSS



TRANSMED data

Freq.	Processing	Origin	Destination
10s	acquisition	ship	local storage
~1h	<ul style="list-style-type: none"> 1h-data file sent 1h-data file checked and processed on the fly (errors, missing data, thresholds...) 	Ship MIO/La Seyne	Mail MIO/La Seyne TRANSMED DB
24h	<ul style="list-style-type: none"> 24h of data from TRANSMED DB decimated (2min median *) 24h of data (re)checked , quality flags added 	DT INSU CORIOLIS	CORIOLIS GOSUD, COPERNICUS
1 month	data from TRANSMED DB manually screened for doubtful data, routines for computation of derived parameters, decimation (2min median) ... => monthly provisory data files of good quality	MIO/La Seyne	<i>TRANSMED DB*</i> HyMeX/ SEDOO
1 year	<ul style="list-style-type: none"> recalibrations of probes (« as is » + systematic cleaning and replatinization of the conductivity cell) replay of 1 year of data to account for sensors drifts (~ null) => monthly definitive data files 	SBE MIO/La Seyne	<i>TRANSMED DB*</i> HyMeX/ SEDOO *: not implemented yet

Data quality :

- SST: no problem
- SSS: Marfret Niolon : stable good quality (recalibration + salinity bottles (~every 2 months))

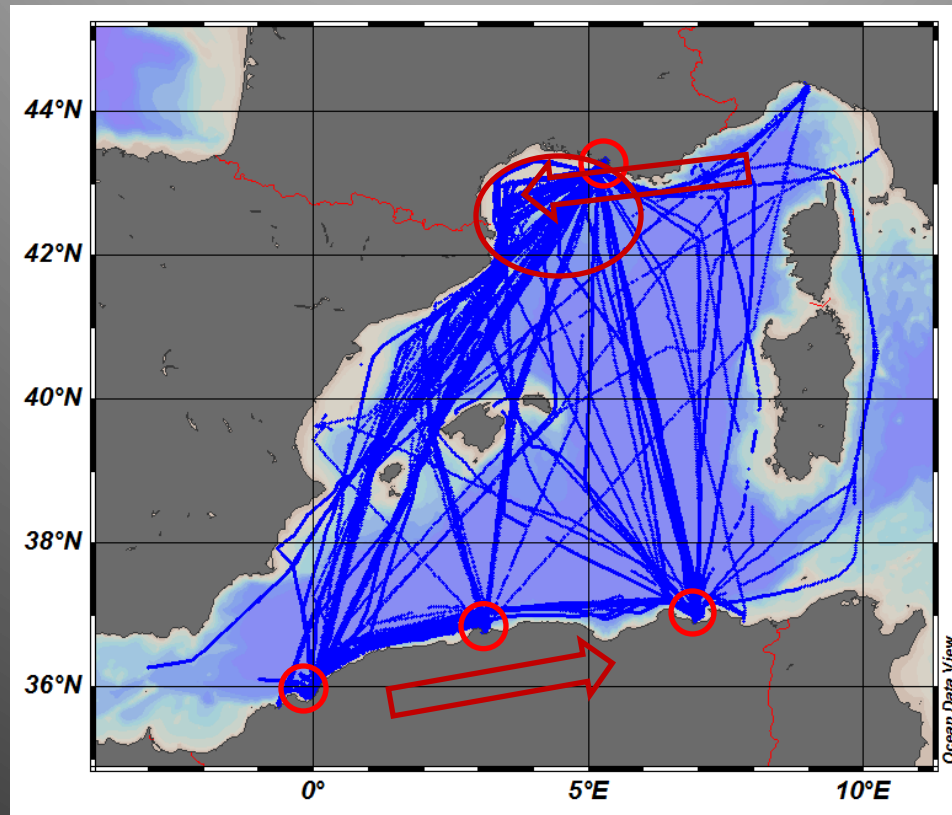
<u>Ships</u>	<u>Period</u>	<u>Drift in salinity</u> (PSU)	<u>Drift in</u> <u>Temperature</u> SBE45 (°C)	<u>Drift in</u> <u>Temperature</u> SBE38 (°C)
Marfret Niolon	Apr.2012 - Jan.2014	<0.002 (!)	<0.0006	<0.0006

- Cap Camarat (2015-??) : external problem of circuitry, need for salinity bottles

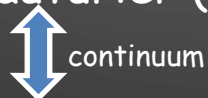
TRANSMED

Séries temporelles SST et SSS de haute résolution:

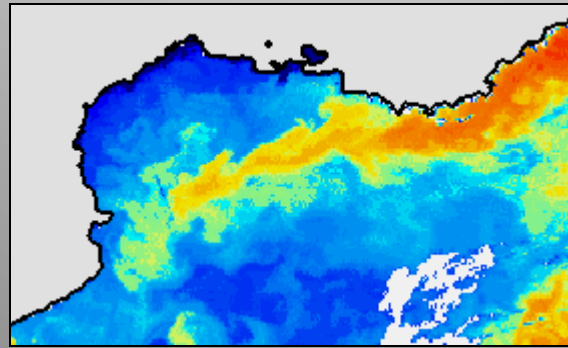
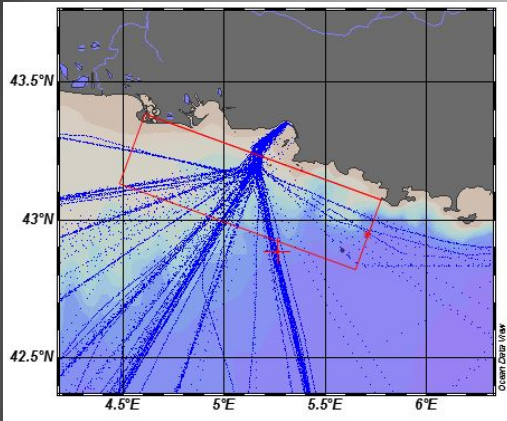
- spatiale: <1km
- temporelle : ~5-15journs



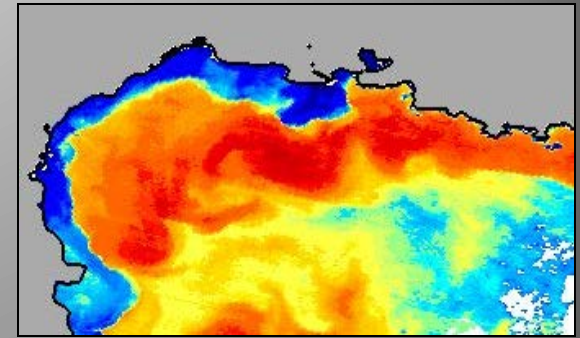
Domaine hauturier (DWF)



Domaine côtier : baie => plateau => courant

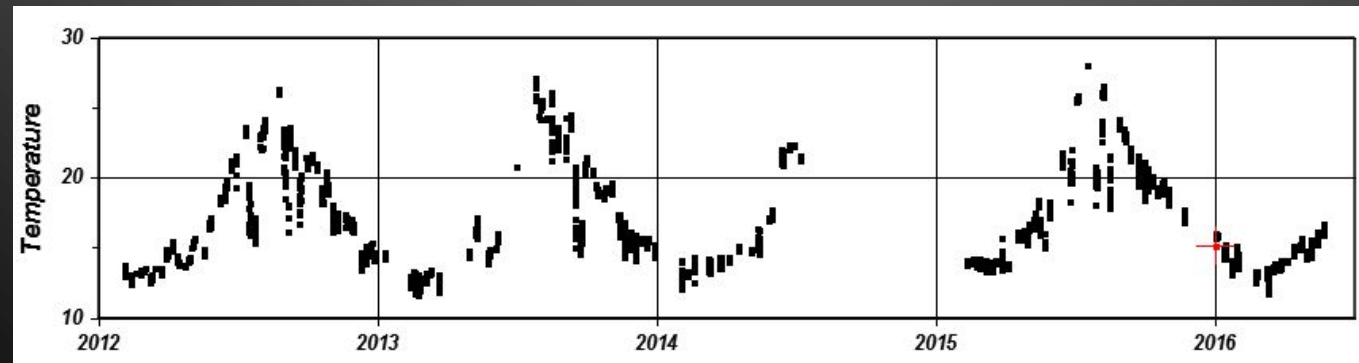
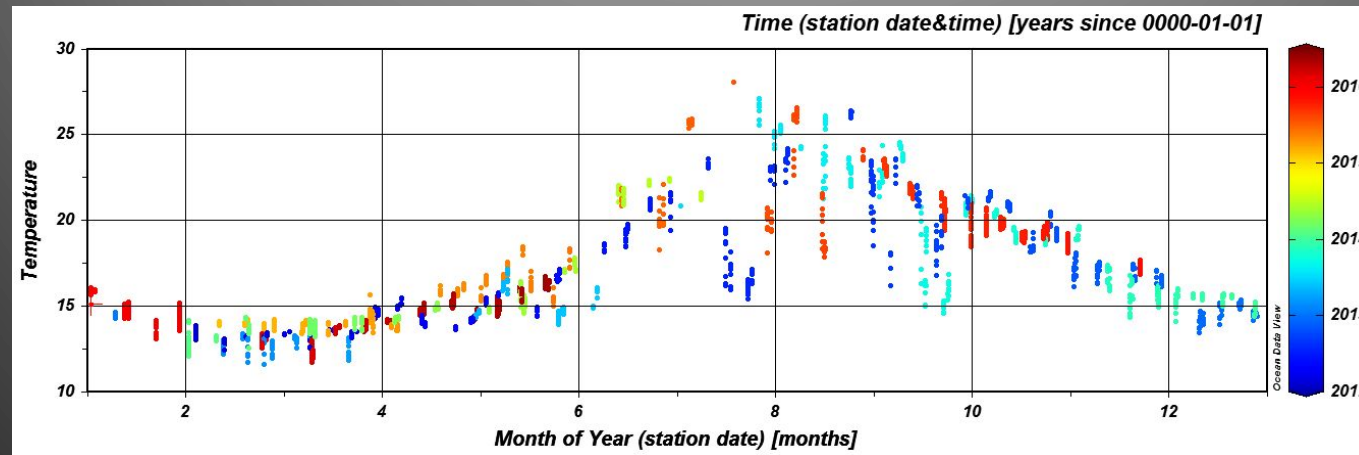


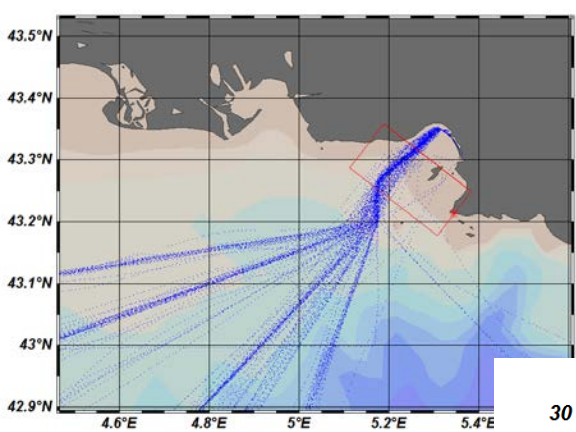
Hiver



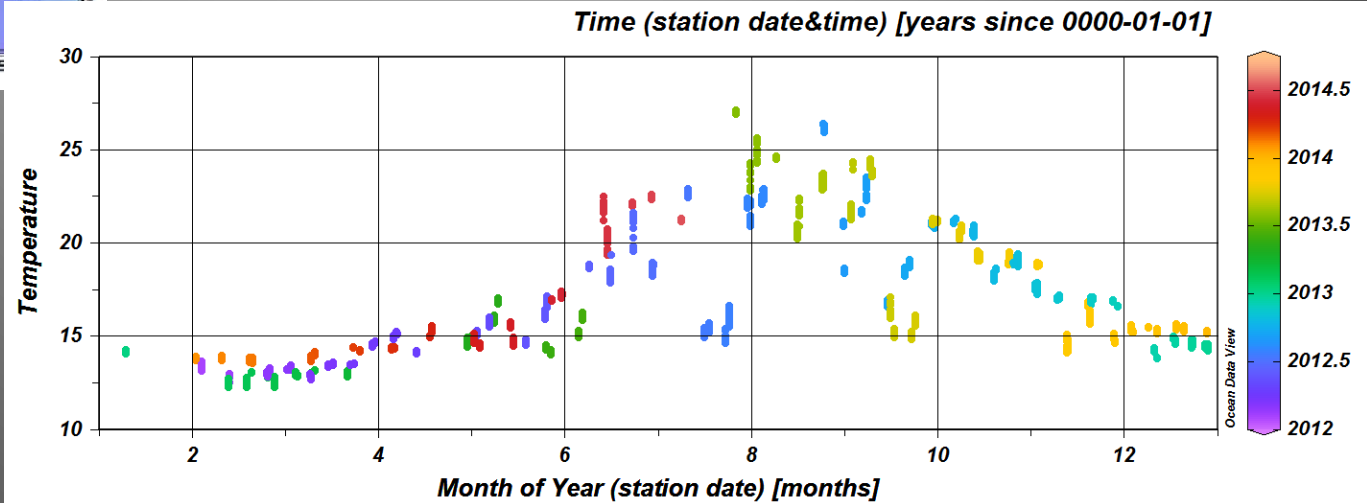
Été

Courant Nord: variabilité saisonnière marquée

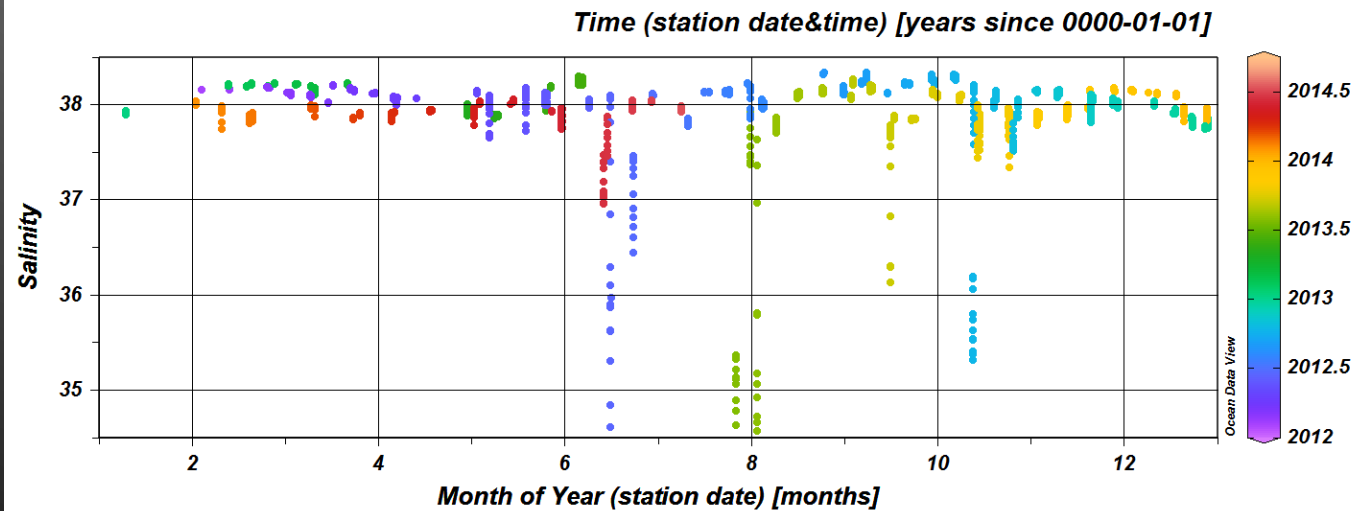


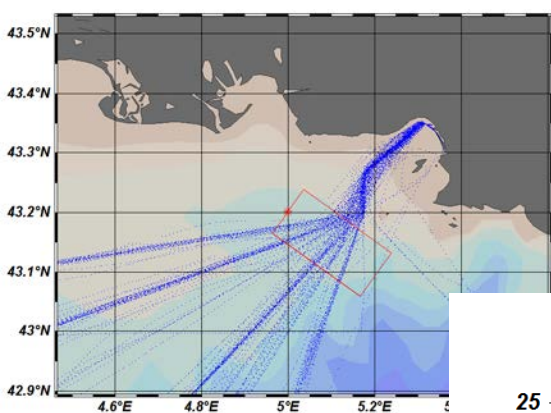


Bay of Marseille Feb. 2012 - Jul. 2014



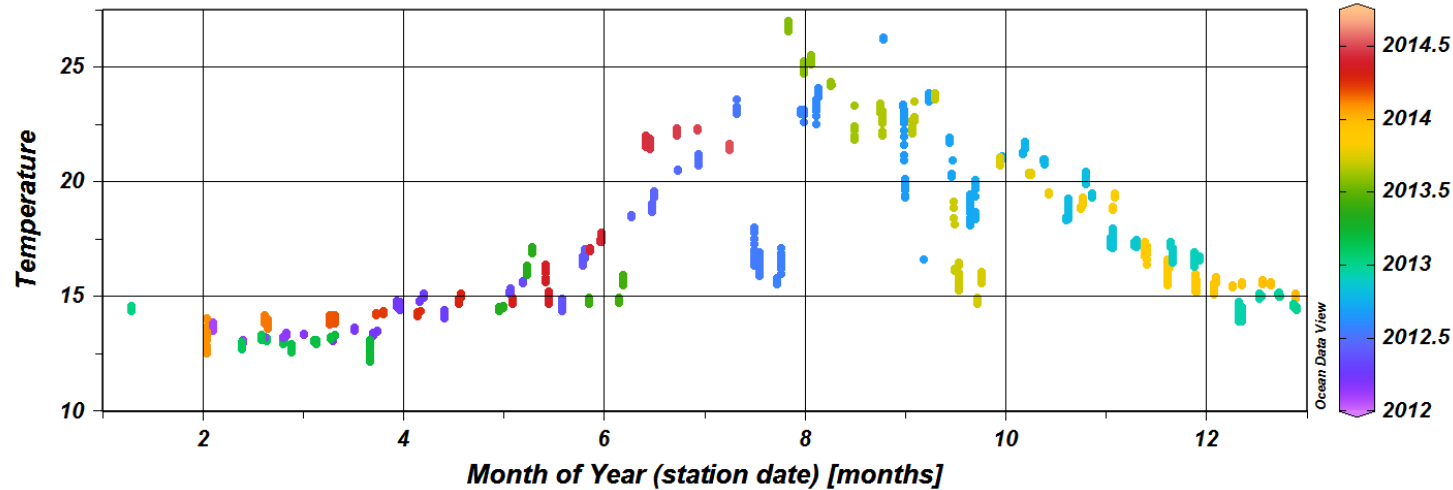
Bay of Marseille





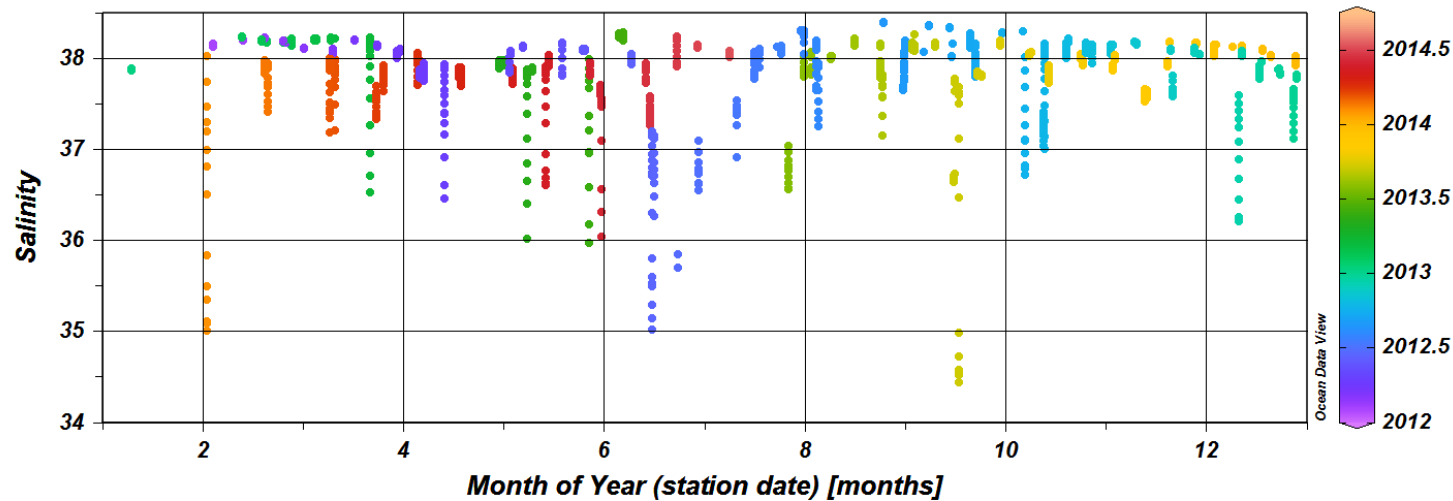
Northern Current Feb. 2012 - Jul. 2014

Time (station date&time) [years since 0000-01-01]

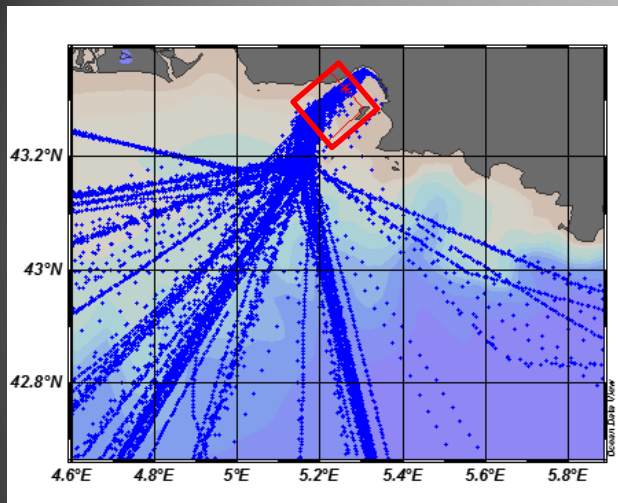


Northern Current of Marseille

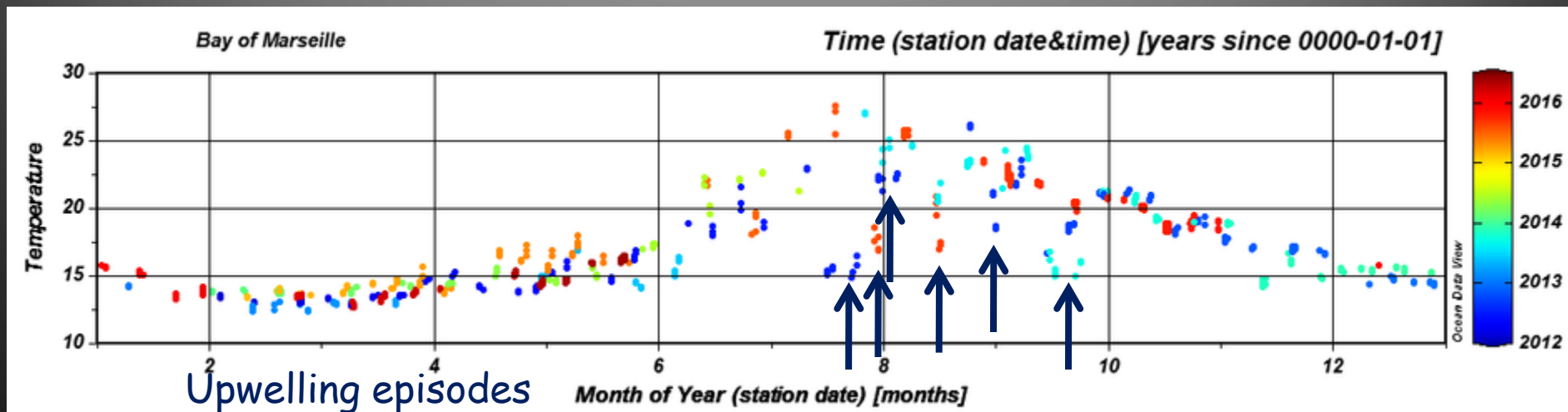
Time (station date&time) [years since 0000-01-01]

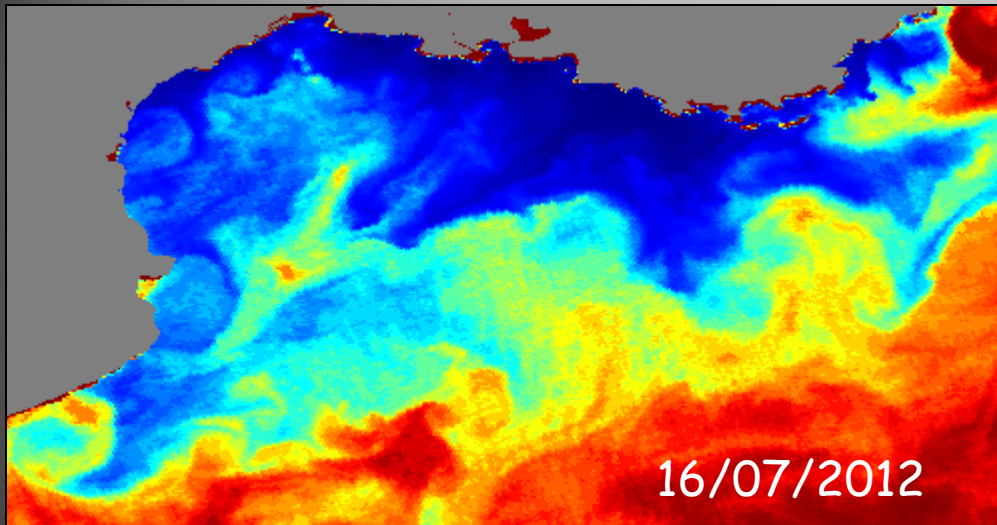


Détermination
d'indices pour
mettre en
évidence les
intrusions du
Courant Nord ?



Bay of Marseille





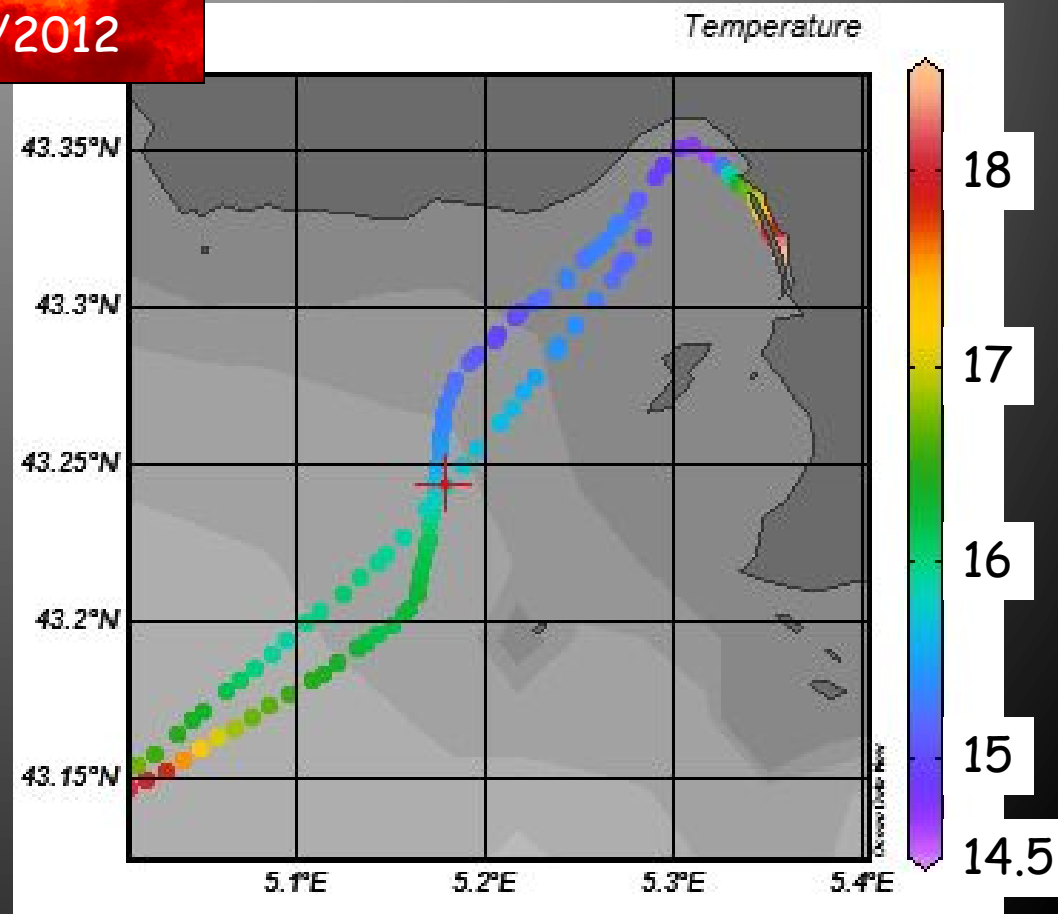
Episode de mistral intense et long
 ⇒ Upwelling très intense:
 T min baie de Marseille ~14.7°C
 (+ extension vers l'Est)

16-17/07/2012

Complémentarité spatiale avec
 obs. au point fixe (dont TMedNet,
 bouée SOLEMIO ...)

*NB: package de capteurs météo.
 +atmosphériques SEOS sur le navire
 (HyMeX/MétéoFrance)*

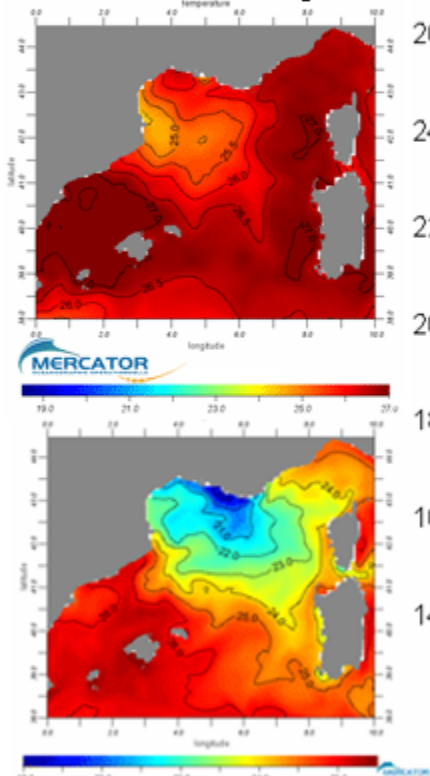
NB2: Pb de flag si $T < 15^{\circ}\text{C}$!



Temperature anomalies during summer 2006

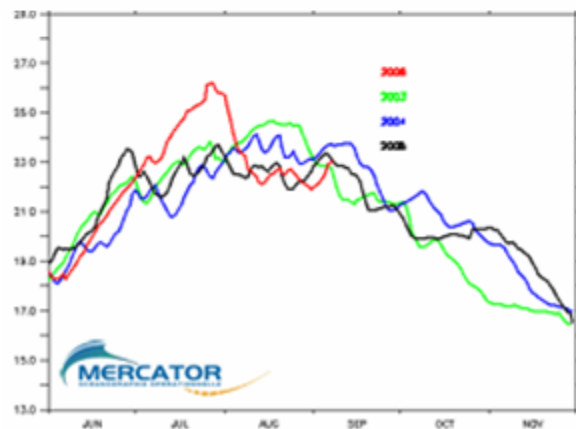
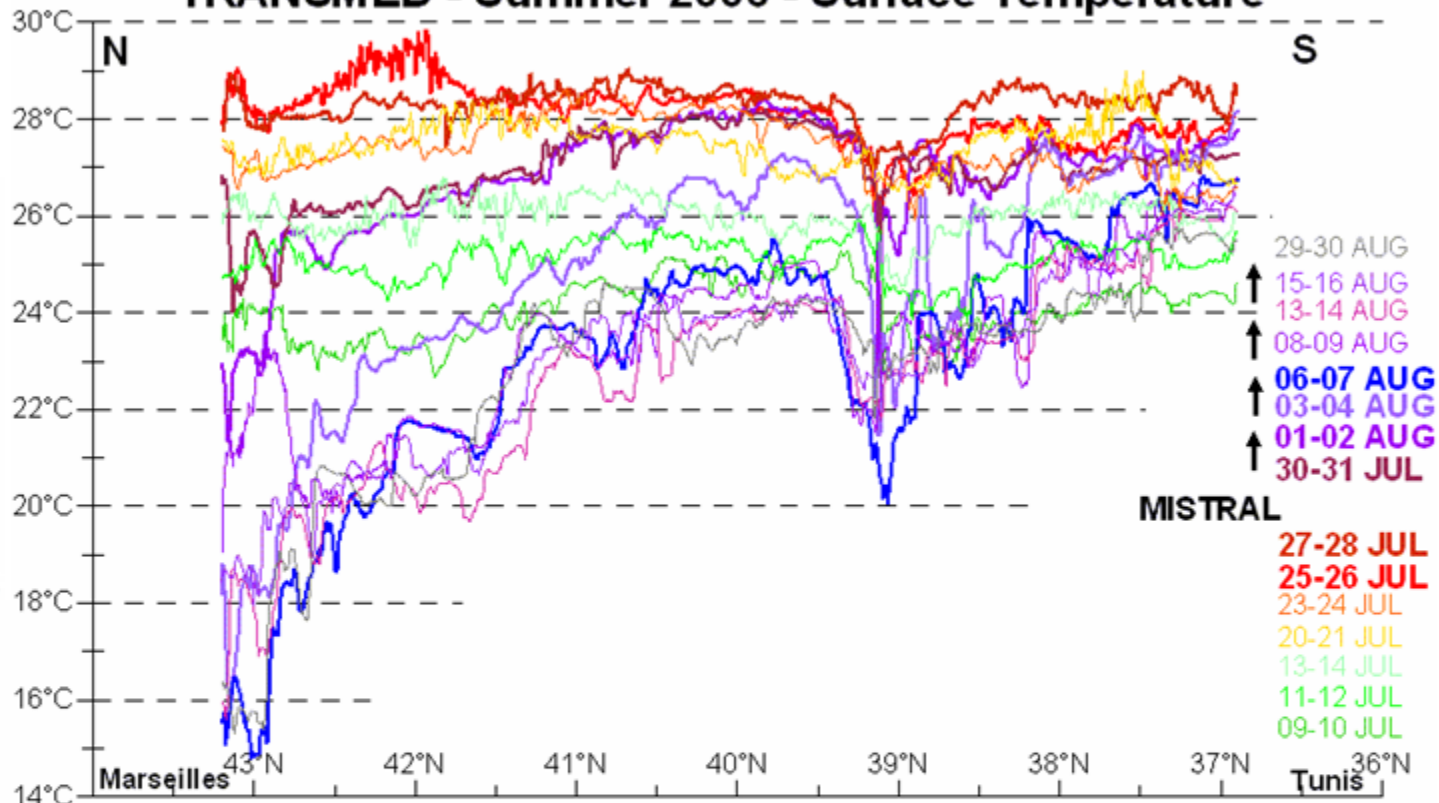
Gulf of Lions

Mean T in JUL06:
+5°C anomaly



Mean T in AUG06:
>-2°C anomaly

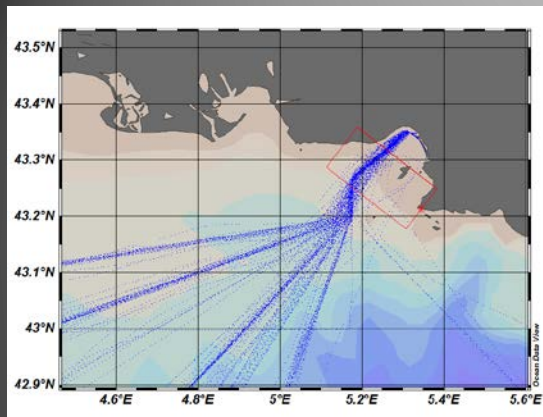
TRANSMED - Summer 2006 - Surface Temperature



Heat content in upper 20m in
the Gulf of Lions

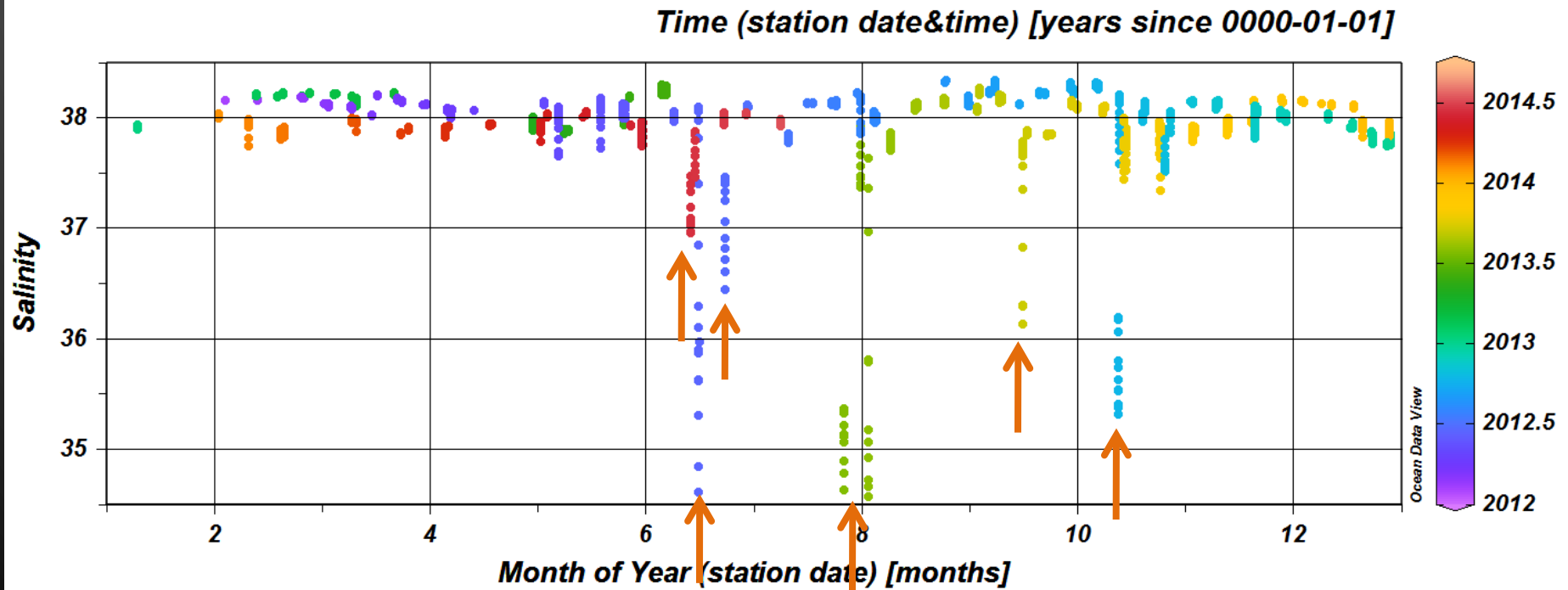
from June to November

2003 2004 2005 2006



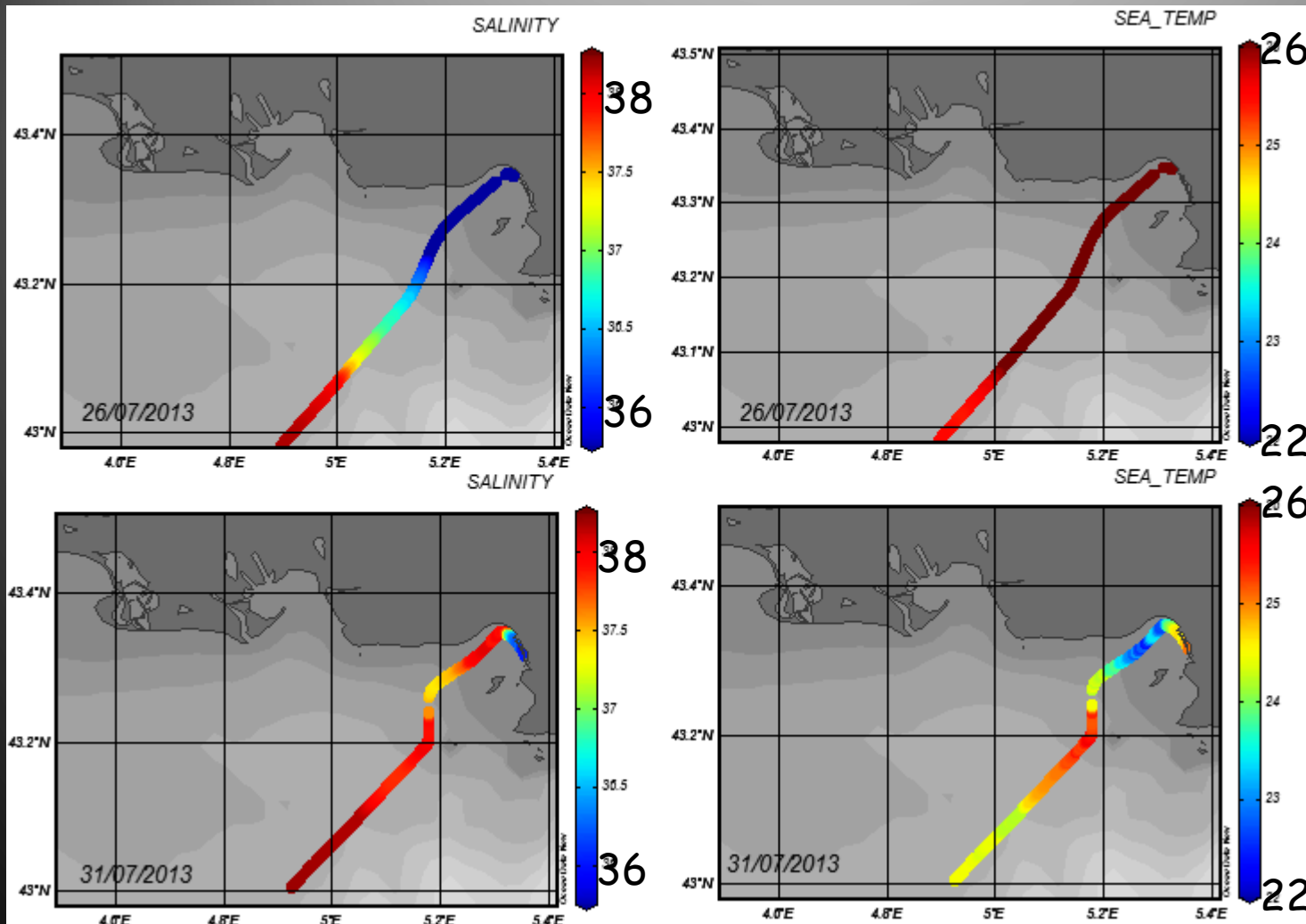
Episodes de dessalure prononcée dans la baie de Marseille (influence de la nappe du Rhône): $SSS < 34$ PSU (+ contaminants + ...)

Bay of Marseille



NB: épisodiquement : apports d'eau douce en fond de baie .

Episode de forte dessalure + température élevée MRS été 2013



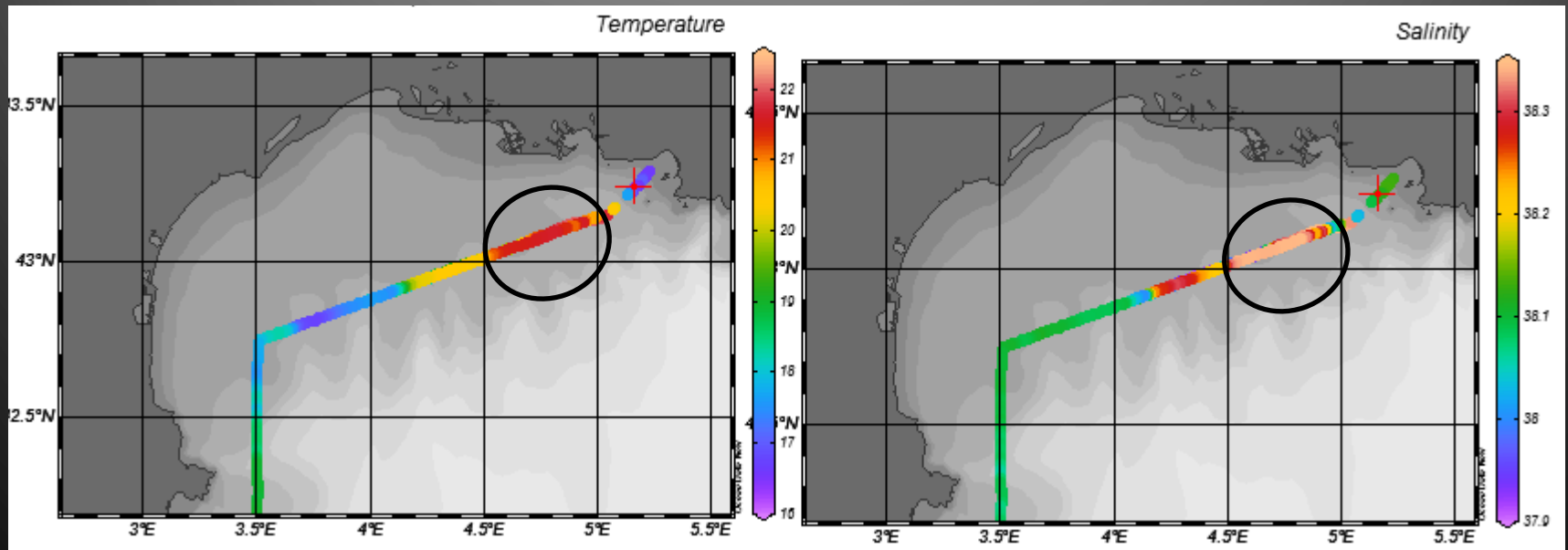
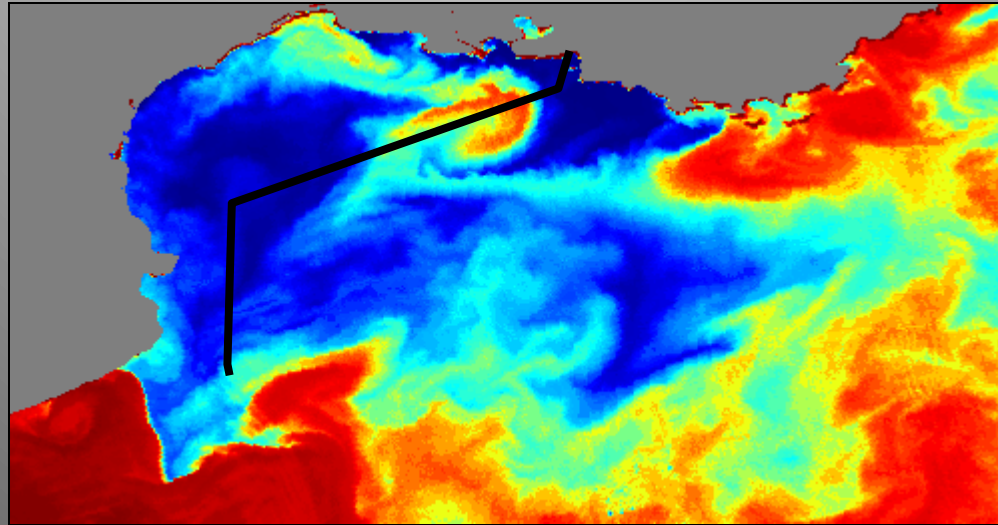
26/07/2013
T : 26.8 - **27.1**°C
S : **34.0** - **36.7**

Mistral modéré

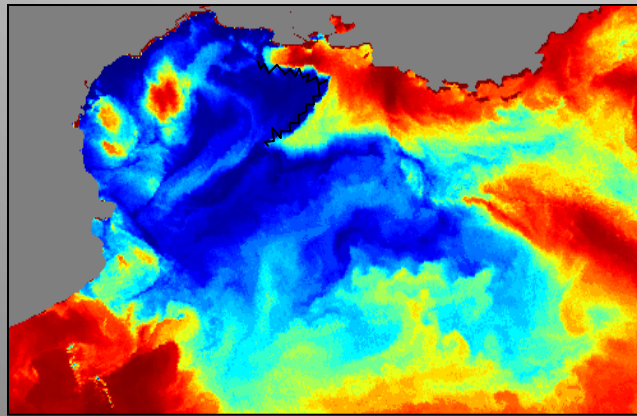
31/07/2013
T : **22.4** - 25.5°C
S : 37.4 - **38.1**

Dessalure liée à la nappe du Rhône

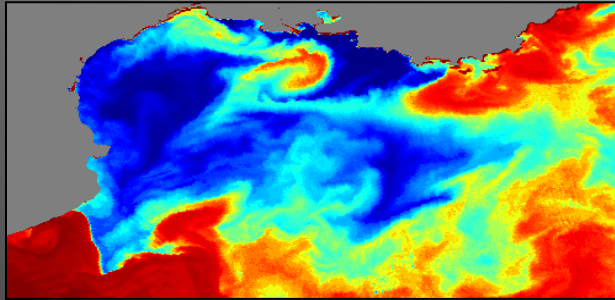
Tourbillon devant le Rhône 14 sept. 2012



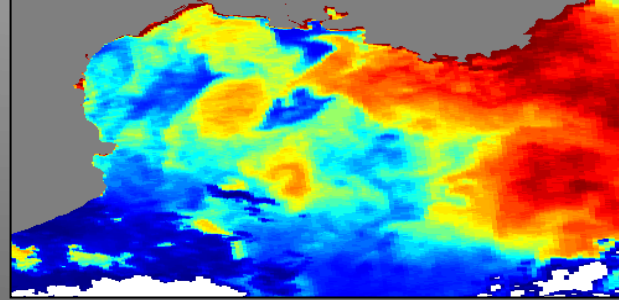
TRANSMED SST et SSS le 14 sept. 2012



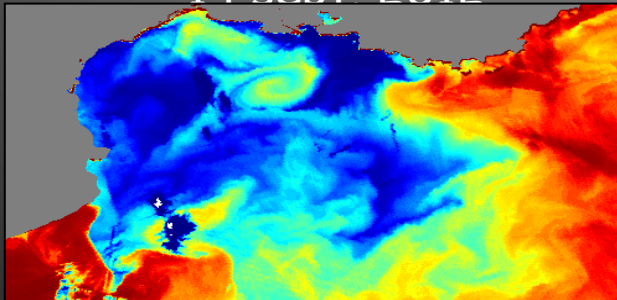
06/09/2012



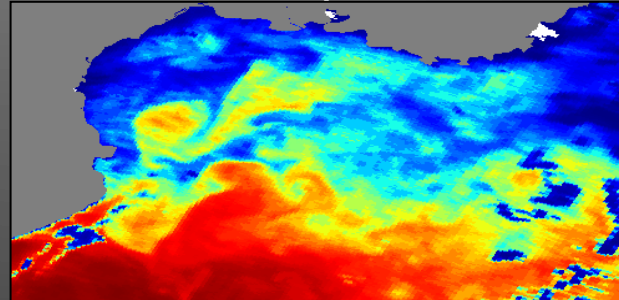
14 sept. 2012



19 sept. 2012



15 sept. 2012



25 sept. 2012

Tourbillon engendré par des épisodes successifs de tramontane/
mistral (hypothèse!), transportant de l'eau du Courant Nord (AW)

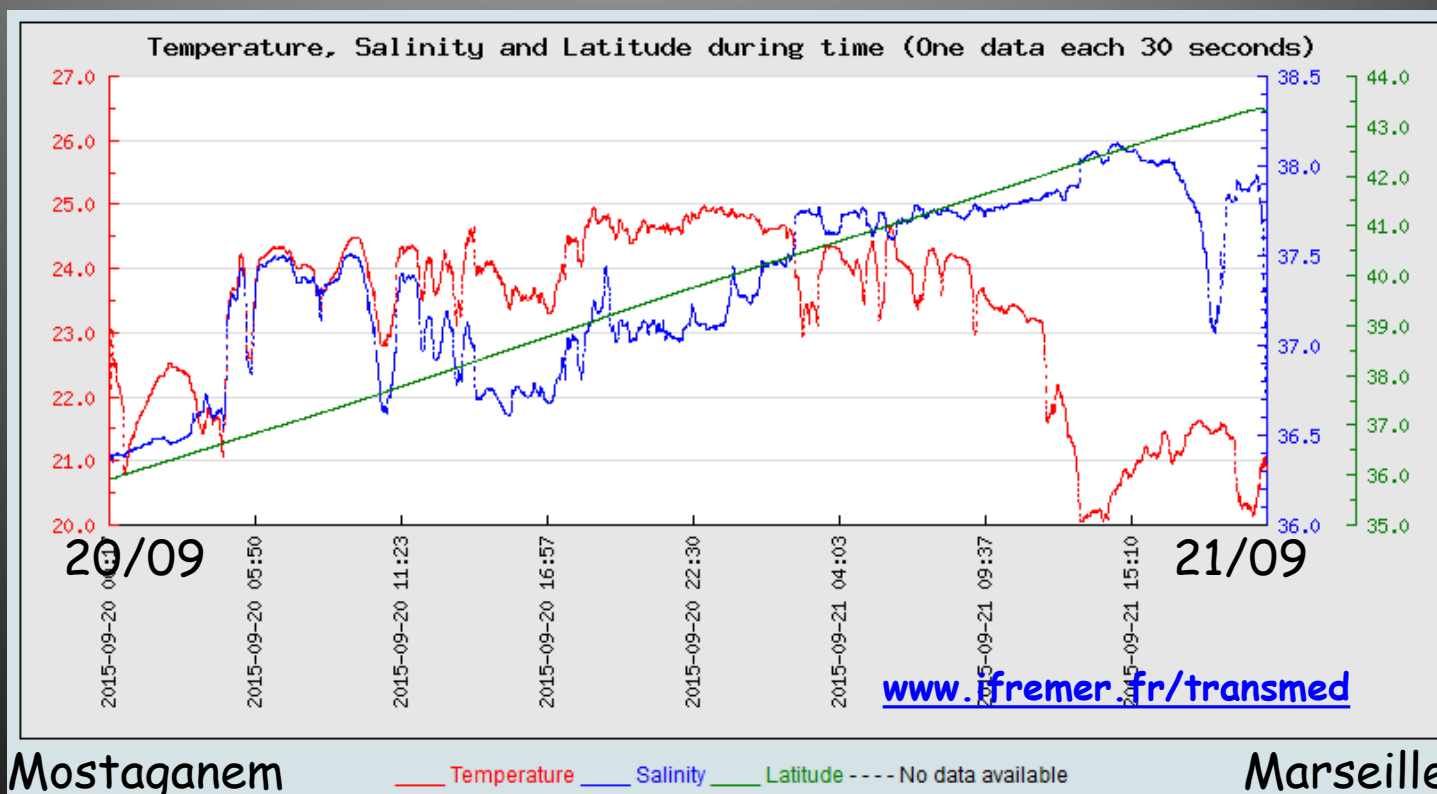
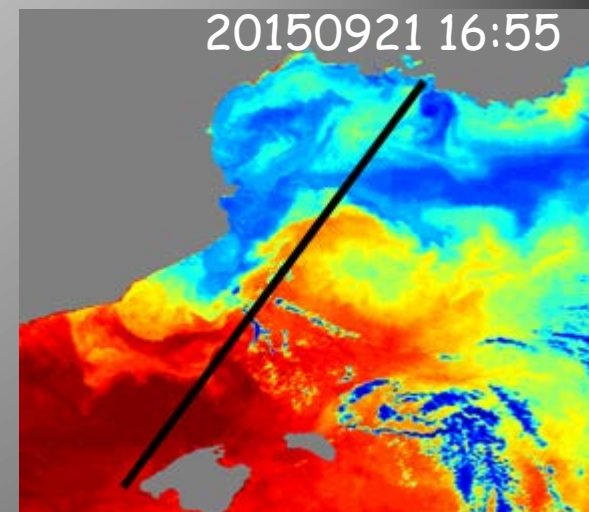
Utilisation de navires d'opportunité: TRANSMED



Circuit: ~10 days



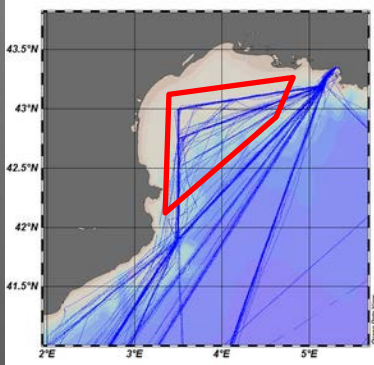
Ro-Ro « Cap Camarat » 02/2015



Influence de la nappe de dilution du Rhône

Littérature: Salinité <37.8 PSU

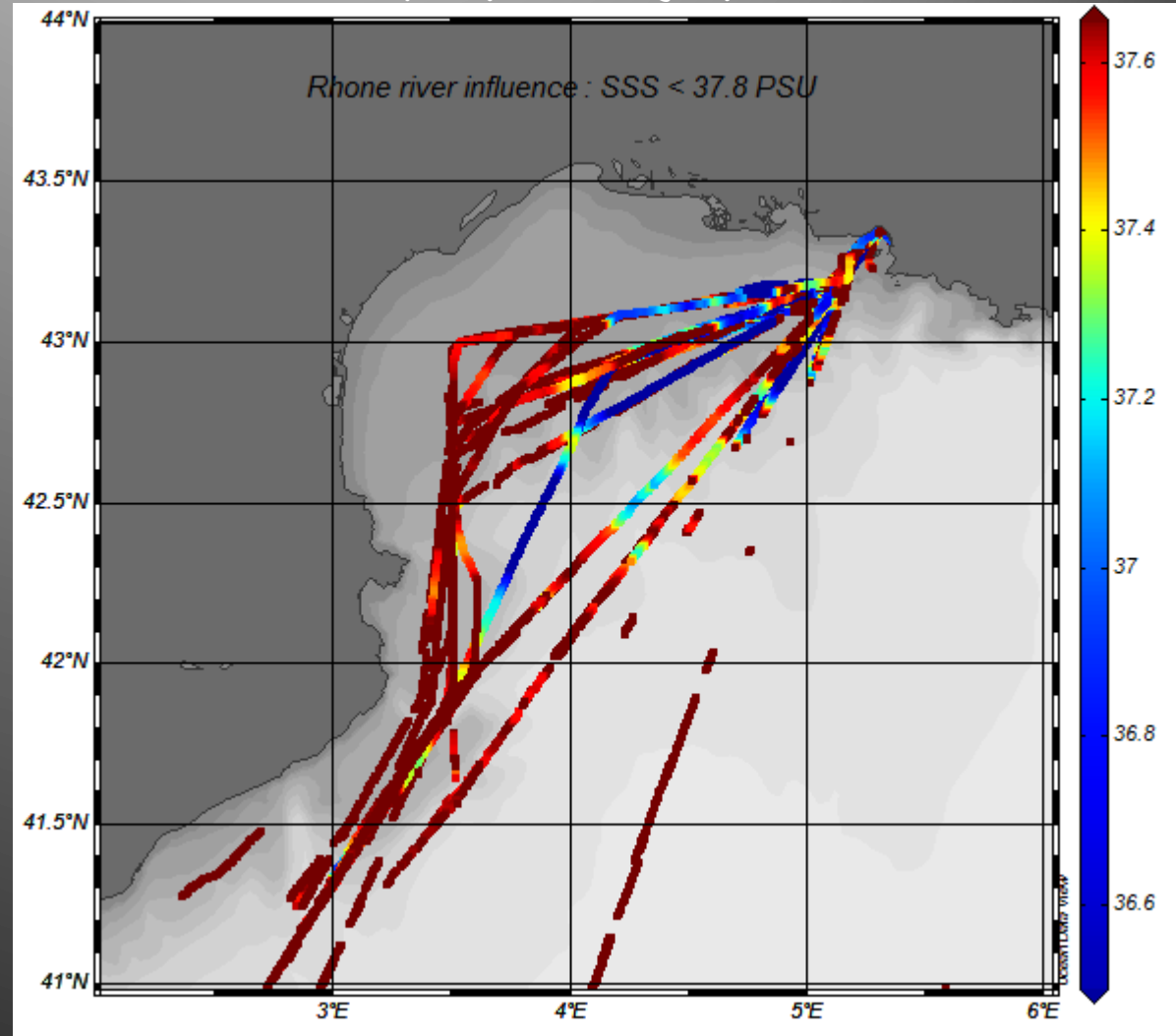
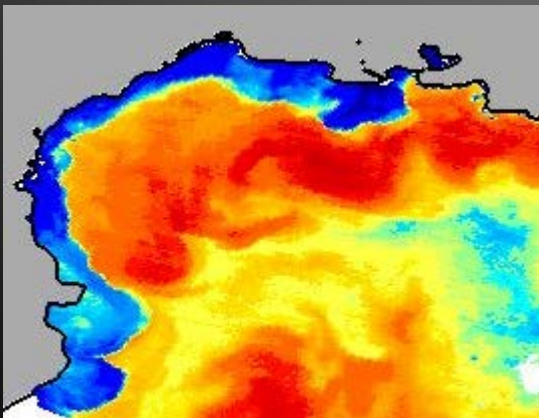
Feb. 2012 -Jul. 2014



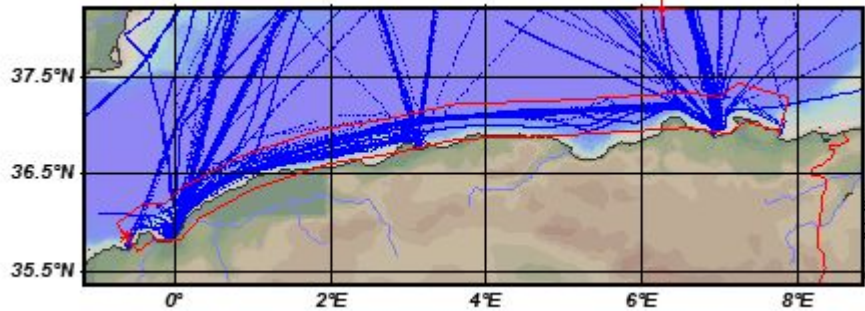
conditions de mistral

Biais:

Nappe du Rhône :
« fleuve côtier »



NB: Amélioration à partir de 2015 avec la route du Cap Camarat



Courant Algérien:
tourbillons de moyenne échelle

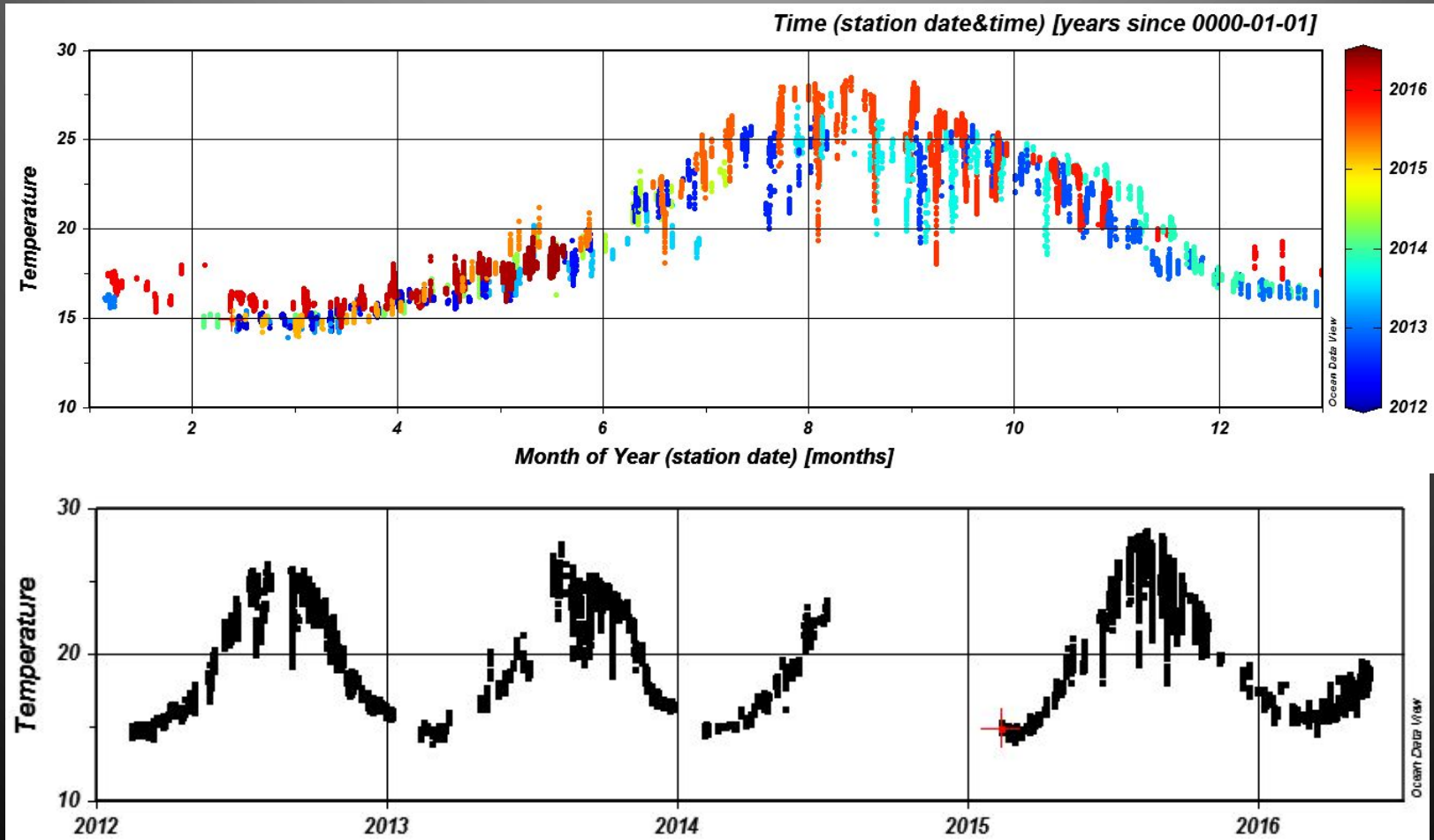
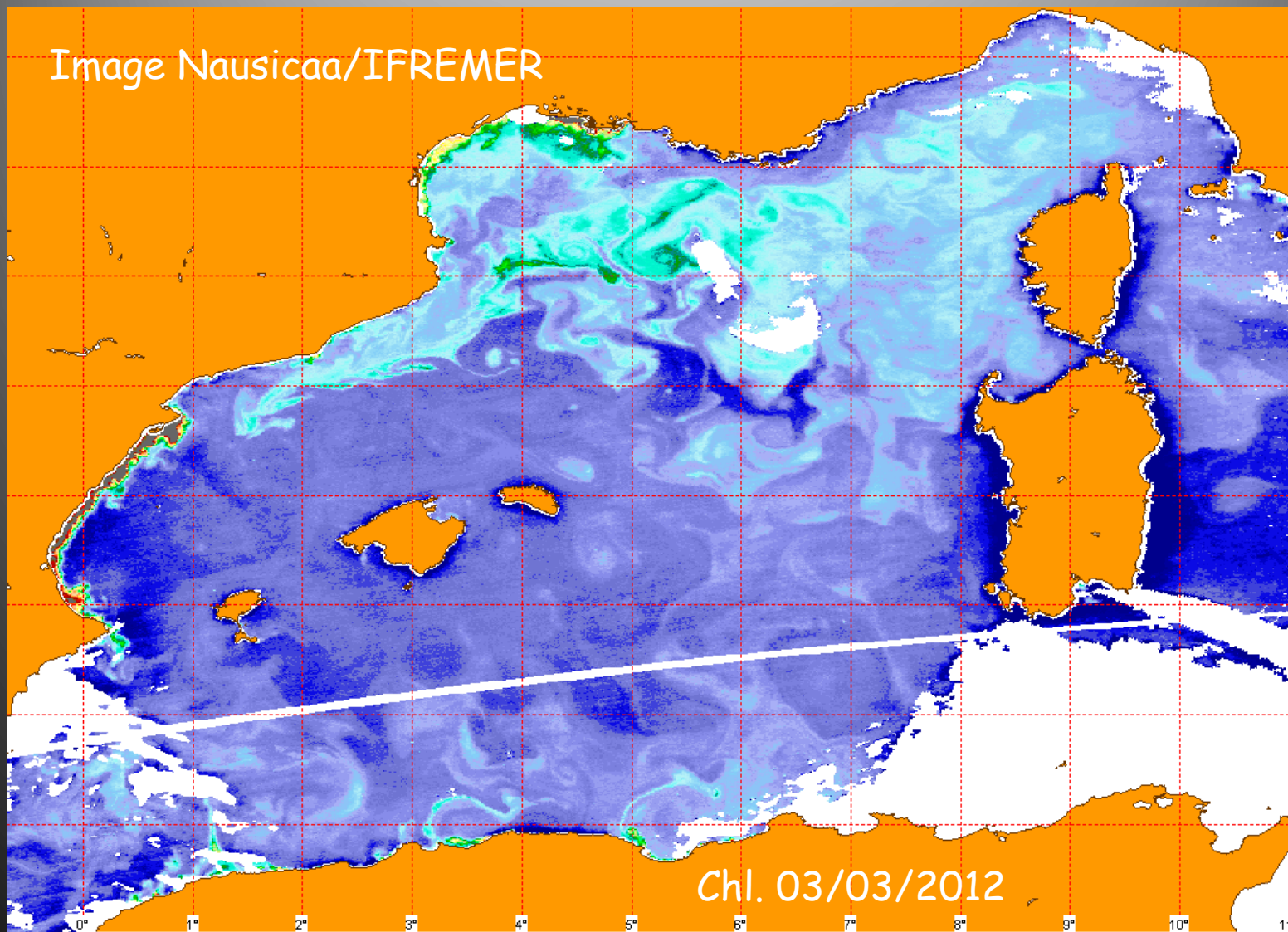
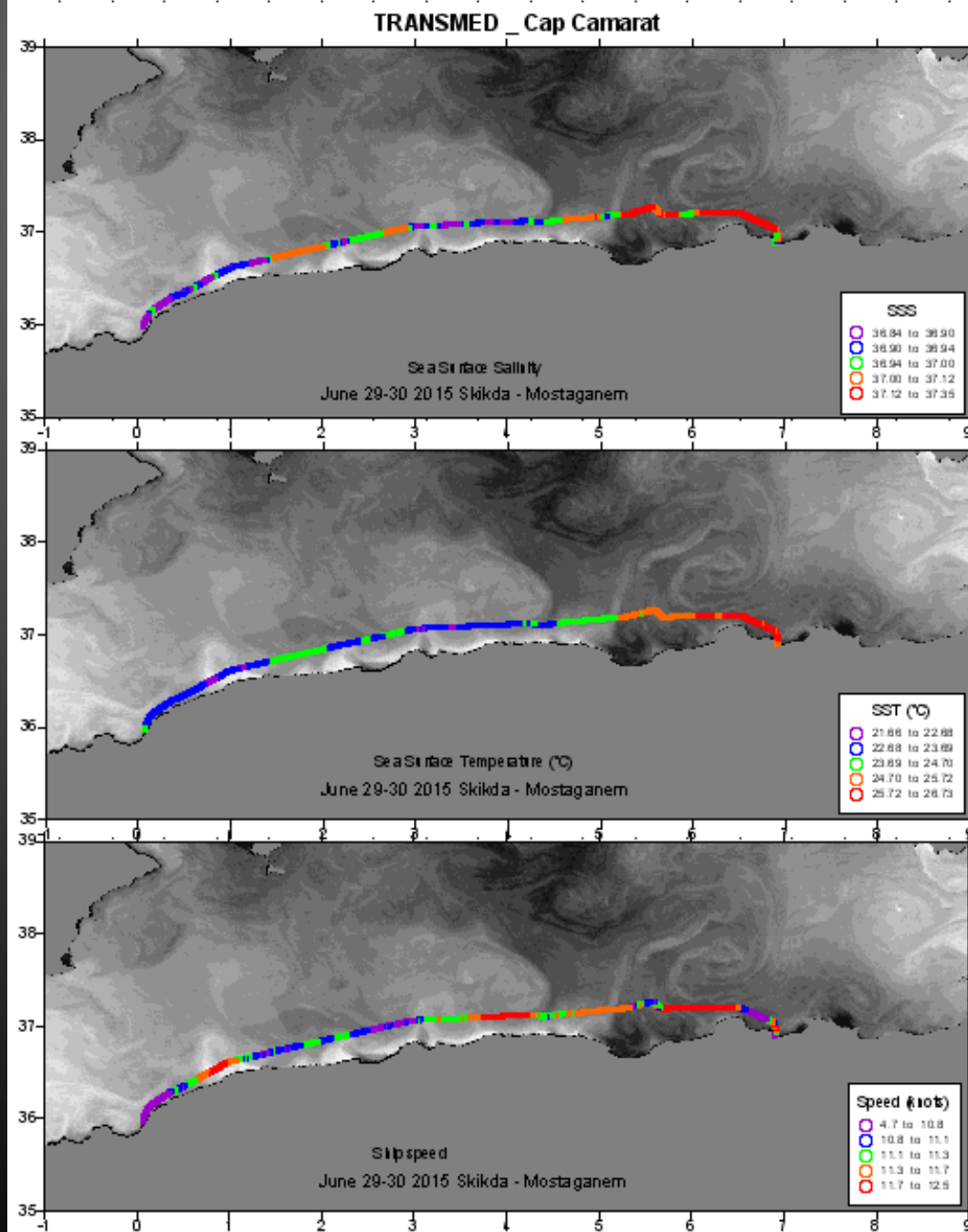


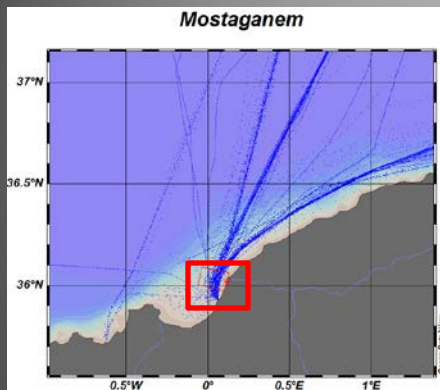
Image Nausicaa/IFREMER



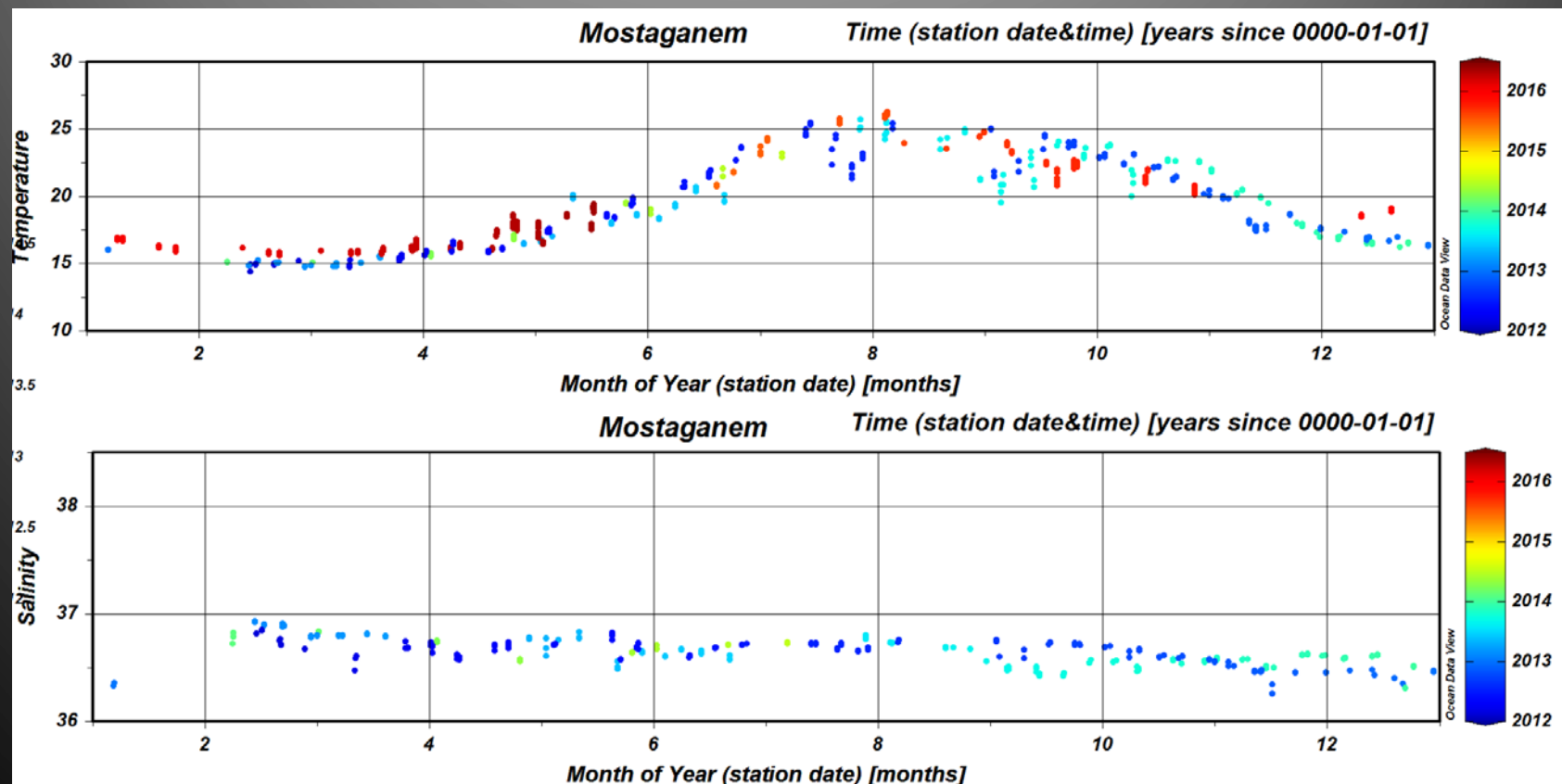


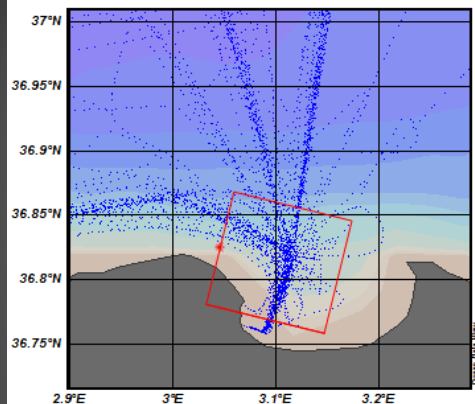
Impact des tourbillons algériens sur la SST, la SSS et la vitesse (direction!) du navire

⇒ Déterminants pour la circulation côtière et l'hydrologie dans les baies

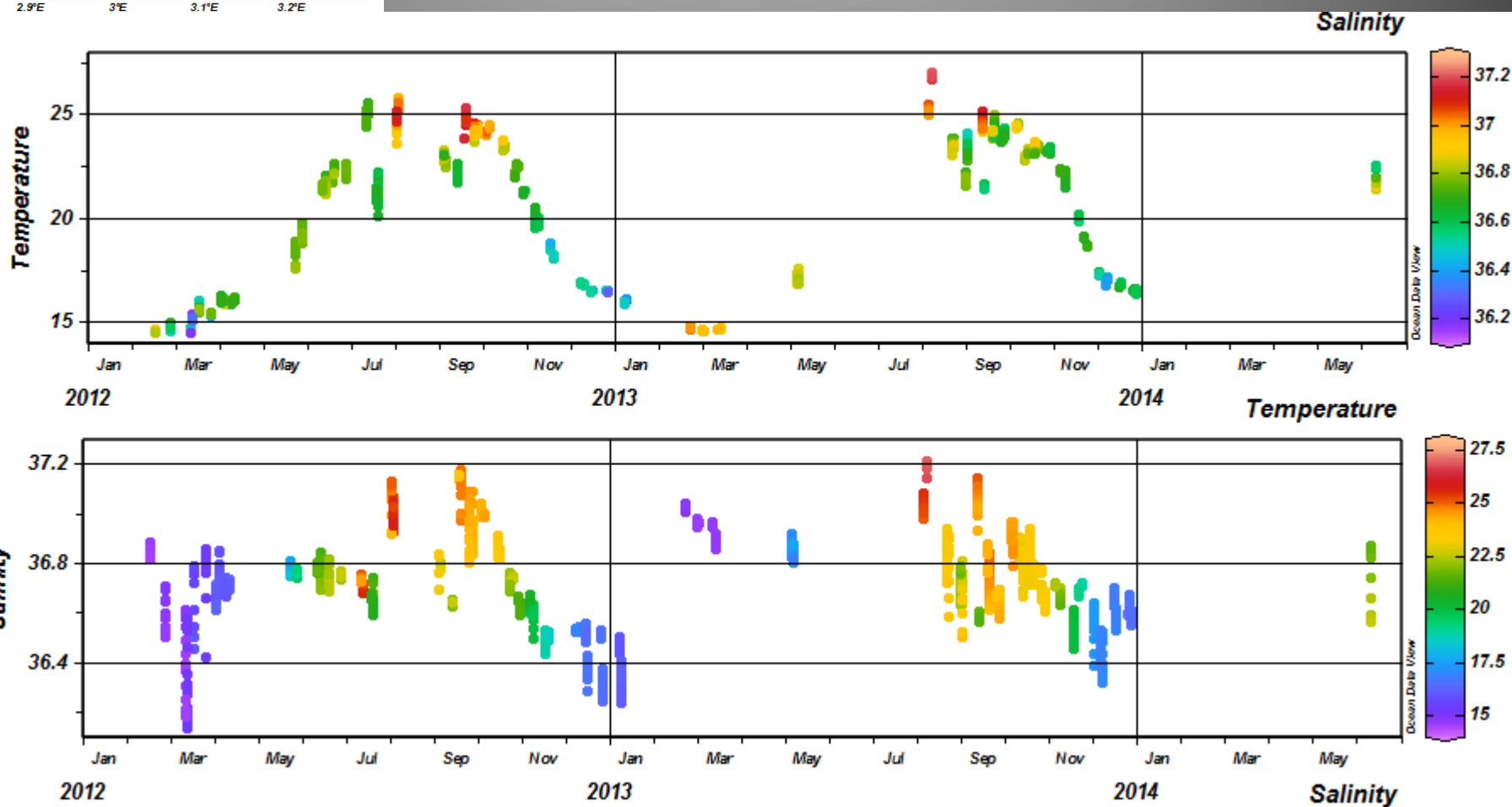


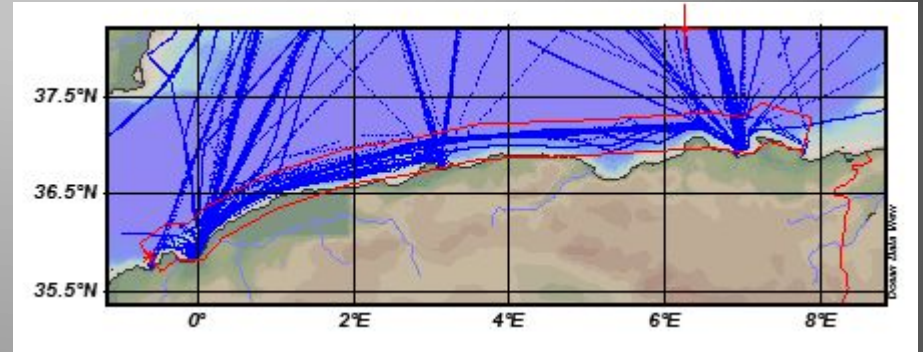
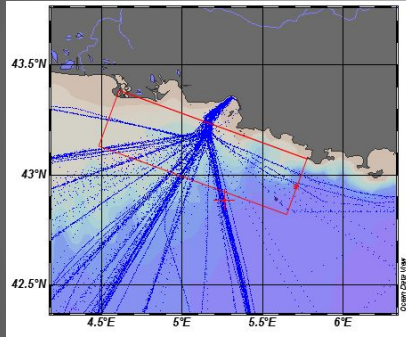
Baie de Mostaganem ($\sim 0^\circ$)





Baie d'Alger ($\sim 3^{\circ}\text{E}$)





Variabilité dans les baies

jour/semaine (vent)

gradients température
intenses ($>10^{\circ}\text{C} / 24\text{h}$),
courts

gradients salinité intenses
(dessalures), superficiels,
courts

Stress très important dans le
golfe du Lion => déterminant
pour les espèces fixées

semaine/mois (propagation
des tourbillons qqkm/j)

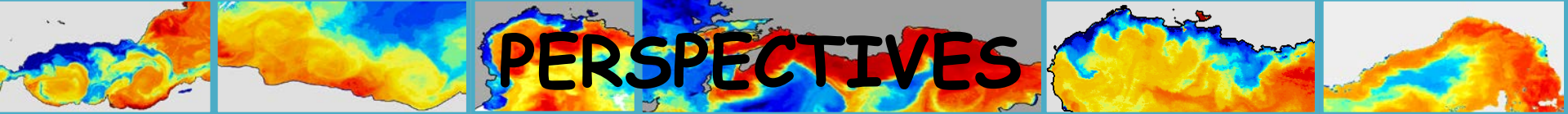
gradients température moins
marqués mais qui durent

gradients salinité marqués
vers valeurs fortes, +
profonds, qui durent

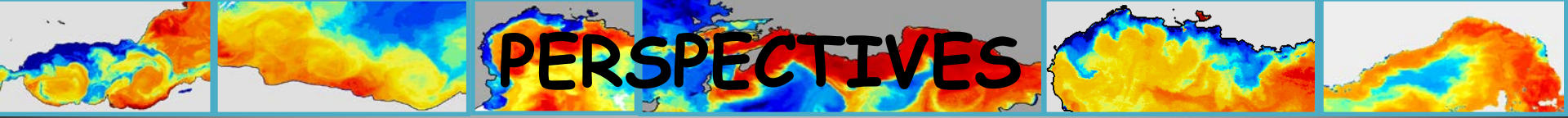
circulation modifiée (sur toute
la colonne d'eau)

réponse biologique aux
upwellings

Population des espèces fixées
différentes (?)

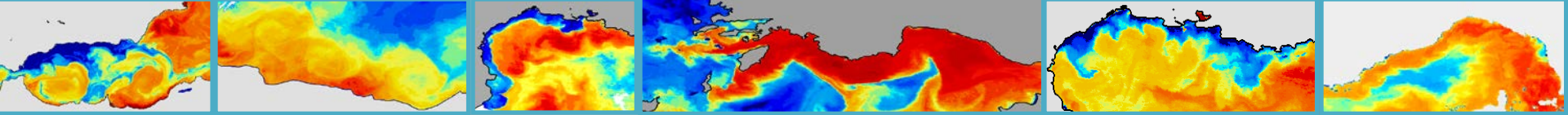


- Validation de modèles et de processus
 - Validation de SMOS et suivants
 - Support à la DCSMM
 - ...
-
- Possibilité d'ajouter des capteurs
 - Possibilité de réduction => navettes pour les îles (Frioul, Port Cros, Lerins.../ PIMS) , archipels outre-mer...
 - Possibilité de développement d'un réseau à l'échelle de la Méditerranée (monitoring AW Gibraltar!)



PERSPECTIVES

- Validation de modèles et de processus
- Validation de SMOS et suivants
- Support à la DCSMM
- ...
- Possibilité d'ajouter des capteurs
- Possibilité de réduction => navettes pour les îles (Frioul, Port Cros, Lerins.../ PIMS) , archipels outre-mer...
- Possibilité de développement d'un réseau à l'échelle de la Méditerranée (monitoring AW Gibraltar!)
- POSSIBILITE DE CONTINUER ?



Merci à tous les contributeurs (nombreux!!)

Appel à collaborations