



COASTAL OBSERVATIONS
& FORECASTS

Assessing sediment dynamics on the continental shelf : a glance at French modelling and observation initiatives

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What are the issues?

Morphodynamic context

- Natural fine sediment infill in estuaries and bays
- Coastal erosion / accretion related to artificial structures
- Coastline dynamics (e.g. beach erosion, estuarine morphological adaptation to climate change-related forcing)
- Aggregate extractions

Environmental context

- Turbidity : light attenuation, link with primary production and vegetation
- Benthic habitat changes (and anthropic impact such as trawling, climate change)
- Fine sediment contamination, link with the whole trophic chain

❖ SHELFLEX : a national network to federate research institutions, universities, consulting companies

Scientific motivations and operational objectives (1/2)

- Can we quantify the sand transfers between the shelf and the coastal zone?
- What is the natural infill rate of bays and estuaries, what is the sediment source for this infill?
- Can we quantify sediment fluxes on the shelf and assess their natural variability (seasonal, interannual, impact of extreme events) in order to sort out current variability from other effects

❖ SHELFFLUX : a national network to federate research institutions, universities, consulting companies

Scientific motivations and operational objectives (2/2)

- Can we quantify the impact of human activities on
 - ✓ resuspension (e.g. trawling, dredging, aggregate extraction)
 - ✓ sediment trapping (e.g. harbors, aquaculture)
- Can we predict how climate change will affect coastal and estuarine morphological changes?
- Can we provide consulting companies with reliable boundary conditions?

❖ SHELF LUX

Strategy

- Using the network in order to answer national (european?) calls for proposal
- Developing a numerical modelling strategy within the national coastal oceanography operational program ([Previmer](#))
- Introducing sediment oriented measurements within existing or planned monitoring networks (e.g. [FONCE](#)), and in collaboration with recurrent oceanographic / fish stock cruises on the shelf



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PREVIMER

A coastal operational forecasting system





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❖ PREVIMER - Objectives

PREVIMER provides coastal synoptic observations and 96 hour to 6 day forecast in regional areas (the English Channel, the Bay of Biscay and NW Mediterranean Sea) down to very local areas on the following parameters:

- direction and intensity of **currents**,
- sea-surface and bottom **temperature and salinity**,
- **sea level**,
- **waves**: frequency, direction and height,
- **nutrients and phytoplankton concentration**,
- **turbidity**

Website

- presentation:

[www.previmer.org/
presentation](http://www.previmer.org/presentation)

2006-2007 : phase 1 based on demonstrators

2008-2012 : phase 2 toward an operational system

The poster features the PREVIMER logo at the top left and the text 'COASTAL OBSERVATIONS & FORECASTS' at the top right. Below this, the word 'PREVIMER' is written in large orange letters. A central paragraph states: 'PROVIDES OBSERVATION DATA AND 48H FORECASTS ON COASTAL ENVIRONMENT ALONG THE FRENCH COASTLINES OVER THE CHANNEL, THE ATLANTIC OCEAN, AND THE MEDITERRANEAN: CURRENTS, TEMPERATURE, SEA LEVEL, SALINITY, PARTICLES OR PLANKTON CONCENTRATIONS, SANITARY QUALITY...'. Below this are three columns: 'TOOLS' (with an image of a buoy), 'APPLICATIONS' (with a map of the French coast), and 'WEBSITE' (with a screenshot of the website). Each column contains a list of details. At the bottom, the website 'WWW.PREVIMER.ORG' is displayed in large white letters.

WWW.PREVIMER.ORG

Project co-financed by the European Union and coordinated by Ifremer





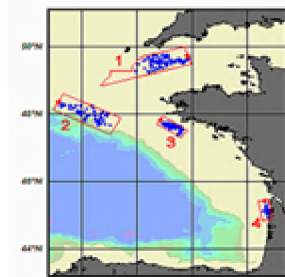
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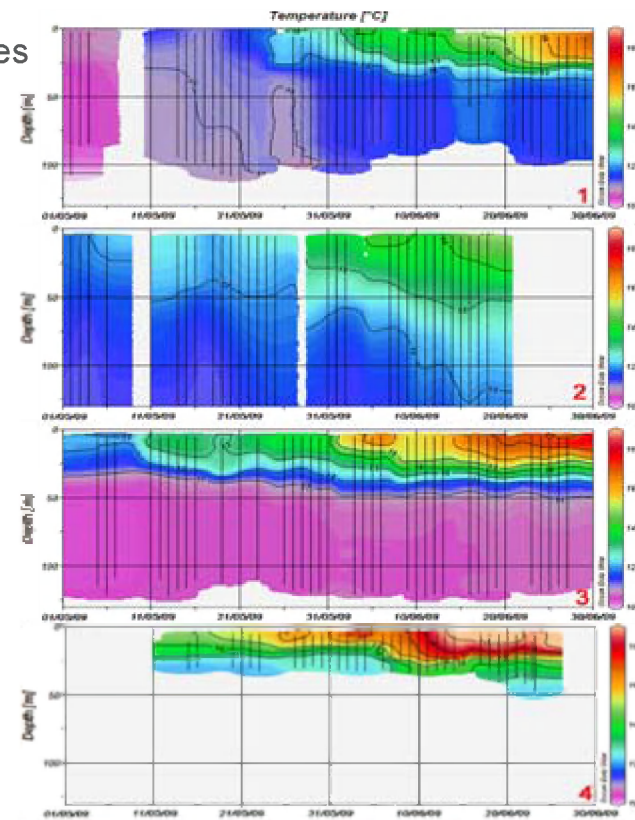
Monitoring networks and instrument developments

❖ RECOPESCA (a network of Voluntary Observing Ships)

- initially, ICES assessment of the pressure of fisheries over the various fishing areas,
- routine acquisition of complementary data: **temperature, salinity, turbidity,**
- data are transferred to the Data Centre by GPRS,
- Probes provided by NKE.
- 1st stage: 30 ships (done).
- 2nd stage: deployment up to 300 ships (2014).



Cartes des profils de température récoltés par le réseau RECOPESCA :
 - en Manche (1),
 - près du talus continental (2),
 - au sud de Penmarch (3) et
 - au nord du bassin d'Arcachon (4).



Profils de température en fonction du temps, en Manche (1), près du talus continental (2), au sud de Penmarch (3) et au nord du bassin d'Arcachon (4).

❖ SCANFISH – towed fish

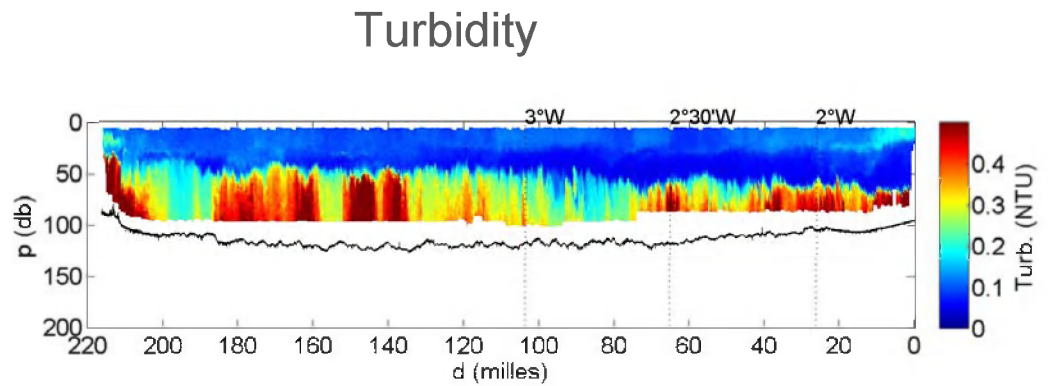
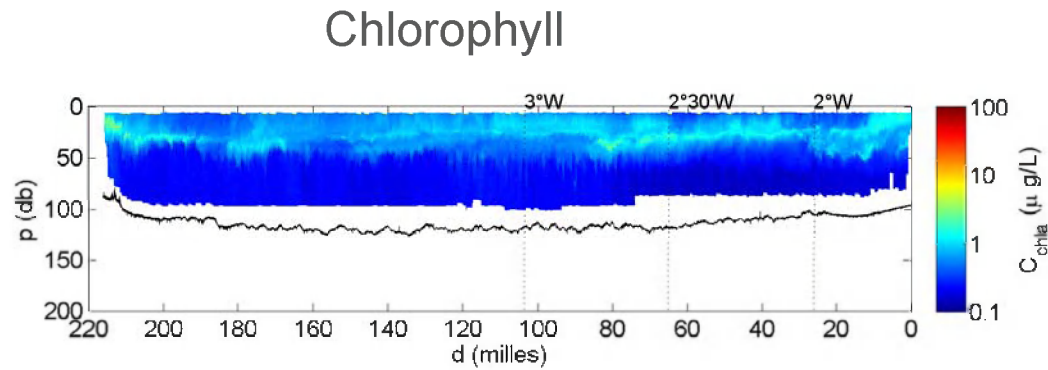
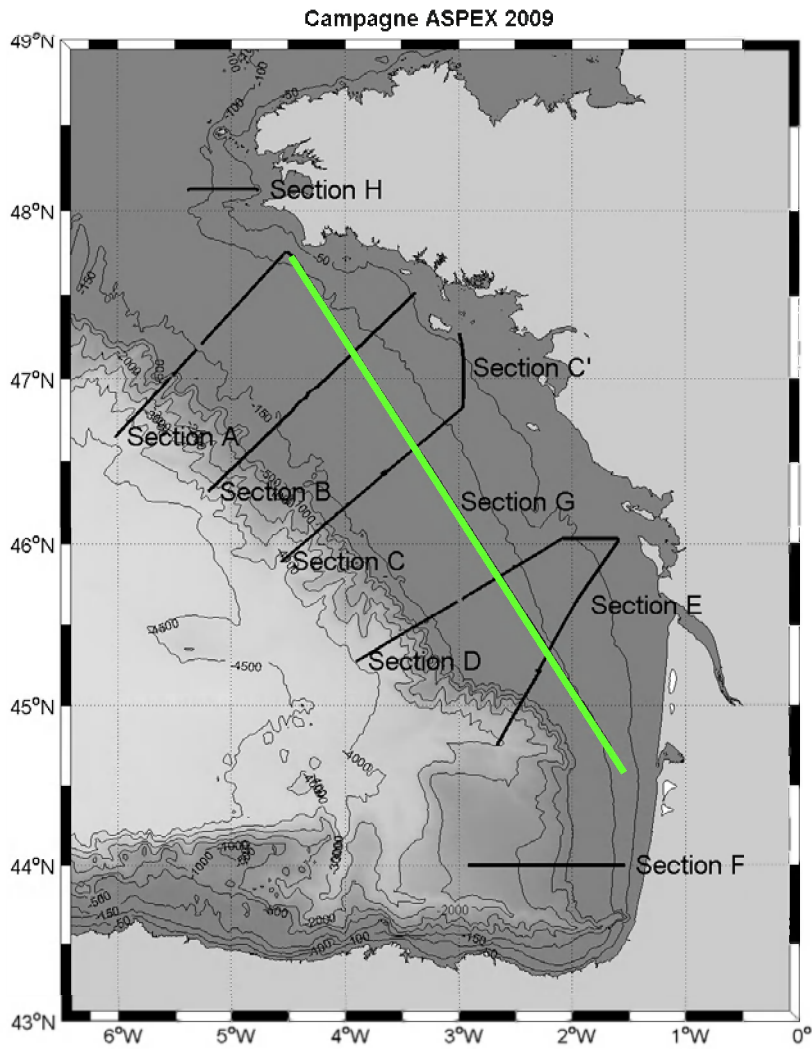
- 1.8m large towed fish oscillating from the surface down to 100 m water depth along the route of the vessel.
- Provides 2D slices for temperature, salinity, chlorophyll and turbidity



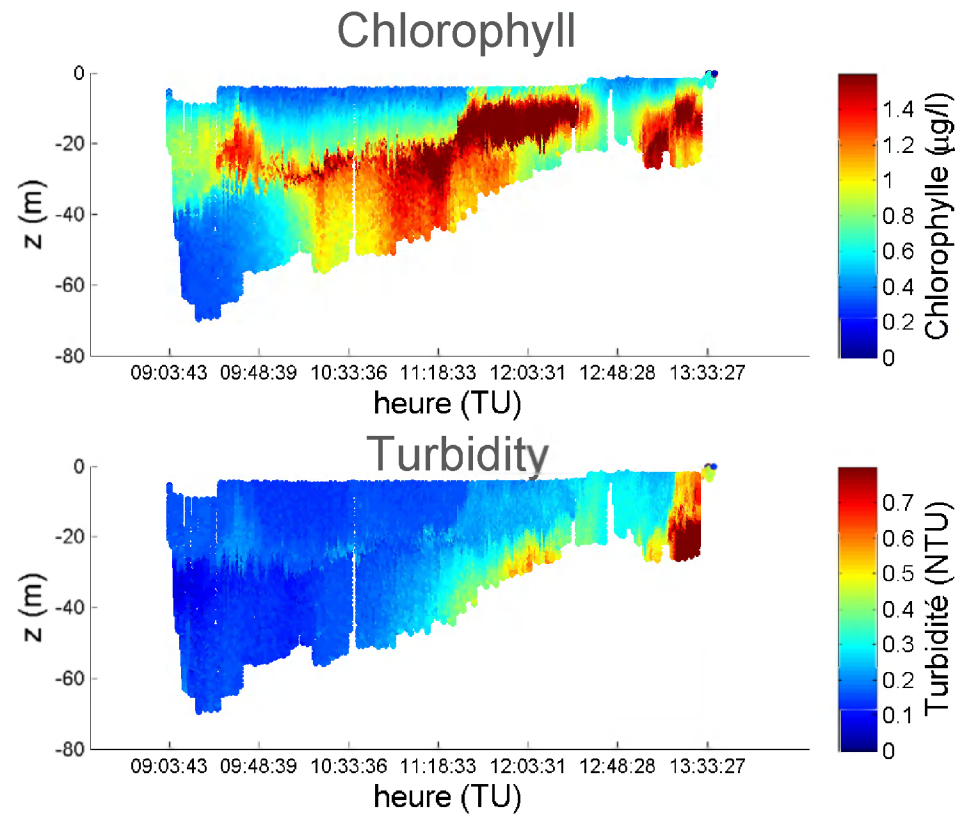
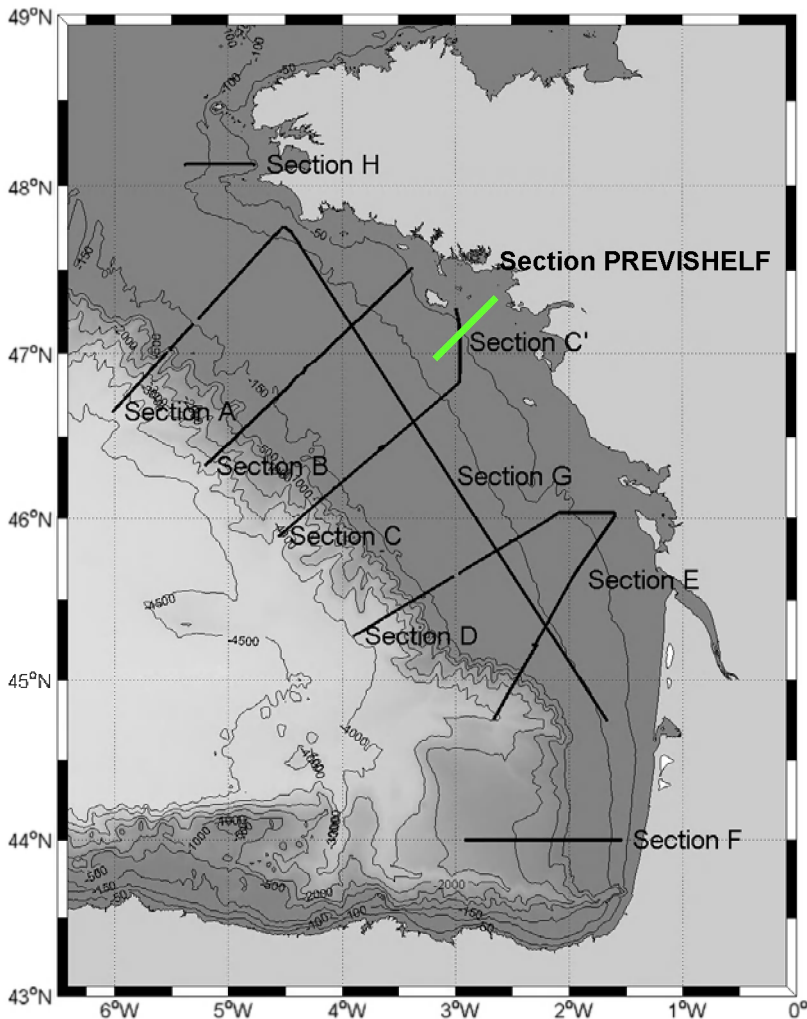


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❖ SCANFISH – towed fish

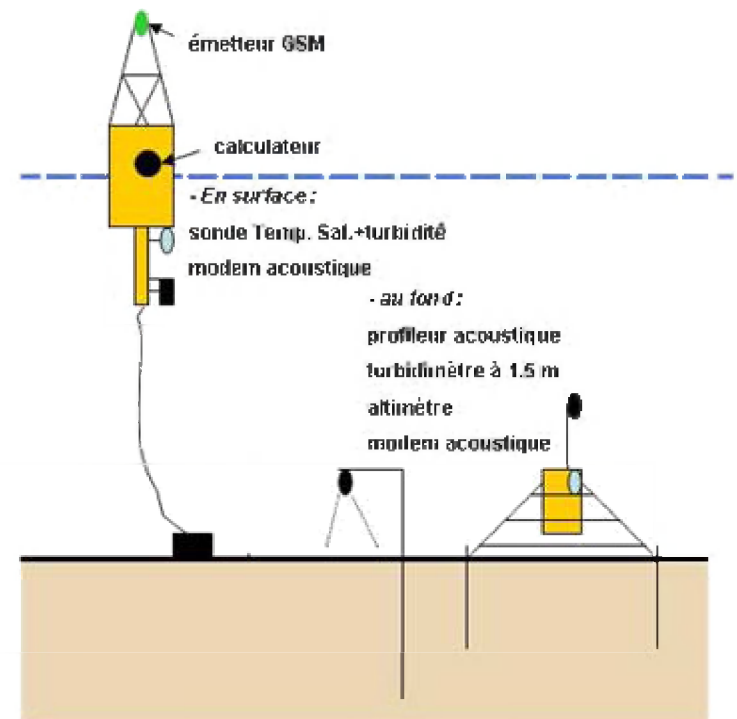


❖ SCANFISH – towed fish



❖ Turbidity measurement buoy

- Southern Brittany prototype



Wave, current, surface and bottom turbidity, altimeter, real time data transmission

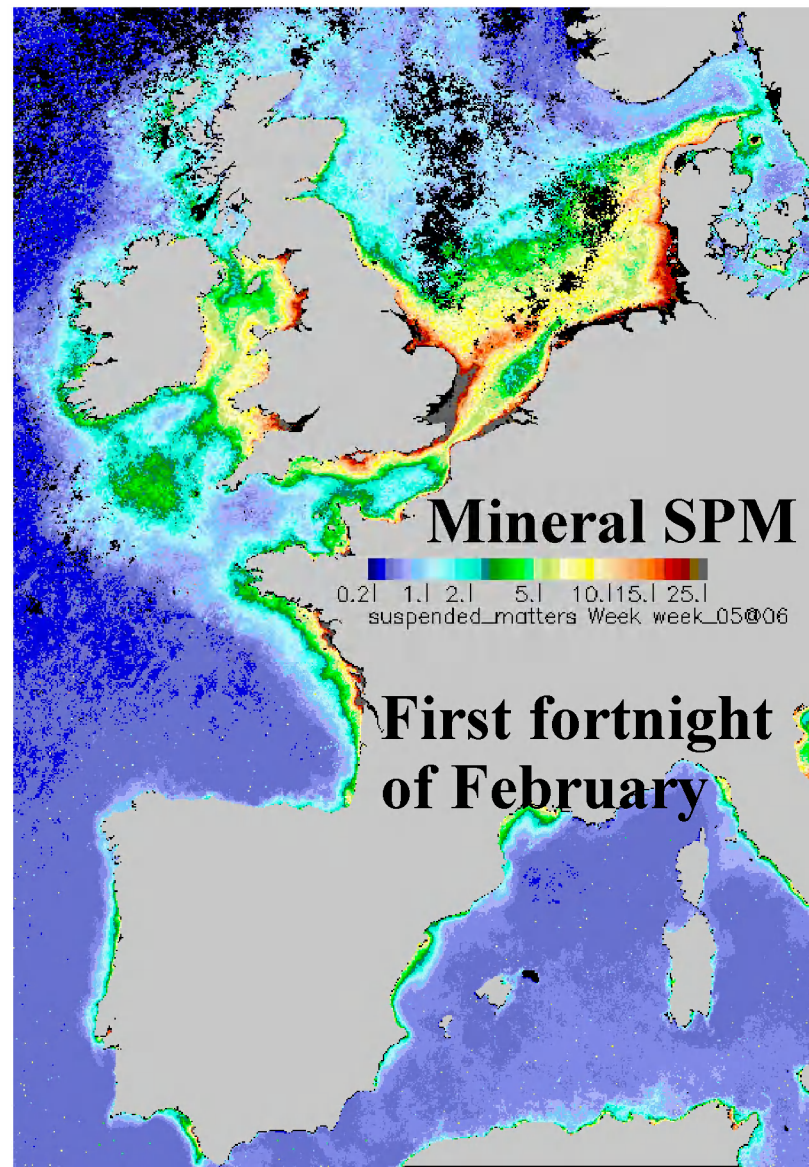
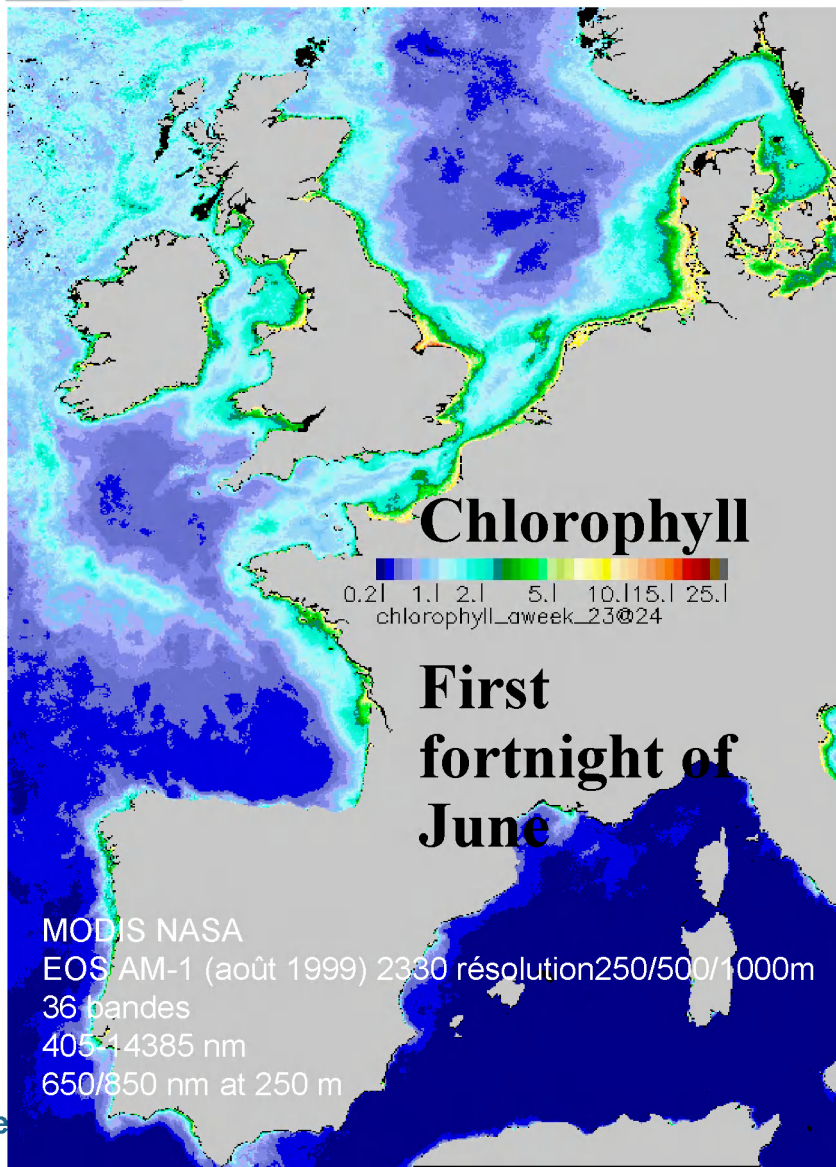
❖ Satellite observation

- Sea surface temperature:
high resolution without clouds (infra-red),
lower resolution when cloudy (radar).
- **Water colour**: exploitation of visible and
near infra-red wave lengths.
- **Image processing using specific algorithms
to discriminate chlorophyll-A from inorganic
suspended matter.**
- Data collected and archived at CERSAT,
distributed using Nausicaa browser.





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3

PREVIMER forecasting models

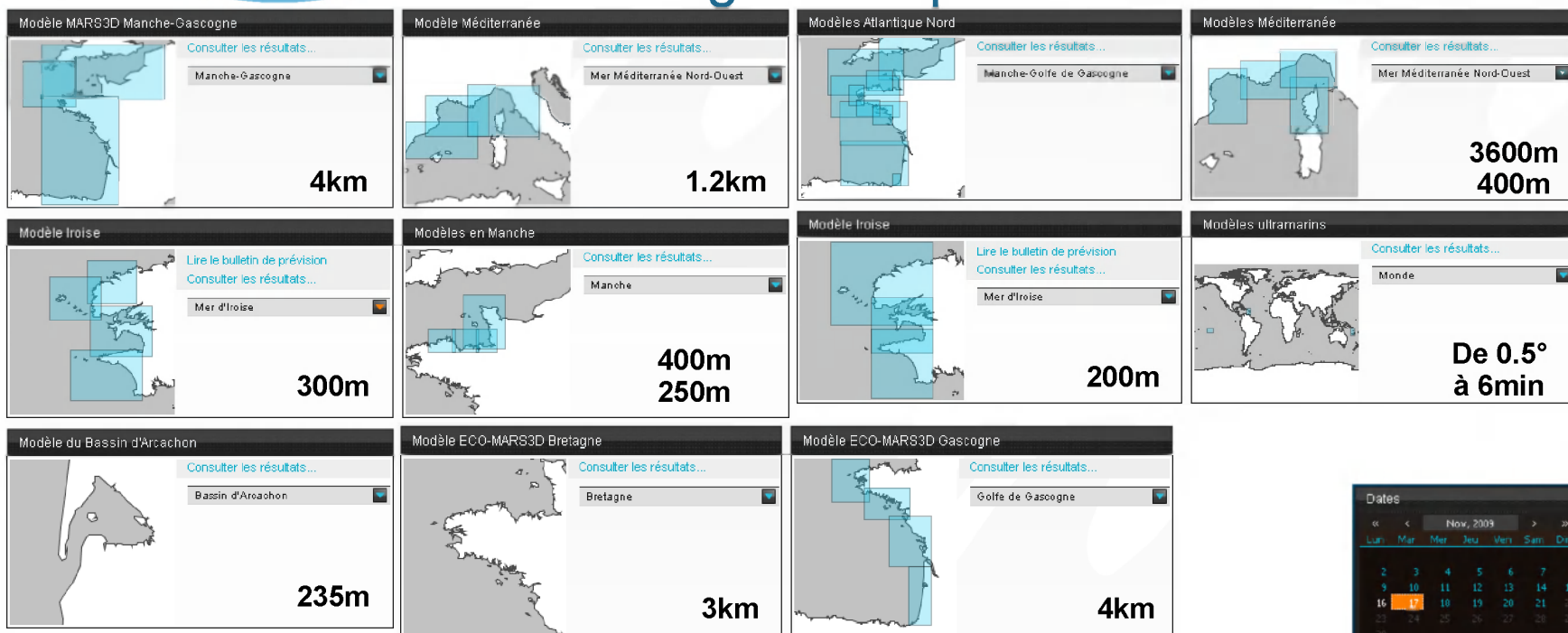
Currents, T, S, storm surges



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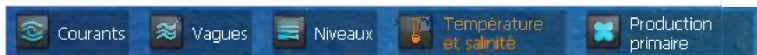
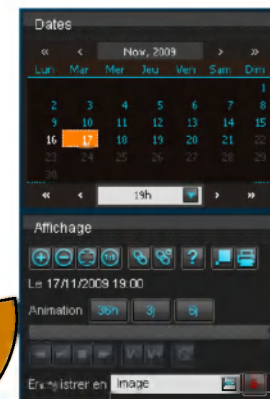
❖ In coastal zones on a range of scales from continental shelf to bay with a capacity for zooming-in on specific areas.

Where ?



What ?

When ?

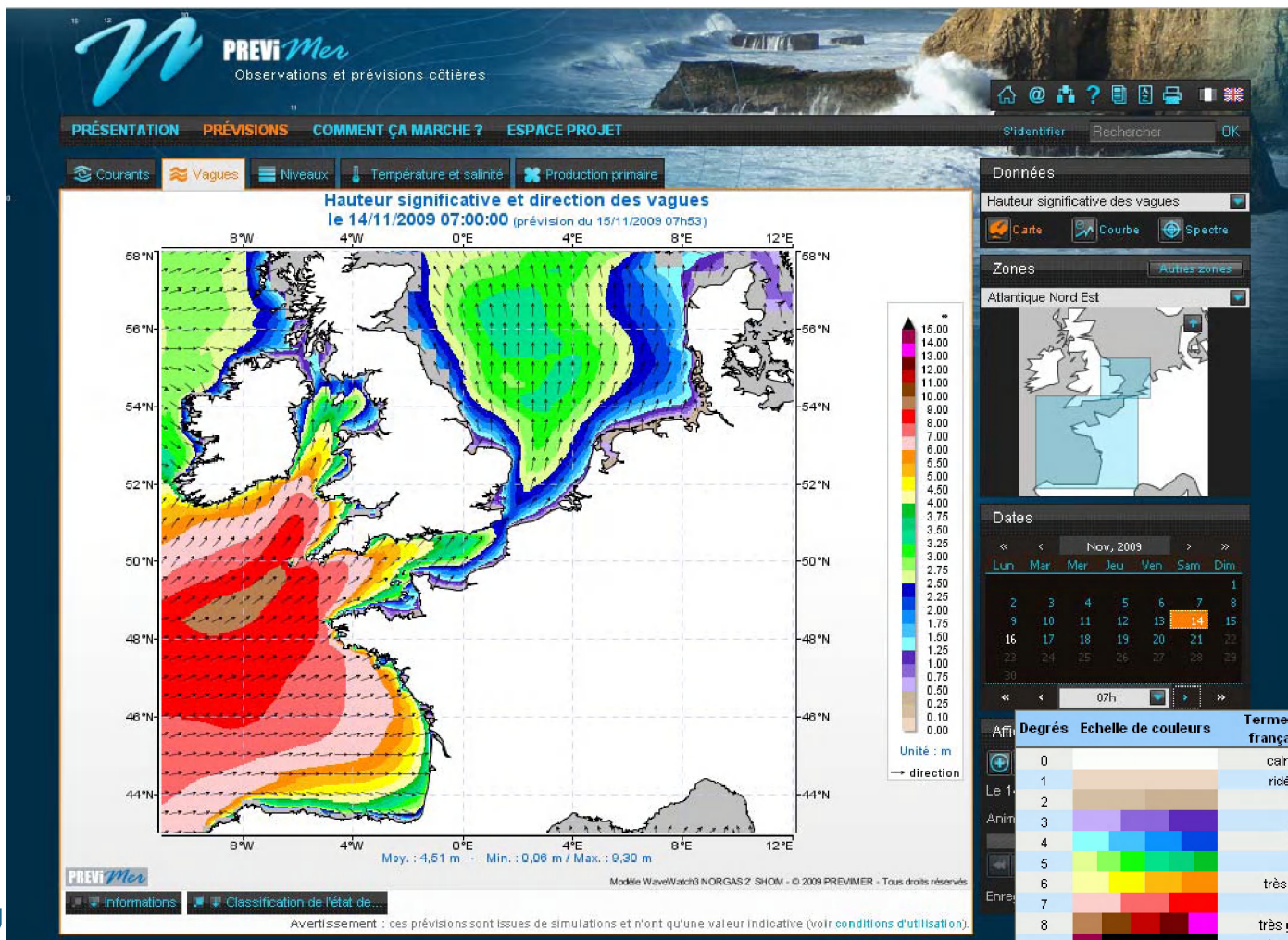


Waves



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Wave forecasts (WWIII regional scale) French Hydrographic Services





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Wave forecasts (unstructured mesh all along the coast, ~200m resolution)

Hauteur significative et direction des vagues
le 14/11/2009 10:00:00 (prévision du 13/11/2009 18h51)

Moy. : 6,53 m - Min. : 0,03 m / Max. : 9,74 m

Aff	Degrés	Echelle de couleurs	Termes descriptifs français (english)	Hauteur des vagues
	0		calme (<i>calm - glassy</i>)	0
Le 1	1		ridée (<i>calm - rippled</i>)	0 à 0,1 m
	2		belle (<i>smooth</i>)	0,1 à 0,5 m
Anim	3		peu agitée (<i>slight</i>)	0,5 à 1,25 m
	4		agitée (<i>moderate</i>)	1,25 à 2,5 m
	5		torte (<i>rough</i>)	2,5 à 4 m
	6		très forte (<i>very rough</i>)	4 à 6 m
Enre	7		grosse (<i>high</i>)	6 à 9 m
	8		très grosse (<i>very high</i>)	9 à 14 m
	9		énorme (<i>phenomenal</i>)	≥ 14m

❖ Ecological modelling of nutrients and phytoplankton

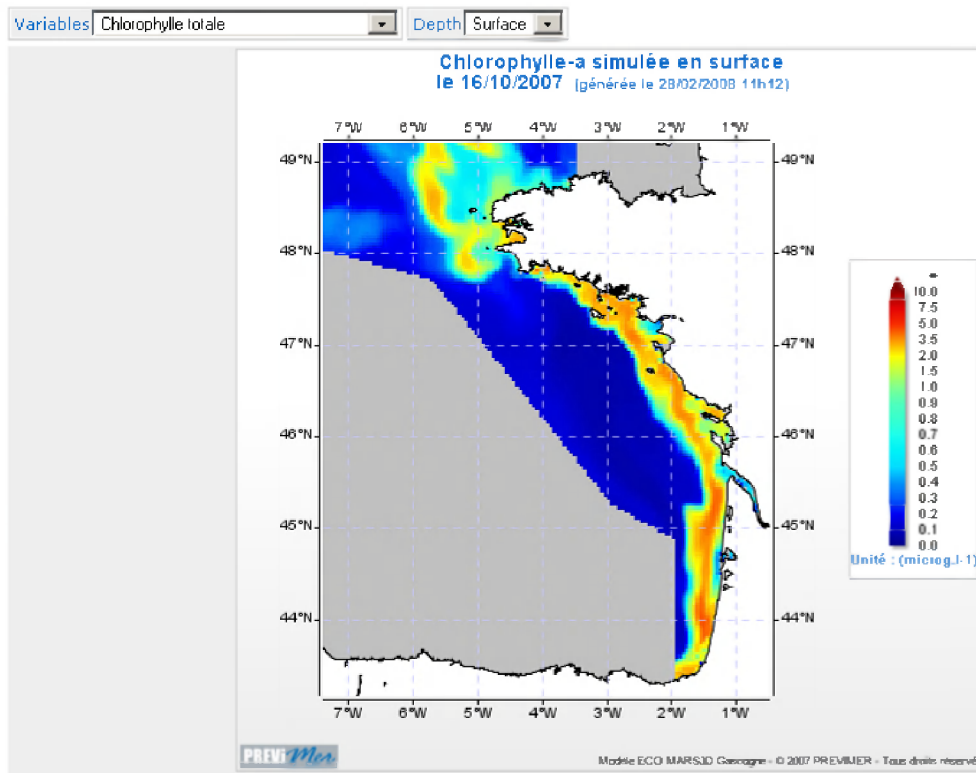
Topics

- About PREVIMER
- Forecasts
 - Currents
 - Waves
 - Water levels
 - Sea Temperature and Salinity
 - Primary production
 - Modèle ECO-MARS3D Gascogne
- How does it work ?
 - Modèle ECO-MARS3D Gascogne
 - Précautions d'usage
 - Nutriments et plancton
 - Modèle numérique
 - Couplage de modèles
 - Description scientifique
 - Réalisateurs
- Help - FAQ
- Glossary
- Terms of Use
- Project space

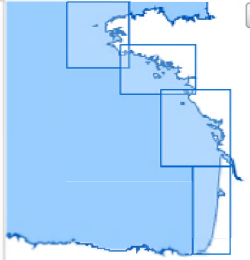
Search

Quick access

- Home page
- Version française
- Contacts
- Site map



Type: Map Areas: Bay of Biscay



October, 2007

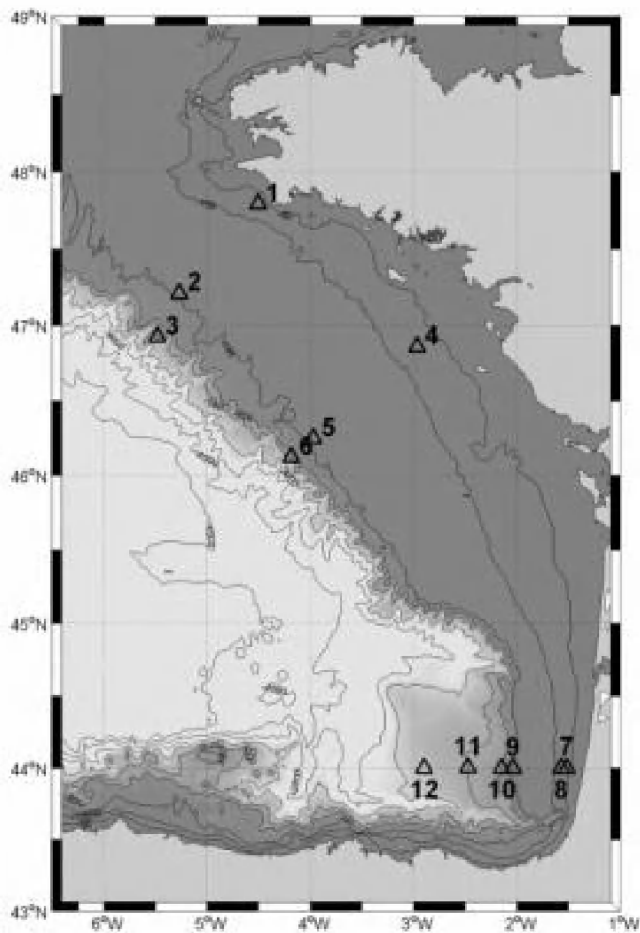
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Animation 12d 24d 48d

Results image

❖ Turbidity, sediment fluxes SHELFLUX / COO

- Modelling : regional scale, river plumes (Seine, Loire, Rhone, not operational)
- Data acquisition
 - ✓ Cruises of opportunity : long-term moorings on the shelf (ADCP, turbidity sensors)
 - ✓ SCANFISH profiles
 - ✓ CTD-Turb profiles during fish stock cruises





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FONCE

French Observatory Network of Coastal Environment

Proposal to develop an monitoring network of the French coastal seas within the context of Coastal Operational Oceanography Programs

Scientific objectives :

- Coastal hydrodynamics characterization
- **Sediment Dynamics**
- Marine Ecosystems

Applications

- Research
- Marine strategy
- Operational Oceanography



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❖ FONCE French Observatory Network of Coastal Environment

WP0: Project management and coordination

WP1: Technology development for sensors, buoys and sub bottom platforms

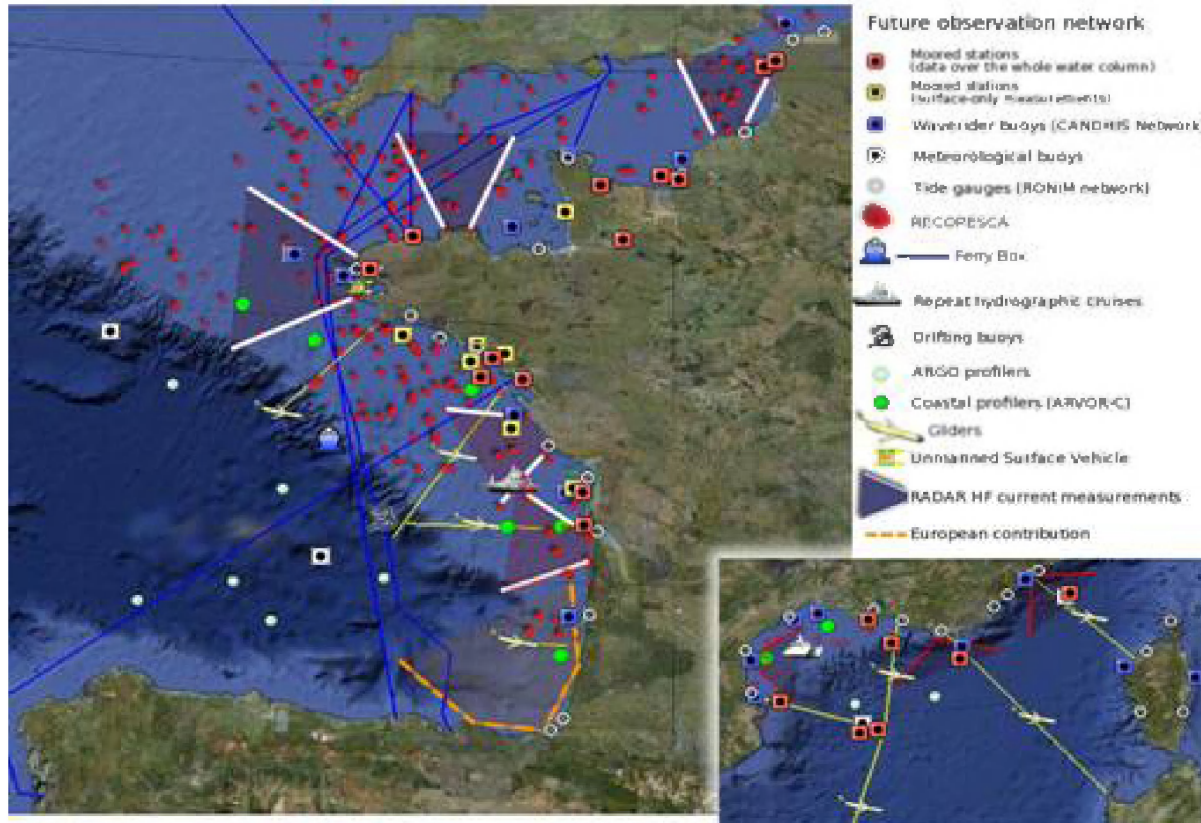
WP2: Development of the fixed observatory network (focus on French main fluvial plumes : Seine, Loire, Gironde, Rhone)

WP3: Observatories of opportunity : Recopesca (CTDs and turbidity sensors on fishing boat trawls) & ferrybox

WP4: HF Radar network

WP5: Glider fleet

❖ FONCE French Observatory Network of Coastal Environment





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❖ FONCE French Observatory Network of Coastal Environment

WP1: Technology development for sensors, buoys and sub bottom platforms

Proposed development for sediment related parameters

- Association of multi-spectral sensors (performant for organic/inorganic material assessment) and multi-frequency acoustic sensors (performant for grain size analysis)
- Improving SPM quantification : development of antifouling systems
- Development of automatic in situ water samplers for SPM calibration

❖ Conclusions

Need for a better understanding of **sediment pathways on the shelf**, based on :

- Observation (national / international networks, satellite image analysis)
- Numerical modelling (link with operational oceanography)

Research needed :

- improved measurement techniques (SPM, sand fluxes)
- feedbacks between turbidity and primary production (for in situ data analysis and satellite image processing)
- quantification of the impact of human activities
- development of indicators (e.g. links between environmental parameters and habitats, Marine Strategy oriented)



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