High frequency measurements of hydrological and biological parameters in the Western English Channel: Evidence for a *Karenia mikimotoi* bloom in July 2010

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Observation Time Series in the Western Channel

Description of the ferry box systems operating in the Western Channel and bay of Biscay

Hydrological and biological measurements in the Western Channel in 2010: evidence for a *Karenia mikimotoi* bloom

First results from measurements in the bay of Biscay in 2011
Time Series in the Western Channel: a long story

Two Types of measurements

Low Frequency

- 16 physico-chemical and biological parameters

High Frequency
(real time data)

Ferry Box

Fixed Platforms
- **Low Frequency Observations:** interannual to seasonal variability
  - Hydrological measurements using Niskin bottles
  - CTD profiles

- **High Frequency Observations:** short term variability (semi monthly to semi-diurnal and hourly variability)
  - Fixed platforms: multi instrumented buoy
  - Voluntary Observatory Ship = ferry boxes onboard Brittany Ferries MV Armorique and Pont Aven
High Frequency Measurements:

**HF Temporal Strategy:**

Fixed Platforms: buoys

with real time data transmission (every 30 minutes)

**HF Spatio-Temporal Strategy:**

Voluntary Observing Ships: Ferrys

with near real time data transmission (at each arrival at ports)
EU Interreg Marinexus program (2010-2013):

Coordination of the observation activities in the northern and southern parts of the Western Channel:

- implementation of a Ferry box line between Roscoff and Plymouth

- High frequency measurements on fixed platforms at both ends of the ferry line
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Easy to operate: close to the observatories
Ferry Box lines in the Western Channel and Bay of Biscay

Brittany Ferries lines:
**Armorique** (daily frequency = 2-3 transects)
**Pont Aven** (weekly frequency)
Measurements along transects in the Western Channel and Bay of Biscay

Continuous measurements of physico-chemical and biological parameters in surface waters

6 parameters:
- Temperature
- Salinity
- Oxygen
- Fluorescence
- Turbidity
- CDOM
Automatic sampler connected to the ferrybox

- **24 bottles (1l)**
- Refrigerated (4°C)
- Remotely piloted from laboratory

**Analysis of additional parameters:**
- **Nutrients** *(nitrate, phosphate, silicate)*
- **chlorophyll a, pigments,…**

**Data qualification** *(salinity, chlorophyll,…)*

2 transects realized per month with 1 coordinated with CPR sampling

*Hambourg, 4th Ferry Box workshop, september 2011*
## Data Base and Website

**HF - High Frequency Data Repository - Campaigns**

### Data Sources

- ASTAN
- Ferry Box Armorique
- Ferry Box Pont-Aven

### Data Transects

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<th>End Date</th>
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Website:

Visualisation of the ferry transects

Visualisation of spatial evolution of variables along the transects
Synoptique de la gestion des données

Real Time Data Transmission to Operational Oceanography (Coriolis Data Center)

IFREMER-IDT-SMI-Pégen

PROJET NAVOP

Termybox sur MV ARMORIQUE et PONT AVEN

E-Mail ou FTP via GPRS

Brittany Ferries

- MV ARMORIQUE
- MV PONT AVEN

Data Base

Reception et sauvegarde de l'ensemble des données

T S O2 F Turb, CDOM ...

Paramètres Techniques

Transfert automatique des données brutes en temps réel

Transfert en temps différé de données validées

Validation en temps différé

Station Biologique de Roscoff

- Etablissement
- Analyse Échantillons
- Résultats études
- Critères techniques non automatisées

Quality Code

Coriolis

QC Audit sur T-S

Sauvegarde des paramètres (non techniques) sans qu'aucun
- O2
- F
- Turb, CDOM
- ...

- Conservation des données brutes initiales
- Sauvegarde incrémentale des données validées

- Mise en libre consultation des données brutes
- Consultation contrôlée des données validées

PREViMer

observations & prévisions côtières

23 avril 2010
Data assimilation in models for coastal prevision

Exemples:
Prediction of the surface temperatures and chlorophyll a fields in the bay of Biscay and around Brittany for 30 August 2011
MV Armorique transects realized between Roscoff and Plymouth from 28 May 2010 and end of October 2010

Total of 233 transects for the first year deployment in 2010
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Exemple: 9th July 2010 transect

Data Acquisition:
Acquisition frequency = 1 minute
Transect duration = about 6h
Number of measurements = 360 for each transect
Transect frequency = 2 daily transects

Results:
- Observation of frontal systems in the northern and southern parts of the Western Channel
- Maximums of fluorescence associated to phytoplankton in the center of the Western Channel corresponding to temperature gradients
- Maximums in dissolved oxygen associated to maximums in fluorescence
Temperature maximums observed in early July and in August interrupted by a strong storm.
Regular increase in salinity beginning first in the southern side of the Western Channel and extending progressively towards the center of the Channel.
Permanent presence of low salinity waters off Plymouth.
Fluorescence maximum in early July (bloom of the dinoflagellate Karenia mikimotoi) associated to the temperature maximum.

Maximum of concentrations in dissolved oxygen associated to the fluorescence maximum.
- Observation of warm waters in the center of the Western Channel and of frontal systems delimiting stratified and well-mixed waters,
- of a maximum of chlorophyll associated to the frontal systems (development of a *Karenia mikimotoi* bloom)
- Complementarity of satellite imagery and continuous surface measurements by ferrybox systems
Access to the daily variability with High Frequency measurements. Maximum in fluorescence well correlated with high concentrations in CDOM and dissolved oxygen.
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Examples of spatial coverage obtained during four consecutive weeks in April 2011

Most important heating observed in the southern part of the bay of Biscay and in the Celtic Sea
Examples of results obtained in April 2011 along the line from Portsmouth to Santander:

- General increase of temperatures along the section during April.
- Low salinity values at 48°N.
- Observation of numerous peaks of fluorescence with maximum values observed in the bay of Biscay.
Minimum of salinity observed at 48°N in the Iroise Sea derived from the Loire river outputs

Mean river discharge < 450 m³/s, 3 times lower than mean April river discharge
Sea Surface Salinity in the Western Channel (1-6 April 2011)

Presence of relatively low salinity waters off the west and north coast of Brittany:

Data from the different sections will give access to the spatial extension of the Loire river influence.
Summary

- Observation of a bloom of the dinoflagellate *Karenia mikimotoi* in the Western Channel in July 2011 associated with high oxygen values

- Interruption of the phytoplankton bloom by a strong storm

- Regular increase of the salinity in the southern part of the Western Channel extending progressively northward to the center of the Western Channel

- Spatial coverage by different lines will give access to a better definition of the spatial extension of the low salinity waters originating from the Loire river in the Western Channel
Thank you