

What is SOCIB?

Multi-platform, integrated
Coastal Ocean
Observing and Forecasting
System

in the Balearic Islands
(Western Mediterranean Sea)

Why SOCIB?

"We must be able to document conditions and measure fluxes within the volume of the ocean, simultaneously and in real time, over many scales of time and space, regardless of the depth, energy, mobility, or complexity of the processes involved."

Delaney and Bargas (2009)

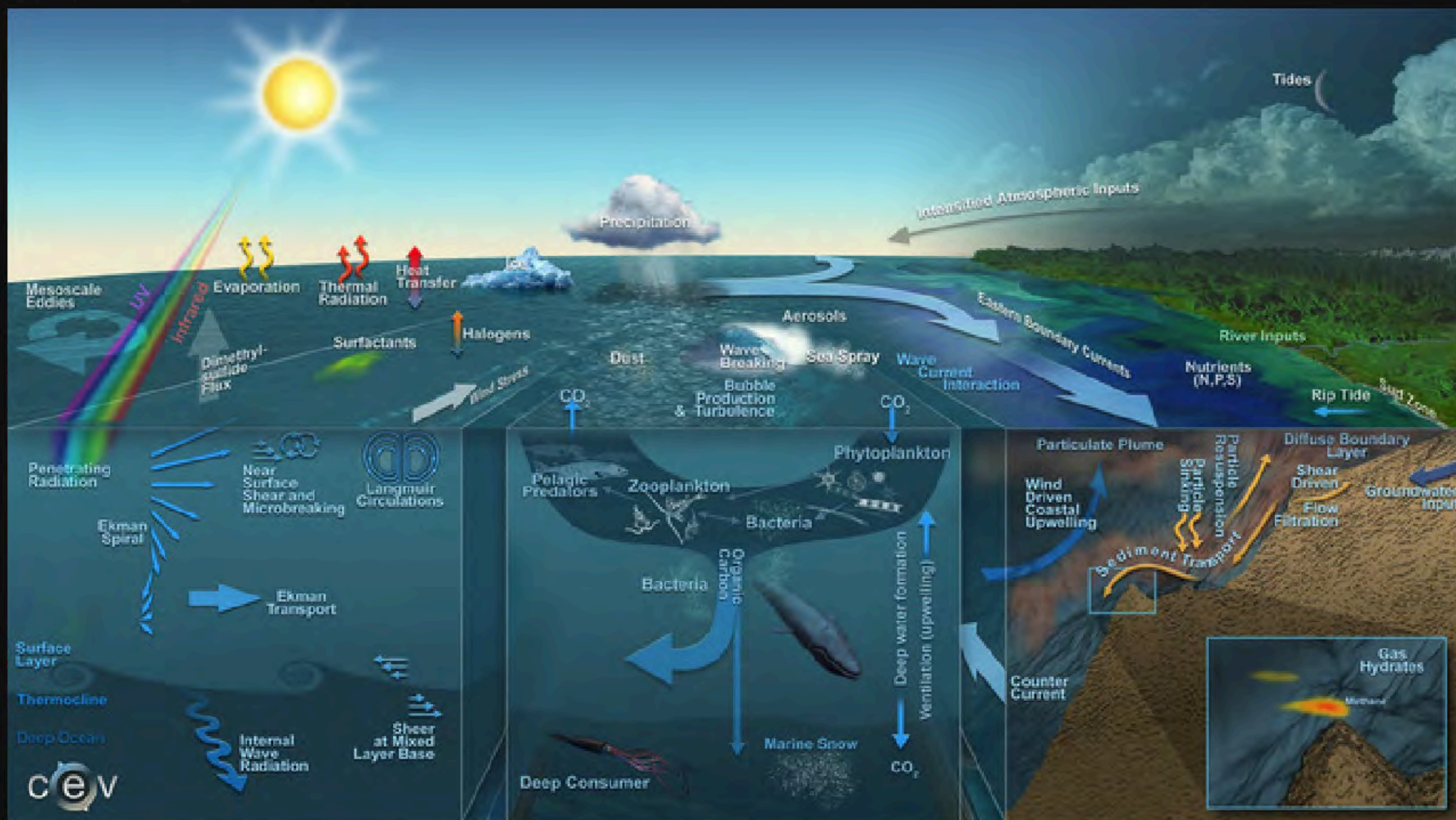
Why SOCIB?

"Citizens' interests and values need to be better integrated into science, technology, research and innovation issues, policies and activities."

HORIZON 2020, Work Programme 2014–2015.

Why SOCIB?

The ocean is complex



Why SOCIB?

"Long-term global monitoring of ocean properties and circulation is the key to understanding climate change and to developing our ability to predict future changes."

Bryden et al. (2012)

New technologies bring a double paradigm shift

1 Ocean observation

2 Data availability

Single platform, ship-based observations



Now: Multi-platform observing systems



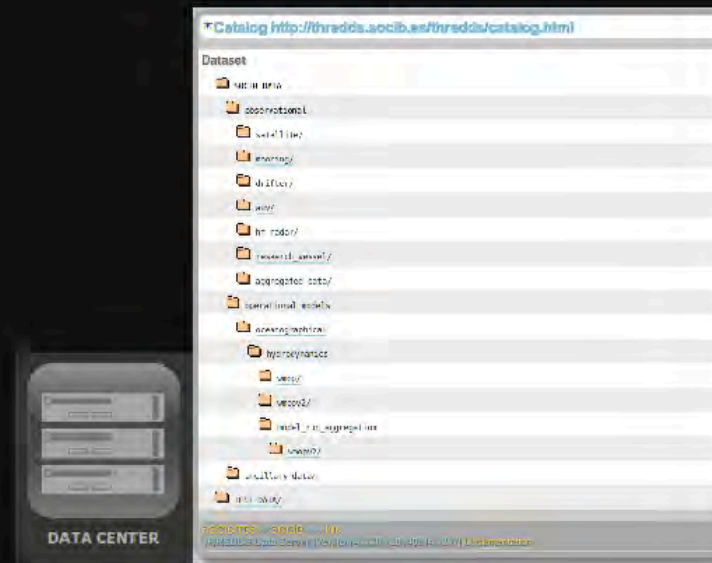
New technologies bring a double paradigm shift

- 1 Ocean observation
- 2 Data availability

12-24 months (years) after cruises



Now: near real-time, quality-controlled data



SOCIB Key Drivers

- 1 Science priorities
- 2 Technology development
- 3 Response capacity to societal needs

SOCIB Facilities

SOCIB Balearic Islands Coastal Observing and Forecasting System

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MINISTERIO DE ECONOMIA Y COMPETITIVIDAD Govern de les Illes Balears

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DOCUMENTARY: "THE GLIDER REVOLUTION" BY THALASSA

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latest news

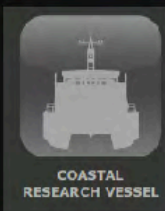
- HCMR (Hellenic Centre for Marine Research) visit to SOCIB Glider Facility [15-04-2014]
- Surface circulation patterns in the Ibiza channel from HF Radar Data: Initial r ... [10-04-2014]
- SOCIB present at the "Historias del Mediterráneo" open public talks at Caixa Fò ... [20-03-2014]

f t in rss YouTube flickr

facilities

- COASTAL RESEARCH VESSEL
- COASTAL HF RADAR
- GLIDER
- LAGRANGIAN PLATFORMS
- FIXED STATIONS
- BEACH MONITORING
- OCEAN FORECAST
- DATA CENTER

SOCIB Facilities



SOCIB Coastal Research Vessel



SOCIB Facilities



SOCIB Coastal Research Vessel



SOCIB Facilities



Coastal HF Radar



SOCIB Facilities



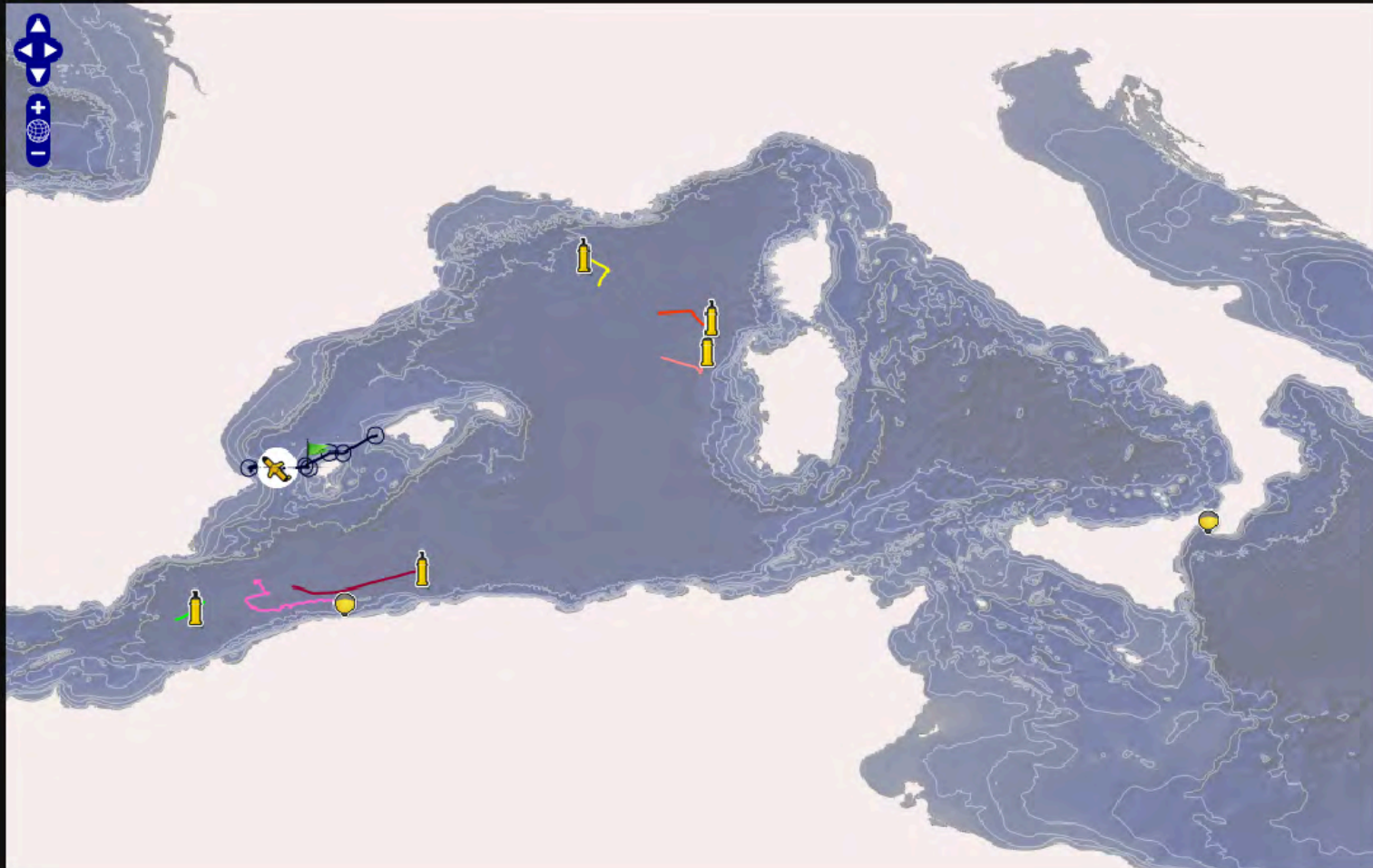
Glider



SOCIB Facilities



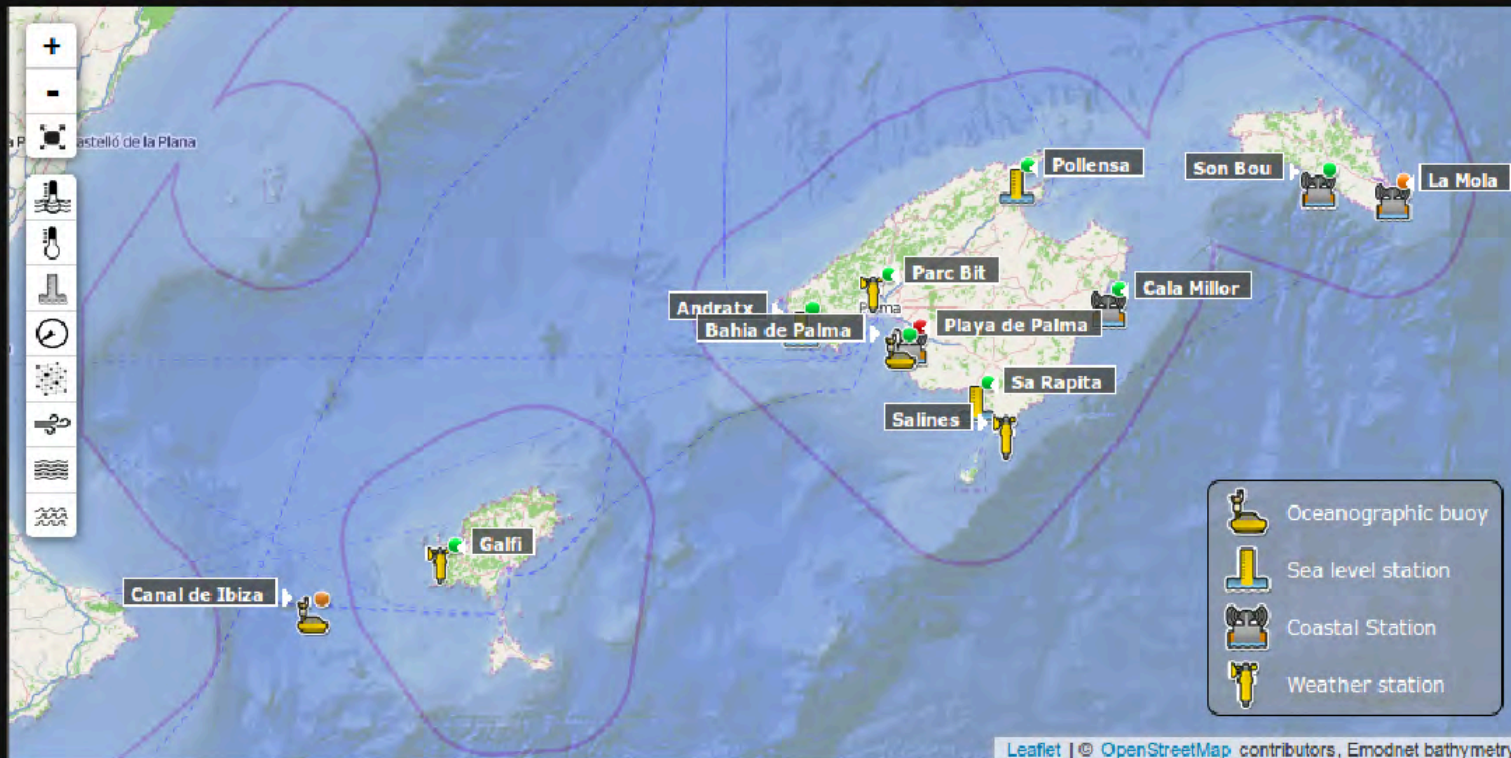
Lagrangian platforms



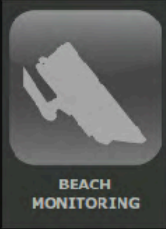
SOCIB Facilities



Fixed stations



SOCIB Facilities



Beach monitoring

The screenshot displays the SOCIB web application interface for beach monitoring. The main window shows a large aerial view of a beach with a camera overlay. The interface includes a sidebar with a location list, a central video player, and a right-hand panel with thumbnail images.

SOCIB Balearic Islands Coastal Observing and Forecasting System

Product name: Snapshot - Date: 24-04-2014

Location list

- Name -
- Plaja de Palma
- Cala Millor
- Son Bou

Overview

24-04-2014

24-04-2014

24-04-2014: Camera 09 at 11:00 (UTC)

14. Camera 09 at 07:00 (UTC)

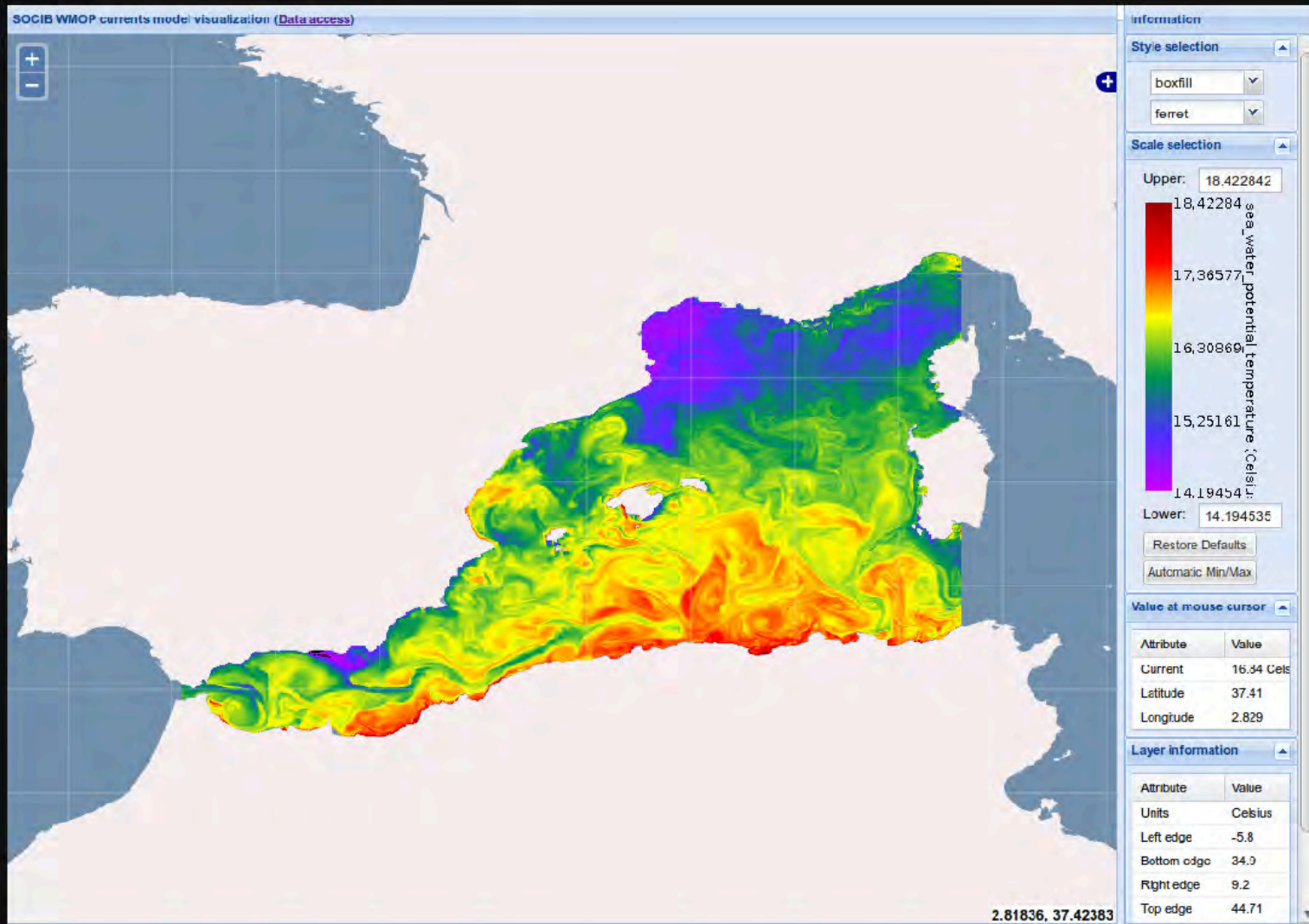
14. Camera 09 at 11:00 (UTC)

14. Camera 09 at 11:00 (UTC)

SOCIB Facilities



Ocean forecast



SOCIB Facilities



Data centre

[Catalog http://thredds.socib.es/thredds/catalog.html](http://thredds.socib.es/thredds/catalog.html)

Dataset

- SOCIB DATA
 - observational
 - satellite/
 - mooring/
 - drifter/
 - auv/
 - hf_radar/
 - research_vessel/
 - aggregated_data/
 - operational_models
 - oceanographical
 - hydrodynamics
 - wmop/
 - wmopv2/
 - model_run_aggregation
 - wmopv2/
 - ancillary_data/
- TEST DATA/

SOCIB Data centre developments

SACOSTA: web-based map viewer for cartographic data

<http://gis.socib.es/sacosta>

web application for multidimensional data from netCDF files

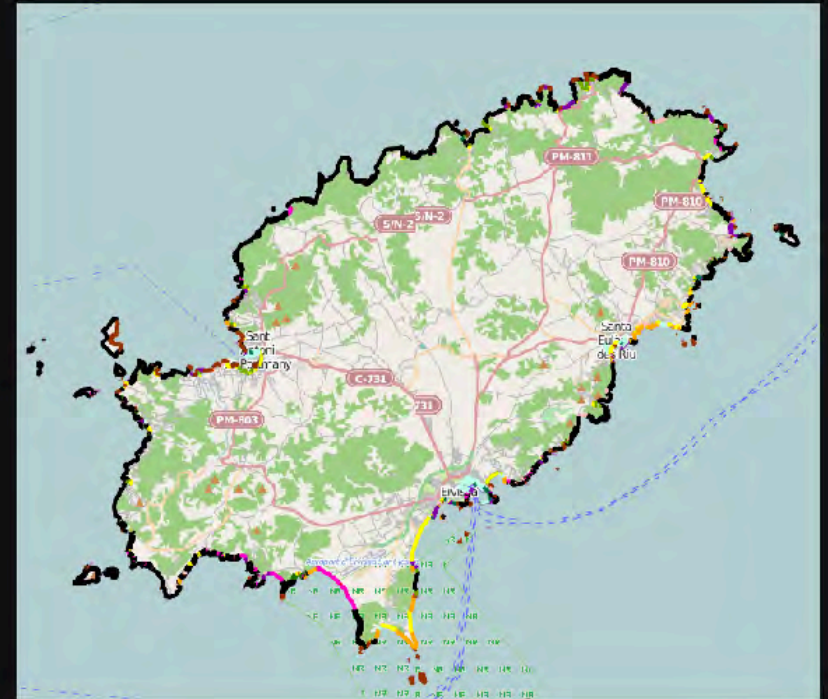
web application for displaying and editing survey data

web-based map viewer to display historical and beach survey data

web application for displaying and editing survey data

web application for displaying and editing survey data

web application for displaying and editing survey data



SOCIB Data centre developments

SACOSTA: web-based map viewer for cartographic data

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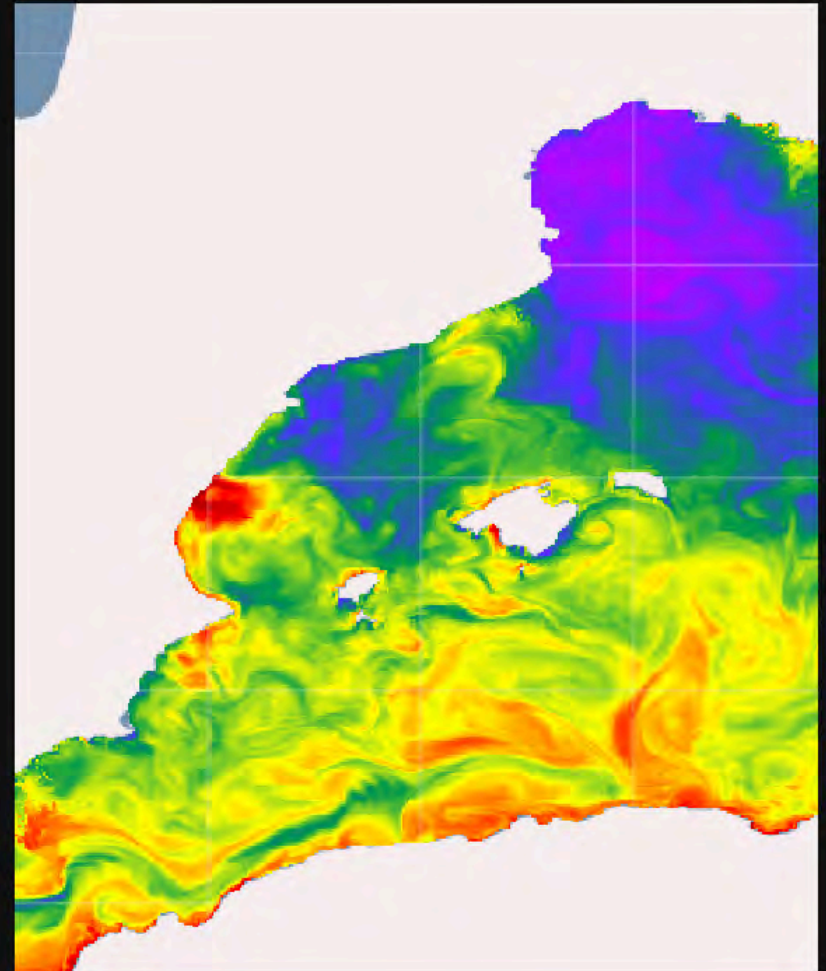
LW4NC2: web application for multidimensional data from netCDF files

<http://thredds.socib.es/lw4nc2>

WATERVIEW: web-based map viewer to display historical and beach survey data
<http://gis.socib.es/waterview>

DEPP: web application to display information related to mobile platforms trajectories
<http://apps.socib.es/depp>

www.socib.es



SOCIB Data centre developments

SACOSTA: web-based map viewer for cartographic data

<http://gis.socib.es/sacosta>

LW4NC2: web application for multidimensional data from netCDF files

<http://thredds.socib.es/lw4nc2>

BEACH DATA VIEWER: web-based map viewer to display historical and beach survey data

<http://gis.socib.es/viewer>

MOBILE PLATFORMS TRAJECTORIES: web application to display information related to mobile platforms trajectories

<http://gis.socib.es/trajectories>

REALTIME DATA FROM FIXED STATIONS AND GLIDER TRAJECTORIES: web application for real time data from fixed stations and glider trajectories

<http://gis.socib.es/realtime>

<http://gis.socib.es/realtime>



SOCIB Data centre developments

SACOSTA: web-based map viewer for cartographic data

<http://gis.socib.es/sacosta>

LW4NC2: web application for multidimensional data from netCDF files

<http://thredds.socib.es/lw4nc2>

BEACH DATA VIEWER: web-based map viewer to display historical and beach survey data

<http://gis.socib.es/viewer>

DAPP: web application to display information related to mobile platforms trajectories

<http://apps.socib.es/dapp>



WATER LEVEL DATA VIEWER: web application for multidimensional data from float stations and glider trajectories

<http://thredds.socib.es/waterlevelviewer>

WATER TEMPERATURE DATA VIEWER:

<http://thredds.socib.es/waterlevelviewer>

SOCIB Data centre developments

SACOSTA: web-based map viewer for cartographic data

<http://gis.socib.es/sacosta>

LW4NC2: web application for multidimensional data from netCDF files

<http://thredds.socib.es/lw4nc2>

BEACH DATA VIEWER: web-based map viewer to display historical and beach survey data

<http://gis.socib.es/viewer>

DAPP: web application to display information related to mobile platforms trajectories

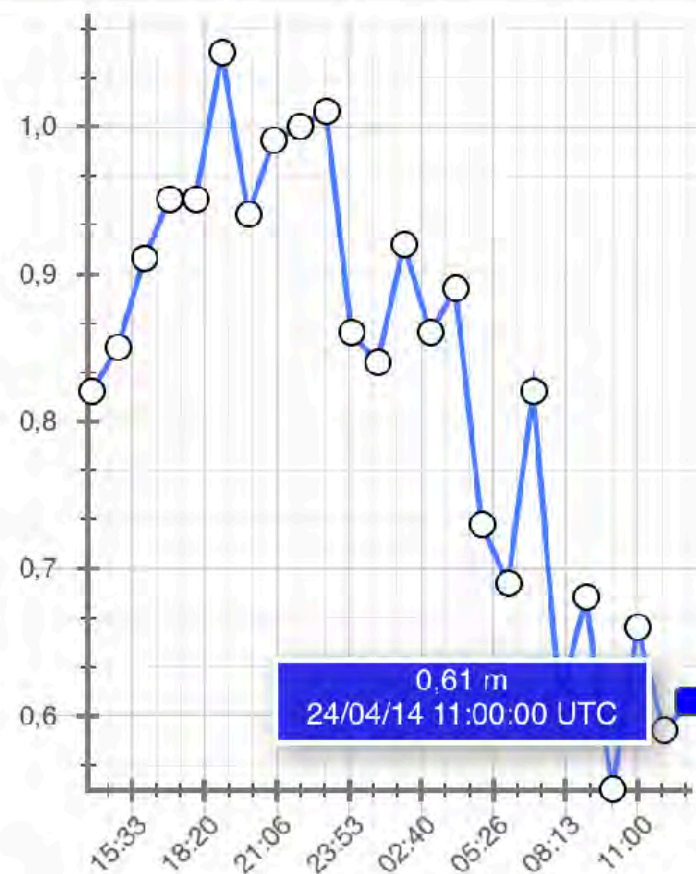
<http://apps.socib.es/dapp>

Smart-phone apps for real time data from fixed stations and glider trajectories

<http://itunes.apple.com/us/app/socib/id482542716?mt=8>

[Back](#) Wave max height (m)

Latest sample time: 24/04/14 11:00:00 UTC



24h

1 week

1 month

HF Radar Facility

Two stations on Ibiza and Formentor islands

TX Frequency: 13.5 Mhz

Bandwidth: 90 kHz

Grid resolution: 3 km

Averaging radius (radials): 6 km

Temporal resolution: hourly
(75 min moving average)

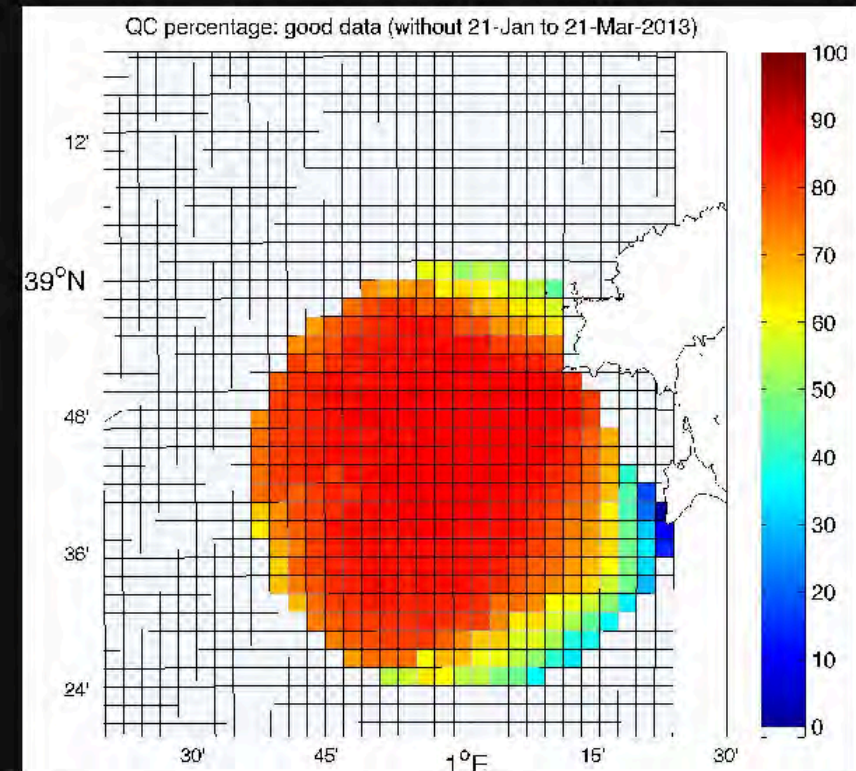
Temporal coverage: 1st June 2012 – ongoing



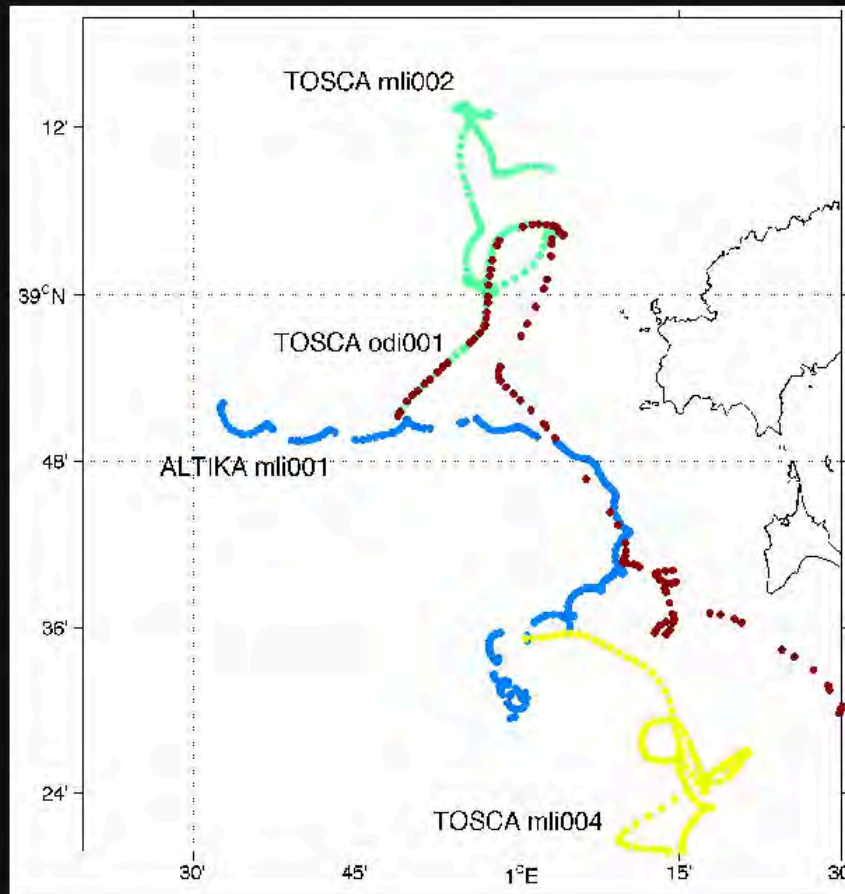
Automated QC procedure

- ✓ CODAR QC procedures
- ✓ SOCIB Data Center procedures and flags for all radial and total data, based on:

- 1** System functioning diagnostic parameters at each radial station (signal-to-noise, average radial bearing, radial vector count)
- 2** Battery of tests for individual total vector (range, gradient, spike)



Validation: drifters vs. radial velocities



Correlations:

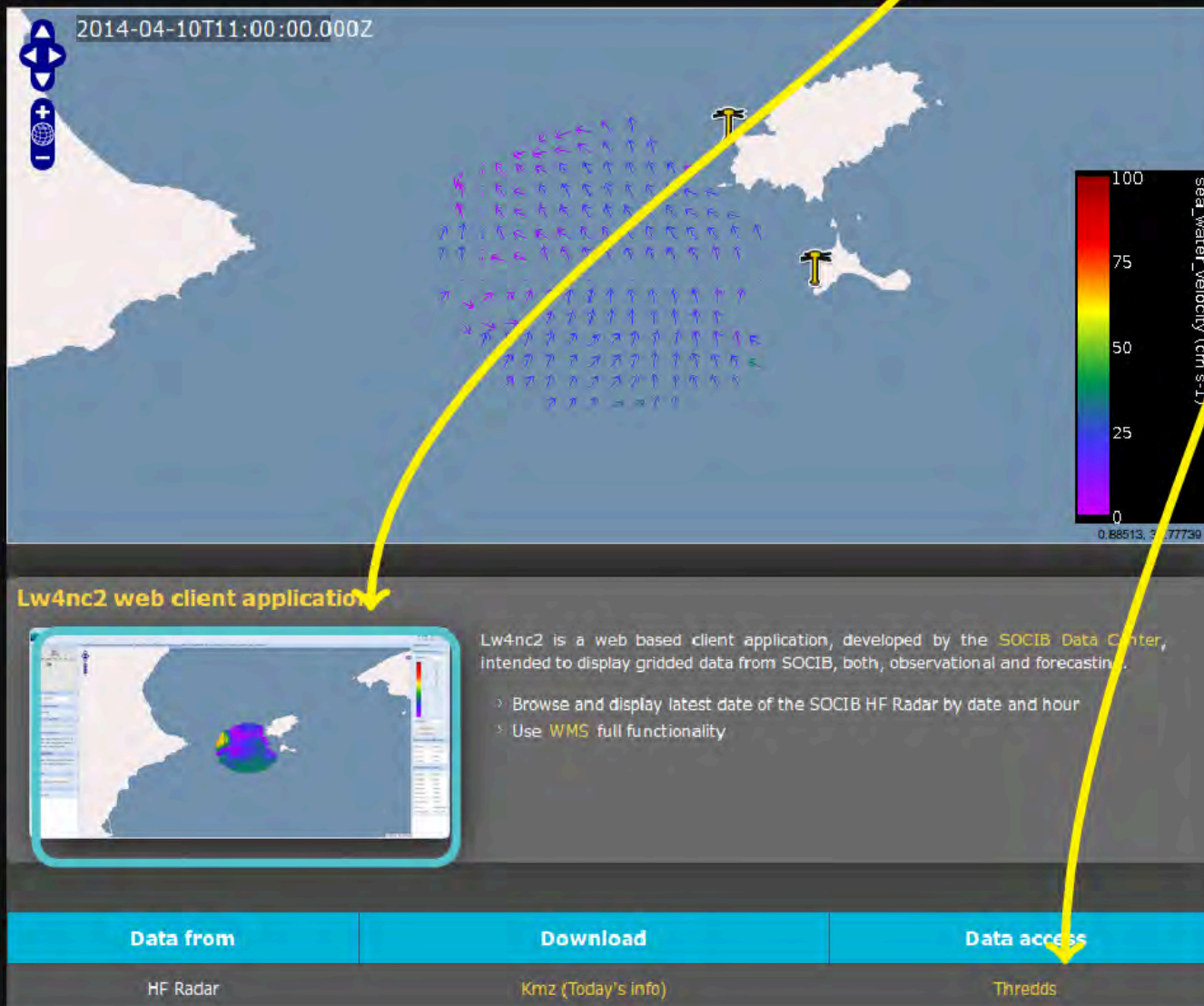
- TOSCA: 0.88 and 0.83
- AltiKa: 0.80 and 0.70

Future work:

- Comparison with model
- Validation against current-meter

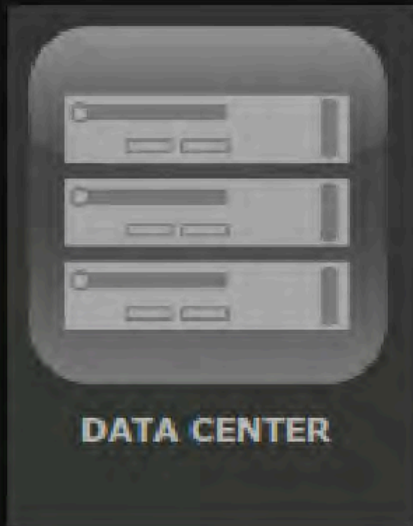
Distribution-visualization

- NetCDF available in near real-time
- Visualisation through Lw4nc2



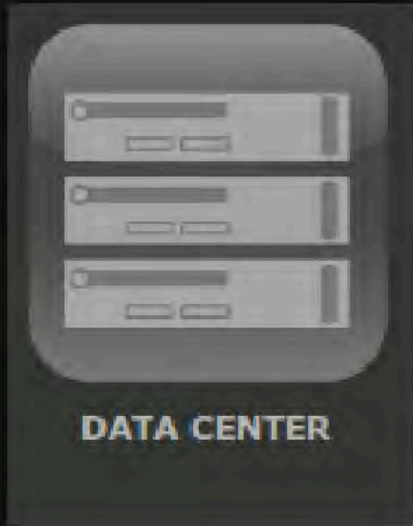
How do we make **easier** and **less costly** the access to real-time and archived data?

SOCIB Data centre principles



- 1** Discoverable and accessible
- 2** Realtime, freely available
- 3** Interoperable, standardized and quality controlled

SOCIB Data centre principles



- 1 Discoverable and accessible
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SOCIB Data centre principles



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Smart-phone applications

Back Mobims Playa de Palma

Type Coastal Station

Latest update Nov. 07 abr 2014 03:40:00 UTC

Lat: 39°30.14927 Lon: 2°45.102492

Variables (tap to plot)

Air temperature at: 40 m	N/A
Wind direction avg. at: 40 m	N/A
Wind gust at: 40 m	N/A
Air pressure (sea. lev)	N/A

Fixed Stations Map

Station Andratx

Sea Level

Updated: miércoles 23 abr 2014 07:59:00 UTC

Sea level (ref. datum) -0.2741 m

Sea water temperature 17.79 C

Air pressure 1019.47 hPa

SOCIB

- Fixed stations
- Giders
- Lagrangian platforms
- Beach monitoring

Fixed Stations Map

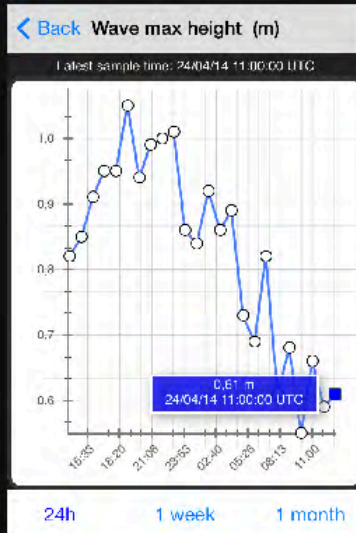
Barcelona

Mar Balear

0.36 m

0.57 m

SSW



Lagrangian platf...

Toulouse

Marsella

Niza

Barcelona

Mar Balear

Mar Mediterraneo

Valencia

Palma

Oran

Sidi Bel Abbas

M Sila

El Arbir

Ain B

Batna

Yella

lanhouat

FACILITIES

- Fixed Stations
- Giders
- Lagrangian Platforms
- Beach Monitoring

CONFIGURATION

- Favorite fixed stations
- Units

ABOUT US

- About
- Help
- Social

Back Playa de Palma Data

0.36 m

0.57 m

SSW

http:

//itunes.apple.com/us/app/socib/id482542716?mt=8

SeaBoard

Sol Hoteles

MELIÀ HOTELS INTERNATIONAL

Be proud of your hotel!

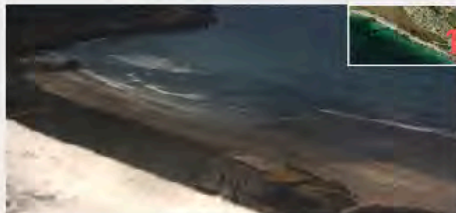
We are pleased to inform you that this hotel contributes to beach conservation and science based coastal and ocean management. Your hotel collaborates with the Beach Monitoring Programme from SOCIB.

SOCIB Balearic Islands Coastal Observing and Forecasting System



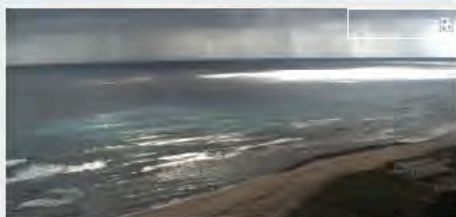
Observation and real time data

Beach evolution



Son Bou - Cam 01: 24/04/2014 12:00

Beach overview



Son Bou - Cam 03: 25/04/2014 17:18

Beach Information

Beach type: 2,5 km linear natural beach with dunes
Sediment type: medium to fine biogenic sands
Scientific interest: beachrocks, lagoon inlet, rip currents

Hotel weather station

Air temperature

16.7°C

17.5°C High 12.0°C Low

Swimming conditions



No data received

More information



Forecast

Weather forecast

Light rain today, with temperatures rising to 22°C on Thursday.

Today



Breezy in the evening, with light rain until evening

Temp 17.7°C 13.1°C	Wind 13.7 km/h (NW)	Humidity 80%	Pressure 1012.3 hPa
--------------------------	---------------------------	-----------------	---------------------------

Saturday



Breezy overnight

Temp 21.6°C 14.9°C	Wind 14.3 km/h (W)	Humidity 71%	Pressure 1015.0 hPa
--------------------------	--------------------------	-----------------	---------------------------

Sunday

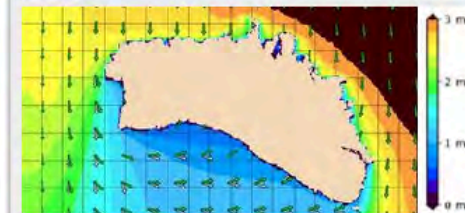


Windy in the morning

Temp 20.3°C 15.0°C	Wind 0.0 km/h (NW)	Humidity 70%	Pressure 1013.3 hPa
--------------------------	--------------------------	-----------------	---------------------------

Powered by Forecasta

Waves forecast



Waves at 26/04/2014 08:00



Puertos del Estado

Fr Apr 25 2014 18:01:39

Educational web: "Follow the glider"

STUDENTS | TEACHERS | EXPLORE

f | | | YOUTUBE

ESPAÑOL

FOLLOW THE GLIDER

EXPLORE

Where are our gliders today →

DISCOVER THE OCEAN'S SECRETS WITH UNDERWATER GLIDERS

SOCIB: ICTS SOCIB
Sistema d'observació i predicció costaner
Illes Balears +034 971 43 99 98

site credits | legal notice

JERICO
Cefas
CSIC
SOCIB
Basque Gliders Coastal Observing and Forecasting System

Educational web: "Follow the glider"

FOLLOW THE GLIDER ✈️

STUDENTS | TEACHERS | EXPLORE | **ESPAÑOL**

CURRENT MISSIONS ▲

- Canales

PAST MISSIONS ▲

- Canales
- FEB 2014
- DEC 2013
- NOV 2013
- SET 2013
- Jerico

In Situ Salinity (Thermal Lag corrected)

Depth (m) vs. Distance (Km) vs. Salinity (PSU)

What does it mean?

SOCIB, ICES SOCIB
Sistema d'observació i predicció costaner
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Balearic Islands Coastal Observing and Forecasting System

From societal needs to technological developments and science

Rissaga (Meteotsunami)

From societal needs to technological developments and science

Societal need



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TEMPORAL EN MENORCA

La «rissaga» deja nueve millones de euros en daños

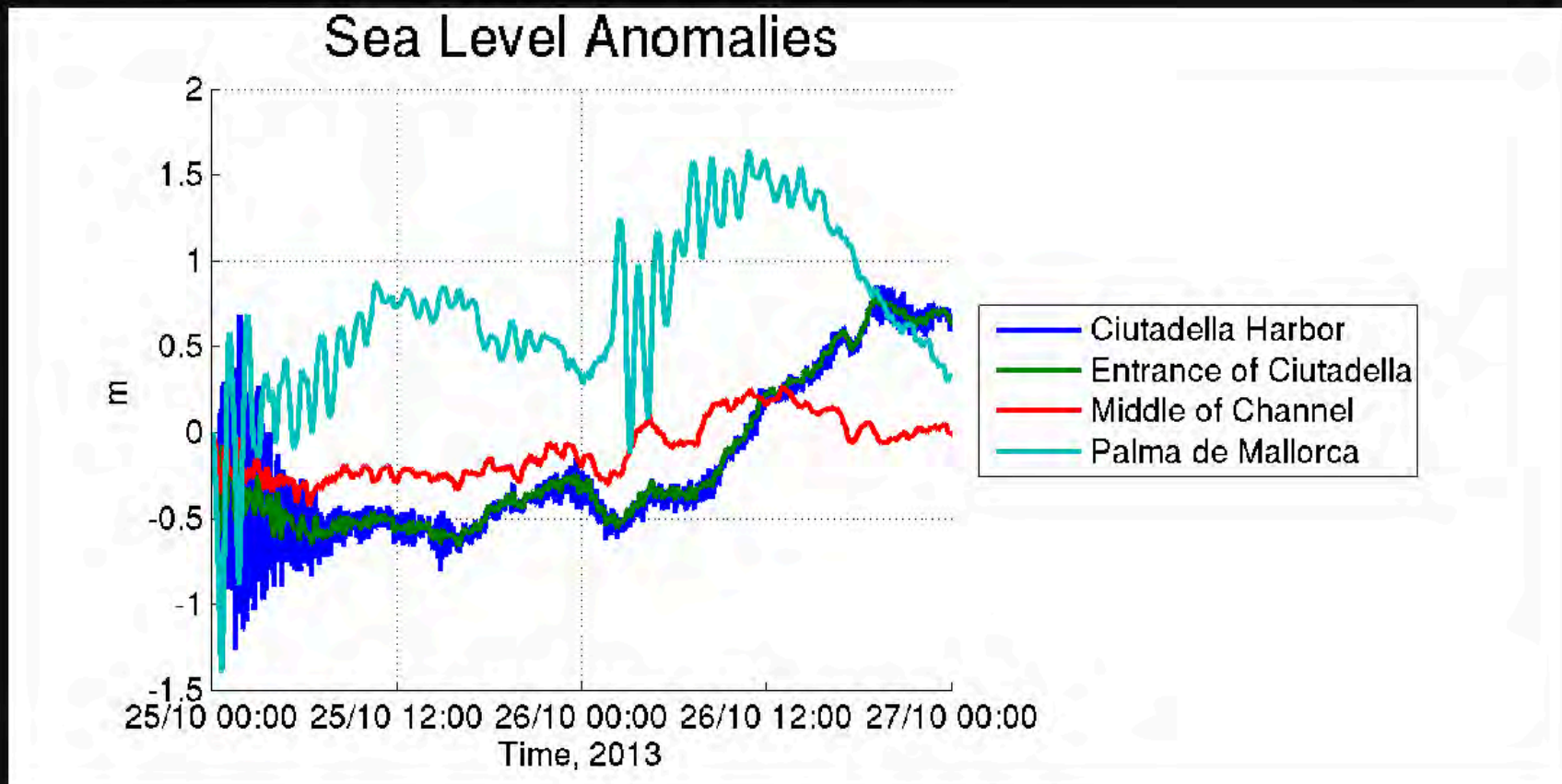
[Twitter](#) [Me gusta](#) 0 [A](#) [A](#) [Enviar](#) [Imprimir](#) [★ Valorar](#) [Añade a tu blog](#) [Comentarios](#)

17/06/2006

Una fuerte *rissaga* (una oscilación brusca de las aguas del mar) provocó 9 millones de euros en daños materiales en las embarcaciones amarradas en el puerto de Ciudadela, según informaron fuentes de la Policía Local y los Bomberos, ocasionando el hundimiento de varias barcas. La brusca oscilación registrada en el nivel de las aguas del puerto se ha producido durante una jornada en la que el Servicio Meteorológico de Baleares, que desde hace años estudia este fenómeno, ya había pronosticado que había riesgo de *rissaga*. Las subidas y bajadas de las aguas del puerto han alcanzado los tres metros, inundando las zonas urbanas próximas, mientras que cuando las aguas se han retirado se ha podido observar perfectamente el fondo del puerto. Este fenómeno meteorológico, que se viene repitiendo en el puerto de Ciudadela desde hace años, consiste en subidas y bajadas de las aguas del puerto, a modo de una marea que se produce a gran velocidad y con fuerza, lo que provoca importantes deterioros. El alcalde de Ciudadela, Lorenzo Brondo, tras ser informado del suceso, ha ordenado la suspensión del pleno que se estaba celebrando en aquel momento en el ayuntamiento. Todos los ediles de la corporación han bajado a la zona portuaria, que permanece cerrada al tráfico rodado. [efe

From societal needs to technological developments and science

Technological developments: coupled ocean-atmosphere model (ROMS + WRF)



From societal needs to technological developments and science

Science: Renault et al., GRL (2011)

GEOPHYSICAL RESEARCH LETTERS, VOL. 38, L10601, doi:10.1029/2011GL047361, 2011

Toward the predictability of meteotsunamis in the Balearic Sea using regional nested atmosphere and ocean models

Lionel Renault,¹ Guillermo Vizoso,² Agustín Jansá,³ John Wilkin,⁴ and Joaquin Tintoré^{1,2}

Received 4 March 2011; revised 29 March 2011; accepted 30 March 2011; published 18 May 2011.

[1] Meteotsunamis are oceanic waves that possess tsunami-like characteristics but are meteorological in origin. In the western Mediterranean, travelling atmospheric pressure oscillations generate these long oceanic surface waves that can become amplified and produce strong seiche oscillations inside harbors. We analyze a June 2006 meteotsunami event in Ciutadella harbor (Menorca Island, Spain), studying numerically the phenomenon during its full life cycle, from the early atmospheric stages to the atmosphere-ocean resonant phase and the final highly amplified harbor oscillation. The Weather Research Forecast (WRF) atmospheric model adequately reproduces the development of a convective nucleus and also reproduces the induced atmospheric pressure oscillations moving at a speed of 27 m/s. The oceanic response is studied using the Regional Ocean Modeling System (ROMS), forced by the WRF pressure field. It

and a Proudman resonance [Proudman, 1929] amplifies the open ocean inverse barometer response. The amplified oceanic gravity wave is then followed by a harbor seiche resonance at Ciutadella and generates a Rissaga, with typical final amplitude of the order of 0.5 to 1 meter and period of around 10 minutes. Rissaga events typically occur several times a year (mainly in summer) and do not generally cause major damage in the harbor, however, destructive Rissaga events do occasionally occur. In such cases, the amplitude is 2 or even up to 5 meters. Inside the harbor, such strong events cause devastating damage to boats and harbor facilities. The last major Rissaga event at Ciutadella, the most important in 20 years, occurred on 15 June 2006, with oscillations of about four meters, as reported by eyewitnesses. It caused a catastrophic drying of a significant part of the harbor with more than 35 boats sunk and about 100 severely damaged [Jansá et al., 2007; Monserrat et al., 2006]. The total economic cost

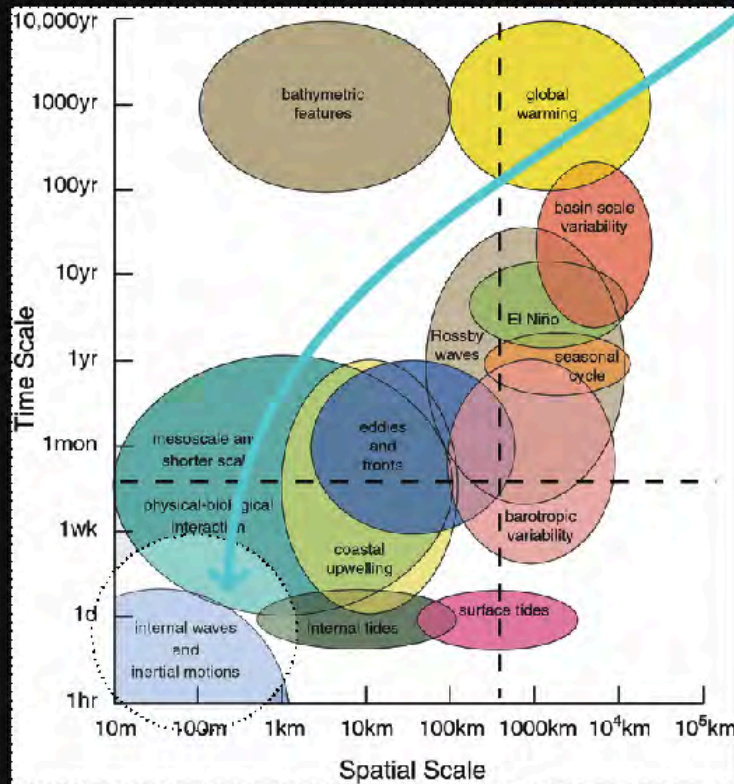
From societal needs to technological developments and science

Other examples:

- oil spill
- jellyfish
- beach evolution
- ...

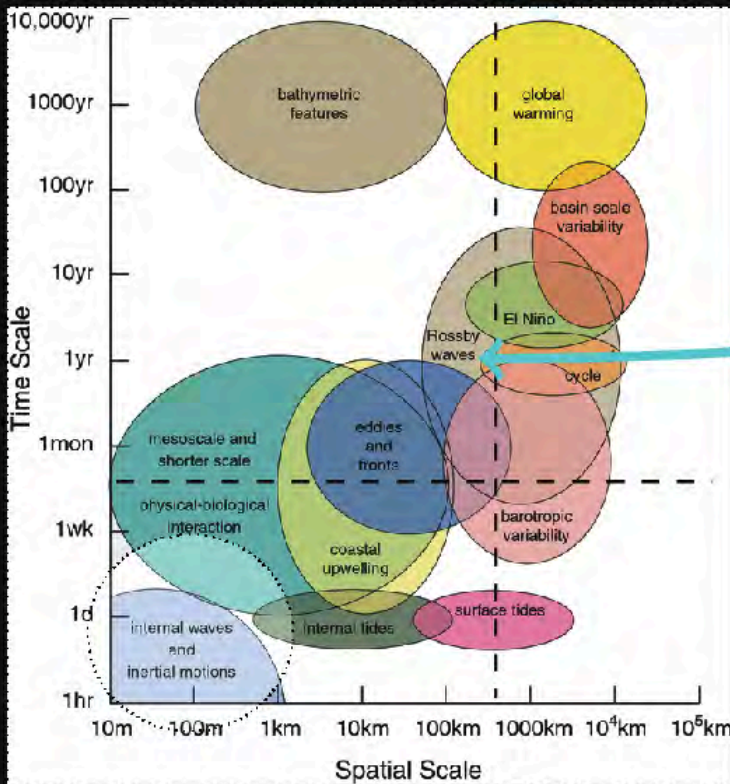
Challenges for the next decade

- 1 Use and integrate new technologies to monitor **small-scale variability** (mesoscale/weeks)
- 2 Resolve the **interactions** and **variability**
- 3 Establish the **variability**, understand the associated **biases** and correct them



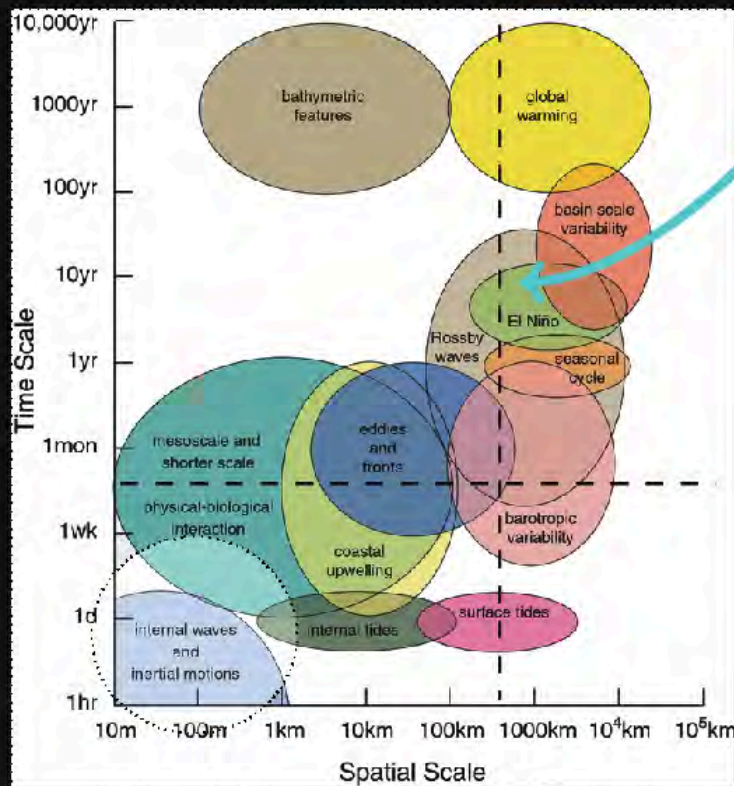
Challenges for the next decade

- 1 Use and integrate new technologies to monitor **small-scale variability** (mesoscale/weeks)
- 2 Resolve the **sub-basin/seasonal** and **inter-annual** variability
- 3 Establish the **inter-decadal** variability, understand the associated biases and correct them



Challenges for the next decade

- 1 Use and integrate new technologies to monitor **small-scale variability** (mesoscale/weeks)
- 2 Resolve the **sub-basin/seasonal** and **inter-annual** variability
- 3 Establish the **decadal** variability, understand the associated biases and correct them



Conclusions

- 1 Response to 3 drivers: science, technology, society
- 2 New technologies to:
 - Monitor the variability (physics and biology) at small scales to
 - Resolve the sub-basin/seasonal and inter-annual variability and by this
 - Establish the decadal variability and budgets, understand the associated biases and correct them
- 3 Select key control sections for routine monitoring of 'choke points' to characterise coastal ocean variability



Thanks
for your attention

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