

# Transnational integrated sea monitoring perspectives: the MOMAR project



19 Aprile 2012

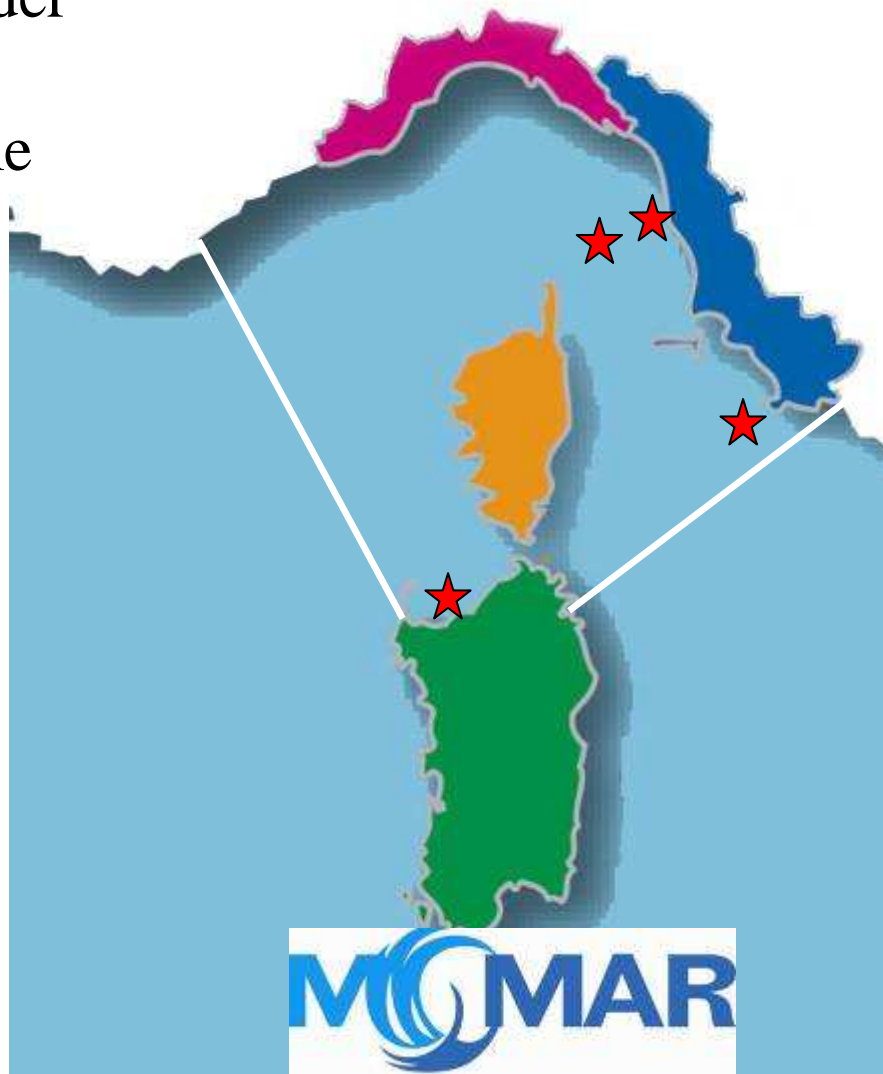
Coastal Observing and Forecasting Systems: today and tomorrow  
Livorno



Cross-border  
European  
Programme

Problems  
to be faced

“The  
International  
Whale  
Sanctuary”

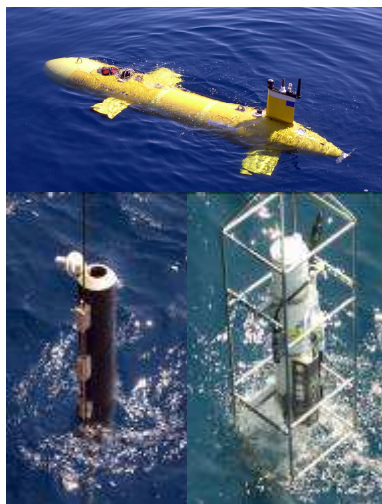


Maritime  
emergencies

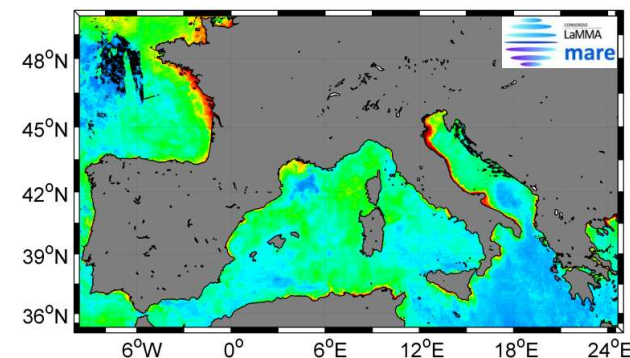


Marine  
monitoring

(WFD →  
MSFD)



Satellite  
data



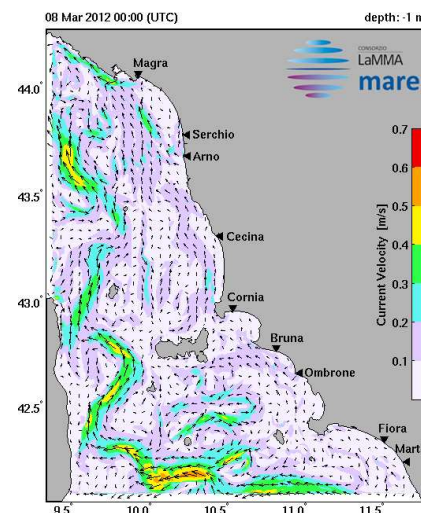
**Towards an integrated monitoring  
system ?**



In-situ  
measur  
ements



Models

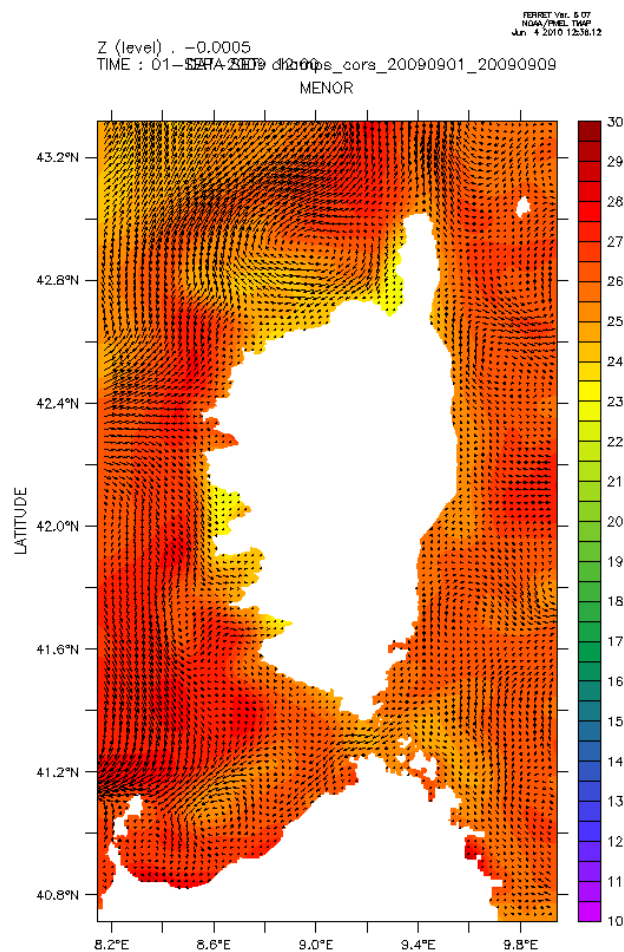




## MOMAR regional/coastal models

Institution	Ocean model	Study area	Resolution	Forcing
IFREMER	MARS 3D	North Mediterranean (MENOR) Corsica Elba	1200 m 400 m 200 m	MM5
LAMMA	ROMS	Tuscany –Archipelago	400 m 200 m	WRF + hydrological modelling
Sardegna Ricerche	GETM	Eastern Sardinia coast Gulf of Asinara	500 -150 m	GFS-BOLAM + hydrological modelling

## The Corsica coastal model



**Hydrodynamic simulations:**

**Model MARS-3D**

**Corse, 400 m resolution**



→ Coastal water characterization

→ Water renewal computation

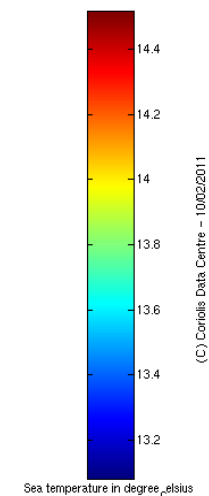
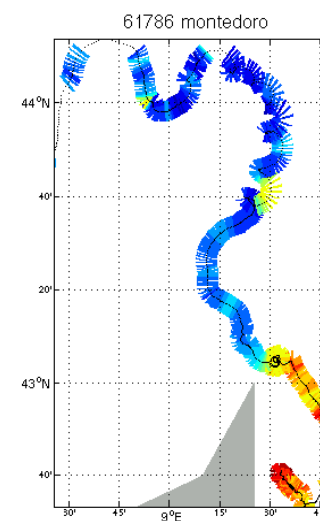
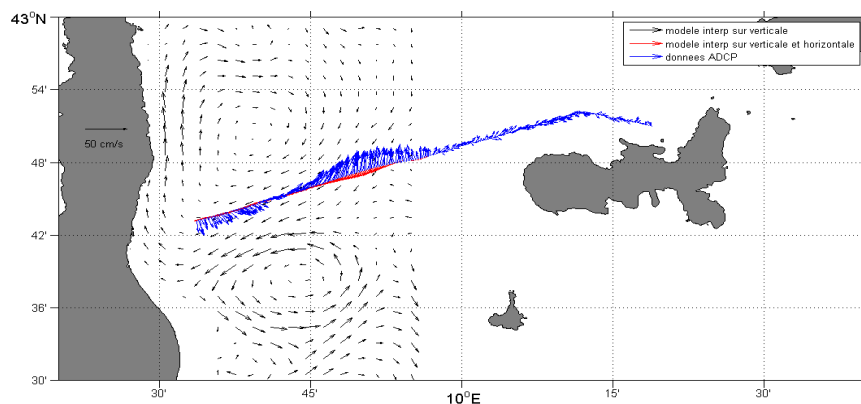
→ Sensitivity to pollution

## The Corsica coastal model

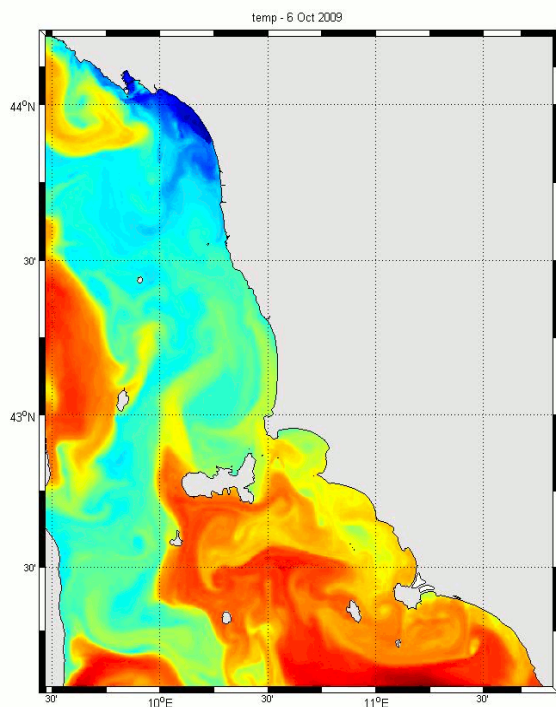
### Validazione locale delle correnti nel canale di Corsica



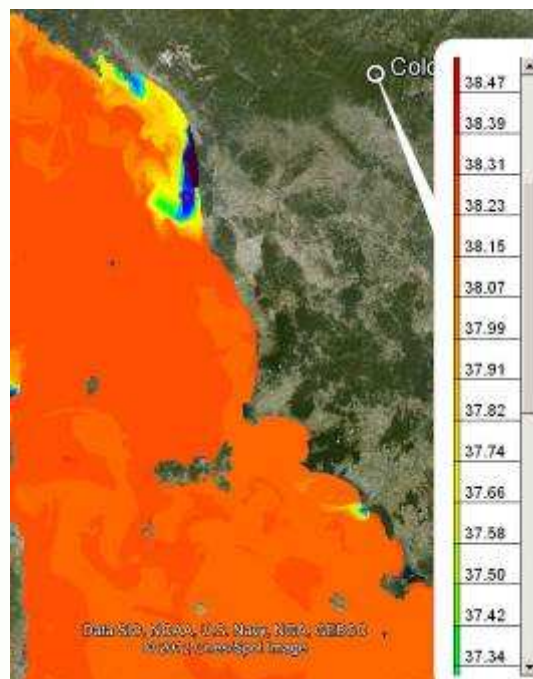
Esempio del vortice  
Bastia - Elba



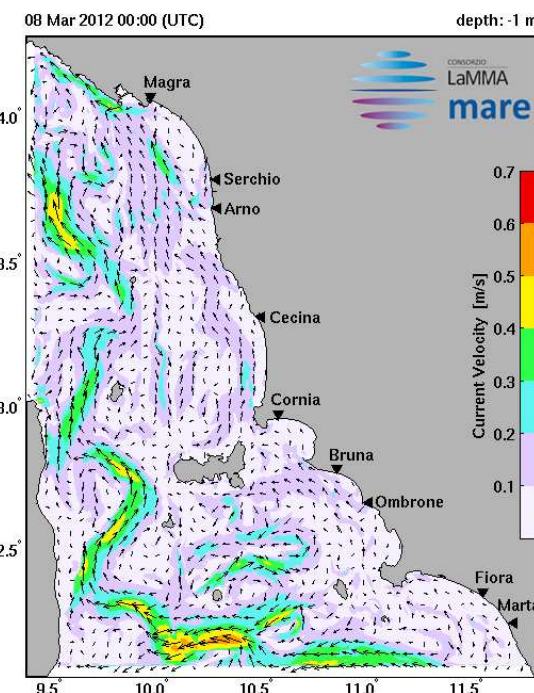
## The Tuscan Archipelago coastal model



Temperature

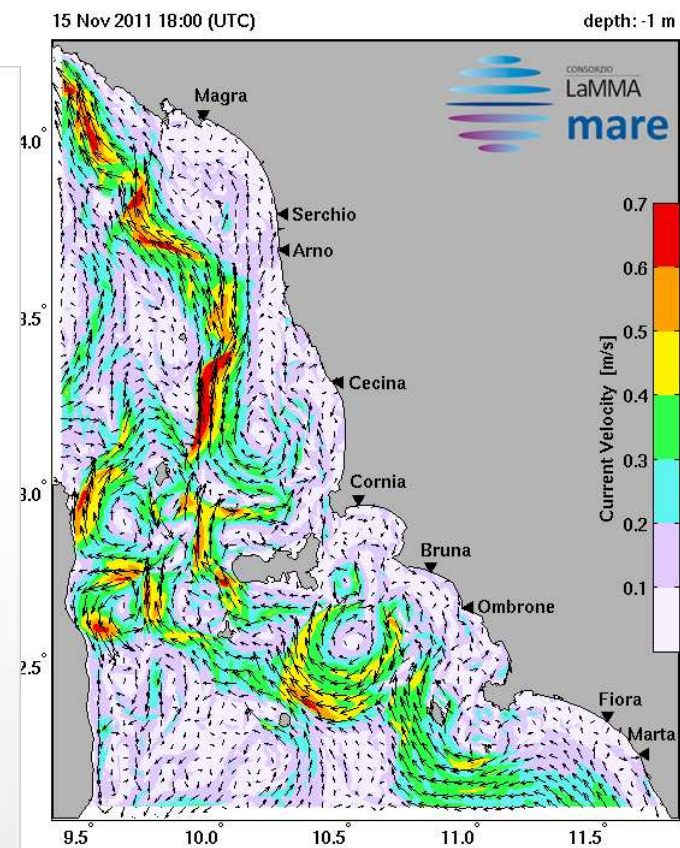
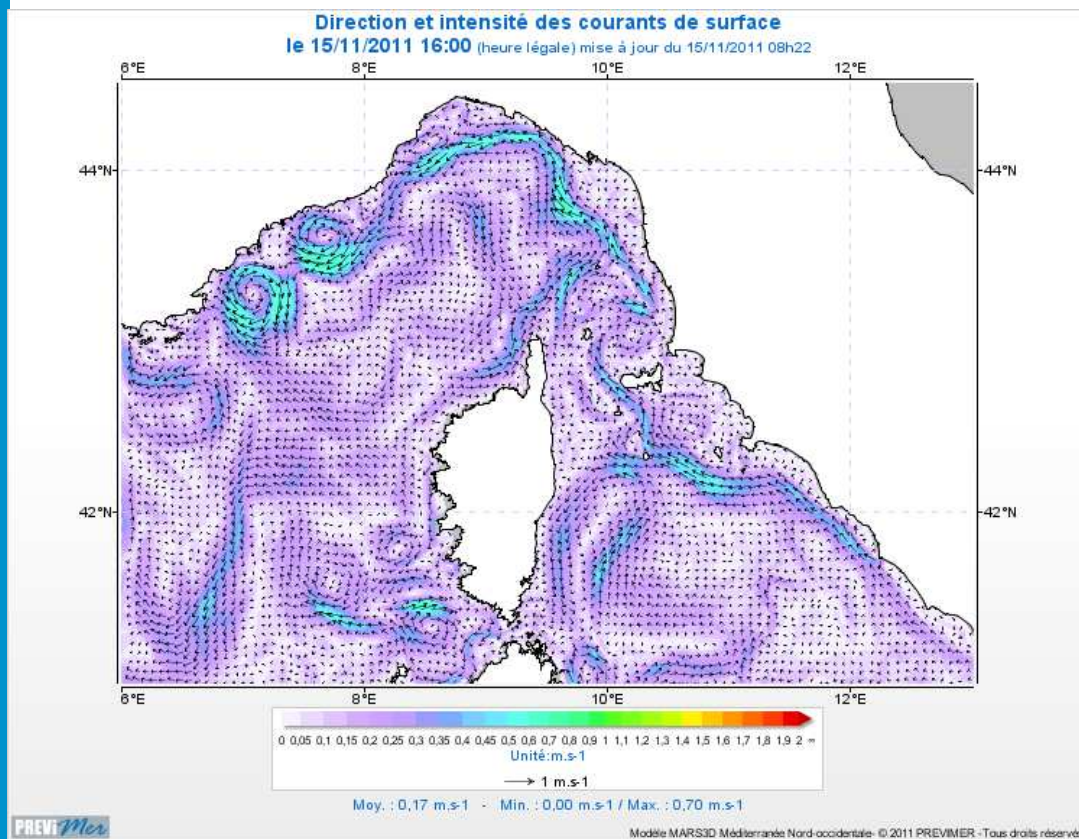


Salinity

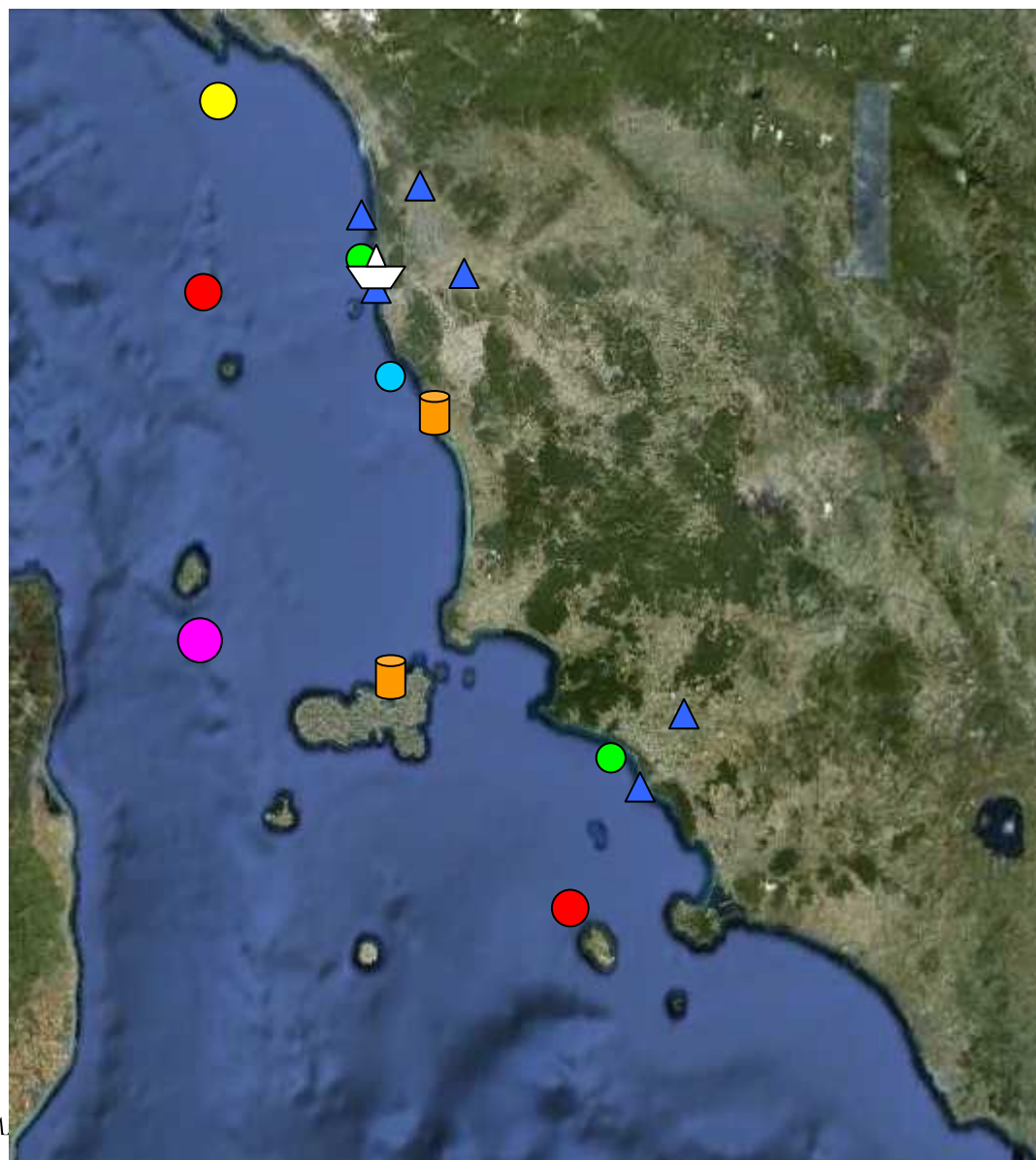


Currents

## MENOR vs ROMS



## The Tuscany Region marine measurement network



Oceanographic  
vessel



Wave buoys



ADCPs



Oceanographic  
buoy



Tide gauge



Hydrometer

## Oceanographic campaigns

**Ifremer**



**MELBA**



**ARPAT**  
Agenzia regionale  
per la protezione ambientale  
della Toscana



**MILONGA**

**Misure Lagrangiane  
OceaNoGrafiche al largo  
dell'Arcipelago toscano**

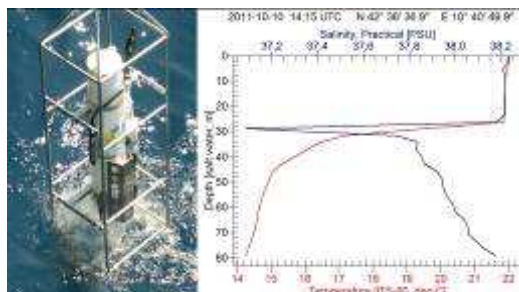


## In-situ measurements

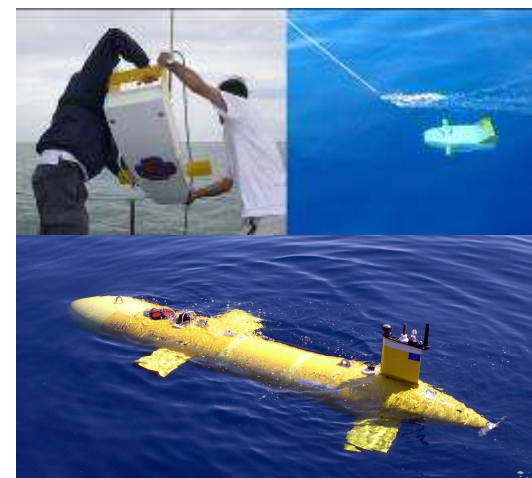
Water sampling/analysis



Temperature and salinity (CTD/floats)



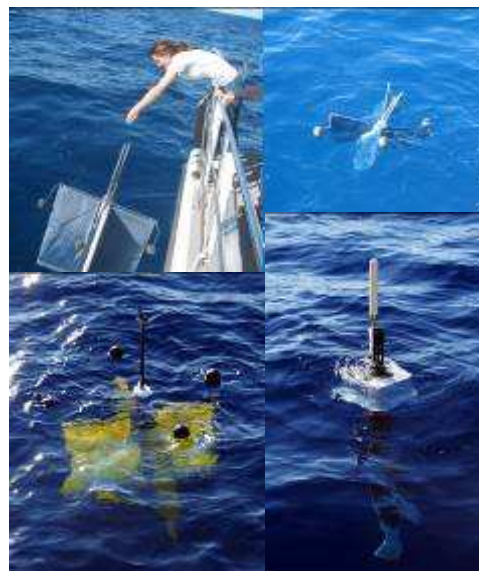
Currents (ADCP)



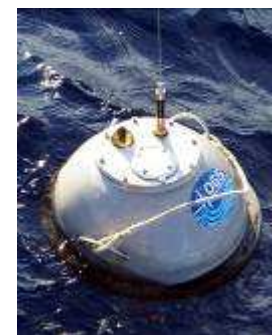
Sediments



Currents (drifters/floats)

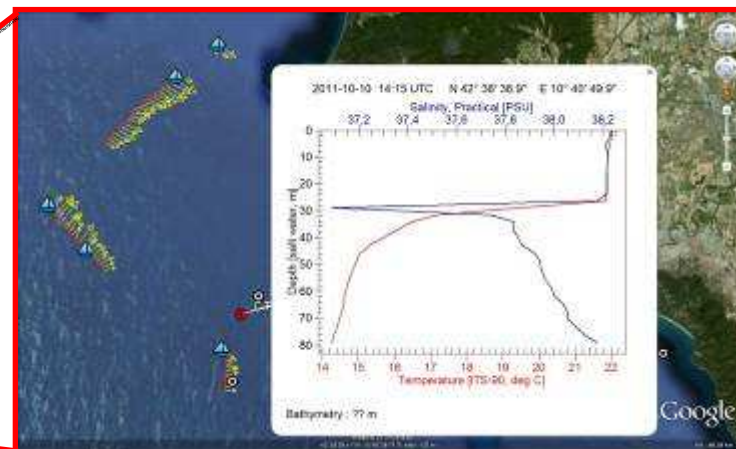


Waves (Buoy)

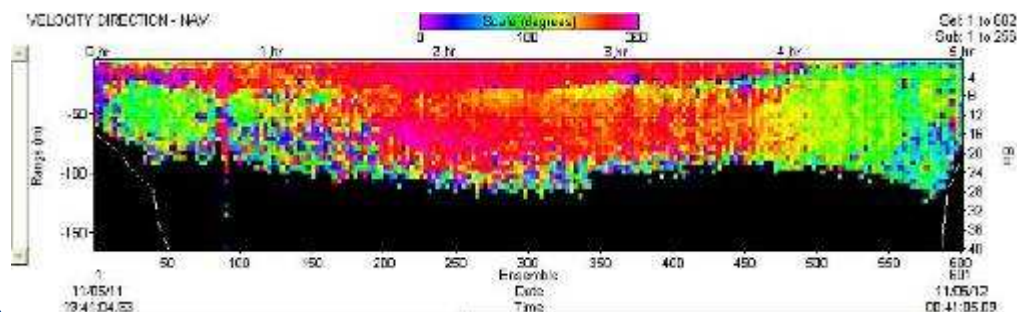


## Misure in-situ

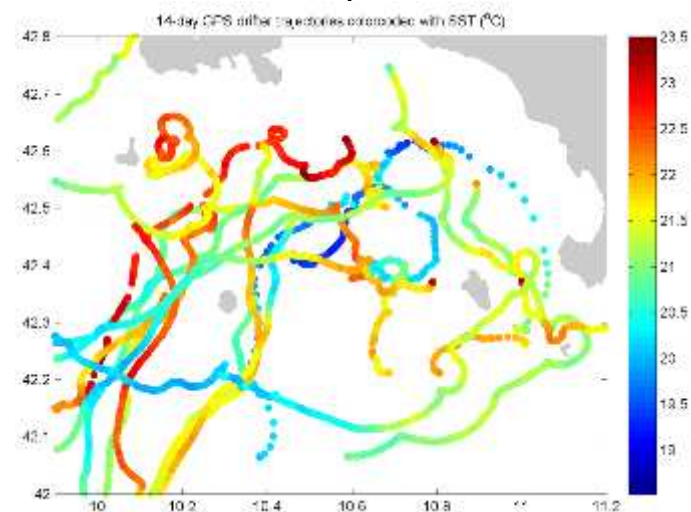
### ADCP e CTD campagna MILONGA



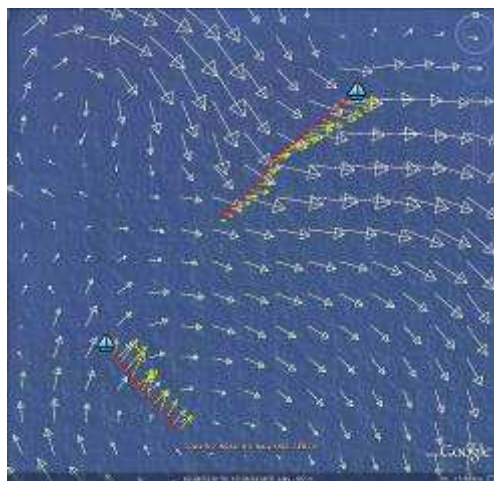
### Profilo di corrente (campagna MELBA)



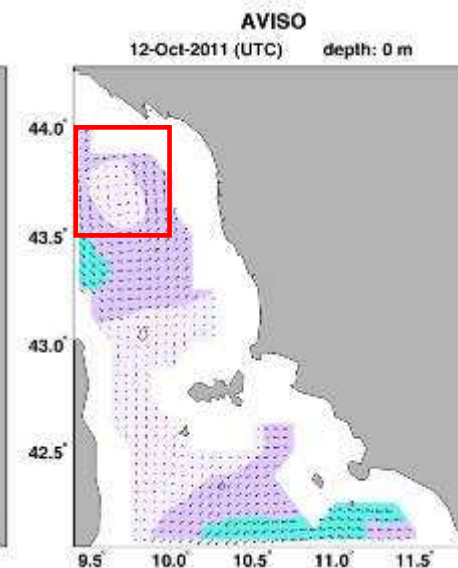
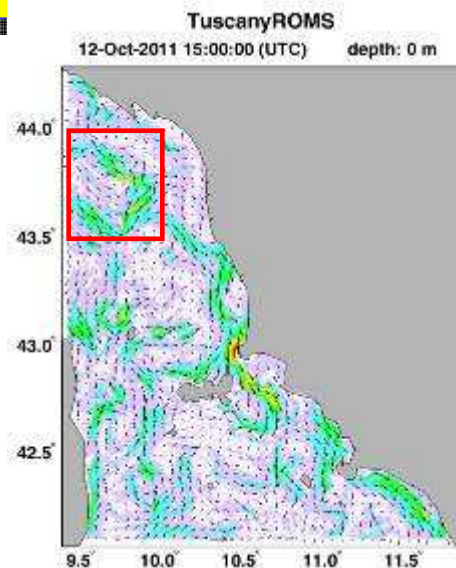
### Traiettorie e temperature drifters



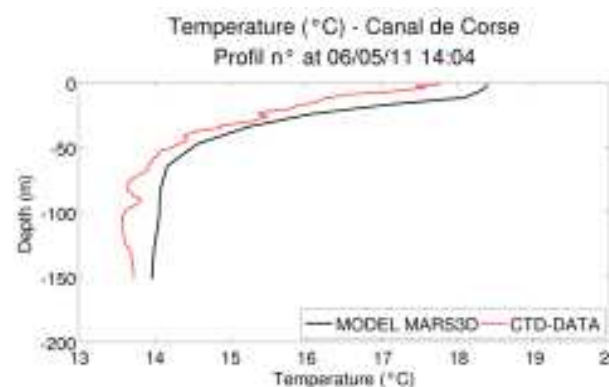
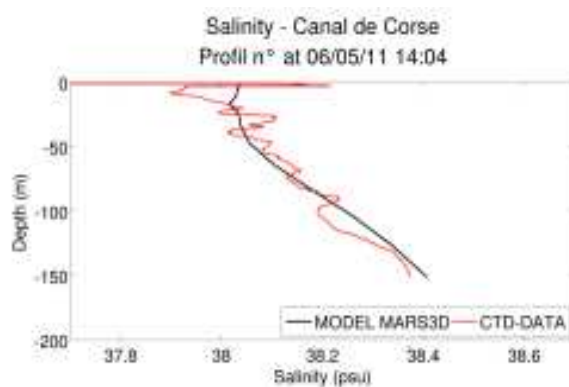
## Model calibration and validation



Model vs ADCP

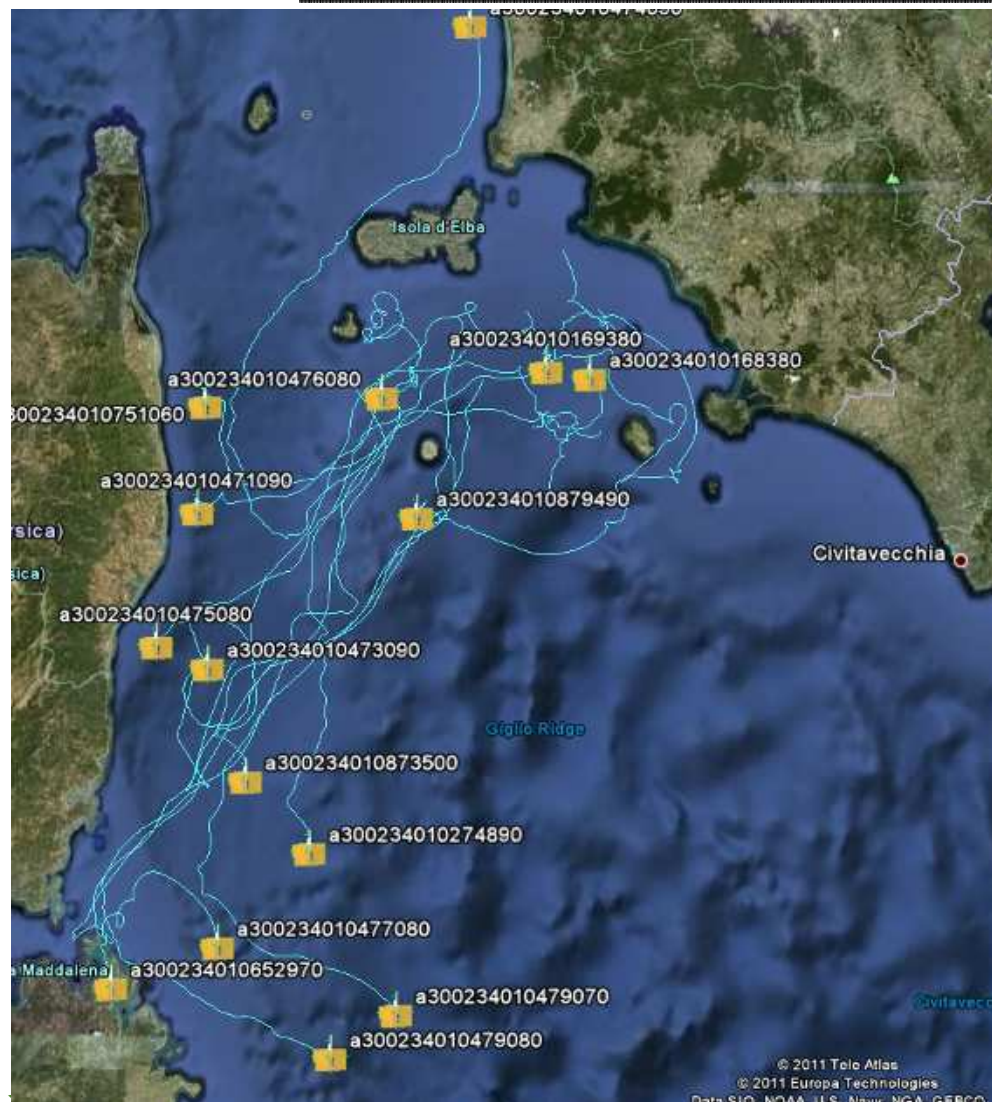


Model vs Satellite

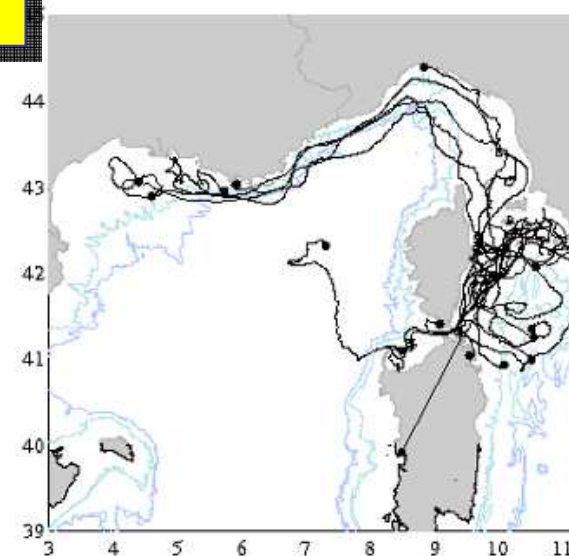


Model vs CTD

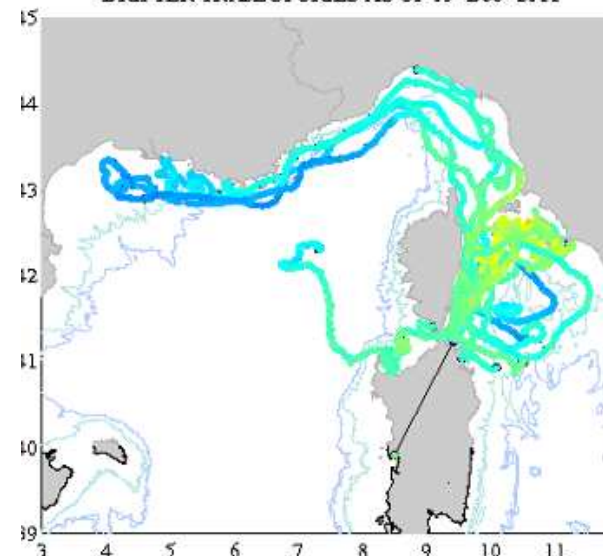
**Drifter positions after 10 to 40 days**



DRIFTER TRAJECTORIES AS OF 05-Dec-2011

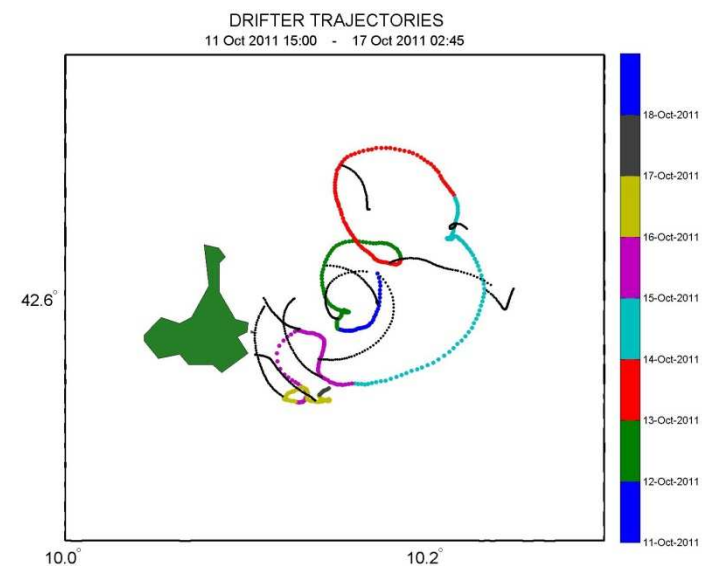
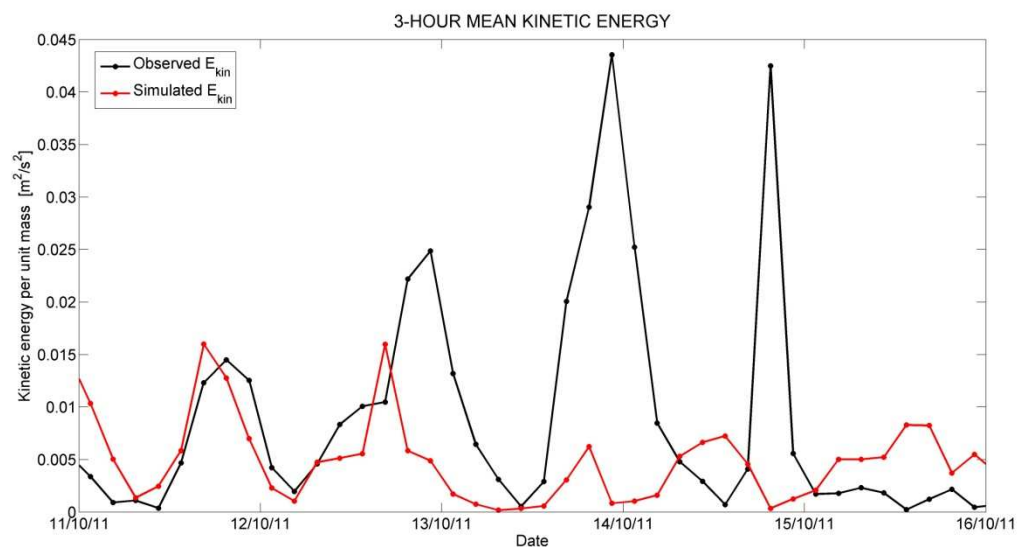
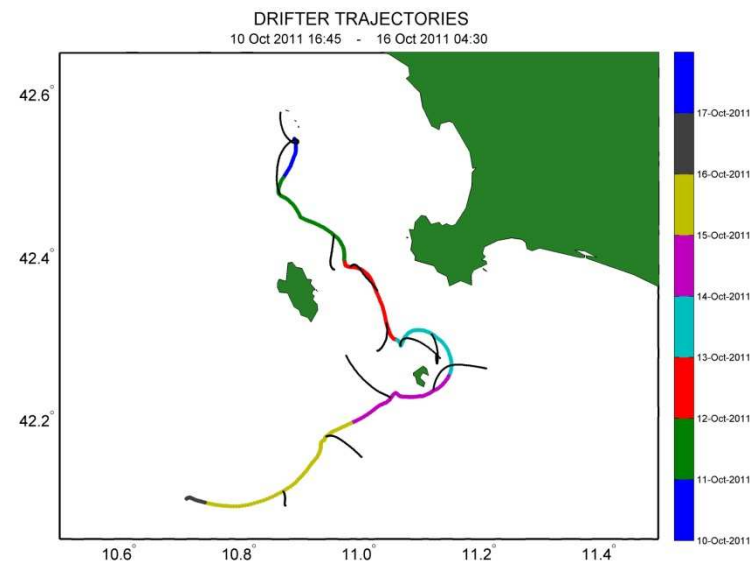
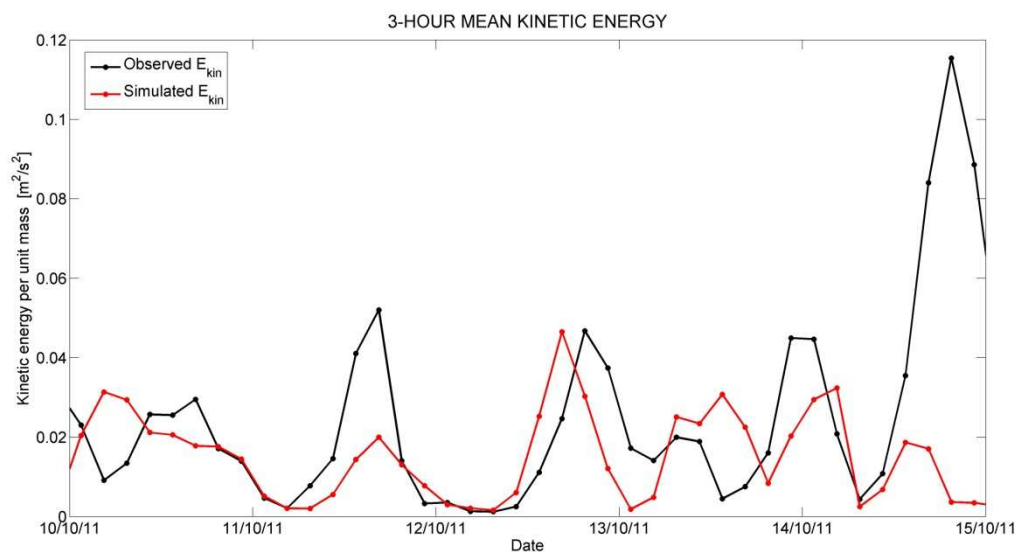


DRIFTER TRAJECTORIES AS OF 05-Dec-2011

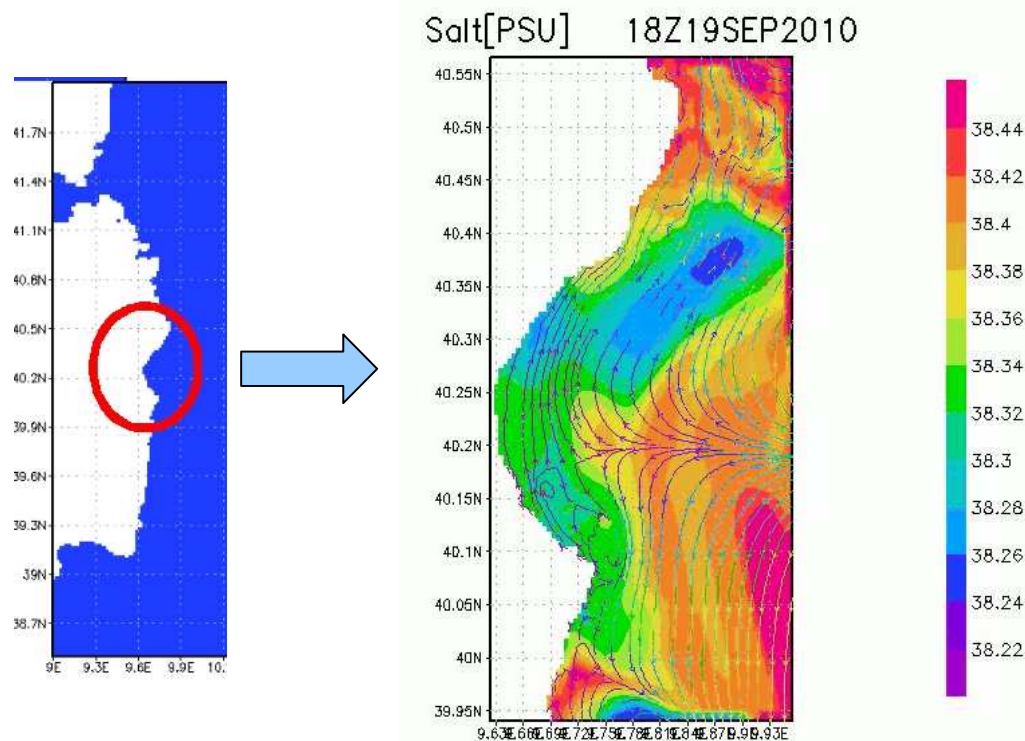


UNION EUROPEENNE



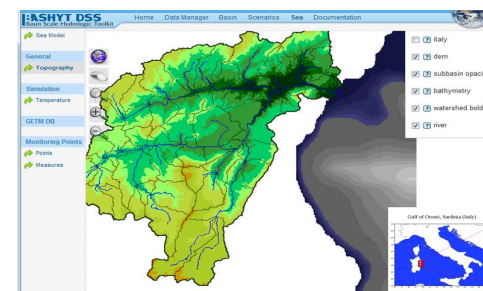


## Sardegna -GETM model Gulf of Orosei

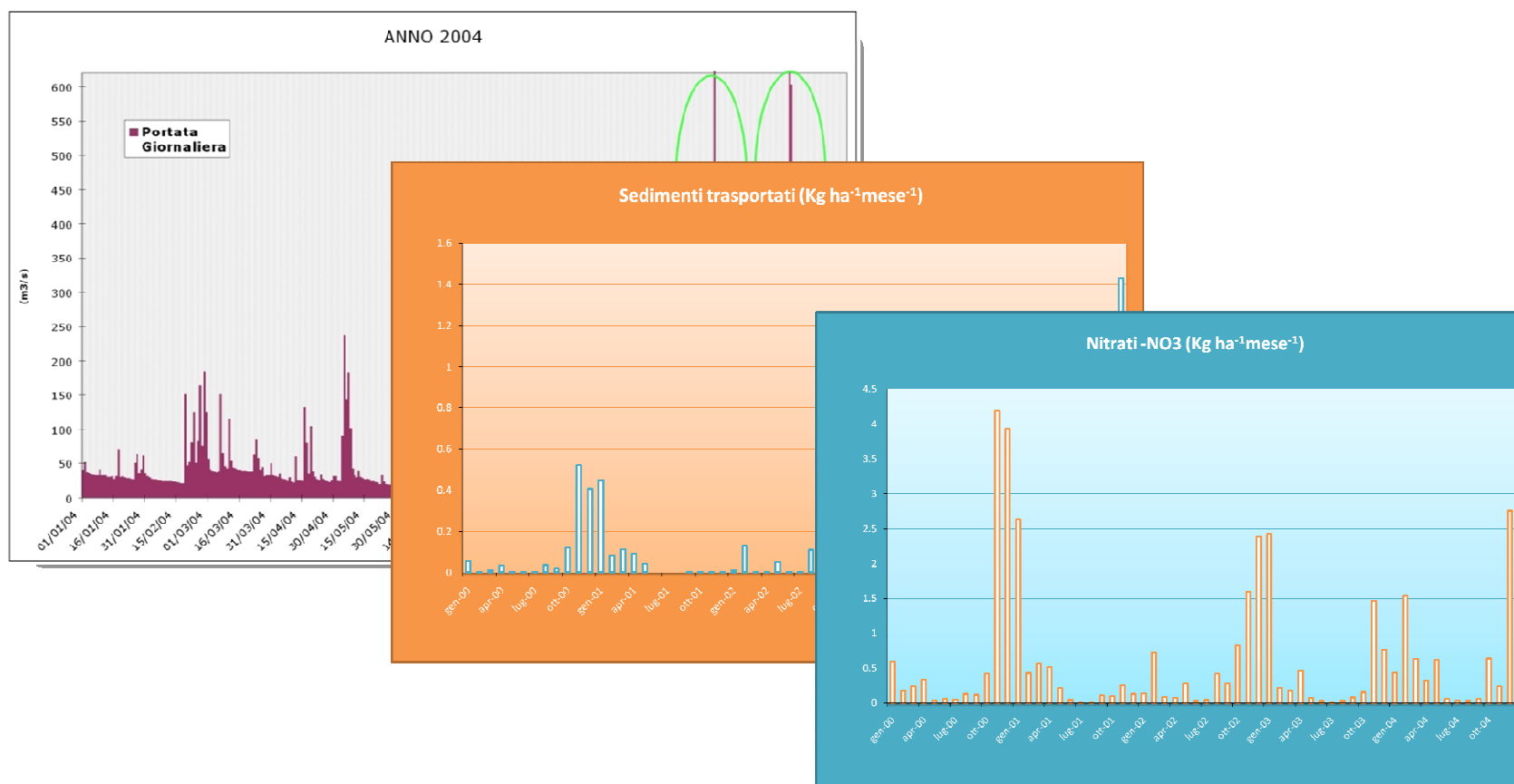


Two nesting levels to study in detail river-sea interactions near the river mouth.

Ocean model coupled to the SWAT hydrological model



## Hydrological models

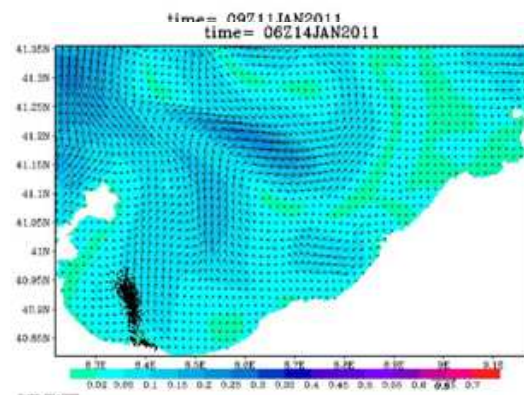


## Applications and case studies



SARDEGNA  
RICERCA

## An oil spill in the Asinara Gulf.



GETM 0.0016°. Istante del 14 jan, h 06.00

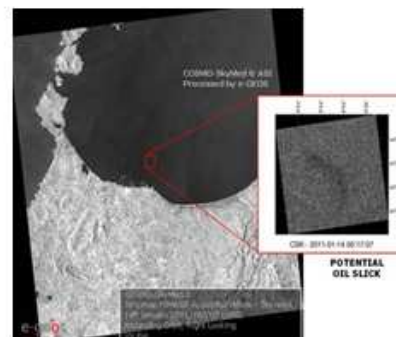
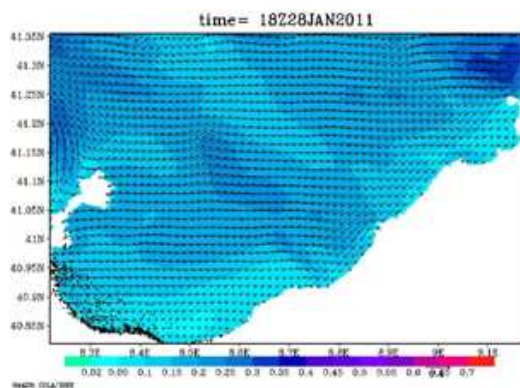


Immagine di riferimento e-GEOS.



GETM 0.0016°. Istante del 28 jan, h 18.00

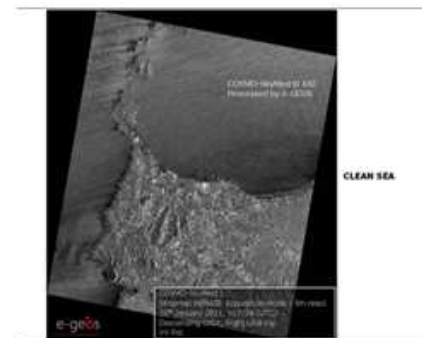


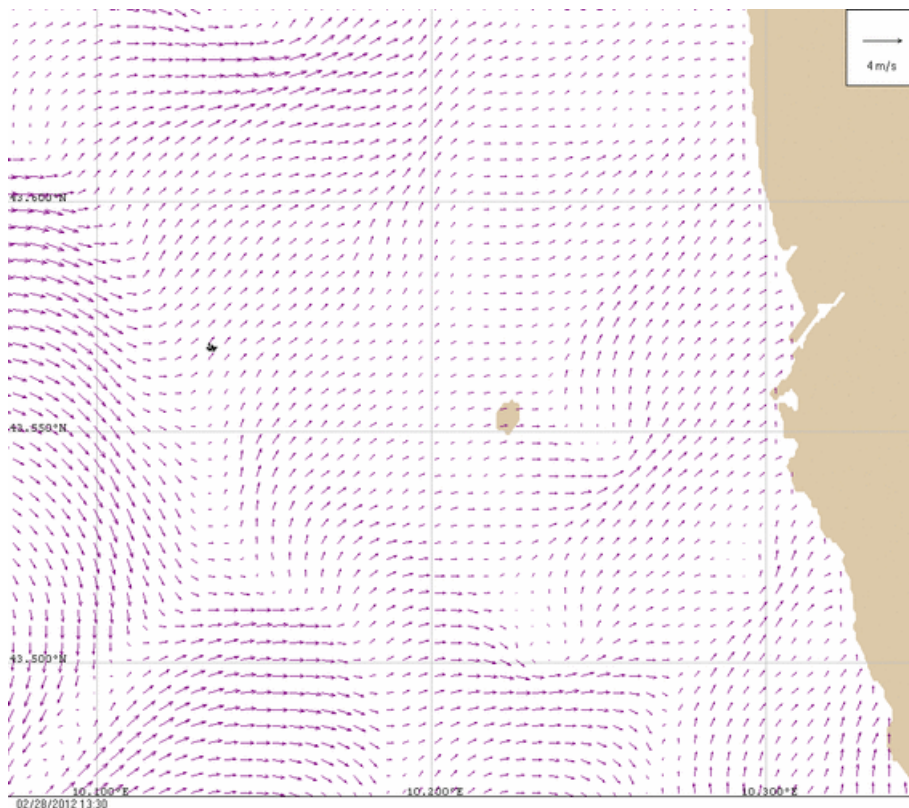
Immagine di riferimento e-GEOS.



## Applications and case studies



### Pollutant dispersion at sea: paraffin dispersed offshore Livorno towards Livorno.



Simulation of paraffin spill (Livorno, 28/02/2012)



## Applications and case studies



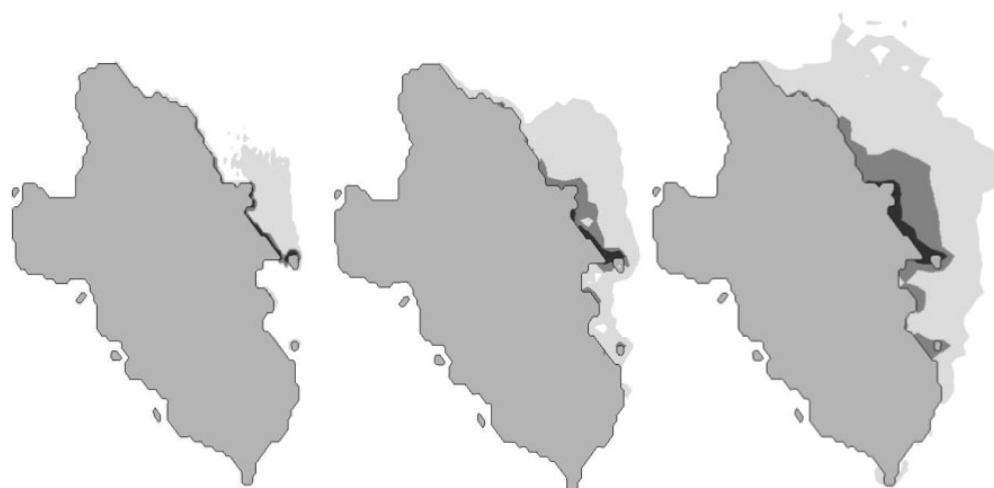
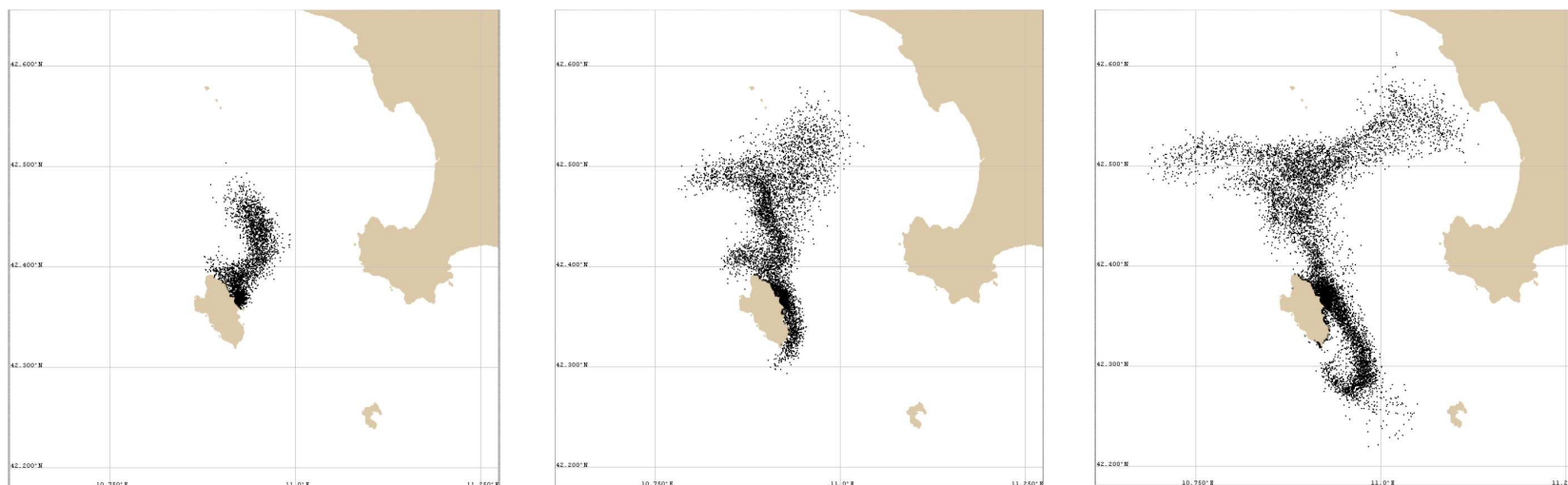
### Emergency response: the Costa Concordia case.

- Rapid installation of a tide gauge, meteorological sensors
- Fast analysis of sea states, to evaluate wreck stability, work planning at sea,
- Continuous hydrocarbon measurements by a special probe
- Support to marine monitoring (optimize sampling points)
- Installation of a X-band radar (for waves, currents, spills, ...)

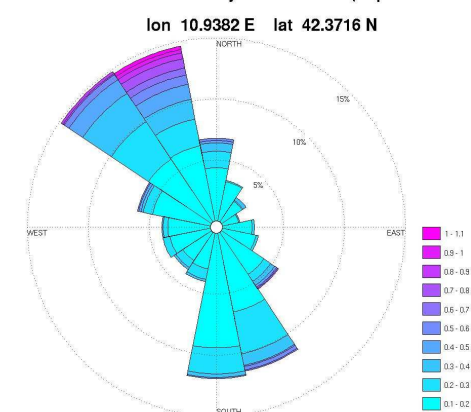
**<http://www.lamma.rete.toscana.it/meteo/previsioni-giglio>**



## Optimize sampling point positions around Giglio



ROMS model current velocity and direction (Sep 2011 - Jan 2012)



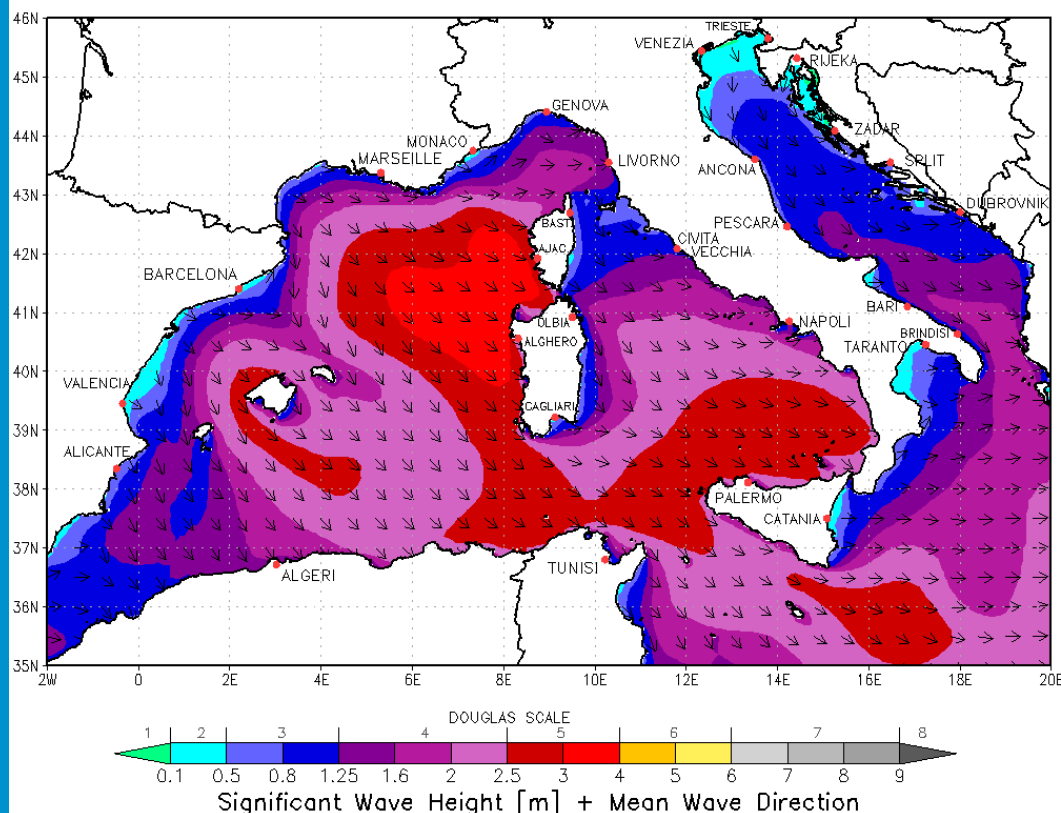
## Applications and case studies



## Drums containing heavy metals and hazardous materials, fallen off the Gorgona.

Consorzio LaMMA  
Init.: Thu, 15 DEC 2011 12 UTC Valid: Sun, 18 DEC 2011 00 UTC T=+60h

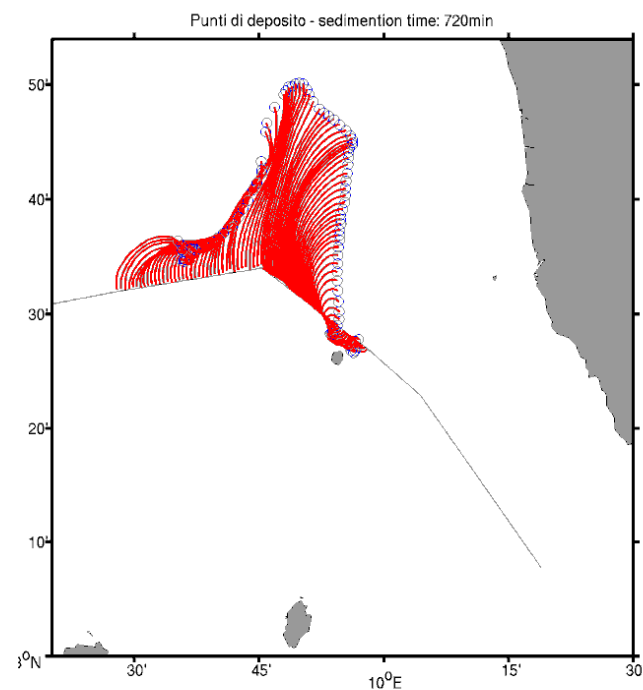
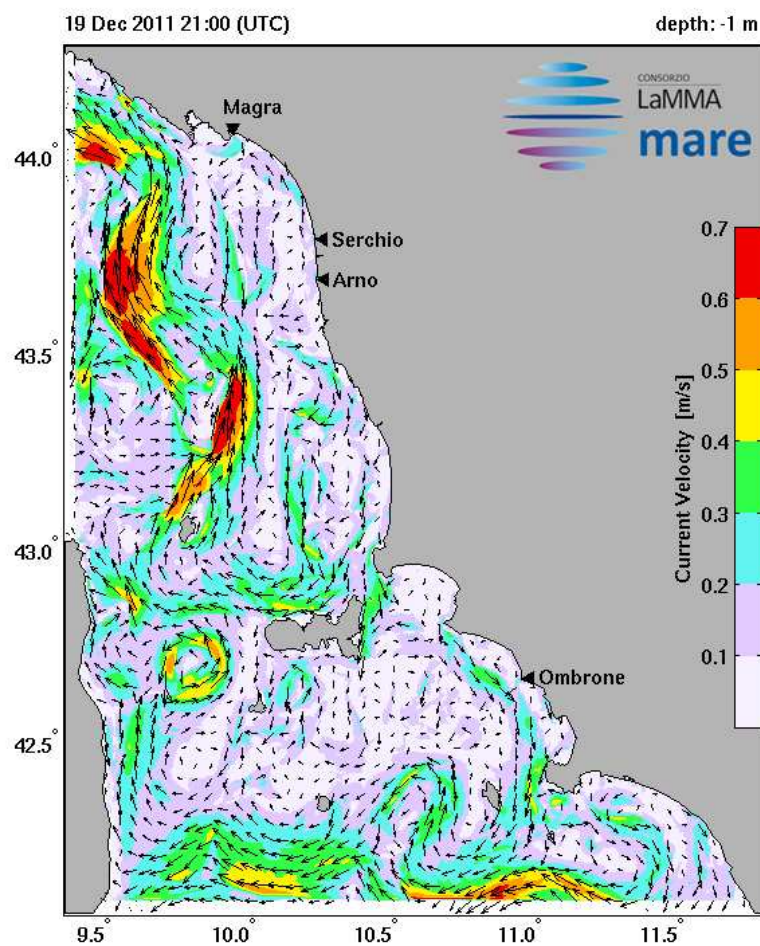
WW3 0.1deg - NMM 0.1deg



## Applications and case studies



**Drums containing heavy metals and hazardous materials, fallen off the Gorgona.**

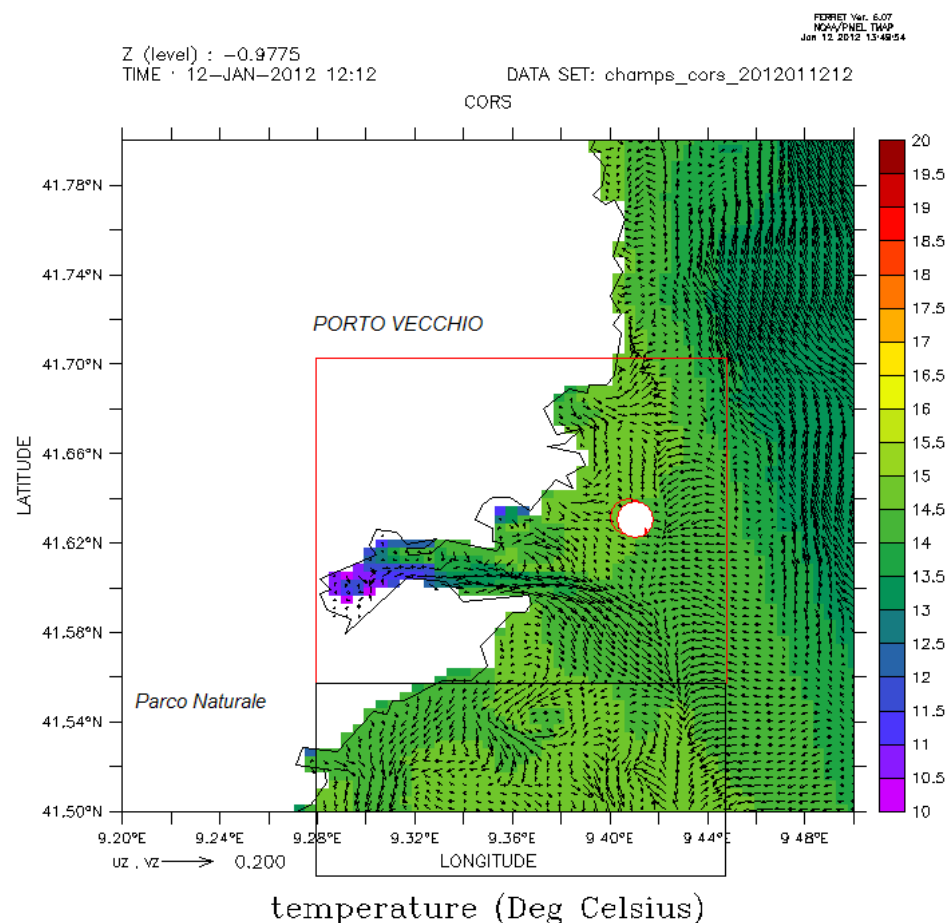


## Applications and case studies

- Give boundary conditions to local models e.g to study how sediments dredged from Porto Vecchio can diffuse contaminants in open sea
- Currents to drive fish eggs and larvae dispersion processes (modeled by ICHTYOP): this will be done in the framework of the STELLAMARE project



## Biology & contamination.





## Workshop



MARITTIMO - IT FR - MARITIME  
TOSCANA - LIGURIA - SARDEGNA - CORSE

# “COASTAL OBSERVING AND FORECASTING SYSTEMS, TODAY AND TOMORROW”

Livorno, 18-19 April 2012



Consiglio Nazionale delle Ricerche

# Thank you!

