

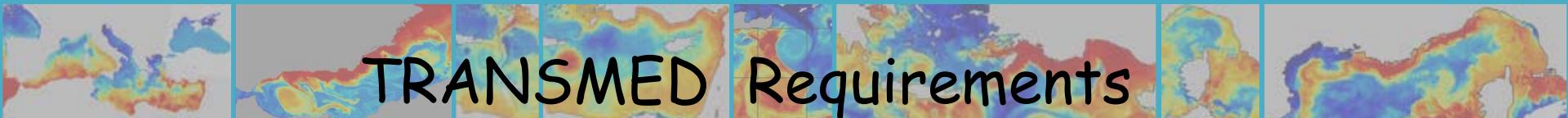
Apports des séries temporelles à haute résolution de SST et SSS dans les zones côtières (Marseille, Algérie)

I.TAUPIER-LETAGE, G. ROUGIER, C. BACHELIER,
D. MALENGROS, N. BHairy,

Mediterranean Institute of Oceanography (MIO)

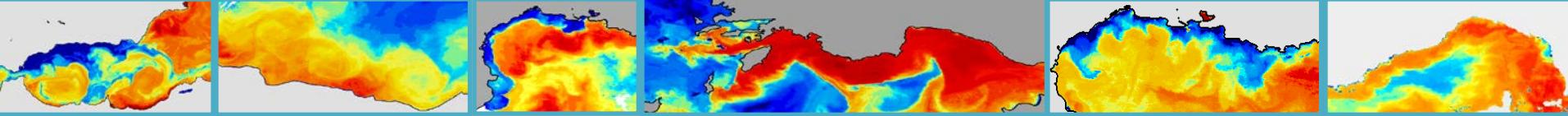
isabelle.taupier-letage@univ-amu.fr

K. BERNARDET, Z. HAFIDI, E.GODHINO, P. GUTERMAN
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



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)

Ship Route
ChronologicalShip Route
Geographical

Data Graphics

Please fill the form below to consult graphics:

Ship Cap Camarat

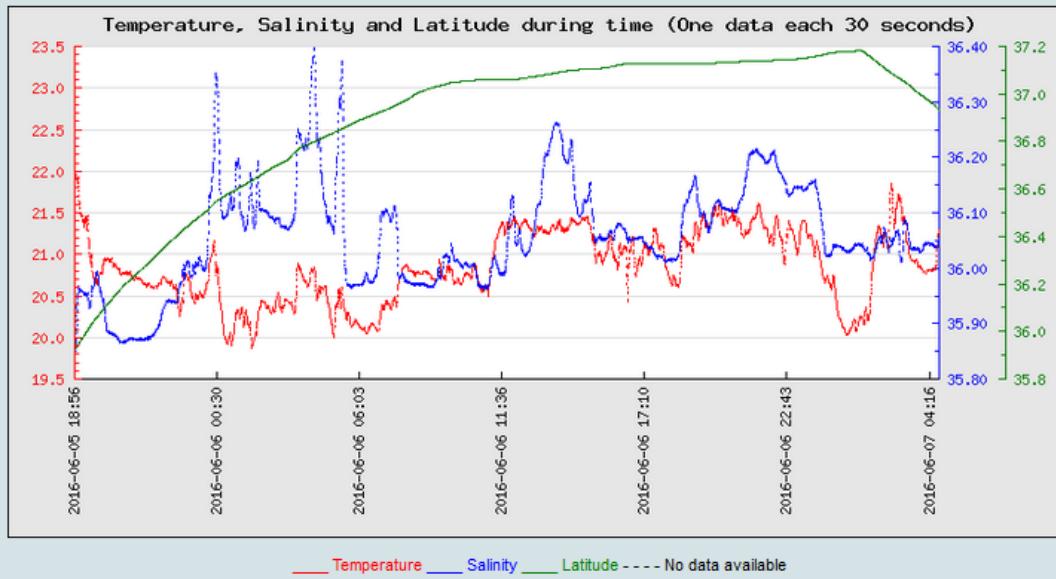
Level 1

Beginning date Ending date

Search

www.ifremer.fr/transmed

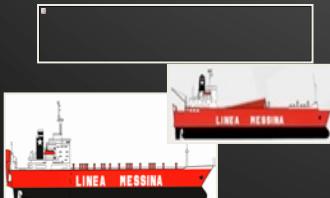
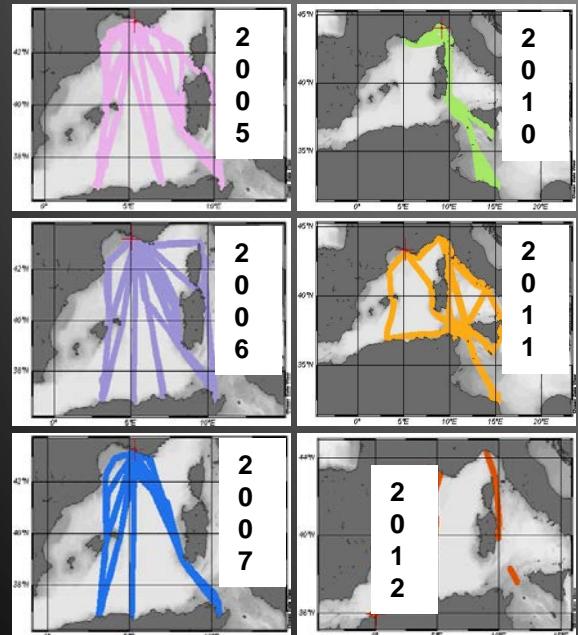
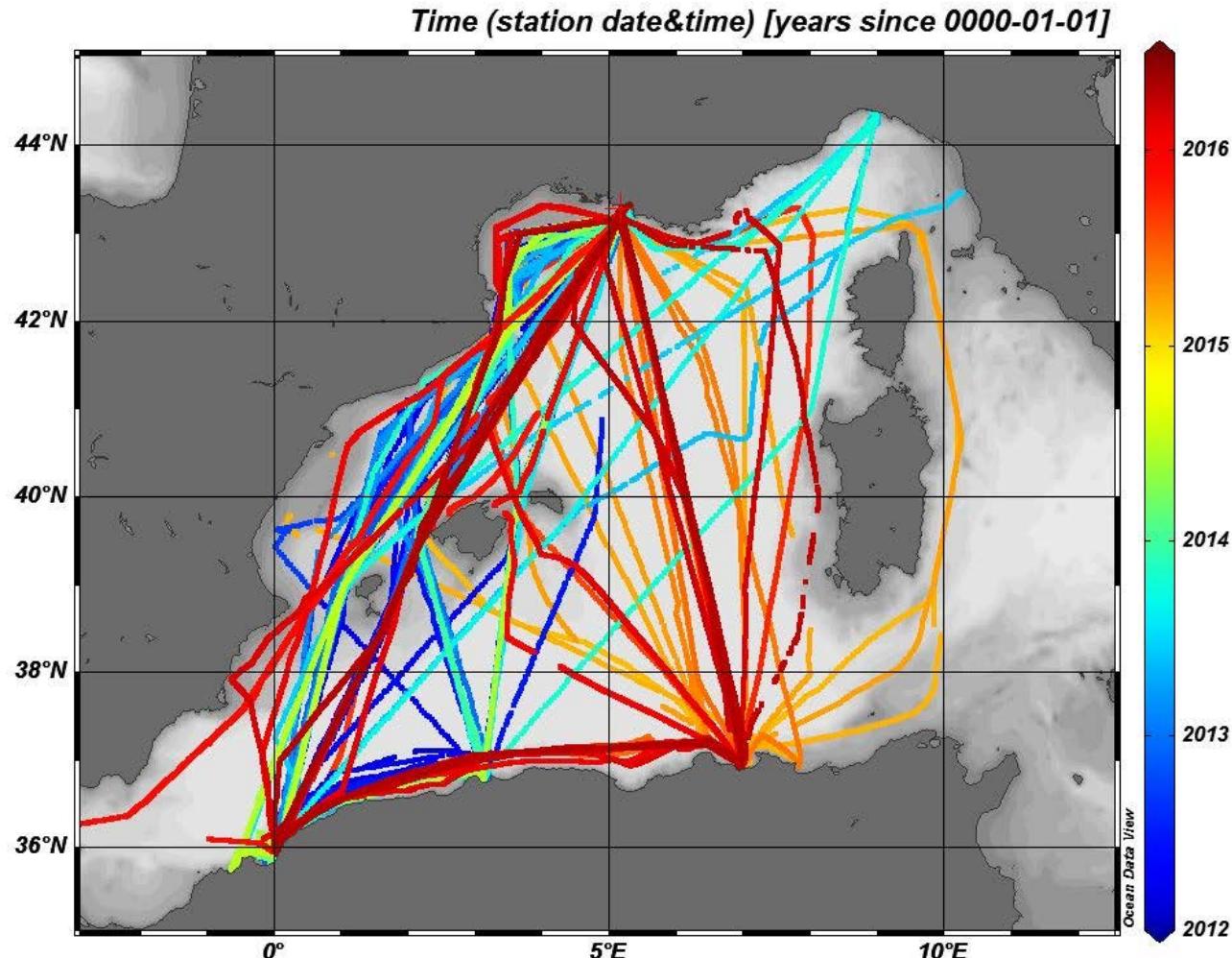
Transit Cap Camarat
Mostaganem -> Skikda
5-7 /06/2016



NB: SSS off
(QC=2)

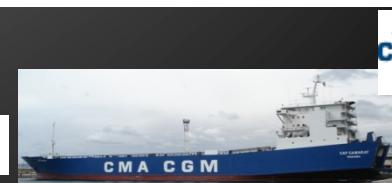


Distribution spatio-temporelle des données TRANSMED



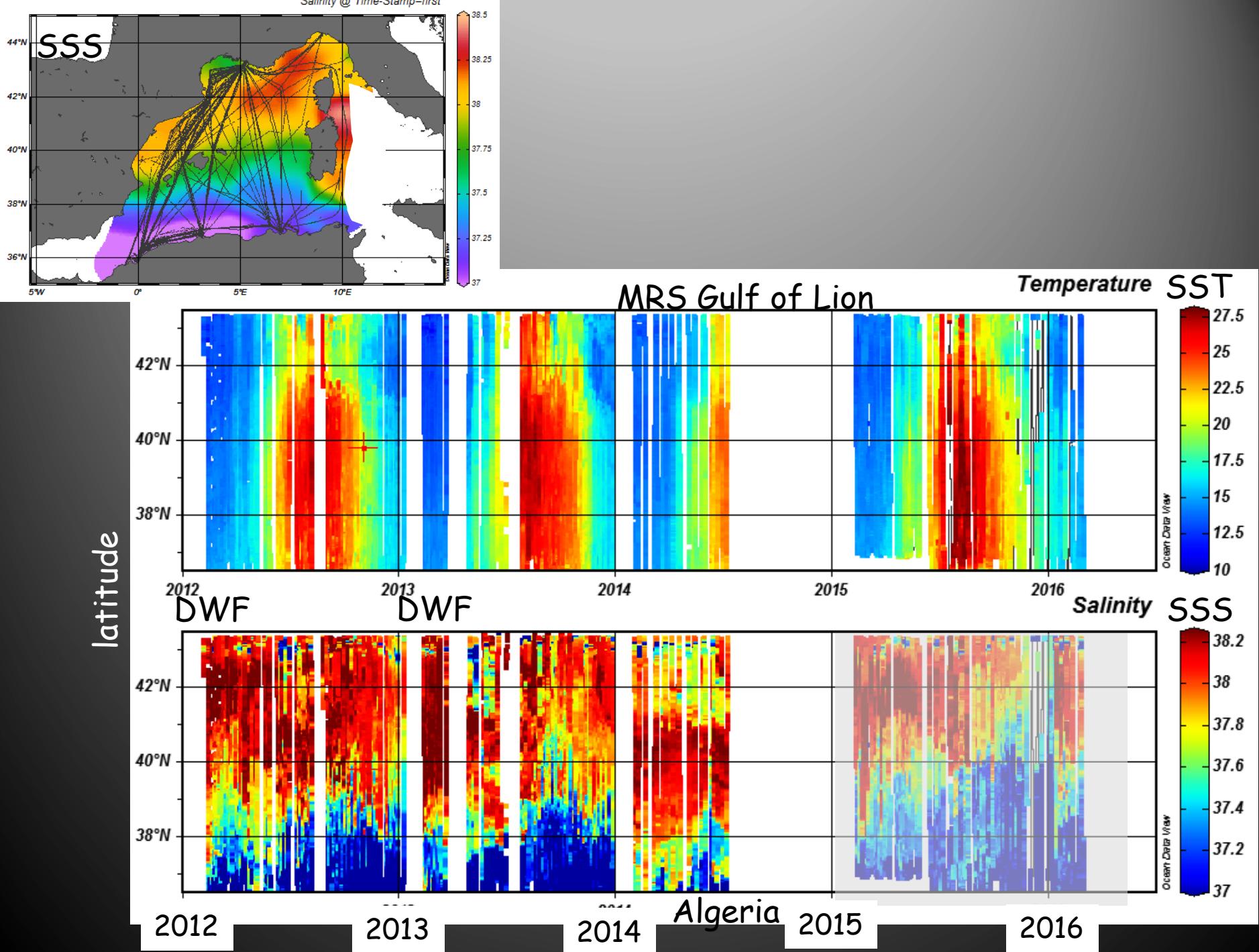
Marfret Nilon (2012-2014)

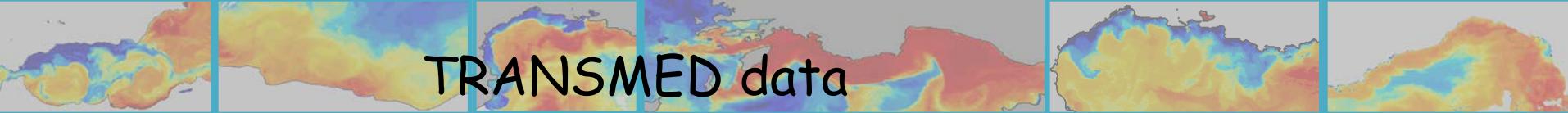
HyMeX
ANR ASICS-MED
International cycle in Mediterranean Experiment



Cap Camarat (2015-?)

CMA CGM





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	TRANSMED DB* 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	TRANSMED DB* HyMeX/ SEDOO *: not implemented yet

Data quality :

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

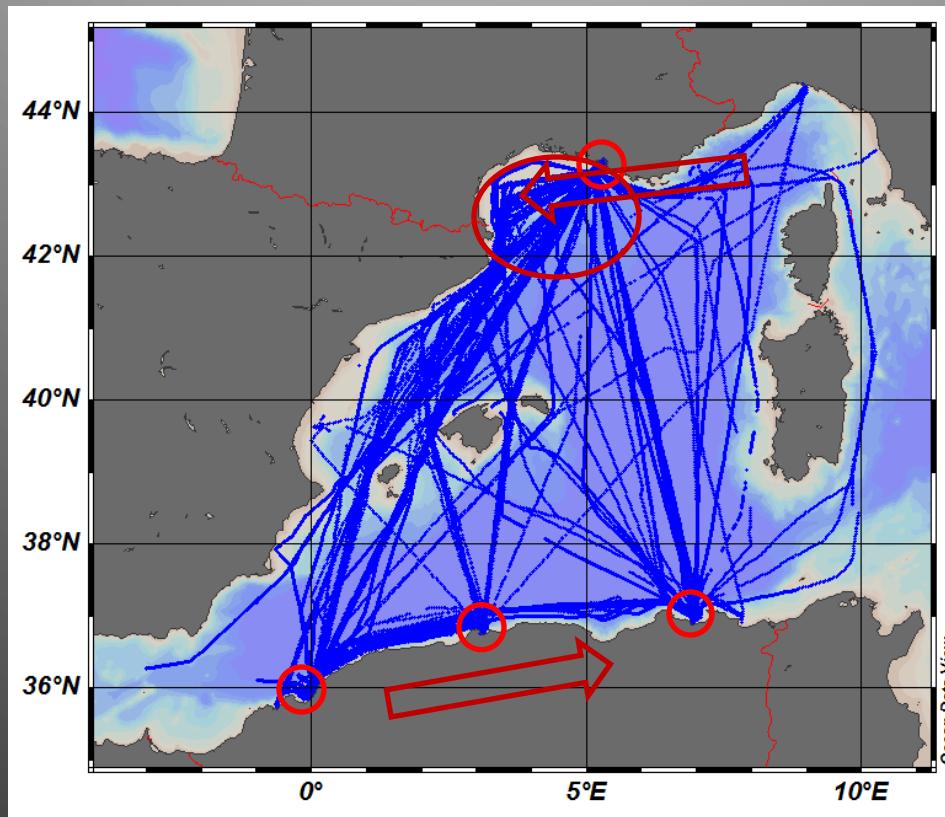
<u>Ships</u>	<u>Period</u>	<u>Drift in salinity (PSU)</u>	<u>Drift in Temperature SBE45 (°C)</u>	<u>Drift in Temperature SBE38 (°C)</u>
Marfret Niolon	Apr.2012 - Jan.2014	<0.002 (!)	<0.0006	<0.0006

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

TRANSMED

Séries temporelles SST et SSS de haute résolution:

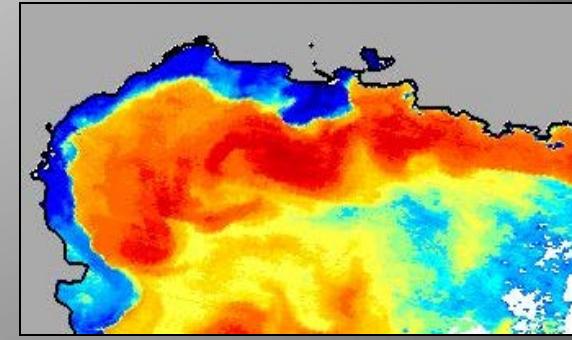
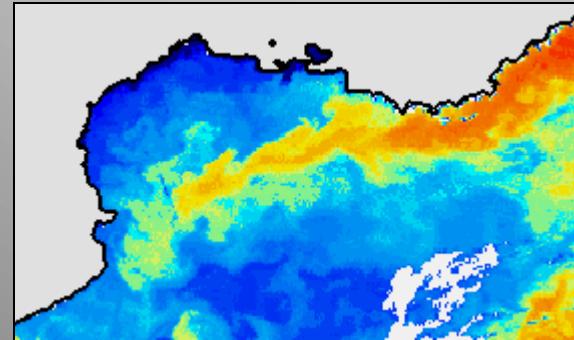
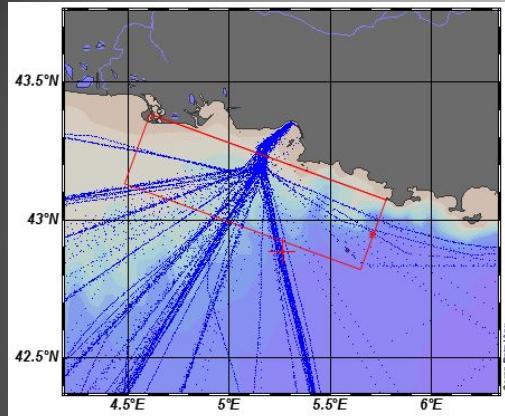
- spatiale: <1km
- temporelle : ~5-15 jours



Domaine hauturier (DWF)



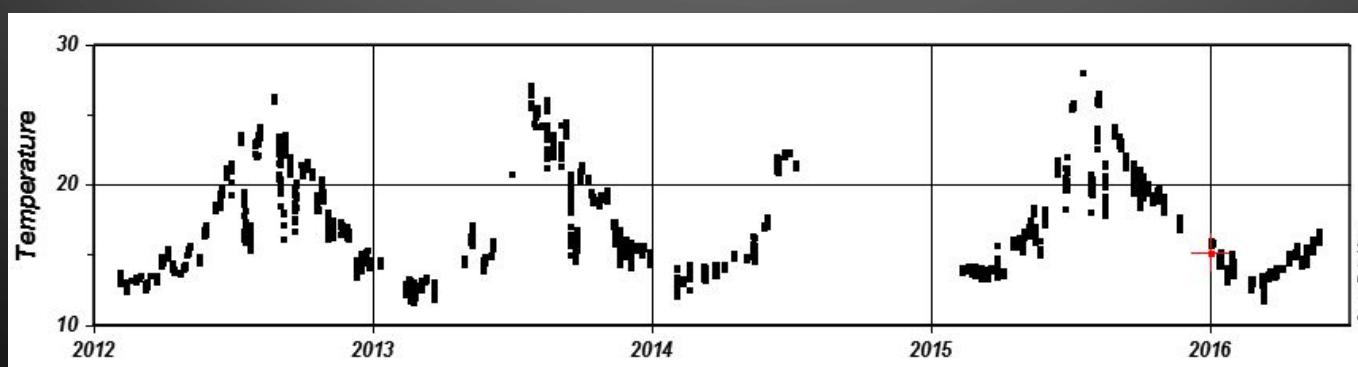
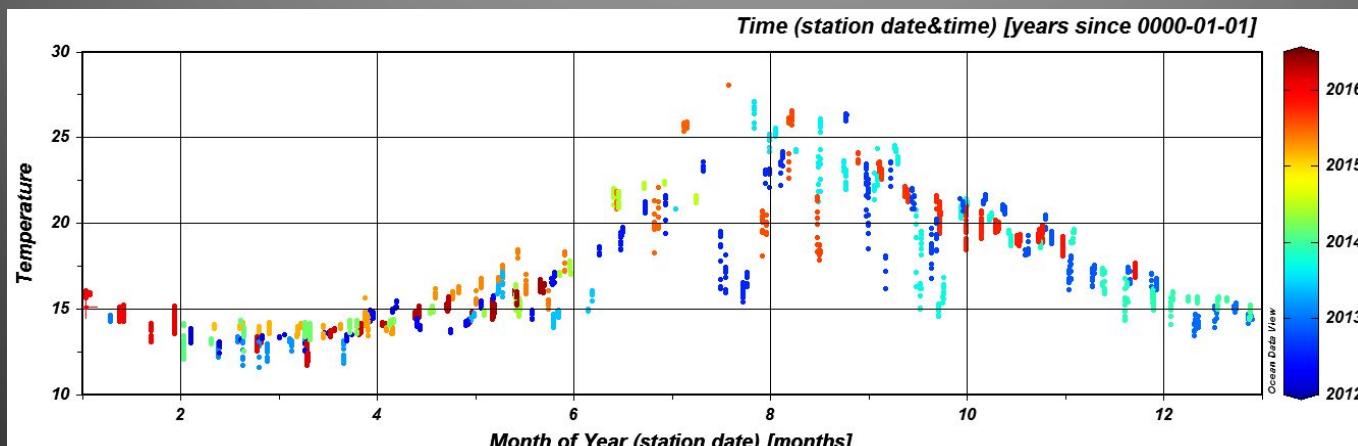
Domaine côtier : baie => plateau => courant

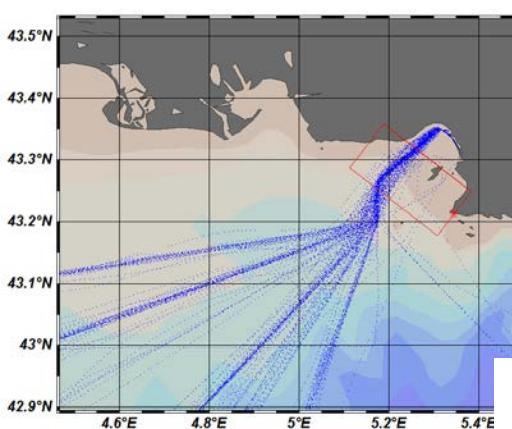


Hiver

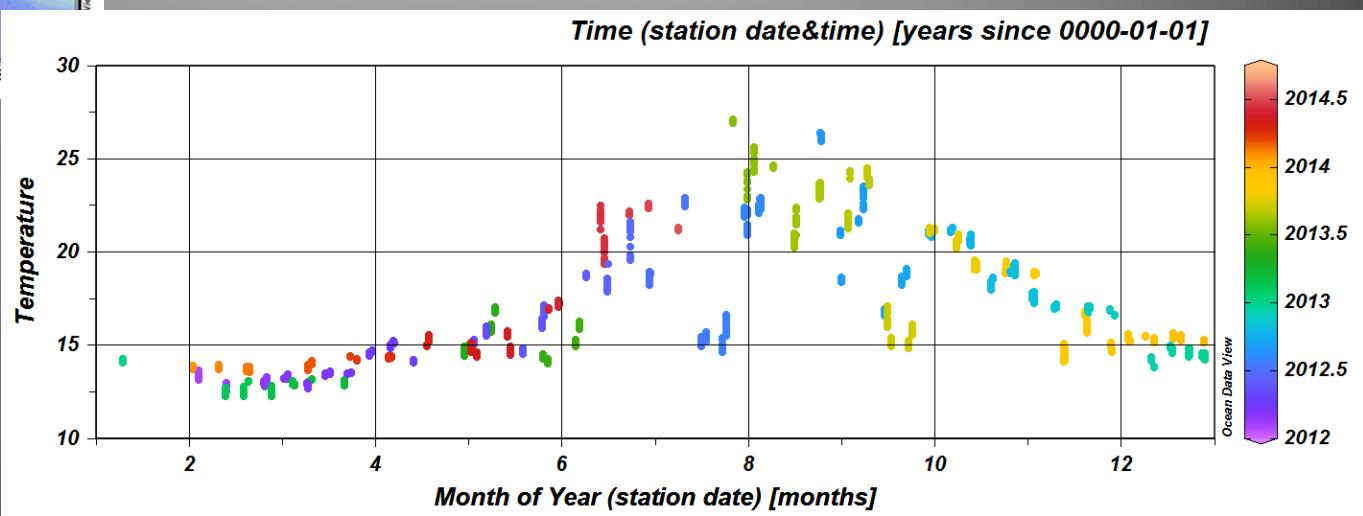
Eté

Courant Nord: variabilité saisonnière marquée



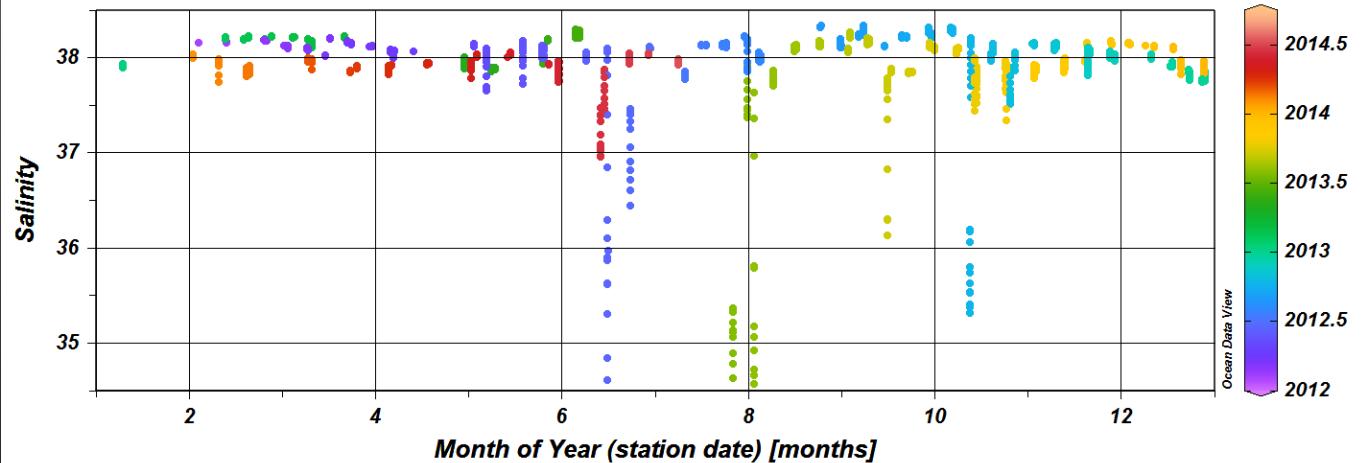


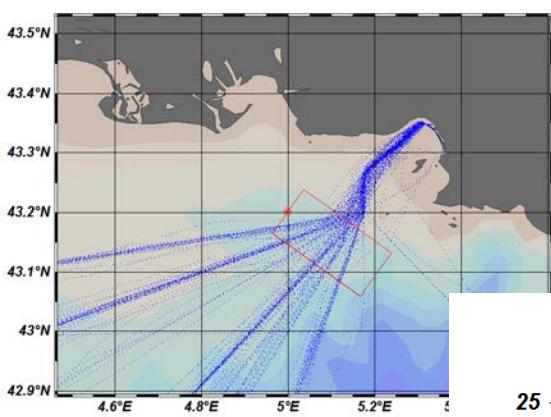
Bay of Marseille Feb. 2012 - Jul. 2014



Bay of Marseille

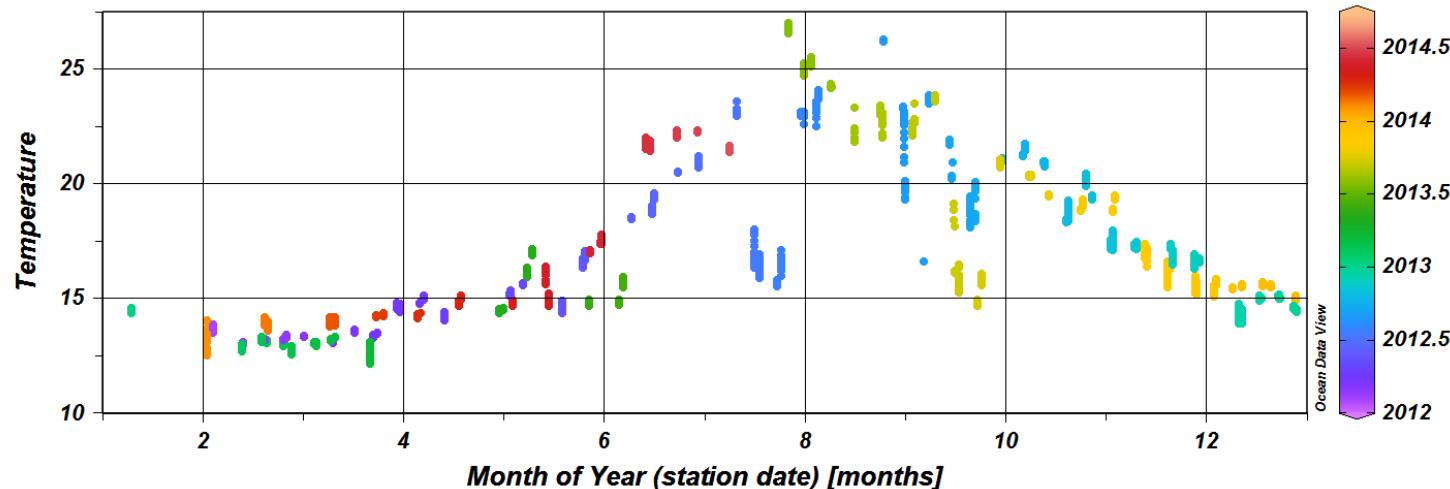
Time (station date&time) [years since 0000-01-01]





Northern Current Feb. 2012 - Jul. 2014

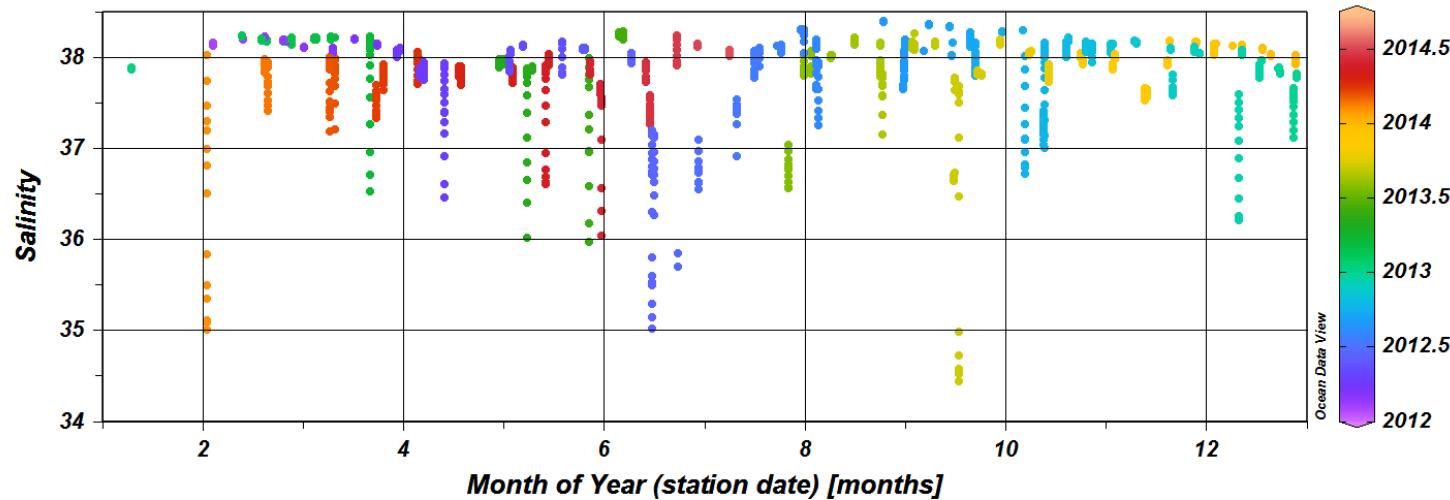
Time (station date&time) [years since 0000-01-01]

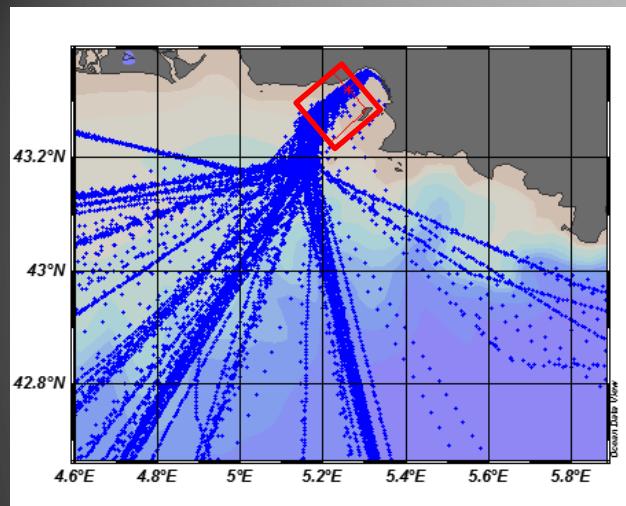


Détermination
d'indices pour
mettre en
évidence les
intrusions du
Courant Nord ?

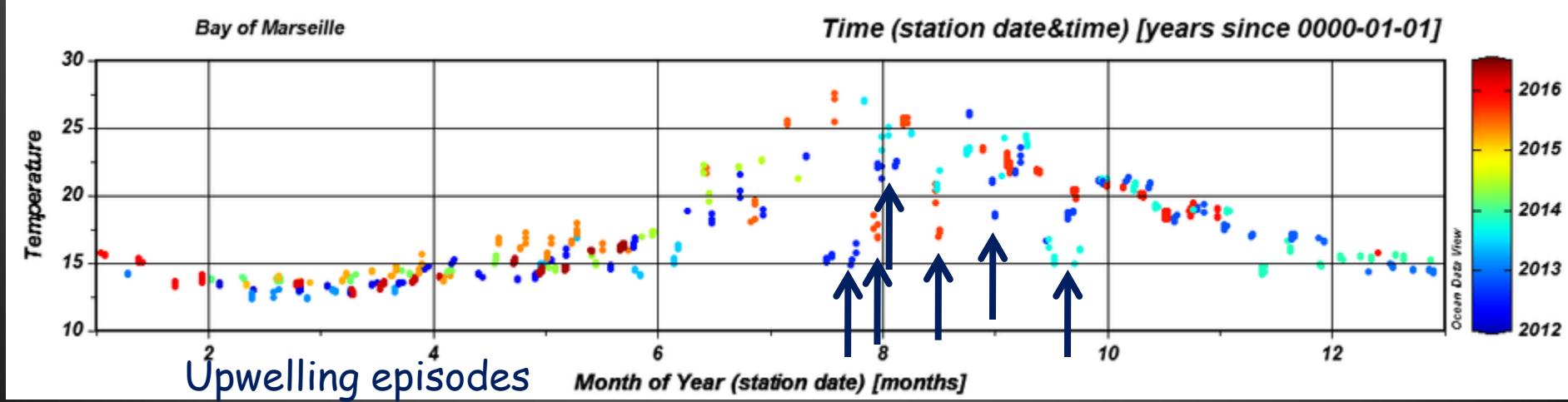
Northern Current of Marseille

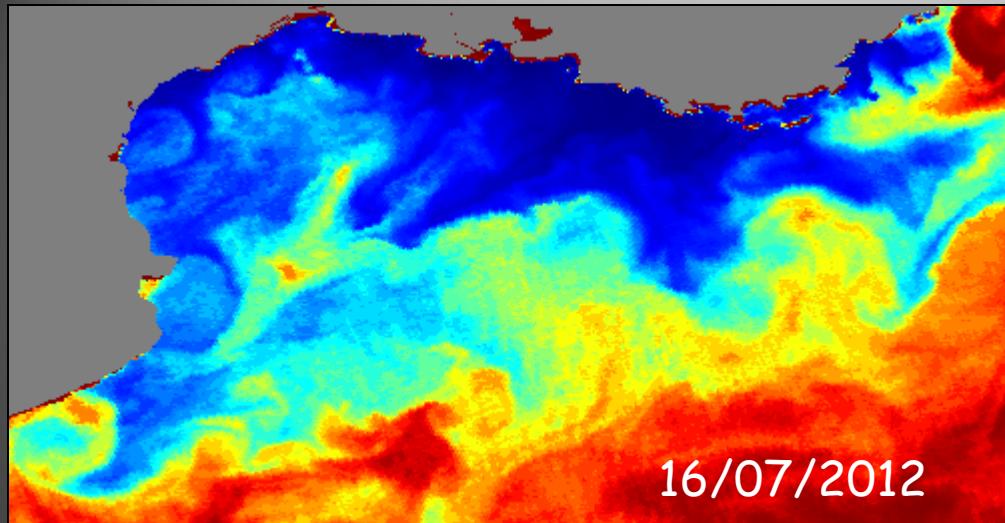
Time (station date&time) [years since 0000-01-01]





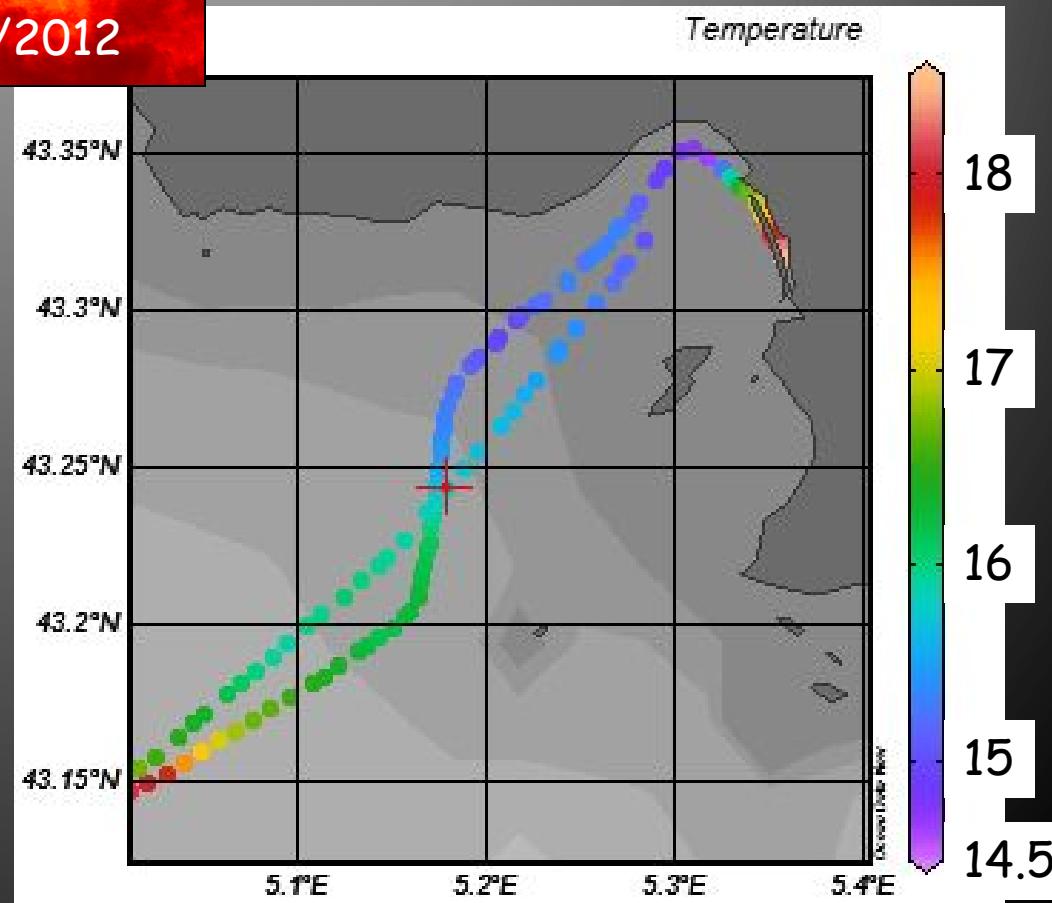
Bay of Marseille





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 ...)

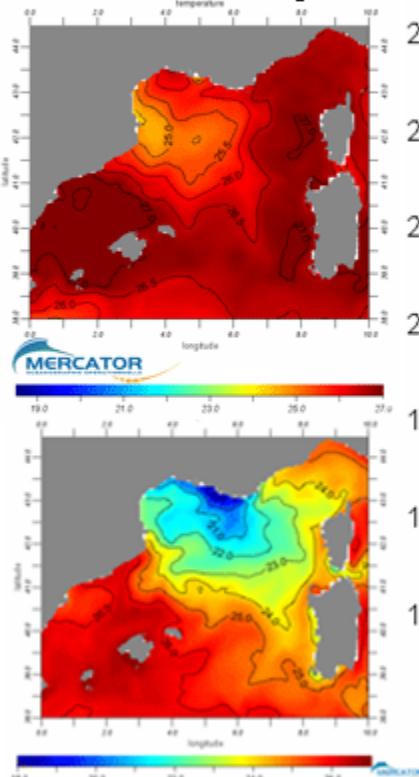
NB: package de capteurs météo.
 +atmosphériques SEOS sur le navire
 (HyMeX/MétéoFrance)

NB2: Pb de flag si T<15°C!

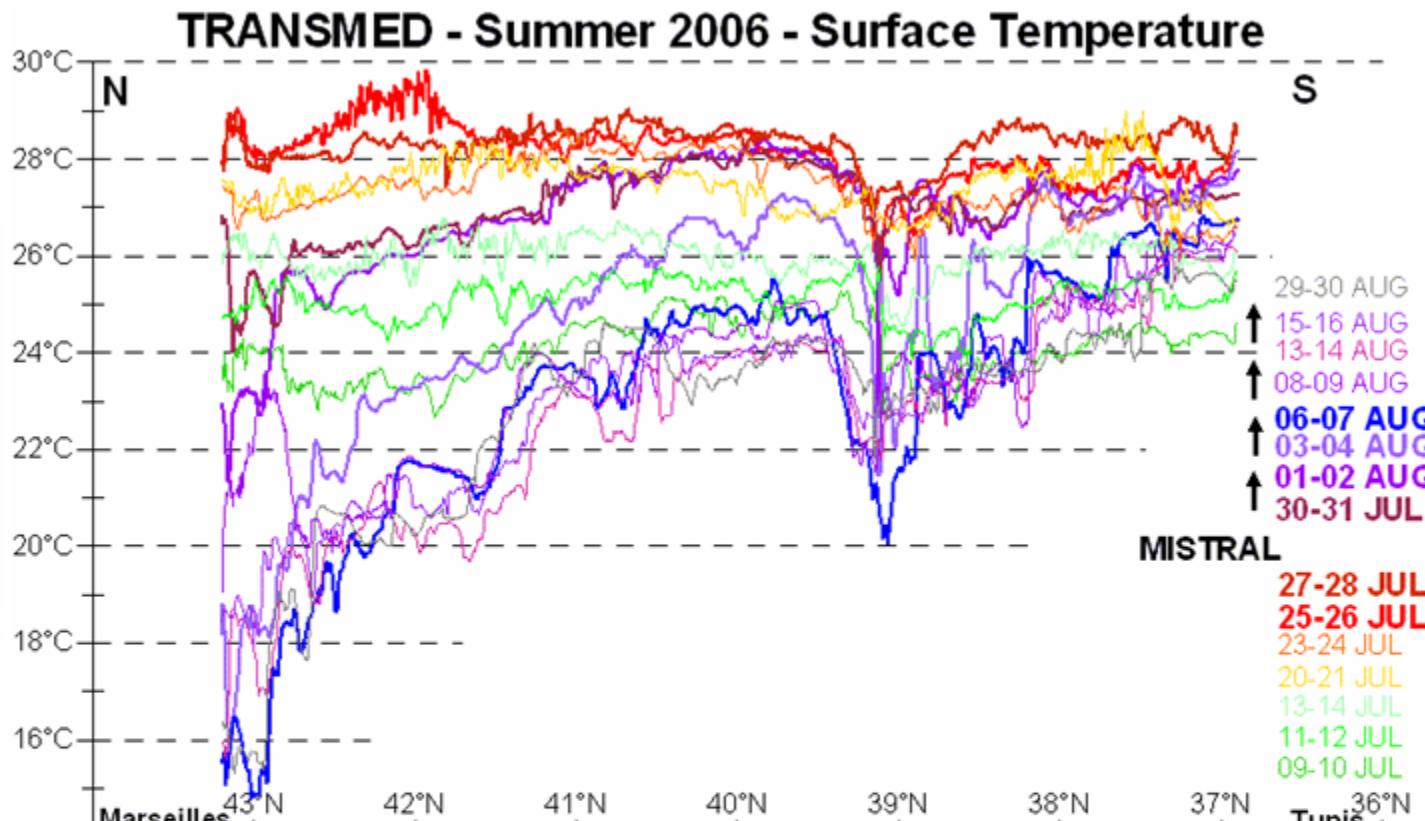
Temperature anomalies during summer 2006

Gulf of Lions

Mean T in JUL06:
+5°C anomaly

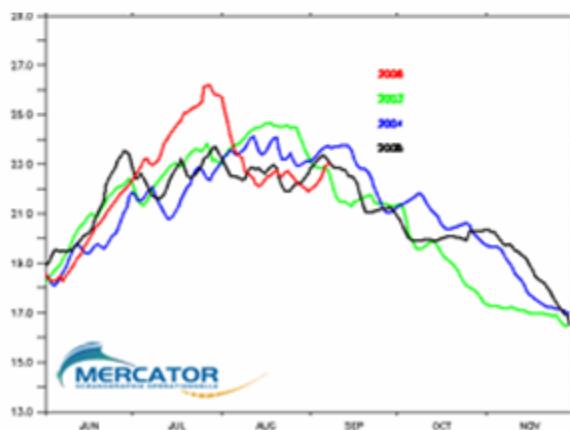


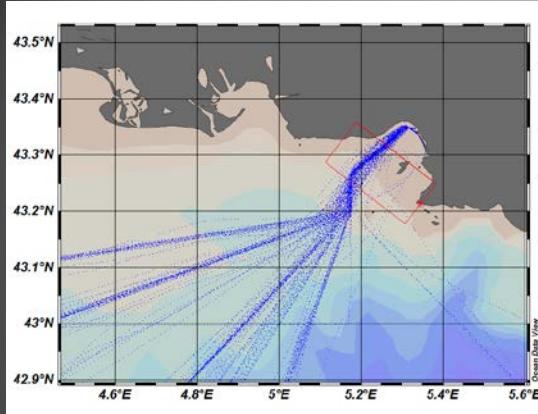
Mean T in AUG06:
>2°C anomaly



Heat content in upper 20m in
the Gulf of Lions
from June to November

2003 2004 2005 2006

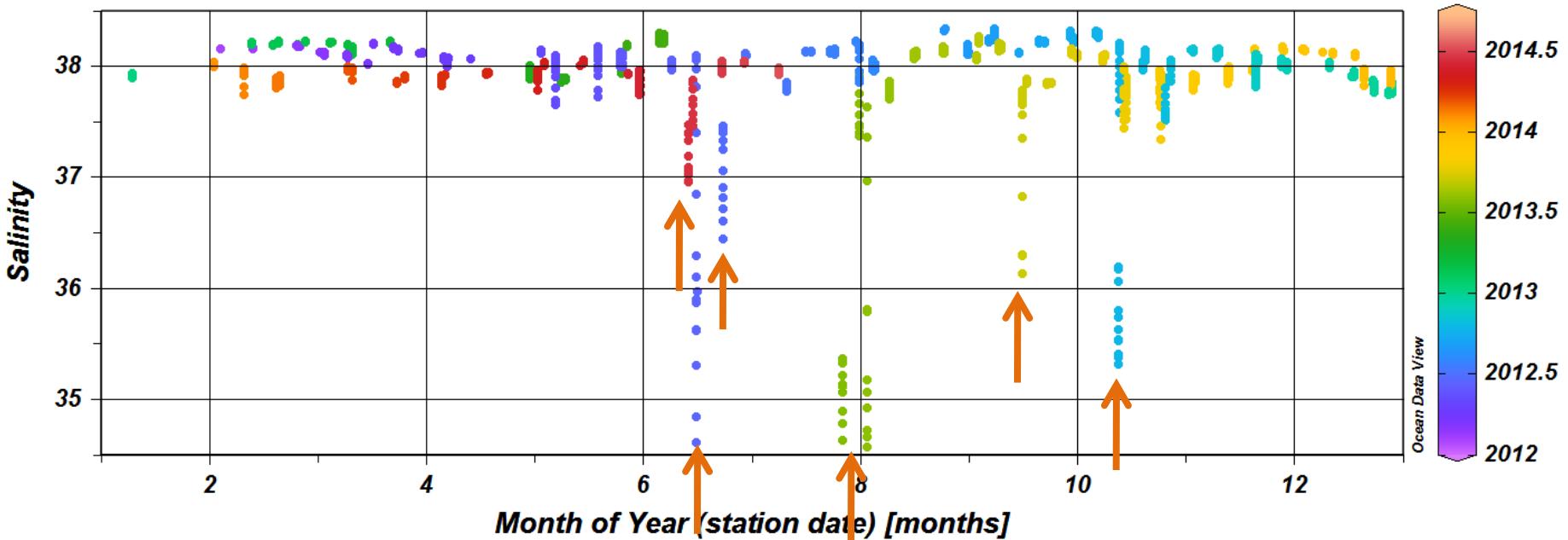




Episodes de dessalure prononcée dans la baie de Marseille (influence de la nappe du Rhône):
SSS < 34 PSU (+ contaminants + ...)

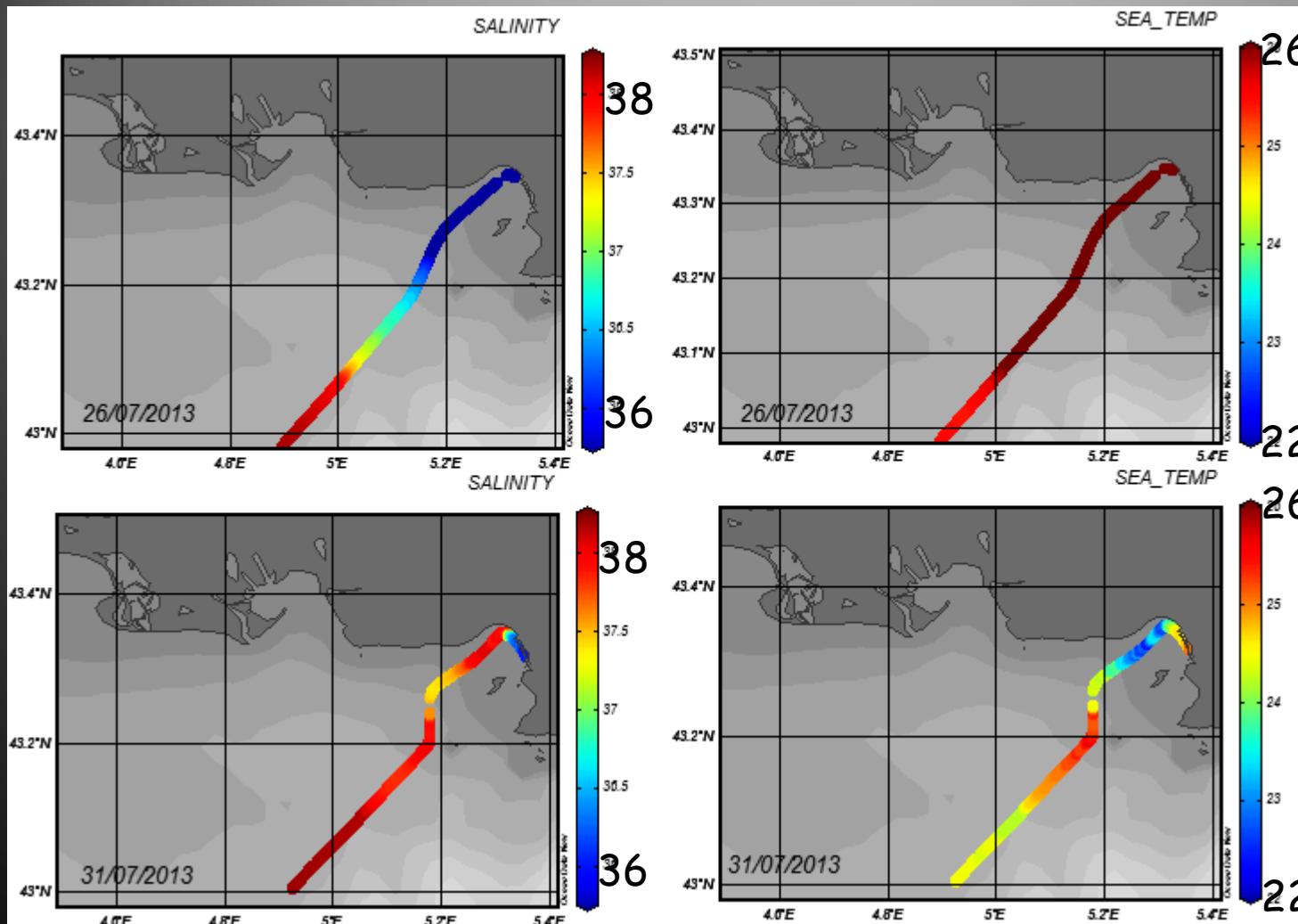
Bay of Marseille

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



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

Episode de forte dessalure + température élevée MRS été 2013



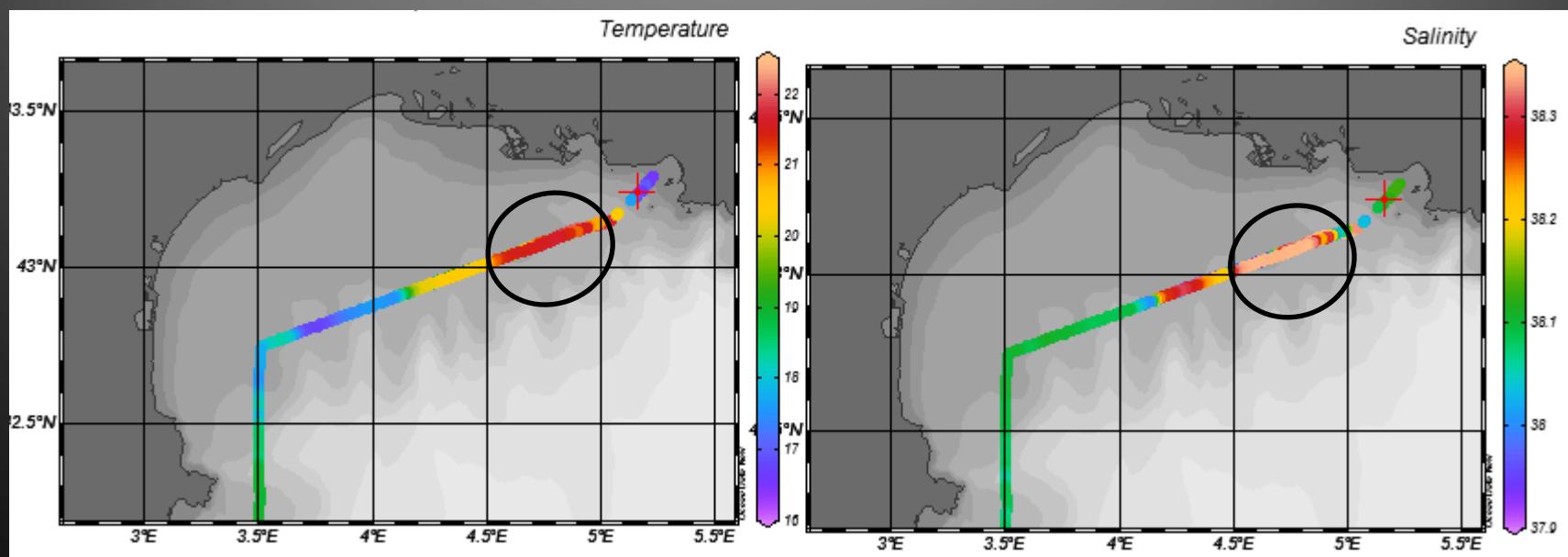
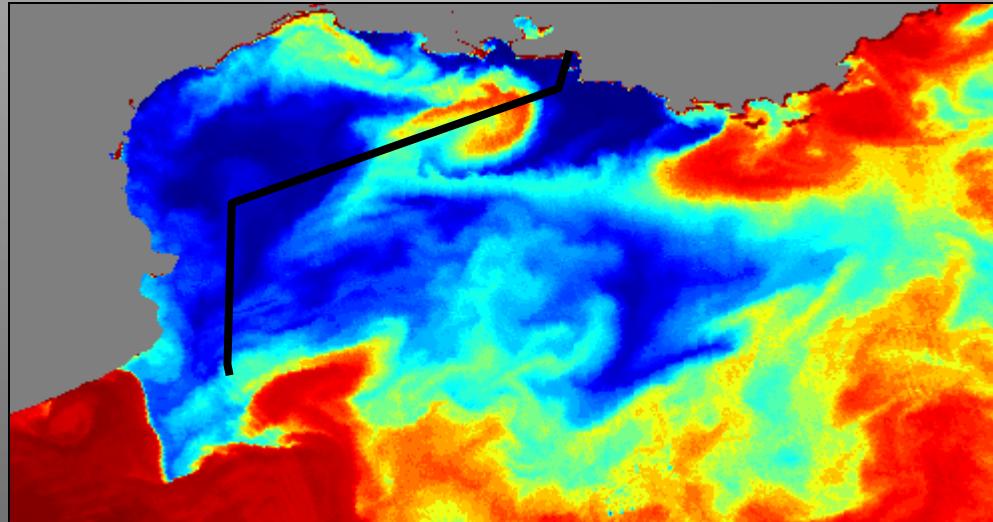
26/07/2013
T : 26.8 - 27.1°C
S : 34.0 - 36.7

Mistral modéré

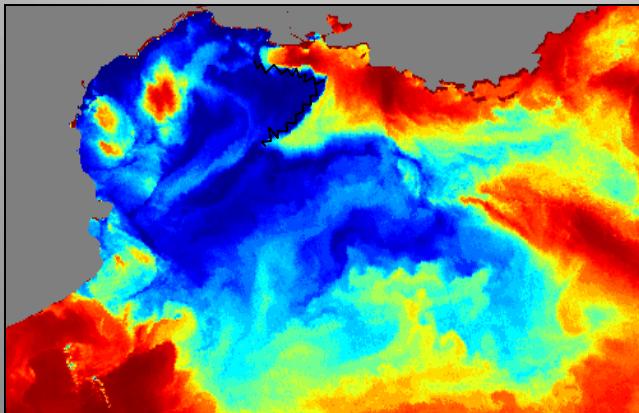
31/07/2013
T : 22.4 - 25.5°C
S : 37.4 - 38.1

Dessalure liée à la nappe du Rhône

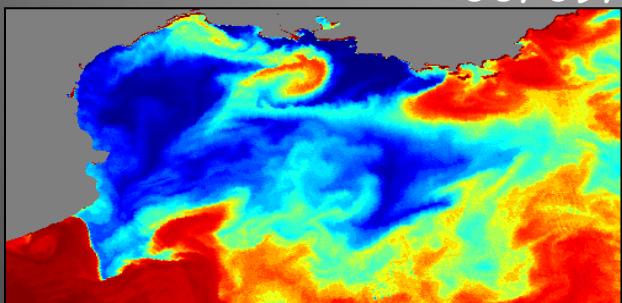
Tourbillon devant le Rhône 14 sept. 2012



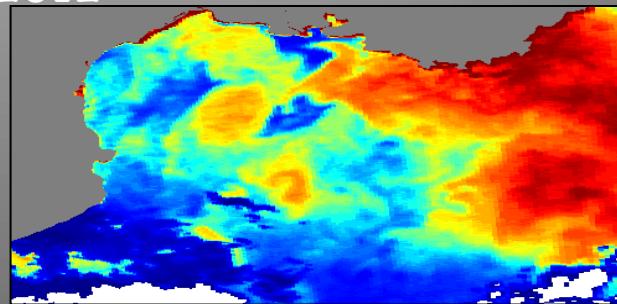
TRANSMED SST et SSS le 14 sept. 2012



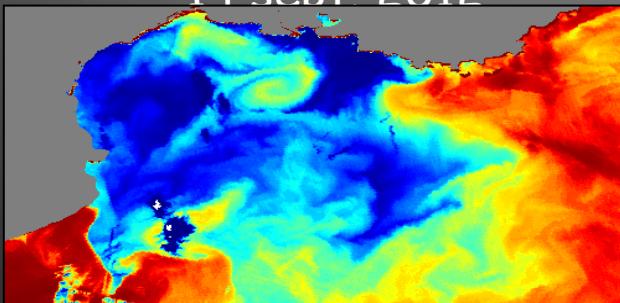
06/09/2012



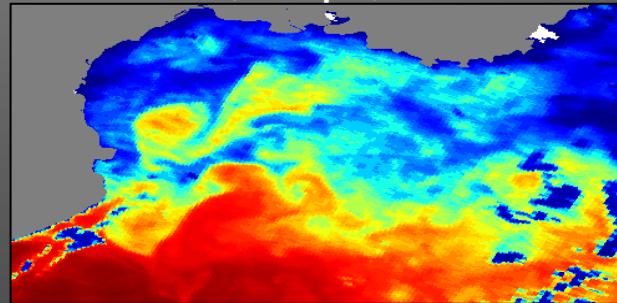
14 sept. 2012



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

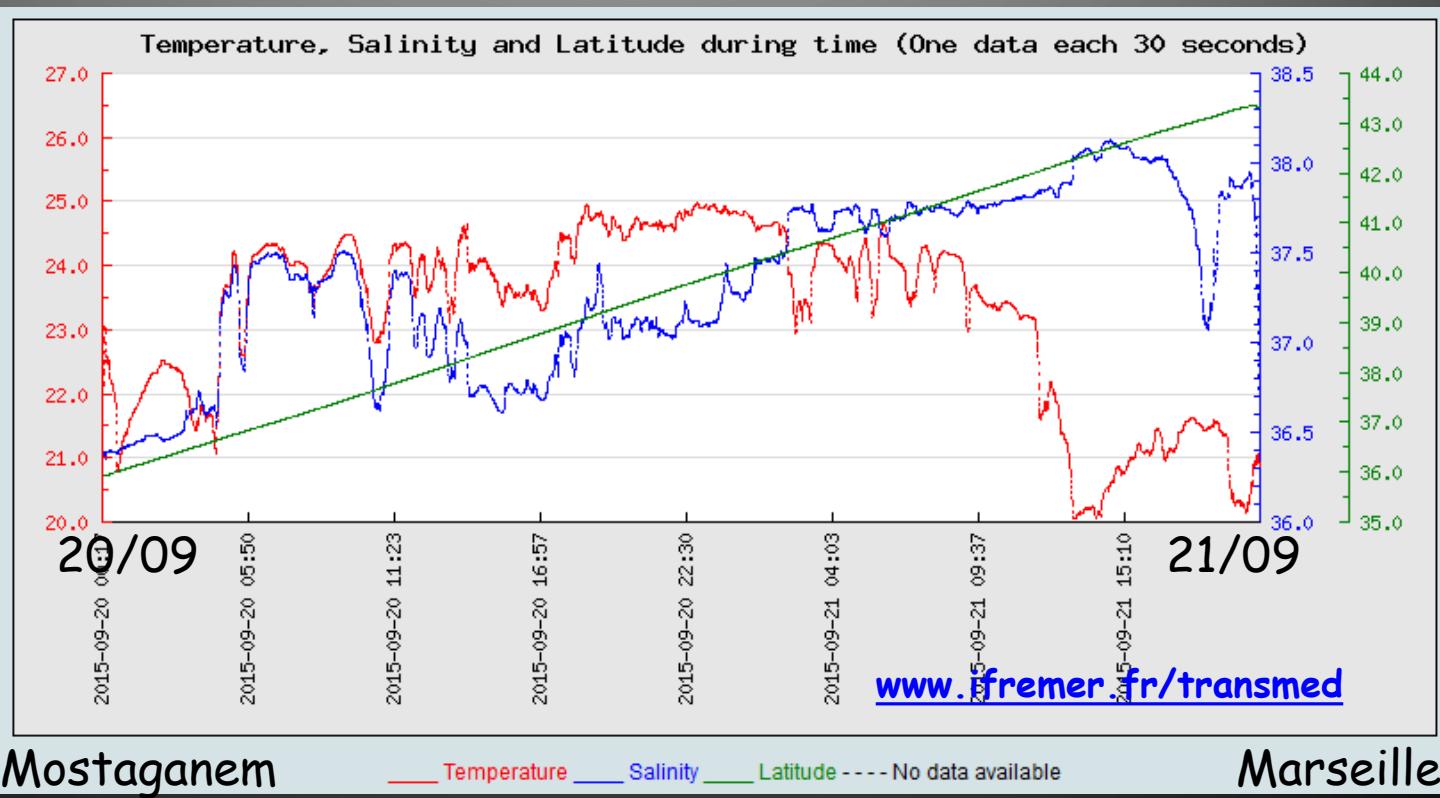
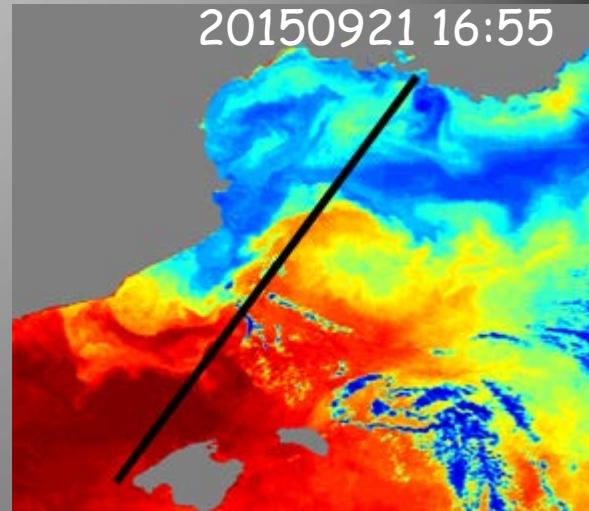
20150921 16:55



Circuit: ~10 days



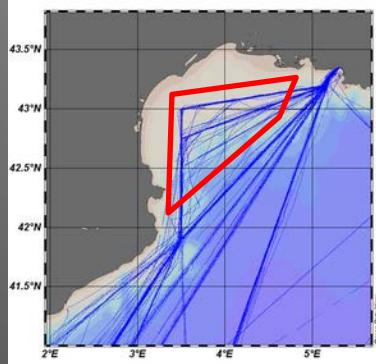
Ro-Ro « Cap Camarat » 02/2015



Influence de la nappe de dilution du Rhône

Littérature: Salinité <37.8 PSU

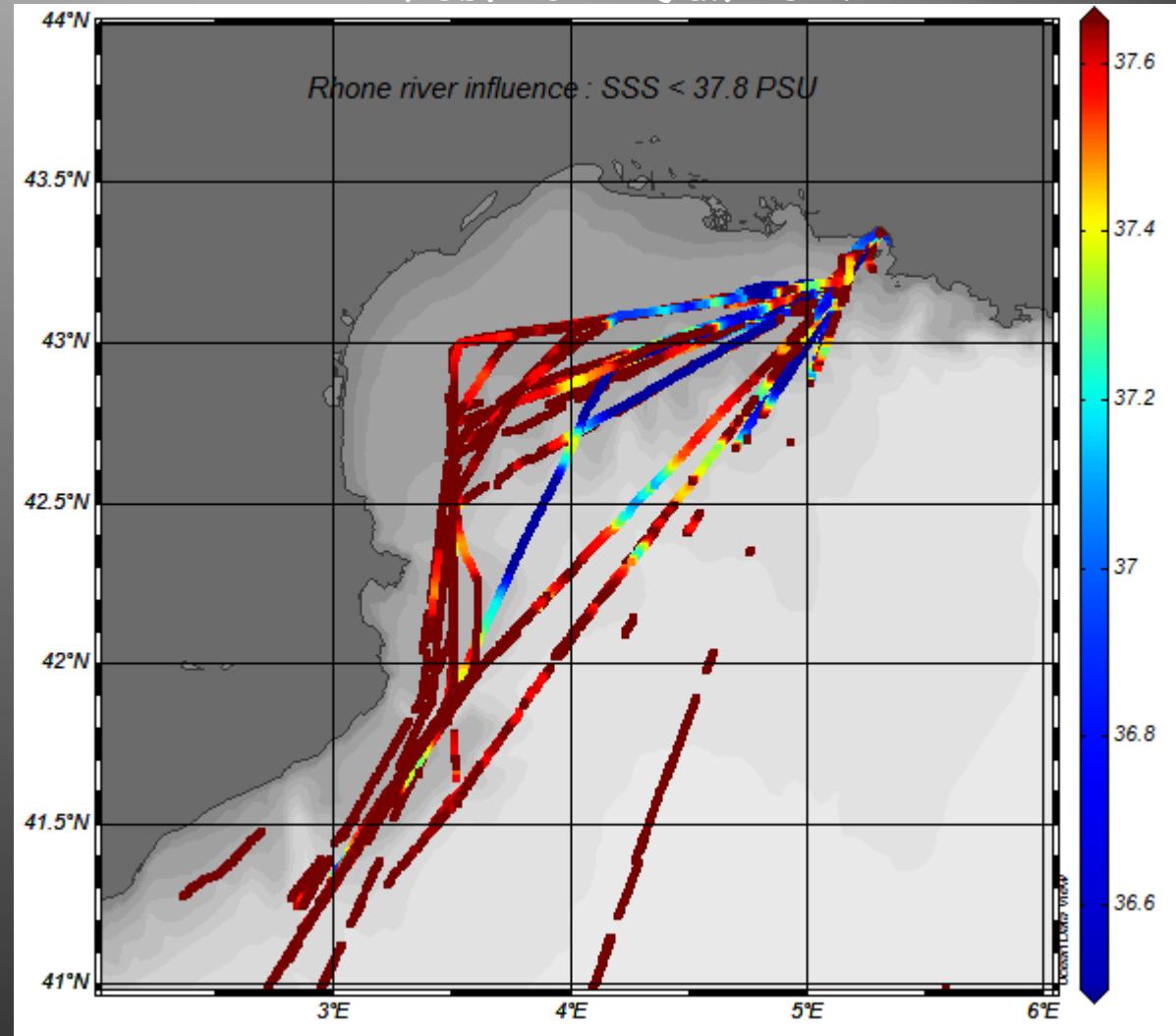
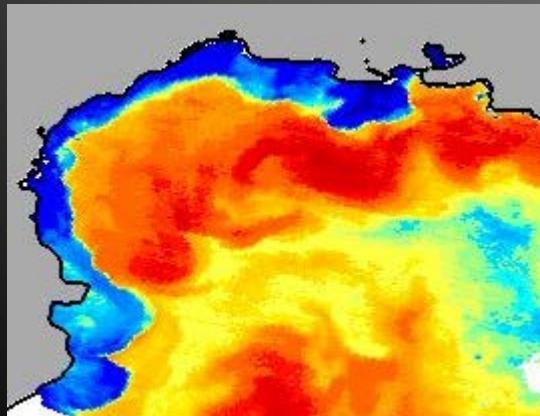
Feb. 2012 -Jul. 2014



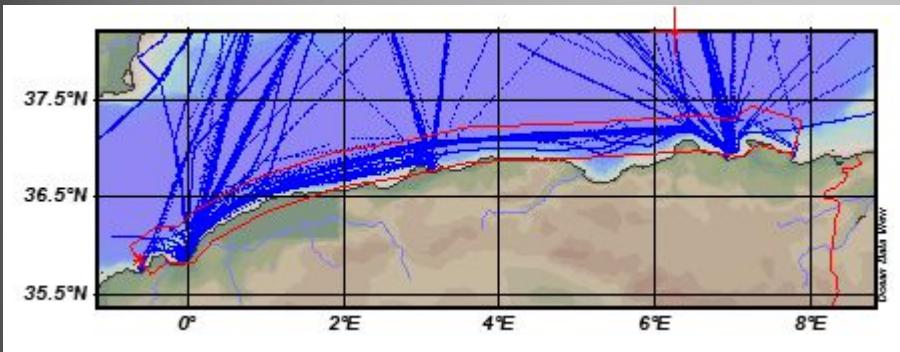
conditions de mistral

Biais:

Nappe du Rhône :
« fleuve côtier »



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



Courant Algérien:
tourbillons de moyenne échelle

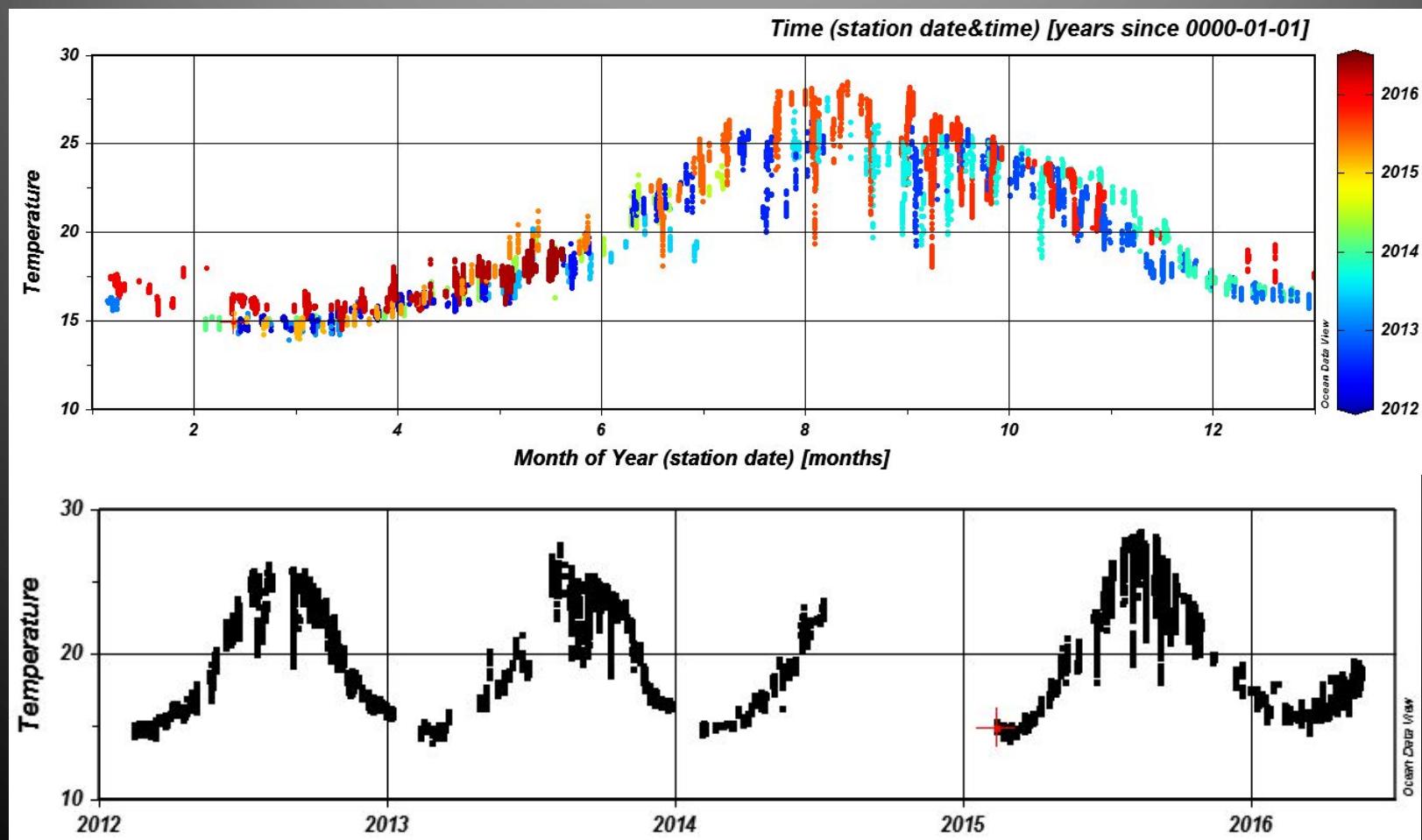
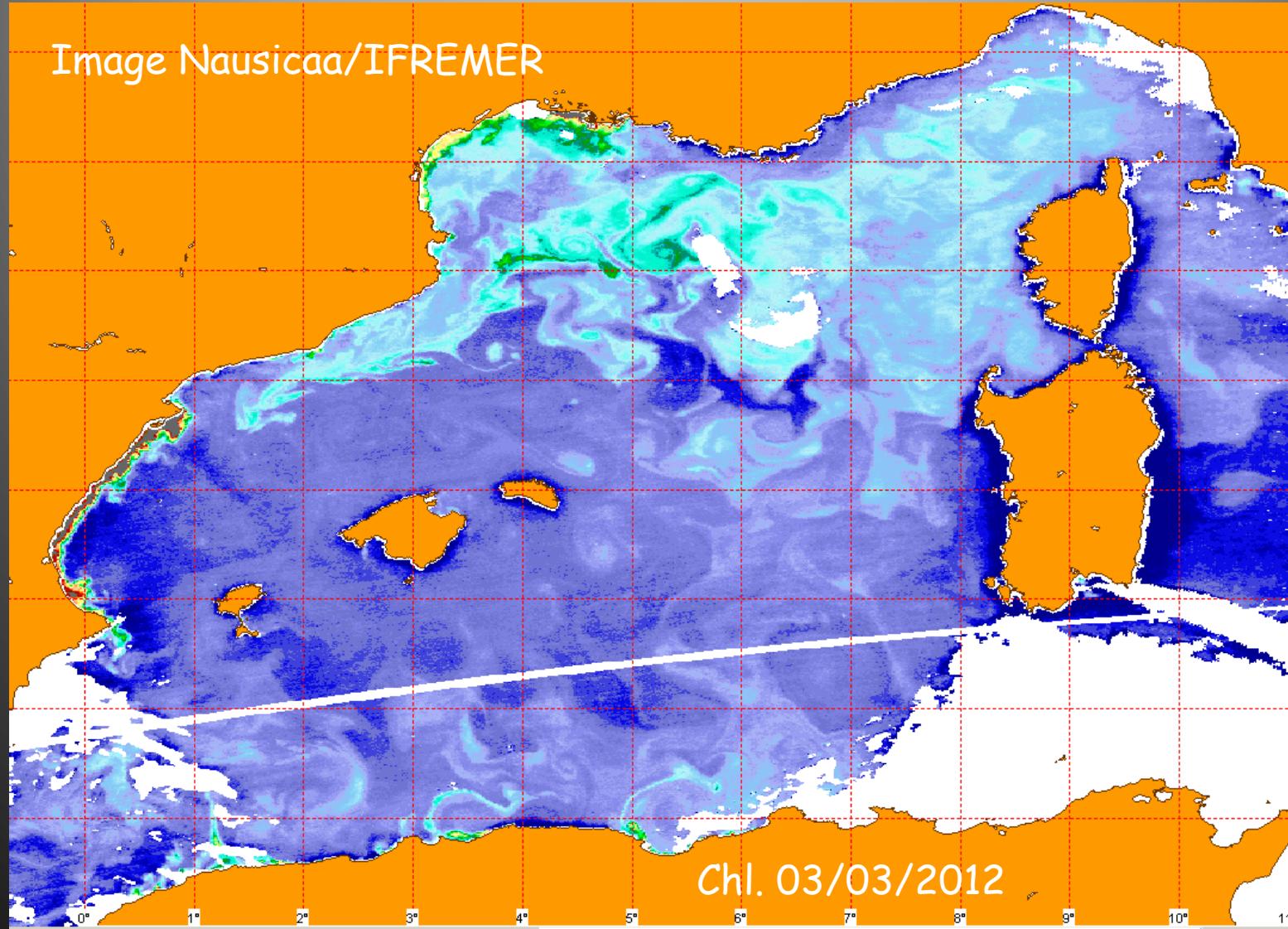
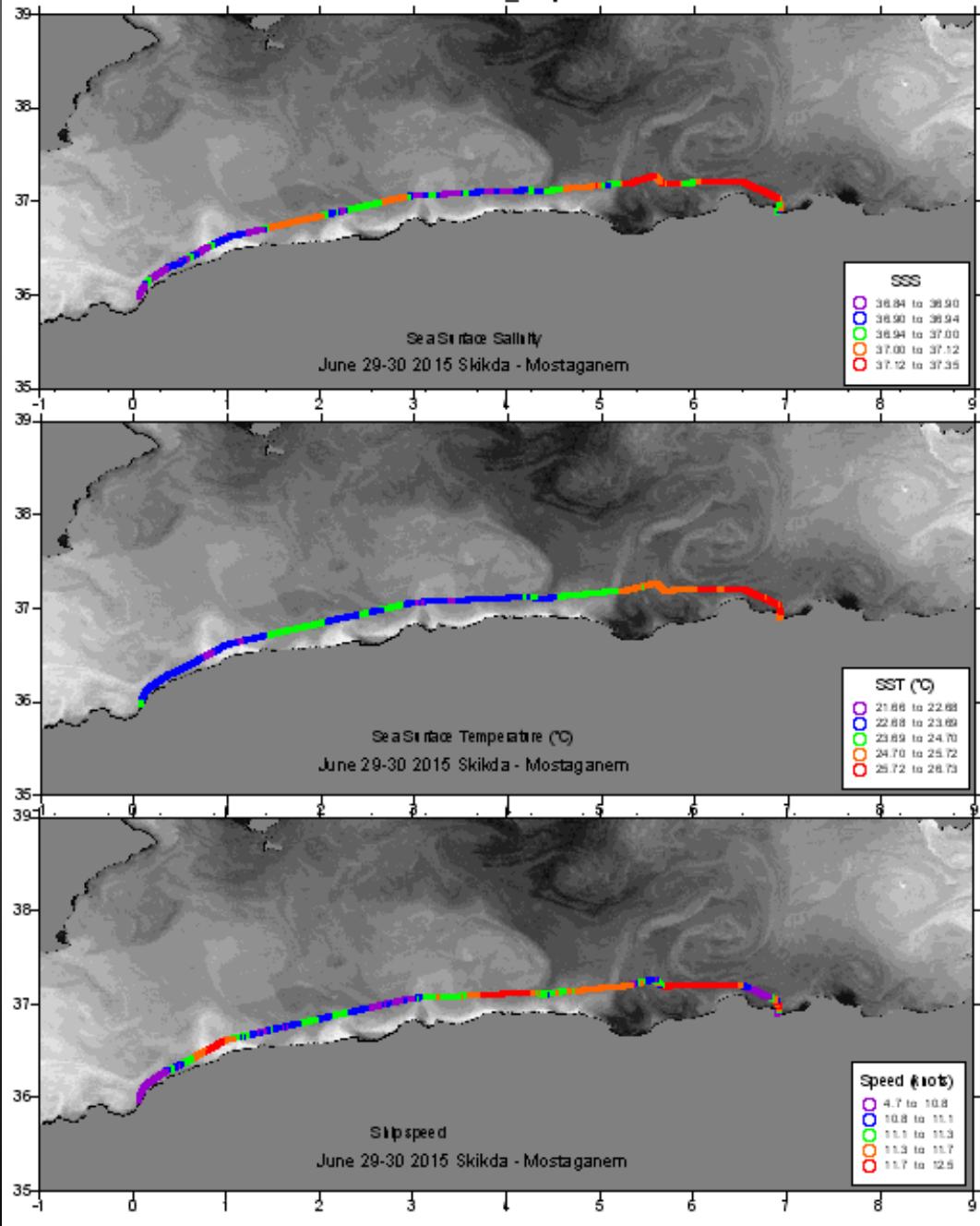


Image Nausicaa/IFREMER

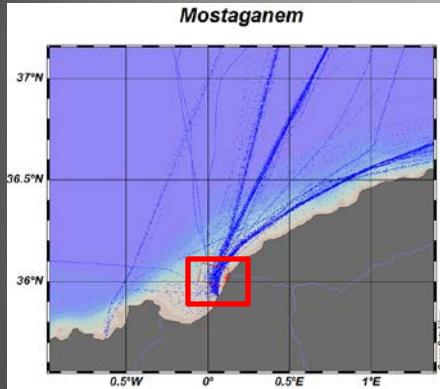


TRANSMED Cap Camarat

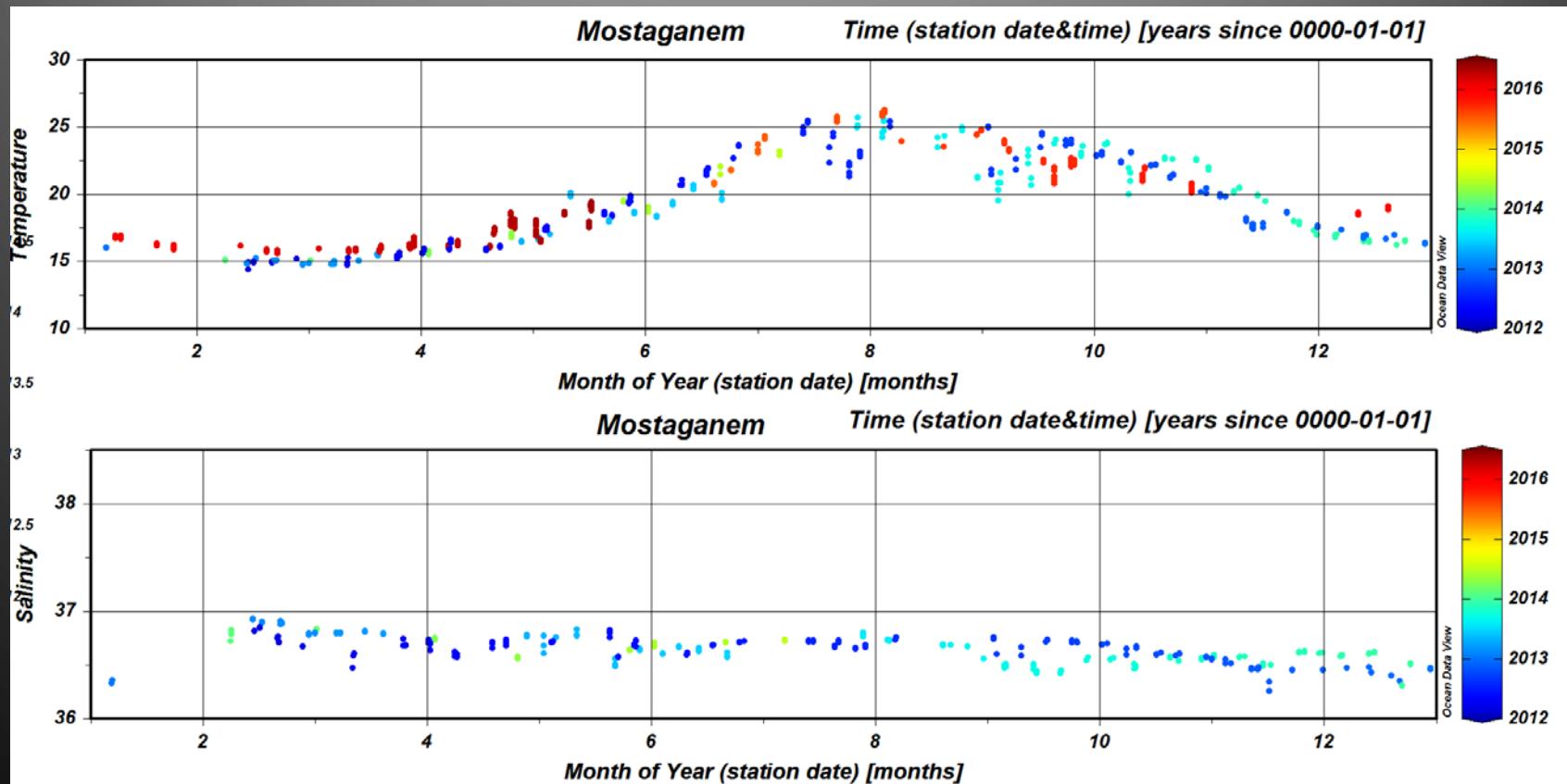


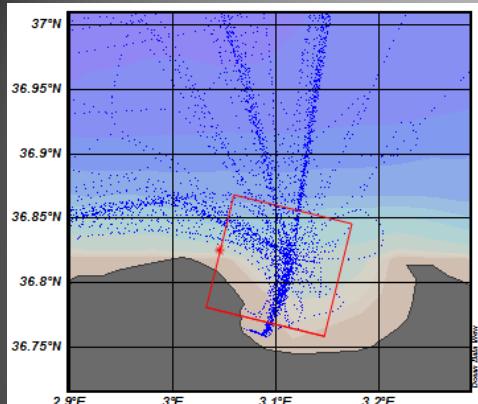
Impact des tourbillons algériens sur la SST, la SSS et la vitesse (direction!) du navire

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

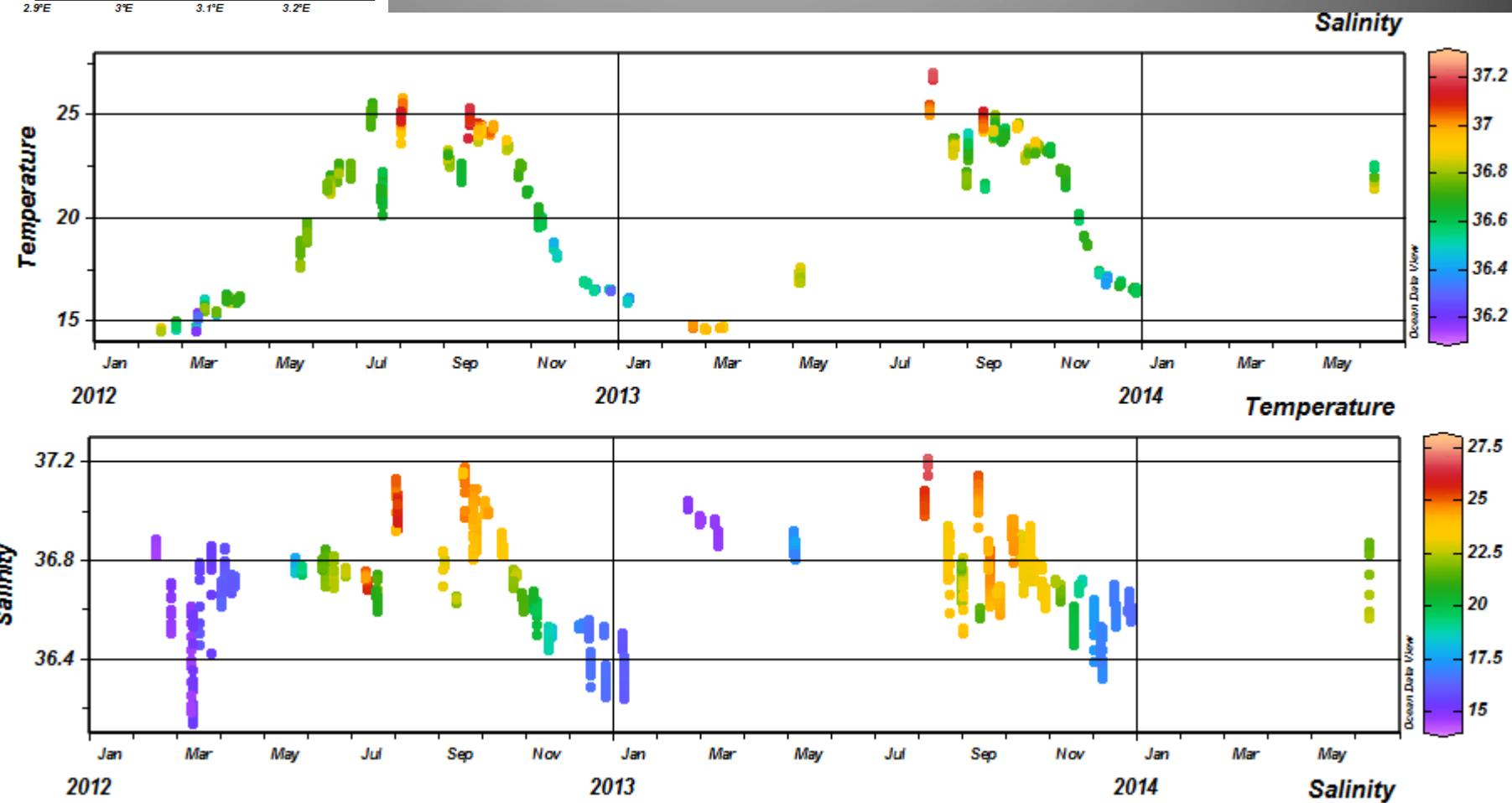


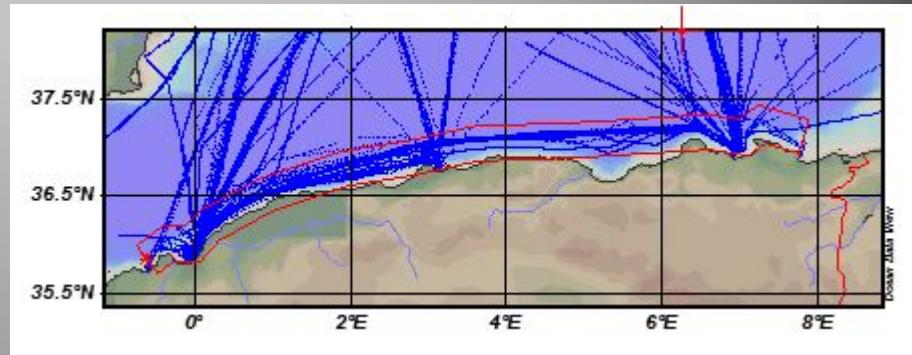
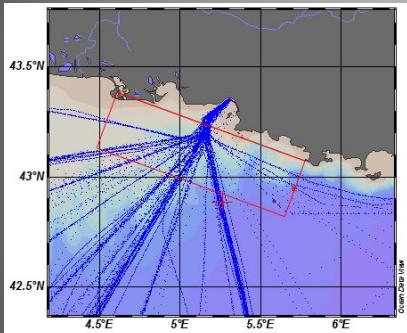
Baie de Mostaganem ($\sim 0^\circ$)





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

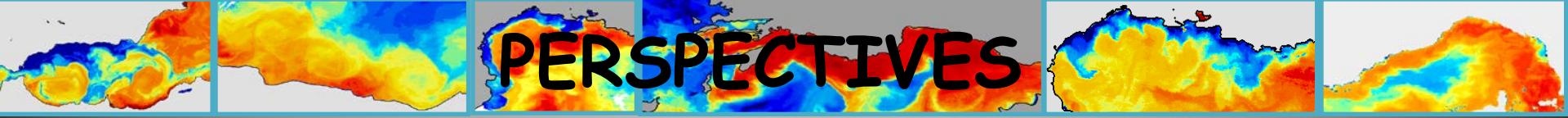
semaine/mois (propagation des tourbillons qqkm/j)

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

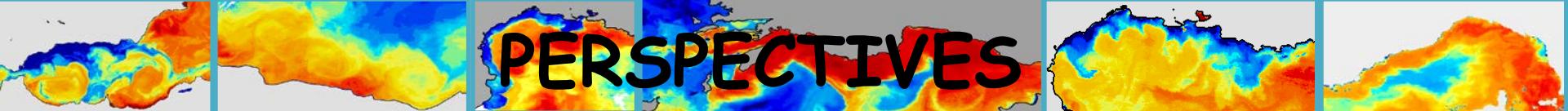
Population des espèces fixées différentes (?)



PERSPECTIVES

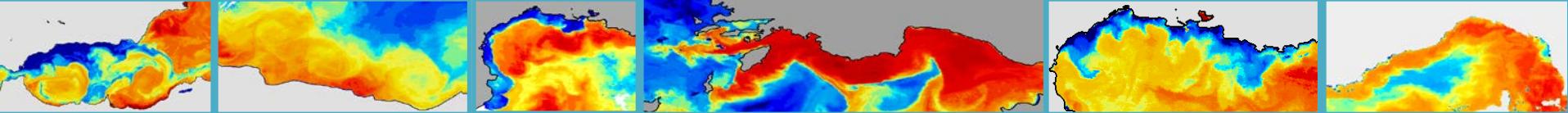
- Validation de modèles et de processus
- Validation de SMOS et suivants
- Support à la DCSMM
- ...

- 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!)



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