

CRUISE REPORT

SOCIB EARISE 2020:

12th March 2020

SOCIB Lagrangian Facility

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Description:	<p>This field campaign has been organized under the WP6 in the Euro-Argo RISE project (<i>Euro-Argo Research Infrastructure Sustainability and Enhancement</i>). The objective is to deploy an I-ARVOR profiler as an the extension of the geographical coverage of Argo into shallow waters of the European Marginal Seas which are areas of important socio-economic impact.</p> <p>Taking advantage of this Cruise, a complete experiment has been done launching also other Lagrangian platforms that will be included in the Euro Argo ERIC and in the Global Drifter Program.</p>
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1. Objectives

This field campaign has been organized by SOCIB in the frame of WP6 from Euro-Argo RISE project (*Euro-Argo Research Infrastructure Sustainability and Enhancement*). The objective of this WP is the extension of the geographical coverage of Argo into shallow waters of the European Marginal Seas which are areas of important socio-economic impact.

The project Euro-Argo RISE funded SOCIB to acquire a T/S ARVOR-I float in the Mediterranean Sea. The main objective is to start operating floats in coastal areas through the continuous change of configuration parameters and the use of adequate at sea monitoring tools.



Fig. 1. EARISE 2020 cruise participants.

2. Experimental design

The Lagrangian Platforms Facility organised a specific EA-RISE 20202 cruise south of the Bay of Palma to carry out a complete experiment, in particular considering the following deployments:

- **Waypoint 1** (N 39° 22.330; E 02° 31.370):
 - Launching of 1 ARVOR-I (under EA-RISE Project) to investigate the Arvor capacity to keep in shallow water, including the human resources to change the parameters.

- One CTD cast was done to compare with the data obtained from the first cycle of the profilers to check possible sensor drifts and offsets in salinity and temperature.
- **Waypoint 2** (N 39° 08.410; E 02° 23.690):
 - Launching of 1 ARVOR-I (under Euro Argo ERIC Program) to enhance the SOCIB profilers database + Argo Spain as to be part of the Euro Argo Program.
 - 2 SVP-B's launched (under Global Drifter Program) to enhance the SOCIB drifters database to maintain an active float of 12 SVP-B per year.
 - One CTD cast was done in the same point to compare with the data obtained from the first cycle of the profilers to check possible sensor drifts and offsets in salinity and temperature.

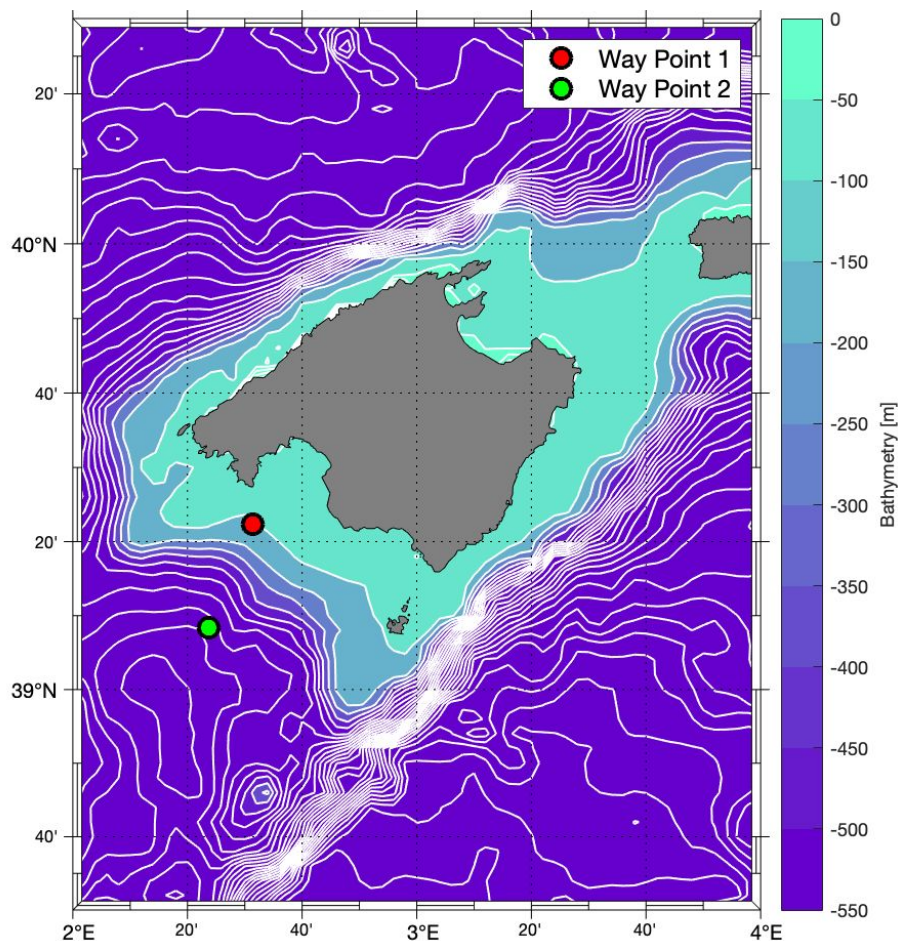


Fig. 2. Experimental design Campaign: EA-RISE 2020.

3. Cruise diary

3.1. DAY 1 - 12th MARCH 2020

Sailing to the WP1:

6:30 UTC: the technical and research crew met onboard.

7:00 UTC: the RV SOCIB sailed from Dique del Oeste, Palma port. Irene Lizarán detected a problem with the echosounder. Miquel Gomila try to fix the problem. Outreach team took pictures of the SOCIB team.

7:15 UTC: the onboard team received the safety talk imparted by the captain.

7:31 UTC: switch on the SCB-ARVORI008 (Program Euro-Argo RISE, WP6).

7:35 UTC: the Arvor-I started the transmission, the email was checked and decodified the .sbd files. The coordinates are correct (39°29.3915' N, 2°36.3407' E). The SVP-B communications were checked in the NOAA web, Irene Lizarán switched on them the day before. Also, the profilers communications were verified (Arvor-I RISE). After a talk with Data Center, it was checked that the Research Vessel was not appearing in the SOCIB Dapp, but the data in the Thredds looked okay.

Launching in the WP1:

8:16 UTC: arrival to the WP1.

8:23 UTC: the RV SOCIB appeared in the dapp. John Allen checked the ADCP data in the shallow waters point. This is a critical point because there is a need to leave the RISE profiler in a restricted bathymetry. The registered measures were:

Depth (m)	Direction of the current	Velocity (cm/s)
Surface	SouthWest	~ 2
60	NorthWest	~ 20
80	NorthWest	~ 20

The WMOP model was checked and the forecast is very similar to the ADCP measurements.

8:43 UTC: the Lagrangian team launched the Arvor-I RISE. The weather conditions: 3.1 kn wind speed, 111° wind direction, water temperature 14.5 °C. The GPS position was at 39°22.291' N, 2°30.991' E. The bathymetry in the launching point was 94.4 m (research

vessel sonda), the RV velocity was 0.7 kn (drifting velocity). After the deployment, the RV started the sailing to WP2. The SCB-ARVORI005 (Program Euro-Argo) was switched on at 10:57 UTC and the communication started at 11:02 UTC. I. Ruiz checked the GPS position from the email and the position was correct.

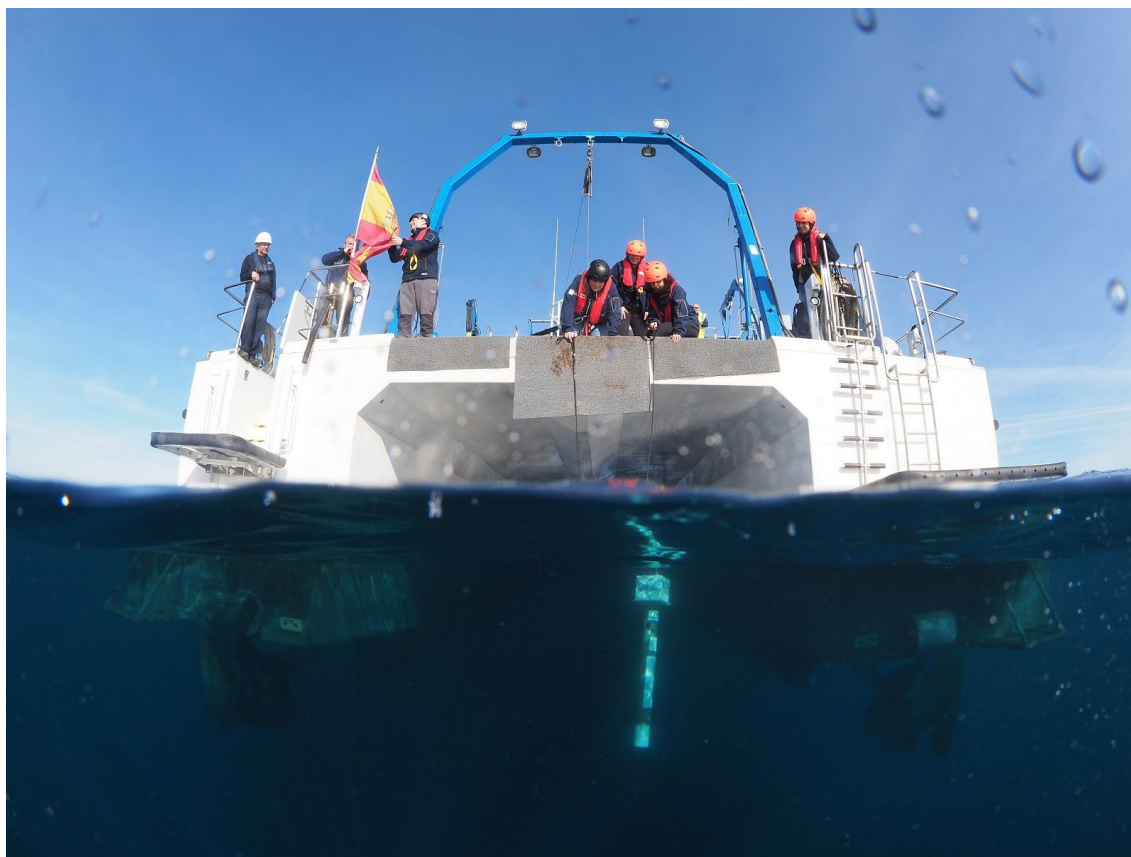


Fig. 3. RISE launching point. Deployment of Arvor-I as part of Euro Argo RISE Project (WP1).

Launching in the WP2:

When arriving at WP2, the team started a CTD cast (10:20 UTC) with a depth ~ 758 m (sonda measure). The official profile finished at 10:53 UTC, as outreach objective, the photographer (M. Gomila) took some pictures with the rosette inside and outside (11:04 UTC) water. Finally, the rosette came to the RV at 11:08 UTC. John Allen checked again the ADCP and the registered measures were:

Depth (m)	Direction of the current	Velocity (cm/s)
Surface	Northeast	~ 15
100	Northeast	~ 15
200-250	Northeast	~ 25-30
400	Northeast	~ 10-15

11:10 UTC: SOCIB team launched the SCB-SVPB006 in a GPS position 39°08.910' N, 2°23.553' E.

11:19 UTC: SOCIB team launched the SCB-SVPB007 in the position: 39°08.971' N, 2°23.519' E. The last deployment was the SCB-ARVORI005 at 11:24 UTC, the annotated position was 39°09.024' N, 2°23.484' E. For all deployments in this point, the probe was calculated with the rosette sonda and the safety distance (12 m). So the depth was calculated approximately 776 m depth. The variables shown in the Vessel Seaboard were stuck and the team could not annotate the values.

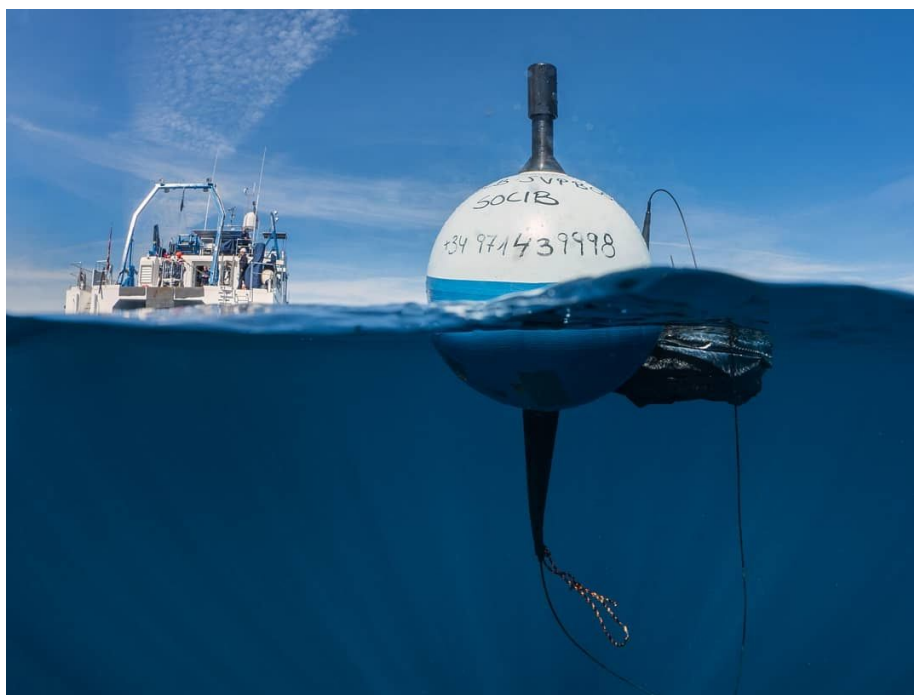


Fig. 4. Deployment of SVP-B as part of Global Drifter Program (WP2).



Fig. 5. Deployment of Arvor-I as part as Euro Argo Program (WP2).

Sailing to port:

At 11:34 UTC the RV started the sail to port after all deployments. The velocity sail was 18.2 kn. At 13:00 UTC the ADCP and the thermosalinograph were stopped. The arrival to port was at 13:13 UTC.

The cruise was successful and awesome.

- END of EARISE 2020 cruise -

4. Data Management

Platform	Arvor-I Profiler
Manufacturer	NKE France
Model	Arvor I (NKE)
IMEI / WMO	300234068501780/6901279 300234068601320/6901278
SOCIB Inventory	SCB-ARVORI005 SCB-ARVORI008
Calibration date	2019
Configuration	Mission configuration parameters
Data collected	Temperature, Salinity, Conductivity, GPS
Sensors	SCB-ARVORI005 SCB-ARVORI008
Launching position	SCB-ARVORI005: N 39° 09.024', E 02° 23.484' SCB-ARVORI008: N 39° 22.291', E 02° 30.991'
Metadata	SCB-ARVORI005 SCB-ARVORI008
Data format	sbd, csv, kmz, netcdf
Data Assembly and Processing	Coriolis: Argo Data Management plan
Data Archival and Preservation	Iridium system email transmission SOCIB raw data
Data Dissemination	Argo Fleet Monitoring SOCIB thredds CMEMS
Data Product	Profiles viewer SCB-ARVORI005 Profiles viewer SCB-ARVORI008 SOCIB DAPP

Platform	SVP-B Surface Drifters
Manufacturer	Data Buoy Instrumentation, LLC (DBi)
Model	SVP-B
IMEI / WMO	300234067548860/6202690 300234067548890/6202691
SOCIB Inventory	SCB-SVPB006 SCB-SVPB007
Calibration date	2019
Configuration	Mission configuration parameters
Data collected	Sea-level pressure, GPS, sea surface temperature
Sensors	SCB-SVPB006 SCB-SVPB007
Launching position	SCB-SVPB006: N 39° 08.910', E 02° 23.553' SCB-SVPB007: N 39° 08.971', E 02° 23.519'
Metadata	SCB-SVPB006 SCB-SVPB007
Data format	kmz, netcdf
Data Assembly and Processing	ERDDAP NOAA
Data Archival and Preservation	NOAA (Global Drifter Program) SOCIB raw data
Data Dissemination	SOCIB thredds ERDDAP NOAA (SCB-SVPB006 , SCB-SVPB007) CMEMS
Data Product	SOCIB DAPP ; SOCIB thredds

Platform	CTD			
Manufacturer	SeaBird			
Model	SBE9+			
S/N	1023			
SOCIB Inventory	SCB-SBE9001			
Calibration date	2018			
Configuration	Mission configuration parameters			
Data collected	Conductivity, Temperature, Depth			
Sensors	Temperature	SBE 3P	03P5391	31/10/2018
	Temperature 2	SBE 3P	03P5425	31/10/2018
	Conductivity	SBE4C	043718	27/09/2018
	Conductivity 2	SBE4C	043907	18/10/2018
	Pressure		1023	28/09/2018
	Altimeter	Datasonics PSA-916D	69894	12/2018
Launching position	WP1: N 39° 22.33', E 02° 31.34' WP2: N 39° 08.464', E 02° 23.596'			
Metadata	CTD			
Data format	xmlcon, bl, hdr, hex, cnv, btl, jpg, netcdf			
Data Assembly and Processing	SBE software			
Data Archival and Preservation	SOCIB raw data			
Data Dissemination	SOCIB thredds			
Data Product	SOCIB DAPP ; Vessel Seaboard ; Profiles viewer ; SOCIB Data Catalog ; Data Discovery ; SOCIB API ; Thredds repository			

Platform	Thermosalinometer
Manufacturer	SeaBird
Model	SBE21 &SBE38
S/N	3370
SOCIB Inventory	SCB-TSL001
Calibration date	2018
Configuration	Mission configuration parameters
Data collected	Salinity, temperature
Sensors	SeaBird SBE21 Termosalinograph / SBE38 Remote temperature
Time coverage	Start: 2020-03-12T07:13:30+00:00 End: 2020-03-12T12:54:20+00:00
Metadata	Thermosalinometer
Data format	bin, raw, proc, ail, netcdf
Data Assembly and Processing	NEREIDAS data pre-processing
Data Archival and Preservation	SOCIB raw data
Data Dissemination	SOCIB thredds
Data Product	SOCIB DAPP ; Vessel Seaboard ; Profiles viewer ; SOCIB Data Catalog ; Data Discovery ; SOCIB API ; Thredds repository

Platform	Weather Station
Manufacturer	Geonica
Model	Meteodata 2000
S/N	-
SOCIB Inventory	SCB-MET009
Calibration date	2011
Configuration	Not available
Data collected	Real wind direction, apparent and real wind velocity, air humidity, air pressure, air temperature
Sensors	Barometer (Young Barometric Pressure Sensor Model 61302V) Thermometer and hygrometer (Geónica Modelo STH-5031) Wind Speed/Direction (Young Marine Wind Monitor Model 05106)
Time coverage	Start: 2020-03-12T07:00:00+00:00 End: 2020-03-13T06:00:00+00:00
Metadata	Meteorological station
Data format	bin,raw, proc, ail, netcdf
Data Assembly and Processing	NEREIDAS data pre-processing. Data sent to the SOCIB Data Center in real time every 1 minute (in mobile phone communication area)
Data Archival and Preservation	SOCIB raw data
Data Dissemination	SOCIB thredds
Data Product	SOCIB DAPP ; Vessel Seaboard ; Profiles viewer ; SOCIB Data Catalog ; Data Discovery ; SOCIB API ; Thredds repository

Platform	Vessel Mounted Acoustic Doppler Current Profiler (VM ADCP)	
Manufacturer	RDI	
Model	Ocean Surveyor 150 kHz	
S/N	1878	
SOCIB Inventory	SCB-RDi001	
Calibration date	2016	
Configuration	The VM-ADCP was setup to record one hundred 4 m depth bins, and was run in bottom track mode throughout.	
Data collected	Horizontal currents, relative acoustic backscatter, navigation, ancillary variable.	
Sensors	Currentmeter, Temperature (mounted on transducer)	
Time coverage	Transect 1 Start: 2020-03-12T06:49 End: 2020-03-12T11:28	Transect 2 Start: 2020-03-12T11:33 End: 2020-03-12T12:54
Metadata	ADCP	
Data format	VMO, N2R, N1R, LOG, LTA, STA, ENX, ENS, ENR, NMS, txt, mat, netcdf	
Data Assembly and Processing	VM ADCP Pre-processing according to the SOCIB Standard Operating Procedures (SOP), but with the configuration as defined above.	
Data Archival and Preservation	SOCIB raw data	
Data Dissemination	SOCIB thredds	
Data Product	SOCIB Data Catalog ; Data Discovery ; SOCIB API ; Thredds repository	

5. Preliminary results

5.1. EA-RISE Profiler

In the WP1, as part of Euro-Argo RISE Project, an Arvor-I was launched. This deployment will help to investigate the potential of profiling floats in coastal areas from different points of view: instrumental, mission configuration, human resources, monitoring tools and alert systems. This profiling float cycles between the surface and 100 dbar every day and drifts at a parking depth of 100 dbar. The θ/S diagram (Figure 7) describes the water masses identified by the Arvor in the study area during the period between 12/03/2020 till 25/03/2020.

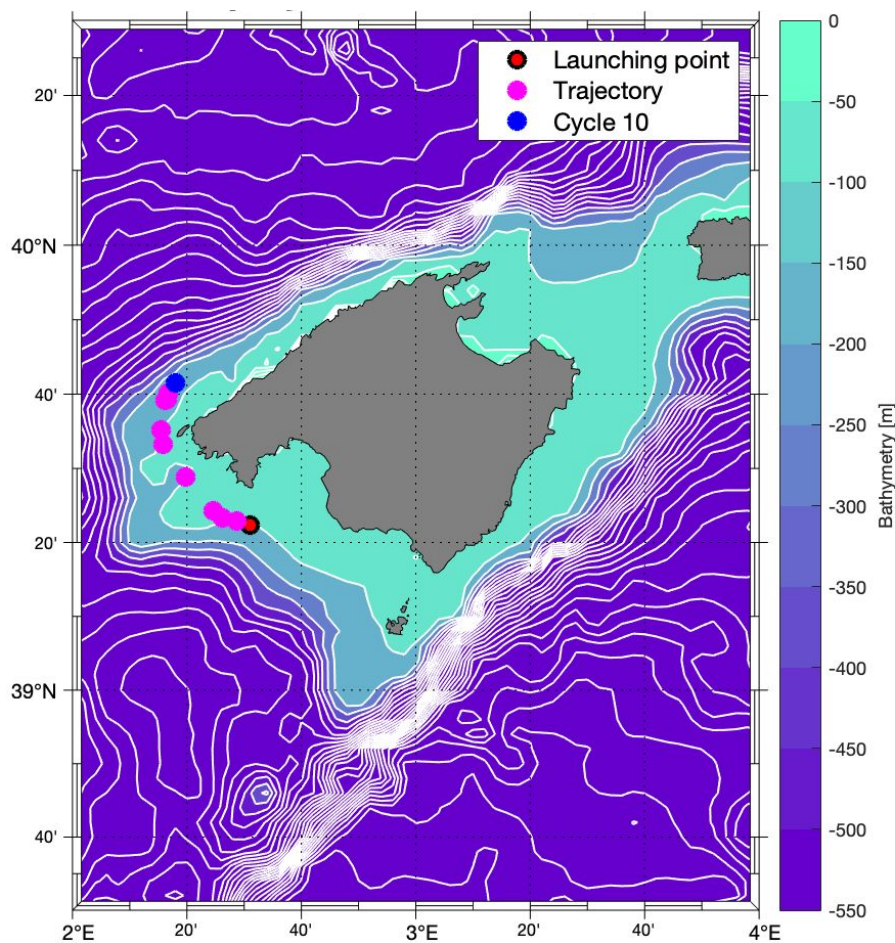


Fig. 6. Arvor-I profiler (WMO 6901278, EA RISE) GPS position since the launching day until 25/03/2020. Red point: launching point, pink points: trajectory followed, and blue point: GPS position at Cycle 10 (25/03/2020).

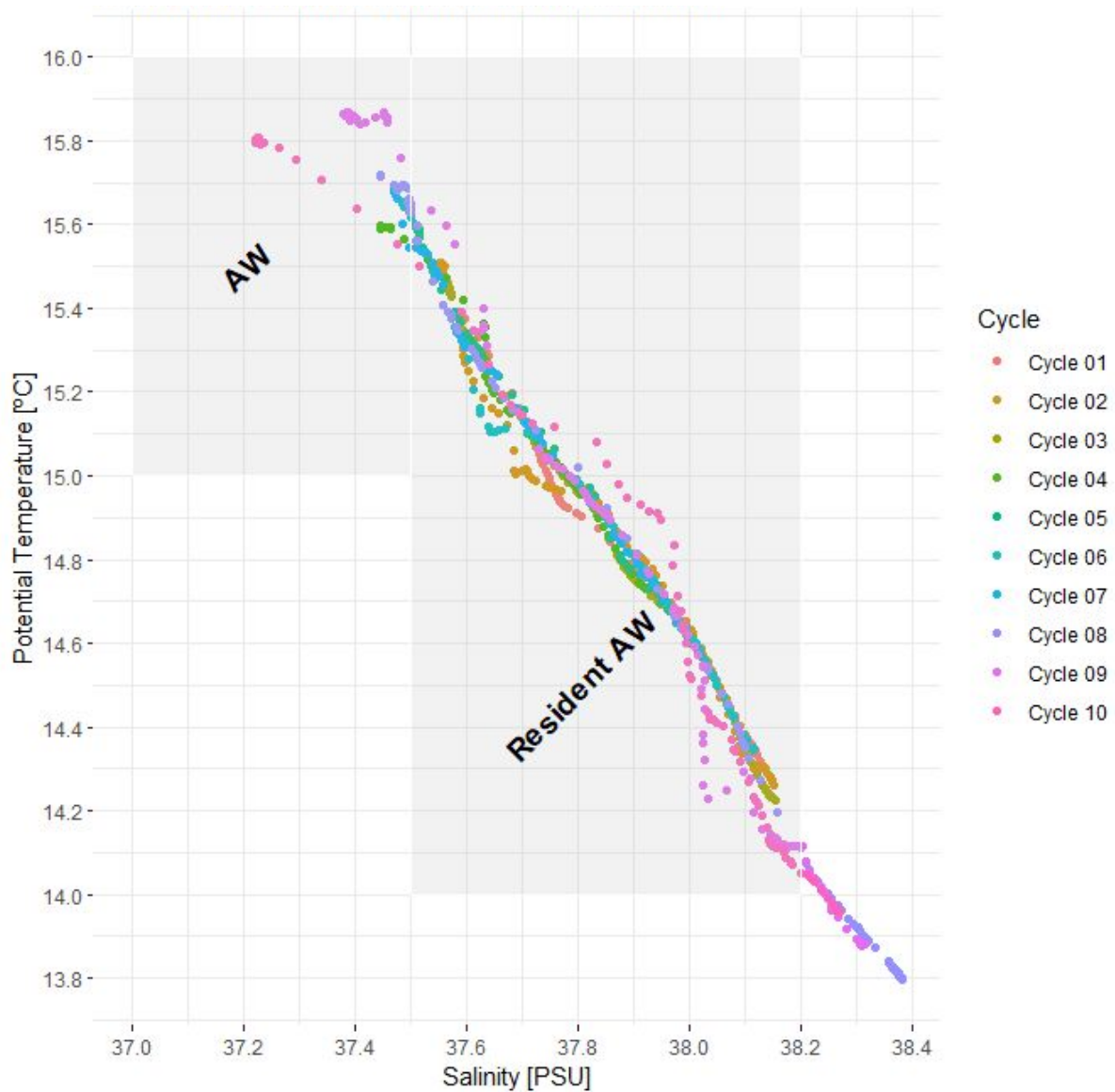


Fig. 7. Potential temperature versus salinity (θ/S) diagrams obtained during the EA RISE 2020 cruise for the profiler with WMO 6901278. Each profile cycle is shown by the colorbar. The characteristic θ/S space for Atlantic Water (AW) and Resident AW are shown as boxes that enclose their corresponding ranges (according to López-Jurado et al., 2008). Period represented: 12/03/2020 - 25/03/2020

5.2. Euro Argo Profiler

An Arvor-I profiler was launched in WP2, as part of the Euro Argo-Program. It is configured to cycle between the surface and 1000/2000 dbar every 5 days and it drifts at the parking depth of 1000 dbar. This deployment will help to investigate column water physical properties. In the θ/S diagram presented in Figure 9, it is described the water masses described by the Arvor in the area during the period between 12/03/2020 until 24/03/2020.

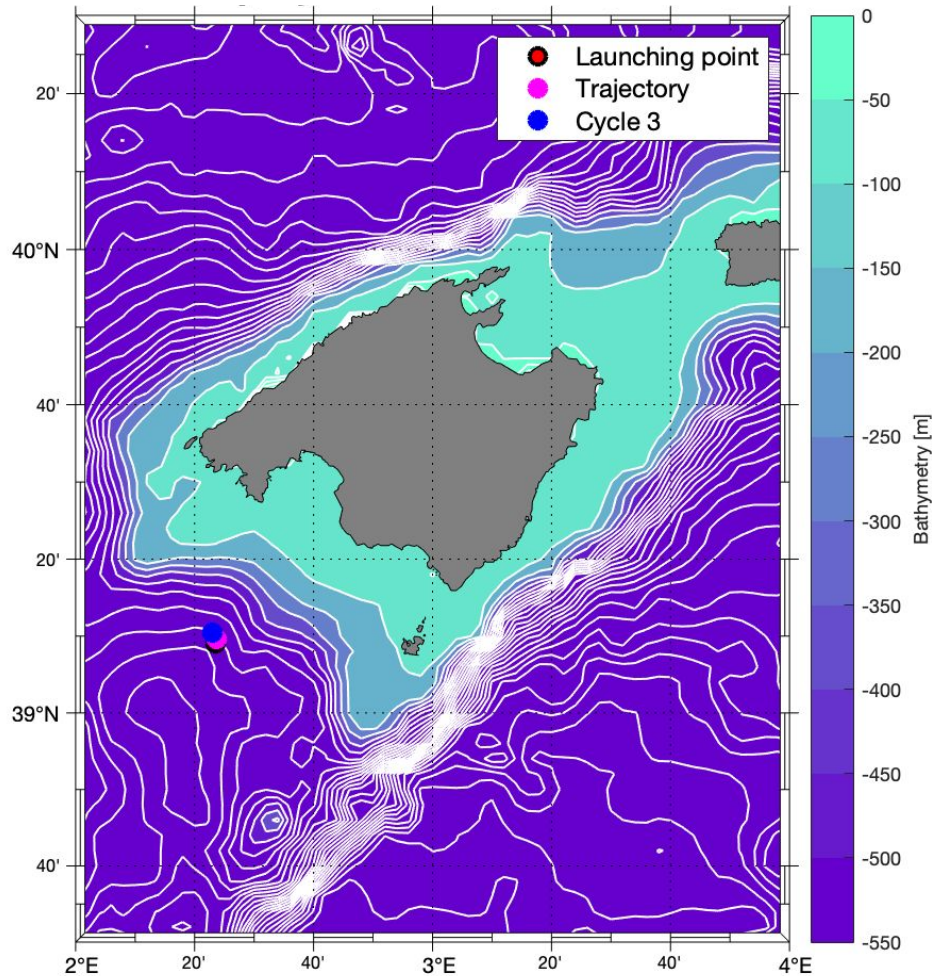


Fig. 8. Arvor-I profiler (WMO 6901279, Euro Argo ERIC) GPS position since the launching day until 24/03/2020. Red point: launching point, pink points: trajectory followed, and blue point: GPS position at Cycle 3 (24/03/2020).

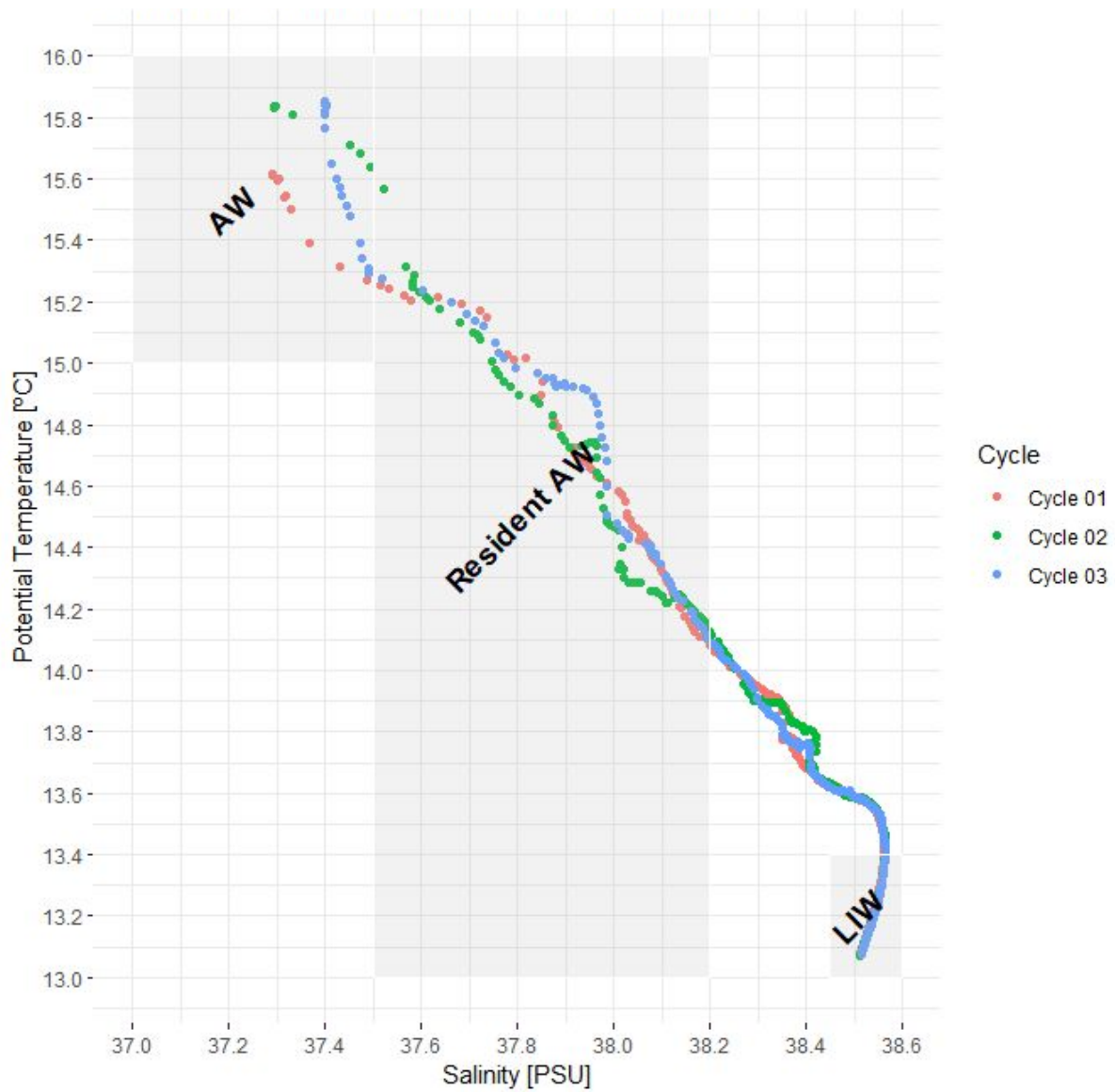


Fig. 9. Potential temperature versus salinity (θ/S) diagrams obtained during the EA RISE 2020 cruise for the profiler with WMO 6901279. Each profile cycle is shown by the colorbar. The characteristic θ/S space for Atlantic Water (AW), Resident AW and Levantine Intermediate Water (LIW) are shown as boxes that enclose their corresponding ranges (according to López-Jurado et al., 2008). Period represented: 12/03/2020 - 24/03/2020

5.3. Surface drifters

Two SVP-B's (surface drifters with barometer sensors) were also launched in the WP2, as part of the Global Drifter Program (NOAA, USA). Sea surface temperature and air pressure at sea level are represented in Figure 10 (Panel A and B, respectively).

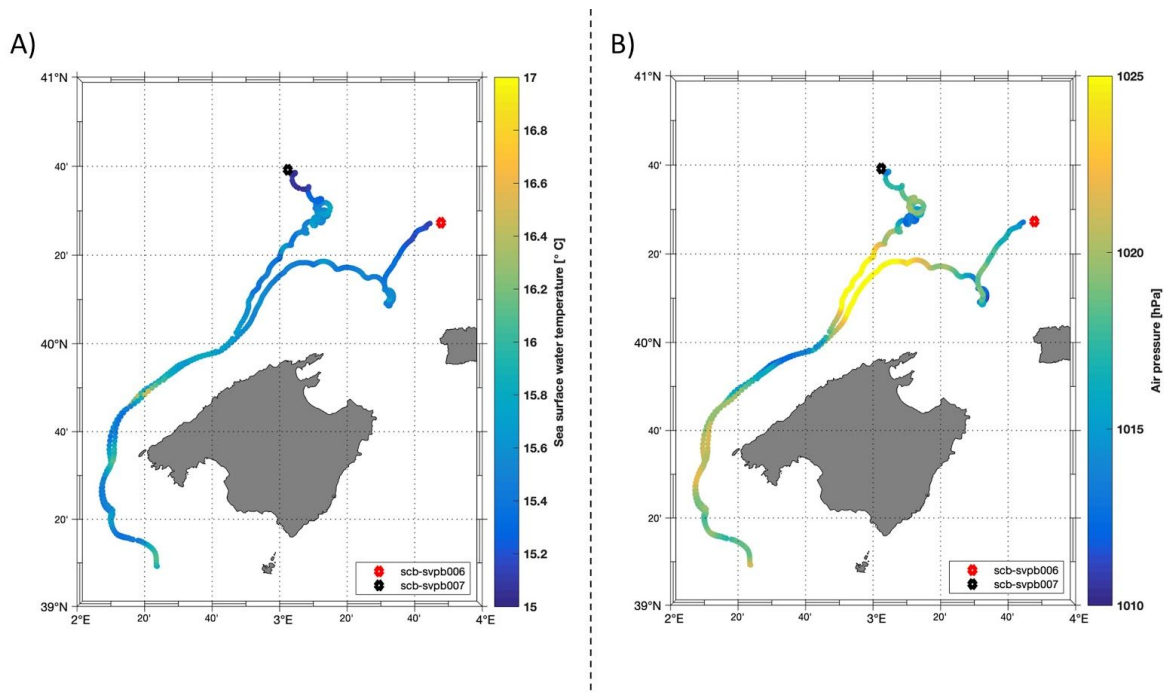


Fig. 10. Sea surface water temperature (Panel A) and air pressure (Panel B) measured by the SVP-B's (with barometer sensor). Period represented: 12/03/2020 - 25/03/2020

5.4. CTD

Due to external inconveniences (COVID-19), it has not been possible to check the initial results. It will be done in a later stage.

5.5. ADCP

Understanding details of the vertical current shear in the water column was a top priority for comparison with and validation of the WMOP current forecasts. For this reason the VM-ADCP was setup to record one hundred 4 m thick depth bins rather than the more commonly used fifty 8 m depth bins. Two files were recorded, one outbound, and one inbound, and both were in bottom tracking mode to ensure that the team could achieve a good calibration check on amplitude factor (A) and misalignment angle (θ) during a relatively short cruise.

The calibrations were as follows:

Outbound: $\theta = -0.095^\circ \pm 0.138$ and $A = 1.0035 \pm 0.0025$

Inbound: $\theta = -0.087^\circ \pm 0.126$ and $A = 1.0015 \pm 0.0019$

The outbound calibration suggests that a slight increase in amplitude factor, A , might be statistically justifiable, however this is not confirmed by the inbound calibration results. Therefore the instrument calibrations were left set at $\theta = 44.1^\circ$ and $A = 1.0045$, as maintained on the previous winter Canales cruise in February 2020.

Due to external inconveniences (COVID-19), presentation of the final data sections are pending.

5.6. Weather station

As it was mentioned in Section 3, the onboard SOCIB R/V weather station registered anomaly data that should be treated carefully. The wind direction and the speed were higher than in a calm day (Figures 11 and 12). This problem will be studied deeply.

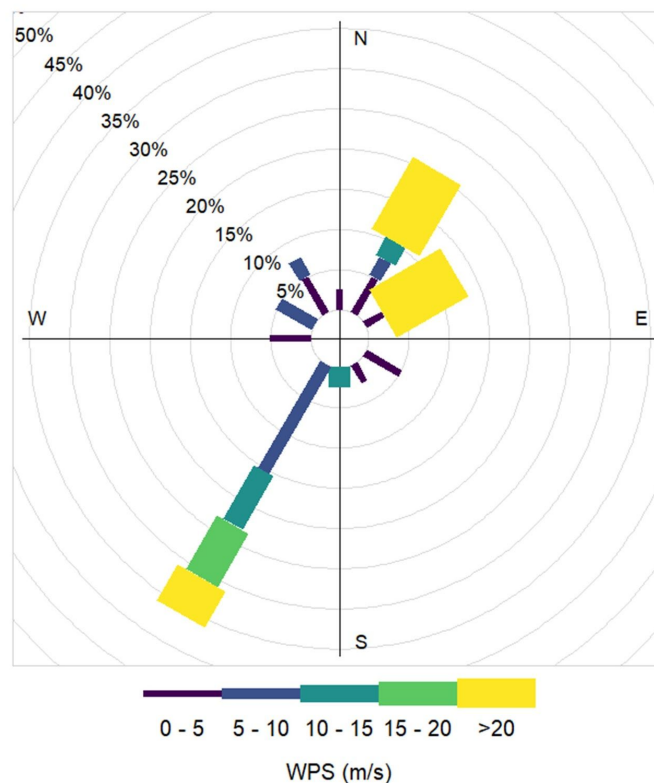


Fig. 11. Wind Rose during the EA RISE cruise from Weather Station on board SOCIB R/V.

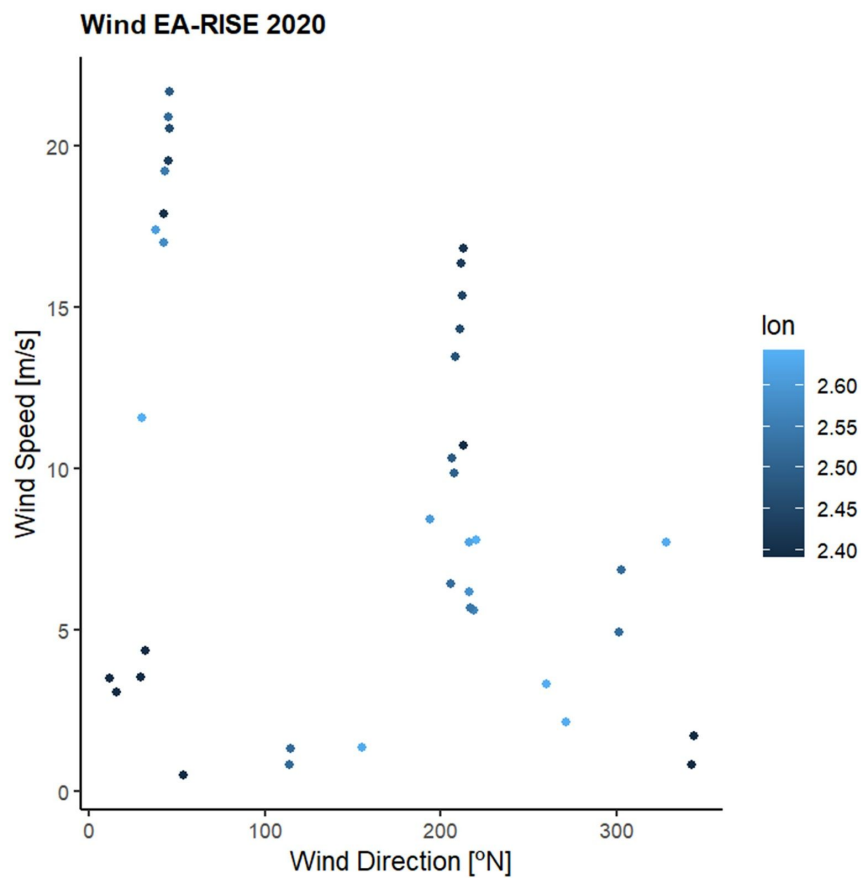


Fig. 12. Wind Speed vs Wind direction measured from Weather Station on board SOCIB R/V.
Location in °E is included for reference.

5.7. Thermosalinometer

Data from the thermosalinometer station installed at the SOCIB R/V are shown in Figure 13.

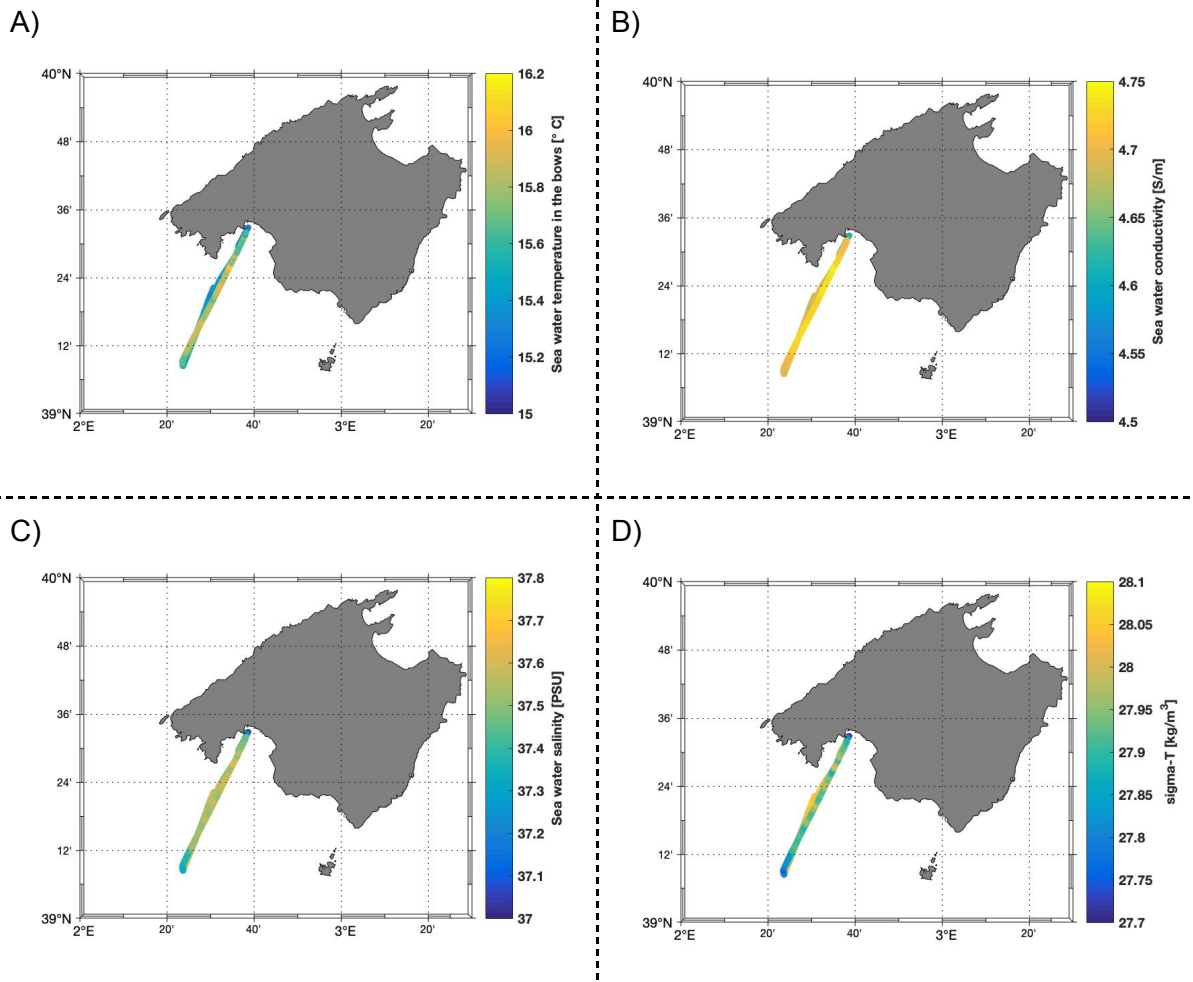


Fig. 13. Variables measured by the thermosalinometer on board SOCIB RV during the cruise: sea water in the bows (Panel A), sea water conductivity (Panel B), sea water salinity (Panel C), Sigma-t (Panel D) .

6. Problems encountered

During the field campaign, no major problems appeared. The main challenge in the days after the cruise will be to maintain the EA-RISE profiler in shallow waters. For this purpose, technical parameters will be changed continuously to control the float depth. WMOP model (Western Mediterranean OPERational forecasting system) will provide the forecast to predict its movement in daily basis.

The echosounder had some problems that were impossible to fix during the cruise. The

Vessel Seaboard was stuck during the second launching point.

7. References

[Allen, J. 2016. SOCIB VM-ADCP Standard Operating Procedures \(SOP\)](#)

[Allen, J. 2016. SOCIB VM-ADCP Standard Operating Procedures \(SOP\). QUICK GUIDE](#)

ARVOR-I & DO-I FLOAT – 33-16-033_UTI. USER MANUAL. Technical report.
DOC33-16-033 du 19 / 11 / 18 rev.9

Drifter deployment instructions: SVP and SVP-Barometer drifters:
https://www.aoml.noaa.gov/phod/gdp/images/Deployment_Instructions_English.pdf

López-Jurado, J. L., Marcos, M., Monserrat, S. 2008. Hydrographic conditions affecting two fishing grounds of Mallorca island (Western Mediterranean): during the IDEA Project (2003–2004). Journal of Marine Systems Volume, 71, 303–315. doi: 10.1016/j.jmarsys.2007.03.007

Sagot, J. Float Deployment Quickstart & Checklist. Arvor-I & Provor-I Float. Technical report. NKE instrumentation (33-16-035), 8.