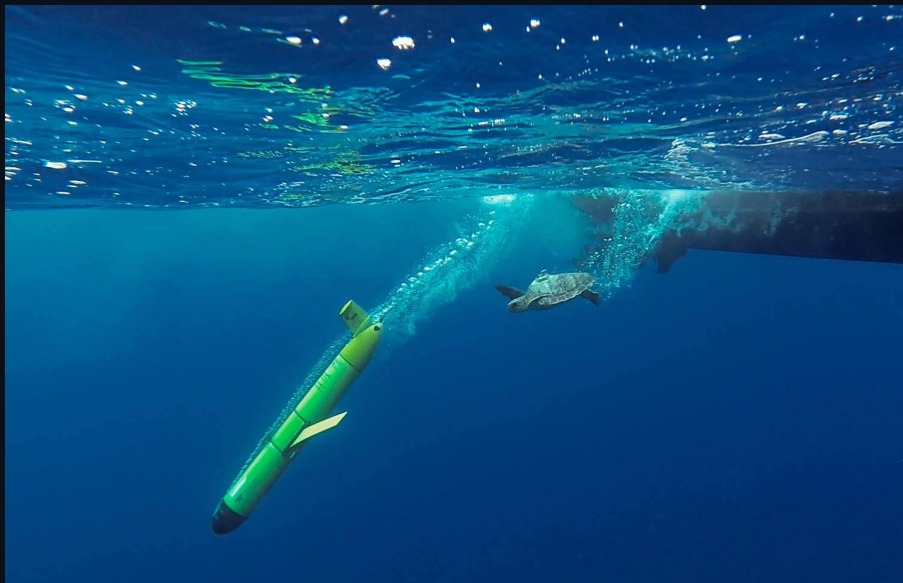


# Data processing and visualization at SOCIB


C. Troupin, J. P. Beltran, B. Frontera, S. Gómara, M. Gomila, A. Krietemeyer,  
C. Muñoz, M. À. Rújula, I. Serra, J. Tintoré





**Make available  
as much good data as possible  
to the maximum number of users**



## Data acquisition



 Data acquisition

 Processing  
(including Quality Control ☒)

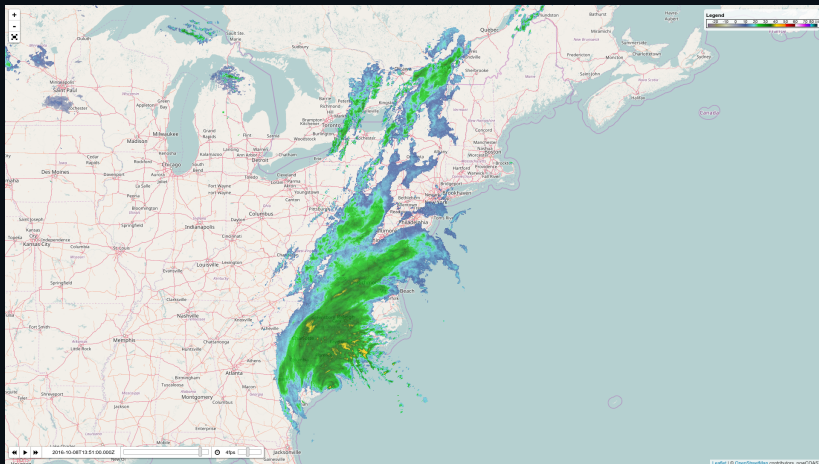
 Data acquisition

 Processing  
(including Quality Control )

 Distribution &  visualisation

⇒ Distribution &  visualisation

# TimeDimension plugin for Leaflet library

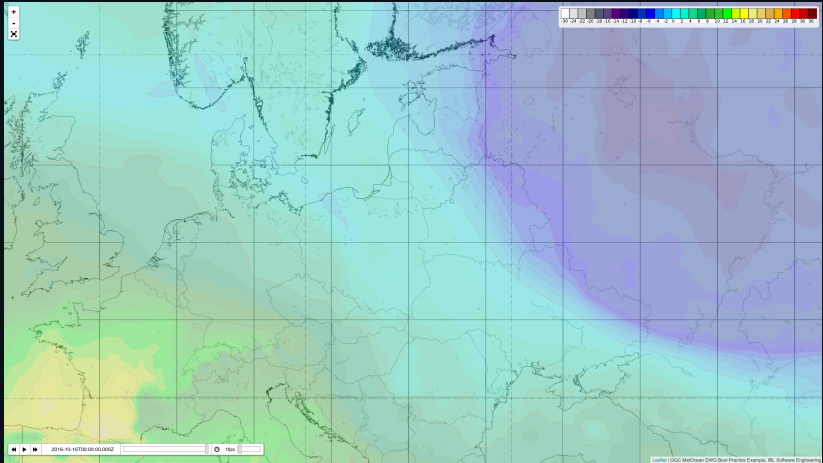


WMS

NOAA nowCOAST weather radar

<https://github.com/socib/Leaflet.TimeDimension>

# TimeDimension plugin for Leaflet library

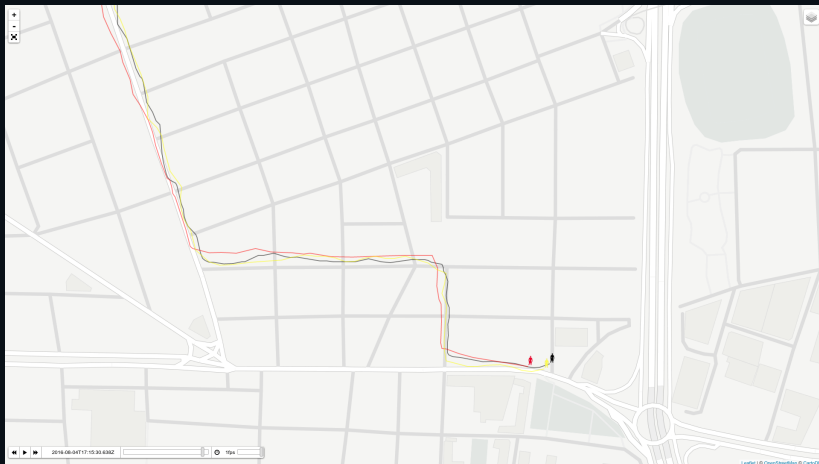


WMS

Temperature from IBL Software Engineering

<https://github.com/socib/Leaflet.TimeDimension>

# TimeDimension plugin for Leaflet library

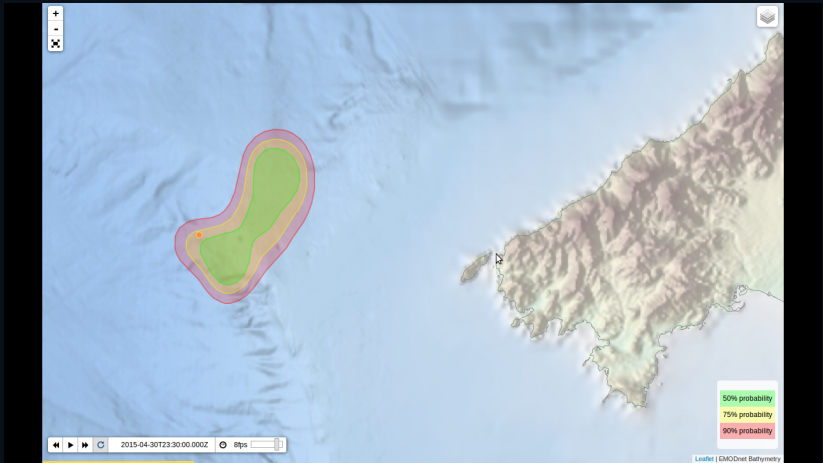


GPX or KML

GPS tracks comparison

<https://github.com/socib/Leaflet.TimeDimension>

# TimeDimension plugin for Leaflet library



GeoJSON

Oil spill model

<https://github.com/socib/Leaflet.TimeDimension>

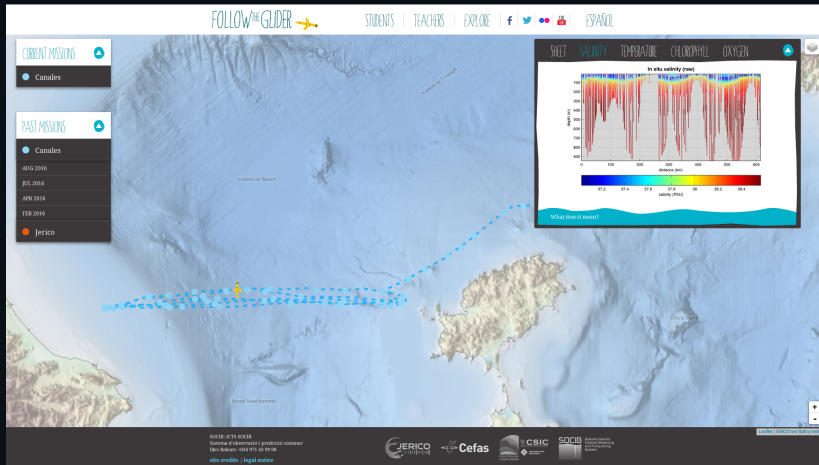
# TimeDimension plugin for Leaflet library

Possible topic for ODIP  
toward standardisation of date format  
in GeoJSON files

<https://github.com/socib/Leaflet.TimeDimension>



# Follow-the-Glider



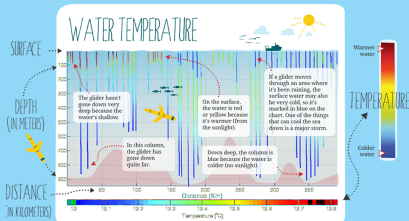
<http://followtheglider.socib.es>

# Follow-the-Glider

## HOW DO WE READ THE DATA WE RECEIVE FROM A GLIDER?

We use the data we receive from a glider to put together charts. They seem hard to read, but it's actually easier than you think.

This is a chart showing the **sea's temperature**: each column shows the glider's course over several kilometers. Some columns are deeper than others. That's because the glider doesn't always reach the same depth. You know why? Because the sea floor isn't flat. Sometimes there are mountains, and the glider can't go any deeper: it would crash against the bottom.



<http://followtheglider.socib.es>

# Medcllic: scientific and outreach project



EN / CA / ES

THE PROJECTEXPLOREDIVULGATIONNEWS



### MEDCLIC: THE MEDITERRANEAN IN ONE CLICK

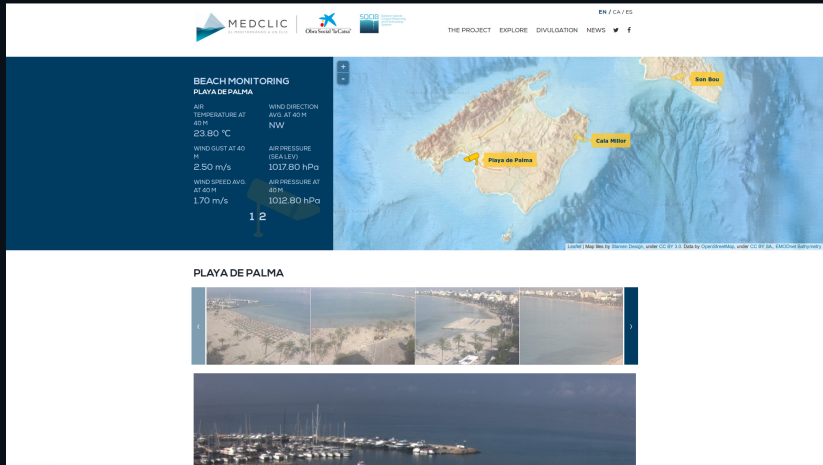
We invite you to immerse yourself in a sea of information thanks to the multiple operating systems which are currently monitoring the Western Mediterranean, collecting real-time data which is accessible to all of society.

**Explore** the different observation systems, **learn** about temperature and wave forecasting and **discover** the importance of oceanographic research.

[www.medcllic.es/en/fr/en](http://www.medcllic.es/en/fr/en)


<http://www.medcllic.es>

# Medcllic: scientific and outreach project




<http://www.medcllic.es>


# Medcllic: scientific and outreach project



AN INSTITUTION OF THE CNRS





Observatoire de la Côte d'Azur



SOCIB

EN / CA / ES

THE PROJECT | EXPLORE | DIVULGATION | NEWS |  

FIXED STATIONS

STATION PARC BIT

AIR TEMPERATURE AT 120 M  
23.70 °C

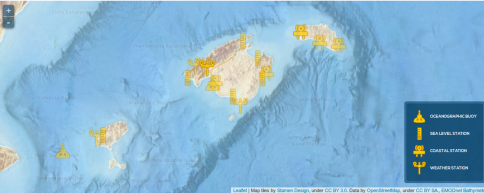
WIND GUST AT 120 M  
1.90 m/s


WIND GUST AVERAGE AT 120 M  
1.30 m/s


WIND DIRECTION AVERAGE AT 120 M  
SSW


AIR PRESSURE (SEA LEVEL)  
1018.10 hPa


1 2



 OCEANOGRAPHIC BUOY

 SEA LEVEL STATION

 COASTAL STATION


 WEATHER STATION

Source: Map data by Google, under CC BY 3.0, Data by OpenStreetMap, under CC BY SA, Imagery by Mapbox

## SOCIB FIXED STATIONS

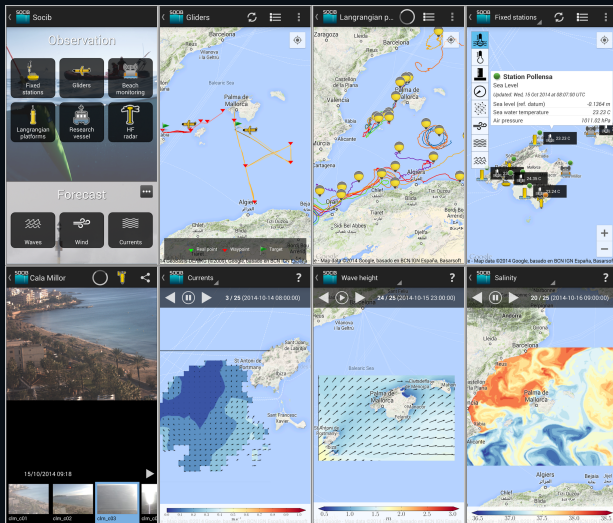
This is a real-time monitoring system for obtaining reliable data relating to different oceanographic parameters (such as waves, currents, temperature and salinity) and also meteorological parameters (atmospheric pressure, wind speed or air temperature) through a network of infrastructures made up of coastal stations, oceanographic buoys, sea level stations and weather stations.



### INNOVATION FOR IMPROVED FORECASTING



<http://www.medcllic.es>

# Apps for smartphones



 <https://play.google.com/store/apps/details?id=com.socib>  
 <https://itunes.apple.com/us/app/socib/id482542716?mt=8>

# Apps for smartphones



## Augmented reality

- Points of interest
- Nearby observing platforms
- Reporting observations
- Access to real-time data

What do they have in common?



# What do they have in common?

Data Discovery

RESTful web services  
to provide information and data  
of SOCIB platforms

# What do they have in common?

## Data Discovery

- Give me the list of active fixed stations
- Tell me the last measurements from a given station
- List the stations providing sea level measurements
- ...

# What do they have in common?

Data Discovery 

"It was quite easy  
you did a very good job and  
your services were really easy to integrate!"

# What do they have in common?

## Data Discovery

"It was quite easy  
you did a very good job and  
your services were really easy to integrate!"

"We had to create a specific database  
only to manage your data  
because of the way you organise them internally."

# What is next?

## New data API



1

Easier data access for any type of users

general public, developers, data managers, scientists, ...

# What is next?

## New data API

1

**Easier data access for any type of users**

general public, developers, data managers, scientists, ...


2

**Easier developments of external applications**

visualisation, apps, data analysis ...

# What is next?

## New data API

- 
- 1 Easier data access for any type of users**  
general public, developers, data managers, scientists, ...
  - 2 Easier developments of external applications**  
visualisation, apps, data analysis ...
  - 3 Data provided in different formats**  
NetCDF, CSV, JSON, ...

# What is next?

## New data API and new data catalog

**SOCIB** about us Data catalog facilities news Outreach competitive access


Data products catalog

## Data products catalog

Filter

Name <input type="text"/>	From date [calendar icon] <input type="text"/> from date	To date [arrow icon] <input type="text"/> to date	Status - Select status ▾	Variable <input type="text"/>
Platform type Turtle ▾	Instrument type - Select instrument type ▾		Data type - Select data type ▾	
Bounding box min longitude <input type="text"/> min latitude <input type="text"/> max longitude <input type="text"/> max latitude <input type="text"/>	show map			
<a href="#">▼ Filter</a>			<a href="#">Clear</a>	

1 products found



**Alnitak TurtleTracking 2014**

Set of deployments associated to Alnitak turtle tracking

[calendar icon] 28/07/2009 → 04/06/2015

N/A

[Show more](#)

©2015 ICTS SOCIB - Sistema d'observació i predicció costaner de les Illes Balears. Parc B'I, Nostra, Bloc A 2<sup>a</sup> pta. 3



# What is next?

## New data API and new data catalog

**SOCIB** [about us](#) [Data catalog](#) [facilities](#) [news](#) [Outreach](#) [competitive access](#)

[Data products catalog](#)

### Data products catalog


#### Alnitak TurtleTracking 2014

Set of deployments associated to Alnitak turtle tracking

Sources overview

Turtle 13

Total 13



Leaflet | Tiles © OpenStreetMap contributors, Imagery © Mapbox


Leaflet | Tiles © OpenStreetMap contributors, Imagery © Mapbox

#### Data sources

Show filter form

Turtle

Turtle observational data



Platform type: Turtle  
Platform name: Turtle\_Ana  
Instrument type: Turtle  
Instrument name: SCB-TTRK012  
Variables (14): [Direction of sea surface velocity](#) [Sea surface speed](#) [Sea water temperature](#) [Salinity](#)


Initial date: 2009-08-07  
End date: 2010-07-30  
Updated at: 2015-06-25 15:35

Source type: Observational  
Data type: Trajectory  
Entries: 2

[Plot data](#) [Data access](#)

Turtle

Turtle observational data



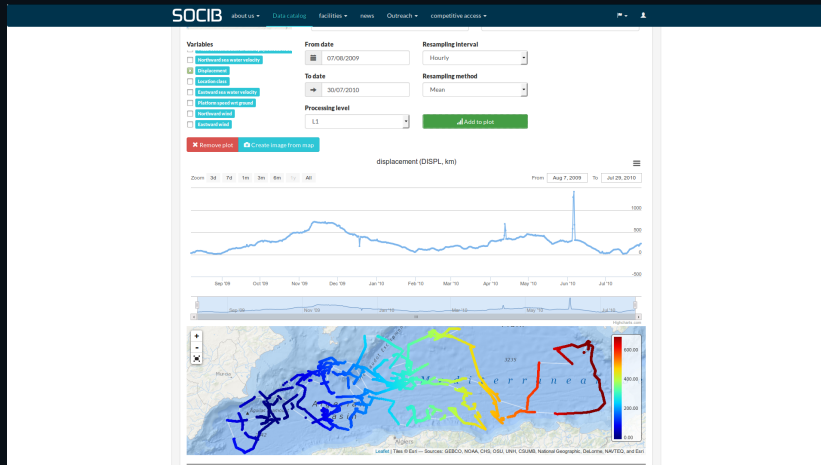
Platform type: Turtle  
Platform name: Turtle\_Koriniki  
Instrument type: Turtle  
Instrument name: SCB-TTRK001  
Variables (14): [Direction of sea surface velocity](#) [Sea surface speed](#) [Sea water temperature](#) [Salinity](#)


Initial date: 2014-05-11  
End date: 2014-08-23  
Updated at: 2015-06-25 14:57



Source type: Observational  
Data type: Trajectory  
Entries: 2

# What is next?



## New data API and new data catalog



 Data acquisition

 Processing  
(including Quality Control )

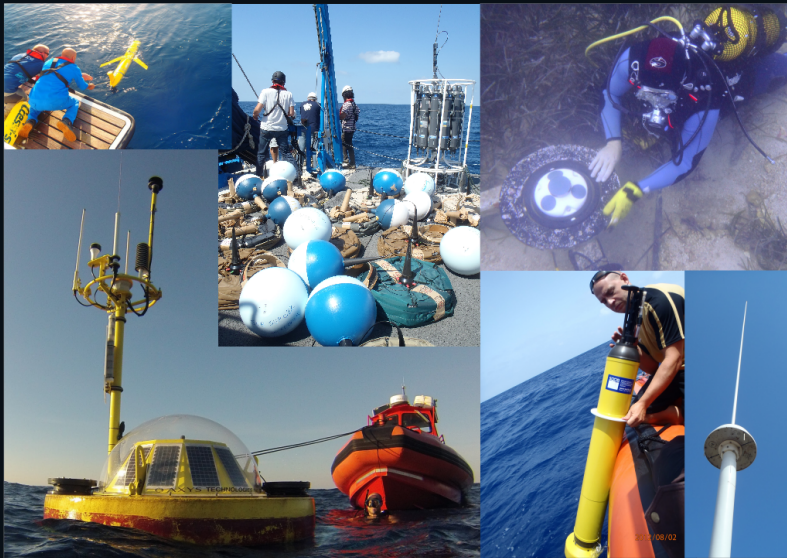
 Distribution &  visualisation

 Processing  
(including Quality Control )

# Multi-platform observing system



# Multi-platform observing system



# Principles

Emulating reality

# Principles

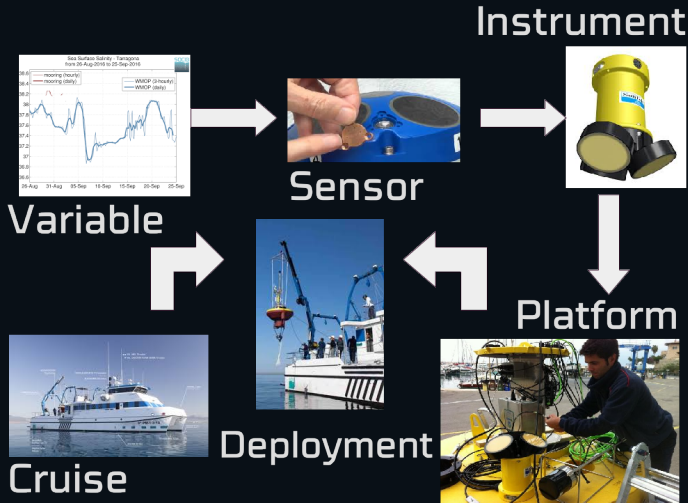
## Emulating reality





# Principles

Emulating reality

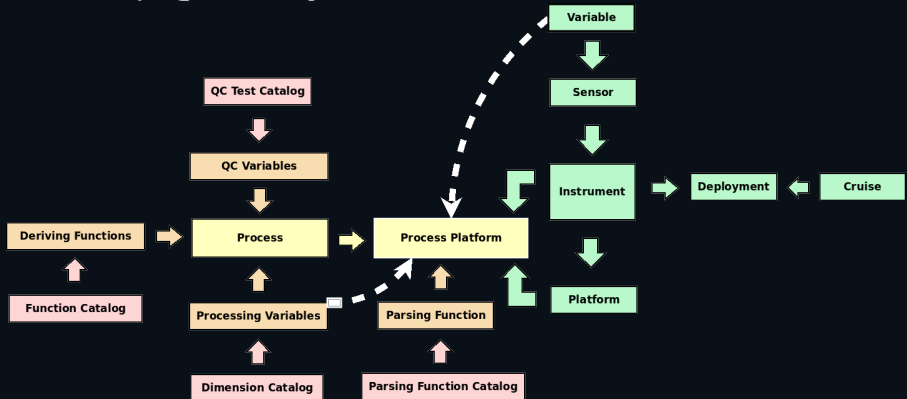


# Principles

Developing creativity

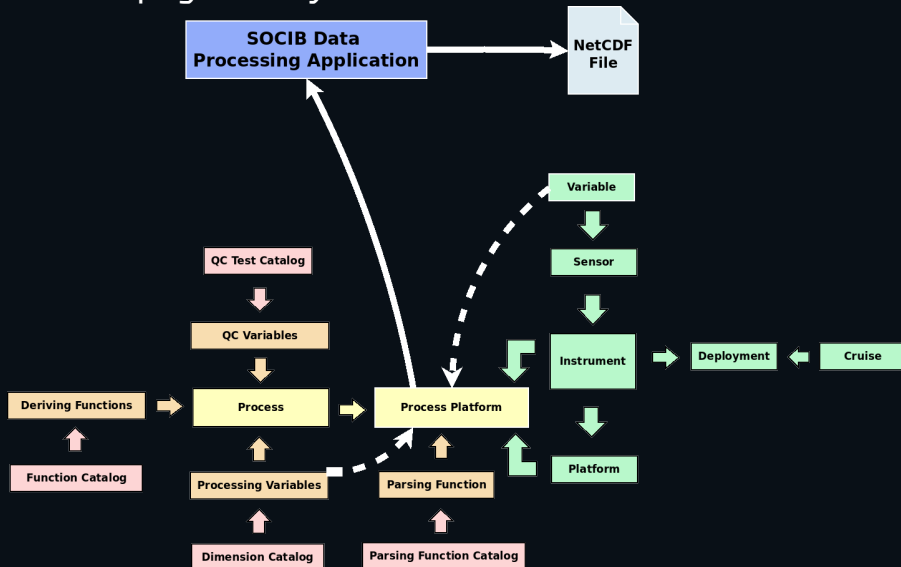
# Principles

## Developing creativity



# Principles

## Developing creativity



In a few words ...

**Robustness**

**Versatility**

**Quickness**

In a few words ...

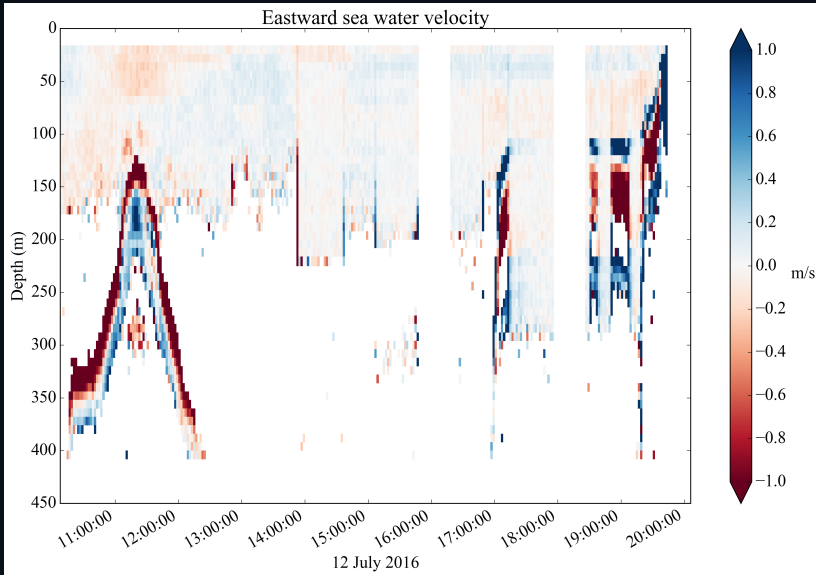
Robustness

Versatility

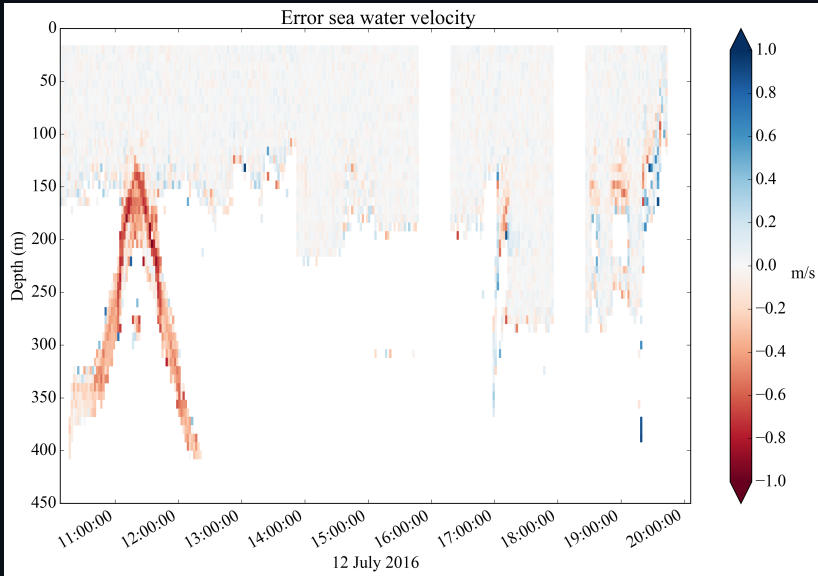
Quickness

Need a proof?

# R/V ADCP data processing

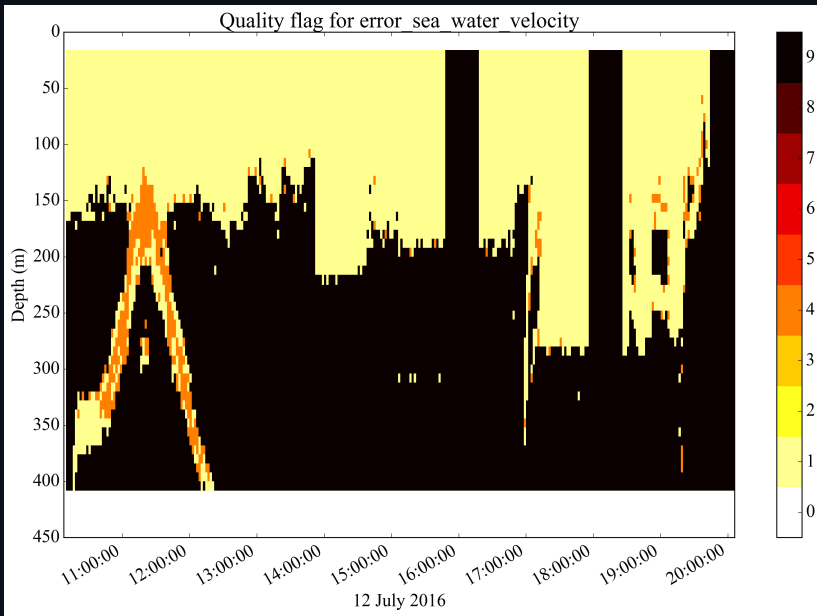


# R/V ADCP data processing





# R/V ADCP data processing



# Digital playground: Jupyter-notebook

• Jupyter-notebook: <https://jupyter.org/>

• Jupyter-notebook: <https://mybinder.org/>

• Jupyter-notebook: <https://mybinder.org/v2/gh/ipython/ipython-notebook/master?filepath=notebooks>

• Jupyter-notebook: <https://mybinder.org/v2/gh/ipython/ipython-notebook/master?filepath=notebooks>

• Jupyter-notebook: <https://mybinder.org/v2/gh/ipython/ipython-notebook/master?filepath=notebooks>

• Jupyter-notebook: <https://mybinder.org/v2/gh/ipython/ipython-notebook/master?filepath=notebooks>

• Jupyter-notebook: <https://mybinder.org/v2/gh/ipython/ipython-notebook/master?filepath=notebooks>

• Jupyter-notebook: <https://mybinder.org/v2/gh/ipython/ipython-notebook/master?filepath=notebooks>

• Jupyter-notebook: <https://mybinder.org/v2/gh/ipython/ipython-notebook/master?filepath=notebooks>

# Digital playground: Jupyter-notebook

Text

markdown

Code fragment

python, Julia, R, ...

Figures, animations or interactive maps

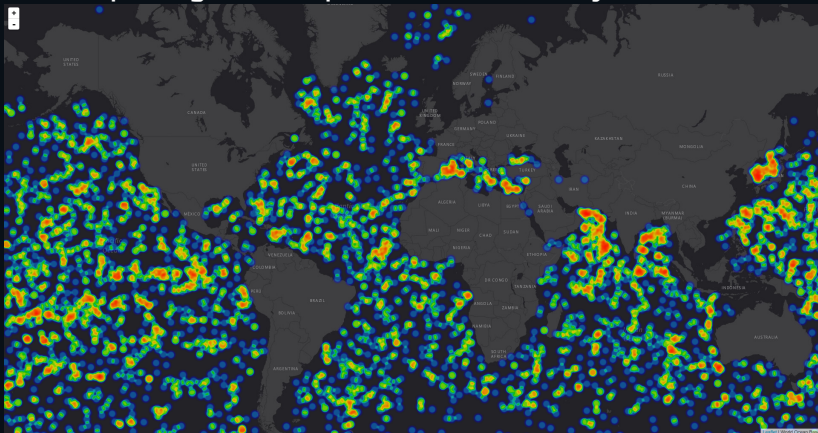
Data story telling

# Digital playground: Jupyter-notebook



# Digital playground: Jupyter-notebook

## Heatmap using CMEMS profiler data, January 2016



Folium package in python to interact with Leaflet

# Future work



1

Artificial intelligence


Infer relevant information during the data processing in order to improve for example, the quality control

# Future work

- 
- 1 Artificial intelligence
  - 2 Big Data

Combining internal and external data  
(smartphone sensors, Automatic Identification System (AIS)  
data, ...)

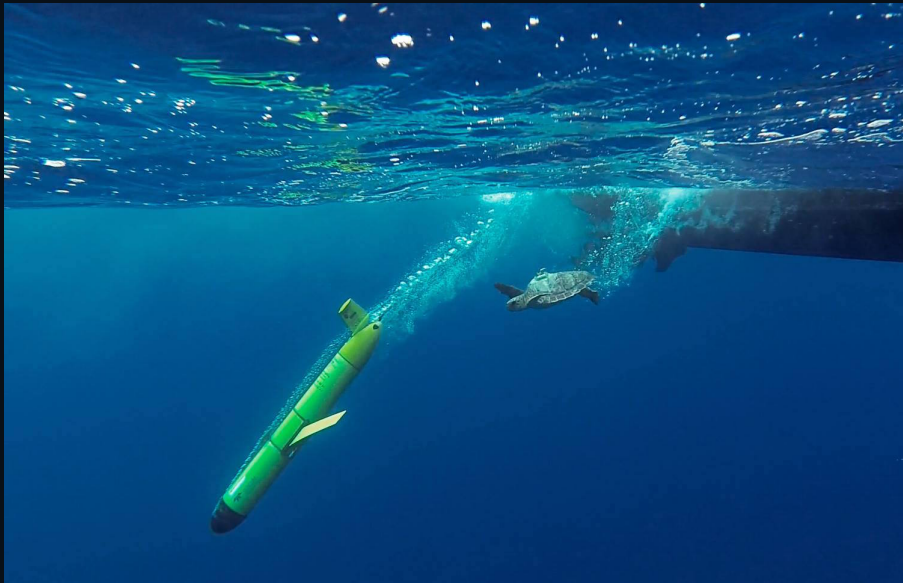
# Future work

- 
- 1 Artificial intelligence
  - 2 Big Data
  - 3 Citizen science

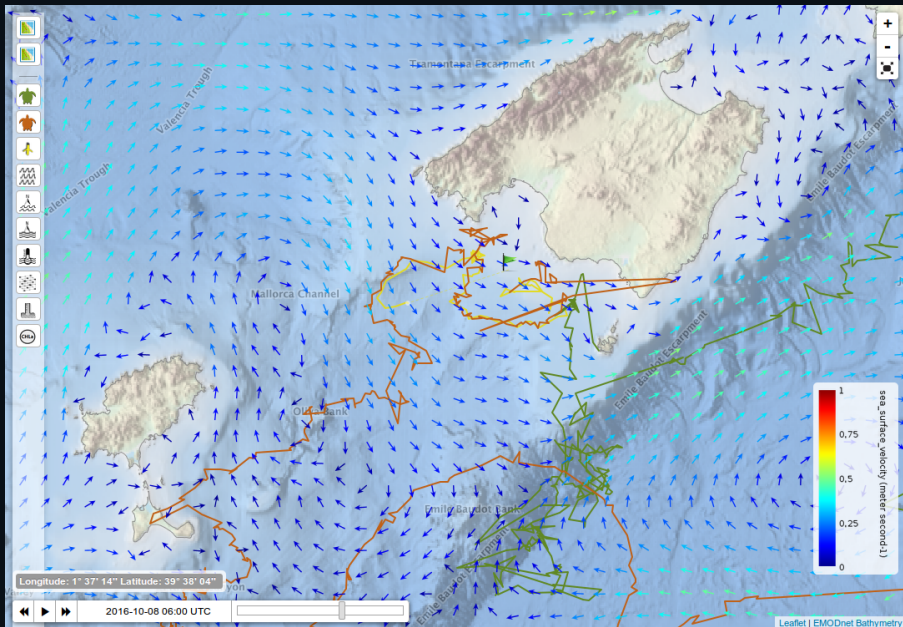
Collecting geo-localised photos shared through social media and link them to specific marine events



# Conclusions



# Conclusions



# Thanks for your attention



## Tools

<https://github.com/socib/Leaflet.TimeDimension>  
<https://jupyter.org/>

## Web

<http://medcllic.es/>  
<http://followtheglider.socib.es/>

## Apps

<http://apps.socib.es/>  
 <https://play.google.com/store/apps/details?id=com.socib>  
 <https://itunes.apple.com/us/app/socib/id482542716?mt=8>

## Social media

 <https://github.com/socib>  
 [https://twitter.com/socib\\_data](https://twitter.com/socib_data)