

SOCIB Glider toolbox: from sensor to data repository

1 Why a Glider Toolbox?

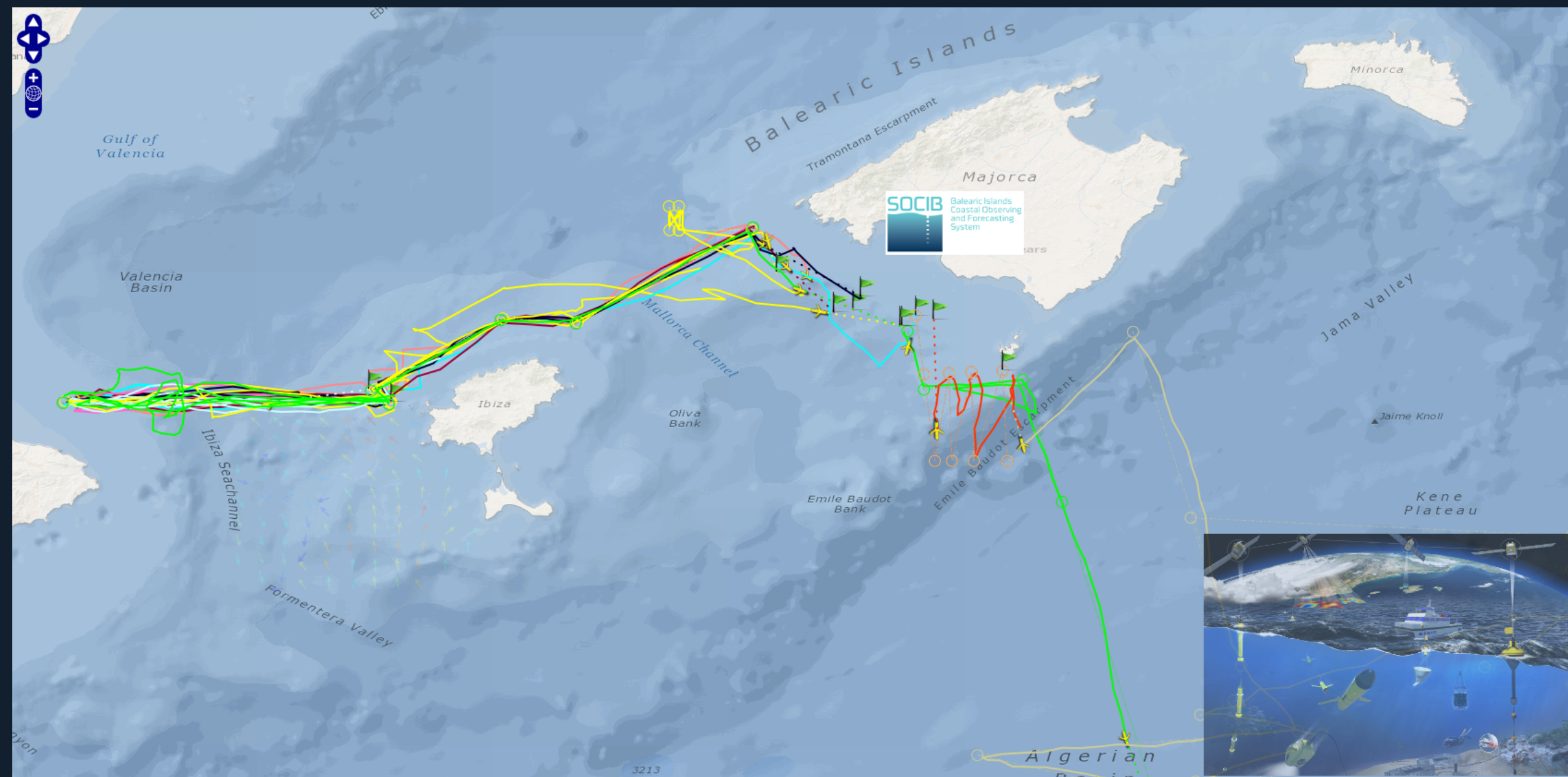
Nowadays, gliders constitute an essential component in ocean observing systems. Because of the specific file formats and the mismatch between the scientific and navigation time systems, the processing data from a glider fleet is far from being an easy task.

The SOCIB glider toolbox is a set of MATLAB/Octave scripts and functions that covers the main stages of the data management process.

The toolbox is available at https://github.com/socib/glider_toolbox.

2 About the developers

SOCIB is a multi-platform Marine Research Infrastructure located in the Mediterranean Sea. Over the last years, SOCIB has acquired an extensive experience in glider technology, both with Slocum and Seaglider platforms (Cusi et al., 2012).



Quasi-continuous glider missions have been carried out in the Ibiza Channel since 2011 to better understand the mesoscale variability in the Balearic Channels (Heslop et al., 2012). Since then:

- over 70 deployments performed,
- over 1400 days and 17000 nautical miles at sea,
- more than 30000 up/down profiles collected.

3 What will you find inside the toolbox?

It contains the tools required to generate standard netCDF files and figures from raw and processed data.

It enables the processing of Slocum and Seaglider data, in real-time or delayed mode, and is suitable for scientists and data centres. Recently the processing of SeaExplorer data has been added.

It offers advanced data features, such as the thermal lag correction (Garau et al., 2011), standards quality control test (range, spikes) and the possibility for additional user-configured tests.

3.1 Processing levels

Three levels of for the netCDF files:

Level 0: contains exactly the same data as the raw files.

Level 1: contains the processed glider data: sequences of measurements along the glider trajectory, with interpolated position coordinates, unit conversions, filters and/or corrections.

Level 2: contains the processed level 1 data in a gridded format. vertical profiles, interpolated onto a user configured vertical grid.

3.2 Processing steps

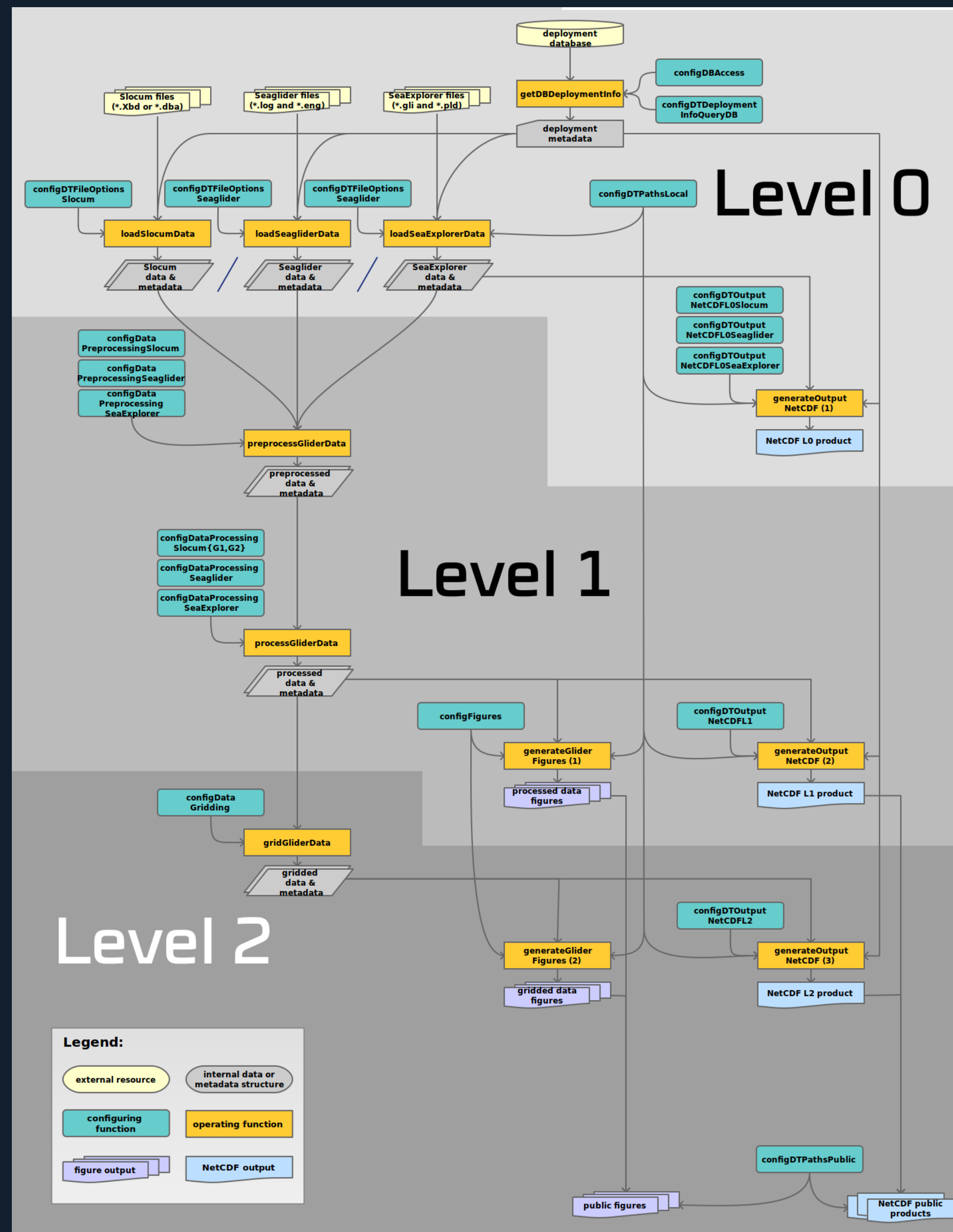
- 1 Data retrieval (level 0): download of raw binary files from remote dock servers or base stations and conversion into a human-readable format.
- 2 Preprocessing of raw data: application of simple unit conversions and factory calibrations.
- 3 Processing (level 1): interpolation of reference coordinates (time, position, ...), general sensor processing (lag correction, interpolation, ...), CTD data processing (pressure filtering, thermal-lag correction, ...), derivation of new measurements (depth, salinity, density, ...).
- 4 Gridding (level 2): interpolation/binning of the level 1 data to have the data as instantaneous vertical profiles (unique longitude-latitude pair for each profile).

3.3 Toolbox diagram

From deployment database to graphical outputs and netCDF products, following the color code:

operating functions
configuring functions
netCDF output

external resource
internal data/metadata structure
figure output



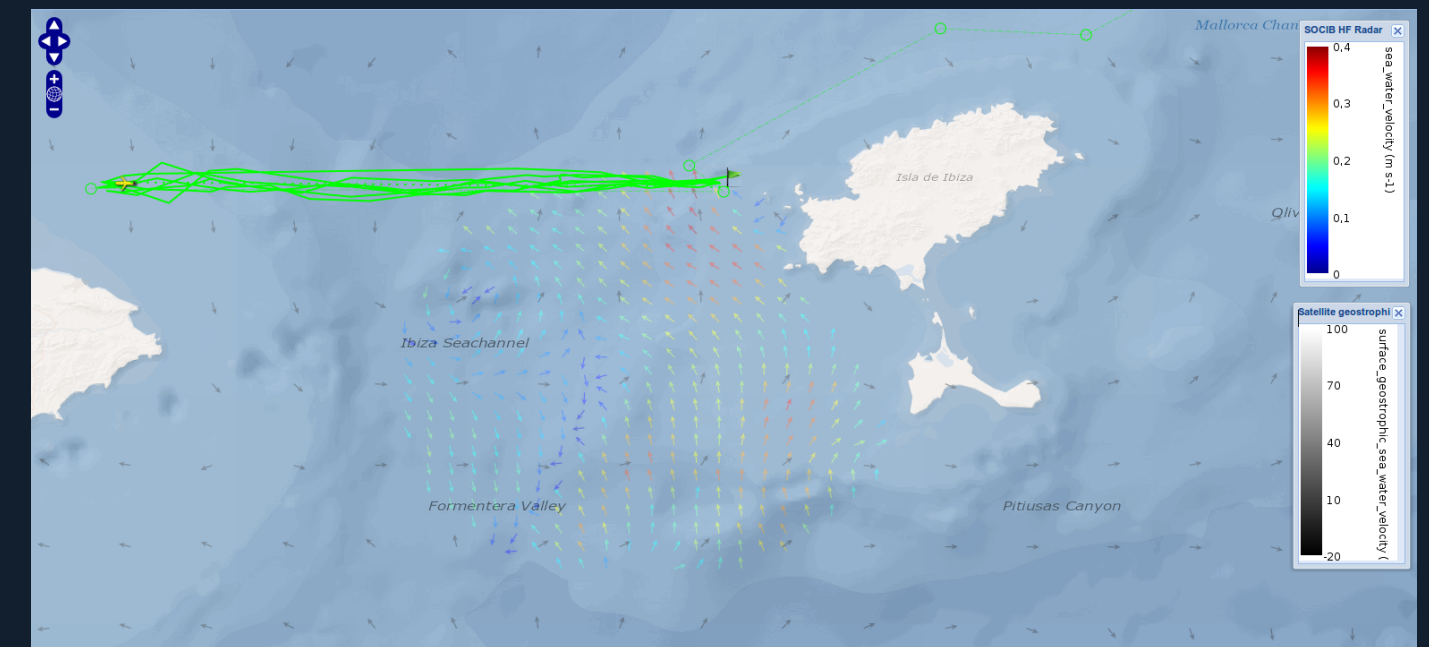
4 How are we using the toolbox?

In addition to the data file preparation for scientists, the toolbox is routinely used to manage all our deployments. The data files in netCDF and the figures are accessible through various in-house applications.

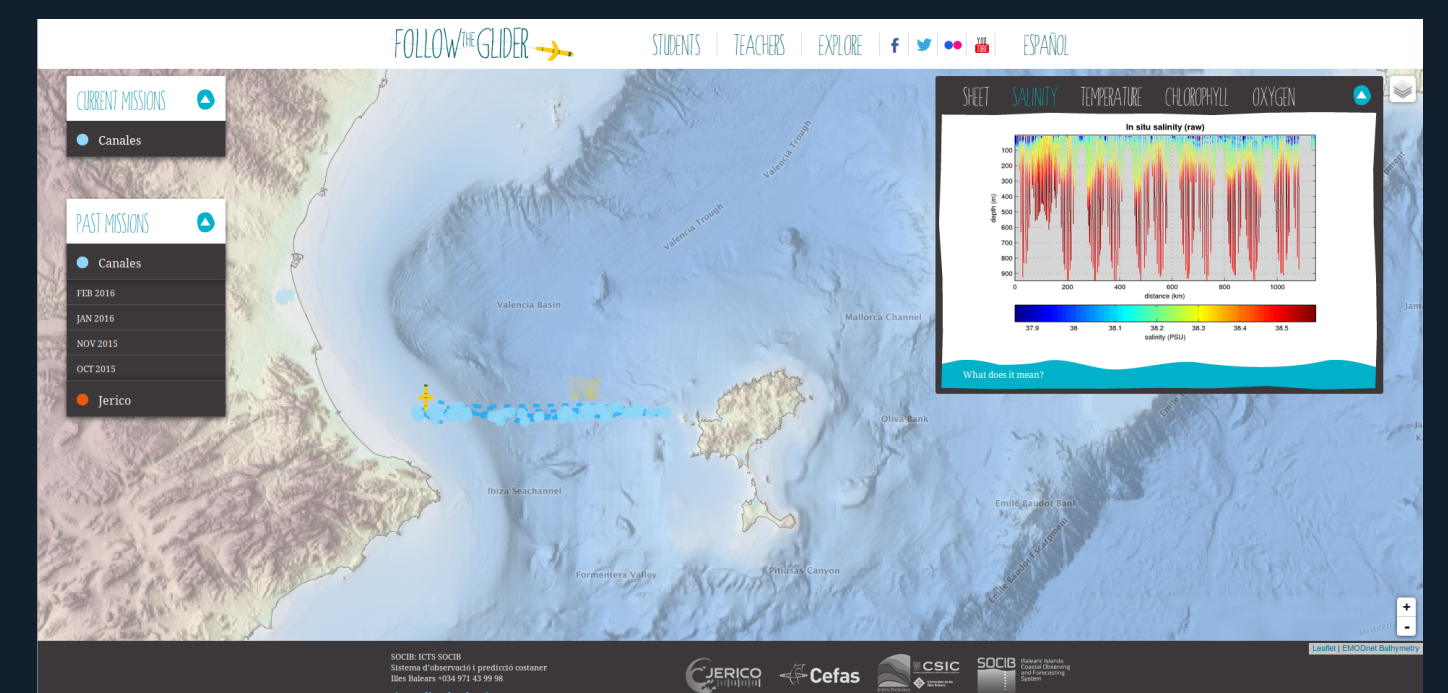
4.1 Deployment Application (Dapp)

Dapp (<http://apps.socib.es/dapp/>) is the application used to visualise all the mobile platforms.

The figure shows an example for the CANALES-May2016 mission. From the applications, links to download the NetCDF files are provided, as well as figures showing the glider measurements during the mission.



4.2 Follow the Glider web



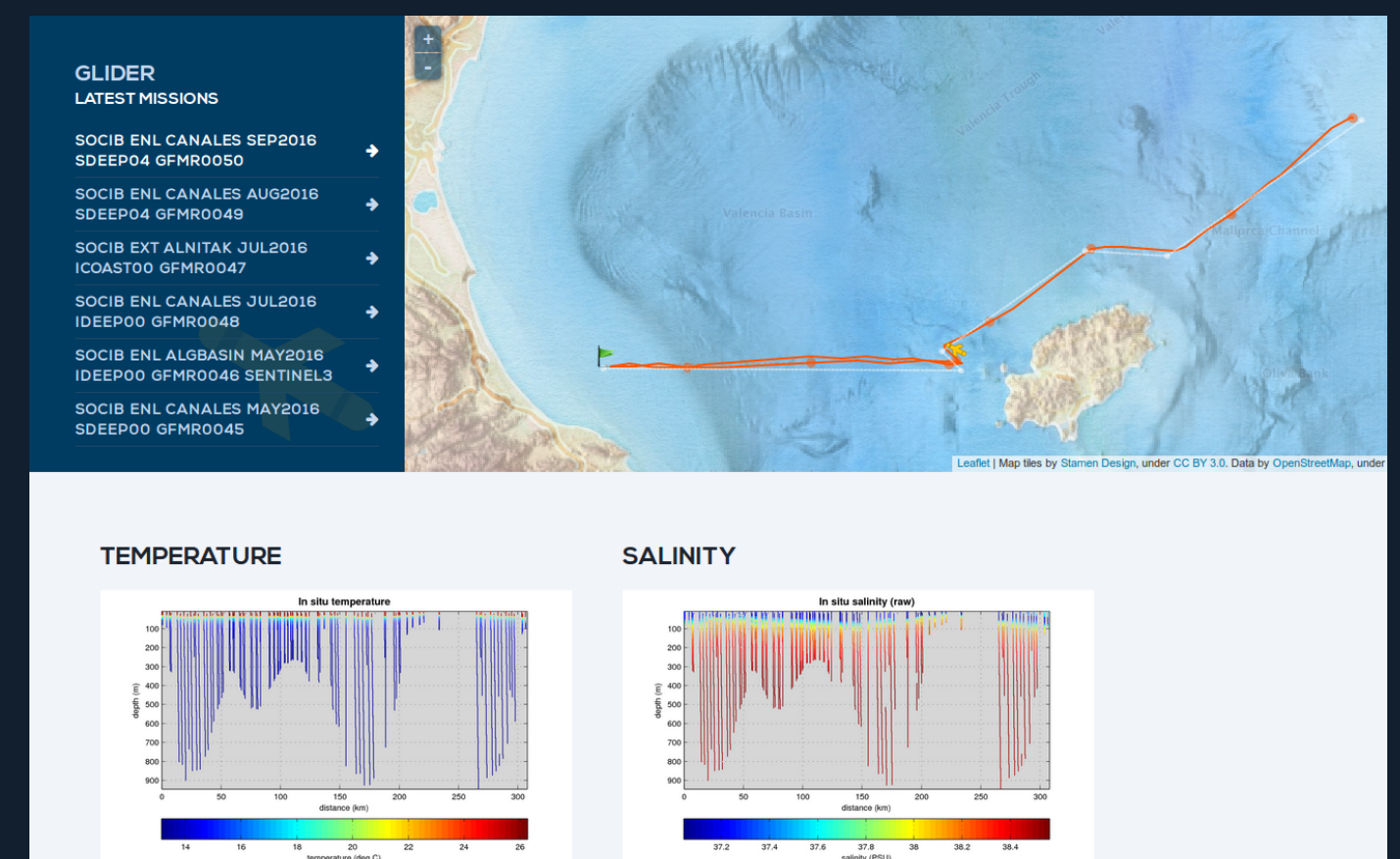
Follow the Glider (<http://followtheglider.socib.es/>) is an application for the discovery of glider data specifically designed for students and teachers.

The same mission in the Ibiza Channel (May 2016) is presented. The salinity data are presented in the sub-plot. All the past and current missions are available.

4.3 Medclit

"Medclit, the Mediterranean in one click" (<http://www.medclit.es>) is a research and dissemination project focused on the scientific, technological and societal approaches of SOCIB, in collaboration with "la Caixa" Foundation.

The web displays the active as well as the archive deployments and provides complementary information on how a glider works with material (animations, diagrams, texts) specifically designed for the general public.



4.4 App for smartphones

Our App offers access to all the data managed by SOCIB facilities, including fixed stations, mobile platforms (drifters, profilers, gliders, turtles) and numerical model outputs (waves or hydrodynamics).

As soon as a deployment starts, the positions appear on the map.



Acknowledgements: This toolbox is based on the previous code developed at IMEDEA and SOCIB by T. Garau. The development of the toolbox also benefited from Perseus FP7 project. The toolbox is provided to the scientific community for download and use under the GNU licence (<http://www.gnu.org/copyleft/gpl.html>) or EUPL1.1 (<https://joinup.ec.europa.eu/software/page/eupl>).

Main references

Garau, B.; Ruiz, S.; Zhang, W. G.; Pascual, A.; Heslop, E.; Kerfoot, J. & Tintoré, J. Thermal Lag Correction on Slocum CTD Glider Data. J. Atmos. Oceanic Tech., 2011, 28, 1065-1071. doi:10.1175/jtech-d-10-05030.1
Heslop, E.; Ruiz, S.; Allen, J.; López-Jurado, J. L.; Renault, L. & Tintoré, J. Autonomous underwater gliders monitoring variability at choke points in our ocean system: A case study in the Western Mediterranean Sea. Geophys. Res. Lett., 2012, 39, L20604. doi:10.1029/2012GL053717
Troupin, C.; Beltran, J.; Heslop, E.; Torner, M.; Garau, B.; Allen, J.; Ruiz, S. & Tintoré, J. A toolbox for glider data processing and management, Methods in Oceanography, 2015, 13-14, 13-23, doi:10.1016/j.mio.2016.01.001