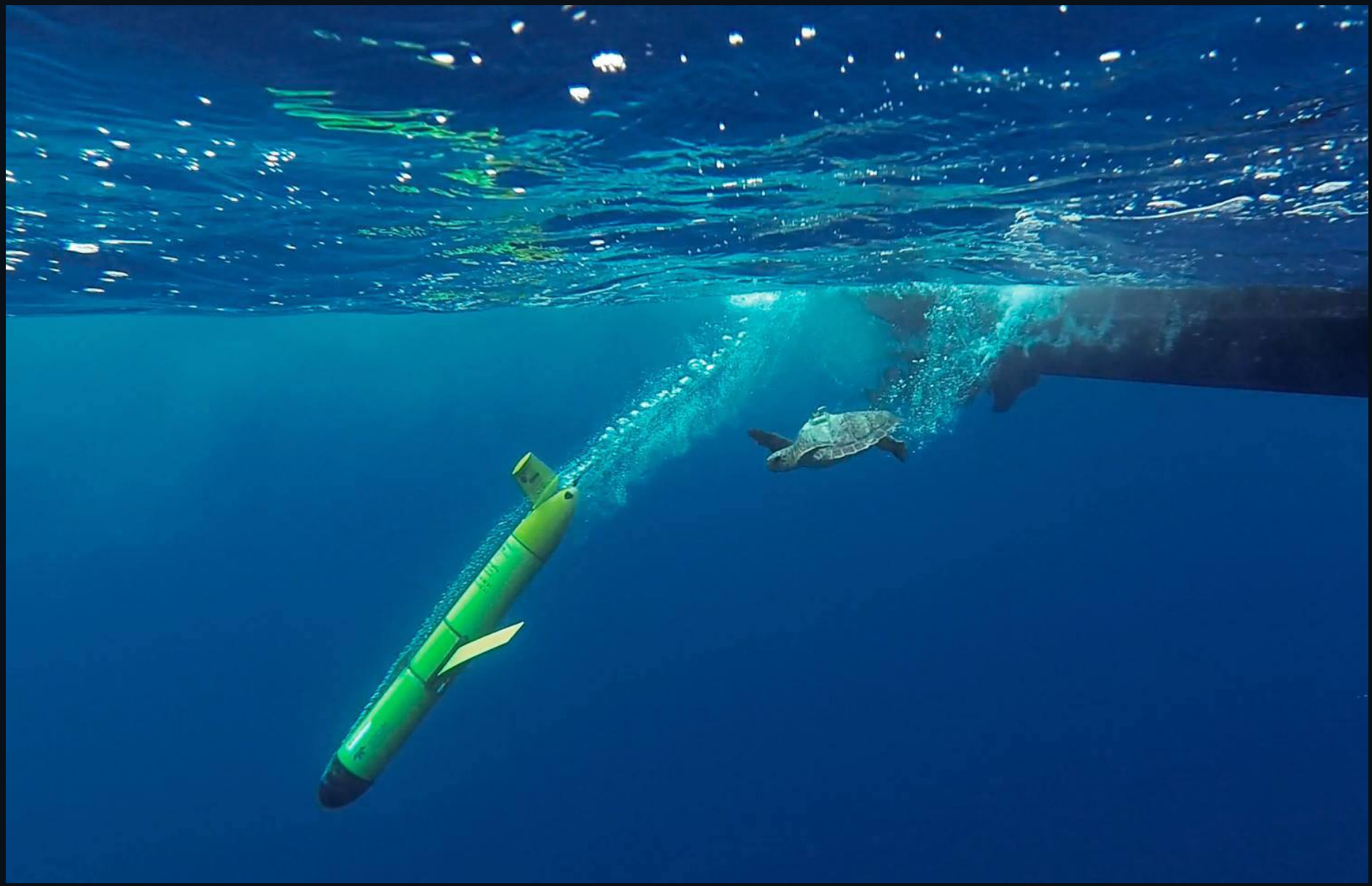
SOCIB Balearic Islands Coastal Observing and Forecasting System

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



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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
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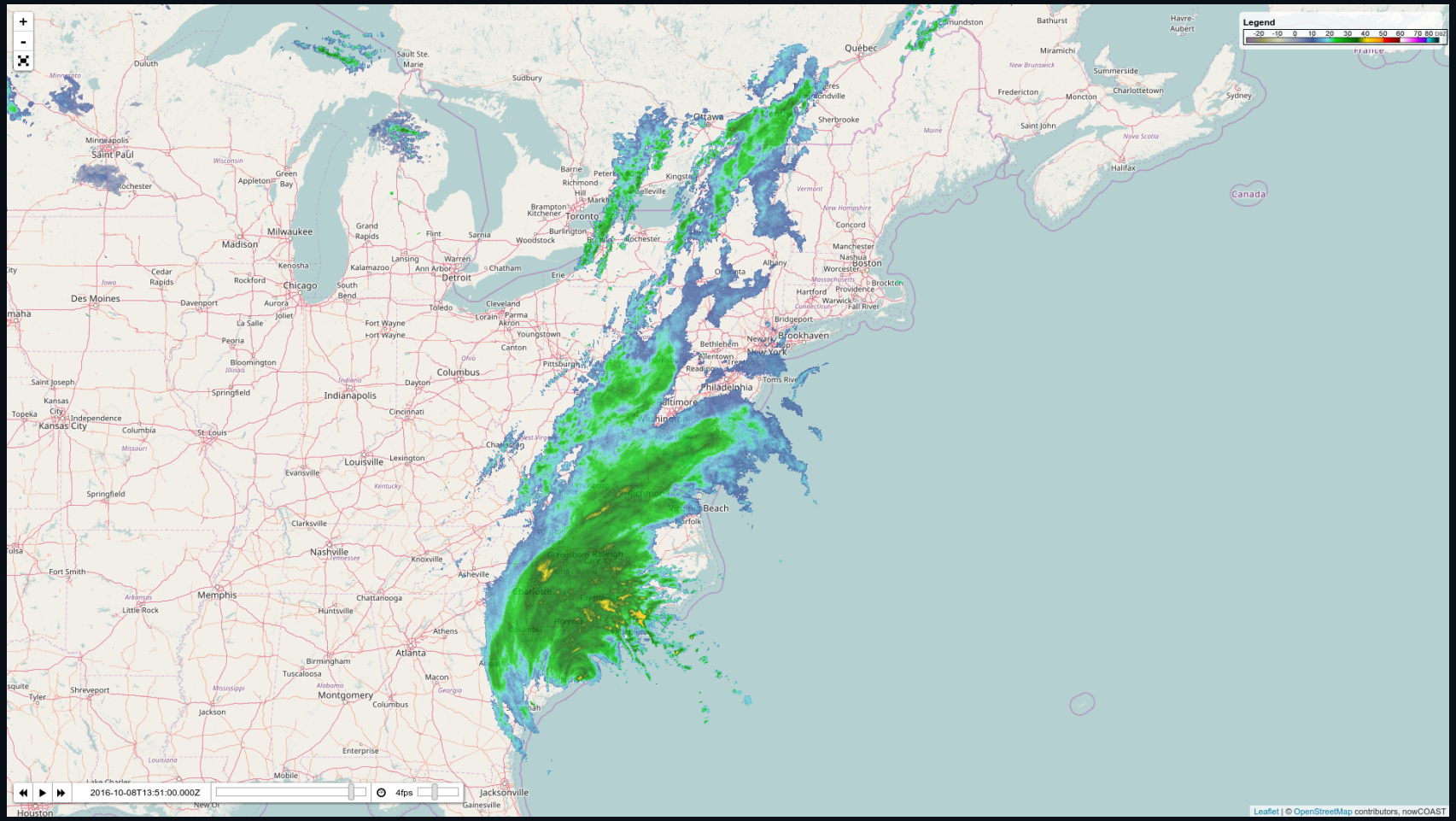
- Distribution & 🖵 visualisation

⇄ Distribution & 🖵 visualisation

TimeDimension plugin for Leaflet library

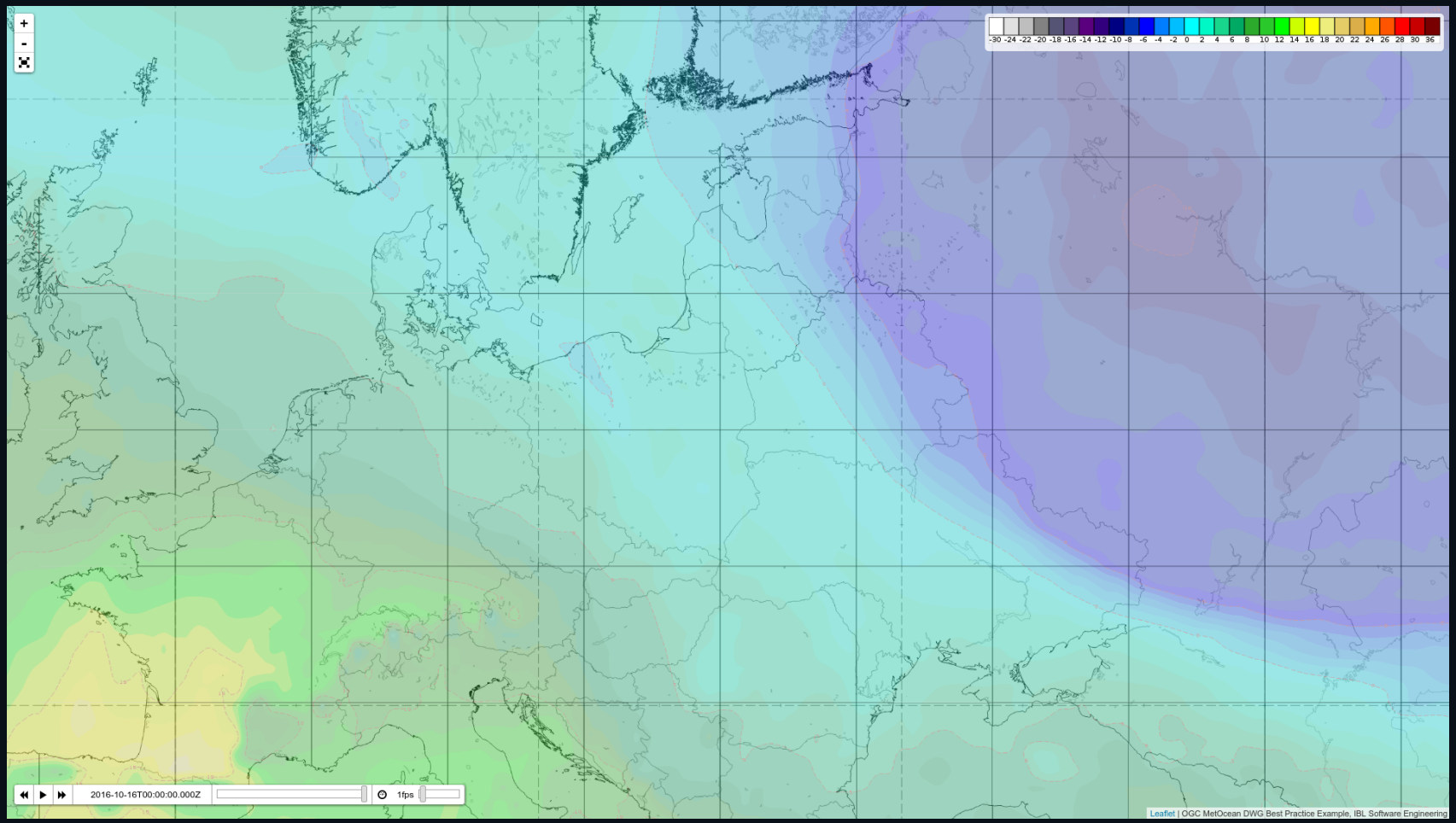


WMS

NOAA nowCOAST weather radar

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

TimeDimension plugin for Leaflet library

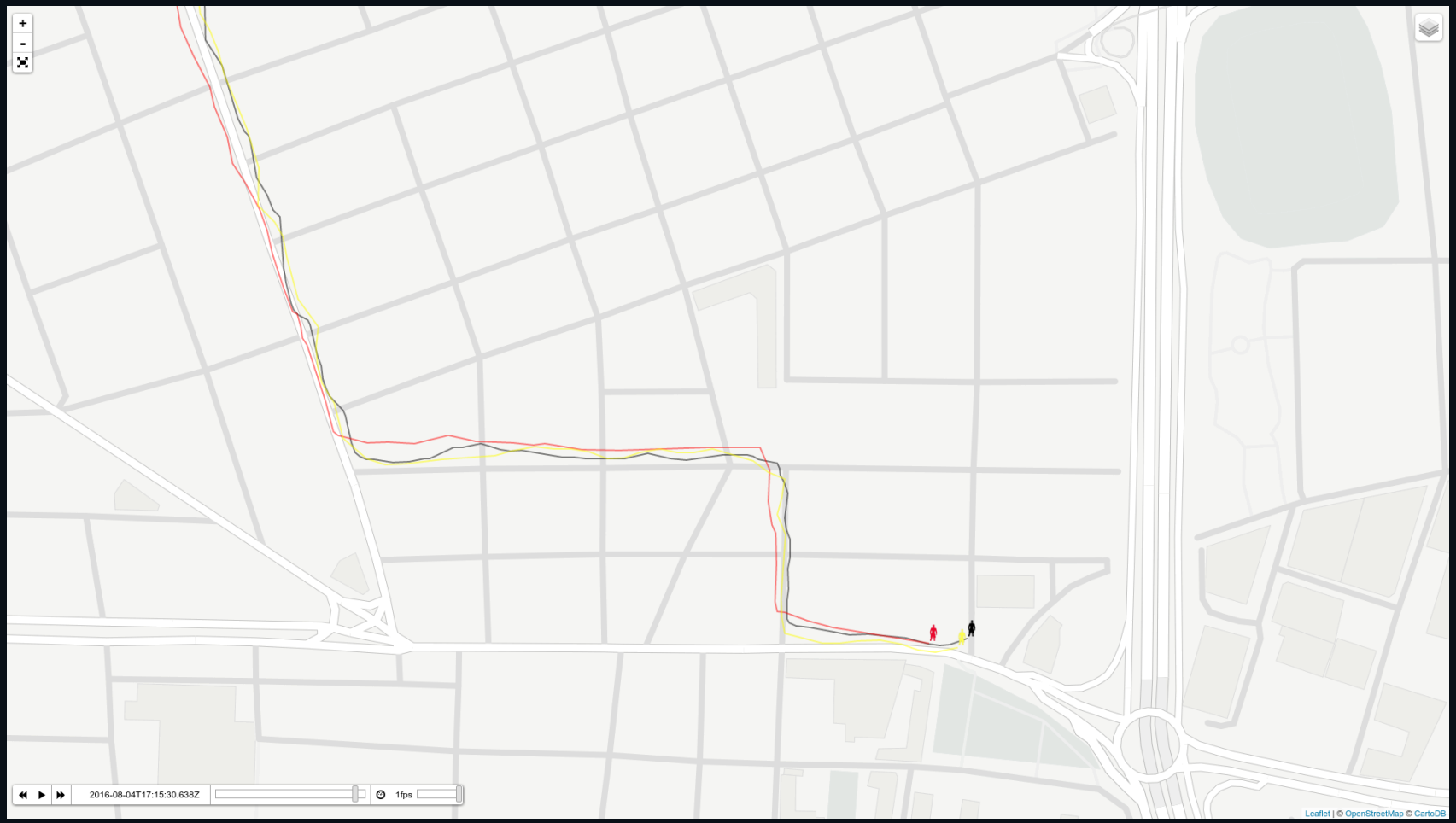


WMS

Temperature from IBL Software Engineering

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

TimeDimension plugin for Leaflet library

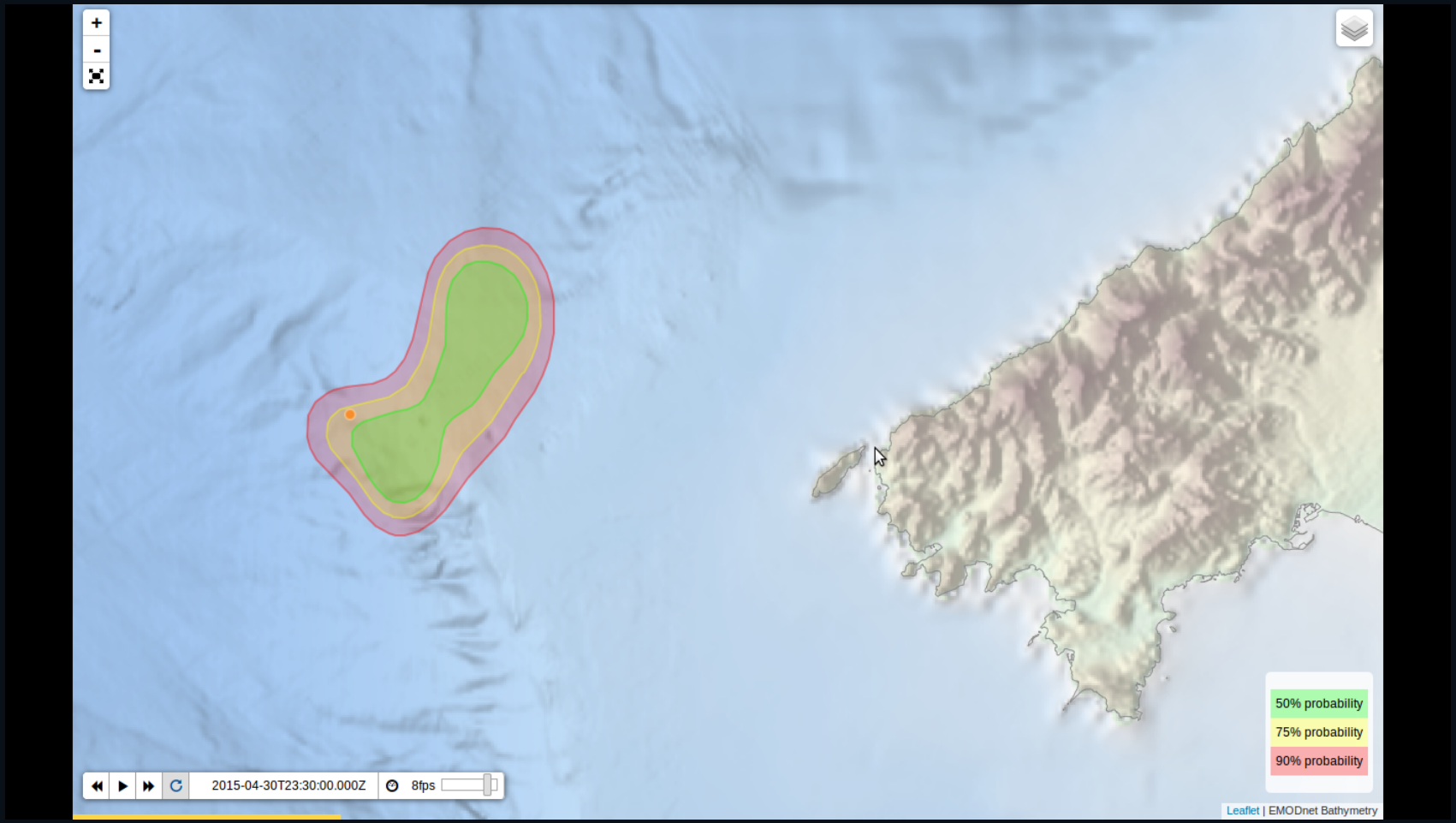


GPX or KML

GPS tracks comparison

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

TimeDimension plugin for Leaflet library



GeoJSON

Oil spill model

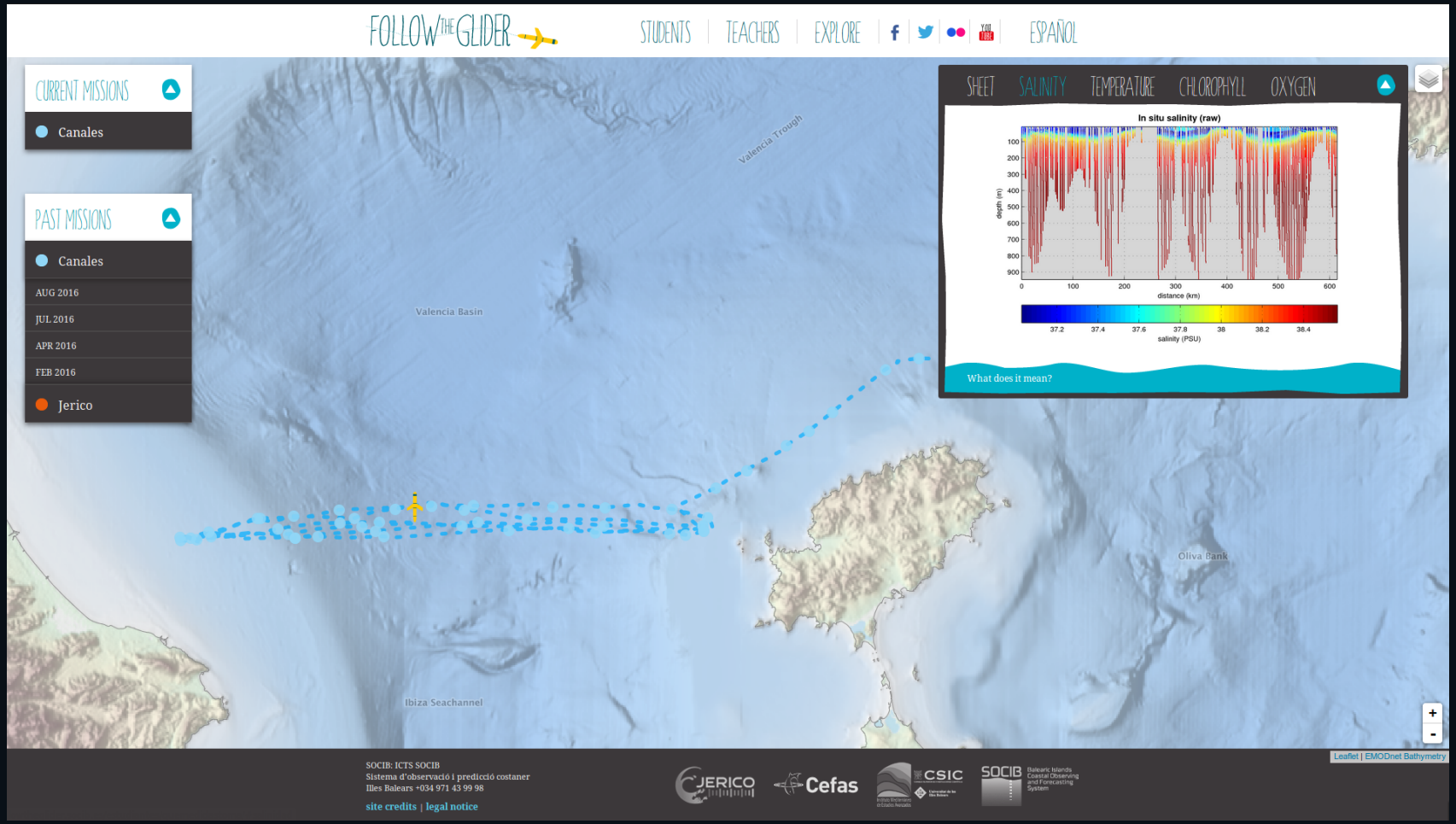
https://github.com/socib/Leaflet.TimeDimension

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



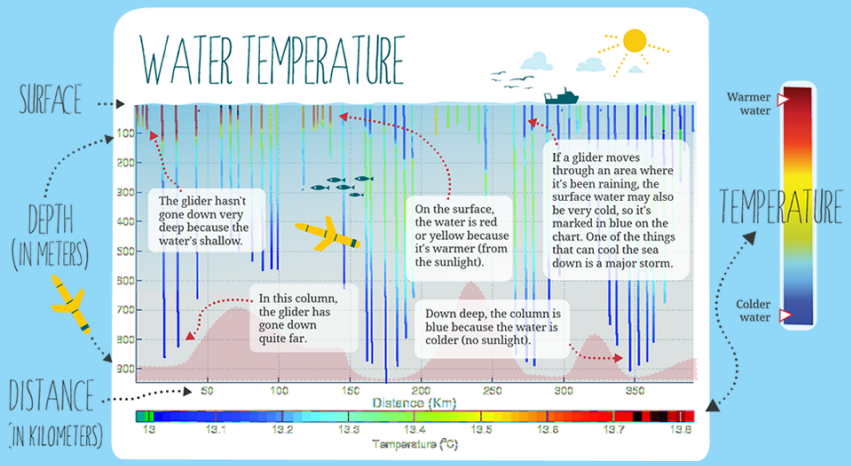
http://followtheglider.socib.es

Follow-the-Glider

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

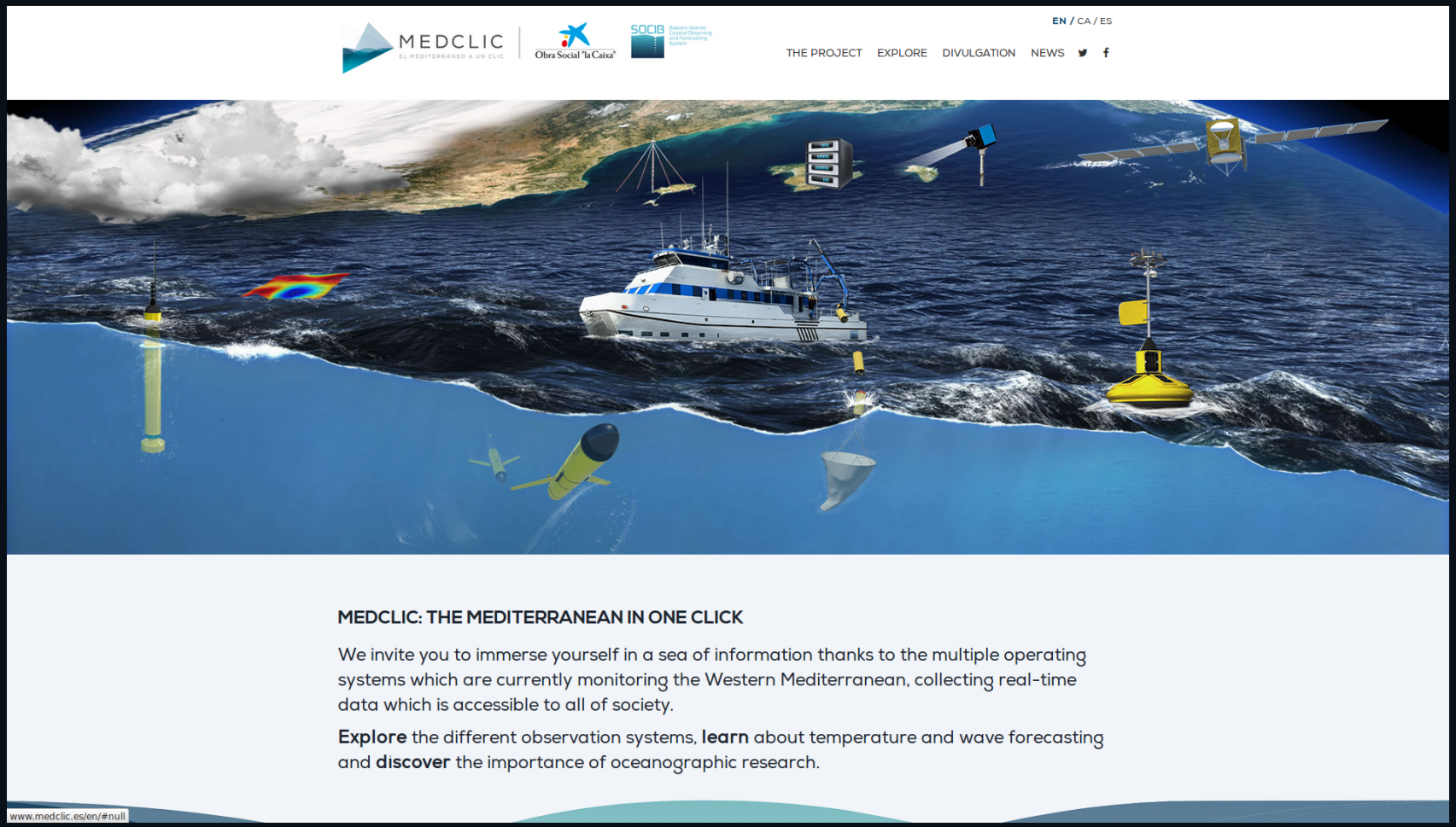
We use the data we receive from a glider to put together charts. They seem hard to read, but it's actually easier than you think.

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.



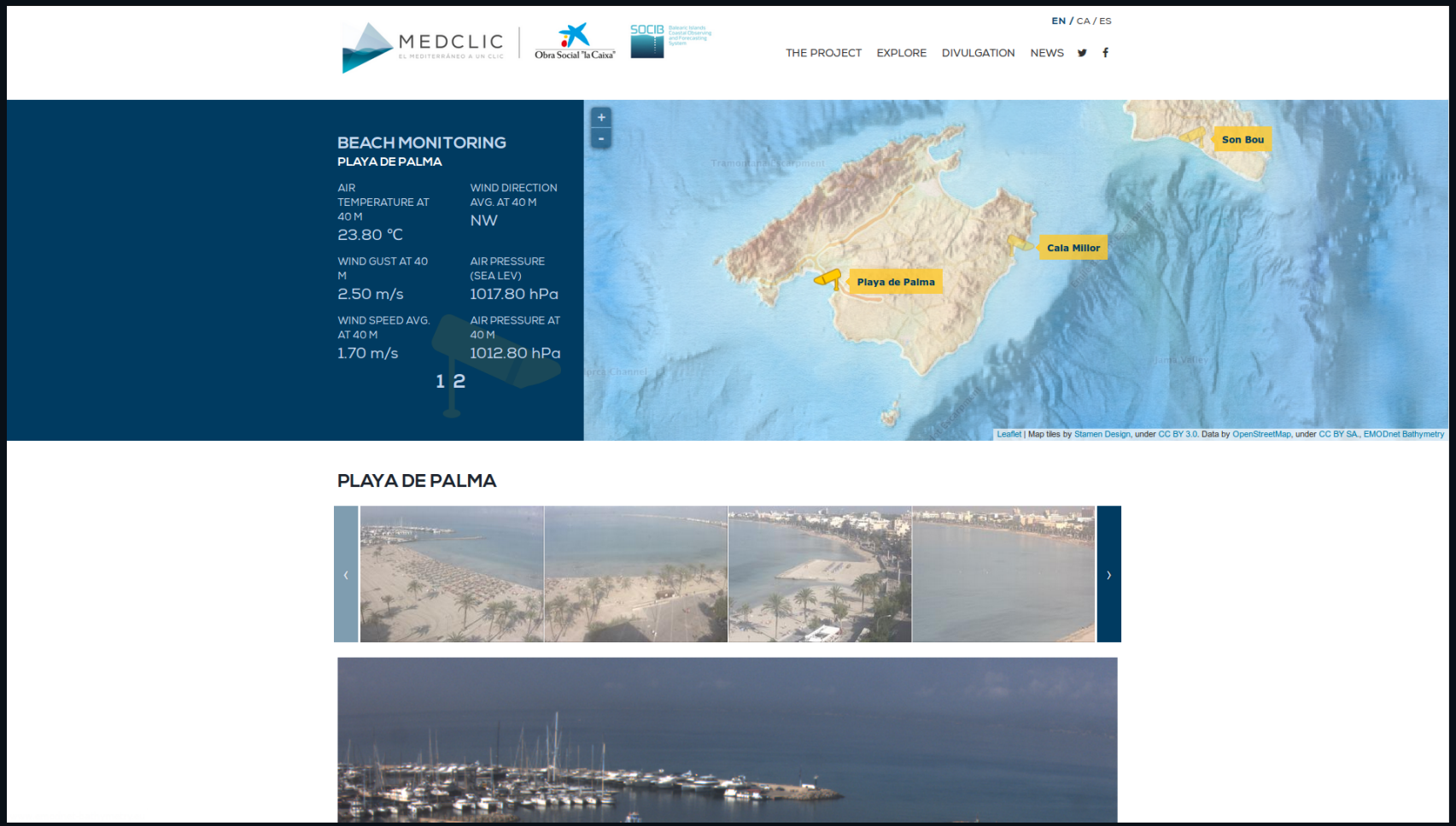
http://followtheglider.socib.es

Medclic: scientific and outreach project



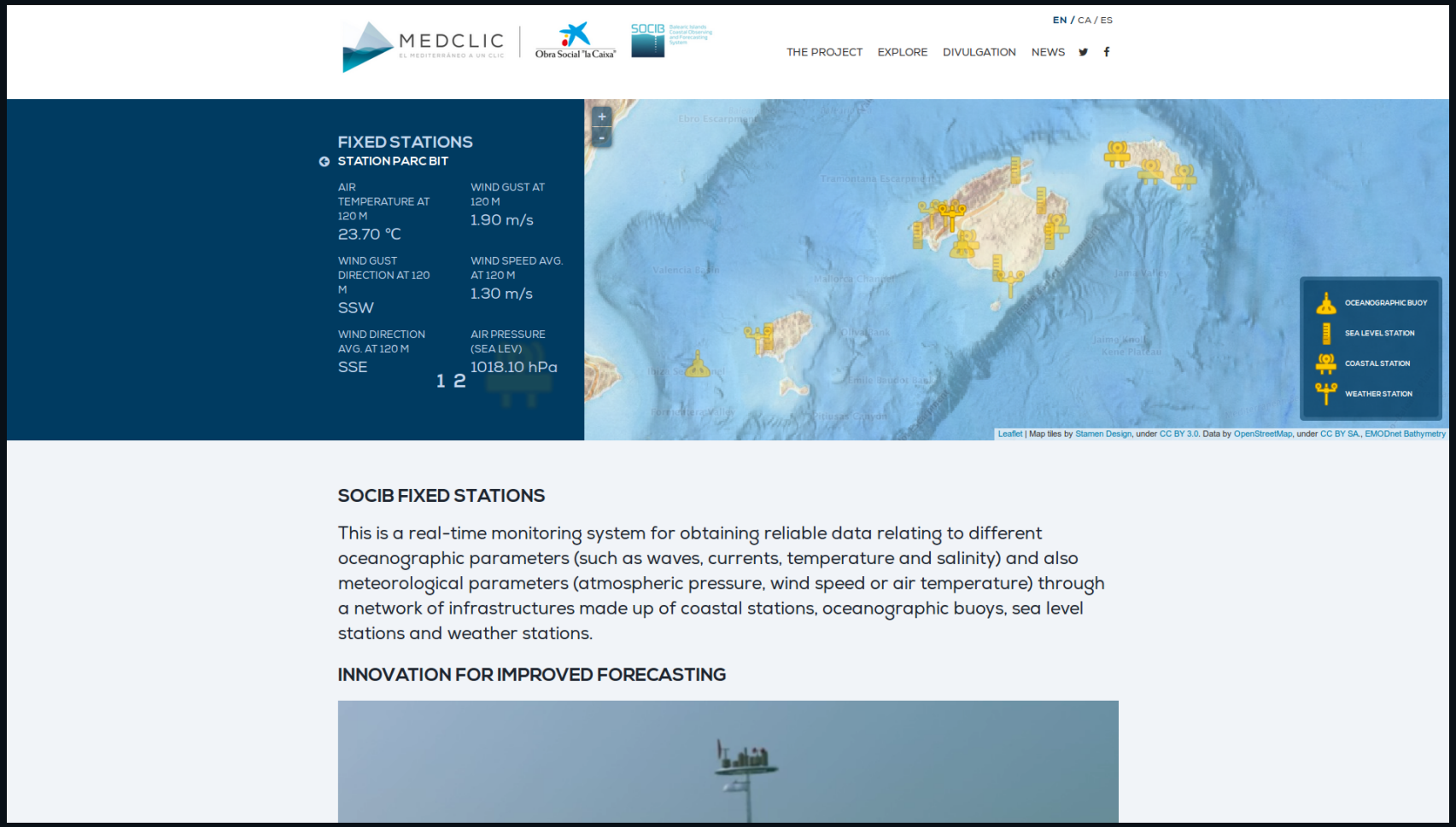
http://www.medclic.es

Medclic: scientific and outreach project



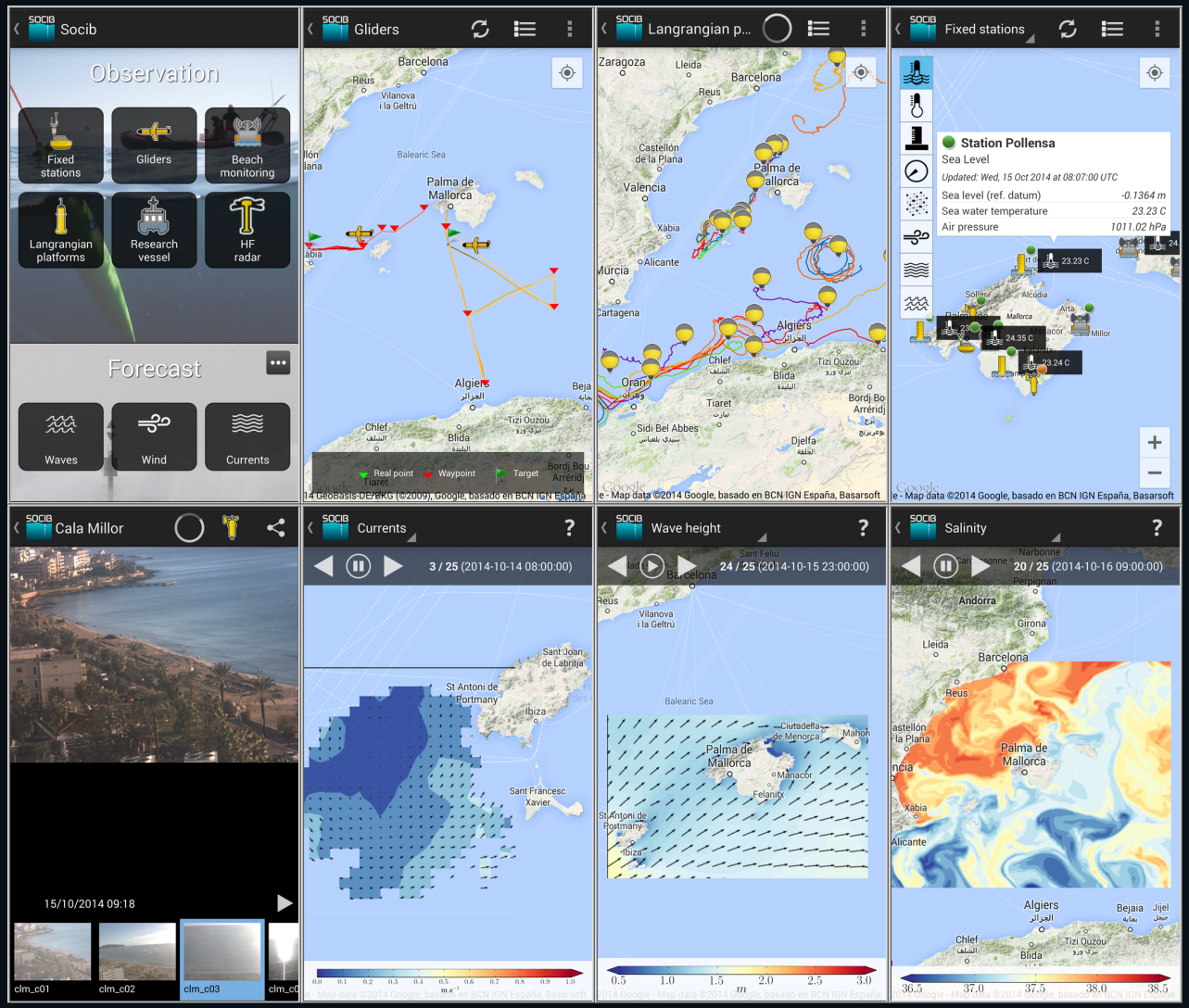
http://www.medclic.es

Medclic: scientific and outreach project



http://www.medclic.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, delovepers, data managers, scientists, …

What is next?

New data API

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

   general public, delovepers, data managers, scientists, …

2. **Easier developments of external applications**

   visualisation, apps, data analysis …

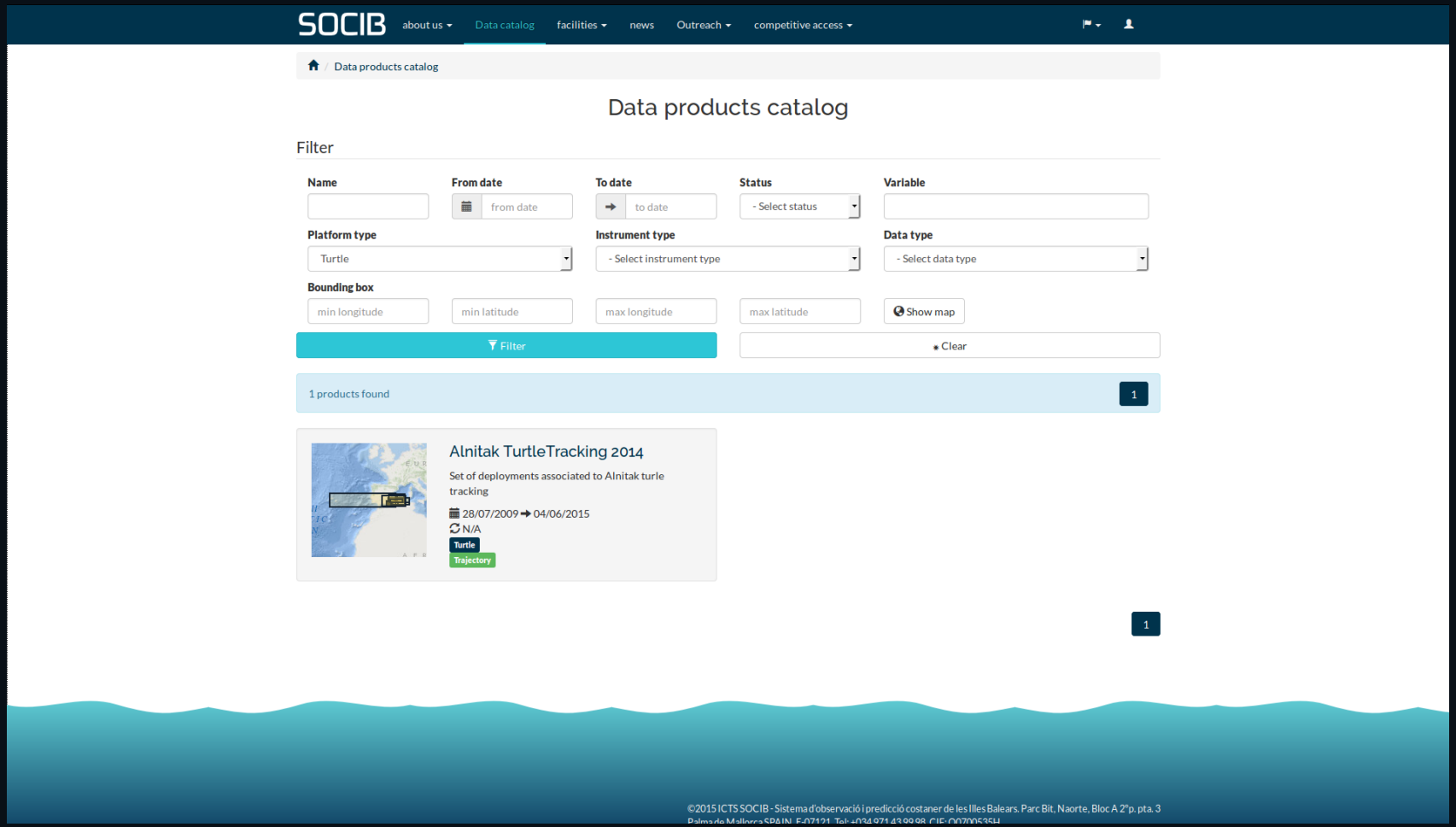
What is next?

New data API

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

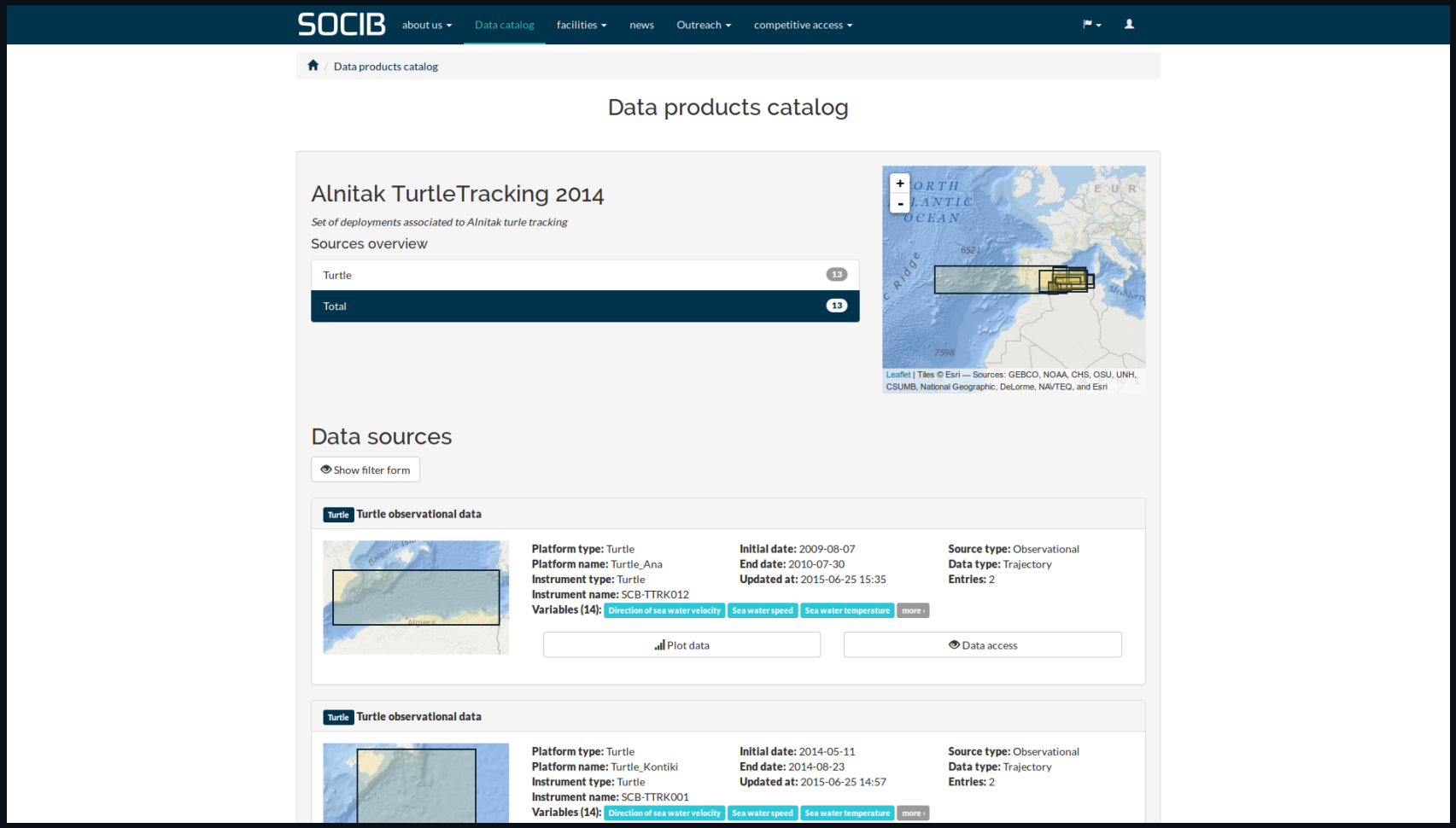
What is next?

New data API and new data catalog



What is next?

New data API and new data catalog



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

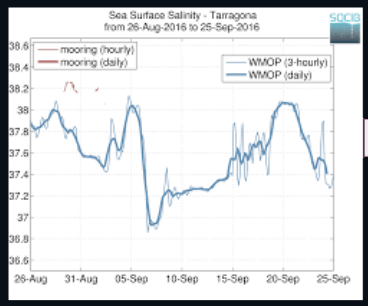
Multi-platform observing system

Principles

Emulating reality

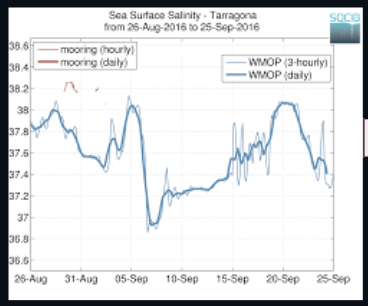
Principles

Emulating reality



Principles

Emulating reality



Variable

Sensor

Instrument

Platform

Deployment

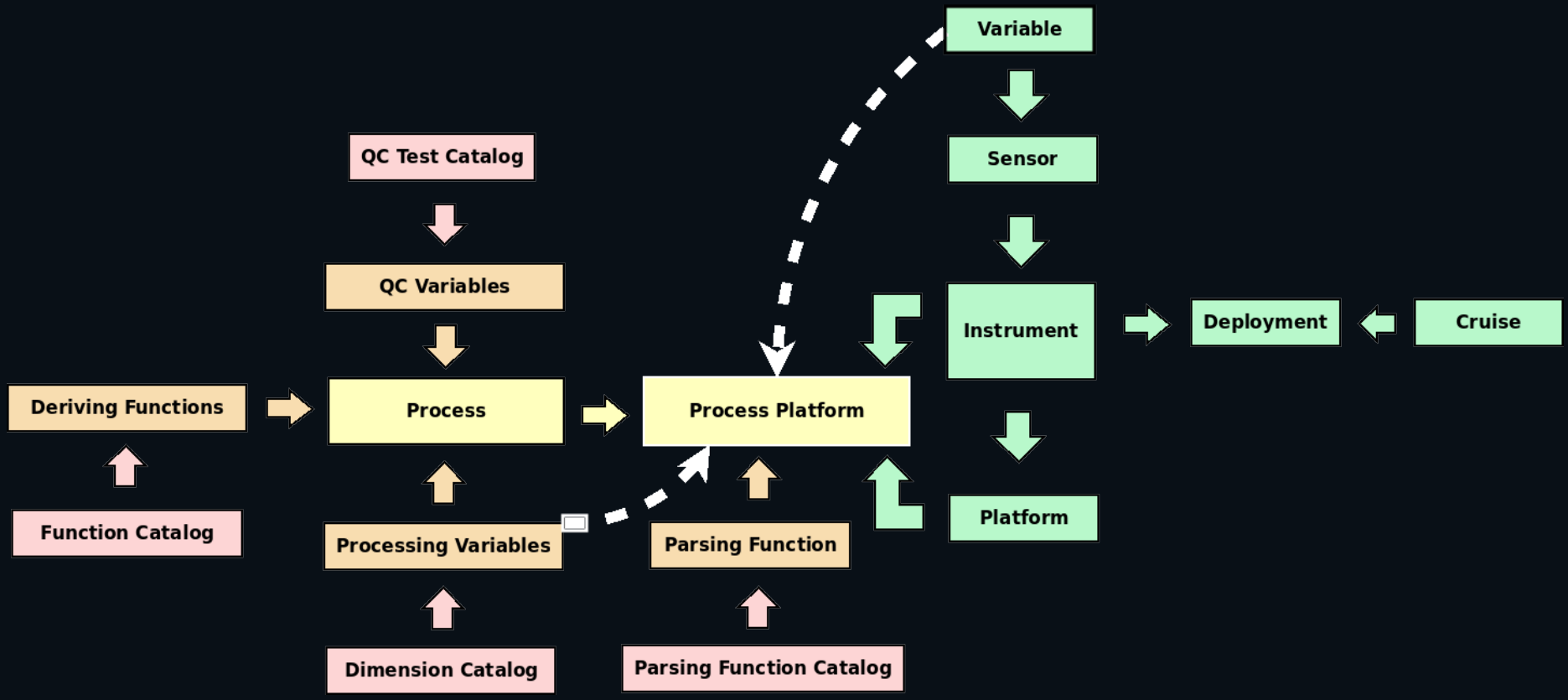
Cruise

Principles

Developing creativity

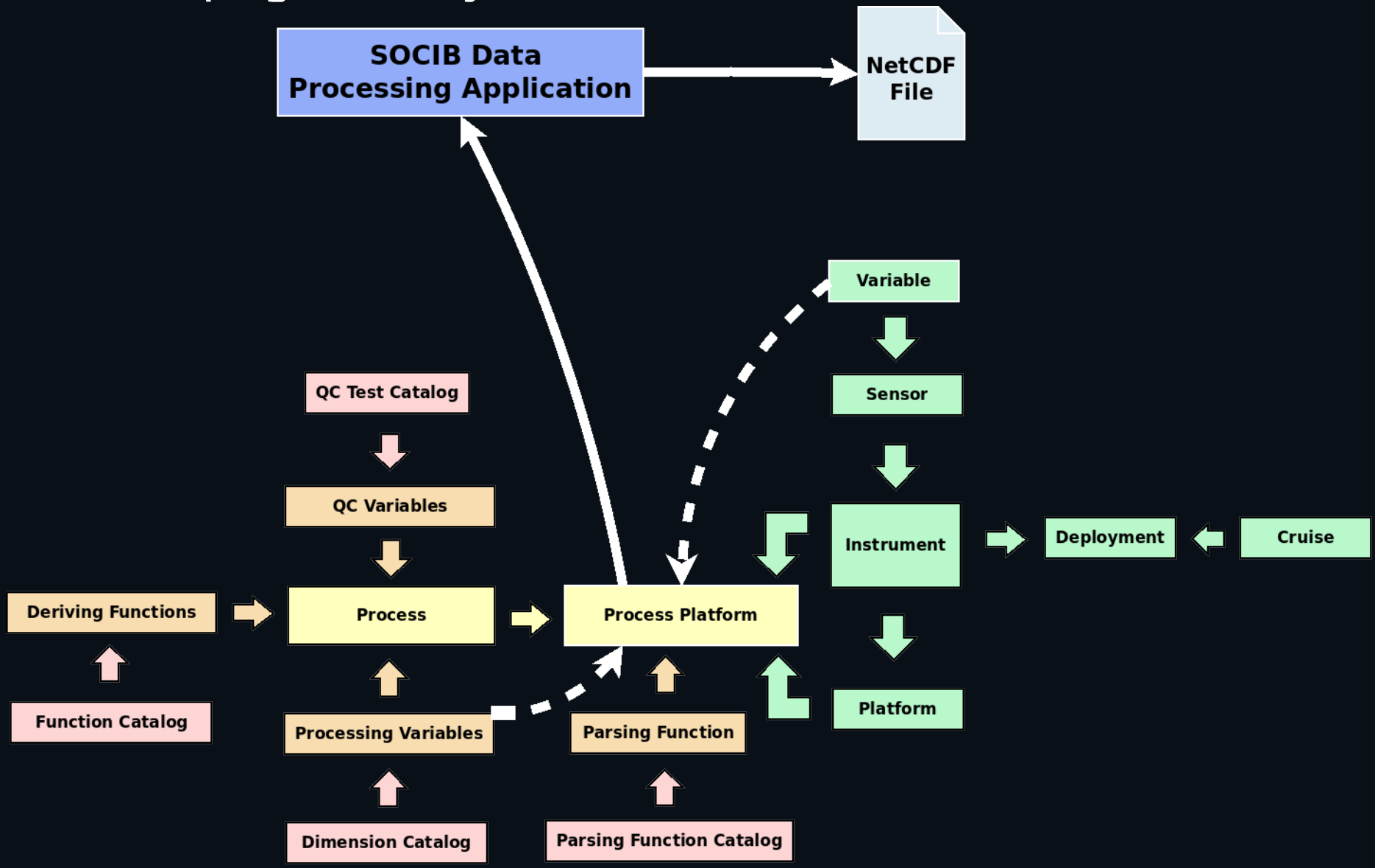
Principles

Developing creativity



Principles

Developing creativity



In a few words …

Robustness

Versatility

Quickness

In a few words …

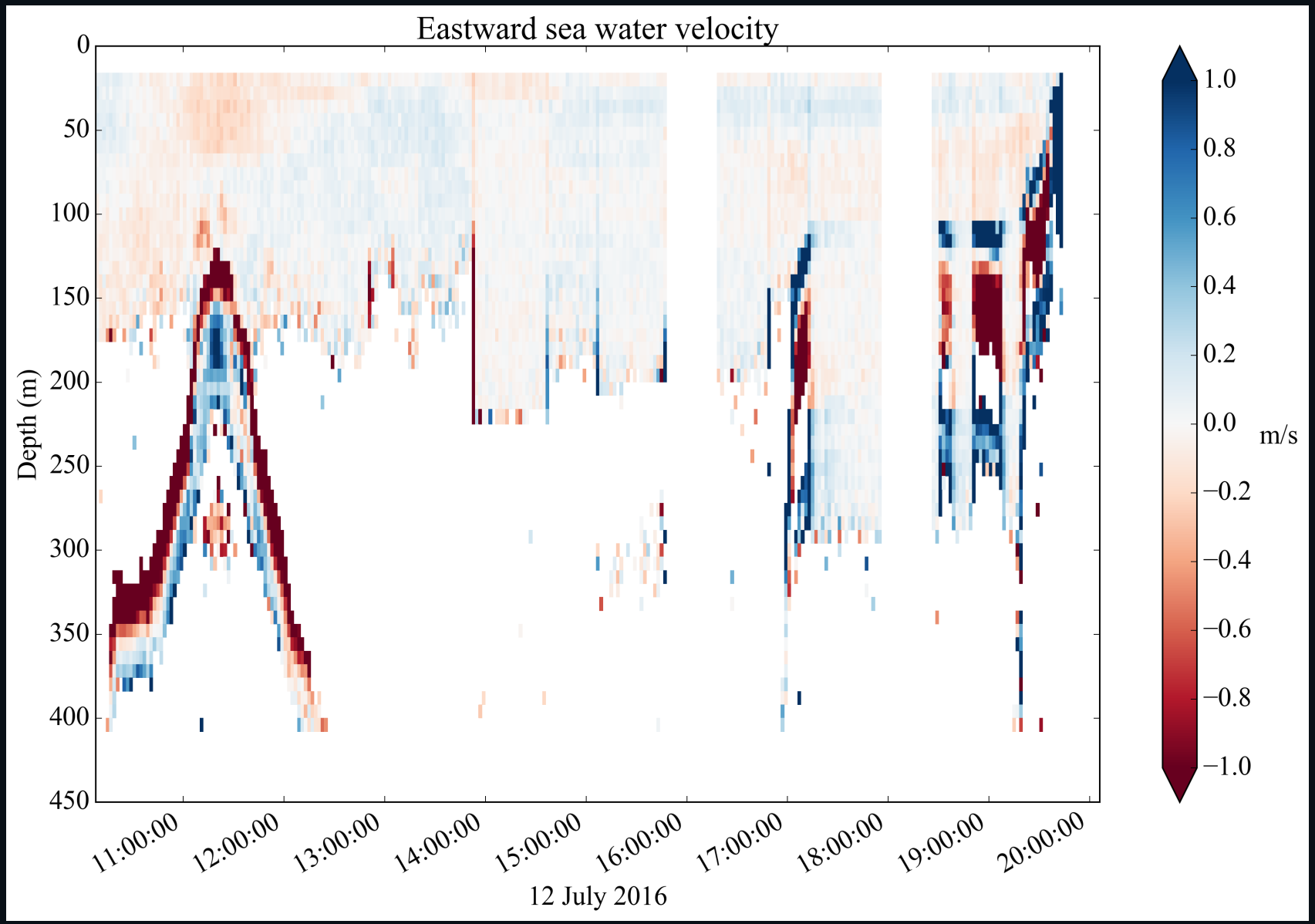
Robustness

Versatility

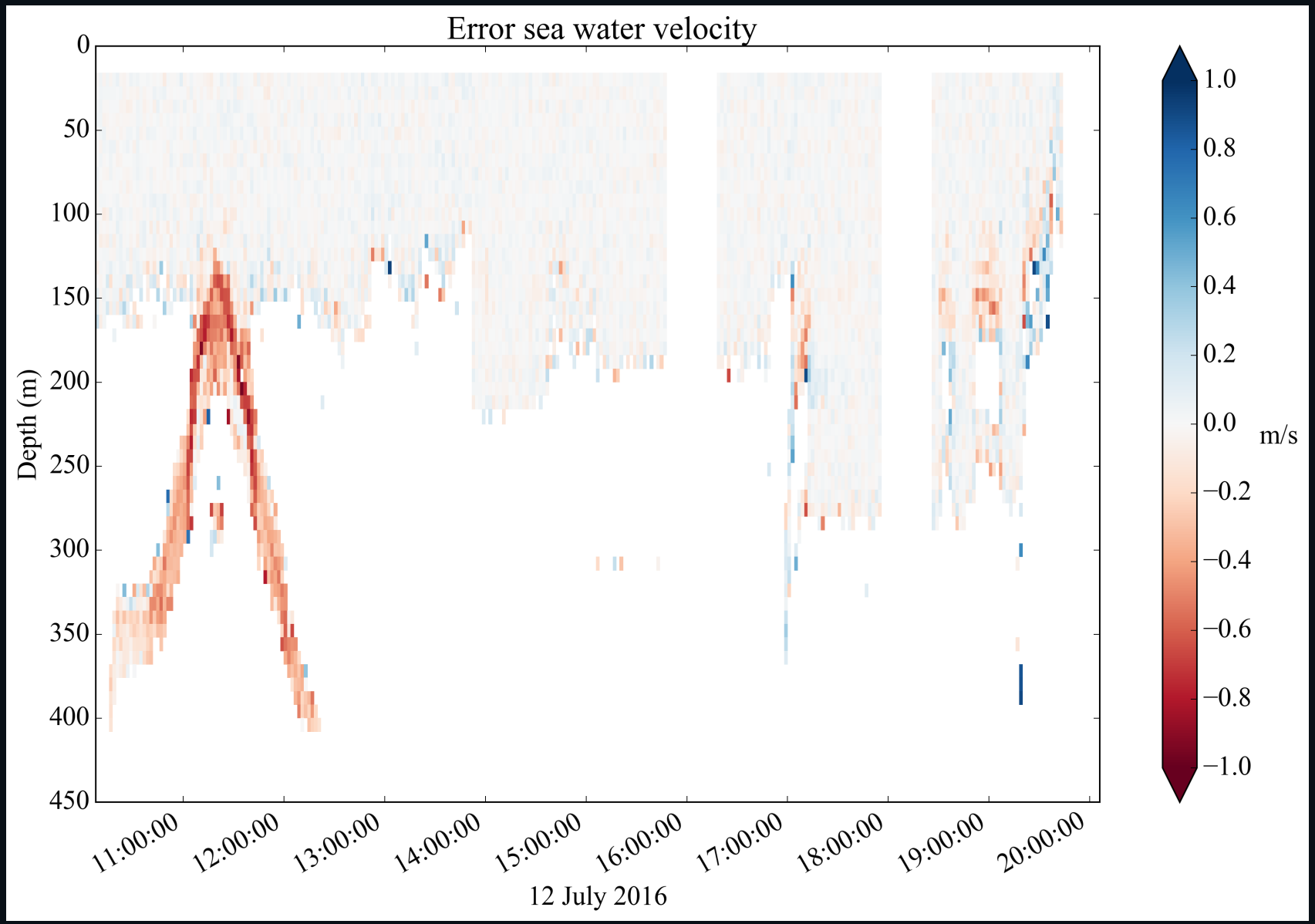
Quickness

Need a proof?

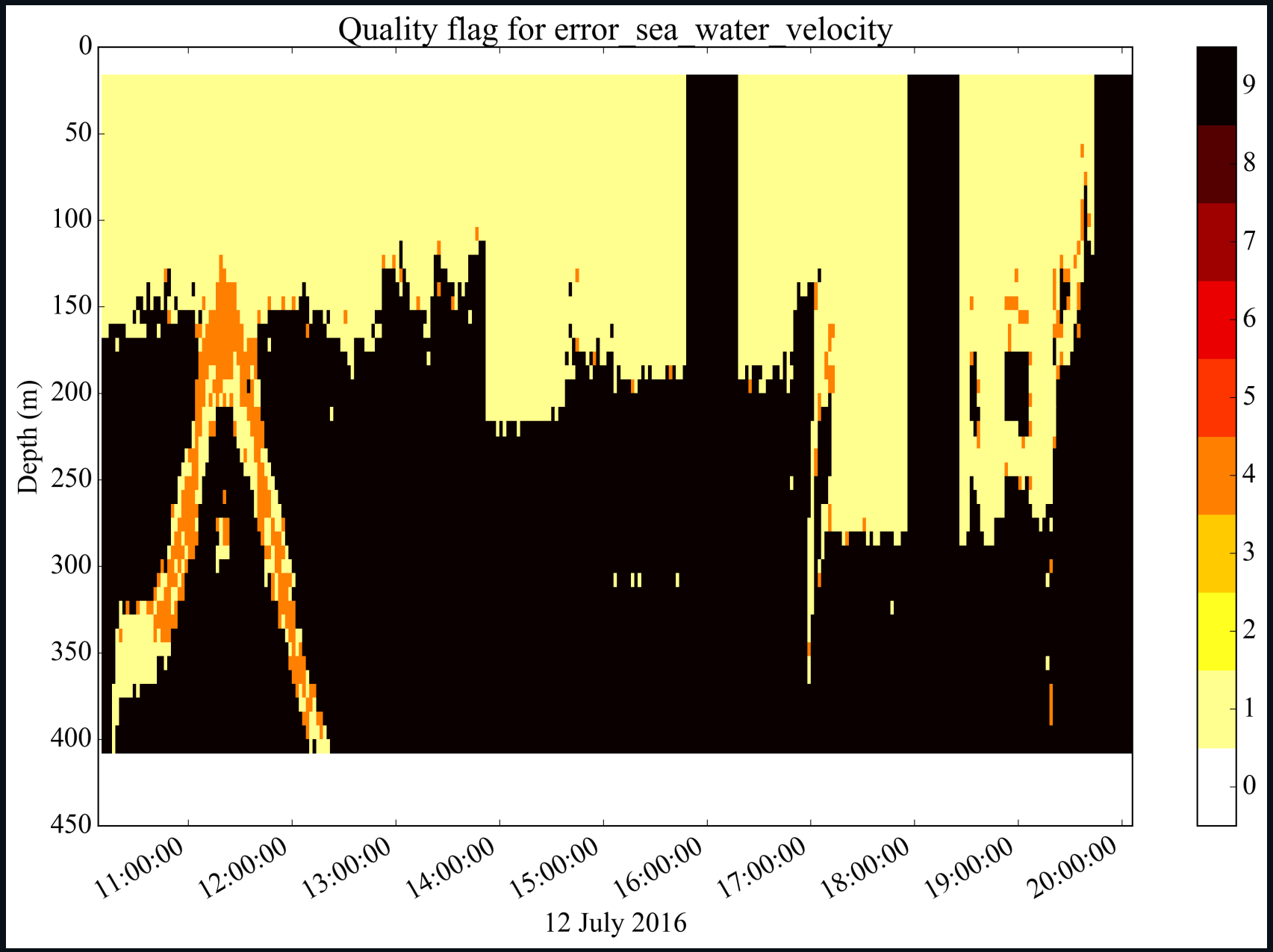
R/V ADCP data processing



R/V ADCP data processing



R/V ADCP data processing



Digital playground: Jupyter-notebook

Digital playground: Jupyter-notebook

Text — markdown

Code fragment — python, Julia, R, …

Figures, animations or interactive maps

Data story telling

Digital playground: Jupyter-notebook

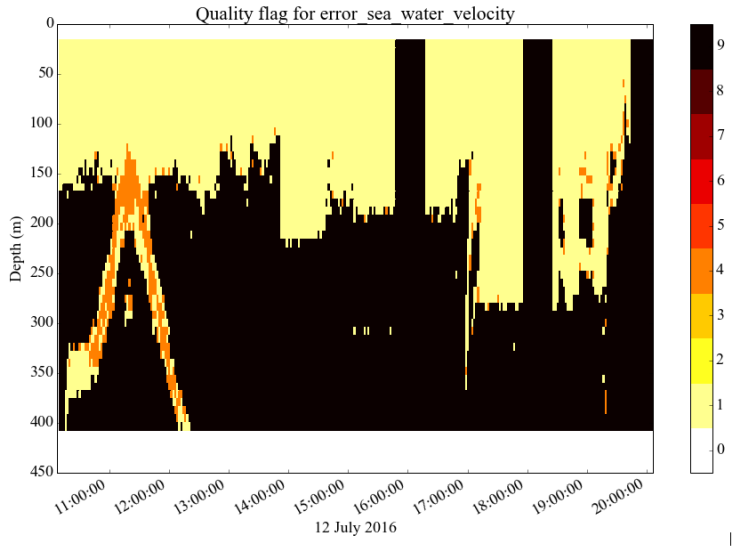
jupyter plot_RV_ADCP_data Last Checkpoint: a few seconds ago (autosaved)

File Edit View Insert Cell Kernel Help Python 2

Code CellToolbar

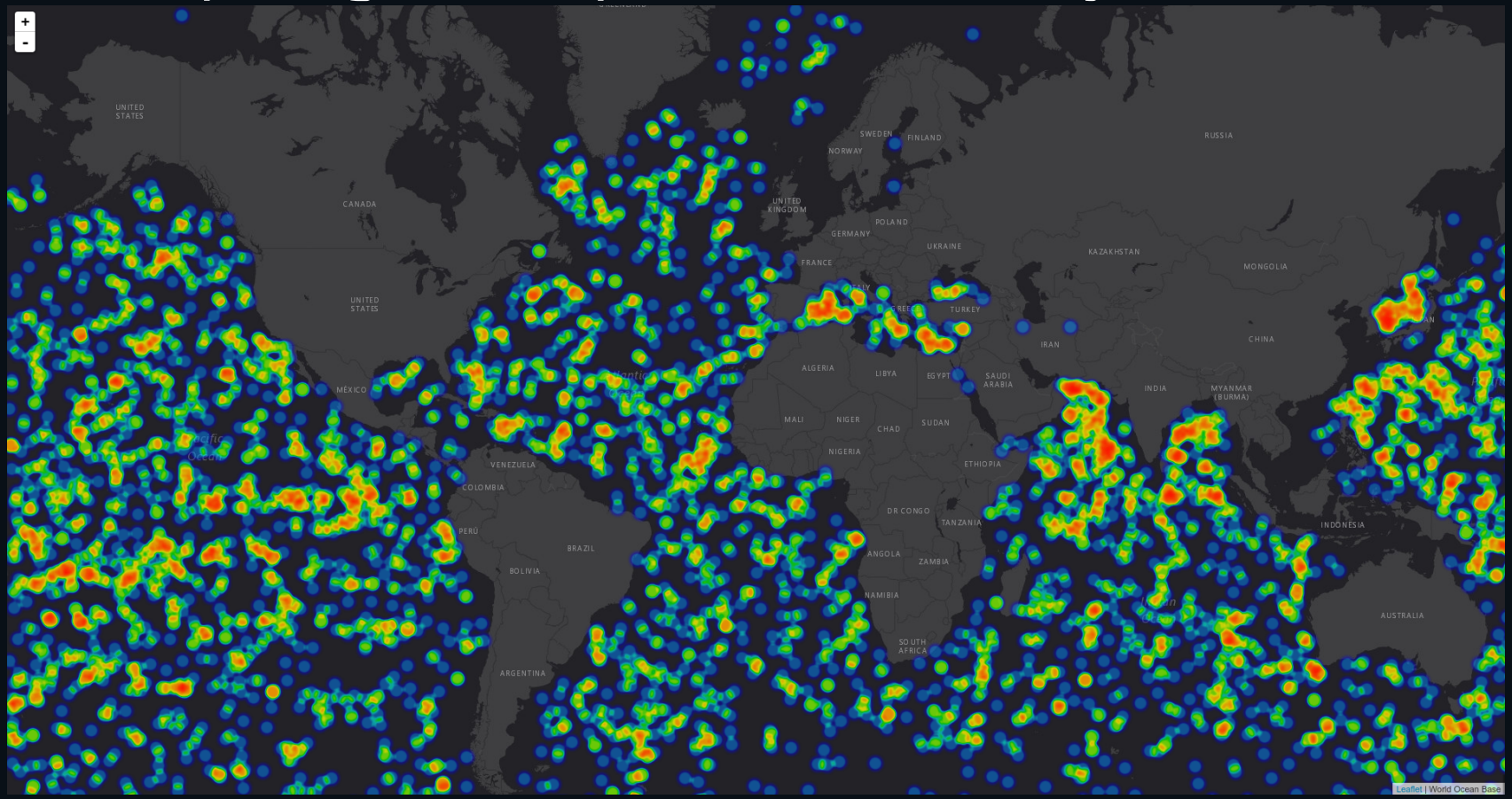
Quality flag

In [157]:
```
fig = plt.figure(figsize=(15, 10))
cmap_error = plt.cm.get_cmap('hot_r', 10)
plt.pcolor(time_converted[0:300], depth, qc_error_velocity[0:300, :].T,
           cmap=cmap_error,vmin=-.5, vmax = 9.5)
cbar = plt.colorbar(ticks=np.arange(0, 10.))
#cbar.set_label(correlation_magnitud_units, rotation=0, ha='left')
plt.xlabel('12 July 2016')
plt.ylabel('Depth' + ' (' + depth_units + ')')
plt.title(qc_error_velocity_title.split('-')[-1])
plt.gca().invert_yaxis()
fig.autofmt_xdate()
plt.savefig('QC_error_sea_water_velocity', dpi=300)
plt.show()
plt.close()
```



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

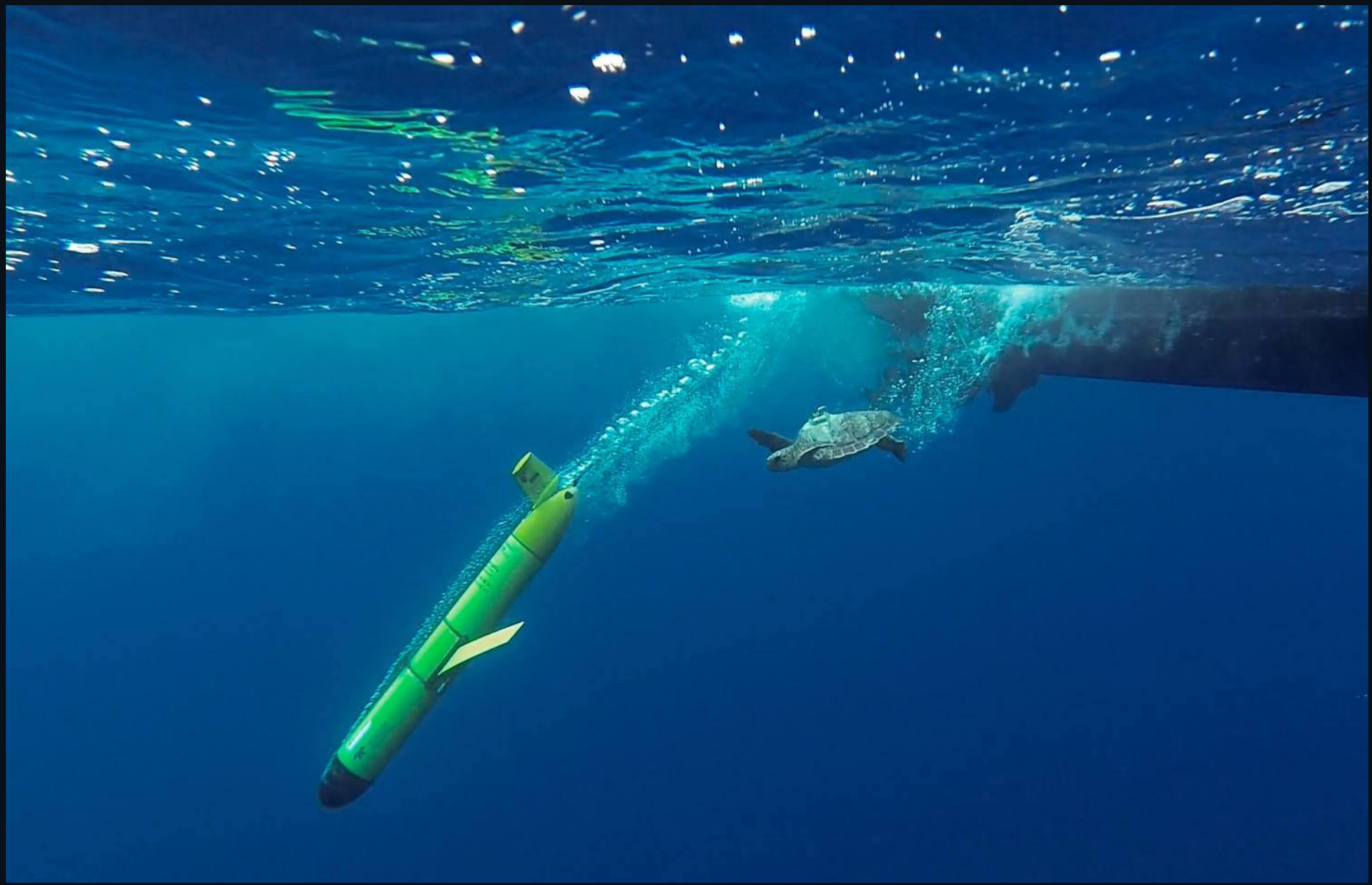
Combining internal and external data
(smartphone sensors, Automatic Identification System (AIS) data, …)

Future work

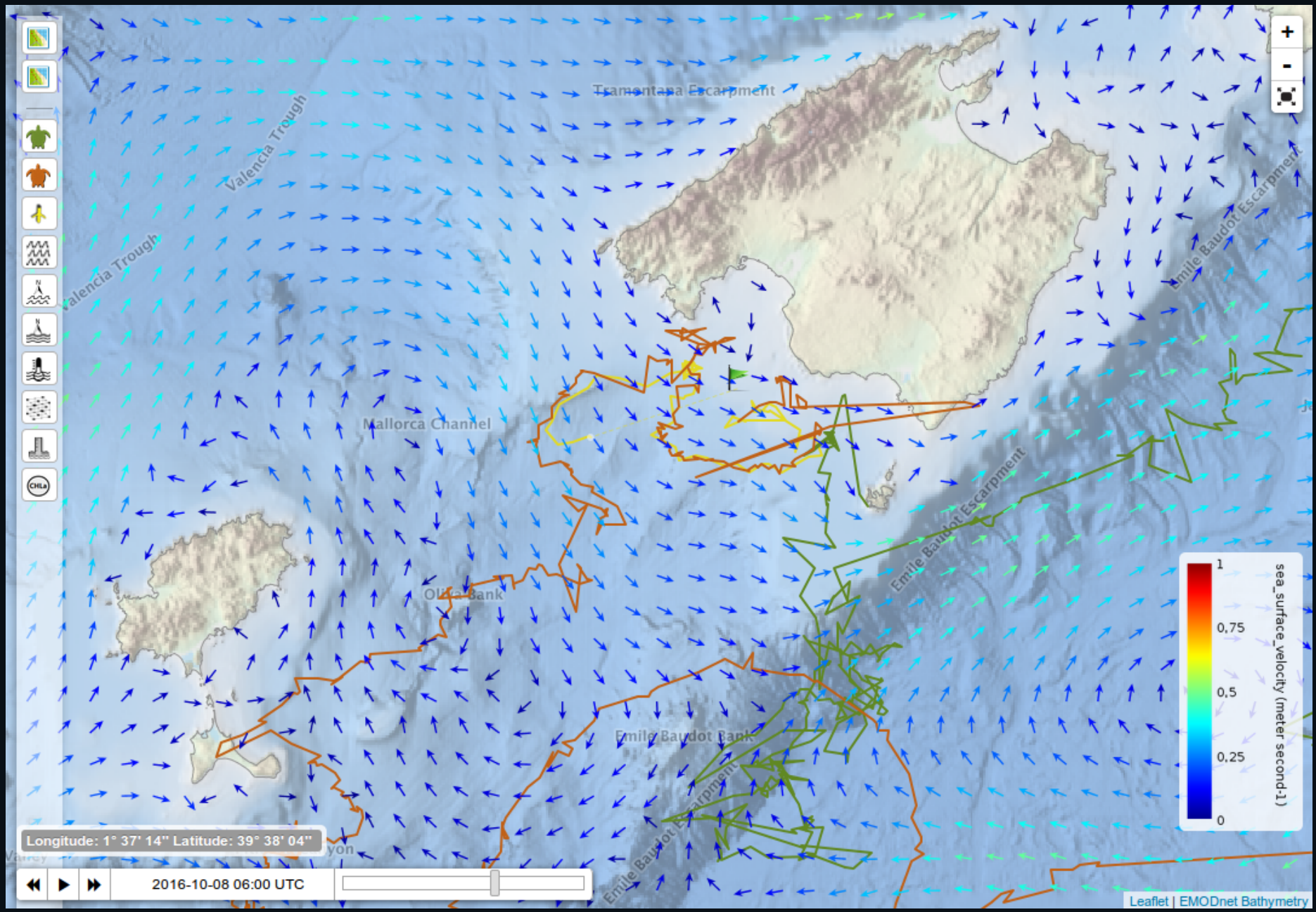
1. Artificial intelligence
2. Big Data
3. Citizen science

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://medclic.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