



JOINT EUROPEAN RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL OBSERVATORIES

## 2<sup>nd</sup> General Assembly – NIVA HQ

*Coastal sub-sea observatories. OBSEA*

Dr. Joaquín del Río | Universitat Politècnica de Catalunya | [joaquin.del.rio@upc.edu](mailto:joaquin.del.rio@upc.edu)

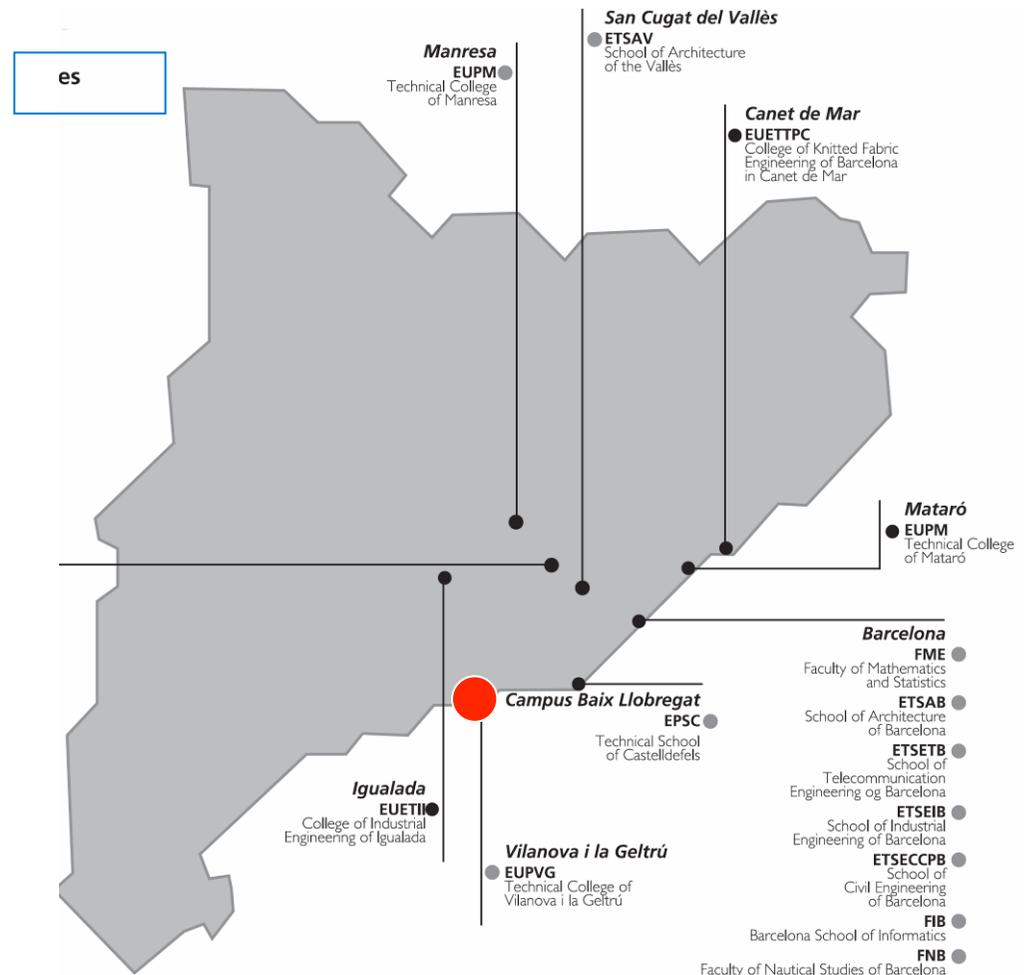
# OUTLINE

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- UPC, SARTI research group and related activities
- Expandable Seafloor Observatory: OBSEA
- OBSEA Related Projects
- Proposals to be included in Jerico NEXT

# The Technical University of Catalonia (UPC)



Localization: **Barcelona – Spain**

Schools: **23**

Departments: **40**

Campus: **7**

Students: **40000**

Lectures & researcher: **2642**

Research Institutes: **3**

## SARTI Research group: members

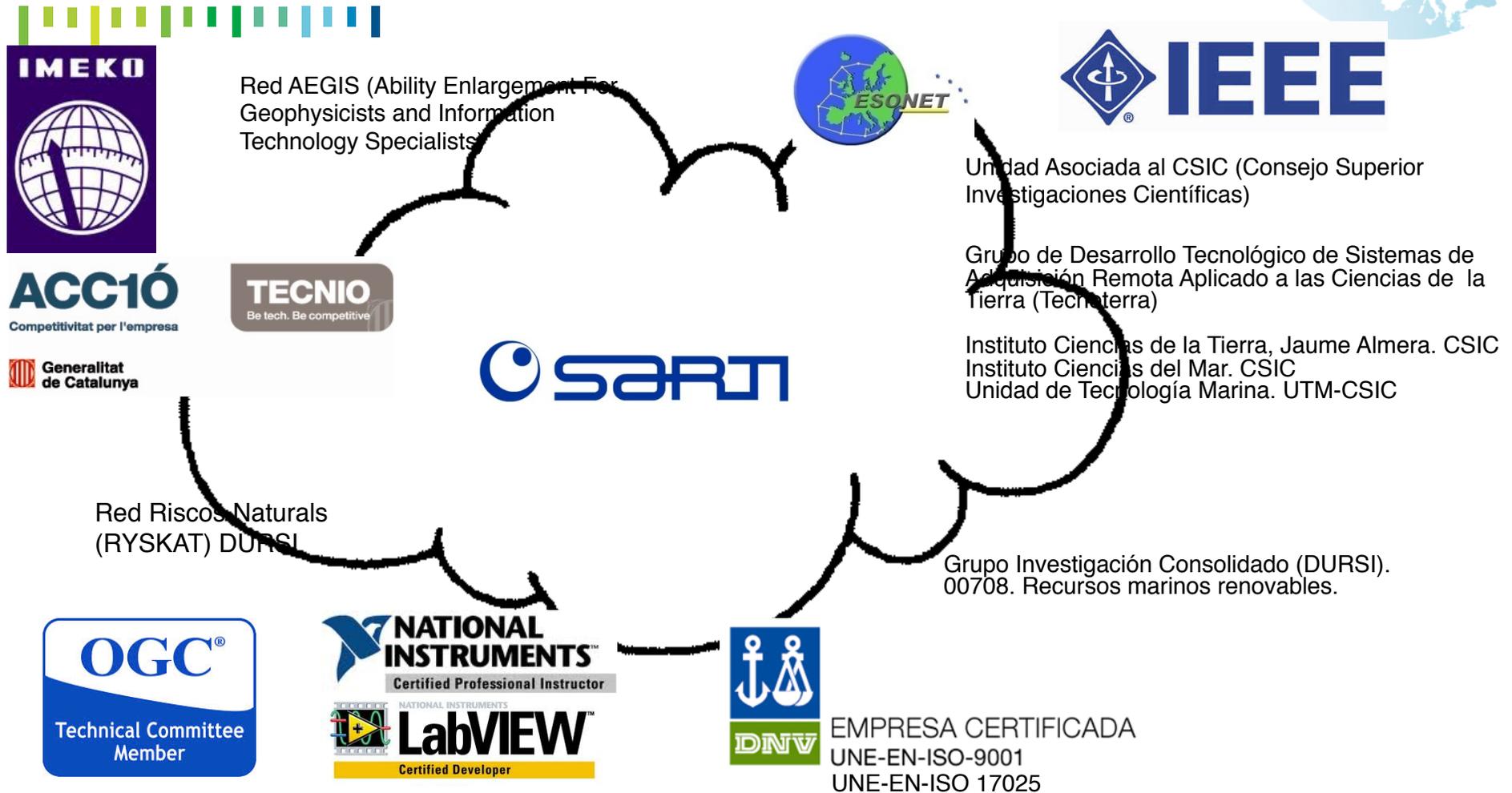


- Artero Delgado, Carla
- Bghiel, Ikram
- Cadena Muñoz, Javier
- Carreras Pons, Normandino
- del Río Fernández, Joaquín
- Garcia Benadí, Albert
- Hidalgo Castro, Alberto
- Mànuel Làzaro, Antoni
- Nogueras Cervera, Marc
- Santamaria Català, Josep
- Sarrià Gandul, David
- Toma, Daniel Mihai
- Vidal Oliveras, Neus
- Spartacus Gomariz
- Rafael Ramos
- Mariano Lopez
- Oriol Pallares
- Ivan Masmitja

- Tècnic d'aplicacions hardware
- Becaris i Doctorands
- Tècnic d'aplicacions hardware
- Becaris i Doctorands
- Cap de projectes electrònics, PDI
- Tècnic d'aplicacions hardware
- Tècnic d'aplicacions informàtiques
- Director, PDI
- Cap de projectes electrònics
- Responsable de qualitat
- Tècnic d'aplicacions hardware
- Becaris i Doctorands
- Cap de formació
- PDI
- PDI
- PDI
- Tècnic
- Tecnic



# SARTI membership





# Projects with companies



-AKO, Alstom, Applus, Ecotecnia, Generalitat de Catalunya, Consell regulador del Cava, CSIC, Diputació de BCN, SIMON, FireVision, Gervall, General Cable, GNE, Gallina Blanca, Iberco, Idiada, KUKA, Itene, Insituto Astrofísico de Canarias, Legrand, Pysmian...





## Related activities

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<http://www.martech-workshop.org>

MARTECH, INTERNATIONAL WORKSHOP ON MARINE TECHNOLOGY

1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> took place in Vilanova I la Geltrú. Barcelona.

4<sup>th</sup> Edition, 2011: Universidad de Cadiz

5<sup>th</sup> Edition, 2013: Universidad de Girona





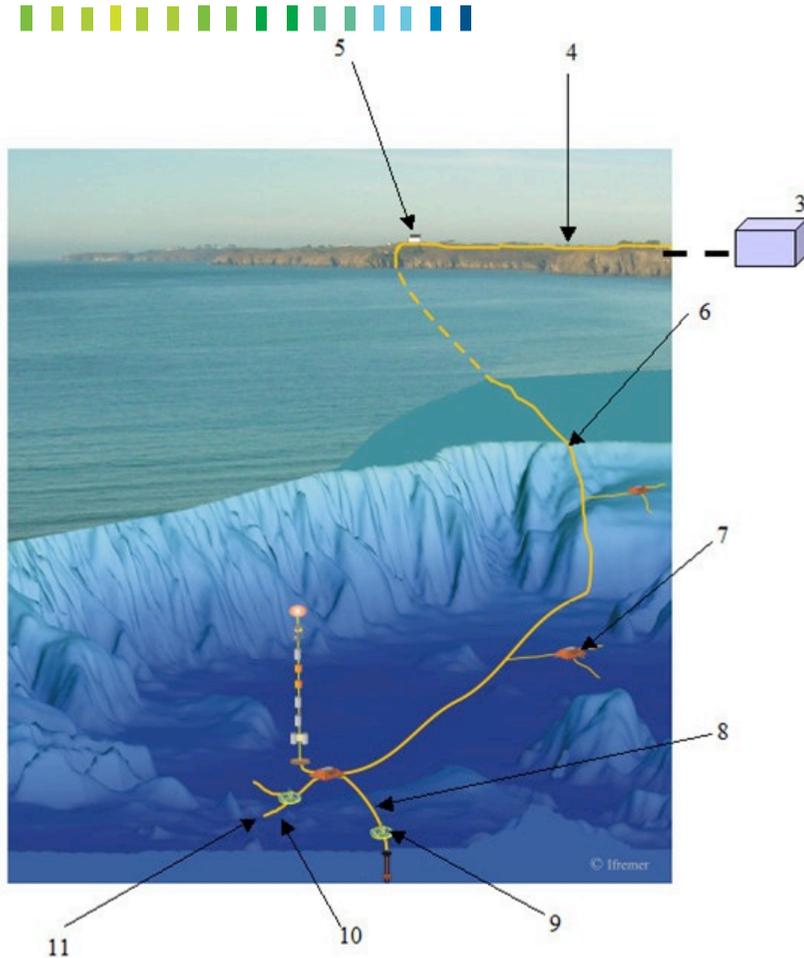
# Guanay II AUV



[www.cdsarti.org](http://www.cdsarti.org)

<http://www.youtube.com/watch?v=Nwd3k0J9uKM>

# Cabled Observatories



## Observatorios Submarinos Cableados

- Monterey Accelerated Research System (MARS), California, USA.
- Victoria Experimental Undersea System (VENUS), Canada.
- Neptune Canada Cabled Observatory (NEPTUNE), Canada.
- Aloha Observatory (ALOHA), Hawai.
- Astronomy with a Neutrino Telescope and Abyss environmental RESearch (ANTARES), Francia
- Dense Oceanfloor Network System for earthquake and Tsunamis (DONET), Japon.
- Neutrino Ettore Majorana Observatory, NEMO-SNI (NEMO), Italia.
- Marine e-Data Observatory Network (MEDON), Francia.
- Martha's Vineyard Coastal Observatory, (MARTA), Massachusetts, USA.
- Marine Cable Hosted Observatory (Hsu, S.-K. et al. 2007), Taiwan.
- New Millenium Observatory (MILLENIUM), Oregon, USA.
- Observatorio Submarino Expandible OBSEA, (Mànuel A. et al 2010), España.

## Leyenda

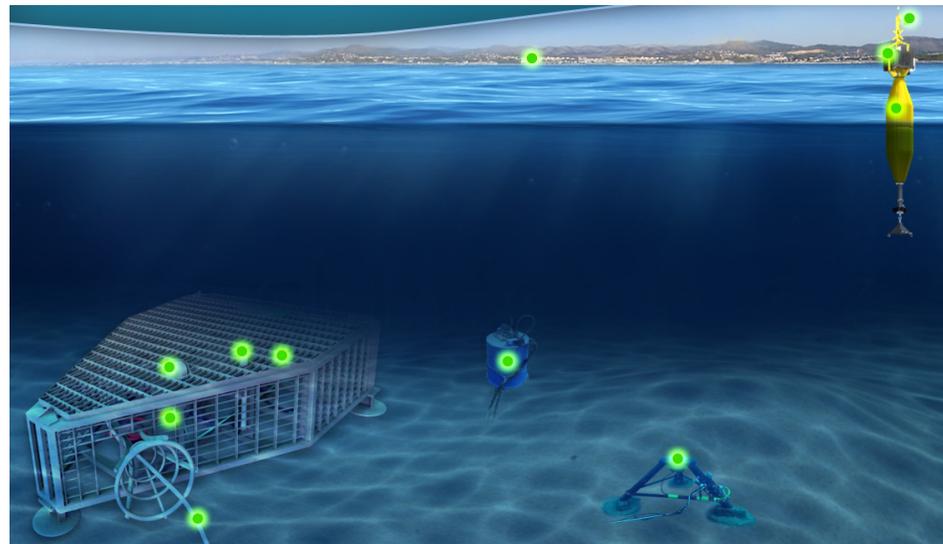
- 3 - Estación Terrestre
- 4 - Red terrestre
- 5 - Terminación de la Estación Terrestre. Inicio infraestructura submarina.
- 6 - Cable de comunicación y alimentación submarino
- 7 - Nodo o extensión de una ramificación del Cable de comunicaciones submarino
- 8 - Ramificación de la red
- 9 - Junction box (nodo de conexión)
- 10 - Enlace a un instrumento
- 11 - Instrumentos

Figura Cortesía de Ifremer, Instituto Francés de Investigación para la Explotación del Mar.

# OBSEA SCHEMA



- *Located in a Marine Protected area: Natura 2000*
- *20m depth, 4km offshore, 16 wetmate connectors for instrumentation (power, communications, synchronization)*
- *Operations by scuba divers and small boats.*
- *The infrastructure is offered under transnational access in FixO3 (TNA).*





## Observatory. OBSEA, UPC Test Site

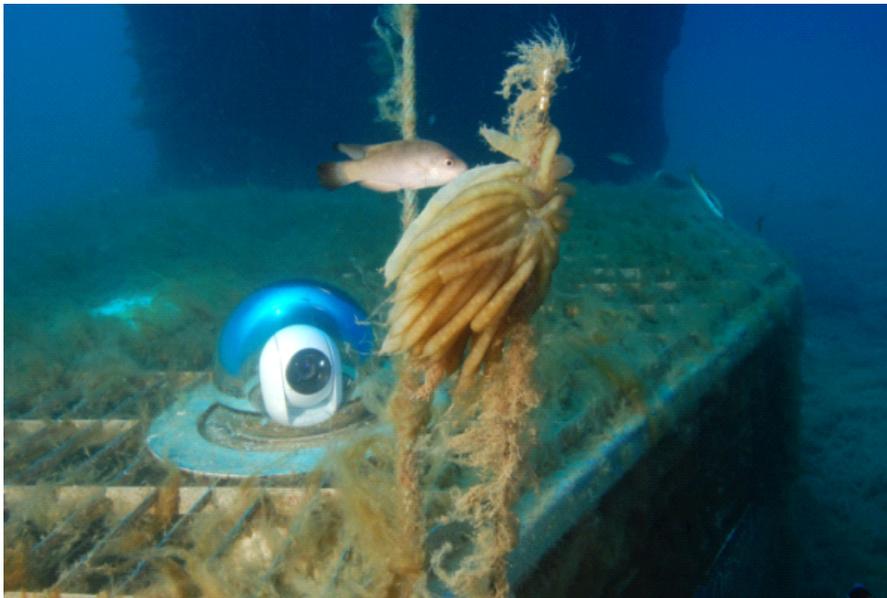


- *Possibility to deploy new instrumentation for testing: installation procedures, data communication, data management, performance, robustness, etc...*
- *Real-time access to data instrumentation.*
- *Present instruments: **Underwater:** CTD, seismometer, ADCP, hydrophone, pH (prototype based on ISFET sensor), video camera. **Surface buoy:** meteo station, video camera.*



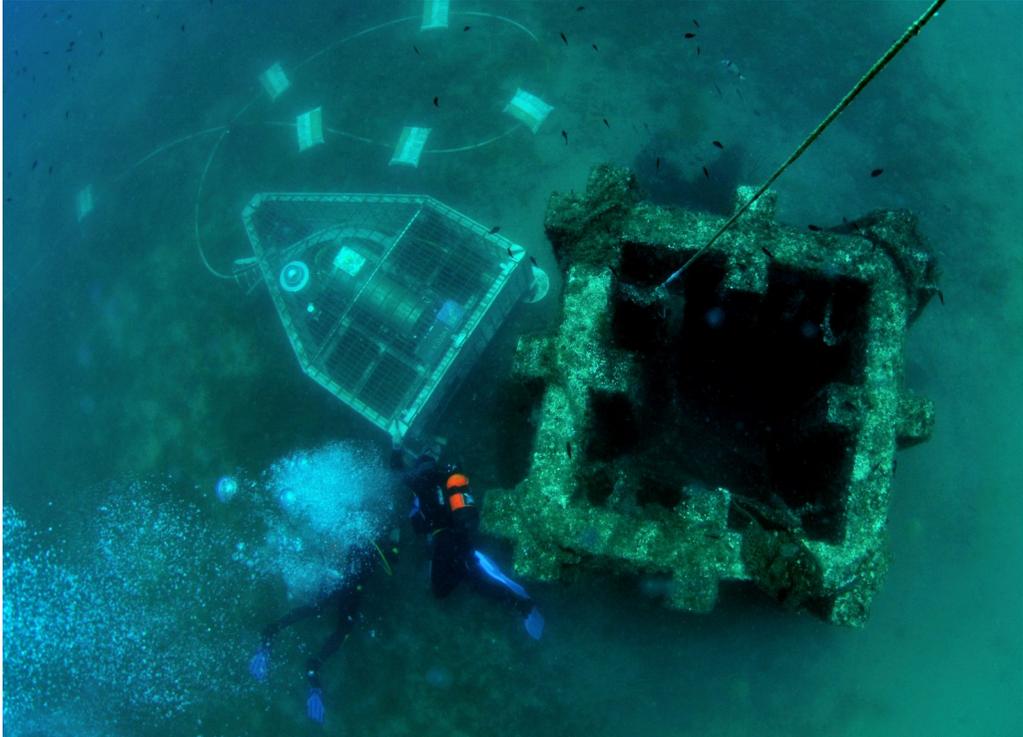


# Obsea photos

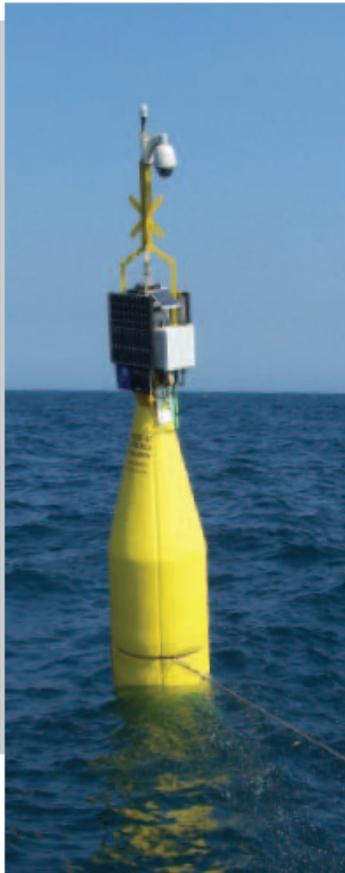


Aguzzi et al. 2011. Sensors 11: 5850-5872.

General Assembly 2 - JERICO - 12



# OBSEA BUOY



IP Camera: 704x576 pixels; 25 fps; 10x Optical Zoom

Solar panels: 4 x 20W

Weather station:

- Position, velocity and GPS time

- Speed and wind direction

- Pressure and temperature

- magnetic compass

- 3-axis accelerometer for Pitch and Roll angles

Buoy signalling light, self-powered:

- High efficiency yellow LED light

- Reach 3 nautical miles

Junction box

- Electronic Control

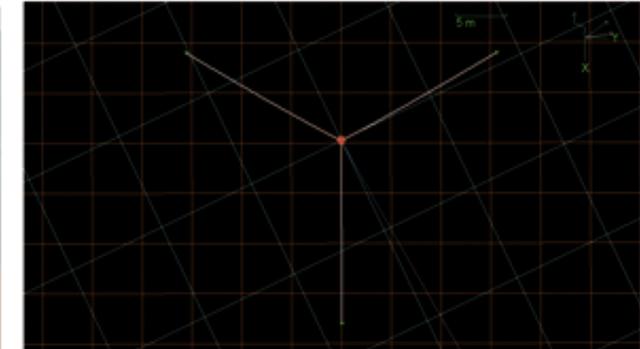
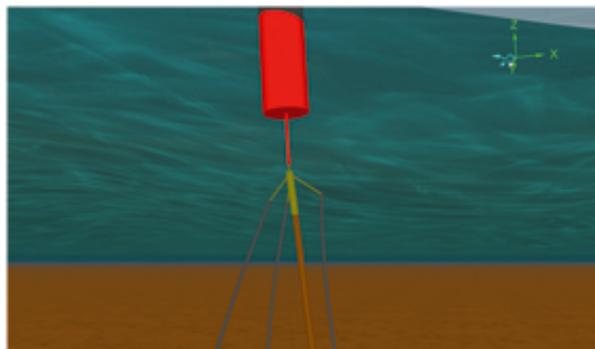
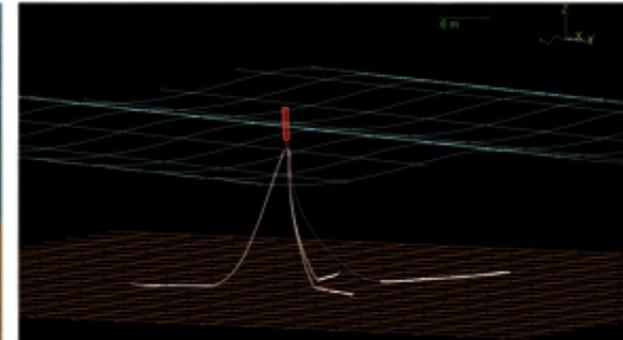
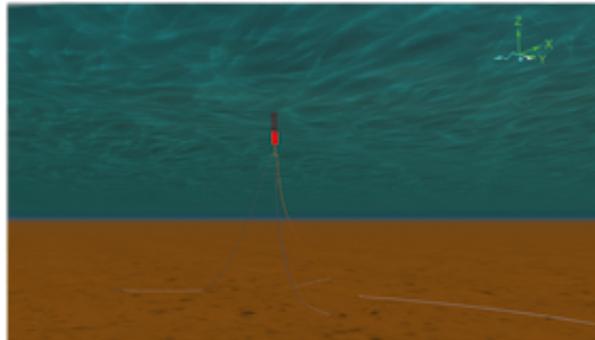
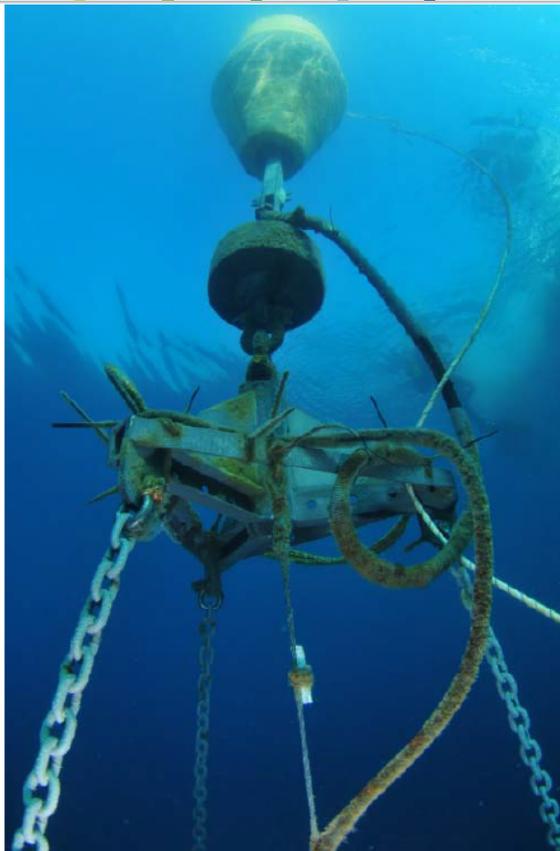
- 3G Modem Communication

Battery Box

- Battery: 12v & 65Ah

- Solar charge controller: 6A

# OBSEA BUOY



[Orcaflex Software. Orcina.](#)



## KEY POINTS FROM PREVIOUS PRESENTATIONS:

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*It was already mention that:*

*Monitoring of marine biodiversity is of increasing important: marine ecosystems and biodiversity*

*Data are needed for assessments.*

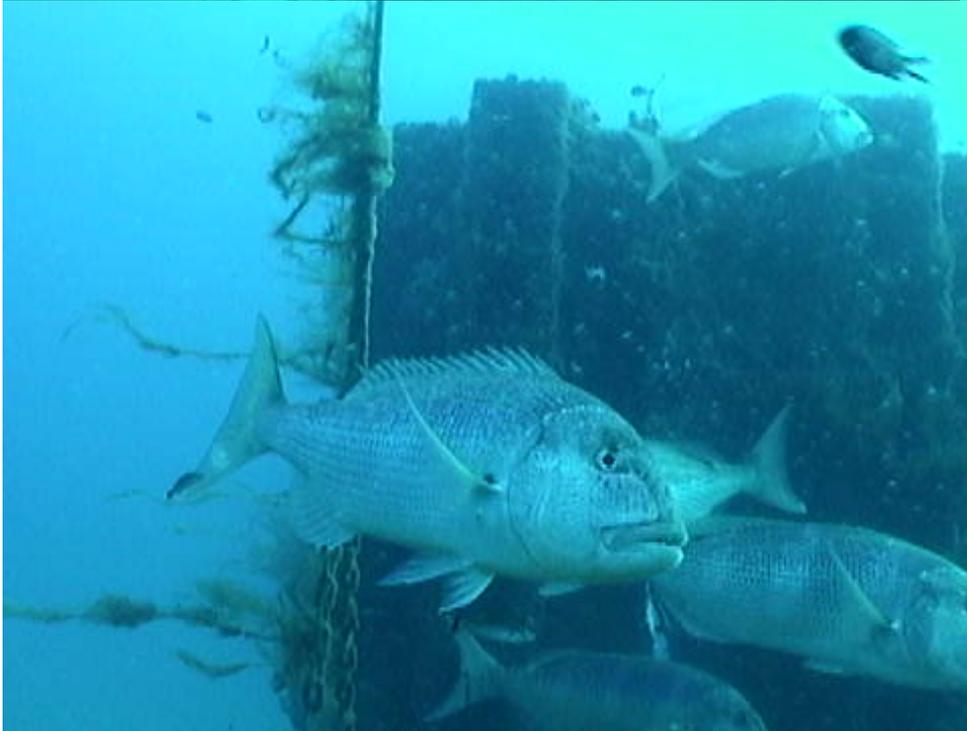
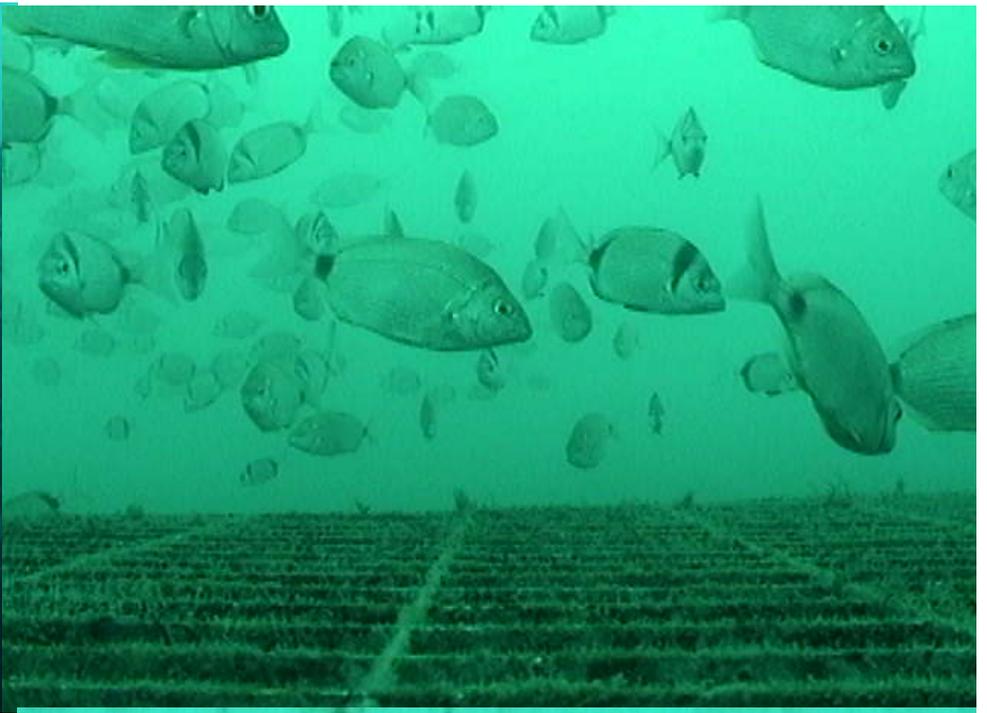
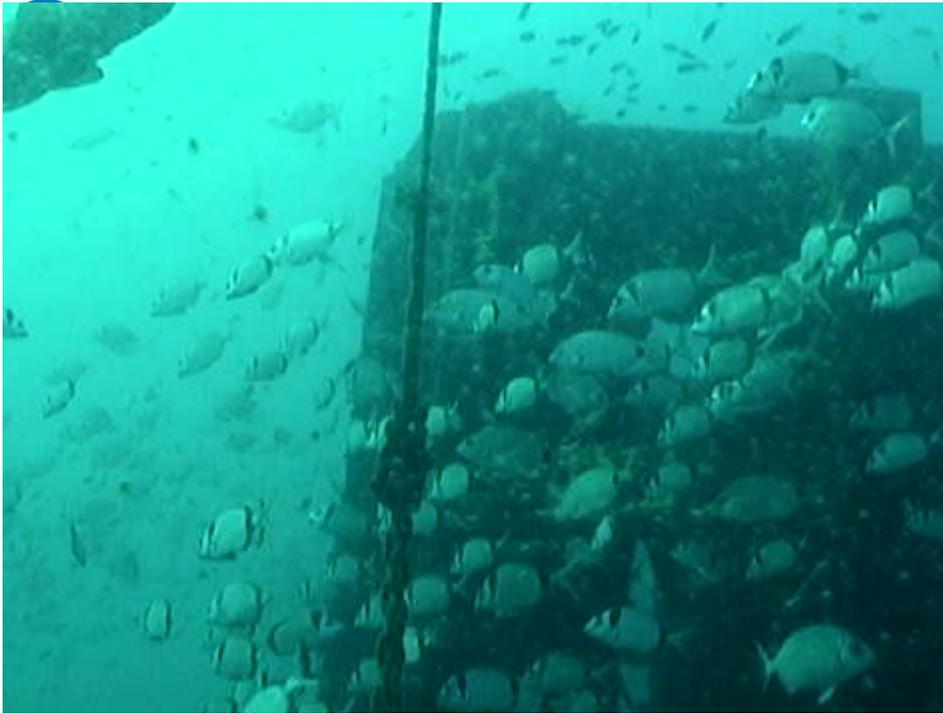
*Implementation of sensors indicative for biodiversity state in the foreseen Jerico observatory network*

*Biodiversity sensing is not straightforward:*

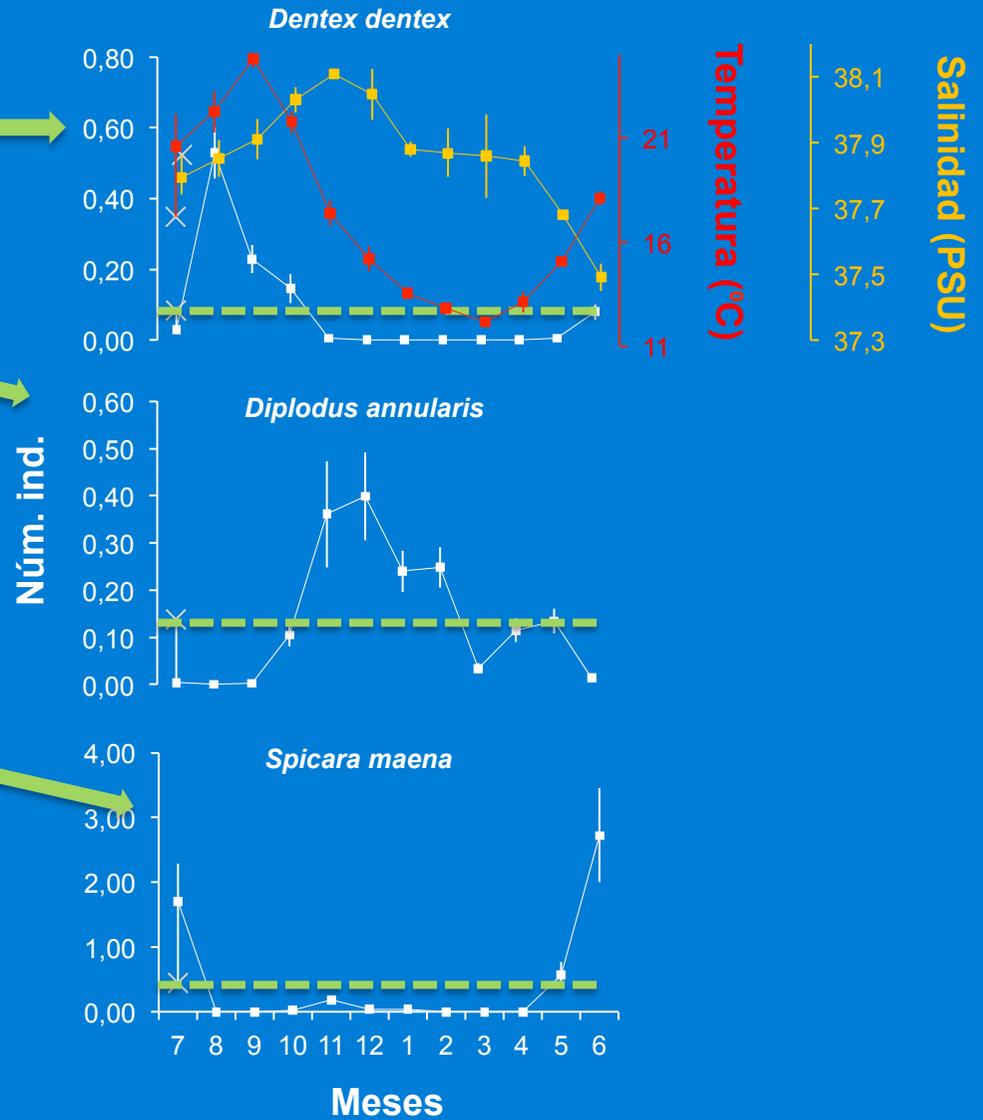
- *Image technologies, passive acoustics, active acoustics*
- *Sufficient temporal resolution*
- *Cost effective (multiparametric)*

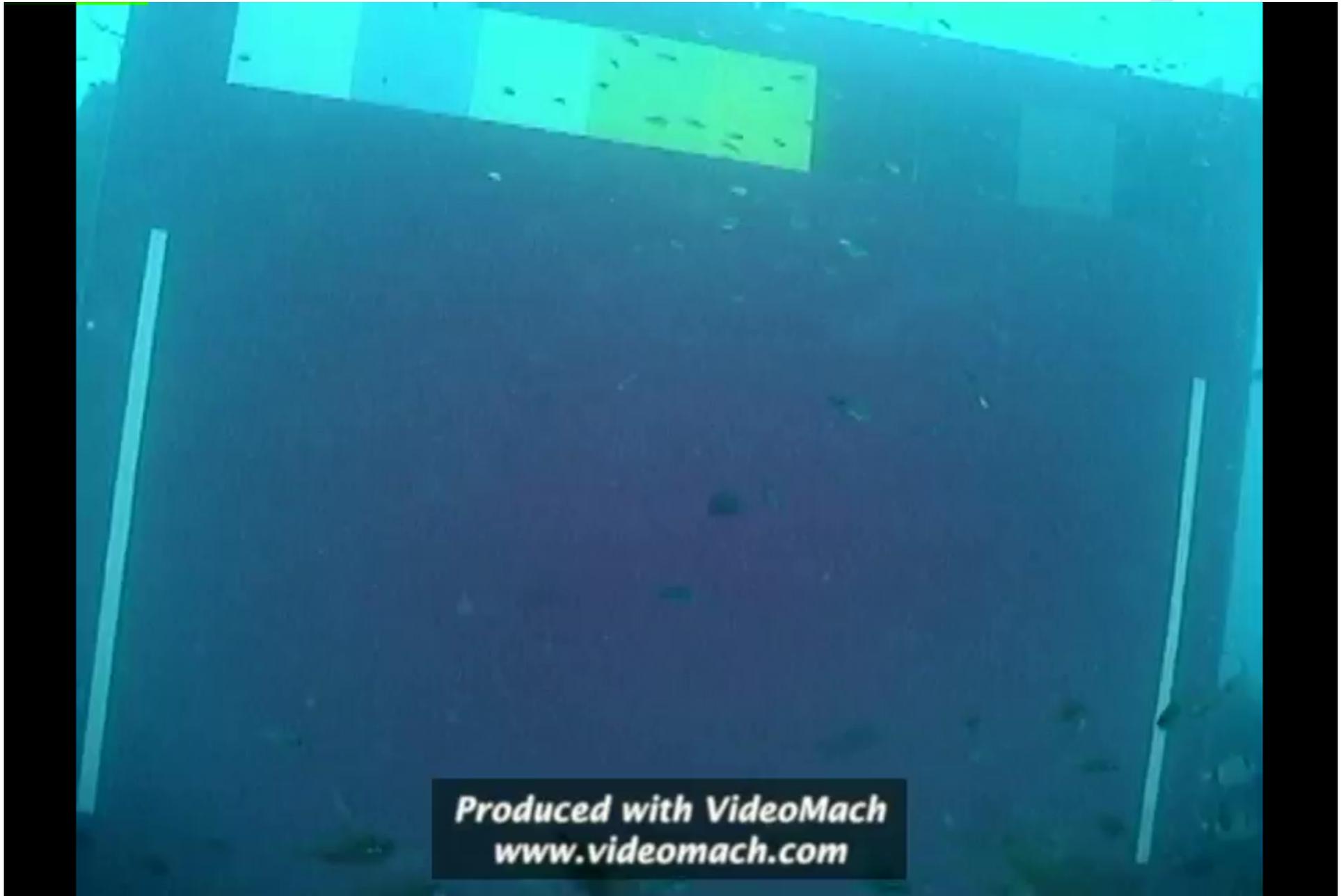
*In situ monitoring is essential: methodologies with potential to sense biodiversity: acoustic telemetry, **camera autodetection**, photo/video analyses, hydrophones.*

*Imaging technologies (camera autodetection, and photo-or video analyses):- high potential indicator value  
Applicable from variety of platforms (not all: power consumption and bandwidth are a constrain)*



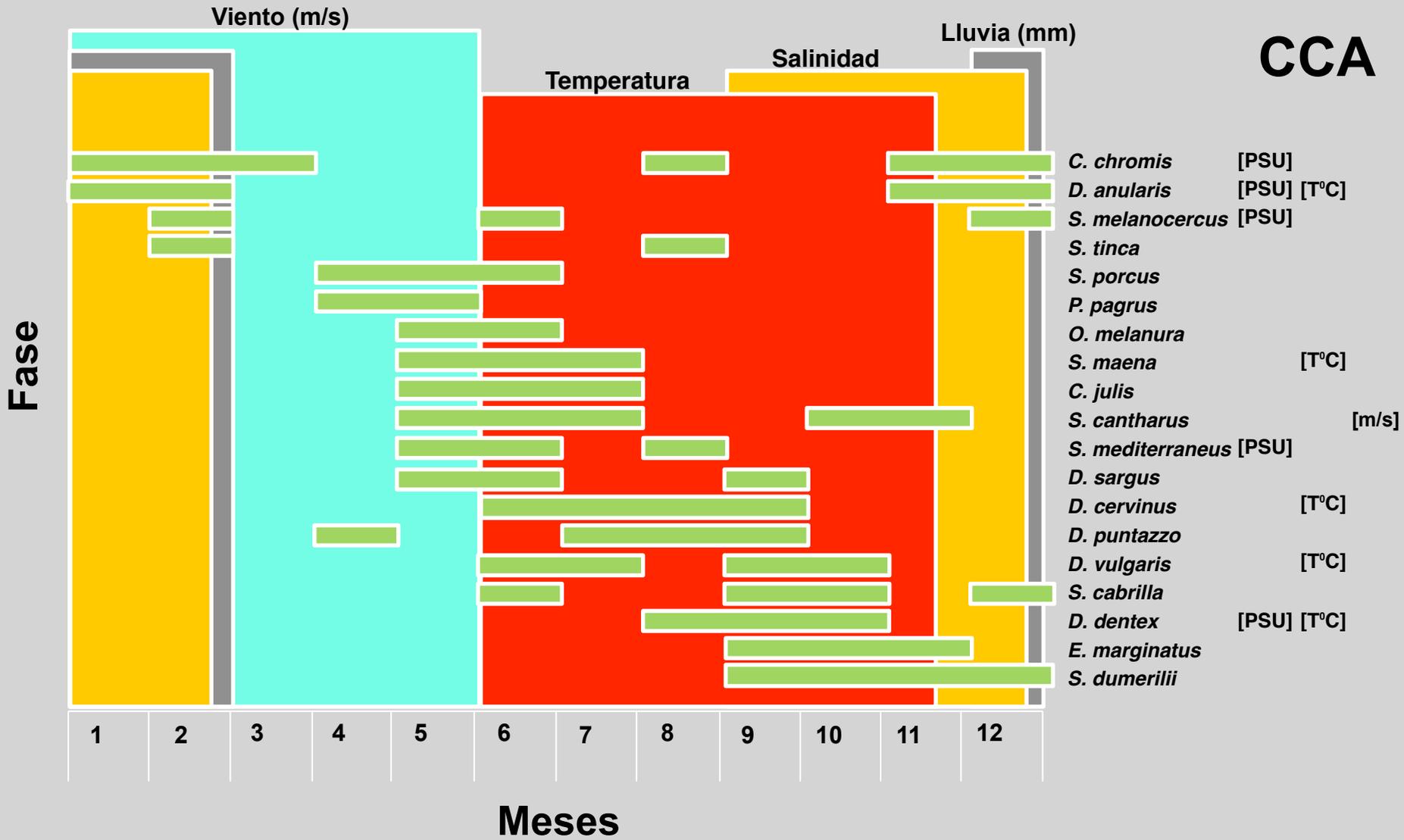
# Continuous monitoring over 12 months



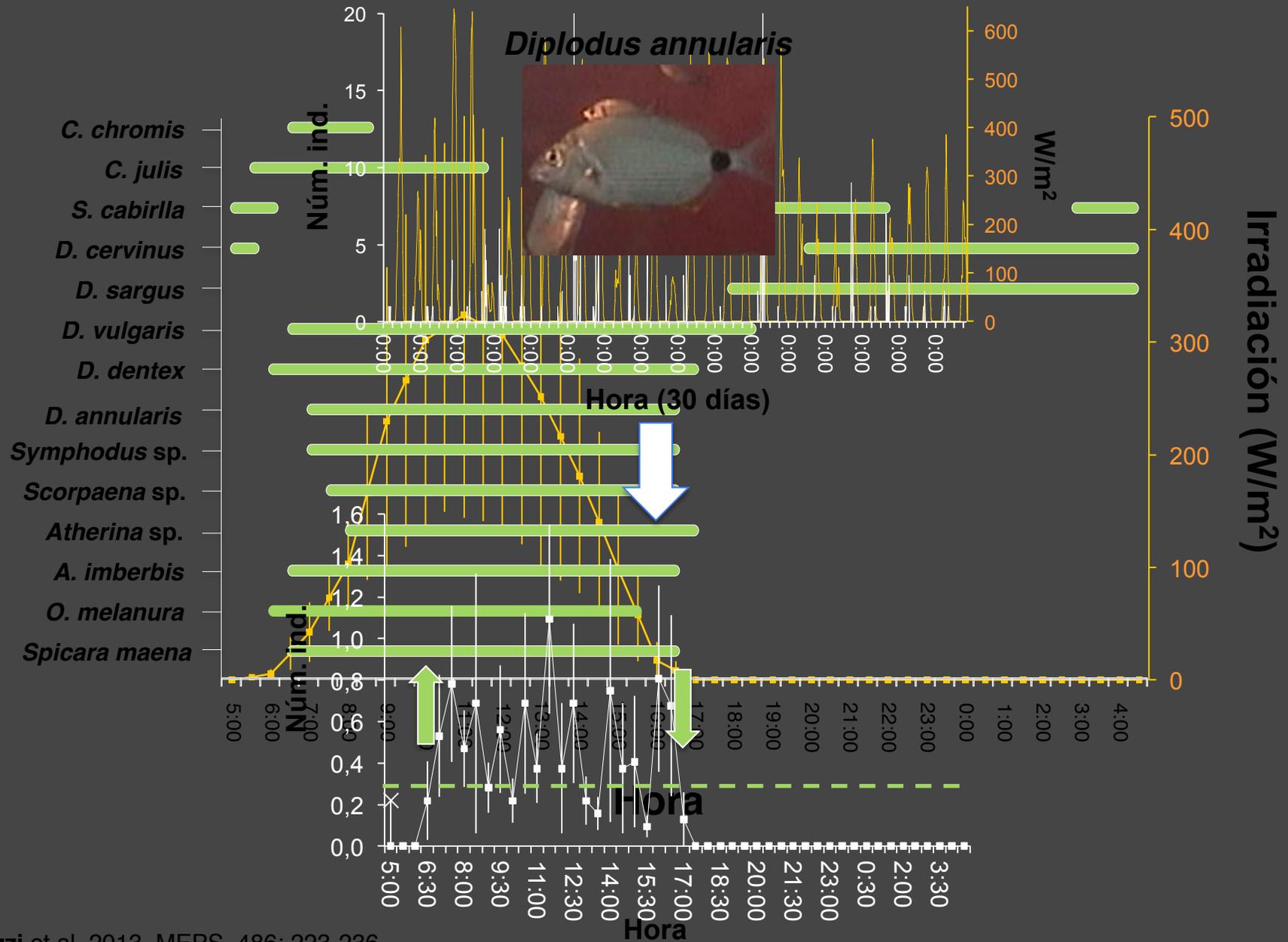


*Produced with VideoMach*  
[www.videomach.com](http://www.videomach.com)

# Seasonal rithms



# Seasonal rithms





# Citizen Science OBSEA Project: open to public

Produced by SARTI research group  
Universitat Politècnica de Catalunya  
Spain  
more info at: [www.obsea.es](http://www.obsea.es)





## JOURNALS: PAPERS PUBLISHED WITH OBSEA DATA

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### **Methods in Ecology and Evolution**

*Marine cabled video observatories for in situ ecological studies*

*Video observatories for fish ecological monitoring*

### **Marine Ecology**

*Diel activity rhythms in temperate rocky coastal fishes: insights from a cabled observatory video-monitoring*

### **Marine Biology**

Seasonal rhythm in a Mediterranean coastal fish community as monitored by a cabled observatory

### **Marine Biology**

Movement patterns of adult spiny lobster (*Palinurus mauritanicus*) and spider crab (*Maja squinado*) by acoustic tracking in an artificial reef

### **Sensors**

A New Colorimetrically-Calibrated Automated Video-Imaging Protocol for Day-Night Fish Counting at the OBSEA Coastal Cabled Observatory

### **Sensors**

A New Laboratory Radio Frequency Identification (RFID) System for Behavioural Tracking of Marine Organisms



## LAST CONFERENCES

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IEEE UNDERWATER TECHNOLOGIES 2013. UT13 JAPAN

Citizen Science and marine community monitoring by video-cabled observatories: the OBSEA Citizen Science Project. 978-1-4673-5948-1/13/\$31.00 ©2013 IEEE

The use of coastal cabled video-observatories to monitor seasonal changes in shallow water fish community. 978-1-4673-5948-1/13/\$31.00 ©2013 IEEE

MSFD D1: Biodiversity

**Data coming from the AWAC:**

*Monitoring sediment dynamics at the boundary between the coastal zone and the continental shelf: OCEANS 2011.*

*Breeze influence on waves and vertical current profile in the coastal area based on EOF analysis (Vilanova I la Geltrú, Barcelona). MARTECH 2013*



## SARTI: LIDO DATA PROVIDER. LAB Expertise in:



- Regulation and International Initiatives
- Biological Sensory Systems
- Passive Acoustic Monitoring**
- Modeling

Cabled observatories  
Offer unlimited power and  
Bandwidth:

Noise measurements (MSFD  
D11) and Mammals detection.

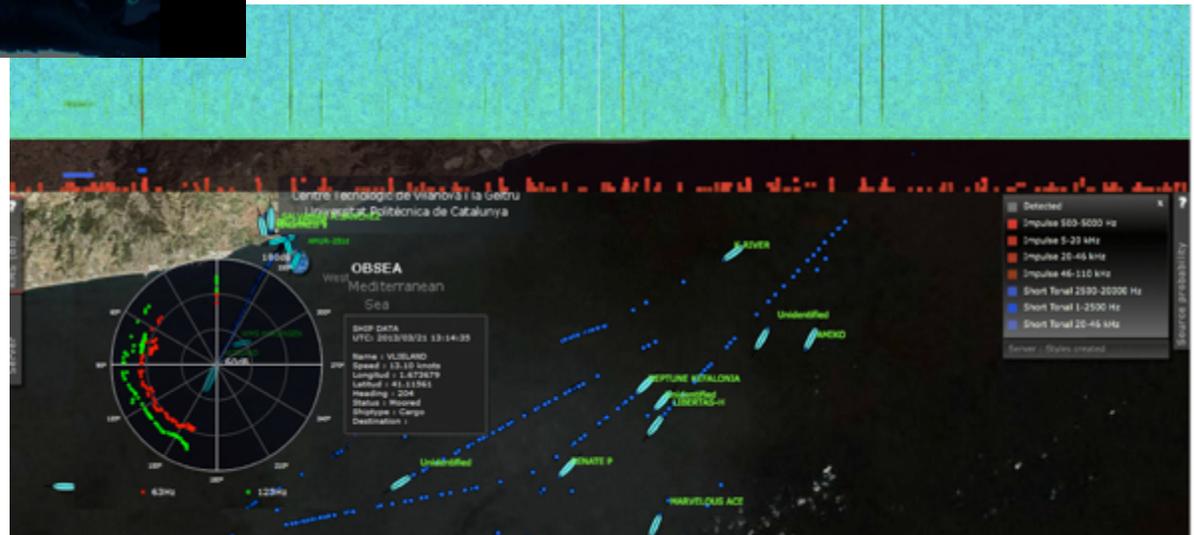
Country/Location	Platform	Data stream
FRANCE	ANTARES	36 x 250 kHz
NEPTUNE CANADA	Folger Passage	1 x 96 kHz
NEPTUNE CANADA	Barkley Canyon	1 x 96 kHz
NEPTUNE CANADA	Barkley Slope	1 x 96 kHz
SPAIN (MED SEA)	OBSEA	1 x 96 kHz
JAPAN (JAMSTEC)	Hatsushima	1 x 100 Hz
JAPAN (JAMSTEC)	Kushiro	3 x 100 Hz
ITALY (ESONET)	NEMO TSS/TSN	2x 4 x 96 kHz
SPAIN (ATLANTIC)	BIMEP	1 x 96 kHz
CTBTO	11 HA	11 x 200 Hz
IRELAND	Shannon Estuary	1 x 96 kHz



# listentothedeep.com (LAB UPC)

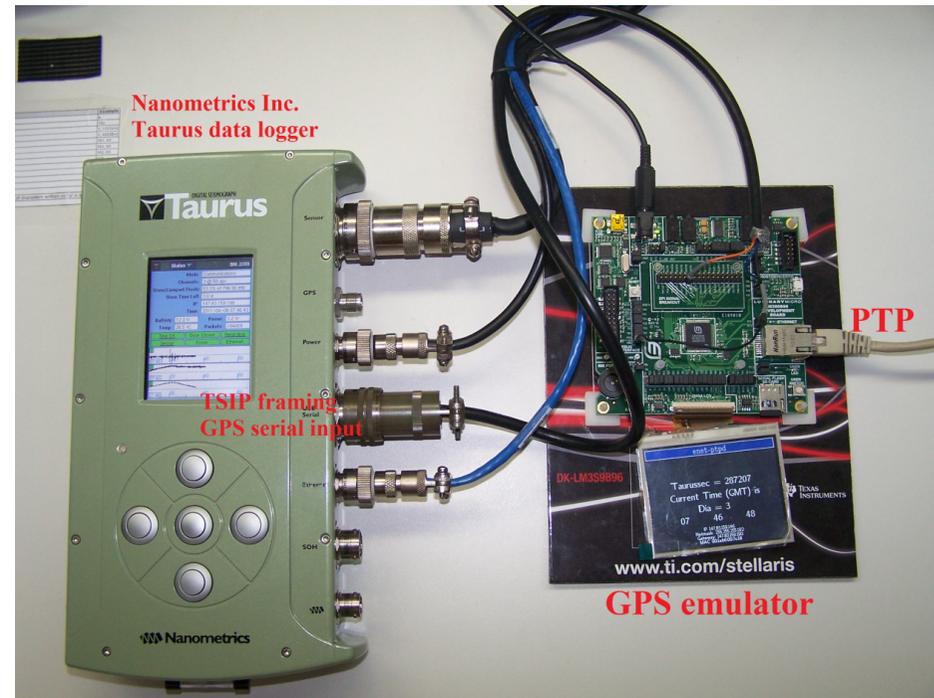
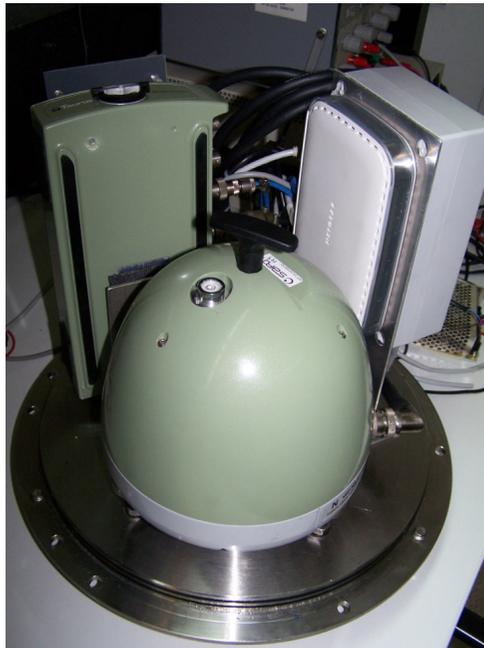


Obsea provides data Streaming to LIDO





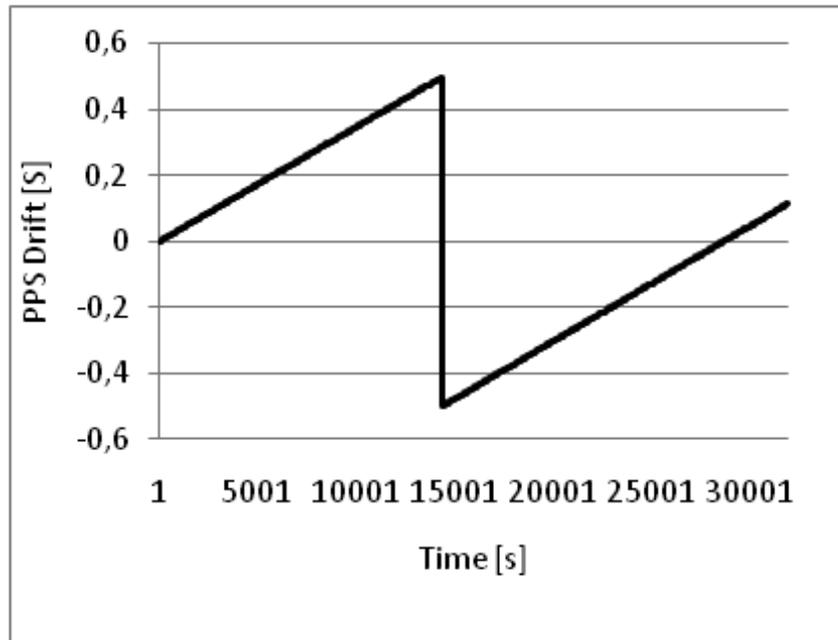
# OBSEA CABLED SEISMETER IS PART OF THE NATIONAL (IGN) AND REGIONAL (IGC) SEISMOMETER NETWORK



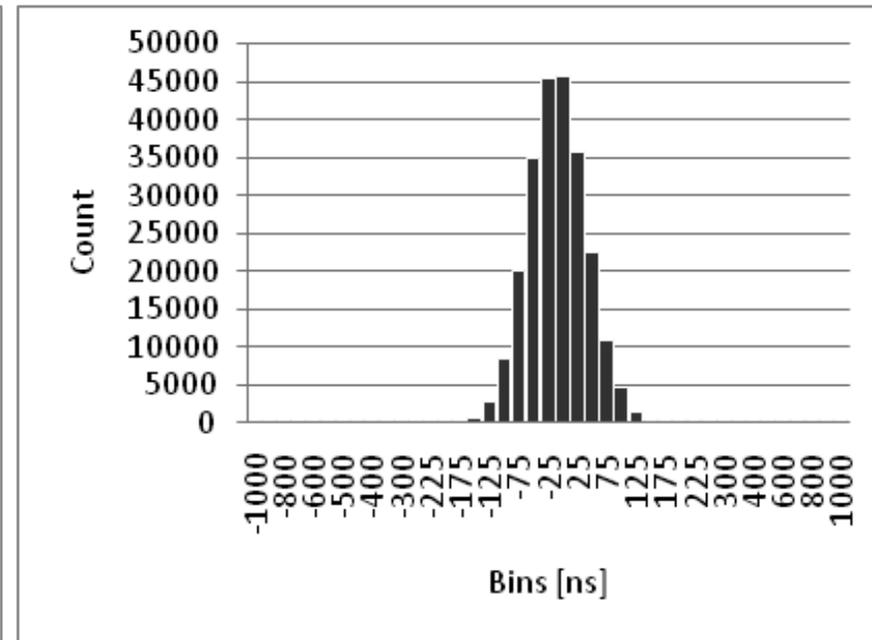
## OBSEA CABLED SEISMETER IS PART OF THE NATIONAL (IGN) AND REGIONAL (IGC) SEISMOMETER NETWORK



Clock drift without network synchronization



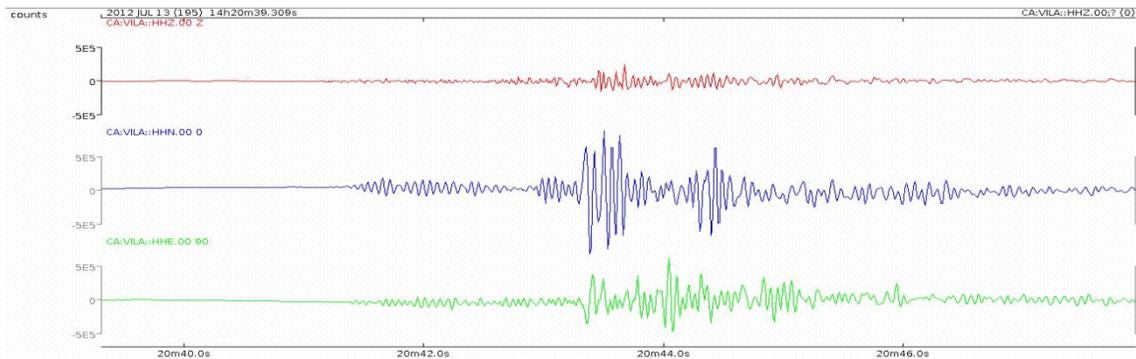
Drift histogram with PTPd active



## OBSEA CABLED SEISMETER IS PART OF THE NATIONAL (IGN) AND REGIONAL (IGC) SEISMOMETER NETWORK

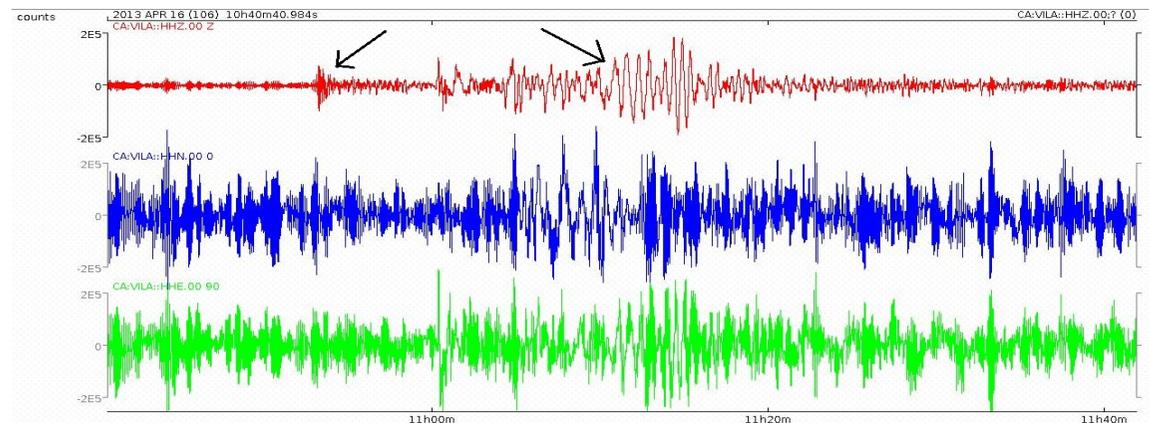


*Seismic data acquired and trusted by IGC (Institut Geològic de Catalunya)*

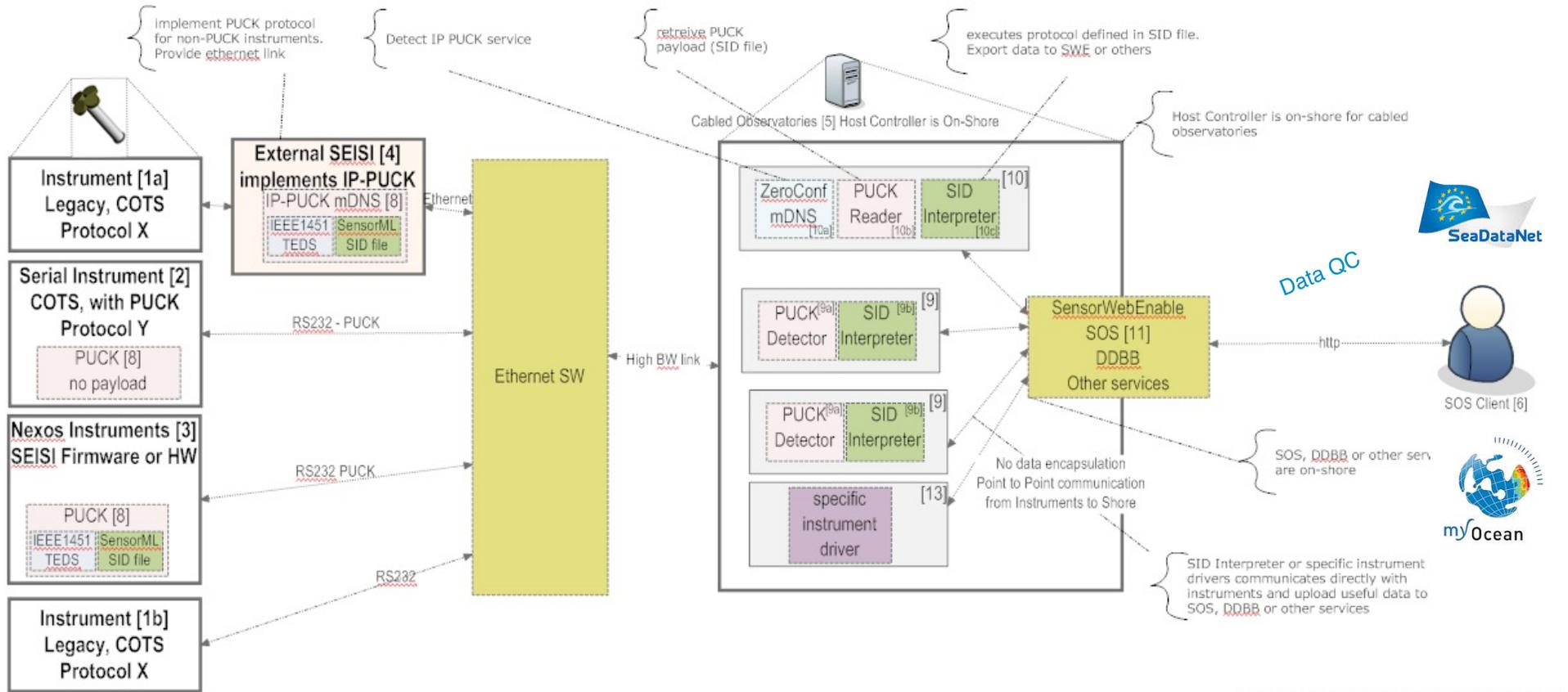


- Local event
  - Sant Pere de Ribes (Spain) July 2012

- Teleseism
  - Sant Pere de Ribes (Spain) July 2012



## INSTRUMENTS AND DATA INTEROPERABILITY





## CONCLUSIONS AND SOME IDEAS FOR JERICO NEXT



- *Biological assessment with video cameras and cabled observatories is an emerging technology: best practices for image acquisition and processing are necessary:*
  - *No agreed common methodology: suitable for JRA*
  - *How to deal with biological DDBBs: suitable for JRA*
  
- *TNA in cabled coastal observatories can be done for instrument research based on high power consumption and high bandwidth instrumentation like video cameras, hydrophones and others:*
  - *Update instrumentation in buoys, moorings and Gglidders represent a big effort in terms of communication protocols integration. Interoperability at instrument level have to be improved.*
  
- *Multiplatform intercol-laboration projects: docking station attached to fixed platforms for AUV, Crawlers or ROVs are emerging now and some proposals were submitted to H2020BG*
  
- *UPC-OBSEA can contribute to WPs and tasks related with Cabled Observatories*



# THANK YOU FOR YOUR ATTENTION

