SOCIB Balearic Islands Coastal Observing and Forecasting System

CRUISE REPORT

SOCIB Canales Winter 2022:

16th to 19th of February 2022

SOCIB_ENLCanales_20220216

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Date:	2022/02/21

Description:	A repeated seasonal hydrographic survey of the Balearic Sea, monitoring the Ibiza and Mallorca Channels. 21 CTD stations were carried out over 2 days; the stations forming one transect across the Mallorca Channel (MC) and one transect across the Ibiza Channel (IC) and one cast close to the PalmaBuoy. An intercalibration cast was performed with the Glider in the Ibiza Channel (IC). In total three SVP-B surface drifters were deployed. Sampling wise, a pilot study for environmental DNA (eDNA) metabarcoding in 4 stations of the IC was performed. 12 microplastic samplings with periods of 15 minutes were performed to 1) obtain the current status of the distribution of floating plastic debris, within the Mallorca Channel (MC) and the Ibiza Channel (IC) and 2) to further verify its correspondence with the forecasting models. ICES-SeaDataNet Cruise Summary Report BSH-RefNo: 20223032
Authors:	N. Wirth, A. Cabornero, L. Díaz, J. Allen
Supervision:	
Keywords:	Mediterranean; Ocean Circulation; Balearic Sea; Ibiza Channel; Mallorca Channel; Northern Current;

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2. Objectives

The present Canales cruise is part of the SOCIB endurance line canales cruises (ENL canales) in the Balearic Sea that was initiated in 2013, for the present cruise the following objectives were defined:

[OB-1] To make a complete SOCIB-Canales CTD section across the Ibiza Channel (IC) and a RADMED CTD section across the Mallorca Channel (MC) consisting of 20 stations in total. The purpose of these sections are seasonal calibration periods for the near continuous Glider monitoring of the IC. Measurements are made with the SeaBird SBE9 + instrument and the oceanographic Niskin bottle rosette for water samples at different depths.

Principal Scientist: A. Cabornero, J.Allen

[OB-2] To make continuous current profile sections of the IC and MC (in total 4 sections) using the vessel mounted acoustic Doppler current profiler (VM-ADCP). These sections are for comparison with model forecasts and to support depth averaged velocity (DAV) calculations from glider data. R/V SOCIB is equipped with a RDI 150 kHz Ocean Surveyor VM-ADCP.

Principal Scientist: J.Allen

[OB-3] Perform a synchronized CTD cast with the simultaneous operating SOCIB glider in Ibiza Channel as close as possible with minimum depth of 500m. The purpose of this cast is the intercalibration of the Glider data with the measurements made with the SeaBird SBE9 + instrument and the oceanographic Niskin bottle rosette for water samples at different depths.

Principal Scientist: N.Zarokanellos

[OB-4] Continue the periodical microplastic sampling on board of the RV SOCIB across the Mallorca Channel (MC) and one transect across the Ibiza Channel (IC) consisting of 8 sampling periods in each section. The main objective is to obtain a current status of the distribution of floating plastic debris, and to verify its correspondence with the forecasting models.

Principal Scientist: J. Martinez

[OB-5] Palma buoy cast

To make a CTD cast as close to the Bahia de Palma observing buoy as safely possible. Water samples from a depth of 0 - 3 meters are essential in order to calibrate the biogeochemical data from the multi-disciplinary sensors on the buoy, and

it is not always possible or convenient to deploy a small boat to get across the bay. This is a small deviation for the R/V SOCIB cruise programme, and therefore if possible it can be carried out both at the beginning and at the end of the Canales mission. It does not replace the regular monthly maintenance/sampling programme at the buoy, it simply re-enforces the programme.

Principal Scientist: A. Cabornero, J.Allen

In addition, the RV SOCIB has been used as ship of opportunity to realize the following tasks:

[T-1] Deployment of a total of 3 surface drifters (SVP-B), 1 SVP-B in the MC and 2 SVP-B in the IC to maintain an active fleet per year of 8 surface drifters as part of the Global Drifter Program (GDP). This program has two principal objectives; 1) maintain a global 5 x 5 degree array of about 1300 satellite-tracked surface drifting buoys to meet the need of *in situ* observations and, 2) provide a data processing system for scientific use of these data.

Principal Scientist: L.Diaz

[T-2] Continuation of the pilot study for eDNA metabarcoding with eDNA sampling in 4 stations in the Ibiza Channel (in coordination with Valencia University, this pilot study started with the Canales Spring 21).

Principal Scientist: D.March

3. Onboard personnel

ID	Name	Role	Affiliation
1	Nikolaus Wirth	Chief Scientist / CTD lead / VM-ADCP(remote support, J. Allen) / Outreach	SOCIB
2	Pau Balaguer	ETD / CTD / Plastics sampling / ship operations	SOCIB
3	Andrea Cabornero	Lead Biochem sampling/eDNA sampling / Plastic sampling / Salinity sampling	SOCIB
4	Juan de la Cruz	Biochem sampling/eDNA sampling / Plastic sampling	SOCIB
5	Lara Díaz Barroso	Biochem sampling/eDNA sampling / Plastic sampling, Drifter Deployment	SOCIB

4. Station plan and Timeline

In order to attain the technical and scientific objectives of the cruise the working days were organized as presented in the cruise plan (section 4).

OB-1 and T-2. 21 stations out of the 21 CTD stations planned were carried out during this cruise. All started with a CTD cast close to the buoy of Palma which had been performed for data calibration, the complete transect of the MC (10 stations) was completed on the same day, February the 16th; and 10 stations of the transect of the IC had been realized on February the 17th (Figure 1 a.). Additionally, in the IC at the stations S2_01, S2_04, S2_07 and S2_T1_END eADN sampling had been performed and handed over the samples once moored in the port of Denia to the person in charge of the University of Valencia.

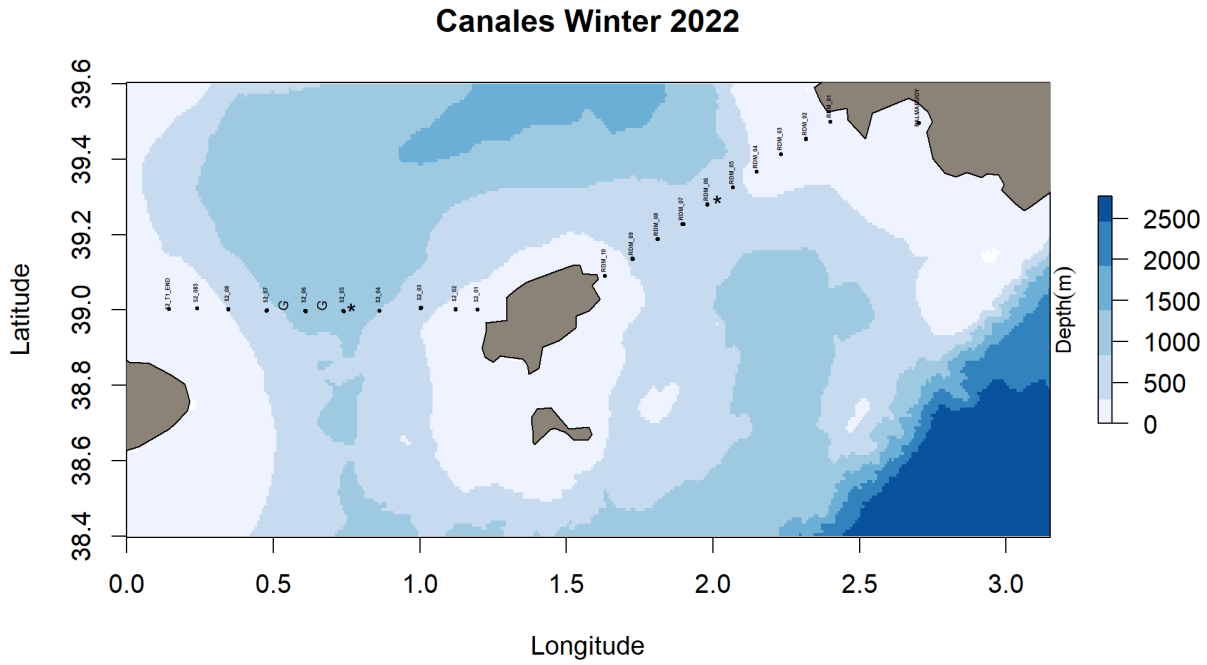


Fig. 1a. CTD cast station plan, * Drifter and float deployment point, G :Glider intercalibration point

OB-2. The ADCP was collecting data throughout the entire duration of the cruise (from the moment the ship left the port to the moment the ship arrived at port). In total, 3 datasets have been archived: (1) the MC, from Palma to Sant Antoni on 16th of February, (2) the IC from Sant Antoni to Denia and (3) IC + MC, the transit from Denia to Palma on 18th of February.

OB-3. At the end of the second working day (February the 17th), a simultaneous CTD cast

with glider U830 - sdeep09 (GFMR0126) was performed for intercalibration. The glider was sampling on a parallel line 1 nautic mail south of the CTD-stations S2_06 (907 m depth) and S2_07 (717m depth).

OB-4. During the third day (December 15th) crossing the IC, 8 microplastic sampling periods were carried out. In continuation, during the night of the same day, on the way to Palma had been realized 4 further stations in the MC. The sample stations are as shown in figure 1b.

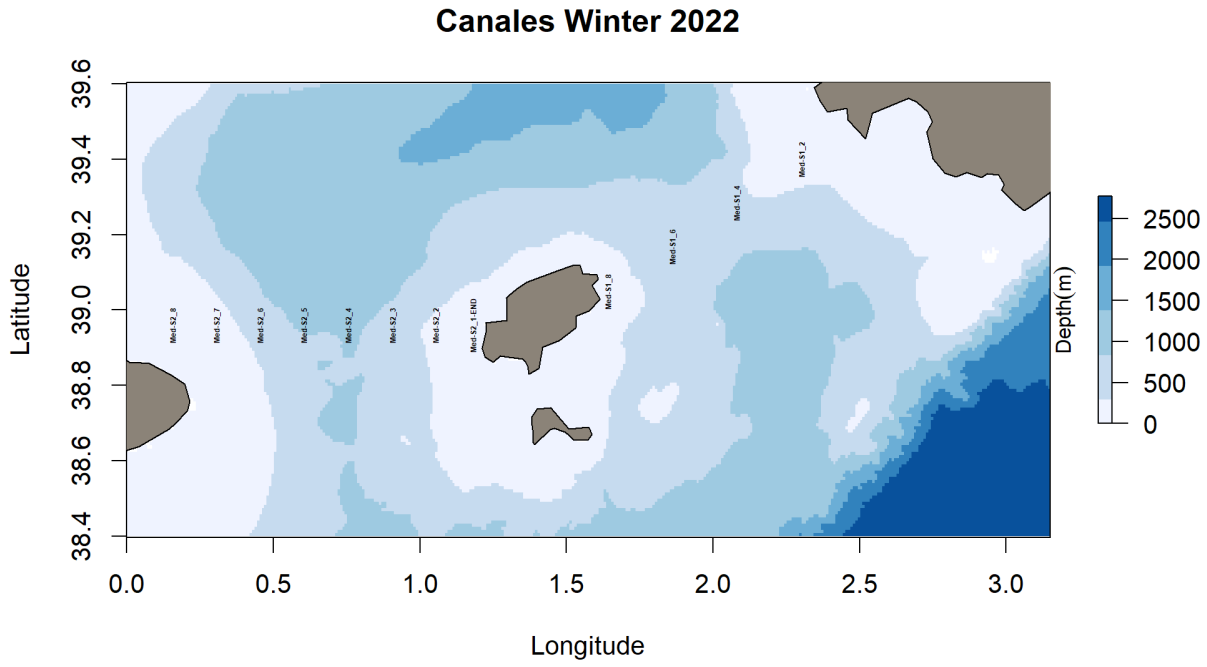


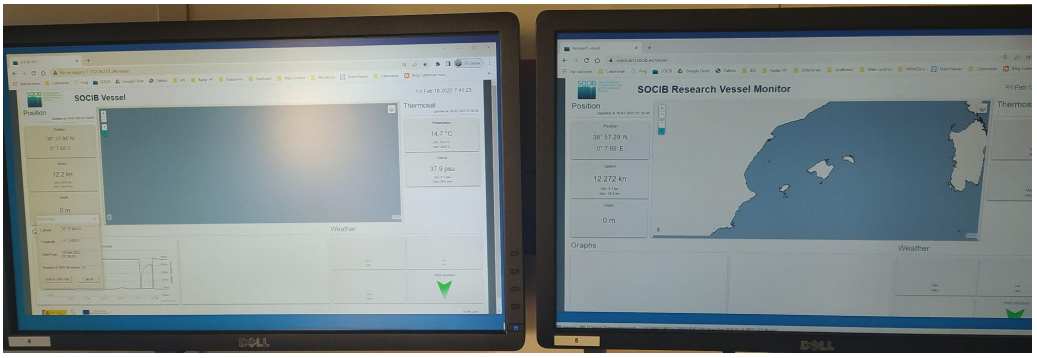
Fig. 1b. Microplastic station plan

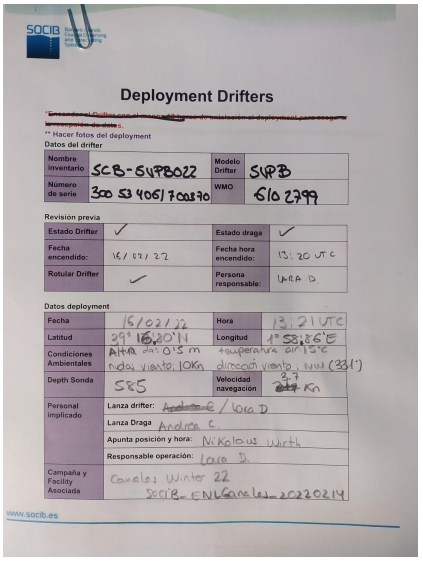
T-1. The SVPB unit SCB-SVPB022 had been deployed on the first day (February the 16th) at station RADMED_06. During the second day (February the 17th) was performed at station S2_05 the deployment of SCB-SVPB023 and SCB-SVPB024.

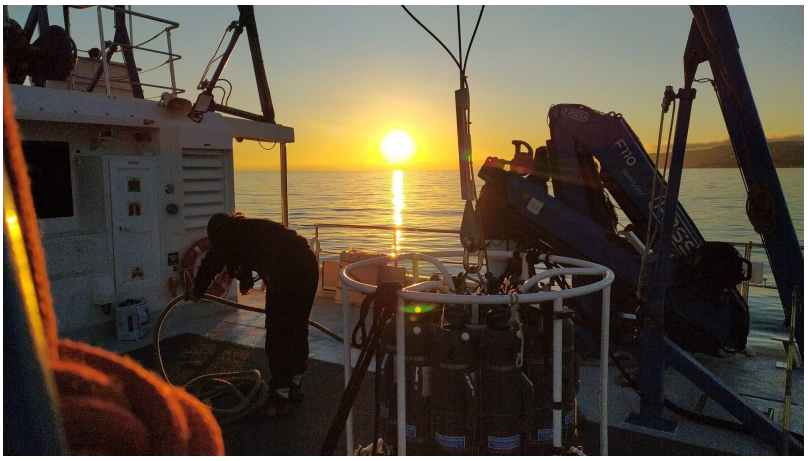
5. Cruise diary

5.1. Day 1 - 16th of February 2022 (Palma to Sant Antoni)

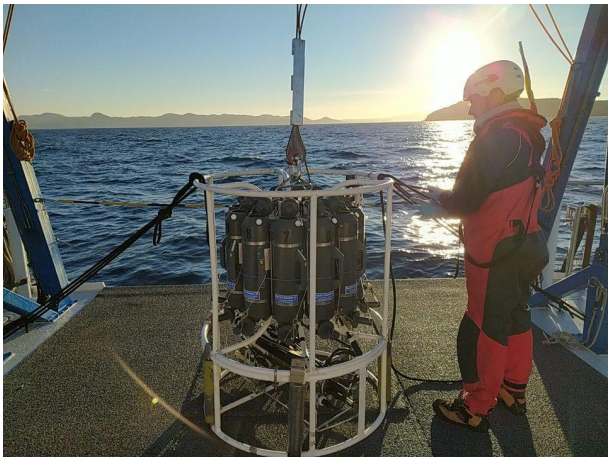
UTC	OBSERVATIONS
06:55	The scientific personnel and ship crew all on board of the RV SOCIB
07:05	Leaving port of Palma
07:15	Meeting with Captain (Weather forecast, Work Plan for today, timing, etc) Safety talk on upper deck
07:25	ADCP turned on Ecosounder turned on. Termosal started preparing CTD and laboratory for sampling
08:30	on Station close to the buoy in the bay of Palma, preparing CTD
	weather conditions: waves: 0.5 m from SW, wind: approx. 10 knots
07:55	Station PalmaBuoy CTD in the water
08:02	CTD on board Sensor PAR not working (but changes in voltage) Sensor Turbidity not working
	sailing with 11.4 knots.
	Revision of PAR and Turbidity sensor
09:25	on Station, preparing CTD
	weather conditions: waves: 0.6 m from SW, wind: less than 10 knots
09:30	Station RADMED_01 CTD in the water
09:34	CTD on board Bottle 4 hasn't closed Sensor PAR not working (but changes in voltage) Sensor Turbidity not working
10:08	Station RADMED_02 CTD in the water
10:13	CTD on board

	Sampling
	Sailing with 11.7 knots to next station
	SEABOARD not working, communication with DataCenter
	
10:42	Station RADMED_03 CTD in the water
10:48	CTD on board
11:22	Station RADMED_04 CTD in the water
11:29	CTD on board Sampling sailing to next station
	weather conditions: waves: 0.6-0.8 m from SW, wind: approx. 10 knots
11:55	Station RADMED_05 CTD in the water Sensor PAR not working (but changes in voltage) Sensor Turbidity not working
11:55	Salinity sampling Termosal
12:20	CTD on board Sampling Sailing to next station with 11,7 knots
12:52	Station RADMED_06 CTD in the water
13:19	CTD on board Sampling
	Sailing to next station with 2,5 knots

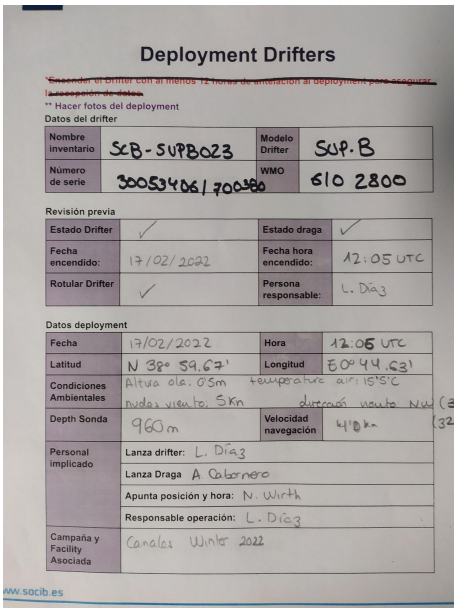
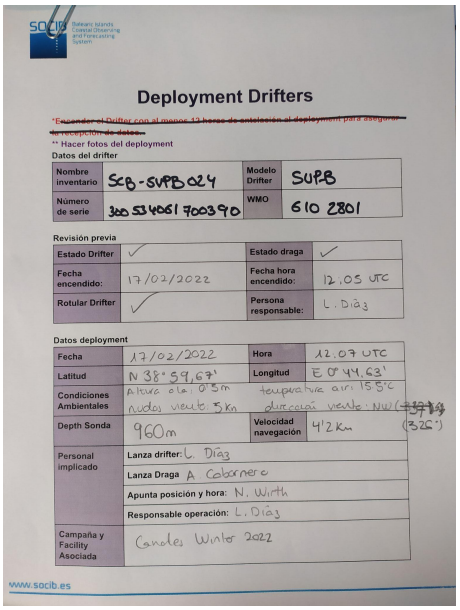
13:16	Deployment of SVPbs SCB-SVPB022 weather and sea conditions: waves: 0.5 m-0.7m, wind: 10 knots
	 Deployment Drifters ** Hacer fotos del deployment Datos del drifter Nombre inventario: SCB-SVPB022 — Modelo Drifter: SVPB Número de serie: 300 53 406/ 7 008 70 — WMO: 6/0 2799 Revision previa Estado Drifter: ✓ — Estado draga: ✓ Fecha encendido: 16/02/22 — Fecha hora encendido: 13:20 UTC Rotular Drifter: ✓ — Persona responsable: LARA D. Datos deployment Fecha: 16/02/22 — Hora: 13:21 UTC Latitud: 39° 16,20'N — Longitud: 1° 58,86'E Condiciones Ambientales: Altura ola: 0.5 m temperatura air 15°C nudos viento: 10Kn dirección viento: NW (330°) Depth Sonda: 585 — Velocidad navegación: 3,7 Kn Personal implicado: Lanza drifter: ~~Andrea C~~ / Lara D Lanza Draga: Andrea C. Apunta posición y hora: Nikolaus Wirth Responsable operación: Lara D. Campaña y Facility Asociada: Canales Winter 22 SOCIB_ENLGcanales_20220214 www.socib.es
13:51	Station RADMED_07 CTD in the water
14:20	CTD on board Sampling
14:50	Station RADMED_08 CTD in the water
15:15	CTD on board Sampling
15:48	Station RADMED_09 CTD in the water
16:06	CTD on board Sampling
16:45	Station RADMED_10 CTD in the water
16:50	CTD on board Sampling
	All stations of the MC completed!
16:50	Sailing to port Sant Antoni
	weather and sea conditions: waves: 0.8 m-1m from SW wind: 10 knots sailing with 8,9 knots.

19:00	turned off ADCP. turned off Termosal
19:20	moored at dock
	backup of PC-Labs
	communication with OUTREACH
	ADCP: Confirmation of good calibration for VM-ADCP from day 1 some black outs detected during the day. revision of GPS 3D ADU 800 all OK and proper calibrated
	
22:00	Finished DAY 1

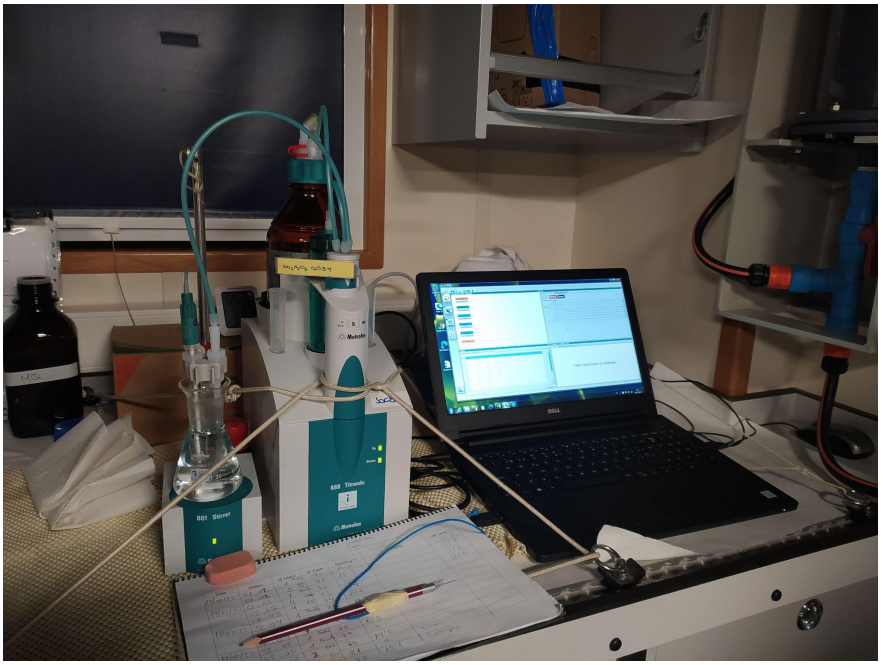
5.2. Day 2 - 17th of February 2022 (Sant Antoni to Denia)

UTC	OBSERVATIONS
06:55	Leaving port of Sant Antoni.
	Meeting with Captain and science crew, (Weather forecast, Work Plan for today, timing, etc)
07:05	ADCP on, Continuing with calibration for VM-ADCP from day 1. Termosal on and Echosounder On.
	weather conditions: 0.5 - 0.7 m from SW, sailing with 11.6 knots
	
07:31	Station S2_01 CTD in the water
07:38	CTD on board eDNA sampling biochem sampling
	sailing to next station
08:04	Station S2_02 CTD in the water
08:13	CTD on board Sampling sailing 11.4 knots to next station
09:09	Station S2_03 CTD in the water
	CTD on board Sampling

	Coordination with GF (intercalibration cast) probably close to S2_06
10:16	Station S2_04 CTD in the water
10:48	CTD on board eDNA sampling Sampling
	
	NO INTERNET COMMUNICATION
11:26	Station S2_05 CTD in the water
12:04	CTD on board Sampling
	Sailing with 4 knots, Deployment of SCB-SVPB023, (11:59 UTC, 39º00,032N 0º43,659E) SCB-SVPB024. (11:58 UTC, 39º00,031N 0º43,702E)
	weather conditions: < 0.5 waves, <5 knots wind speed
	 

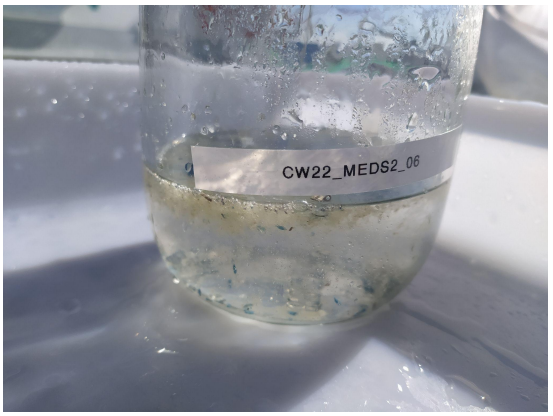
	 
12:45	Station S2_06 CTD in the water
13:25	CTD on board Sampling Glider Intercalibration
14:04	Station S2_07 CTD in the water at 5 m
14:33	CTD on board eADN sampling Sampling
	Salinity sampling Termosal
	Glider Intercalibration
15:11	Station S2_08 CTD in the water
15:26	CTD on board Sampling
15:30	Coordination with GF (intercalibration cast)
	Gilder surface: 38 59.308 N 0 37.072 E Station S2_06 and Station S2_07 will be used for data comparison.
16:10	Station S2_085 CTD in the water
16:19	CTD on board

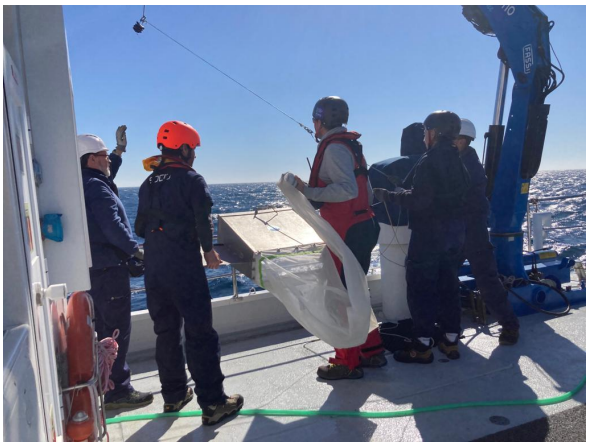
	Sampling
16:44	Station S2_T1END CTD in the water
16:51	CTD on board eADN sampling Sampling
	
	All stations of the IC completed!
	Coordination with OUTREACH
18:00	moored at port in Denia
	
	backup of PC-Labs and data transfer to SOCIB
	preparation of microplastic sampling for the next day

18:30	Transfer of eDNA samples to Natalia (UV)
	Meeting with Captain, weather forecast for the next two days. Planning of options in case of bad weather.
20:00	Analysis of oxygen samples first day
	
	ADCP data conversation Logbook
00:30	Finished DAY 2

5.3. Day 3 - 18th of February 2022 (Denia to Palma)

UTC	OBSERVATIONS
06:55	Leaving port of Denia.
	Meeting with Captain
07:10	ADCP on. Echosounder on Termosal on
07:25	preparing MantaTrawl for deployment, restructuring the laboratory for plastic sampling.
	Weather Conditions:wind speed: <5 knots, waves 0.4m - 0.6m
	SEABOARD DOES NOT WORK
08:13	Station MED-S2_08 MantaTrawl in the water. Using the aft crane to deploy the MantaTrawl
	
08:29	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol,
	sailing to next station with 11,5 knots
09:07	Station MED-S2_07 MantaTrawl in the water problems during deployment, touched upside down into the water. Weather Conditions: :wind speed: 7-10 knots, waves 0.5-0.7m from S
	sailing to the next station with 11.3 knots, changing heading (direccion E) 30º to south for sailing

	later on under more stable conditions during the sampling.
10:04	Station MED-S2_06 MantaTrawl in the water
10:20	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 10.9 knots
	
	Weather Conditions: :wind speed: 10 knots from S, waves 0.7m - 0.9m
11:10	Station MED-S2_05 MantaTrawl in the water
	SEABOARD fixed temporally, pending: check the data
11:25	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol,sailing to next station with 11.3 knots
	Modification of procedure for microplastic sampling, removed extra weight, broken rope
	 

	Salinity Sampling Termosal
12:16	Station MED-S2_04 MantaTrawl in the water.
12:31	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 11.5 knots
12:38	Weather conditions: wind speed 15 knots, waves 0.7m - 0.9m Salinity Sampling Termosal
	Meeting with Captain, according to the weather forecast for the next day it had been taken the decision that instead of staying the night in Sant Antoni port, go directly to Palma sampling in the MC on the way. The stations to be sampled will depend on the weather conditions and the speed of the vessel.
13:21	Station MED-S2_03 MantaTrawl in the water
	
13:36	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 11.7 knots
14:20	Station MED-S2_02 MantaTrawl in the water
14:35	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 11.9 knots
15:13	Station MED-S2_01 MantaTrawl in the water
15:28	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol.
	All stations of the IC are done!
	Coordination with scientific team on land

	Communication Outreach
15:33	Sailing to north of Ibiza with 11.9 knots
17:20	**Start sampling MC**
17:34	Station MED-S1_08 MantaTrawl in the water
17:49	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 11.6 knots
	Weather conditions: wind speed 15-18 knots SE, waves 0.7m - 0.9m
18:58	Station MED-S1_06 MantaTrawl in the water
19:13	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 12.4 knots
	
20:13	Station MED-S1_04 MantaTrawl in the water
	Weather conditions: wind speed 5-8 knots E, waves 0.6m - 0.7m
20:28	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 13.0 knots
21:28	Station MED-S1_02 MantaTrawl in the water
21:44	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 11.9 knots
	Weather conditions: wind speed 8-10 knots NE, waves 0.7m

	sailing to Palma Port
	4 out of 8 microplastic stations were done. The weather is rolling to North, and the wind is becoming stronger as predicted by the weather forecast.
22:15	preparing the laboratory for analysis of oxygen samples second day (IC)
23:02	ADCP stopped Ecosounder stopped
23:20	Termosal stopped
23:50	Moored at Palma Harbour
00:30	analysis of oxygen samples second day (IC)
03:00	Finished DAY3

Cruise Canales Winter 2022 finished.

General observations:

- 2 bottles (salinity samples) had been taken in each cast at the selected depths (by the scientific responsable) as well as 2 times per day from the Termosal
- Bottle 3 of the rosette doesn't close properly, and can be used with the help of an extra rope.
- **Turbidity sensor is not working**, no changes of voltage detected. It had been reviewed the connection and the configuration of the sensor, but nothing strange was detected.
- **The PAR sensor is working** but the value output in the software is not correct. Reviewing the configuration during the cruise, it couldn't be found the mistake.
- **CTD configuration and CTD processed data has to be checked in detail**. During the whole cruise, several "warnings" popped up of the SBE-software. Most of them are because of "lost NMEA data" which can be because of network problems but also had been observed several times some delays and jumps during the down/up-cast.
- **Adding an extra CTD station** (PalmaBuoy) is extremely time challenging for the whole crew. This extra time on the first day is only possible if there are no unexpected events later on. High risk of losing the last stations in the MC due to time constraints.
- **Problems with Internet connection**: Balancing between Satellite and 4G not working properly. Very poor connection via Satelite. **REVIEW NEEDED**
- Several **problems with the internal network** on board. Several blackouts during the day had a big negative influence on instruments collecting data. **REVIEW NEEDED**
- **SEABOARD**: Seaboard is not working properly: **REVIEW NEEDED**
- **MantaTrawl:** Using the crane on the aft deck is easier to handle and the distance between the MantaTrawl and the vessel hull can be maximized. No further protections needed. But furthermore it would be beneficial to have a transport box and protection of the net as also a structure to place the MantaTrawl during the stations on deck. .
- MantaTrawl: regarding weather conditions the coming up huge forces acting on ropes and blocks. Before every cruise is highly important a special review and renewal of parts possibly damaged (change rope, chequel, blocks,..)

6. Scientific Reports

The following contains an overview of the data collected from the CTD.

CTD and water bottle sampling

Data acquisition: CTD casts (using a CTD, see section CTD Probe) were carried out at 21 stations encompassing 1 transects across the MC, 1 transect across the IC and the PalmaBouy on the first day. At each station, water samples were collected with the rosette at various depths for measuring *in situ* salinity, dissolved oxygen and total chl *a* in order to apply corrections to the sensors. Refer to the available logbook generated during the cruise for more details on sampling depths, replicates and parameters sampled at each station.

Data preprocessing and visualization: The sensor data were processed using SBE (Sea-Bird Electronics) Data Processing Version V7 23.2 (for details refer to SBE Web site). The resulting data are then processed in ODV in order to provide the figures in the following section. Post cruise processing will involve the correction of the salinity data based on calibration with *in situ* water samples analyzed in the lab with a Guideline Portasal model 8410A salinometer.

Biological and Biogeochemical data collection

As mentioned in the general objectives, the primary objective of the biogeochemical data collection during this cruise is to compare the data obtained from sensors, CTD chl a fluorescence (Seapoint) and oxygen (SBE-43) sensor against the *in situ* discrete water samples.

Secondary field objectives are:

1. To estimate total chl *a* concentration and distribution (as a proxy for phytoplankton biomass).
2. To study phytoplankton community composition (micro, nano and pico).
3. To monitor plastics.
4. Use this particular cruise for a pilot study of environmental DNA.
5. To use the RV SOCIB as a vessel of opportunity to register jellyfish following SOCIB protocols with ICMAN. (No observations during the present cruise)

The biogeochemical sampling was carried out on 2 days from the 16th to 17th February 2022 and followed the established R/V SOCIB protocols. The oxygen samples were analyzed on board after an 8-12 h period of darkness with a titration procedure with potentiometric endpoint detection (Metrohm 888 Titrator) and the final oxygen dataset will be produced post-cruise following the analysis of the data. Post-cruise chl *a* determination community composition analyses will be carried out at the IMEDEA.

The microplastic collected samples will be stored at the IMEDEA until further analysis

The eDNA samples were transferred to the University of Valencia in Denia on the evening of February the 17th for further analyses .

7. Preliminary physical results

Hydrography

The following figures show the potential temperature – salinity distribution of all stations of the entire water column, where color indicates the longitude of the corresponding station; the potential temperature in the upper section ~200 m depth; the vertical distribution of salinity and the vertical distribution of density.

7.1. Mallorca Channel

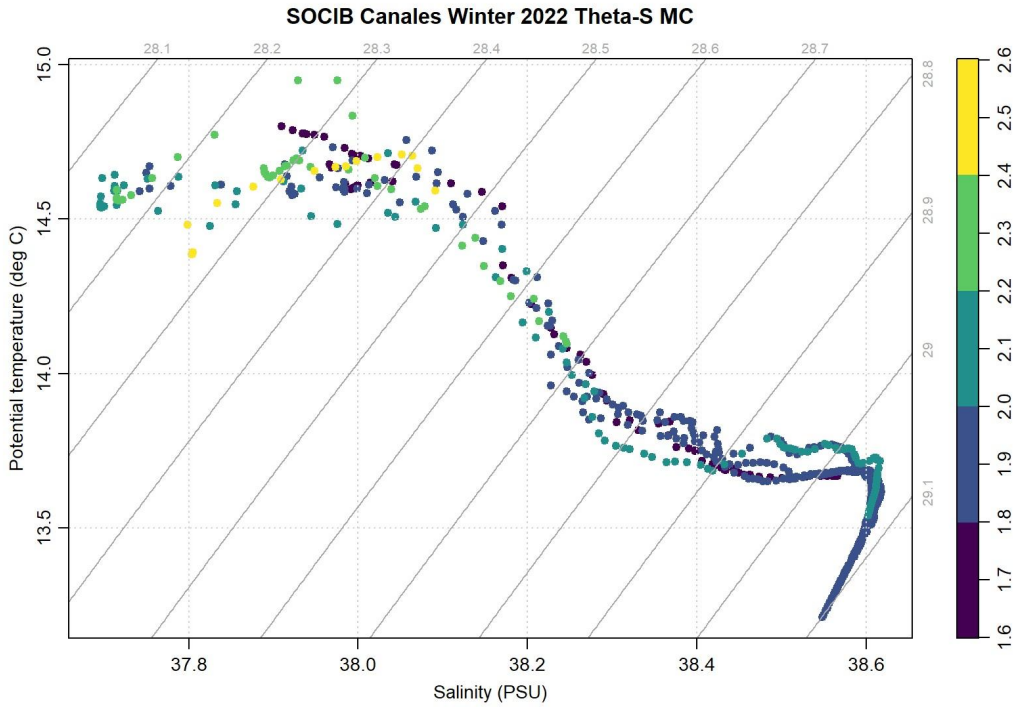


Fig 2 a. T-S diagram of the stations sampled in the MC, the color bar indicates longitude.

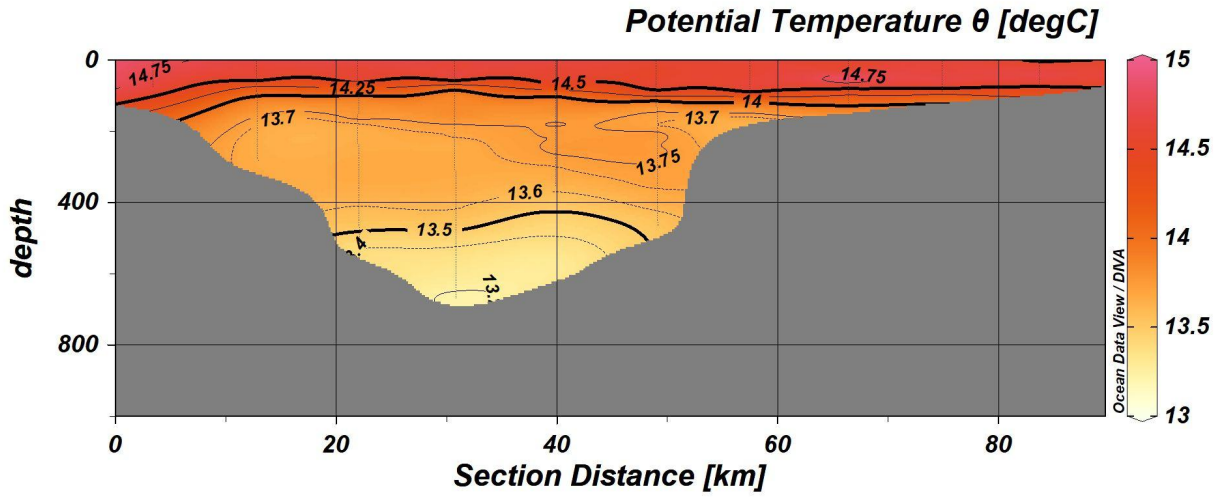


Fig. 2 b. Potential temperature (ºC) of the MC cross-section

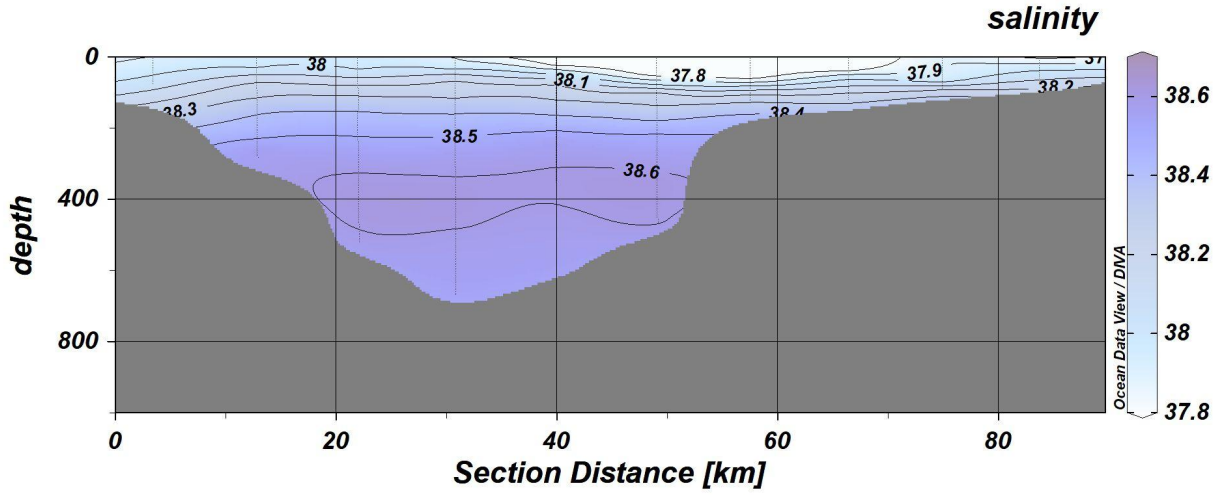


Fig. 2 c. Salinity (PSU) of the MC cross-section

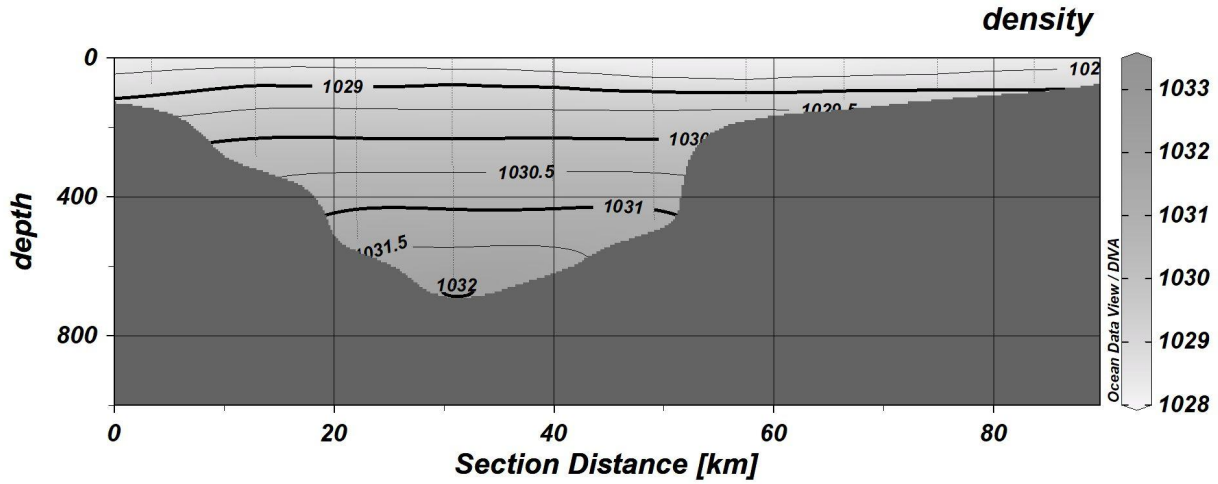


Fig. 2 d. Density (kg m^{-3}) of the MC cross-section

7.2. Ibiza Channel (North section)

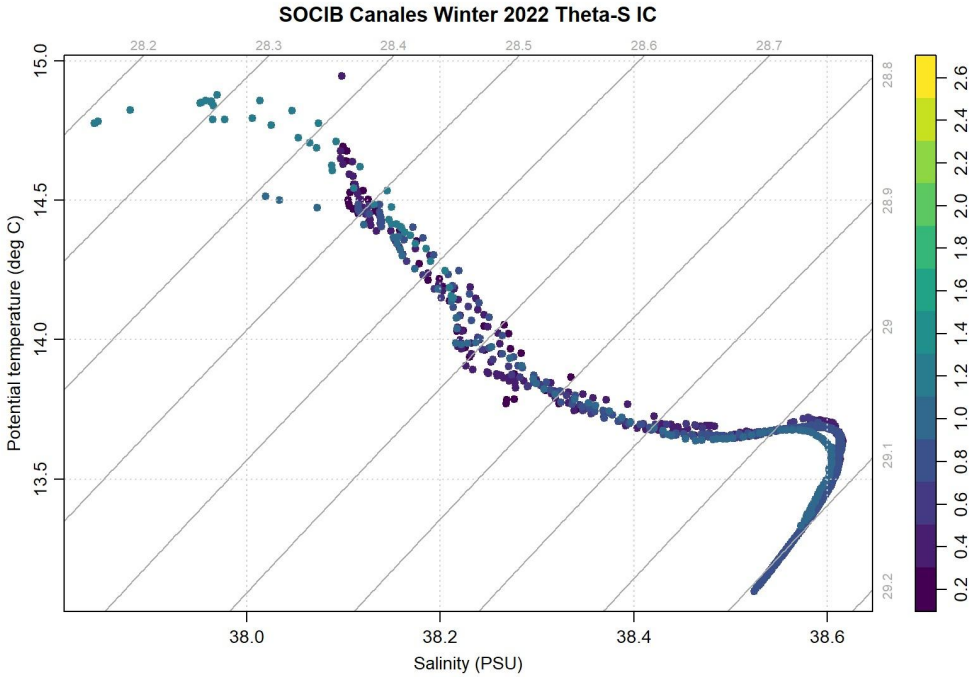


Fig 3 a. T-S diagram of the station sampled in the ICN, the color bar indicates longitude.

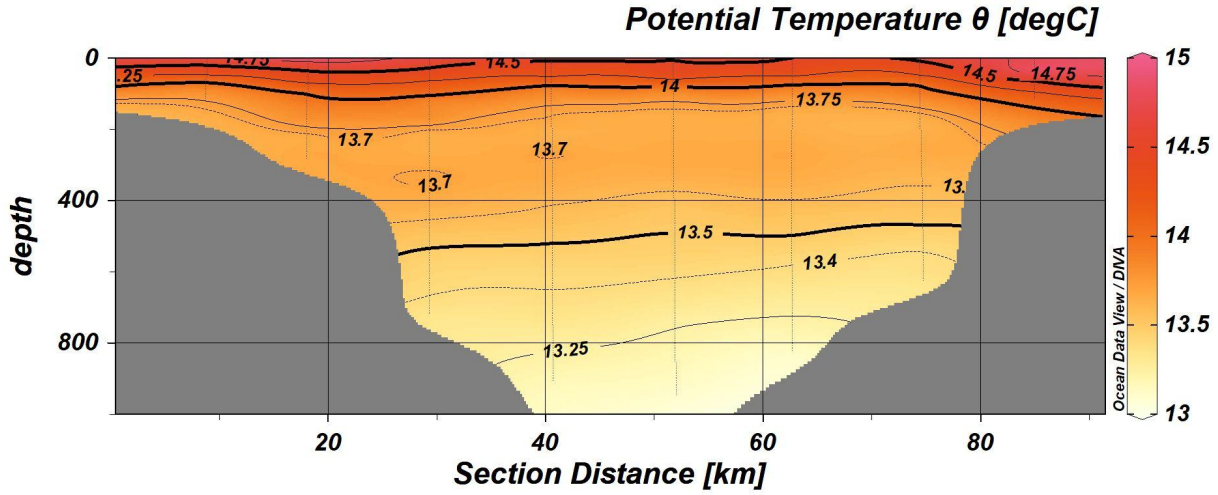


Fig. 3 b. Potential temperature (ºC) of the ICN cross-section

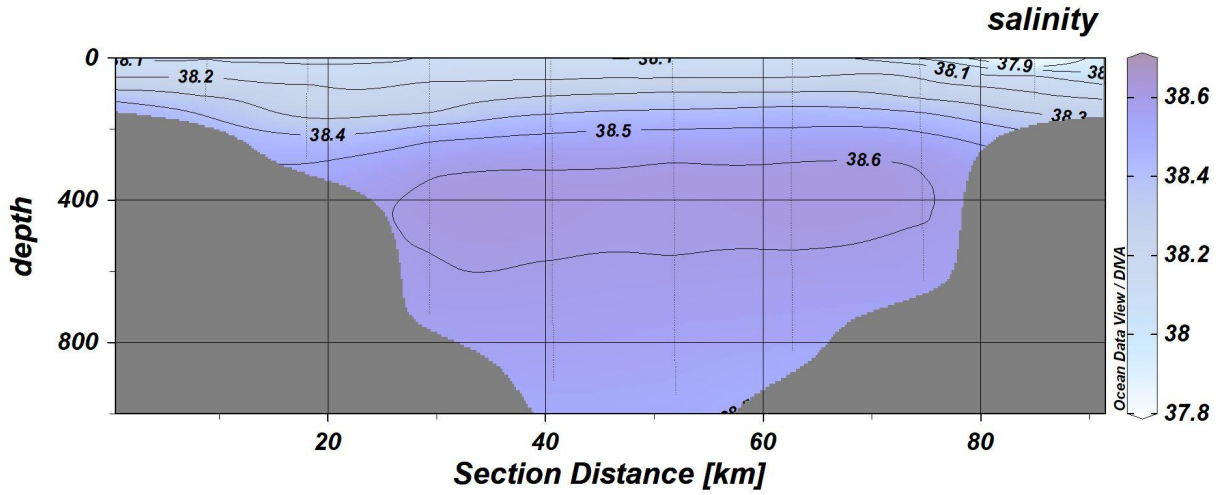


Fig. 3 c. Salinity of the ICN cross-section

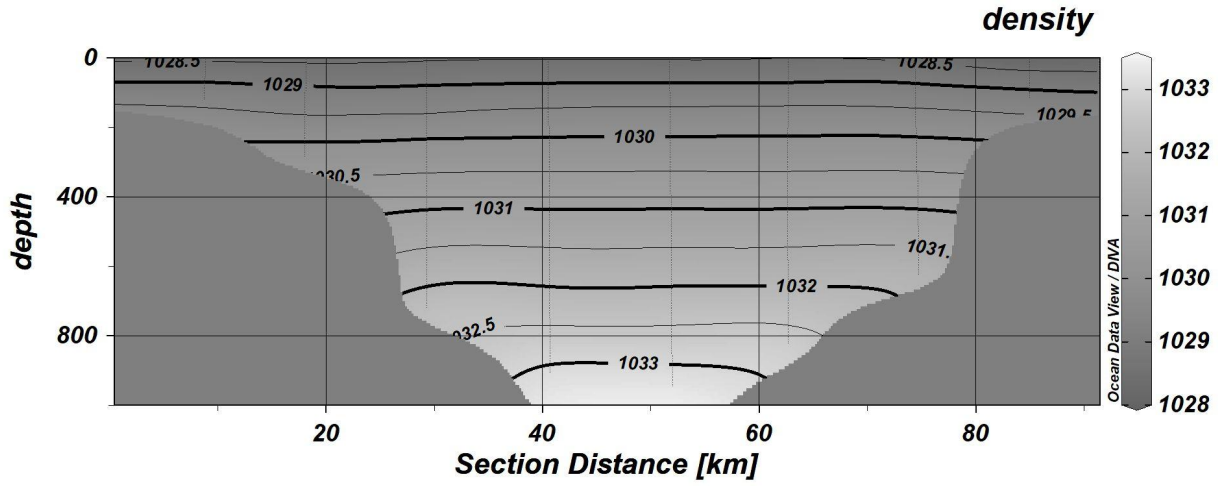


Fig. 3 d. Density (kg m^{-3}) of the ICN cross-section.

ADCP

The following figures show the preliminary results (north velocities) obtained during the cruise.

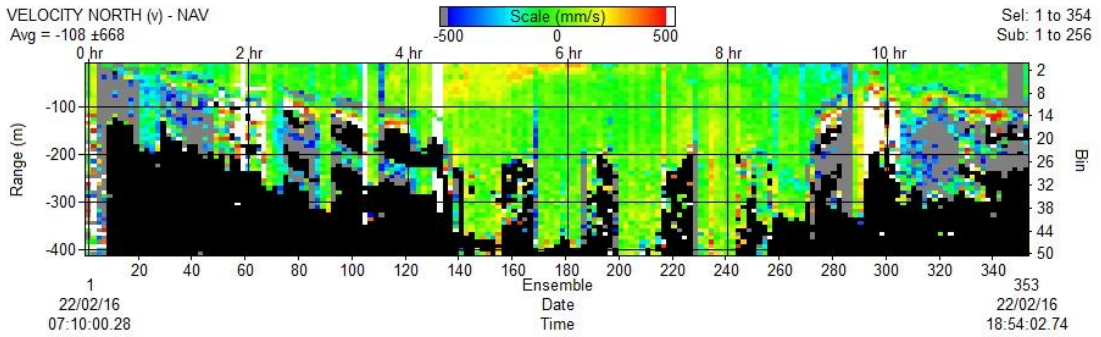


Fig. 4a. Initial figure for NRT VM-ADCP data. Shown are the north velocities for the MC section on the first day (16.02.2022).

The lack of depth penetration when steaming is clearly apparent and easily explained by the relatively poor sea state during the first day of the cruise. Some light Northward flow around 15-25 cm/s is seen on the Mallorca side of the channel.

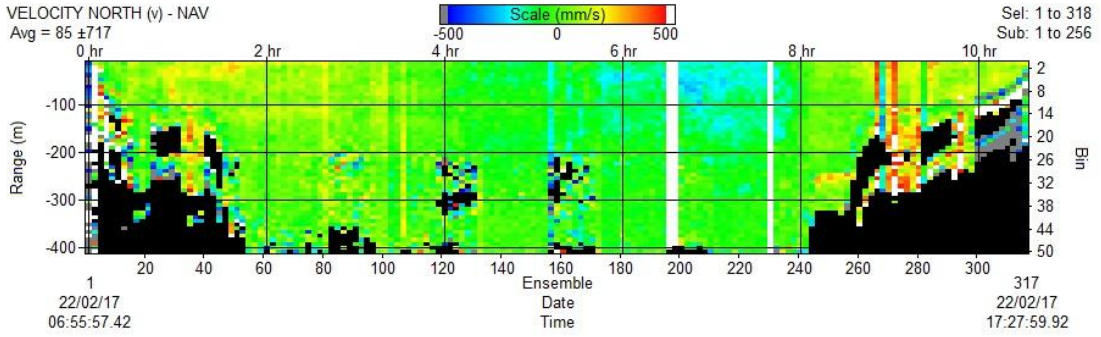


Fig. 4b. Initial figure for NRT VM-ADCP data. Shown are the north velocities for sections IC on the second day (17.02.2022).

In the Ibiza Channel we see the traditional northward flow, 10-25 cm/s, on the Ibiza side of the channel and southward 'Northern Current' flow, 20-30 cm/s on the mainland side of the channel. However, we also see a northward flowing 'counter current' on the shelf slope and

shelf, approaching Denia.

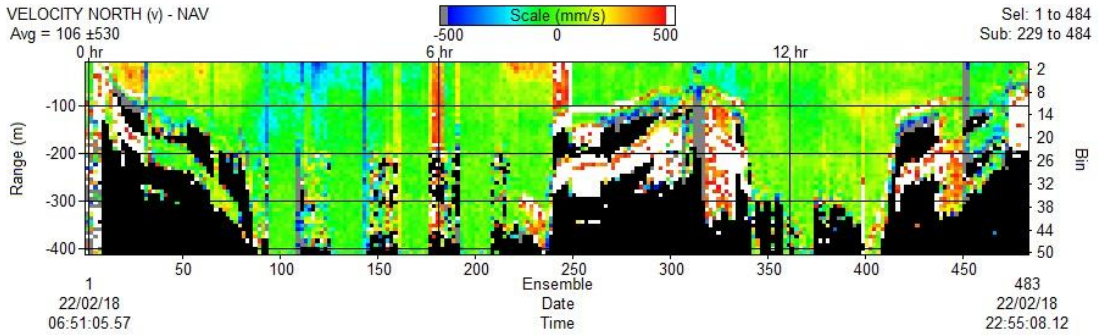


Fig. 4c. Initial figure for NRT VM-ADCP data. Shown are the north velocities for sections IC on the third day and continuing the section of the MC until Palma bay (18.02.2022).

On the return leg across both channels a number of significant periods of 3D-GPS data drop out can be clearly seen, particularly around ensemble 180 and also around ensemble 245; this requires further investigation.

Palma buoy

The following figures show the temperature, salinity, turbidity, oxygen and fluorescence values obtained for the fixed station located at Palma Bay.

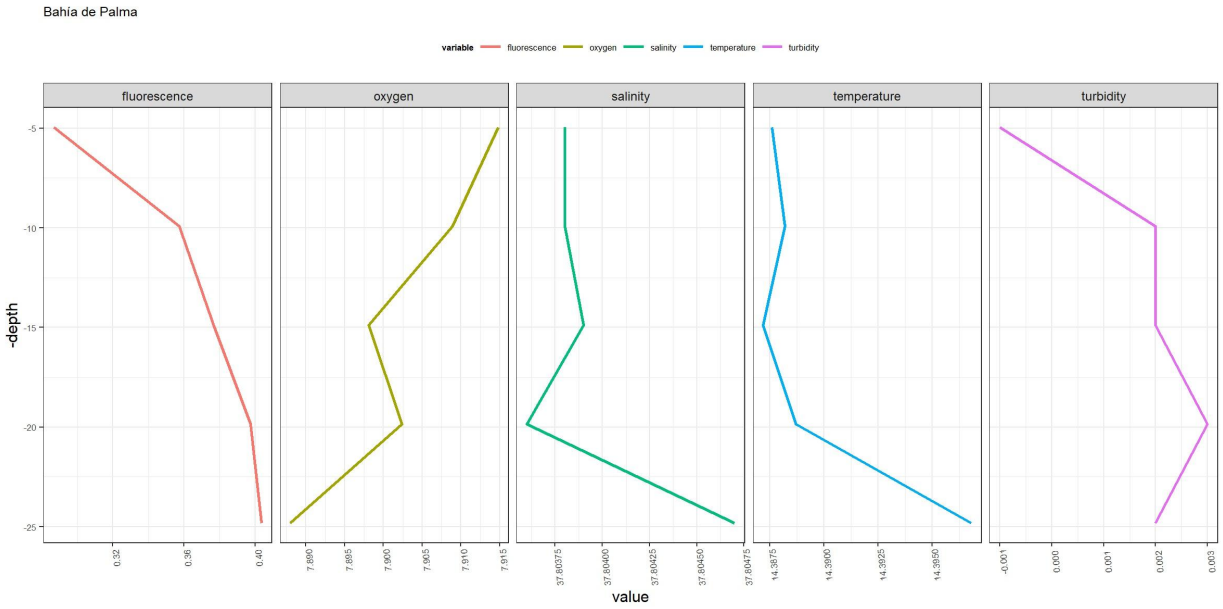


Fig. 5. Initial figure for several parameters in the fixed station of Bahía de Palma.

8. Preliminary biogeochemical results

Below we present some preliminary results obtained with the CTD sensors for dissolved oxygen and *in vivo* fluorescence (with the ODV). The final biogeochemical dataset will be produced in due course following the post-cruise analysis of the data.

8.1. Mallorca Channel

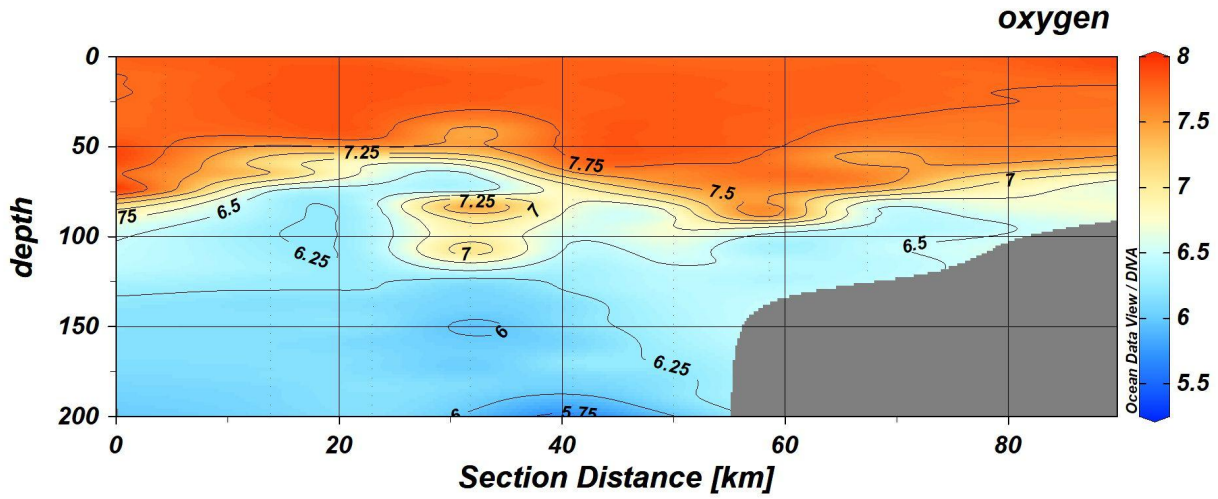


Fig. 6 a. Initial figure for dissolved oxygen concentration (mg/l) distribution obtained on the Mallorca Channel cross-section.

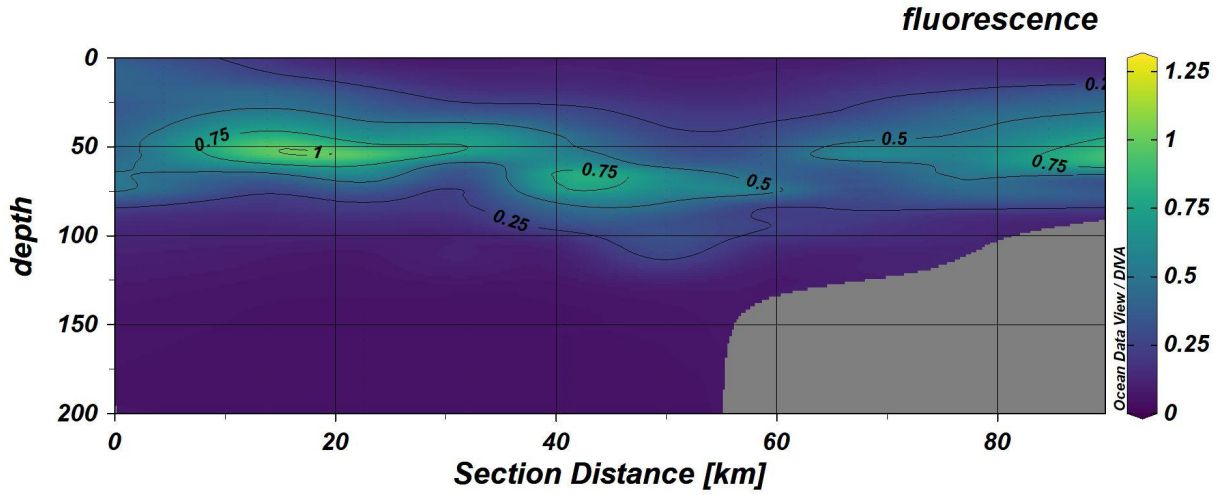


Fig. 6 b. Initial figure for chl *a* fluorescence distribution obtained on the Mallorca Channel (upper section 200 m)

8.2. Ibiza Channel

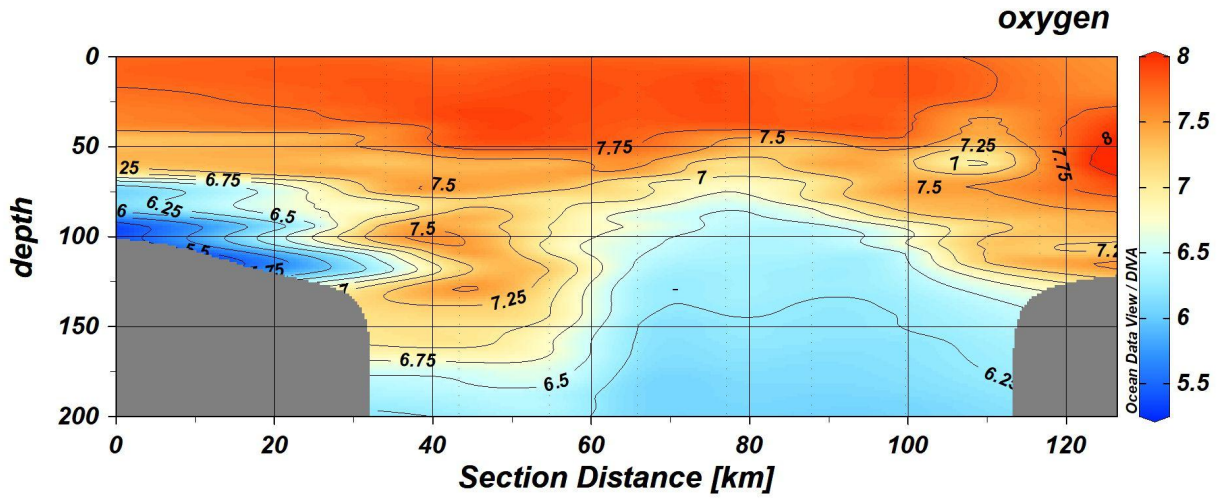


Fig. 7 a. Initial figure for dissolved oxygen concentration (mg/l) distribution obtained on the Ibiza Channel cross-section.

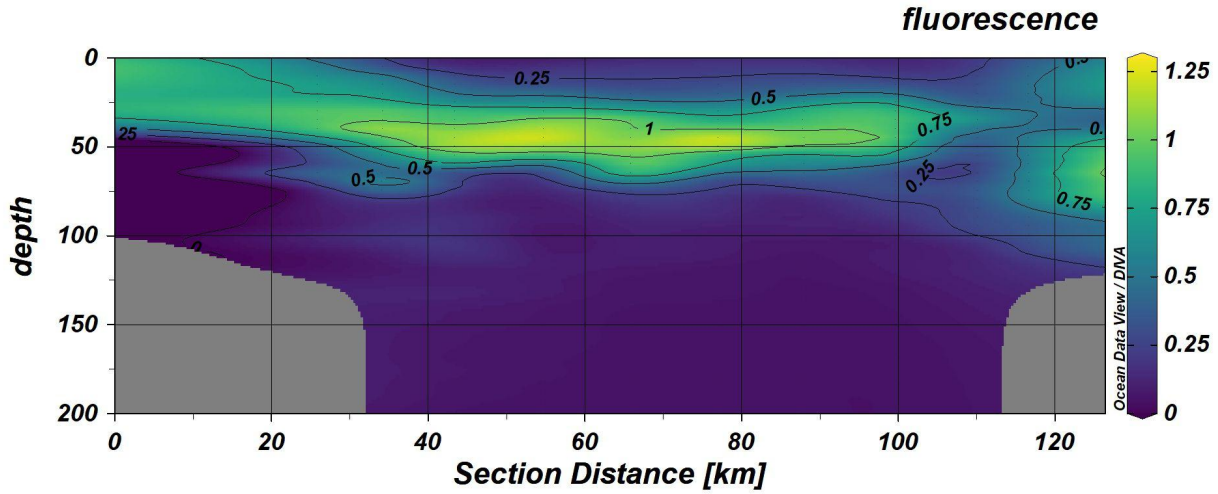


Fig. 7 b. Initial figure for chl *a* fluorescence distribution obtained on the Ibiza Channel (upper section 200 m)

9. Preliminary results from Microplastic sampling

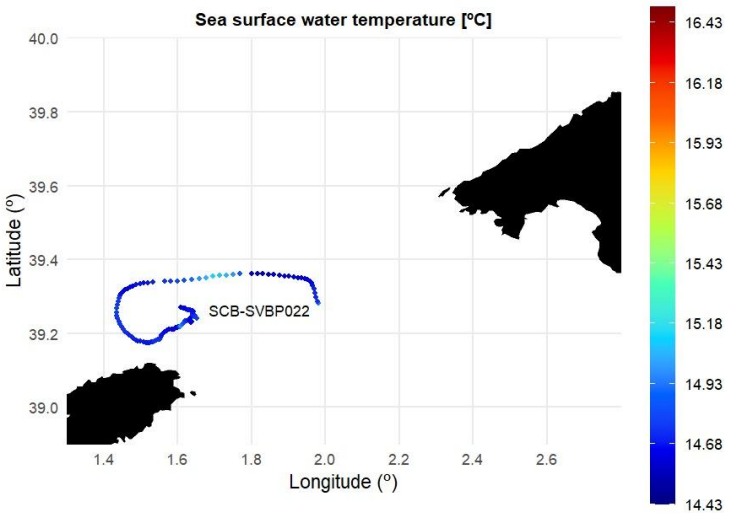
During the Canales Winter 2022 had been sampled at 12 stations. The sampling points are positioned at an equidistant distance of 7 nautical miles, in the case of the IC, and 6.2 nm in the MC. For this sampling has been used a Manta trawl with a 200 micras pore size net, trawling it during 15 minutes at around 2-3 knots speed. The collected samples by the net have been pre-processed using a 150 micras sieve, transferred to a glass container and preserved adding 50% of ethanol.

The samples will be processed in the lab following the methodology (two chemical digestion processes) for removing organic matter. After this process, the sample is filtered through a GF/C filter.

The filter will be analyzed using a binocular loupe to identify and classify the different pieces of plastic by size, kind of plastic, color, etc..

10. Preliminary results from the Lagrangian platforms

During the Canales Winter 2022, 3 SVP-B (surface drifters SVP with a barometer sensor) were launched (1 on 16/02/2022 in the Mallorca Channel and 2 on 17/02/2022 in the Ibiza Channel) as part of the Global Drifter Program (NOAA, USA). Sea surface temperature and air pressure are shown in Figures 7a and 7b, respectively.



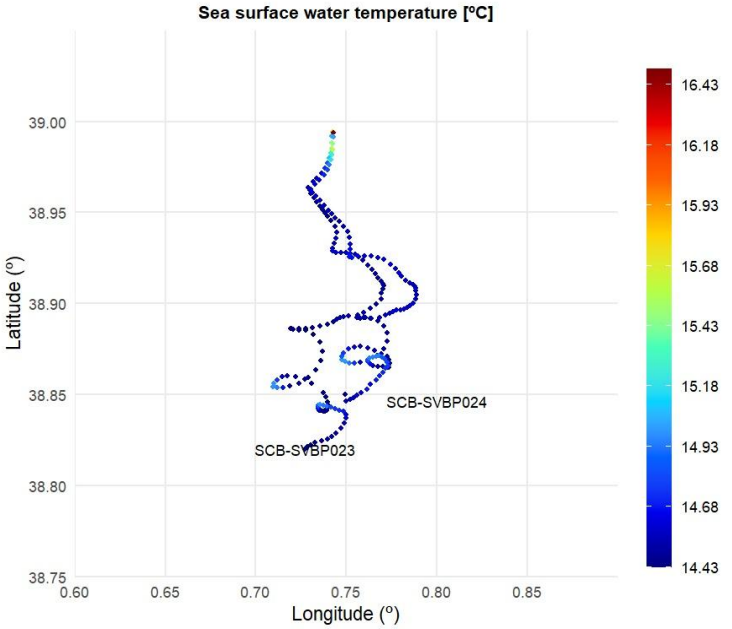
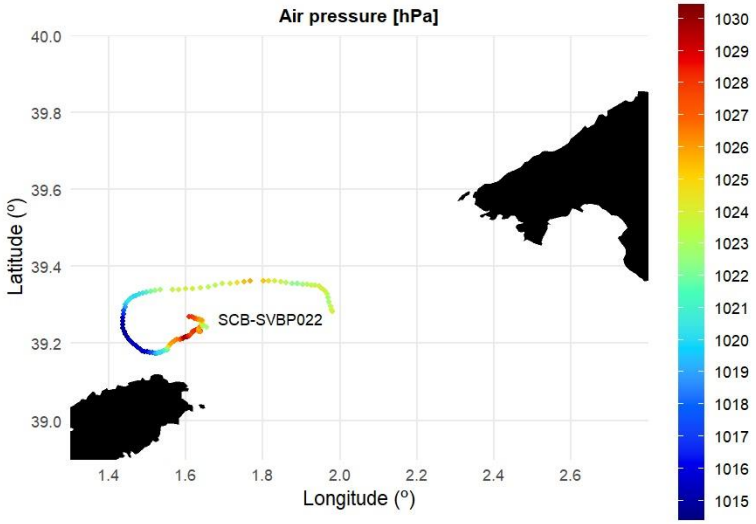


Fig. 8 a. Sea surface water temperature measured by the SVP-B's in the Mallorca (up) and Ibiza (down) Channel. Period represented, for MC, from 16/02/2022 and for IC from 17/02/2022 until 22/02/2022.



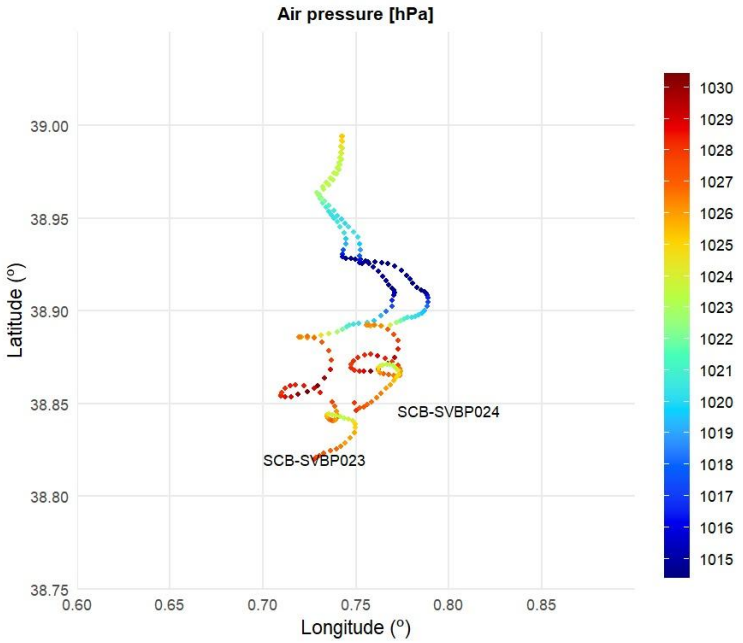


Fig. 8 b. Air pressure is measured by SVP-B's in the Mallorca (up) and Ibiza (down) Channel. Period represented, for MC, from 16/02/2022 and for IC from 17/02/2022 until 22/02/2022.

11. Preliminary results Glider Intercalibration

During the SOCIB Canales Winter 22 cruise, an intercomparison of the ship-based CTD with the glider CTD was intended in the Ibiza Channel on the second day. (Figure 8). The best interampling spots produced are the S2_06 and S2_07.

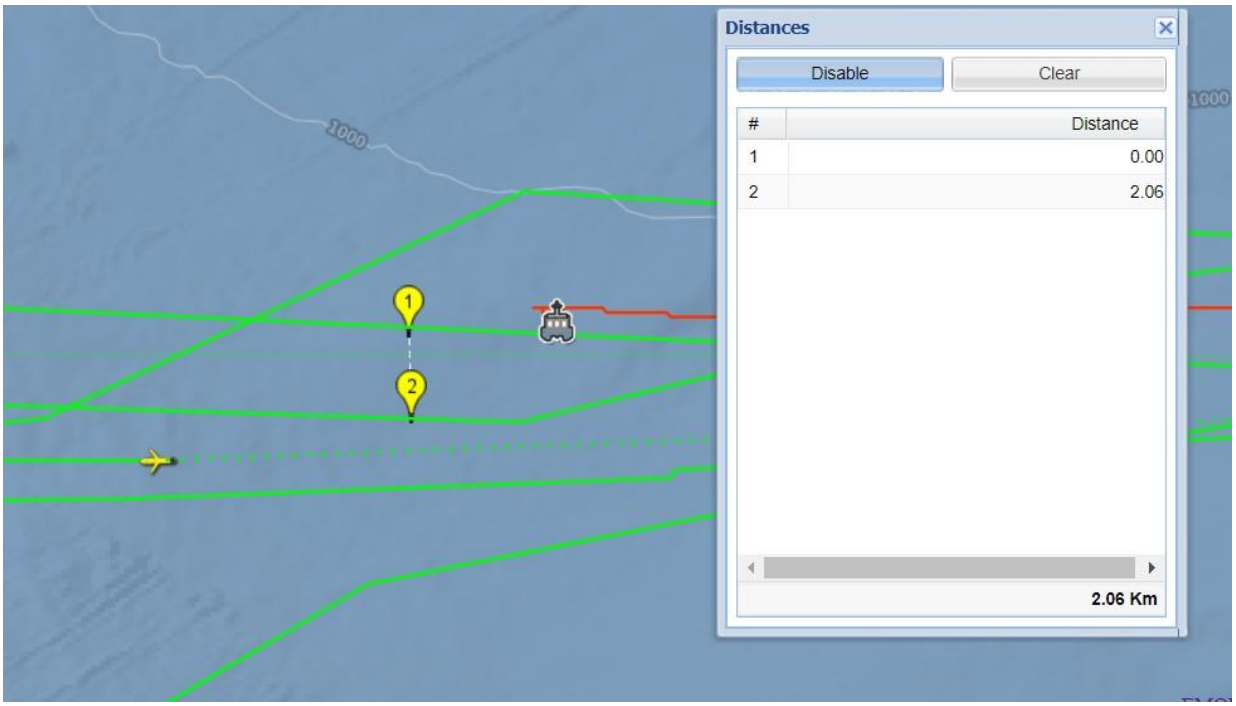


Fig. 9. Bathymetric map of the study area.

12. Data Management and Dissemination

Data management is carried out by the Data Center Facility together with the teams involved in the cruise. More specifically this activity includes metadata management and processing configurations for real time data, delayed time data processing and data archiving and preservation, open access to data and distribution to the main European data systems. The latter currently includes distribution of cruise metadata to SeaDataNet, CTD data to In-Situ TAC (Copernicus Marine Service) and the Argo Reference Database, and bottle samples data to EMODnet Chemistry. Further details are available in the Research Vessel Facility Data Management Plan.

13. Processed Data Repository

Data Source	Thredds URL
Position	http://thredds.socib.es/thredds/catalog/research_vessel/gps/socib_rv-scb_pos001/L1/2022/02/catalog.html?dataset=research_vessel/gps/socib_rv-scb_pos001/L1/2022/02/dep0076_socib-rv_scb-pos001_L1_2022-02-16.nc
Weather Station	http://thredds.socib.es/thredds/catalog/research_vessel/weather_station/socib_rv-scb_met009/L1/2022/02/catalog.html?dataset=research_vessel/weather_station/socib_rv-scb_met009/L1/2022/02/dep0074_socib-rv_scb-met009_L1_2022-02-16.nc
Thermosal	http://thredds.socib.es/thredds/catalog/research_vessel/thermosalinometer/socib_rv-scb_tsl001/L1/2022/02/catalog.html?dataset=research_vessel/thermosalinometer/socib_rv-scb_tsl001/L1/2022/02/dep0066_socib-rv_scb-tsl001_L1_2022-02-16.nc
CTD	https://thredds.socib.es/thredds/catalog/research_vessel/ctd/socib_rv-scb_sbe9001/L1/2022/catalog.html?dataset=research_vessel/ctd/socib_rv-scb_sbe9001/L1/2022/dep0022_socib-rv_scb-sbe9001_L1_2022-02-16_data_dt.nc
ADCP	http://thredds.socib.es/thredds/catalog/research_vessel/current_profiler/socib_rv-scb_rdi001/L1/2022/catalog.html?dataset=research_vessel/current_profiler/socib_rv-scb_rdi001/L1/2022/dep0037_socib-rv_scb-rdi001_L1_2022-02_data_dt.nc
SCB-SVPB022	http://thredds.socib.es/thredds/dodsC/drifter/surface_drifter/drifter_svpb022-scb_svpb022/L1/2022/dep0001_drifter-svpb022_scb-svpb022_L1_2022-02-16.nc
SCB-SVPB023	http://thredds.socib.es/thredds/dodsC/drifter/surface_drifter/drifter_svpb023-scb_svpb023/L1/2022/dep0001_drifter-svpb023_scb-svpb023_L1_2022-02-17.nc
SCB-SVPB024	http://thredds.socib.es/thredds/dodsC/drifter/surface_drifter/drifter_svpb024-scb_svpb024/L1/2022/dep0001_drifter-svpb024_scb-svpb024_L1_2022-02-17.nc

Instrumentation description and configuration

CTD-Probe

Manufacturer:	SeaBird
Model:	SBE9+
S/N:	1023
SOCIB Inventory:	SCB-SBE9001
Deck Unit:	SBE11
SOCIB Inventory:	SCB-SBE11001

Sensor	Model	S/N	Calibration date
Temperature	SBE 3P	03P5391	16/12/2020
Temperature 2	SBE 3P	03P5425	16/12/2020
Conductivity	SBE4C	043718	15/12/2020
Conductivity 2	SBE4C	043907	15/12/2020
Pressure		1023	16/12/2020
Oxygen	SBE 43	2119	23-01-2021
Transmissometer	WET Labs C-Star 25-650	CST-1419DR	27/01/2021
Turbidity	STM Sea Point	12182	2021-02-09
Fluorometer	Seapoint 6000m	3259	2021-02-09
Irradiance	PAR Biospherical	70364	2021-02-24

	QCP-2300L-HP		
Surface Irradiance	SPAR Superficie Biospherical QSR2200	20395	24/02/2021
Altimeter	Datasonics PSA-916D	69894	12/2020

Configuration

For controlling the CTD the following file was used: 2022-02-08_1023.xmlcom. The information contained in that file is located in CTD Configuration File.

13.1. Acoustic doppler profiler

Manufacturer:	RDI
Model:	Ocean Surveyor 150 kHz
S/N:	1878
SOCIB Inventory:	SCB-RDi001

Configuration

The VM-ADCP initialisation files were copied from the previous Canales cruise, for both bottom track and water track modes. These had a misalignment angle set, φ of 44.1 degrees and an amplitude correction factor, A, of 1.0045.

A VM-ADCP calibration check was made in bottom track mode on the first day's transect from Palma to San Antonio. These gave a further:

mis-alignment angle, φ = -0.0503 ± 0.4182 and

amplitude factor A = 1.0020 ± 0.0088.

As these suggested there was no statistically significant reason to change either the misalignment angle or the amplitude correction factor, the initialisation files were left as they were.

13.2. Weather Station

Manufacturer:	Geonica
Model:	Meteodata 2000
S/N:	
SOCIB Inventory:	SCB-MET009
Calibration date:	2021

Sensor	Model	SOCIB Inventory	S/N
Pressure	YOUNG - 61302V	APRE-SCB-YOUNG002	BPA14406
Temperature & Humidity	Geonica - STH5031	ATEMP & RHUM-SCB-GEONICA002	0878
WIND	YOUNG- model 0516	WIND-SCB-YOUNG002	177091
GPS		GPS-SCB-RVPOS001	

Configuration

The data were collected using the NEREIDAS System. The data were stored directly in the vessel server and processed through the SOCIB-DC system.

13.3. SVP-B Surface Drifters

Manufacturer:	Data Buoy Instrumentation, LLC (DBi)
Model:	SVP-B
IMEI / WMO:	300534061700370/6102799 300534061700380/6102800 300534061700390/6102801
SOCIB Inventory:	SCB-SVPB022 SCB-SVPB023 SCB-SVPB024
Calibration date:	Testing SCB-SVPB022 Testing SCB-SVPB023 Testing SCB-SVPB024

14. References

Joyce T.M. (1989). On in situ “calibration” of shipboard ADCPs. Journal of Atmospheric and Oceanic Technology 6:169–172.

Langdon C. (2010). Determination of dissolved oxygen in seawater by Winkler titration using the amperometric technique. In: Sloyan B.M., Sabine C. (Eds). GO–SHIP repeat hydrography manual: A Collection of Expert Reports and guidelines. IOC/IOCCP. Paris.

Utermöhl H. (1958). Zur Vervollkomnung der quantitativen Phytoplankton-Methodik. Mitteilungen der internationale Vereinigung für theorische und angewandte Limnologie 9:1–38.

APPENDIX 1: CTD configuration files in Canales Winter 2022

2022-02-08 1023.XMLCON

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<SBE_InstrumentConfiguration SB_ConfigCTD_FileVersion="7.26.4.0" >
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    <VoltageWordsSuppressed>0</VoltageWordsSuppressed>
    <ComputerInterface>0</ComputerInterface>
    <!-- 0 == SBE11plus Firmware Version >= 5.0 -->
    <!-- 1 == SBE11plus Firmware Version < 5.0 -->
    <!-- 2 == SBE 17plus SEARAM -->
    <!-- 3 == None -->
    <DeckUnitVersion>0</DeckUnitVersion>
    <ScansToAverage>24</ScansToAverage>
    <SurfaceParVoltageAdded>1</SurfaceParVoltageAdded>
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    <NmeaPositionDataAdded>1</NmeaPositionDataAdded>
    <NmeaDepthDataAdded>0</NmeaDepthDataAdded>
    <NmeaTimeAdded>0</NmeaTimeAdded>
    <NmeaDeviceConnectedToPC>0</NmeaDeviceConnectedToPC>
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          <C>0.00000000e+000</C>
          <D>0.00000000e+000</D>
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          <G>4.33136324e-003</G>
          <H>6.26353083e-004</H>
          <I>1.93507156e-005</I>
          <J>1.39822766e-006</J>
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          <Offset>0.0000</Offset>
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range sensors. -->
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            <I>-1.13356304e-003</I>
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        <OxygenSensor SensorID="38" >
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          <CalibrationDate>23-Jan-21</CalibrationDate>
          <Use2007Equation>1</Use2007Equation>
          <CalibrationCoefficients equation="0" >
            <!-- Coefficients for Owens-Millard equation. -->
            <Boc>0.0000</Boc>
            <Soc>0.0000e+000</Soc>
            <offset>0.0000</offset>
            <Pcor>0.00e+000</Pcor>
            <Tcor>0.0000</Tcor>
            <Tau>0.0</Tau>
          </CalibrationCoefficients>
          <CalibrationCoefficients equation="1" >
            <!-- Coefficients for Sea-Bird equation - SBE calibration
in 2007 and later. -->
            <Soc>4.6957e-001</Soc>
            <offset>-0.4818</offset>
            <A>-5.4721e-003</A>
            <B> 2.5687e-004</B>
            <C>-3.7069e-006</C>
            <D0> 2.5826e+000</D0>
            <D1> 1.92634e-004</D1>
            <D2>-4.64803e-002</D2>
            <E> 3.6000e-002</E>
            <Tau20> 1.3100</Tau20>
            <H1>-3.3000e-002</H1>
            <H2> 5.0000e+003</H2>
            <H3> 1.4500e+003</H3>
          </CalibrationCoefficients>
        </OxygenSensor>
      </Sensor>
      <Sensor index="6" SensorID="27" >
        <NotInUse SensorID="27" >
          <SerialNumber></SerialNumber>
          <CalibrationDate></CalibrationDate>
          <OutputType>2</OutputType>
          <Free>1</Free>
        </NotInUse>
      </Sensor>
      <Sensor index="7" SensorID="71" >
        <WET_LabsCStar SensorID="71" >
          <SerialNumber>CST-1419DR</SerialNumber>
          <CalibrationDate>27-Jan-21</CalibrationDate>
          <M>21.3130</M>
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          <B>-0.1070</B>
          <PathLength>0.250</PathLength>
        </WET_LabsCStar>
      </Sensor>
      <Sensor index="8" SensorID="27" >
        <NotInUse SensorID="27" >
          <SerialNumber></SerialNumber>
          <CalibrationDate></CalibrationDate>
          <OutputType>2</OutputType>
          <Free>1</Free>
        </NotInUse>
      </Sensor>
      <Sensor index="9" SensorID="33" >
        <OBS_SeapointTurbiditySensor SensorID="33" >
          <SerialNumber>12182</SerialNumber>
          <CalibrationDate>09-Feb-21</CalibrationDate>
          <!-- The following is an array index, not the actual gain
setting. -->
          <GainSetting>3</GainSetting>
          <ScaleFactor>1.000</ScaleFactor>
        </OBS_SeapointTurbiditySensor>
      </Sensor>
      <Sensor index="10" SensorID="11" >
        <FluoroSeapointSensor SensorID="11" >
          <SerialNumber>3259</SerialNumber>
          <CalibrationDate>09-Feb-21</CalibrationDate>
          <!-- The following is an array index, not the actual gain
setting. -->
          <GainSetting>1</GainSetting>
          <Offset>0.000</Offset>
        </FluoroSeapointSensor>
      </Sensor>
      <Sensor index="11" SensorID="0" >
        <AltimeterSensor SensorID="0" >
          <SerialNumber>69894</SerialNumber>
          <CalibrationDate>2020-10</CalibrationDate>
          <ScaleFactor>15.000</ScaleFactor>
          <Offset>0.000</Offset>
        </AltimeterSensor>
      </Sensor>
      <Sensor index="12" SensorID="42" >
        <PAR_BiosphericalLicorChelseaSensor SensorID="42" >
          <SerialNumber>70364</SerialNumber>
          <CalibrationDate>24-02-2021</CalibrationDate>
          <M>1.00000000</M>
          <B>0.00000000</B>

<CalibrationConstant>18248175182.48170100</CalibrationConstant>
          <ConversionUnits>6</ConversionUnits>
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          <Multiplier>60220000000000.00000000</Multiplier>
          <Offset>-0.05495163</Offset>
        </PAR_BiosphericalLicorChelseaSensor>
      </Sensor>
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        <NotInUse SensorID="27" >
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          <CalibrationDate></CalibrationDate>
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          <Free>0</Free>
        </NotInUse>
      </Sensor>
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        <SPAR_Sensor SensorID="51" >
          <SerialNumber>20395</SerialNumber>
          <CalibrationDate>24/02/2021</CalibrationDate>
          <ConversionUnits>6</ConversionUnits>
          <ConversionFactor>8.9163e+013</ConversionFactor>
          <RatioMultiplier>1.00000000</RatioMultiplier>
        </SPAR_Sensor>
      </Sensor>
    </SensorArray>
  </Instrument>
</SBE_InstrumentConfiguration>
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