

# Fixed platforms in France

## MAREL systems:

An automated system  
for high frequency monitoring  
of coastal waters

## CONTENT OF THE PRESENTATION

- 1) Introduction,
- 2) Main functionalities of the Marel system,
- 3) Major realisations,
- 4) Measured parameters
- 5) Operational organisation,
- 6) Data collecting management,
- 7) Examples of collected data,
- 8) Marel local network in France,
- 9) Maintenance,
- 10) Energy,
- 11) Additional sensors

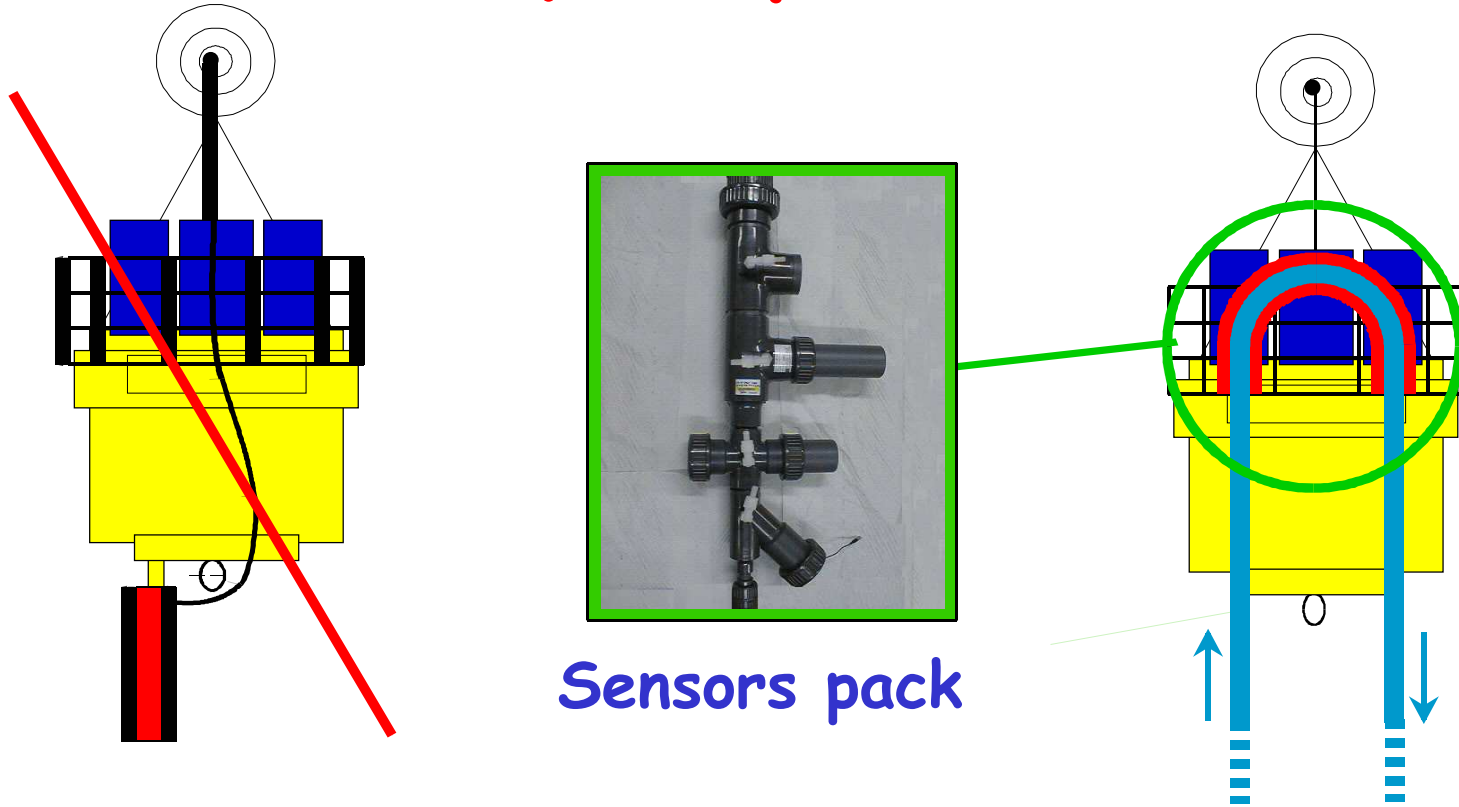
## -1-INTRODUCTION

- Ten years of high frequency data collection,
- Large panel of locations,
- Large number of measured parameters,
- Experience of operational maintenance,
- Continuous development of new systems.

## -2a- MAREL: main functionalities

- Adjustable high frequency data logging,
- "IN SITU" sensors,
- Measurements of main water characteristics,
- Sensors protection against biofouling,
- Maintenance period of sensors over 3 months,
- Remote-control capabilities,
- Auto-control of the measuring platforms,
- Measurements under quality assurance,
- Modularity towards integration additional sensors,
- Daily data transfer by GSM.

## -2b- MAREL: main functionalities

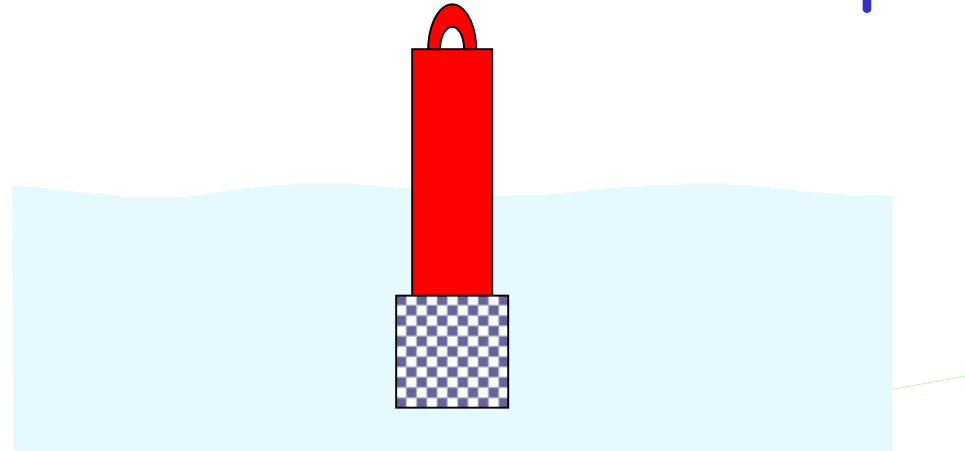


Sensors pack

- Pumping system and production of chlorine ensure a full control of measuring conditions,

## -2c- MAREL: main functionalities

Sensors pack



- OR Local in situ production of chlorine ensure a full control of measuring conditions,

## -3b- MAREL Sites

Marel-Carnot (Boulogne/mer)

Network : Marel baie de Seine

MAREL Estran MOREST : Baie des Veys

MAREL ARGENTON : SILO & SAPHYRE

Marel-Iroise (Brest)

MAREL Estran MOREST : Fort Espagnol

MAREL Vilaine

MAREL Estran MOREST : Perquis

Network : Marel-Gironde

- PAUILLAC
- BORDEAUX
- LIBOURNE
- PORTETS



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# -3b- MAJOR REALISATIONS

Various locations  
means  
Adapted solutions



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## -3c- MAJOR REALISATIONS

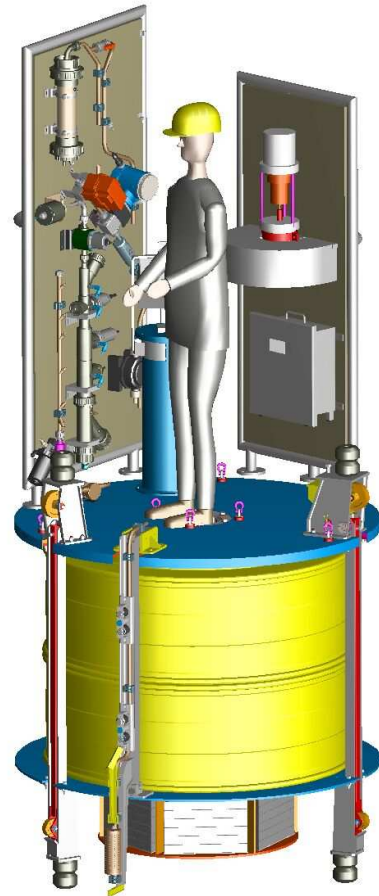
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## -3d- MAJOR REALISATIONS

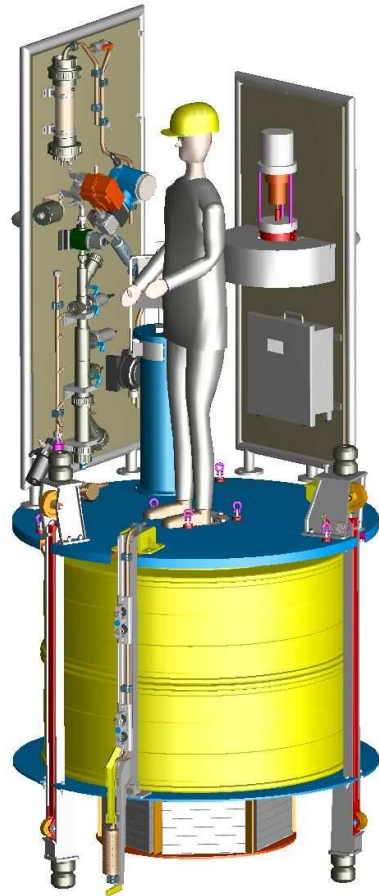
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## -3e- MAJOR REALISATIONS

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# -3f- MAJOR REALISATIONS



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## Estuarine Platform

*Fixed platforms Marel: an automated*

## -3g- MAJOR REALISATIONS

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## -3h- MAJOR REALISATIONS

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## -3i- MAJOR REALISATIONS



Antenna

Lifting fit

Buoyancy (80 liters)

Probe, electronics, power

Sensors

### MAREL SMATCH BUOY

Cheap and light

Easy to deploy or to move

Easy to maintain

# -3i- MAJOR REALISATIONS

## SYVEL (SYstème de Veille dans l'Estuaire de la Loire)

Mise en service : février 2007



- Paramètres mesurés**
- conductivité (salinité)
  - turbidité (MES)
  - oxygène dissous
  - température

- Fréquence d'acquisition**
- demi-horaire
  - horaire pour Cordemais

Rencontre autour du bouchon vaseux - 9 décembre 2010



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## -4a- MEASURED PARAMETERS

<i>PHYSICO-CHIMICAL PARAMETERS</i>		
<i>Parameters</i>	<i>Range</i>	<i>Accuracy</i>
<i>Water temperature</i>	<i>-5 to +30°C</i>	<i>0,1 °C</i>
<i>Conductivity</i>	<i>0 to 70 mS/cm</i>	<i>0,3 mS/cm</i>
<i>Dissolved Oxygen</i>	<i>0 to 20 mg/l</i>	<i>0,2 mg/l</i>
<i>pH</i>	<i>6,5 to 8,5 upH</i>	<i>0,2 upH</i>
<i>Turbidity</i>	<i>0 to 4000 NTU</i>	<i>10 %</i>
<i>Chlorophyll</i>	<i>0 to 50 FFU</i>	<i>10 %</i>

## -4b- MEASURED PARAMETERS

<i>METEOROLOGICAL PARAMETERS</i>		
Parameters	Range	Accuracy
Air temperature	-20 to + 30°C	0,1 °C
Air pressure	900 to 1100 Hpa	0,3 Hpa
P.A.R.	0 to 3000 $\mu$ mol/s/m <sup>2</sup>	10 $\mu$ mol/s/m <sup>2</sup>
Hygrometry	0 to 100%	2%
Wind Speed	0 to 40 m/s	1 m/s
Wind Direction	0 to 360°	10 °

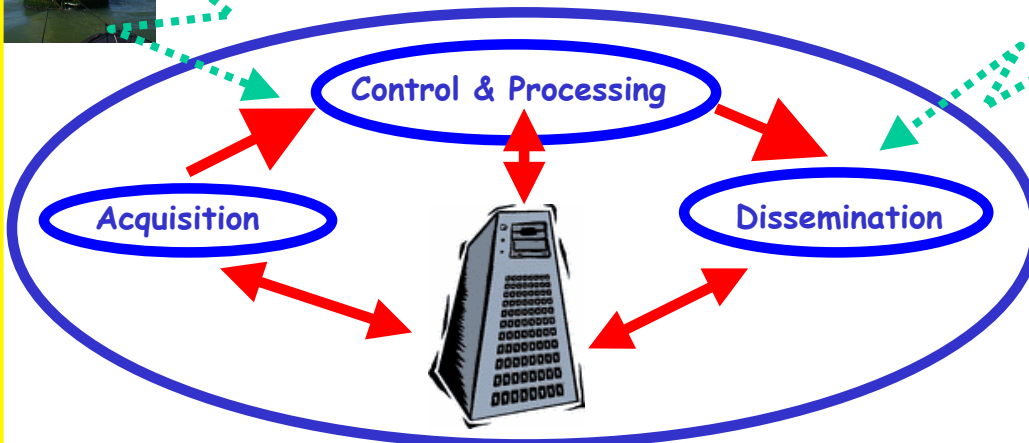
<i>ADDITIONAL PARAMETERS</i>		
Parameters	Range	Accuracy
Nitrates	0,1 to 100 $\mu$ mol/l	5 %
Silicates	0,1 to 100 $\mu$ mol/l	5 %
Ammonium	0,1 to 100 $\mu$ mol/l	5 %
p CO <sub>2</sub>	200 to 1000 $\mu$ atm	1 atm

## -5- OPERATIONAL ORGANISATION

- 1) Necessity of “on site” maintenance,
  - Networks supervision,
  - “In Situ” preventive operation,
  - Operational team: breakdown service
- 2) Metrology under Quality Assurance:
  - Sensors calibration,
  - Sensors and devices follow-up...
- 3) Network Database constitution
- 4) An industrial partner: NKE - France

# -6a- DATA TRANSMISSION

## Marel Local Network



Network supervision  
Data logging and computing  
Data control



# -6b- Data quality control software

Possibility of zooming a subset of observations

Superposition of different processing levels

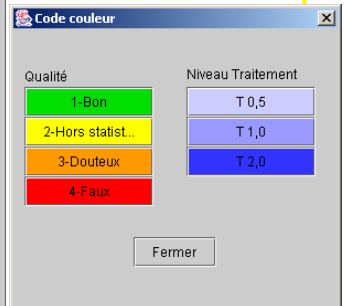
Moving the time window

Numerical information about a targeted point of the plot

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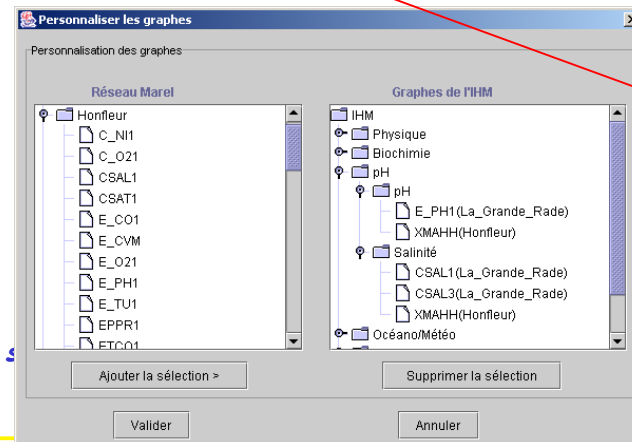
Tide signal



data points are colored according to the level of processing and the quality flag

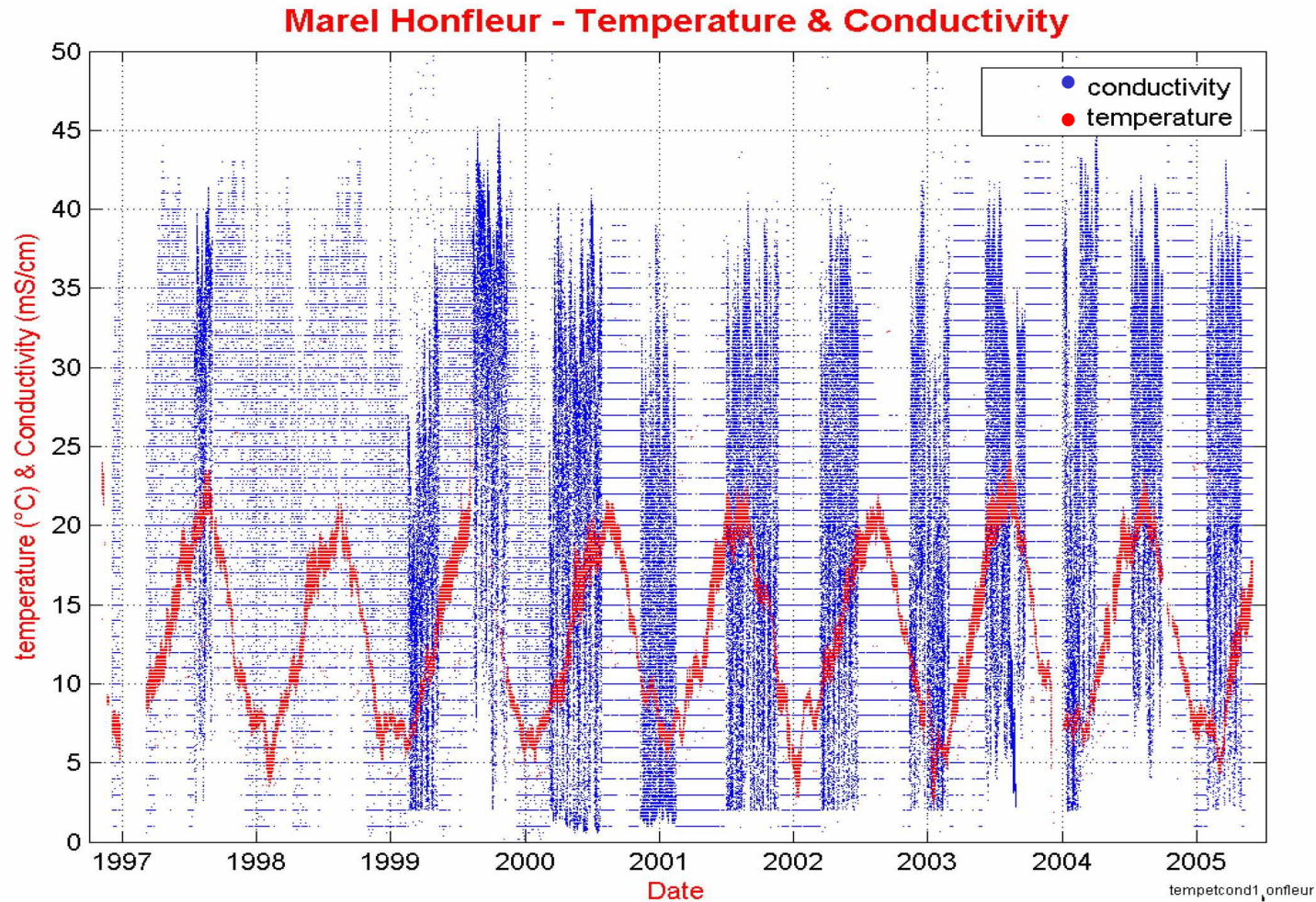
Zoom function on the time axis

Possibility to add or delete a time series  
water  
21/28



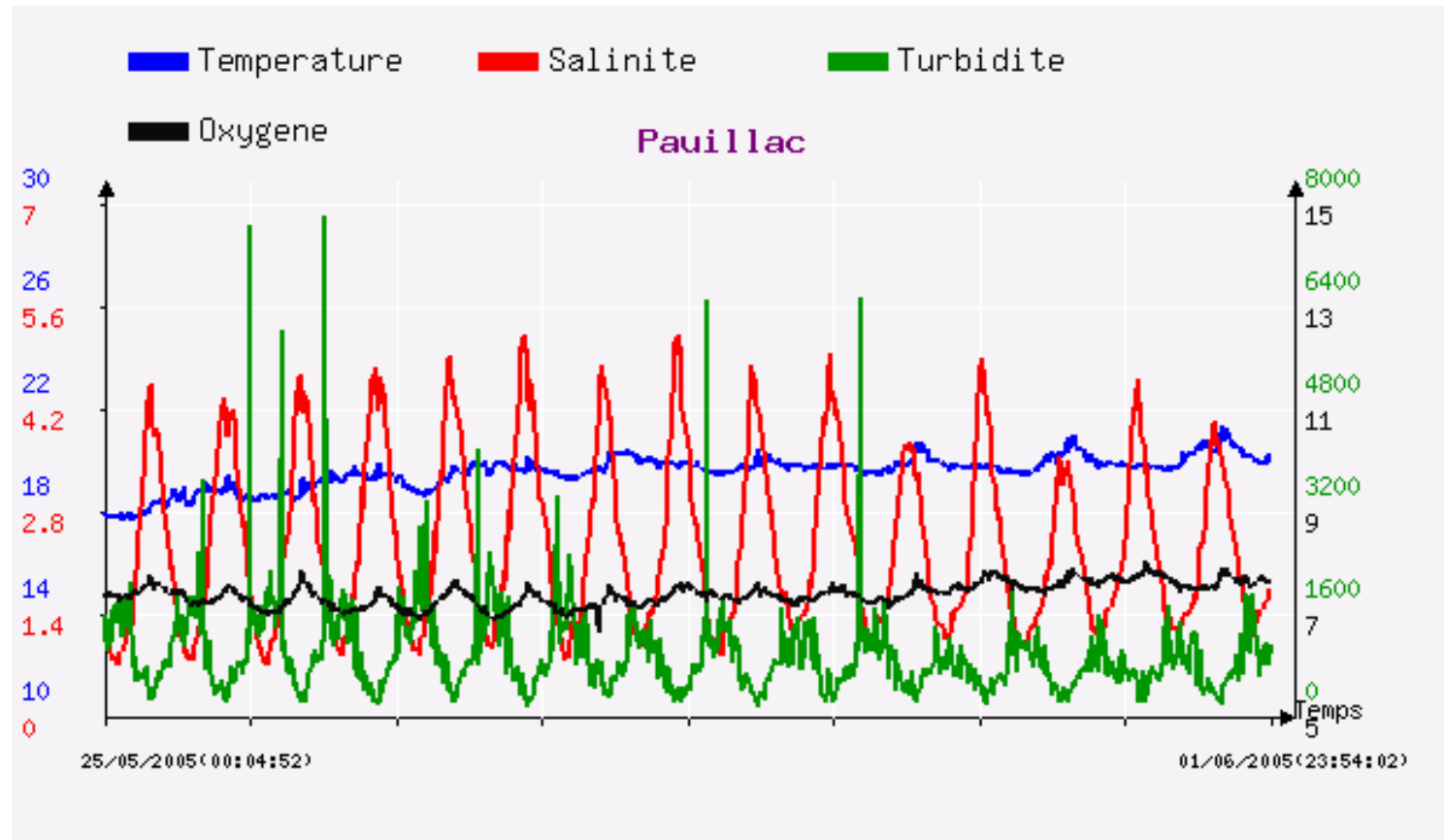
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# -7b- EXAMPLE OF LONG TERM SERIES Marel-Honfleur France: 1997-2005



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## -7c- EXAMPLE OF HIGH FREQUENCY CAPABILITIES PAUILLAC France (Gironde network)



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## -8- DATA DIFFUSION ON THE WEB

- Various profiles for connection and access: public, scientist, technical, owner
- Data visualization,
- Data downloading,
- Metrology reports consulting,
- Raw data accessibility,
- Maintenance logging & management,
- ...



## -9- Maintenance and accessibility

- Systems at sea: limited accessibility:
  - ✓ weather, boat, crews...
- Floating support must adapted to maintenance
  - ✓ design, cost...
- Limitation of travel at sea (3 months),
- Tele-maintenance

## -10- Energy

- Central point for all autonomous system:
  - ✓ all devices must be chosen for this point...
- Dimensional point for all systems
  - ✓ size of buoys...
- Many possible solutions, limited adapted solution
  - ✓ wind mills, solar energy...
- Limiting point for adding more sensors...

## -11- Additional sensors

- Today platform: adaptability:
  - ✓ evolution, new sensors
- Necessity of “open central unit”
  - ✓ connection of unknown sensors (project beginning),
  - ✓ communication and energy must be adapted,
  - ✓ data management also must be “flexible”
  - ✓ integration must be anticipated

## -12- Standards

### ➤ Standards:

- ✓ Conception,
- ✓ Maintenance principles,
- ✓ Metrology, Data managements, Data owners  
(possibility of confidential data)
- ✓ Communication solutions,
- ✓ Energy sources,
- ✓ Sensors connection...