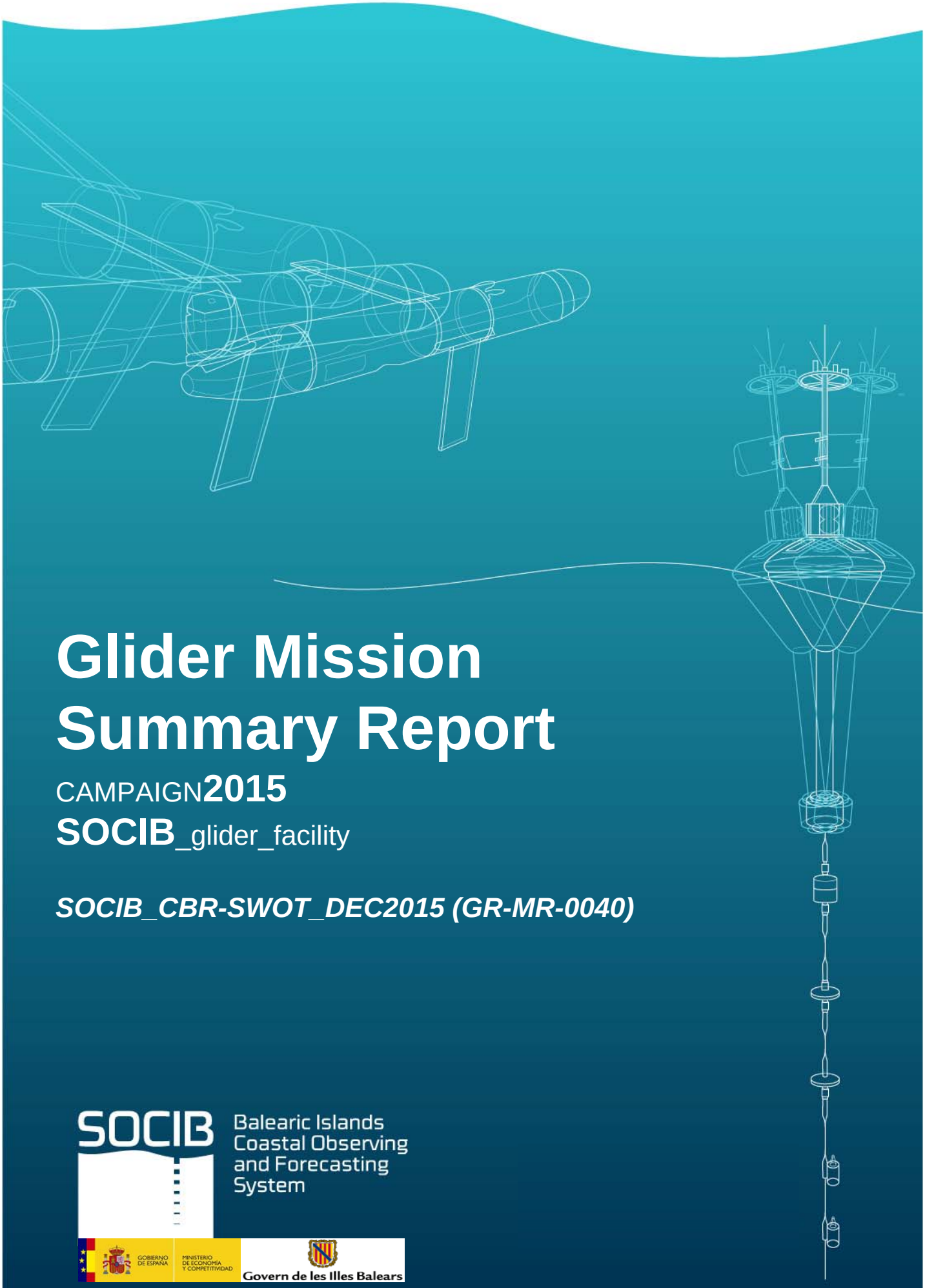

Glider Mission Summary Report

CAMPAIGN**2015**

SOCIB_glider_facility

SOCIB_CBR-SWOT_DEC2015 (GR-MR-0040)

SOCIB Balearic Islands Coastal Observing and Forecasting System

GOBIERNO DE ESPAÑA · MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD · Govern de les Illes Balears

Mission Name	*SOCIB_CBR-SWOT_DEC2015(GF-MR-0040)*		
Platform Model	*Slocum 1000 G2*		
Platform ID / Name / WMO Code	*U243 / SDEEP00 / 68457*		
Related Platforms / Missions	• *SDEEP00 (ABACUS-2 Open Access Mission)* • *IMEDEA glider IDEEP00 (SOCIB GF-MR-0041 mission)* • *Profiler drifter IME-APEX002 (wmo 6900662)* • *Profiler drifter SCB-APEX005 (wmo 6901243)*		
Start Date	*2015-12-11*		
End Date	*2015-12-21*		
Total Days	*11*	**Total distance (Km / Nm)**	*122 / 66*
Survey Area (NODC or SDN region)	*National Park of Cabrera (Balearic Islands, SPAIN)*		
Objective(s)	• *The aim of this strategy is to sample a 3D field in order to better characterize and quantify the fine-scale structures present in sea surface height fields.* • *This will be used to anticipate high-resolution altimeter observations provided by the future SWOT satellite (https://swot.jpl.nasa.gov/). The area of south Cabrera will be sampled by SWOT, just after launch during the fast phase (1-day orbit).* *Dr.Ananda Pascual (ananda.pascual@imedea.uib-csic.es)*		

Scientific Sensors (name & model / serial_number / calibration date)	• *GPCTD -SBE- / sn 0064 / 24-Nov-2014* • *FLNTUSLC -WetLabs- / sn3711 / 22-Oct-2014* • *OPTODE -Aandera- / sn 1409 / 18-Jun-2014* *(calibration sheets available upon request to glidertech@socib.es)*
Number of Profiles	*714 (CTD), 714 (FLNTU), 714 (OXY)*
Significant Events	• *4th mission in 2015 by SDEEP00 (Unit 243)* • *Demo mission to evaluate feasibility of using Gliders in Cabrera National Park* • *G2 glider powered by TWR Lithium battery pack* • *This mission is a concatenation to previous ABACUS-2 mission (sharing same mission identifier gf-mr-0040). 2 missions within the same deployment* • *Strong currents pushing the glider S-SE* • *Problems detected with the Altimeter (sea-floor hit twice)*
Mission Summary	*This mission attempted to be a demonstration-test of the Cabrera-Swot program, with the goal of evaluating its feasibility, carried out in the framework of SOCIB's Open-Access program.* *No Pre-mission Report was created prior to this mission since it was not planned before the launching of the glider. Instead, the Cabrera-Swot initiative appeared during the execution of ABACUS-II as a perfect example of real-time and adaptive sampling offered by the glider platform.* *Preparation and Launching phases did not occur in the scope of this demo-mission as it was a continuation of ABACUS-I. Both missions were concatenated, within the same deployment.* *The survey period was, in general terms, successful at a 50%. Some preliminary aspects were accomplished (as zig-zagging in the selected area and moving from deep to shallow waters) whereas others were not (completing the programmed route). No emergency interventions were required although there was a critic point when the glider hit the bottom twice in two consecutive transects. Navigation was satisfactory enough but not very adjusted to programmed route. Main achievements were: (1) Managing the last 11 days of the ABACUS-II deployment as an independent mission and (2) overcoming the intense currents with real 24/7 monitoring and piloting. A single waypoint lists was configured although only a 10% of the waypoints were hit (currents and logistics were conditioning factors). Underwater maneuvers were mostly executed accordingly to a configuration that changed multiple times mainly because the Altimeter exhibited an erratic behavior that created (1) premature inflections and (2) even two bottom-hits. For the rest, the sub-surface navigation was alright. Data logging during sampling seems to have been successful and according to details shown in Chart 1 (normal and non-critical oddities raised by Science-Payload and FLNTU sensor). Surface maneuvers occurred non-periodically and lasted 5 to 30 minutes. The nature of this mission and the uncomfortable situations of currents and altimeter issues resulted in the glider surfacing irregularly as required for piloting.*

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Energetically, the power source (Primary Lithium Batteries) behaved perfectly being stable and fully capable of fulfilling the requirements of all the on-board systems. Electro-Mechanical actuators and sensors exhibited a more than acceptable performance (but Oddities raised by buoyancy-pump and digifin).Communication systems were reliable and fluent ; only the occurrence of some false sea-floor detections forced pilots to investigate the performance of the Altimeter. It seems there is a problem with the transducer that induces the glider to detect a false bottom being at a distance equal (this is relevant) to the max-range of the Altimeter(Note_1). Additionally, the number of positive hits in a row to consider it valid was too high (5 instead of 3) and this resulted in 2 collisions with sea-floor. Electronic modules (processors, memory cards, control boards,...) revealed no evidences of problems at all. Moreover, there were no signs of problems derived from the Hull sections nor the hydrodynamic elements attached to those (related aspect noticed during conclusive bench work).

The recovery operation was developed on the 21st of December by 2 SOCIB members on board SOCIB-I fast-RIB. It was a singular operation in the sense that it was a Dual-deployment (units 184-ideep00- and 243-sdeep00-).Extraction of U243 from water was in N38º 54.381' E02º 43.834'.

The conclusion phase associated to this mission began the same day after SDEEP00 was recovered and transported (21/Dec) to SOCIB's Glider-Lab (IMEDEA building). During the following 3 days the glider underwent the conclusion procedure mainly focused on (1) general checkout of all devices, assemblies and components (complete disassembly); (2) external-surfaces and sensor cleaning/refurbishment (which was intensive due to the presence of abnormally grown-up 1cm-3cm barnacles. Corrosion was not particularly evident) ; (3) gathered-data backup (direct duplication of memory flash-cards in this case) and uploading to SOCIB's data-center for post-processing; and, finally, (4) preparation for storage and battery removal (this pack will be reused in 2016). After that, the storage status of the vehicle is 'under-repair' due to a problem detected with the Altimeter device. This failure must be reviewed and solved before assigning a new mission to this Unit 243 (SDEEP00).

(Note that although multiple administrative and notification procedures took place during the different stages described above, these have not been reported due to being considered out of the scope of this report. Same applies for multimedia and public-diffusion; and also for accounting).

With respect to the human resources: coordination amongst multiple participants (glider-techs, field-techs, scientists & open-access-users) was fluent and efficient. There were no personal damages and the availability of each member, for all the tasks assigned at each moment, was correct (including on-alert shifts for field intervention and 24/7 glider monitoring during survey).

Detail Charts:

Date (utc)	S_{EN}	f_{SMP}	D_{RNG}	M_{DIV}	M_{CLI}
11/Dec @18:09 (M.S.)	GP-CTD	0,5000	[-5, 2000]	yes	yes
11/Dec @18:09 (M.S.)	OXY	0,2500	[-5, 2000]	yes	yes
11/Dec @18:09 (M.S.)	FLNTU	0,1250	[-5, 150]	yes	yes
11/Dec @18:09 (M.S.)	FLNTU	0,0625	[150, 300]	yes	yes

S_{EN}: Sensor type
f_{SMP}: Frequency of sampling (Hz)
D_{RNG}: Depth range this configuration applies (m)
M_{DIV}: Sampling during Diving maneuver
M_{CLI}: Sampling during Climbing maneuver

Chart 1 Summary of Underwater Strategies (Sampling)

Note_1:

(27/01/2016): an investigation on the behavior of U243's Altimeter has been made and observations have been shared with the glider manufacturer (TWR). Up to date, the status of this repair-issue is:

- *Altimeter's voltage shows spikes that the software confuses with positive detections at max-range of the altimeter. This occurred during the whole diving period, even in 2000m-deep waters.*
- *TWR has seen this effect in the past. Reducing the max-range of the altimeter is a first solution to try although it may not solve the problem.*
- *The altimeter is not usually recalibrated (nor repaired). If this altimeters is considered faulty then the best solution is to replace it.*
- *Up to date, SOCIB is waiting for receiving a quotation to replace the altimeter. Action that could be performed in-house without the need to ship the glider to the US*

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Principal Investigator (e-mail or contact phone/address)	• *Prof. Joaquim Tintoré jtintore@socib.es (+34 971439821)* • *Dr. Ananda Pascual ananda.pascual@imedea.uib-csic.es (+34 971611732)*
Institute	*SOCIB*
Project Affiliation (web-site)	*http://www.socib.eu*
Partnership / Participation	• *SOCIB* • *IMEDEA (in-kind contribution of infrastructures)*
Glider Software Version	*v7.13 Acomms*
Data Retrieval (real-time ⌈ RT ⌉ / delayed-mode ⌈ DM ⌉)	• *RT: via satellite link every 6 hours, every day* • *DM: direct download of full gathered data sets (flash-cards backup)*
Compass Calibration (specify procedure)	*Error measurement during mission preparation revealed no necessity to perform a compass calibration*
Battery Type	*ELECTROCHEM factory Lithium Pack (700Ah-nominal cap.)*
Battery Consumption (Ah)	*69.5Ah (reading from 264.7Ah to 334.2Ah)*
Data Available From	*http://thredds.socib.es/thredds/dodsC/auv/glider/sdeep00-scb_sldeep000/L1/2015/dep0017_sdeep00_scb-sldeep000_L1_2015-12-11_data_dt.nc*
Full Mission Report From	*glidertech@socib.es*
Technical Contact	*glidertech@socib.es*

Figure 1

(Map providing general overview of Survey Area)

On-line Track

http://apps.socib.es/dapp/?deployments=558-11-0-000033&layers=isobaths&units=scientific

Figure 2

(Map providing detailed overview of Survey Area and traced Flight Path with surface points if possible)

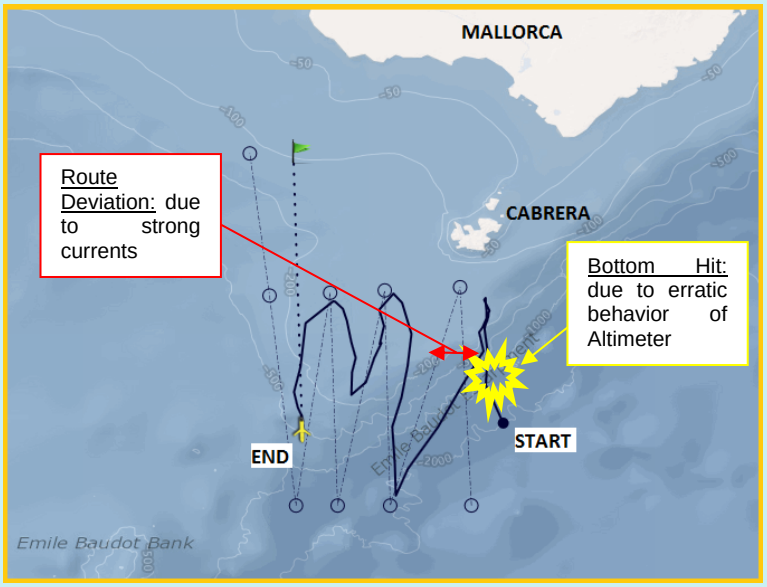

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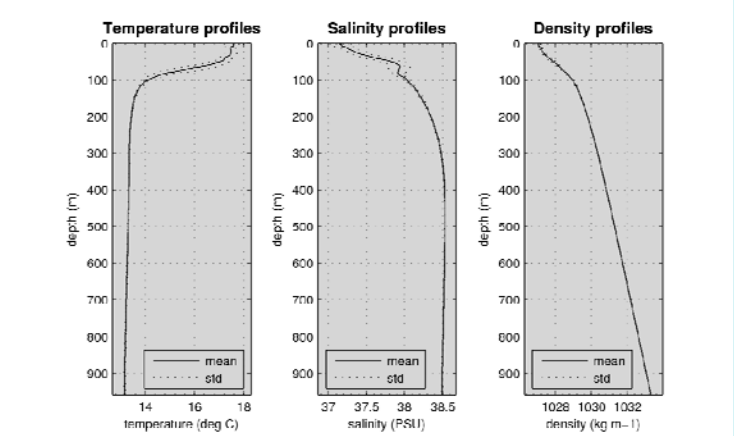
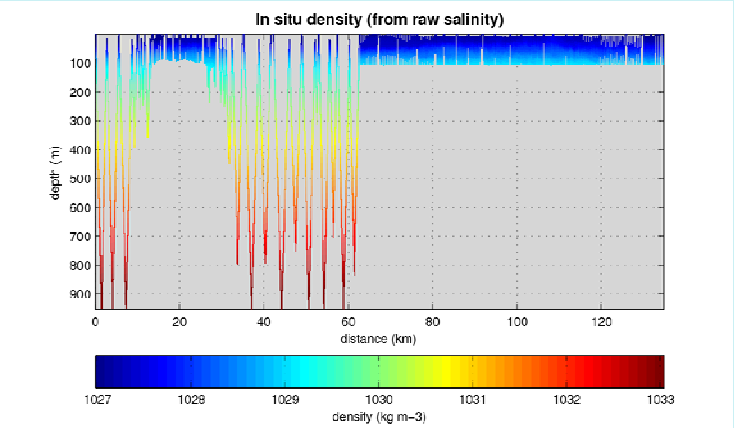
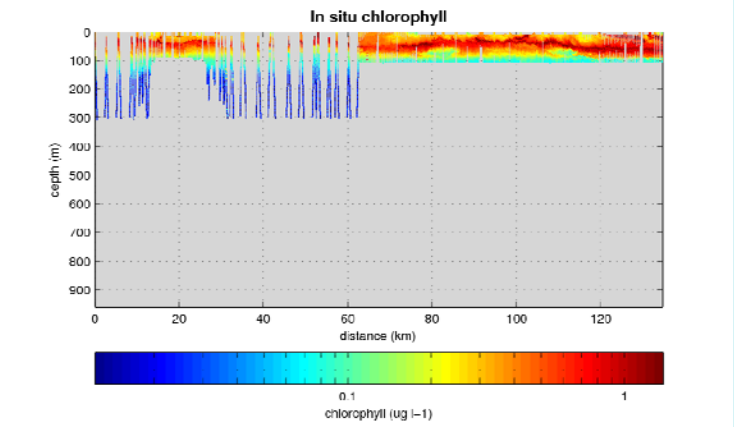
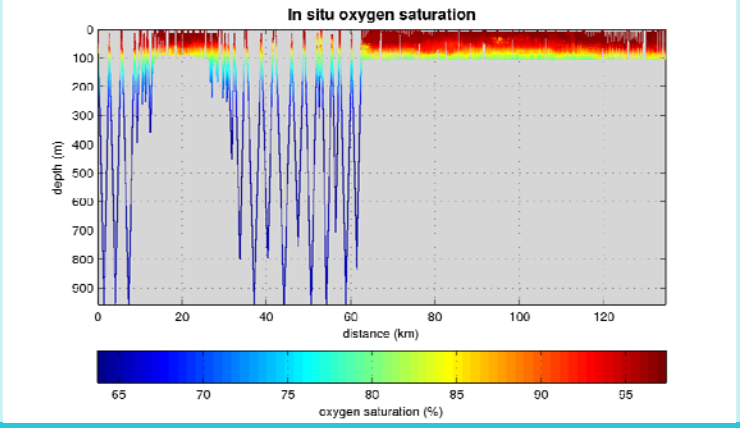
Figure 3

(Compilation of preliminary post-processing plots provided by SOCIB's data-center glider-toolbox and processing services. Contact data.center@socib.es for further info. Plots available through DAPP - See Figure 1 -)









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