SOCIB Balearic Islands Coastal Observing and Forecasting System

CRUISE REPORT

SOCIB Canales Spring 2021:

17th to 20th of May 2021

SOCIB_ENLCanales_20210517

Document type:	Cruise report
Date:	2021/05/21

Description:	A repeated seasonal hydrographic survey of the Balearic Sea, monitoring the Ibiza and Mallorca Channels. 16 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) An intercalibration cast was performed with the Glider in the Ibiza Channel (IC). In the IC, two SVP-B surface drifters were deployed at station S2_05. Sampling wise, a first pilot study for environmental DNA (eDNA) metabarcoding in 3 stations of the Ibiza Channel was performed. 16 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: **20213097**
Authors:	J. Allen, E. Alou, A. Carbonero, L. Díaz, N. Wirth
Supervision:	
Keywords:	Mediterranean; Ocean Circulation; Balearic Sea; Ibiza Channel; Mallorca Channel; Northern Current;

DOCUMENT VERIFICATION LIST

Date:	Checked by (name)	SOCIB division	Ref.
2021-06-XX	J.Tintore	-	-

DOCUMENT DISTRIBUTION LIST

Date:	Distribution to:
2021-05-27	internal (involved scientists and cruise participants)

CHANGE RECORD

#	Date	Description	Author	Checked by
	21/05/2021	v1.0 of document	A.Cabornero / N.Wirth	
	07/06/2021	v1.1 of document	E. Alou/A. Cabornero/N. Wirth	

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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 points 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 Scientists: J.Allen, E.Alou-Font

[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 500 m) for intercalibration.

Principal Scientist: N.Zarokanellos

[OB-4] Continue the microplastic monitoring across the Mallorca Channel (MC) and 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: E.Alou-Font

[OB-5] Deployment of 2 surface drifters (SVPB) 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

[OB-6] Operational test of the EARS system. This cruise has been one of the pilot cruises using the new Eurofleets data integrated system (EARS - both automatic data system and desktop application). This system will be needed to be implemented and used in the Eurofleets + programs such as the GRASSMAP cruise (planned for September 2021).

Principal Scientist: X.Notario

[OB-7] Perform a first pilot study for eDNA metabarcoding, sampling eDNA in 4 stations in the Ibiza Channel (in coordination with Valencia University).

Principal Scientist: D.March

[OB-8] Collect all relevant data at the two last known waypoints before losing the comunicacion with the glider units sdeep5 (lost in May 2018) and sdeep7 (lost in April 2021) in the Ibiza Channel. The aim of over-sailing these waypoints close to the northern line of the IC with the instrumentation installed on board of the R/V SOCIB is to investigate any anomalies (bottom profile, currents, etc).

Principal Scientist: A.Miralles

[OB-9] Deployment of the glider sdeep06 - U827 for the SOCIB Glider Canales Endurance line. This glider unit is planned to be deployed from the R/V SOCIB on the first day of the cruise (near Sant Antoni).

Principal Scientist: *A.Miralles*

3. Onboard personnel

ID	Name	Role	Affiliation
1	Nikolaus Wirth	Chief Scientist / CTD lead / VM-ADCP / Outreach / Drifter deployment (remote support, J. Allen, E. Alou, L. Díaz, E. Lizarán)	SOCIB
2	Pau Balaguer	ETD / CTD / Plastics sampling / ship operations	SOCIB
3	Josep Baeza	ETD / CTD / Salinity Sampling / Plastics sampling	SOCIB
4	Andrea Cabornero	Lead Biogeochemical sampling and analyses / eDNA sampling / EARS	SOCIB
5	Juan de la Cruz	Biochem sampling/eDNA sampling / Plastic sampling	SOCIB
6	Matteo Marasco	Data steward / sampling support	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 OB-7. 16 stations out of the 20 CTD stations planned were carried out during this cruise. The complete transect of the MC (10 stations) was completed on May the 17th and 6 stations of the transect of the IC on May the 18th (Figure 1 a.). During the down cast (at 300 m) at station S2_07 the comunicacion with the rosette was lost and the problem could not be fixed at that time while on board. Once at the harbour that day we verified that the problem was caused by a broken cable that affected the deck-unit of the CTD, making the continuation of the survey as planned not possible resulting in stations S2_08, S2_85 and T1_END not sampled during this cruise.

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).

OB-6. On the first day (May the 17th) the EARS software was configured and the system was on for the cruise duration.

OB-9 and OB-3. At the end of the first working day (May the 17th), the glider unit SDEEP06 - U827 was deployed from the vessel before entering the port of Sant Antoni for the SOCIB Glider Canales Endurance line, mission GFMR0117.

OB-3. During day 2, May the 18th, starting the IC line from Ibiza close to station S2-02 a simultaneous CTD cast with unit GFMR0117 was performed for intercalibration. The best intersampling spot was produced on N39.0302 E0.8777 at 2021-05-19T15:09:15+00:00 (glider perspective). **OB-5.** The deployment of the SVPB surface drifters was performed at station S2_05 (SCB-SVPB014,SCB-SVPB015) during this day and **OB-8** We collected all relevant data at the two last known waypoints before losing the communication with glider units deep5 (lost in May 2018) and sdeep7 (lost in April 2021).

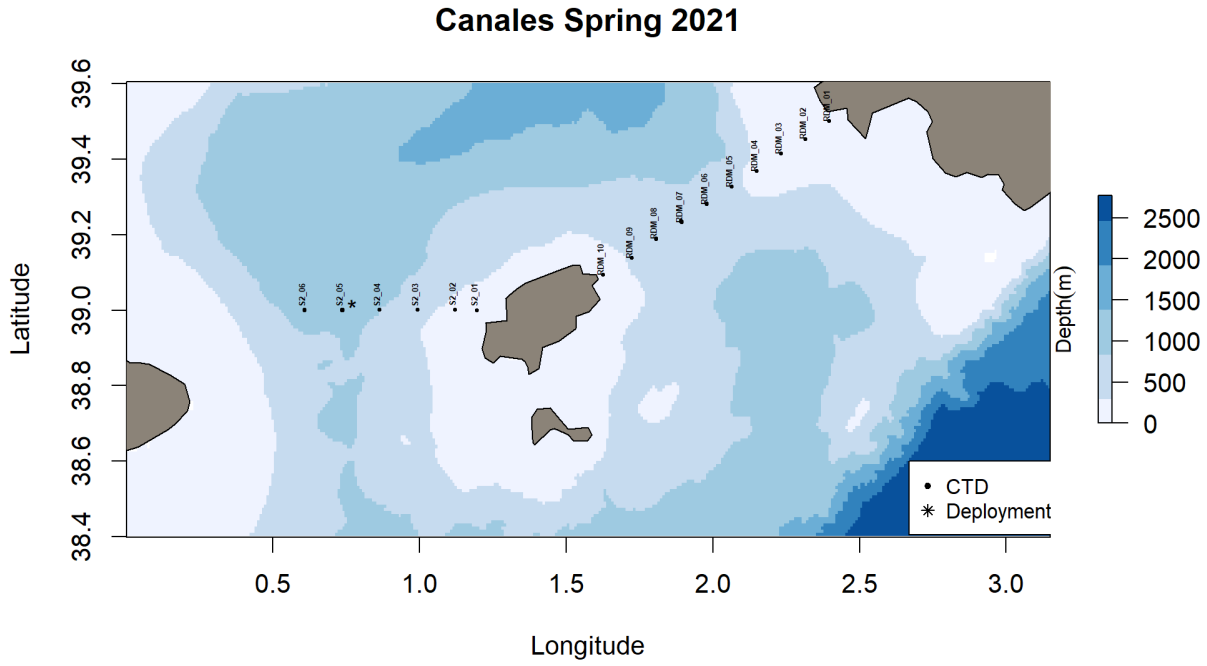


Fig. 1a. CTD cast station plan

OB-4. During the third (May 19 th) and fourth day (May 20th), crossing the IC and MC, 16 microplastic sampling periods were carried out according to the waypoints shown in figure 1b.

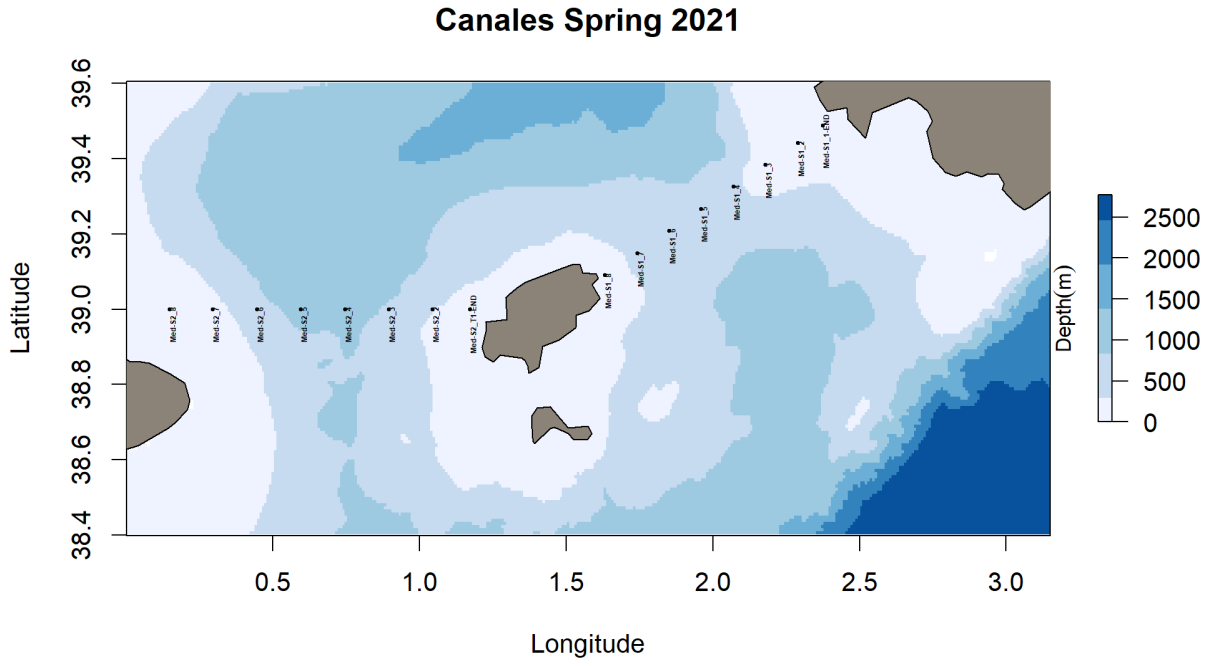
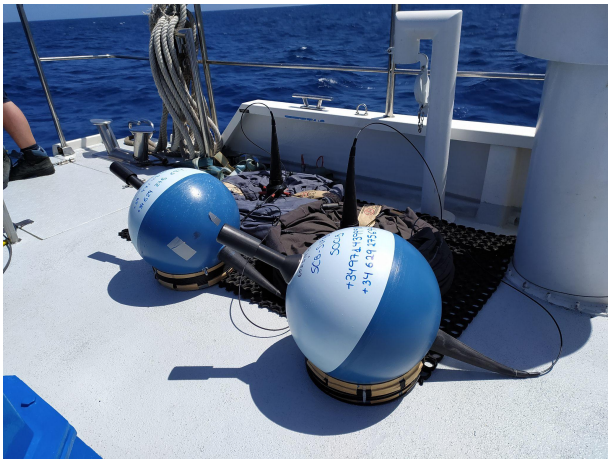
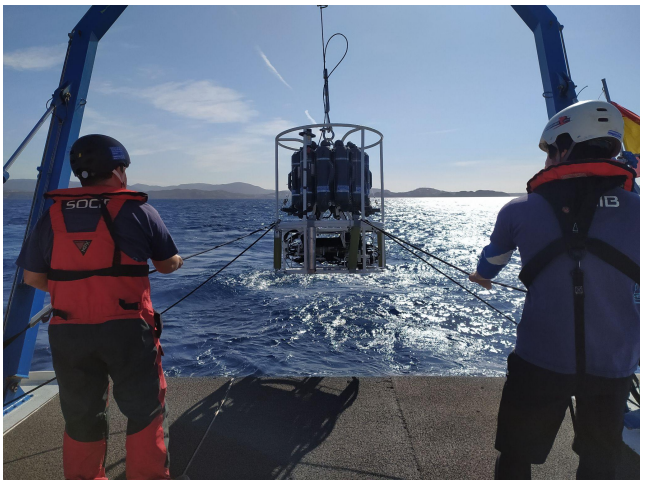


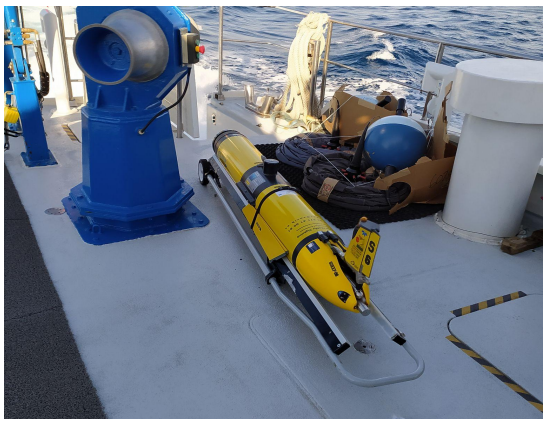
Fig. 1b. Microplastic station plan

5. Cruise diary

5.1. Day 1 - 17th of May 2021 (Palma to Sant Antoni)

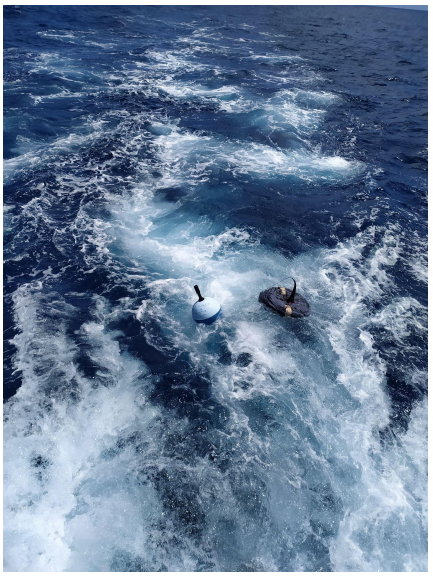
UTC	OBSERVATIONS
05:40	The scientific personnel and ship crew all on board of the RV SOCIB
05:45	Meeting with Captain (Weather forecast, Work Plan for today, timing, etc)
06:05	Leaving port of Palma
06:15	ADCP, Termosal, Ecosounder turned on. EARS software started and configured for the cruise
06:45	Safety talk on upper deck
	weather conditions: 0.5 -0.7 m from NW, sailing with 12.7 knots.
07:10	Drifters prepared on deck and turned on (SCB-SVPB014 and SCB-SVPB015)
	
07:48	Station RADMED_01 CTD in the water
08:01	CTD on board Bottle 3 not operative, Bottle 4 hasn't closed completely. Sampling Confirmed that the new cable of the Fluorometro is working fine.
08:35	Station RADMED_02 CTD in the water

08:43	CTD on board Sampling sailing with 11.8 knots to next station
09:14	Station RADMED_03 CTD in the water
09:22	CTD on board Sampling
09:53	Station RADMED_04 CTD in the water
10:00	CTD on board Sampling
10:30	Station RADMED_05 CTD in the water
10:53	CTD on board Sampling Sailing to next station with 12,3 knots weather and sea conditions: good
	
11:25	Station RADMED_06 CTD in the water
11:51	CTD on board Sampling
12:27	Station RADMED_07 CTD in the water
12:54	CTD on board Sampling

13:26	Station RADMED_08 CTD in the water
13:55	CTD on board Sampling
14:29	Station RADMED_09 CTD in the water
14:39	Glider prepared on deck and turned on
14:48	CTD on board Sampling
15:26	Station RADMED_10 Fishnet exactly on station, sailing 500 m WNW CTD in the water
15:31	CTD on board Sampling **All stations of the MC completed!**
	Sailing to waypoint for Glider Deployment
16:45	Preparation of Glider Deployment
	
17:11	Glider in the water at N 39º02.000', E 1º14.000'
17:30	Sailing to port
	moored at dock
	Coordination with LPF, GF and outreach regarding the tasks for the next day.

5.2. Day 2 - 18th of May 2021 (Sant Antoni to Denia)

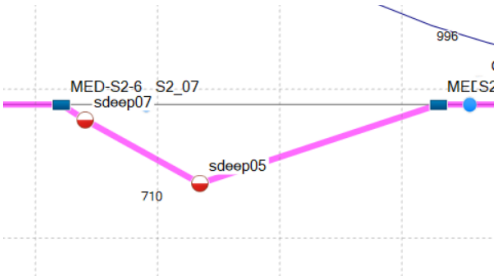
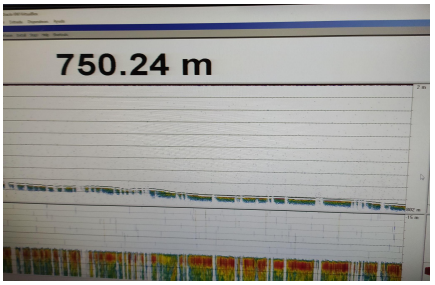
UTC	OBSERVATIONS
06:05	Leaving port of Sant Antoni. ADCP on, Termosal and Ecosounder On.
	Meeting with Captain and science crew, (Weather forecast, Work Plan for today, timing, etc) sailing 12.4 knots to the first station. Confirmation that the 2 SVPB had transmitted their position and are ready for the deployment. Coordination with GF regarding simultaneous cast with the glider
06:37	Station S2_01 CTD in the water at 5m
	CTD on board eDNA sampling
	
06:50	CTD in the water
07:58	CTD on board Sampling
	weather conditions: 0.7 - 0.9 m from NW, sailing with 11.4 knots.
07:21	Station S2_02 CTD in the water
07:30	CTD on board Sampling sailing 10.8 knots to next station
08:02	Station S2_03 CTD in the water
08:26	CTD on board Sampling

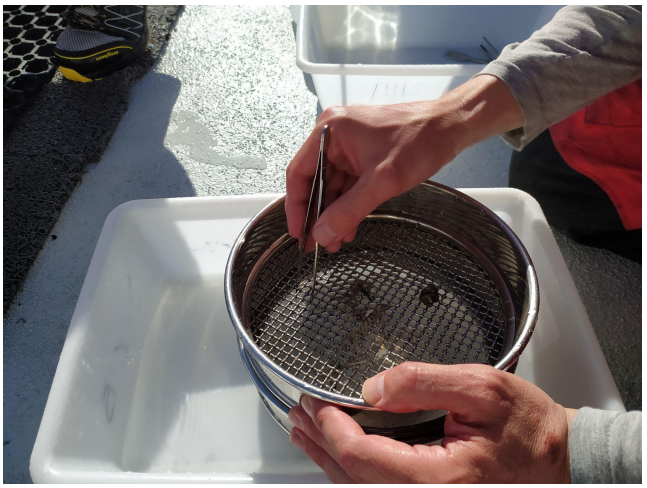
09:33	Station S2_04 CTD in the water at 5m
09:39	CTD on board eDNA sampling
09:50	CTD in the water
09:50	CTD on board Sampling
	weather conditions: 0.7 - 1.0 m from WNW, sailing with 10.2 knots.
10:25	Station S2_05 CTD in the water
11:09	CTD on board Sampling
11:16	Deployment of SCB-SVPB014 (38º59,99N 0º43,79E)
11:17	Deployment of SCB-SVPB015 (38º59,99N 0º43,61E)
	 
	weather conditions: 0.7 - 0.9 m from waves, 12knots wind speed
11:48	Station S2_06 CTD in the water
12:32	CTD on board Sampling
13:12	Station S2_07 CTD in the water at 5 m

13:16	CTD on board eADN sampling
13:30	CTD in the water
	Lost connection to CTD at 300 m during the downcast and Error in DeckUnit. Reset of system - still no connection and error in DeckUnit. Recovering CTD. Problem analysis of DeckUnit and checking of Rosette.
15:15	Problem could not be fixed. sailing to port of Denia
	Coordination with LPF (Fotos, sheets of deployment) Coordination with GF (intercalibration cast)
17:30	moored at port in Denia
	Problem analysis of CTD cable and DeckUnit preparation of microplastic sampling for the next day
	Transfer of eDNA samples to Natalia (UV)
	Data processing of CTD data. Analysis of oxygen samples

5.3. Day 3 - 19th of May 2021 (Denia to Sant Antoni)

UTC	OBSERVATIONS
05:10	Leaving port of Denia. ADCP on. Preparation of Microplastic sampling
	Weather Conditions:wind speed: 10-12 knots, waves 0.6m - 0.9m
	preparing MantaTrawl for deployment, preparation of lab for sampling.
	
07:45	Observation of Jellyfish (Pelagia Noctiluca) approx. 10 at N39º00,0' and E0º59,02'
07:59	Station MED-S2_08 MantaTrawl in the water
08:15	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 10.4 knots
08:49	Station MED-S2_07 MantaTrawl in the water
09:05	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 9.8 knots
09:35	Station MED-S2_06 MantaTrawl in the water
09:50	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol,sailing to next station with 11.0 knots
	Weather Conditions: (getting better) :wind speed: 6-9 knots, waves 0.5m - 0.7m

10:00	Sailing over last known positions of sdeep07 and sdeep05, reducing speed to 5 knots.
	 
10:25	Station MED-S2_05 MantaTrawl in the water
	Observation of a whale (grey whale) at N39º15,70' and E1º57,07
10:41	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol,sailing to next station with 11.3 knots
11:12	Station MED-S2_04 MantaTrawl in the water
	
11:27	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 11.5 knots
	Observation of dolphins (4 x adults) at N39º23,29' and E2º11,43'
11:58	Station MED-S2_03 MantaTrawl in the water
12:15	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 12.0 knots
12:45	Station MED-S2_02 MantaTrawl in the water

13:01	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 11.9 knots Weather conditions: (good) wind speed 6-8 knots, waves 0.4m - 0.6m
13:24	Station MED-S2_01 MantaTrawl in the water
13:40	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol. **All stations done!**
	
	Sailing to port with 11.0 knots
15:00	Moored at Sant Antoni harbour.
	Preservation of microplastic samples with ethanol. Configuration of automatically backup of PC-Labs and data transfer to SOCIB Implementation of new folder structure Data exploration and visualisation coordination with RRI

5.4. Day 4 - 5th of February 2021 (Sant Antoni to Palma)

UTC	OBSERVATIONS
05:55	Leaving port of Sant Antoni. ADCP on (problems with remote control via NoMachine) Preparation of Microplastic sampling
	Weather Conditions:wind speed: 5-7 knots, waves 0.5 m
07:41	Station MED-S1_08 MantaTrawl in the water
07:58	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 11,8 knots
08:43	Station MED-S1_07 MantaTrawl in the water
08:58	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 12.0 knots
09:40	Station MED-S1_06 MantaTrawl in the water
09:55	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 12.0 knots
11:20	Station MED-S1_05 MantaTrawl in the water
11:36	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 12.0 knots
	Weather Conditions:wind speed: 9 - 11 knots, direction:108, waves less than 0.5 m
12:34	Station MED-S1_04 MantaTrawl in the water
12:50	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 11.7 knots
13:41	Station MED-S1_03 MantaTrawl in the water
13:57	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 12.0 knots

14:49	Station MED-S1_02 MantaTrawl in the water
15:05	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol, sailing to next station with 11.5 knots
15:42	Station MED-S1_01 MantaTrawl in the water
15:58	Manta Trawl on board, sampling, preservation of microplastic samples with ethanol **All stations done!**
	sailing to port with 11 knots
	Cleaning up the lab, and material on deck. Data backup
17:00	Moored at Palma harbour.

Cruise Canales Spring 2021 finished.

General observations:

- Previous problems with the sensors of the rosette, especially anomalies of the fluorometer sensor (Seapoint sn3820) have been resolved.
- **The cable of the CTD needs repair.**
- **The DeckUnit of the SBE-9plus has to be reviewed by the technical service.**
- Difference of the two salinity sensors: 0.002-0.003.
- Difference of the two temperature sensors: 0.000-0.001.
- **Bottle 3 of the rosette doesn't close, needs repair.**
- 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
- **Observed differences between the two oxygen sensors changing during the cruise**. It would be important to check the differences and the sensor annual drift.
- **MantaTrawl: missing protection of the wings.** During the maneuver the MantaTrawl could hit the hull of the vessel and damage the gelcoat. Protection is needed or improvement of the maneuver on board. Furthermore it would be beneficial to have a transport box and protection of the net.

EARS3 pilot test

In the context of the commitments within the Eurofleets + project, the EARS shipboard system was checked with a pilot test. Previously to the cruise the EARS3 software was installed and tested for the first time during the cruise. This was as a previous check to its functionality in order to gather metadata of events and data as acquired during the cruises.

Several problems were identified and mostly related to the lack of automated functioning on the administration of events such as instrument deployments:

1. SOCIB already has its own instrumentation application for the deployments and the use of this system means to build a new instrument tree with events that needs to be done manually. There are some missing instrument models and related events that will need to be created for future campaigns.
2. While manually creating the instrument tree configuration with events it was not possible to export all the files (.csv extension). It seems that this was mostly related to the lack of being fully connected to the SOCIB DC. The result was that the files with some events were created but without recording data.
3. The suggestion for the next canales cruise would be to fully check the EARS system while gathering "en-route" data in an automatic mode with instruments such as thermosal, the weather station or the GPS.

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 16 stations encompassing 1 transects across the MC and 1 transect across IC until station S2_06. 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 analysed 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.

The sampling was carried out on 2 days from the 17th to 18th May 2021 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 and phytoplankton community composition analyses will be carried out at the IMEDEA by fluorometry (Turner-10 AU instrument) and microscopy (respectively). The microplastic collected samples will be stored at the IMEDEA until further analysis and the eDNA samples were transferred to the University of Valencia in Denia on May the 18th for further analyses (see cruise diary section for Marine Mammal observations). The obtained sheets with the jellyfish observations were scanned and sent to the ICMAN responsable by email.

7. Preliminary physical results

Hydrography

The following figures show the potential temperature – salinity distribution of all stations of the entire water column, where colour 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

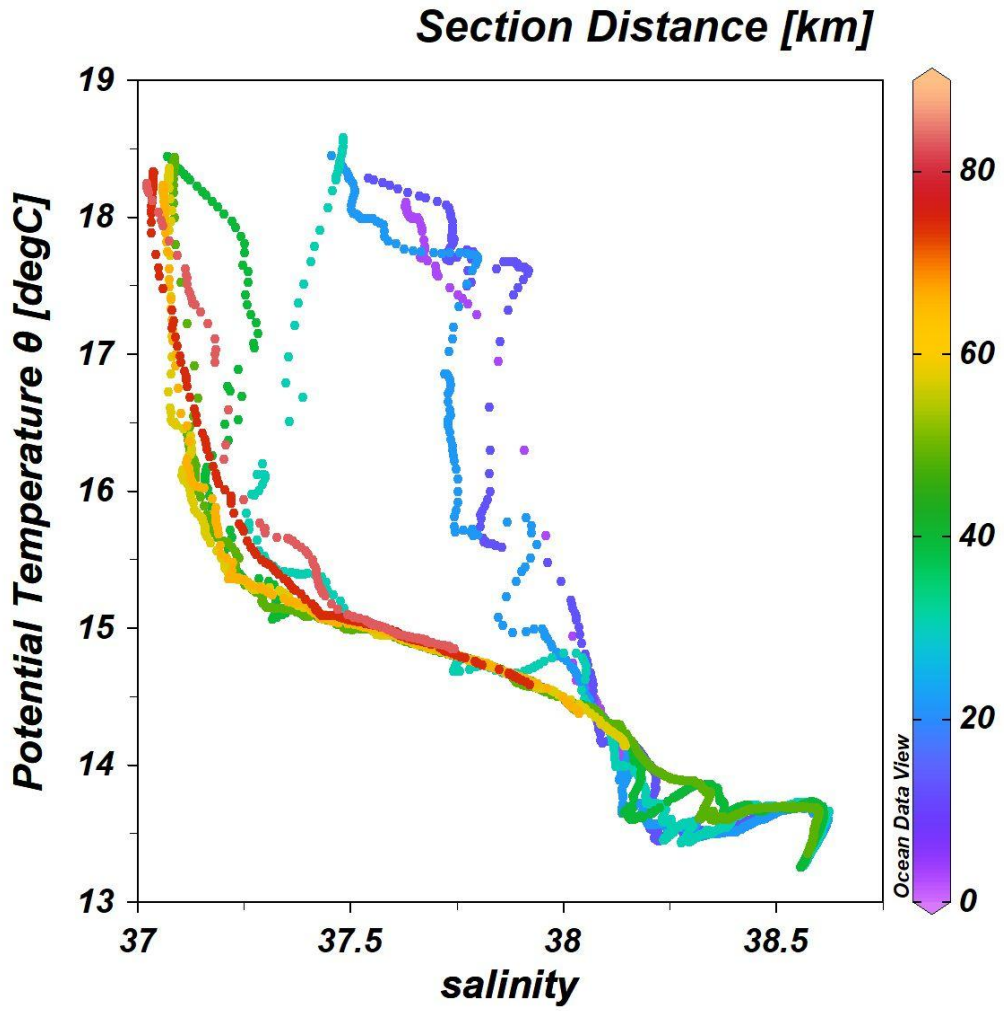


Fig 2 a. T-S diagram of the stations sampled in the MC, the colour bar indicates the distance (km) in the MC transect; the colour spectrum from red to blue corresponds to the transect from East to West, respectively.

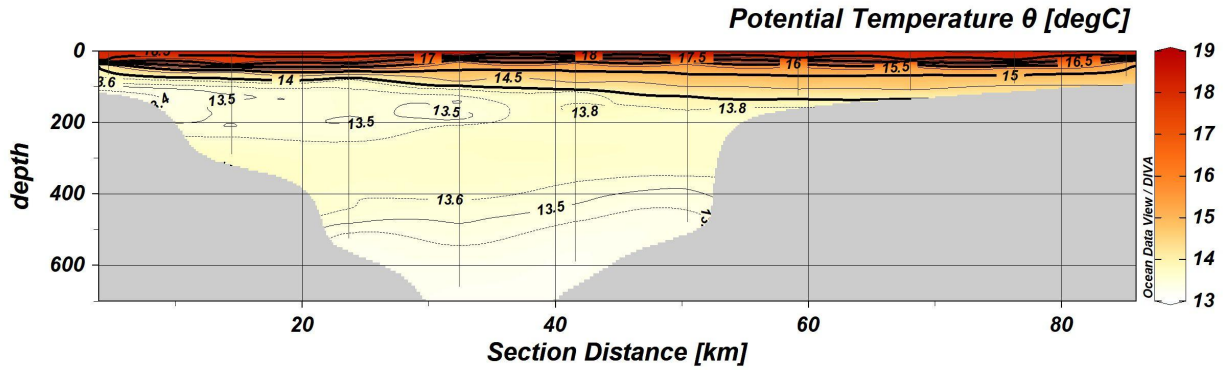


Fig. 2 b. Potential temperature (ºC) of the MC cross-section

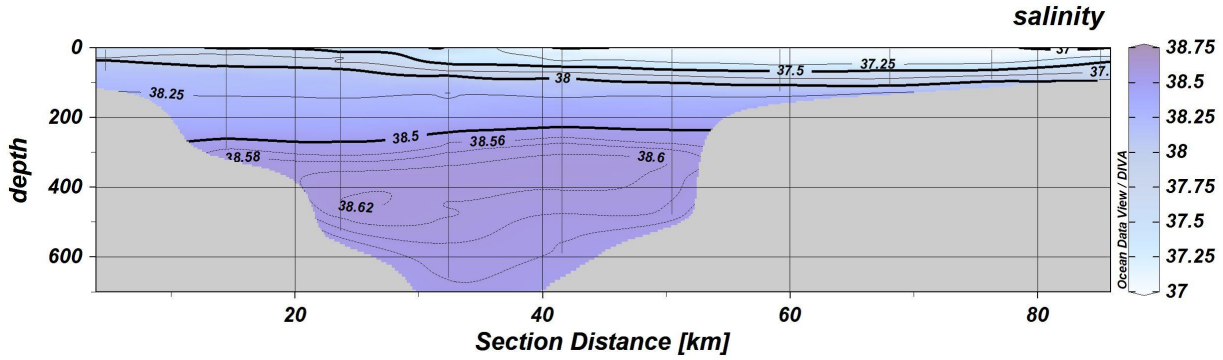


Fig. 2 c. Salinity (PSU) of the MC cross-section

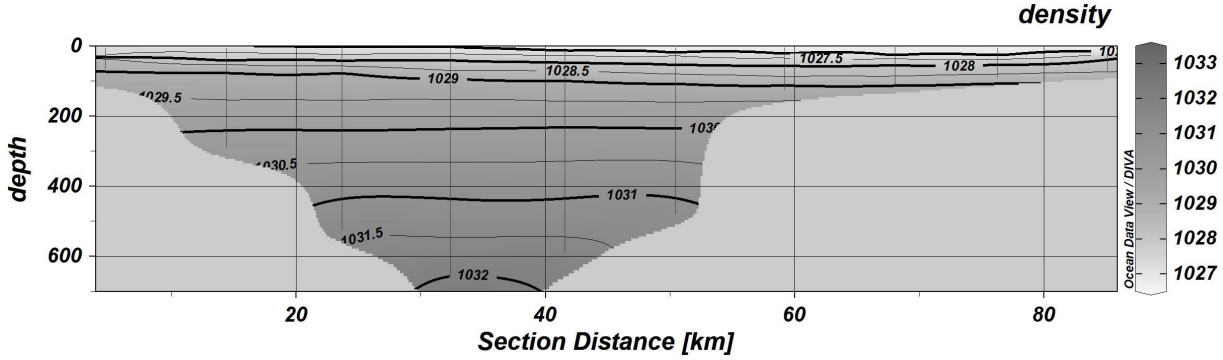


Fig. 2 d. Density (kg m^{-3}) of the MC cross-section

7.2. Ibiza Channel (North section)

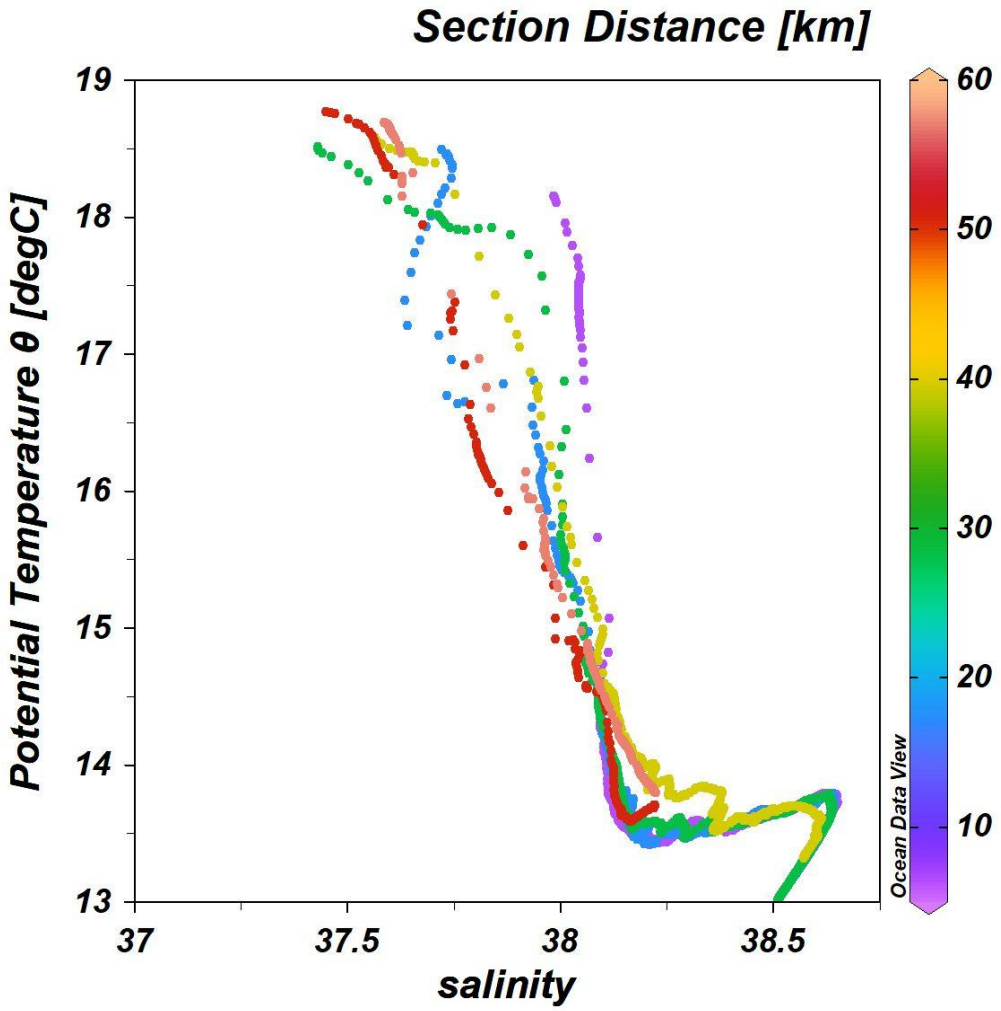


Fig 3 a. T-S diagram of the station sampled in the ICN, the colour bar indicates the distance (km) in the ICN ; the colour spectrum from red to blue corresponds to the ICN transect, from East to West, respectively.

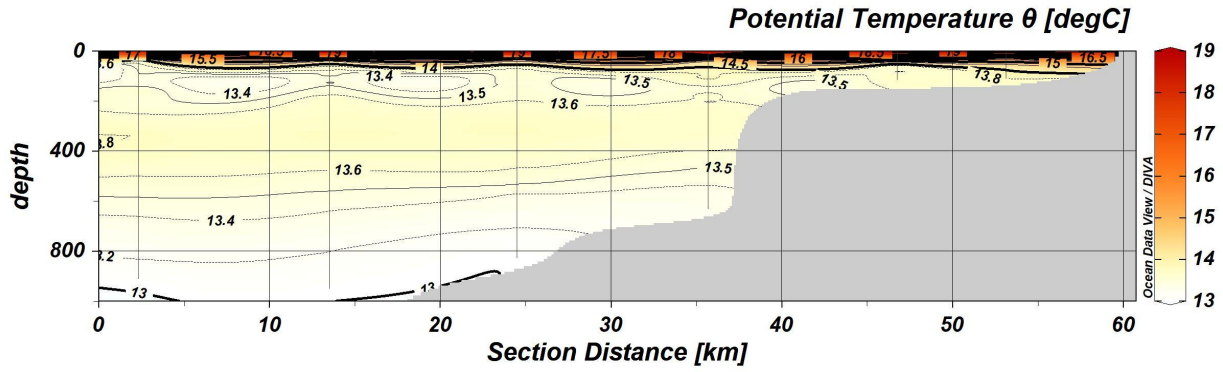


Fig. 3 b. Potential temperature (ºC) of the ICN cross-section

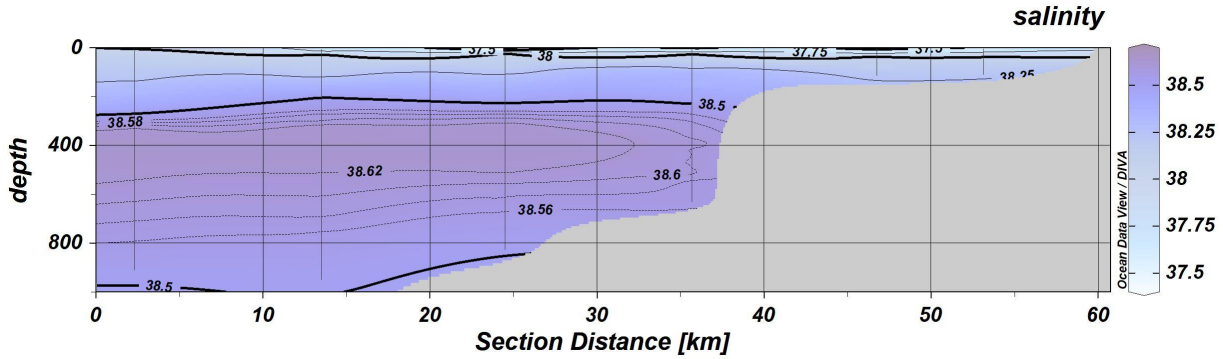


Fig. 3 c. Salinity of the ICN cross-section

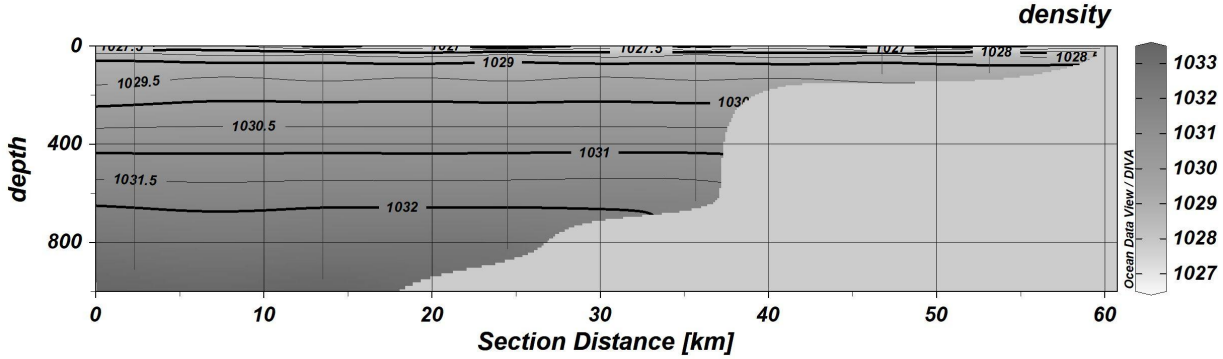


Fig. 3 d. Density (kg m^{-3}) of the ICN cross-section.

ADCP

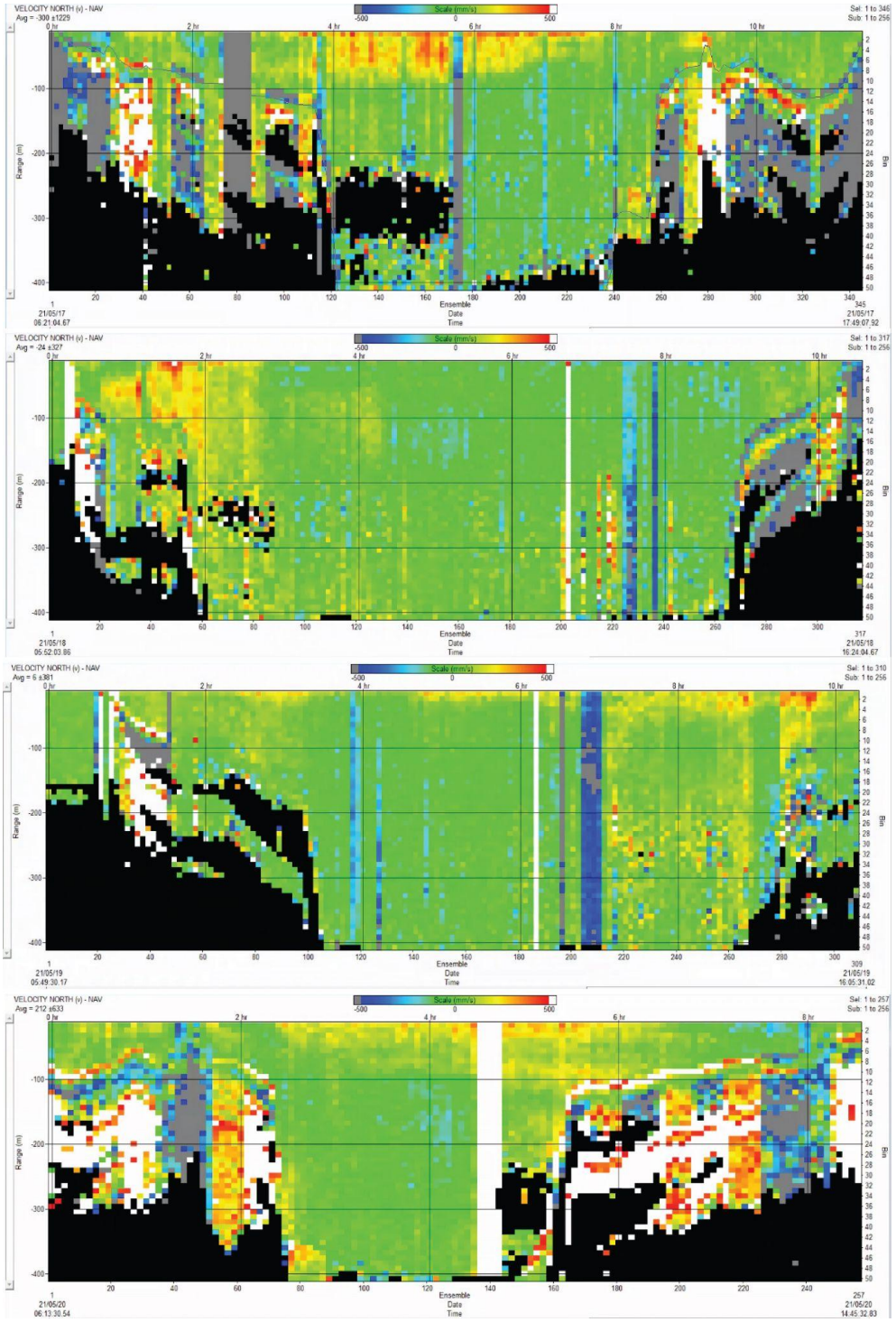


Fig. 4. Initial figure for NRT VM-ADCP data. Shown are the north velocities for sections 1-4 of

the cruise counting top to bottom.

There are some short periods of rogue profiles in the data (**Figure 4**), but generally the VM-ADCP appeared to work well in conditions that were workable, but certainly not calm. Depth penetration is clearly exceeding 400 metres most of the time in deep waters and whilst steaming. From a scientific point of view, it is very interesting, and unusual, to see an almost complete absence of southward flowing water, even sections 3 and 4 (Ibiza Channel) show no evidence of a 'Northern Current'.

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

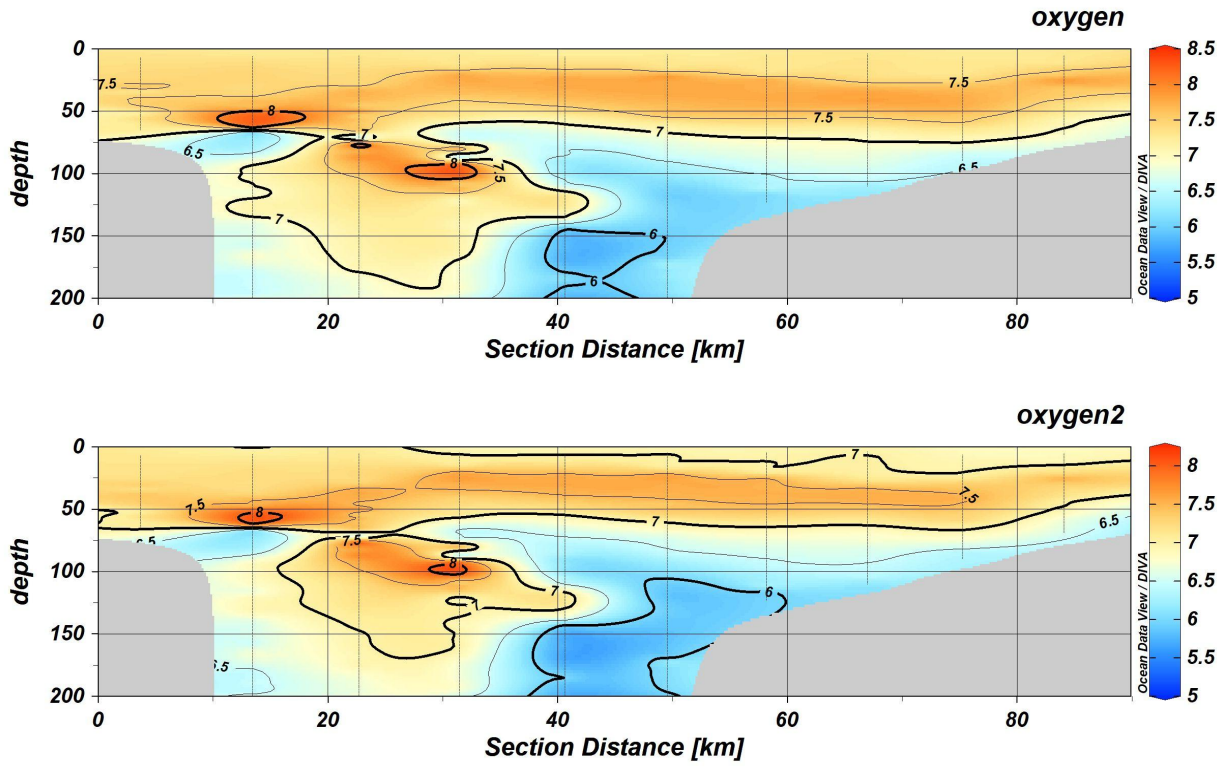


Fig. 5 a. Initial figure for dissolved oxygen concentration (mg/l) distribution obtained on the Mallorca Channel cross-section. Sensor 1 (upper panel) and sensor 2 (bottom panel) (upper 200 m)

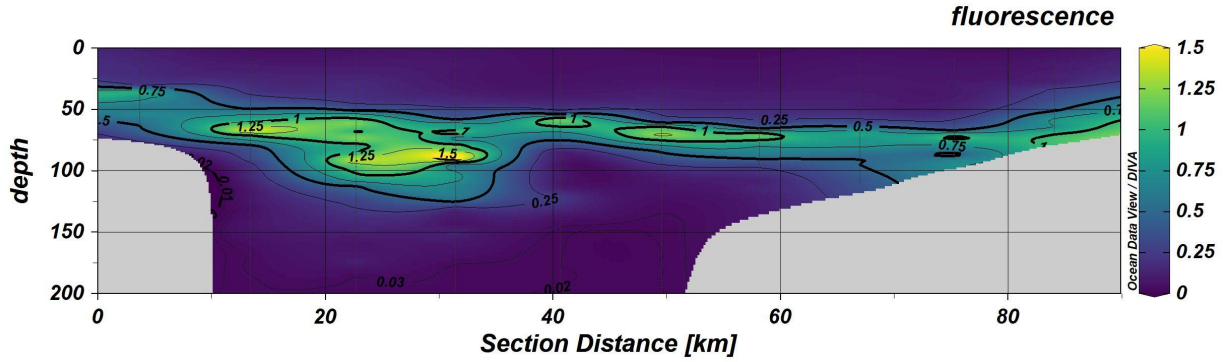


Fig. 5 b. Initial figure for chl *a* fluorescence distribution obtained on the Mallorca Channel (upper section 200 m)

8.2. Ibiza Channel

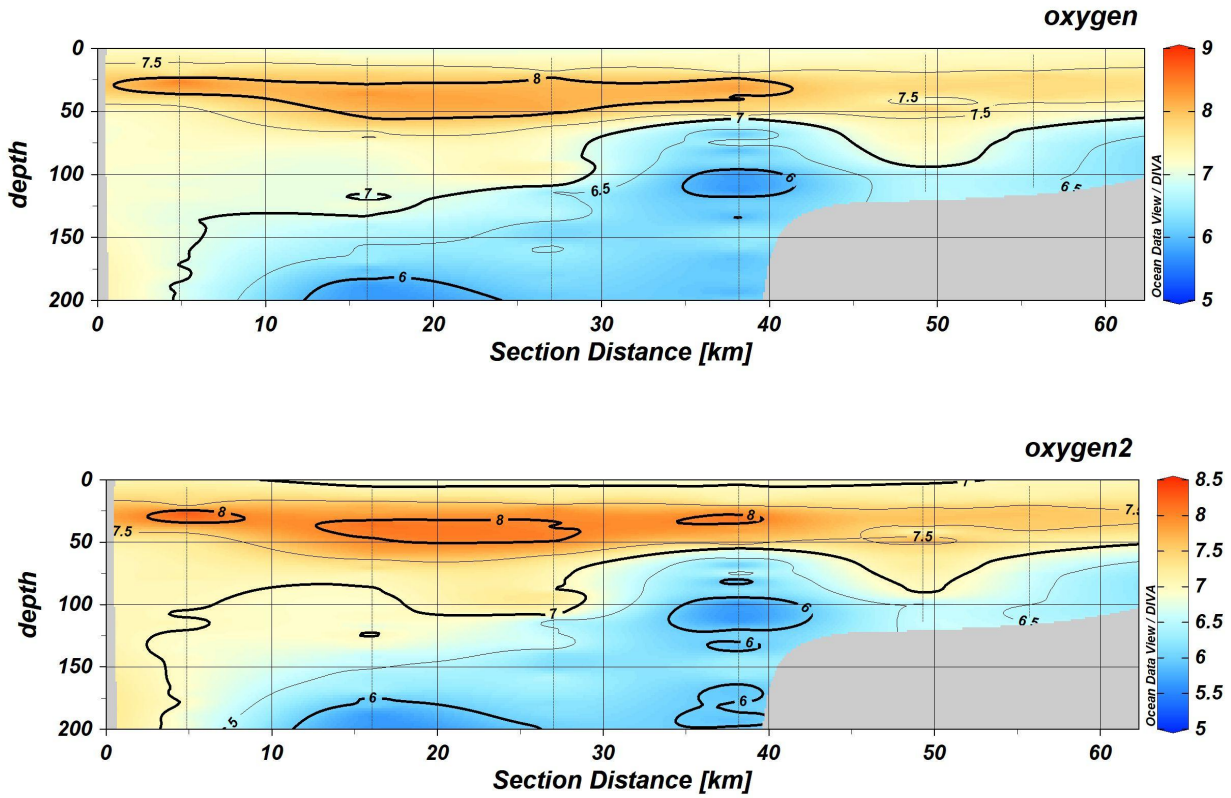


Fig. 6 a. Initial figure for dissolved oxygen concentration (mg/l) distribution obtained on the Ibiza Channel cross-section. Sensor 1 (upper panel) and sensor 2 (bottom panel) (upper 200

m)

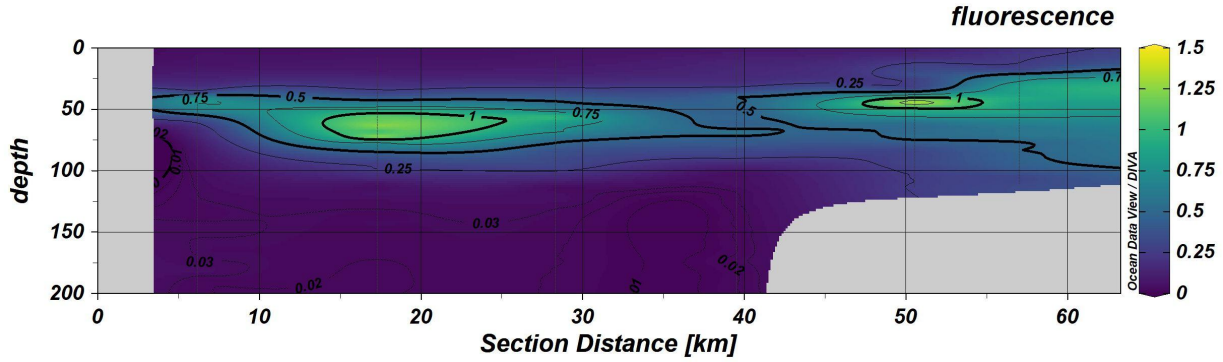


Fig. 6 b. Initial figure for chl *a* fluorescence distribution obtained on the Ibiza Channel (upper section 200 m)

9. Preliminary results from the Lagrangian platforms

During the Canales Spring 2021, 2 SVP-B (surface drifters SVP with a barometer sensor) were launched (18/05/2021) as part of the Global Drifter Program (NOAA, USA). Sea surface temperature and air pressure are shown in Figures 7 a and 7 b, respectively.

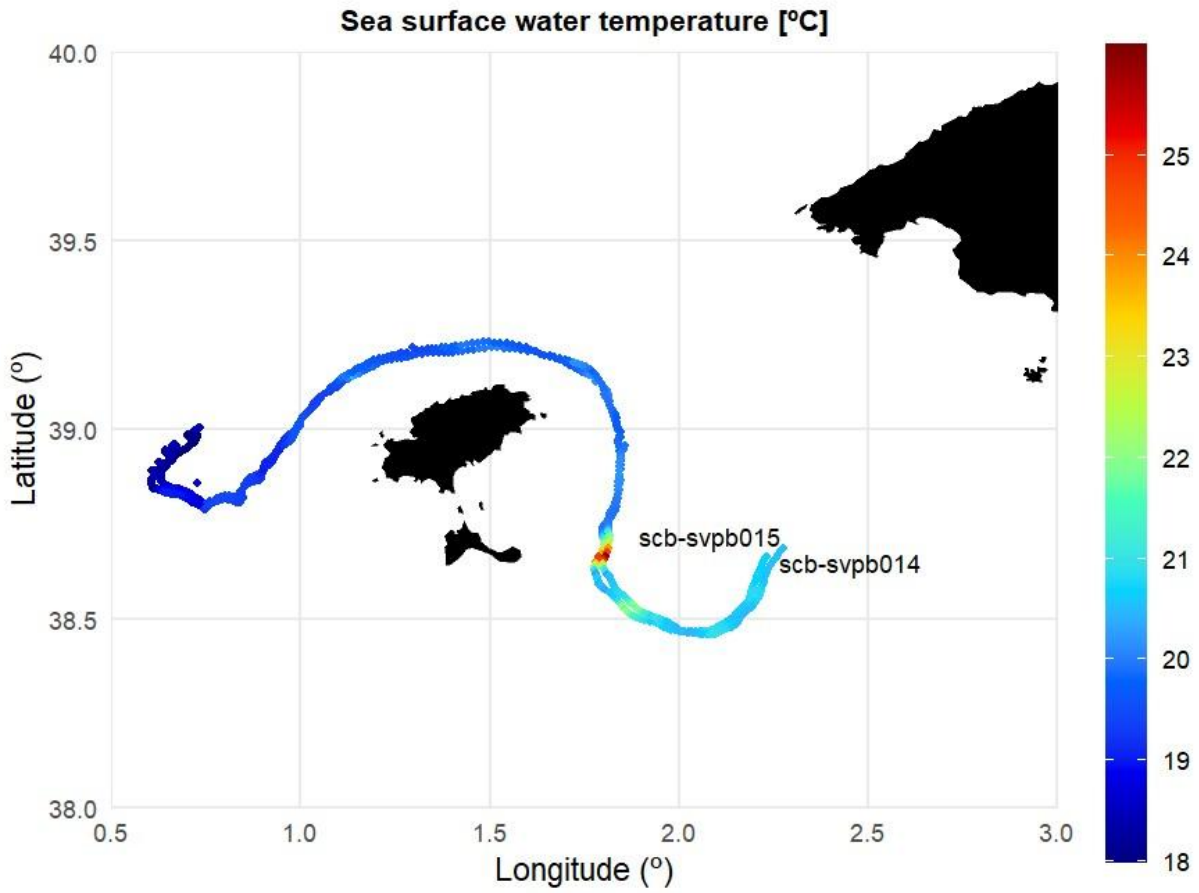


Fig. 7 a. Sea surface water temperature measured by the SVP-B's (with barometer sensor). Period represented: 18/05/2021-02/06/2021.

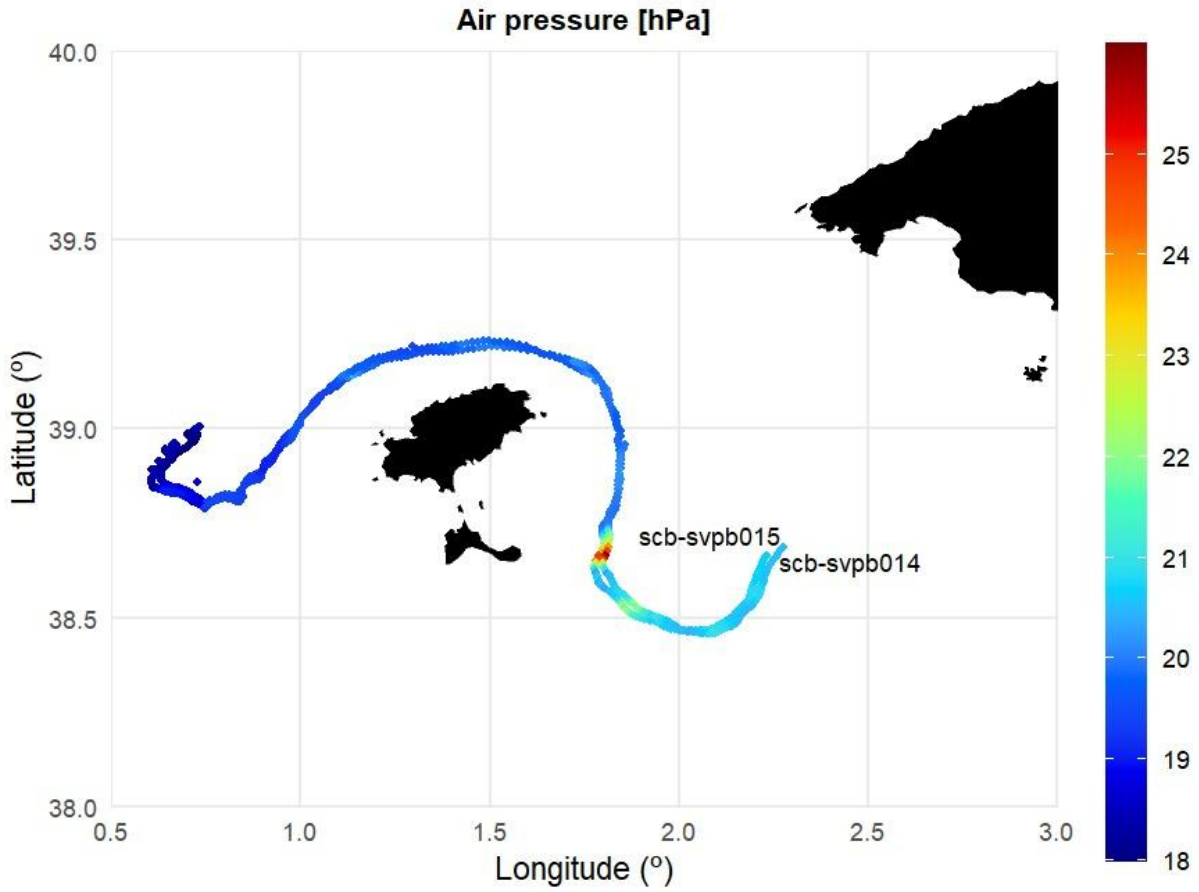


Fig. 7 b. Air pressure measured by SVP-B's (with barometer sensor). Period represented: 18/05/2021-02/06/2021.

10. Preliminary results Glider Intercalibration

During the spring canales 2021 cruise, an intercomparison of the ship-based CTD with the glider CTD was intended in the Ibiza Channel on the second day, May the 18th after the deployment of the sdeep06 - U827 glider unit (Mission GFMR0117) near to Sant Antoni. However the strong currents deflected the glider and the cast was not performed within the suitable radius of less than 800 m (Figure 8). The best interampling spot was produced on N39.0302 E0.8777 at 2021-05-19T15:09:15+00:00, glider perspective. This corresponds to station S2_04. The RV was located at N39.003 E0.861 at 2021-05-18T09:52:20+00:00 It was 3.6 km away from the RV and 29.2 h in time.

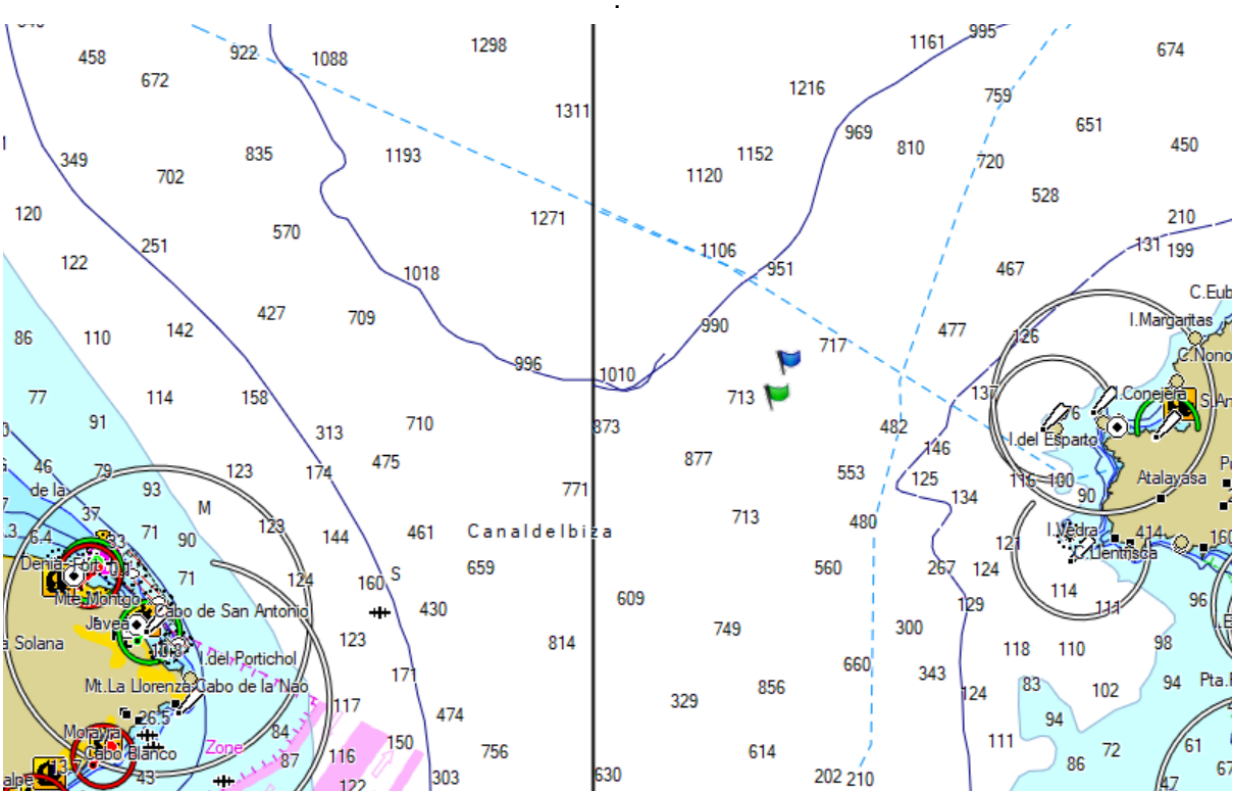


Fig. 8 . Bathymetric map of the study area. The green flag indicates the location of the R/V and the blue flag the location of the glider during the intercomparison CTD exercise.

Posterior to the cruise, the glider unit sdeep01 - U244 (mission GFMR0113) was located near station RADMED_06 on May the 26th. In the next few weeks, an intercomparison will be available on due time.

11. Processed Data Repository

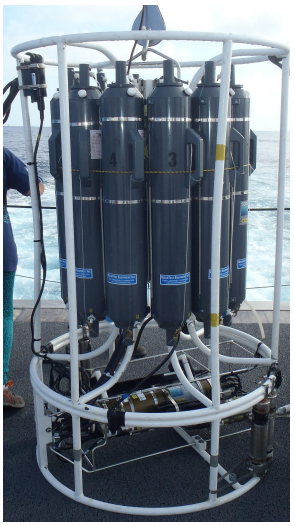
Data Source	Thredds URL
Position	http://thredds.socib.es/thredds/dodsC/research_vessel/gps/socib_rv-scb_pos001/L1/2021/05/dep0069_socib-rv_scb-pos001_L1_2021-05-17.nc
Weather Station	http://thredds.socib.es/thredds/dodsC/research_vessel/weather_station/socib_rv-scb_met009/L1/2021/05/dep0066_socib-rv_scb-met009_L1_2021-05-17.nc
Thermosal	http://thredds.socib.es/thredds/dodsC/research_vessel/thermosalinometer/socib_rv-scb_tsl001/L1/2021/05/dep0064_socib-rv_scb-tsl001_L1_2021-05-17.nc
SCB-SVPB014	http://thredds.socib.es/thredds/dodsC/drifter/surface_drifter/drifter_svpb014-scb_svpb014/L1/2021/dep0001_drifter-svpb014_scb-svpb014_L1_2021-05-18.nc
SCB-SVPB015	http://thredds.socib.es/thredds/dodsC/drifter/surface_drifter/drifter_svpb015-scb_svpb015/L1/2021/dep0001_drifter-svpb015_scb-svpb015_L1_2021-05-18.nc

Instrumentation description and configuration

In this section are described the instrumentation and the configuration used during the cruise

11.1. CTD-Probe

Manufacturer:	SeaBird
Model:	SBE9+
S/N:	1414
SOCIB Inventory:	SCB-SBE9003
Deck Unit:	SBE11+
SOCIB Inventory:	SCB-SBE11002



Sensor	Manufacturer - Model	S/N	Inventory ID	Calibration date
Temperature	SeaBird - SBE 3P	03-6451	WTEM-SCB-SBE9003	28/01/2020
Temperature 2	SeaBird - SBE 3P	03-6465	WTEM-SCB-SBE9003.2	28/01/2020
Conductivity	SeaBird - SBE4C	04-4933	COND-SCB-SBE9003	28/01/2020
Conductivity 2	SeaBird - SBE4C	04-4935	COND-SCB-SBE9003.2	28/01/2020
Pressure	-	1414	-	07/02/2020
Oxygen	SeaBird - SBE 43	43-3917	OXI-SCB-SBE9003	17/01/2020
Oxygen	SeaBird - SBE 43	43-3918	OXI-SCB-SBE9003.2	17/01/2020
Transmissometer	WET Labs C-Star	CST-2010DR	TRANS-SCB-SBE9003	10/02/2020 25/10/2019
Turbidity	STM Sea Point	3432	TURB-SCB-SBE9003	16/01/2020
Fluorometer	Seapoint 6000m	3920	FLUO-SCB-SBE9003	16/01/2020

Irradiance	PAR Biospherical QCP-2350	70754	PAR-SCB-SBE9003	04/11/2019
Surface Irradiance	SPAR Superficie Biospherical QSR2200	20519	SPAR-SBE9001	11/04/2016
Altimeter	Datasonics PSA-916D	7692	ALTIM-SCB-SBE9003	13/01/2020

Configuration

For controlling the CTD the following file was used: 2020-10-29_1414_SOCIB.xmlcom. The information contained in that file is located in CTD Configuration File

11.2. 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 February 2021, 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:

mis-alignment angle, φ = -0.0647 ± 0.2926 and

amplitude factor A = 1.0016 ± 0.0070.

The standard deviation in these figures were noticeably lower than during the preceding winter cruise, and more like the magnitude that we would normally expect. These statistics clearly indicated that the calibration was still good and therefore remained unchanged, a conclusion supported by inspection of the data (Figure 6 above).

11.3. Weather Station

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

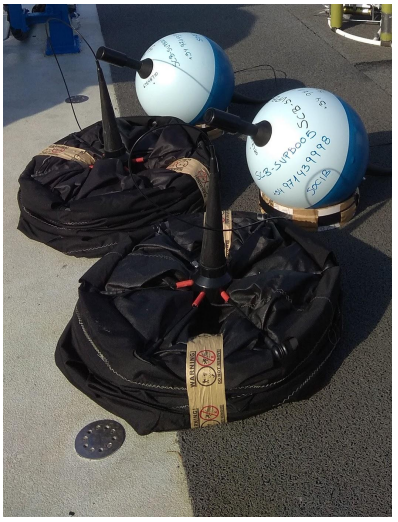
Sensor	Model	SOCIB Inventory	S/N
Pressure	YOUNG - 61302V	**APRE-SCB-YOUNG002**	BPA14406
Temperature & Humidity	Geonica - STH5031	**ATEMP & RHUM-SCB-GEONICA002**	0878
WIND	YOUNG- model 0516	**WIND-SCB-YOUNG002**	177091
GPS		GPS-SCB-RVPOS001	

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.

11.4. SVP-B Surface Drifters

Manufacturer:	Data Buoy Instrumentation, LLC (DBi)
Model:	SVP-B
IMEI / WMO:	300534060251880/6102791 300534060251970/6102792
SOCIB Inventory:	SCB-SVPB014 SCB-SVPB015
Calibration date:	Testing SCB-SVPB014 Testing SCB-SVPB015



12. 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 Winter2021

2020-10-29 SCB-SBE9003 (_1414).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>1</ScansToAverage>
    <SurfaceParVoltageAdded>1</SurfaceParVoltageAdded>
    <ScanTimeAdded>0</ScanTimeAdded>
    <NmeaPositionDataAdded>1</NmeaPositionDataAdded>
    <NmeaDepthDataAdded>0</NmeaDepthDataAdded>
    <NmeaTimeAdded>0</NmeaTimeAdded>
    <NmeaDeviceConnectedToPC>0</NmeaDeviceConnectedToPC>
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          <D>0.00000000e+000</D>
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          <H>6.40804481e-004</H>
          <I>2.29979583e-005</I>
          <J>2.16160286e-006</J>
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          <Slope>1.00000000</Slope>
          <Offset>0.0000</Offset>
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      <Sensor index="1" SensorID="3" >
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range sensors. -->
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          </Coefficients>
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            <H>1.45853995e+000</H>
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            <CPcor>-9.57000000e-008</CPcor>
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            <!-- Coefficients for Sea-Bird equation - SBE calibration
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          <SerialNumber>13432</SerialNumber>
          <CalibrationDate>16/01/2020</CalibrationDate>
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setting. -->
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          <Offset>-0.05999105</Offset>
        </PAR_BiosphericalLicorChelseaSensor>
      </Sensor>
      <Sensor index="12" SensorID="0" >
        <AltimeterSensor SensorID="0" >
          <SerialNumber>77692</SerialNumber>
          <CalibrationDate>13/01/2020</CalibrationDate>
          <ScaleFactor>15.000</ScaleFactor>
          <Offset>0.000</Offset>
        </AltimeterSensor>
      </Sensor>
      <Sensor index="13" SensorID="27" >
        <NotInUse SensorID="27" >
          <SerialNumber></SerialNumber>
          <CalibrationDate></CalibrationDate>
          <OutputType>0</OutputType>
          <Free>0</Free>
        </NotInUse>
      </Sensor>
      <Sensor index="14" SensorID="51" >
        <SPAR_Sensor SensorID="51" >
          <SerialNumber>20519</SerialNumber>
          <CalibrationDate>2016/04</CalibrationDate>
          <ConversionFactor>1.6314e+003</ConversionFactor>
          <RatioMultiplier>1.00000000</RatioMultiplier>
        </SPAR_Sensor>
      </Sensor>
    </SensorArray>
  </Instrument>
</SBE_InstrumentConfiguration>
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        <ConductivitySensor SensorID="3" >
          <SerialNumber>4933</SerialNumber>
          <CalibrationDate>28-Jan-20</CalibrationDate>
          <UseG_J>1</UseG_J>
          <!-- Cell const and series R are applicable only for wide
range sensors. -->
          <SeriesR>0.0000</SeriesR>
          <CellConst>2000.0000</CellConst>
          <ConductivityType>0</ConductivityType>
          <Coefficients equation="0" >
            <A>0.00000000e+000</A>
            <B>0.00000000e+000</B>
            <C>0.00000000e+000</C>
            <D>0.00000000e+000</D>
            <M>0.0</M>
            <CPcor>-9.57000000e-008</CPcor>
          </Coefficients>
          <Coefficients equation="1" >
            <G>-1.00933881e+001</G>
            <H>1.45853995e+000</H>
            <I>-9.14173035e-004</I>
            <J>1.46287053e-004</J>
            <CPcor>-9.57000000e-008</CPcor>
            <CTcor>3.2500e-006</CTcor>
            <!-- WBOTC not applicable unless ConductivityType = 1. -->
            <WBOTC>0.00000000e+000</WBOTC>
          </Coefficients>
          <Slope>1.00000000</Slope>
          <Offset>0.00000</Offset>
        </ConductivitySensor>
      </Sensor>
      <Sensor index="2" SensorID="45" >
        <PressureSensor SensorID="45" >
          <SerialNumber>1414</SerialNumber>
          <CalibrationDate>05-FEB-2020</CalibrationDate>
          <C1>-4.872211e+004</C1>
          <C2>1.021526e+000</C2>
          <C3>1.640390e-002</C3>
          <D1>3.968600e-002</D1>
          <D2>0.000000e+000</D2>
          <T1>3.006224e+001</T1>
          <T2>7.580840e-005</T2>
          <T3>4.157030e-006</T3>
          <T4>1.442530e-009</T4>
          <Slope>1.00000000</Slope>
          <Offset>0.00000</Offset>
          <T5>0.000000e+000</T5>
          <AD590M>1.281000e-002</AD590M>
          <AD590B>-9.177960e+000</AD590B>
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        </PressureSensor>
      </Sensor>
      <Sensor index="3" SensorID="55" >
        <TemperatureSensor SensorID="55" >
          <SerialNumber>6456</SerialNumber>
          <CalibrationDate>28-Jan-20</CalibrationDate>
          <UseG_J>1</UseG_J>
          <A>0.00000000e+000</A>
          <B>0.00000000e+000</B>
          <C>0.00000000e+000</C>
          <D>0.00000000e+000</D>
          <F0_Old>0.000</F0_Old>
          <G>4.37275644e-003</G>
          <H>6.40880978e-004</H>
          <I>2.25445354e-005</I>
          <J>2.11567301e-006</J>
          <F0>1000.000</F0>
          <Slope>1.00000000</Slope>
          <Offset>0.0000</Offset>
        </TemperatureSensor>
      </Sensor>
      <Sensor index="4" SensorID="3" >
        <ConductivitySensor SensorID="3" >
          <SerialNumber>4935</SerialNumber>
          <CalibrationDate>28-Jan-20</CalibrationDate>
          <UseG_J>1</UseG_J>
          <!-- Cell const and series R are applicable only for wide
range sensors. -->
          <SeriesR>0.0000</SeriesR>
          <CellConst>2000.0000</CellConst>
          <ConductivityType>0</ConductivityType>
          <Coefficients equation="0" >
            <A>0.00000000e+000</A>
            <B>0.00000000e+000</B>
            <C>0.00000000e+000</C>
            <D>0.00000000e+000</D>
            <M>0.0</M>
            <CPcor>-9.57000000e-008</CPcor>
          </Coefficients>
          <Coefficients equation="1" >
            <G>-1.00495801e+001</G>
            <H>1.43217730e+000</H>
            <I>-3.25151158e-005</I>
            <J>9.01116581e-005</J>
            <CPcor>-9.57000000e-008</CPcor>
            <CTcor>3.2500e-006</CTcor>
            <!-- WBOTC not applicable unless ConductivityType = 1. -->
            <WBOTC>0.00000000e+000</WBOTC>
          </Coefficients>
```

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          <Slope>1.00000000</Slope>
          <Offset>0.00000</Offset>
        </ConductivitySensor>
      </Sensor>
      <Sensor index="5" SensorID="38" >
        <OxygenSensor SensorID="38" >
          <SerialNumber>3917</SerialNumber>
          <CalibrationDate>17-Jan-20</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>5.1266e-001</Soc>
            <offset>-0.4972</offset>
            <A>-4.2444e-003</A>
            <B> 1.7236e-004</B>
            <C>-2.6264e-006</C>
            <D0> 2.5826e+000</D0>
            <D1> 1.92634e-004</D1>
            <D2>-4.64803e-002</D2>
            <E> 3.6000e-002</E>
            <Tau20> 1.1800</Tau20>
            <H1>-3.3000e-002</H1>
            <H2> 5.0000e+003</H2>
            <H3> 1.4500e+003</H3>
          </CalibrationCoefficients>
        </OxygenSensor>
      </Sensor>
      <Sensor index="6" SensorID="38" >
        <OxygenSensor SensorID="38" >
          <SerialNumber>3918</SerialNumber>
          <CalibrationDate>18-Jan-20</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>
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```
            <Tau>0.0</Tau>
          </CalibrationCoefficients>
          <CalibrationCoefficients equation="1" >
            <!-- Coefficients for Sea-Bird equation - SBE calibration
in 2007 and later. -->
            <Soc>4.1213e-001</Soc>
            <offset>-0.5355</offset>
            <A>-3.8925e-003</A>
            <B> 1.5970e-004</B>
            <C>-2.4108e-006</C>
            <D0> 2.5826e+000</D0>
            <D1> 1.92634e-004</D1>
            <D2>-4.64803e-002</D2>
            <E> 3.6000e-002</E>
            <Tau20> 1.0800</Tau20>
            <H1>-3.3000e-002</H1>
            <H2> 5.0000e+003</H2>
            <H3> 1.4500e+003</H3>
          </CalibrationCoefficients>
        </OxygenSensor>
      </Sensor>
      <Sensor index="7" SensorID="71" >
        <WET_LabsCStar SensorID="71" >
          <SerialNumber>2010</SerialNumber>
          <CalibrationDate>02/12/2020</CalibrationDate>
          <M>23.7510</M>
          <B>-0.0140</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>13432</SerialNumber>
          <CalibrationDate>16/01/2020</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" >
```

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        <FluoroSeapointSensor SensorID="11" >
          <SerialNumber>3920</SerialNumber>
          <CalibrationDate>16/01/2020</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="42" >
        <PAR_BiosphericalLicorChelseaSensor SensorID="42" >
          <SerialNumber>70754</SerialNumber>
          <CalibrationDate>11/04/19</CalibrationDate>
          <M>1.00000000</M>
          <B>0.00000000</B>

<CalibrationConstant>16835016840.00000000</CalibrationConstant>
          <Multiplier>1.00000000</Multiplier>
          <Offset>-0.05999105</Offset>
        </PAR_BiosphericalLicorChelseaSensor>
      </Sensor>
      <Sensor index="12" SensorID="0" >
        <AltimeterSensor SensorID="0" >
          <SerialNumber>77692</SerialNumber>
          <CalibrationDate>13/01/2020</CalibrationDate>
          <ScaleFactor>15.000</ScaleFactor>
          <Offset>0.000</Offset>
        </AltimeterSensor>
      </Sensor>
      <Sensor index="13" SensorID="27" >
        <NotInUse SensorID="27" >
          <SerialNumber></SerialNumber>
          <CalibrationDate></CalibrationDate>
          <OutputType>0</OutputType>
          <Free>0</Free>
        </NotInUse>
      </Sensor>
      <Sensor index="14" SensorID="51" >
        <SPAR_Sensor SensorID="51" >
          <SerialNumber>20519</SerialNumber>
          <CalibrationDate>2016/04</CalibrationDate>
          <ConversionFactor>1.6314e+003</ConversionFactor>
          <RatioMultiplier>1.00000000</RatioMultiplier>
        </SPAR_Sensor>
      </Sensor>
    </SensorArray>
  </Instrument>
</SBE_InstrumentConfiguration>
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