CRUISE REPORT

SOCIB Canales AUTUMN 2018:

13th to 15th November 2018

SOCIB_ENL_CANALES_NOV2018_AUTUMN

Document type:	Cruise report
Date:	2018-11-21

Description:	A repeat seasonal hydrographic survey of the Balearic Sea, monitoring the Ibiza and Mallorca Channels. 24 CTD stations were carried out over 3 days; the stations forming two transects across the Ibiza Channel (IC) and one transect across the Mallorca Channel (MC).
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Keywords:	Mediterranean; Ocean Circulation; Balearic Sea; Ibiza Channel; Mallorca Channel; Northern Current;

DOCUMENT VERIFICATION LIST

Date:	Checked by (name)	SOCIB division	Ref.
2019-04-15	C. Muñoz	SOS	

DOCUMENT DISTRIBUTION LIST

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CHANGE RECORD

ver	Date	Description	Author	Checked by
1.0.0	2018-11-21	v1.0 of document	E. Alou	C. Muñoz
1.1.0	2018-12-12	Physical variables report, configuration files and figures, general and biogeochem check	C. Muñoz E. Alou	E. Alou
1.2.0	2019-06-06	Add data references and CSR links	C. Muñoz	C. Muñoz

Index of contents

Objectives

1. Provide seasonal water bottle calibrated CTD transects to calibrate near-continuous autonomous glider monitoring of the Ibiza Channel.

2. Complete repeat hydrographic survey of the Ibiza Channel (IC) and Mallorca Channel (MC) through deployment of a CTD instrument frame (SeaBird SBE911*plus*) with extra mounted sensors and rosette equipped with 12 5l Niskin bottles.

3. Discrete water sample collection at various depths for the purpose of:
    a. Sensor field correction with the *in situ* discrete water samples for salinity, dissolved oxygen and chlorophyll *a* (chl *a*) concentration.
    b. Biogeochemical sampling of nutrients and phytoplankton community (through microscopic post-cruise analyses).

4. Deployment of Canales glider.

5. Support of Lagrangian experiment.

Onboard personnel

ID	Name	Role	Affiliation
1	Eva Alou	Chief Scientist/Lead biogeochemical sampling and analysis	SOCIB
2	Cristian Muñoz	CTD/Biogeochemical sampling	SOCIB
3	Carlos Castilla	Lead Technicians/CTD	SOCIB
4	Irene Lizarán	CTD/Salinity sampling	SOCIB
5	John Allen	Physics lead/Salinity sampling	SOCIB
6	Andrea Cabornero	Biogeochemical sampling	SOCIB

7	Juan David Osorio	CTD/Biogeochem sampling support	IMEDEA
8	Andrés Orejarena	CTD/Biogeochem support	IMEDEA
9	Paz Rotllán	Biogeochemical sampling support	SOCIB

Contents

List of figures

List of tables

Station plan

24 CTD stations were carried out over a period of 3 days; 2 transects in the Ibiza Channel (IC) and one transect in the Mallorca Channel (MC). The ADCP was not collecting data throughout the entire duration of the cruise. Figure 1 shows the station locations and the order in which stations were carried out.

A ship activity log detailing actions carried out during the cruise is provided in Appendix 1.

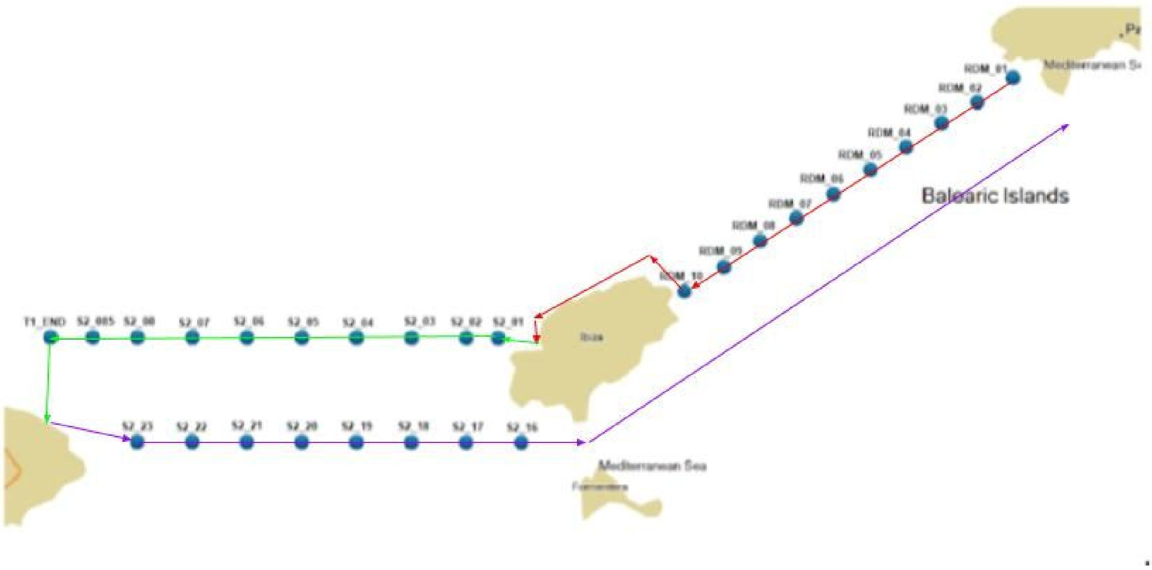

Fig. 1: Station plan

Cruise diary

Day 1 - 13th NOV 2018

SOCIB slipped from her berth in Puerto de Palma a few minutes after 07:00 GMT. Sadly we had to say good-bye to Lara as we left her behind to recover from a nasty cold that was making her feel very unwell. The weather looked unsettled and cloudy, but currently calm as we headed to the beginning of the Mallorca Channel line and station RadMed_01. For this

Canales, we had a CTD unit kindly on loan from EMS; our CTD instruments were still delayed in the USA being laboratory calibrated. This CTD from EMS had only one set of temperature, conductivity and oxygen sensors.

Station RadMed_01 started at 08:37 GMT. With the CTD safely recovered, SOCIB left station at ~ 08:50 GMT.

SOCIB arrived at station RadMed_02 at 09:13 GMT. The CTD was safely recovered at 09:25.

Station RadMed_03 began at 09:48 and the CTD was safely recovered by 10:02 GMT.

Station RadMed_04 began at 10:28. The CTD was safely recovered at 10:43.

Station RadMed_05 began at 11:09. At approximately 200 m water depth, the oxygen signal from the SBE43 instrument jumped low and became very noisy. Soon afterwards at around 220 m the temperature signal also became very noisy, taking salinity values with it of course. On the upcast the temperature sensor became clean again after approximately 185 m, and of course so did salinity and oxygen. With a good fluorimeter trace (the fluorimeter instrument draws most current from the sea-cable), this pointed to a bad cable between the temperature sensor and the breakout box. The CTD was recovered at 11:37.

A spare new connecting cable was fitted by 11:58, sadly there were no obvious signs of a problem with the old cable. Station RadMed_05B was started again at 12:03 GMT. Everything looked ok this second time apart from the last 20 - 40 m or so above the bottom where salinity and oxygen again looked rather unrealistically noisy, so the conclusion was a little uncertain at this stage. The CTD was safely recovered at 12:25 GMT.

SOCIB arrived on station RadMed_06 at 12:50 GMT. The station was finished and the CTD recovered by 13:25. The temperature, salinity and oxygen were very noisy between 350 and 450 metres water depth on the down cast, after which the signals were clean again for another 100 m depth, and the upcast was completely clean. If I'm right with the following explanation, I had only seen this once before, the connector cable was difficult to fit, it was new and in an awkward position; it is possible to have some residual air in one of the connectors, which then doesn't properly click home until it gets pressure cycled beyond a certain level.

SOCIB slowed to 6 knots for the deployment of an SVP drifter at around 13:30 GMT, the deployment was made at 39 ° 15.938 ' north, 001 ° 57.561 ' east. This was an ex-PreSwot drifter that had been reconfigured following a recovery in Soller previously.

SOCIB arrived on station RadMed_07 at 13:52 GMT. The CTD was safely recovered by

14:26 GMT. Sadly my theory on the last cast was wrong, the oxygen became very noisy at around 400 m on the downcast along with salinity and temperature. More importantly, although temperature and therefore salinity remained noisy on the upcast to around 400 m, oxygen remained noisy for another 80-100 m shallower.

SOCIB arrived on station RadMed_08 at 14:48 GMT. Before deploying the CTD, Irene and Cristian disconnected the SBE43 oxygen sensor; this was to test one further hypothesis, that because the spiking seems to exist in the oxygen sensor for more of the profile, perhaps a bad (shorting) connection to this instrument at pressure could be effecting voltage levels within the breakout box that could cause the clearly more subtle spiking in temperature and thus salinity. So this cast would have no oxygen profile. CTD cast RadMed_08 eventually began at 15:03 GMT. At ~ 160 m the temperature signal became very noisy and the CTD was abandoned. The CTD was recovered at 15:24 GMT.

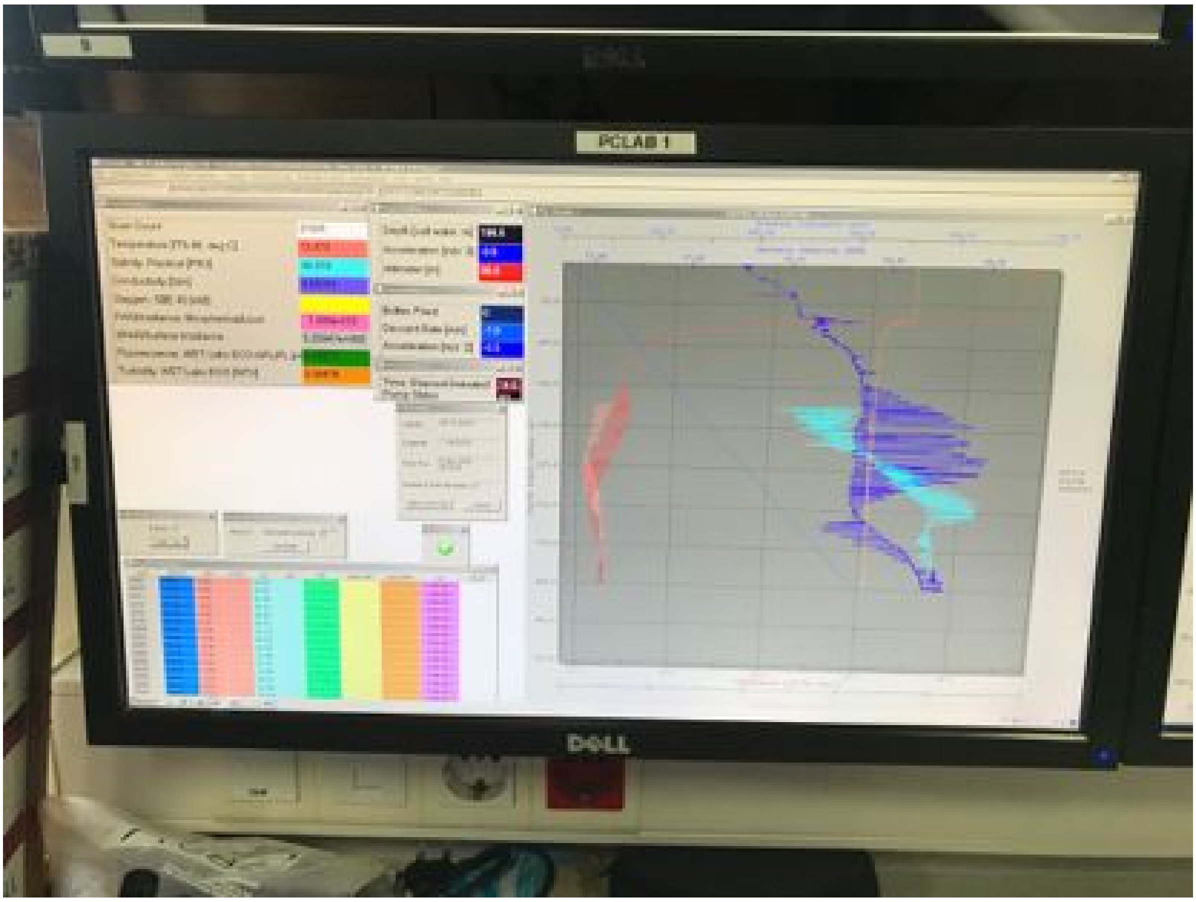

Fig. 2: Spiking in the temperature sensor (red, downcast and pink, upcast) during the first RadMed_08 CTD cast.

As a final test, the temperature, conductivity and oxygen sensors were removed from the channel 00 connectors, and fed instead into the channel 01 connectors, on the SBE 9 breakout box on the CTD frame. However, it was quickly discovered, and confirmed in documentation, that the pump status depends on the primary conductivity only, and there is no way to calculate salinities or oxygen using a mix of primary and secondary instrumentation. This was a major blow, nevertheless it was felt worth carrying out a cast with temperature in the secondary channel and conductivity in the primary channel. C2T1D1 cast at station RadMed_08 started at 17:05 and was recovered at ~17:30 GMT. Whilst the temperature sensor did not behave in such a noisy manner as in the above image, it was still noisy at the 0.06 – 0.1 level which would completely destroy salinity and oxygen calculations. This meant that either reserve options of a) constructing a y-cable to feed the conductivity data into both conductivity channels in parallel, or b) to make future casts with just temperature and conductivity and derive salinity, potential temperature etc. later in delayed mode, were no longer solutions.

SOCIB set course for San Antonio after a frustrating day. It would be necessary to think, make some phone-calls and see if we had any useful options left. Most likely it looked like we would deploy a gilder the next morning and then head back to Palma, but no-one was keen to accept that without a little more consideration. SOCIB was tied up alongside by 20:15 GMT.

DAY 2 - 14th NOV 2018

SOCIB slipped from the port of San Antonio at exactly 07:00 GMT, and headed out towards the Ibiza Channel northern line station, S2_01. The mood was buoyant despite knowing that a damaged temperature sensor could bring the cruise to a very premature halt today. The morning weather was calm with scattered if unsettled looking clouds, ironically the forecast for tomorrow, Thursday, had improved significantly.

SOCIB arrived on station S2_01 at 07:33 GMT. The CTD was safely recovered at 07:45, as this was a shallow ~100 m CTD, no temperature related problems were noted in the salinity or oxygen.

SOCIB arrived on station S2_02 at 08:04 GMT. The CTD was safely recovered at 08:16 GMT.

SOCIB arrived on station S2_03 at 08:47 GMT. The CTD was safely recovered at 09:15, however the noisy temperature signal had returned from a pressure of ~260 dbar, although smaller than the day before, perhaps up to ~ 0.05. Whilst waiting for a reply from EMS, it was decided to make the glider deployment whilst we weighed up our options.

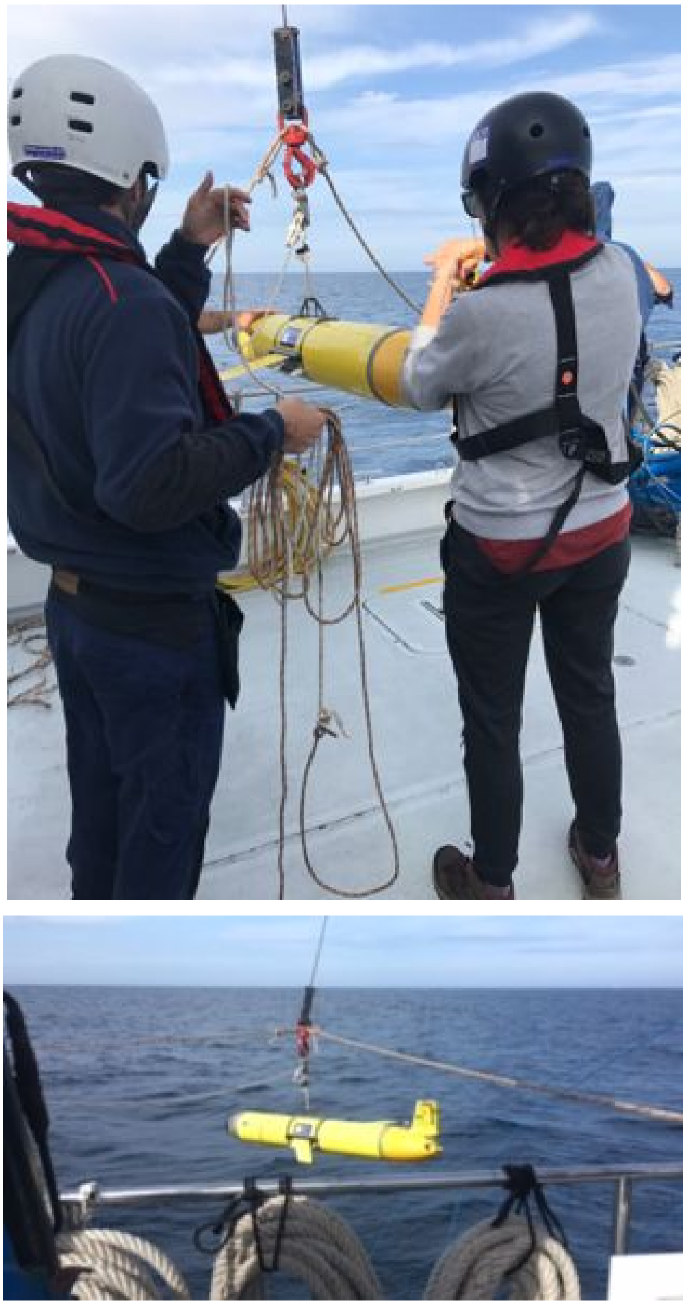

Fig. 3: SDEEP01 glider launch operation

After a satellite phone call with Marc, SOCIB turned around to head back to S2_02, where mobile phone coverage would be stronger. SOCIB arrived at S2_02 at 10:16 GMT. After what appeared to be an overly complicated and very risky airborne launch from the aft crane, at approximately 11:00 GMT, the aft restraining line became tangled around it's eye on the glider. This aft line had to be extended to give it more slack before eventually it came free and the line could be pulled through the eye. The glider, SDEEP01, was finally freely deployed at 11:10 GMT.

SOCIB left S2_02 at 11:40 heading for S2_04, to carry out a test CTD in deep water. During the glider deployment, Irene had replaced the cable for the CTD pump. Under careful inspection, we had seen some small noise (spikes) in the conductivity signal. This noise was much less than that observed in temperature and was uncorrelated, but left the tiny possibility that a surging or intermittent pump at pressure could be causing the problem.

SOCIB arrived on station S2_04 at 12:29 GMT. With a clean profile all the way to ~ 820 m, it looked like we had finally found the problem, a surging or intermittent pump due to a failing cable under pressure. The CTD was safely recovered at 13:13 GMT.

Station S2_05 began at 13:50 GMT. The CTD was safely recovered at 14:25 GMT, again with clean profiles, this time to over 950 m water depth.

Station S2_06 began at 15:00 GMT. With the CTD safely recovered, SOCIB was underway by 15:37 GMT.

Station S2_07 began at 16:10 GMT. The CTD was safely recovered at 16:44.

Station S2_08 began at 17:16 GMT. The CTD was safely recovered at 17:34. SOCIB then set course for Denia; we had lost too much time earlier on in the day to complete the last two shallow stations of the line and make it in to Denia in time to allow for oxygen laboratory analysis this evening, and a full southern line tomorrow. SOCIB was tied up alongside in Denia by 19:00 GMT.

DAY 3 - 15th NOV 2018

SOCIB delayed leaving Denia to pick up a spare temperature sensor for the CTD. This had been negotiated with UTM, when it still seemed the most likely source of our problems. The sensor was being sent from Vigo to Barcelona, but was redirected to Denia instead.

SOCIB slipped from the port of Denia at 07:35 GMT, into a wet but calm morning, clouds covering Denia mountain like an impenetrable table cloth. However the sea, up to around 1 metre would be on our nose most of the day, so this was not expected to be pleasant.

Station S2_23 began at 08:52 GMT. With the CTD safely recovered, SOCIB was underway by 09:06 GMT.

Station S2_22 began at 10:03 GMT. With the CTD safely recovered, SOCIB was underway by 10:20 GMT.

Station S2_21 began at 11:25 GMT. With the CTD safely recovered, SOCIB was underway by 12:02 GMT.

Station S2_20 began at 13:01 GMT. With the CTD safely recovered, SOCIB was underway by 13:39 GMT.

Station S2_19 began at 14:28 GMT. With the CTD safely recovered, SOCIB was underway by 15:02 GMT.

With a much calmer sea, as we steamed further east, the rather depressing speeds of 5-7 knots during the morning were replaced by more welcome 14-16 knots, so station S2_18 began at 15:34 GMT. With the CTD safely recovered, SOCIB was underway by 15:56 GMT.

Station S2_17 began at 16:25 GMT. With the CTD safely recovered, SOCIB was underway by 16:33 GMT.

Station S2_16 began at 17:02 GMT. The CTD was safely recovered by 17:12 GMT. B/O SOCIB then set course for the Freus Channel and beyond to Palma de Mallorca.

Fig. 4: The Canales Autumn 2018 scientific and technical team

Instrumentation description and configuration

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

CTD-Probe

Manufacturer:	SeaBird
Model:	SBE9+
S/N:	0956
SOCIB Inventory:	EMS-SBE9001
Deck Unit:	SBE11
SOCIB Inventory:	EMS-SBE11

<table>
<tr><th>Sensor</th><th>Model</th><th>S/N</th><th>Calibration date</th></tr>
<tr><td>Temperature</td><td>SBE 3P</td><td>5136</td><td>2017/10/27</td></tr>
<tr><td>Conductivity</td><td>SBE4C</td><td>3646</td><td>2017/10/18</td></tr>
<tr><td>Pressure</td><td></td><td>0956</td><td>2012/12/04</td></tr>
<tr><td>Oxygen</td><td>SBE 43</td><td>3734</td><td>2018/09/01</td></tr>
<tr><td>Turbidity</td><td rowspan="2">Fluorómetro/Turbidímetro ECO, clorofila a (0-50µg/l) y Turbidez (0-100 NTU), Wetlabs</td><td rowspan="2">5187</td><td rowspan="2">2018/09</td></tr>
<tr><td>Fluorometer</td></tr>
</table>

Irradiance	PAR_BiosphericalLicorChelsea Sensor	4633	-
Surface Irradiance	SPAR Superficie Biospherical QCR2200	20519 SPAR-SBE9001	2016/04/11
Altimeter	Datasonics PSA-916D	74738	2018/09

Configuration

For controlling the CTD the following files were used:

- RADMED_01.xmlcon: used for stations RDM01, 02, 03, 04, 05bis, 06, 07.
- RADMED_08.xmlcon: used for stations RDM08.
- S2_01.xmlcon: used for stations S2_01, 02, 03.
- S2_04.xmlcon: used for stations S2_04 to S2_23.

Thermo-salinometer

Manufacturer:	SeaBird
Model:	SBE21
S/N:	3370
SOCIB Inventory:	SCB-TSL001
Calibration date:	2018/07/03

Configuration

The data are collected using the UTM - Termosal.exe software. The data are stored directly in the main desktop and are processed through the SOCIB-DC system.

Weather Station

Manufacturer:	Geonica
Model:	Meteodata 2000
S/N:	
SOCIB Inventory:	SCB-MET009
Calibration date:	2011

Configuration

The data are collected using the UTM - SADO System. The data are stored directly in the main desktop and are processed through the SOCIB-DC system.

Scientific Reports

Physical data report

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

CTD and water bottle sampling

Data acquisition: CTD casts were carried out at 24 stations encompassing 3 transects across the IC and the MC. At each station, water samples were collected with the rosette at various depths for measuring *in situ* salinity, dissolved oxygen and fluorescence in order to apply corrections to the conductivity, oxygen and fluorescence 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 Matlab 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 Guildline Portasal model 8410A salinometer. The biogeochemical sampling will be discussed in the next section: the biogeochemical report.

Biogeochemical data report

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

Secondary field objectives are:

1. To estimate chl *a* concentration and distribution (as a proxy for phytoplankton biomass).
2. To assess nutrient concentration distribution: Nitrate (NO_3-), nitrite (NO_2-), silicate (SiO_4^{2-}) and phosphate (PO_4^{3-}).
3. To study phytoplankton community composition.

The sampling was carried out on 3 days from the 13th to the 15th November 2017 and followed the established R/V SOCIB protocols.

Dissolved oxygen

Discrete water samples (Winkler's method, Langdon 2010, see protocols) for comparison were taken at each station along each transect at a maximum of 3 depths. We chose depths of varying oxygen concentrations (in order to sample the full spectrum of oxygen concentrations). Refer to the available logbook generated during the cruise for more details on sampling depths, replicates and parameters sampled at each station.

Samples were analyzed on board after an 8-12 h period in darkness with a titration procedure with potentiometric endpoint detection (Metrohm 888 Titrator).

The final dissolved oxygen dataset will be produced post-cruise following the analysis of the data.

Chl *a* concentration

Samples for chl *a* concentration were taken at all stations at 4 depths (see logbook for details). Post-cruise chl *a* determination will be carried out at the IMEDEA by fluorometry (Turner Trilogy fluorometer, see available protocol).

Nutrients

Samples for inorganic nutrient concentrations were taken at all stations at a maximum of 9 depths (see logbook for detailed information on sampling depths and protocols). Samples will be kept frozen at -20ºC at the IMEDEA until analysis.

Phytoplankton community composition

Samples were taken on each station at the deep chlorophyll maximum (DCM, see logbook) for general cell identification (cells fixed in Lugol's solution, Utermöhl 1958). Samples for microscopy will be analyzed post-cruise at the IMEDEA.

Preliminary results

Preliminary physical results

1. Hydrography: T-S diagram

Figure 5, shows the potential temperature – salinity distribution of all stations of the entire water column, where colour indicates the longitude of the corresponding station. The most saline surface water is typically found in the western part of the Ibiza Channel. In contrast the eastern part of the Ibiza Channel shows some of the freshest surface water signals. Similar behaviour was found for the Malloca Channel, with no presence of the LIW.

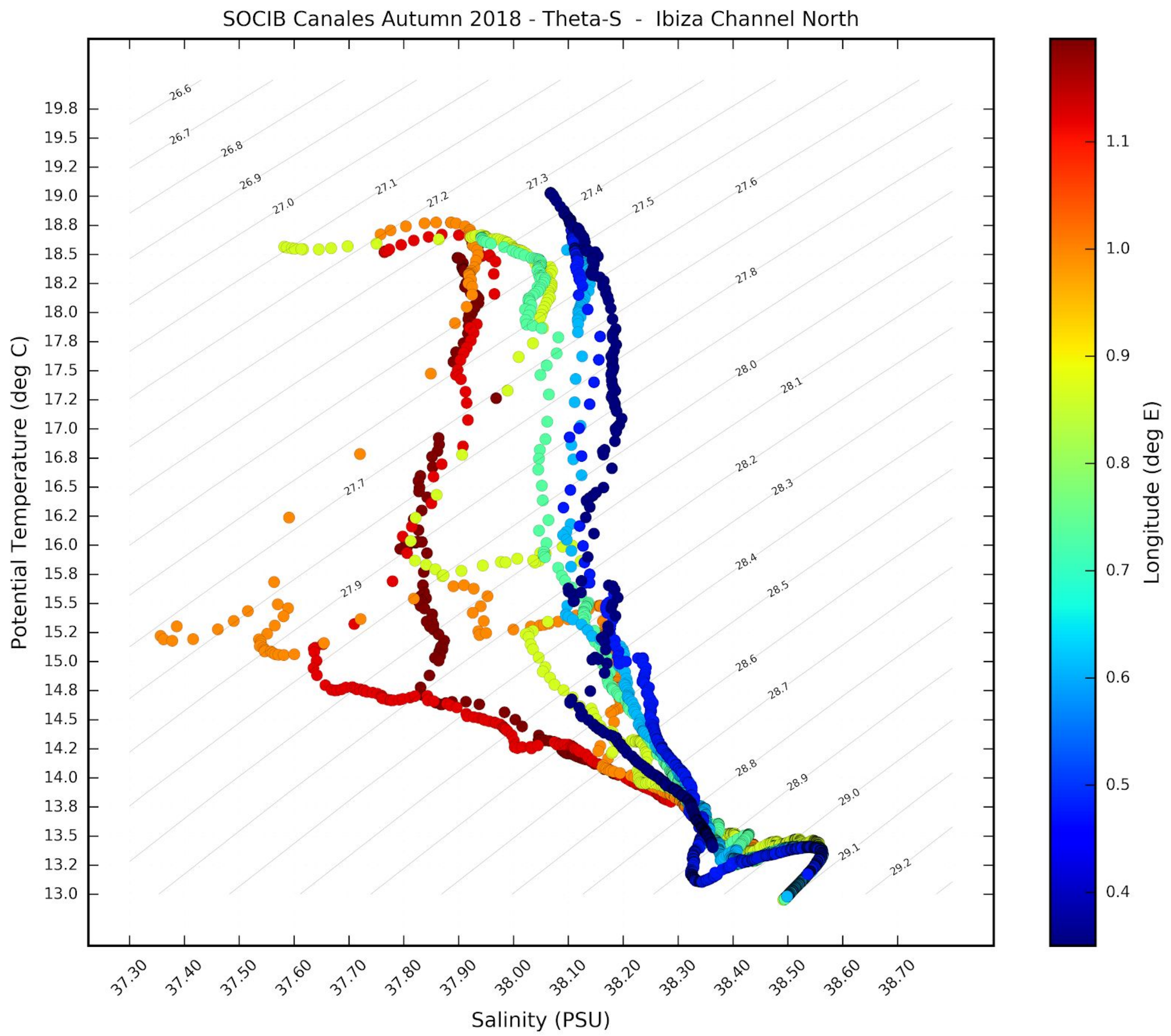

Fig 5a. T-S diagram of all ICN stations; the colour bar indicates the longitude of the station; thus the colour spectrum from red to blue corresponds to the ICN transect, from East to West.

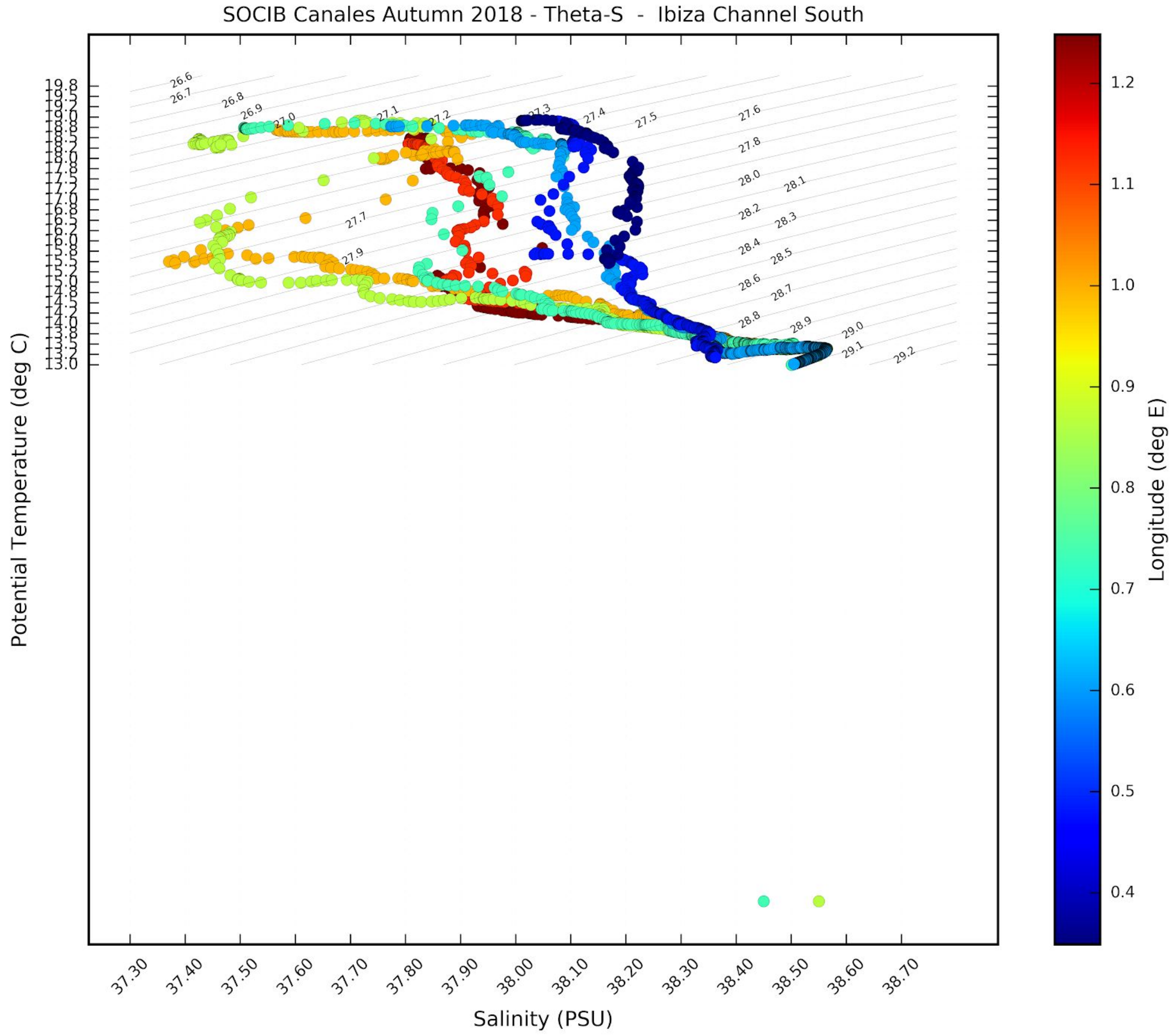

Fig 5b. T-S diagram of all ICS stations; the colour bar indicates the longitude of the station; thus the colour spectrum from red to blue corresponds to the ICS transect, from East to West.

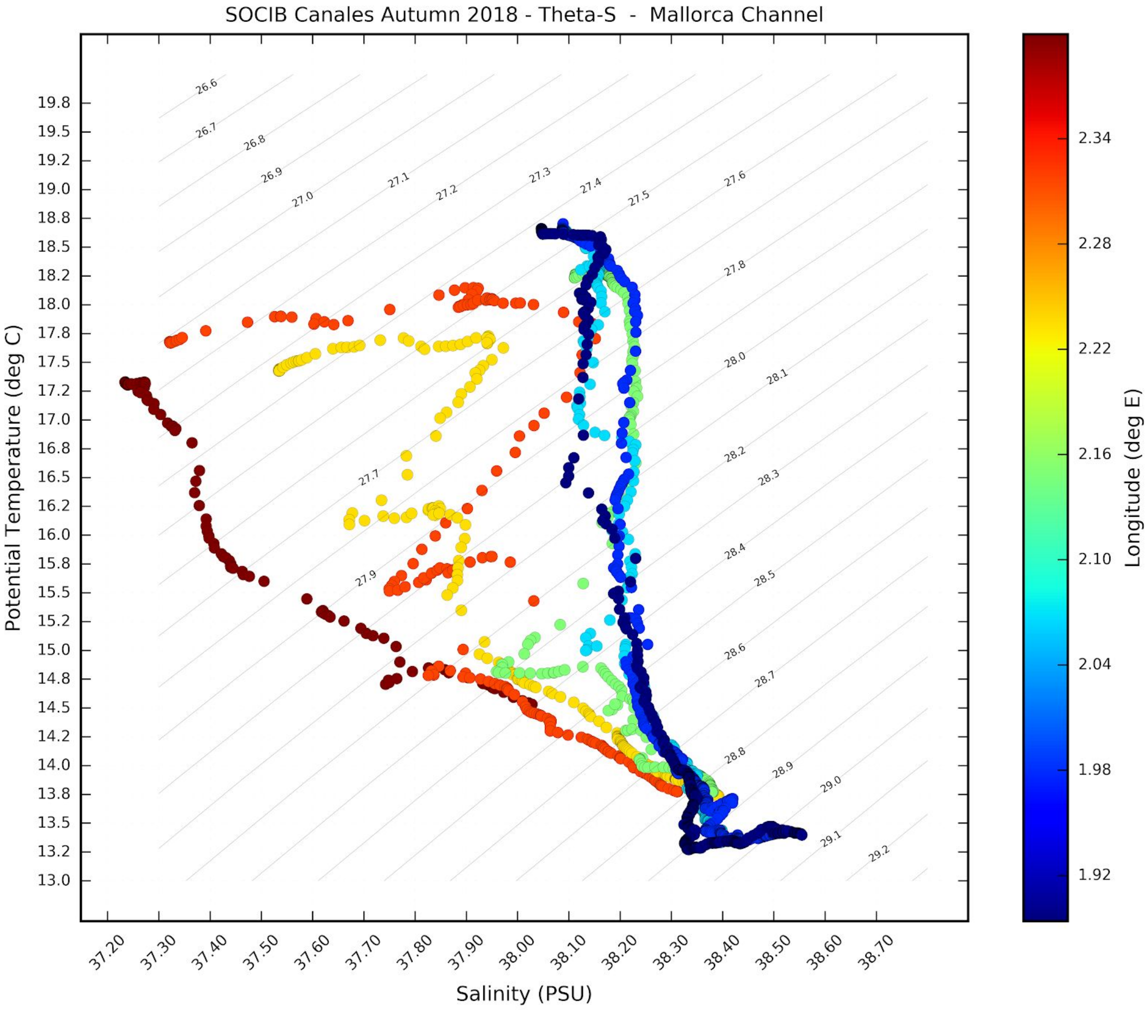

Fig 5c. T-S diagram of all MC stations; the colour bar indicates the longitude of the station; thus the colour spectrum from red to blue corresponds to the MC transect, from East to West.

2. Ibiza Channel: North

The figures presented in this section are showing the third, most northerly transect of the IC.

Figure 6 shows the different variables acquired through the CTD profiles across the northern IC covering from 0.1º E (peninsula shelf) til 1.2º E (Ibiza shelf). Most of the profiles are shown only in the upper section ~200m depth.

Potential temperature (figure 6a) has an almost uniform vertical distribution presenting a weak temperature gradient between 12.60ºC and 18.60ºC.

Salinity (figure 6b) presents typical horizontal gradients on the continental shelves that are wider distributed around the Ibiza shelf than in the peninsula shelf. Salinity vertical distribution range is 37.35 psu - 38.70 psu.

Density (figure 6c) also presents a vertical distribution characterized by weak vertical gradients between 1027 and 1033 kgm-3.

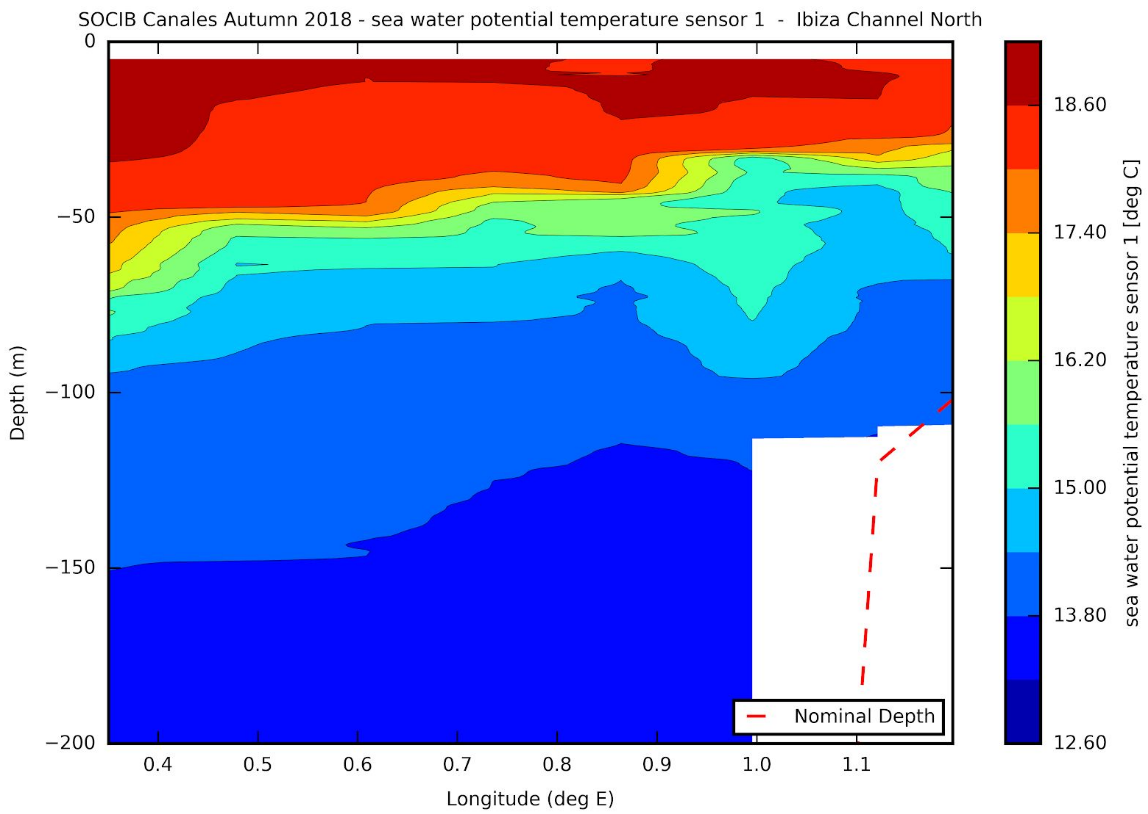

Fig. 6a. Temperature (ºC) of the first (most northerly) transect of the IC (only the upper 200 m of the water column is shown in order to highlight the subsurface lense centred at 0.6º E).

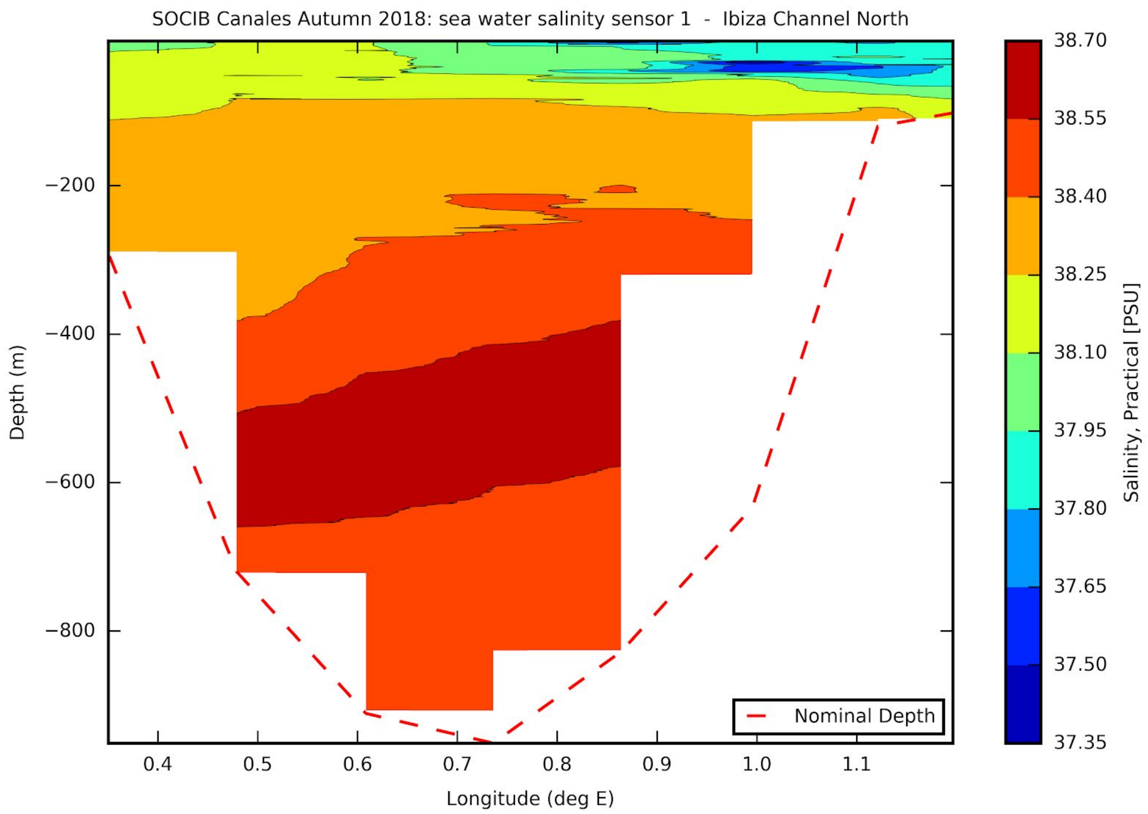

Fig. 6b. Salinity of the first (most northerly) transect of the IC.

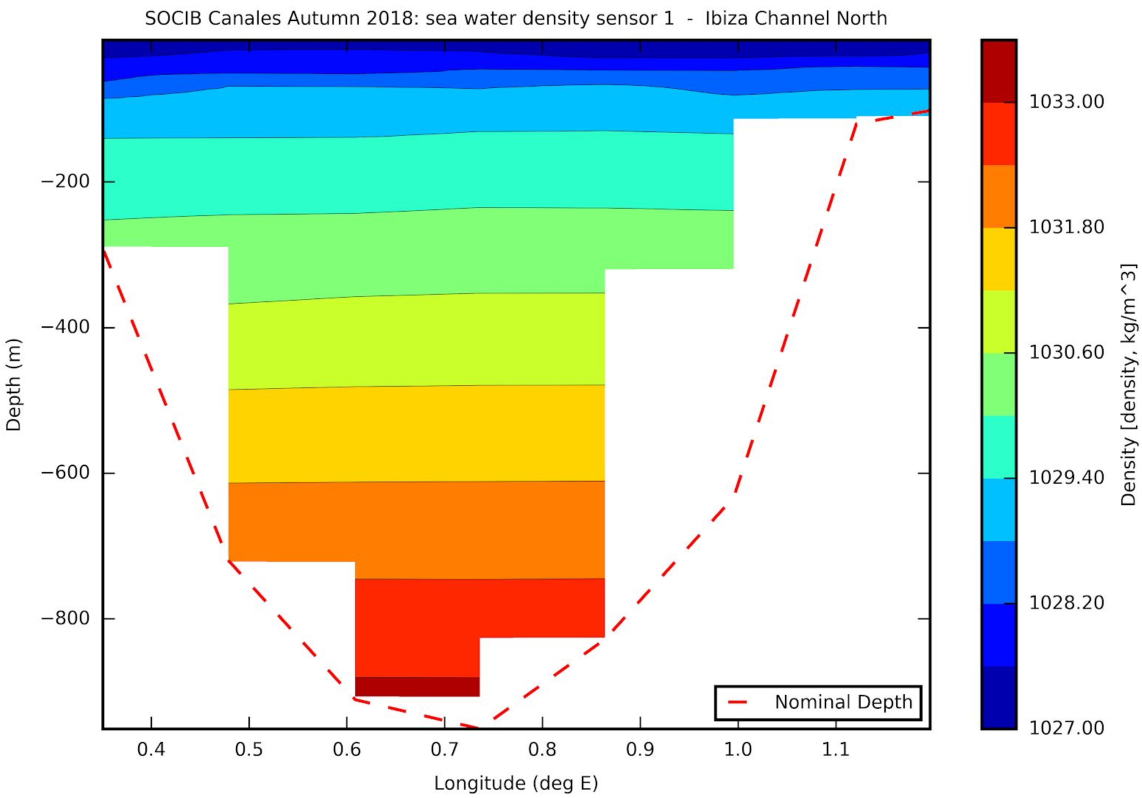

Fig. 6c. Density (kg m^{-3}) of the first (most northerly) transect of the IC.

3. Ibiza Channel: South

Figure 7 shows the different variables acquired through the CTD profiles across the southern IC covering from 0.3º E (peninsula shelf) til 1.3º E (Ibiza shelf). Profiles are shown mostly in the upper section ~200m depth.

Potential temperature (figure 7a) has an almost uniform vertical distribution presenting a weak temperature gradient between 12ºC and 18ºC.

Salinity (figure 7b) presents typical horizontal gradients on the continental shelves that are wider distributed around the Ibiza shelf than in the peninsula shelf. Salinity vertical distribution range is 37.35 psu - 38.70 psu.

Density (figure 7c) also presents a vertical distribution characterized by weak vertical gradients between 1027 and 1033 kgm-3.

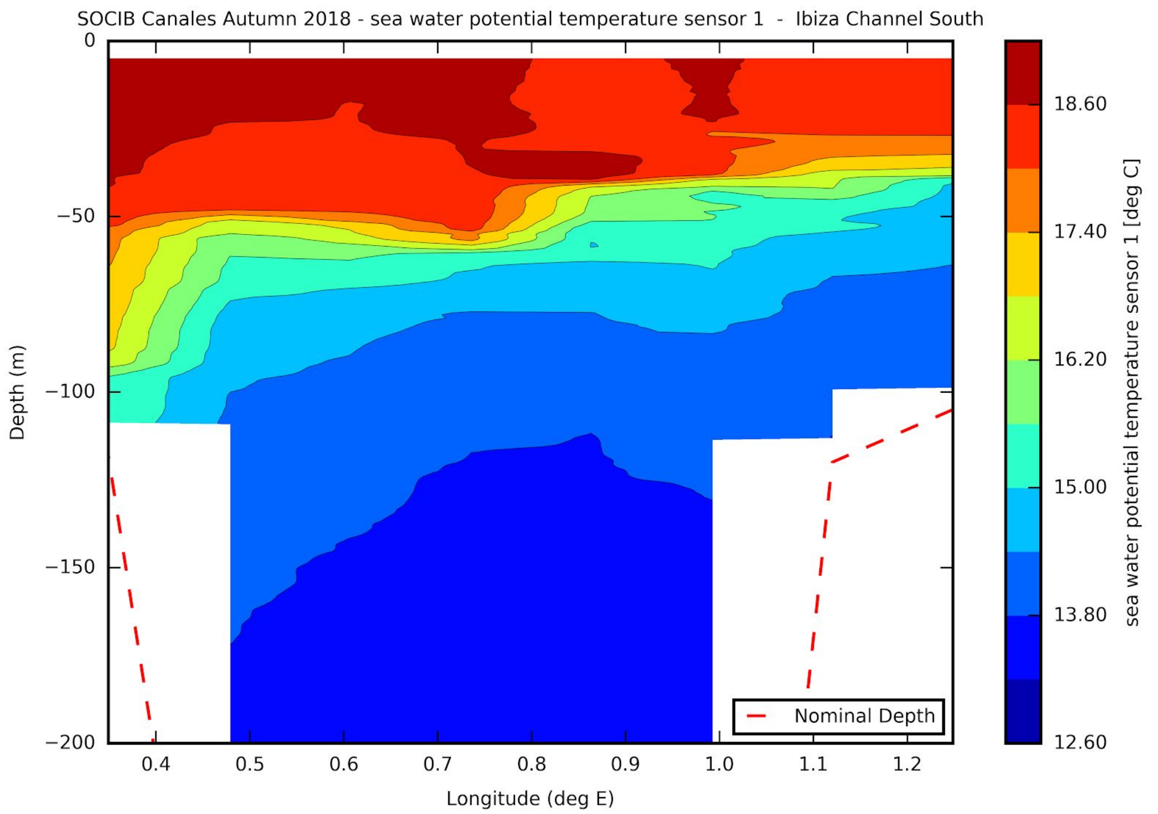

Fig. 7a. Potential temperature (ºC) of the southernmost IC cross-section.

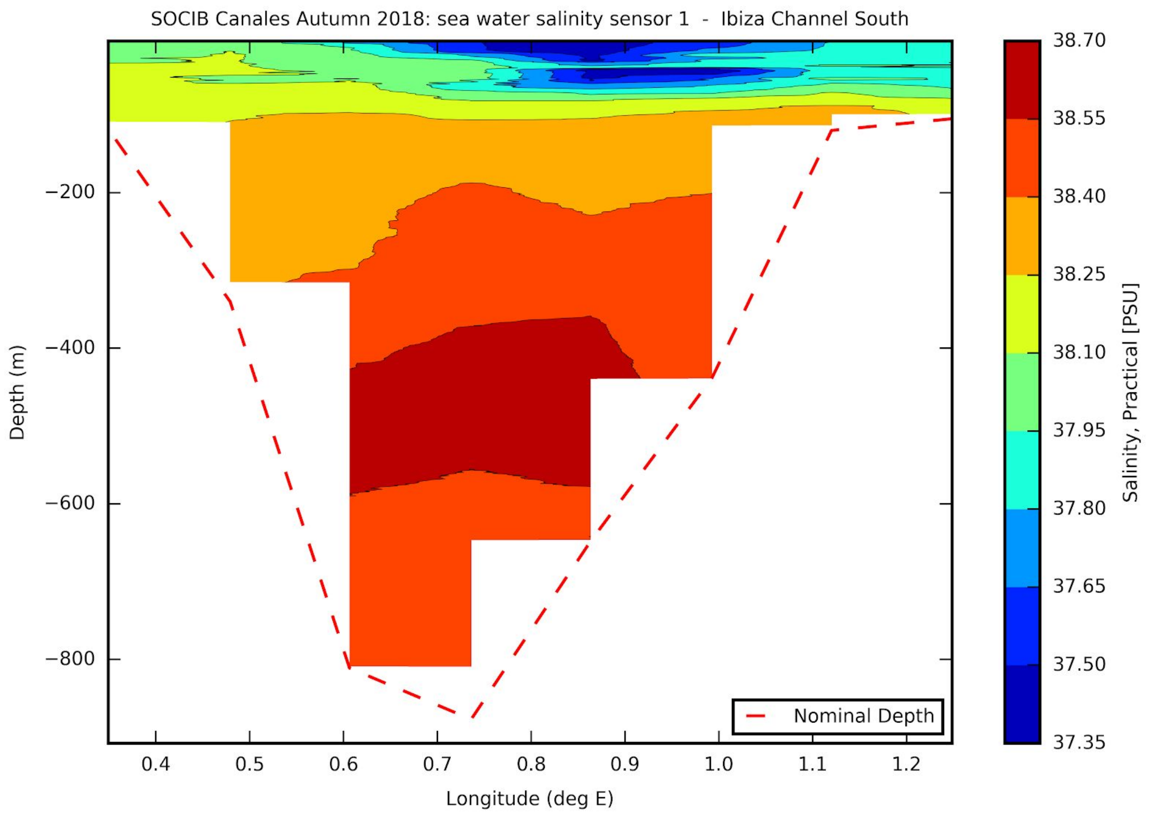

Fig. 7b. Salinity of the southernmost IC cross-section.

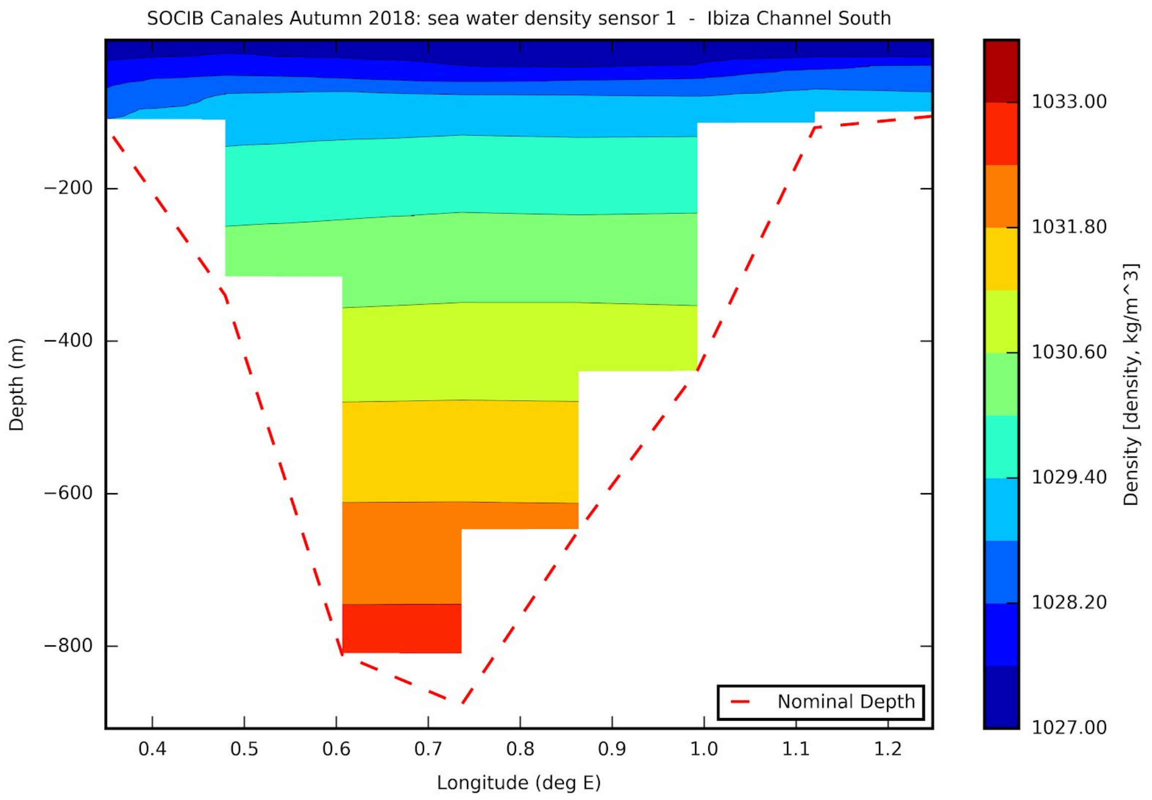

Fig. 7c. Density (kg m^{-3}) of the southernmost IC cross-section.

4. Mallorca Channel

Figure 8 shows the different variables acquired through the CTD profiles across the Mallorca Channel covering from 1.9º E (Ibiza shelf) til 2.4º E (Mallorca shelf). Profiles are shown mostly in the upper section ~200m depth.

Potential temperature (figure 8a) has an almost uniform vertical distribution presenting a weak temperature gradient between 13.20ºC and 19.20ºC.

Salinity (figure 8b) presents typical horizontal gradients on the continental shelves that are wider distributed around the Mallorca shelf than in the Ibiza shelf. Salinity vertical distribution range is 37.20psu - 38.70 psu.

Density (figure 8c) also presents a vertical distribution characterized by weak vertical gradients between 1026.80 and 1030 kgm-3. Profiles were taken only until 350 m depth due to operational constraints with the CTD.

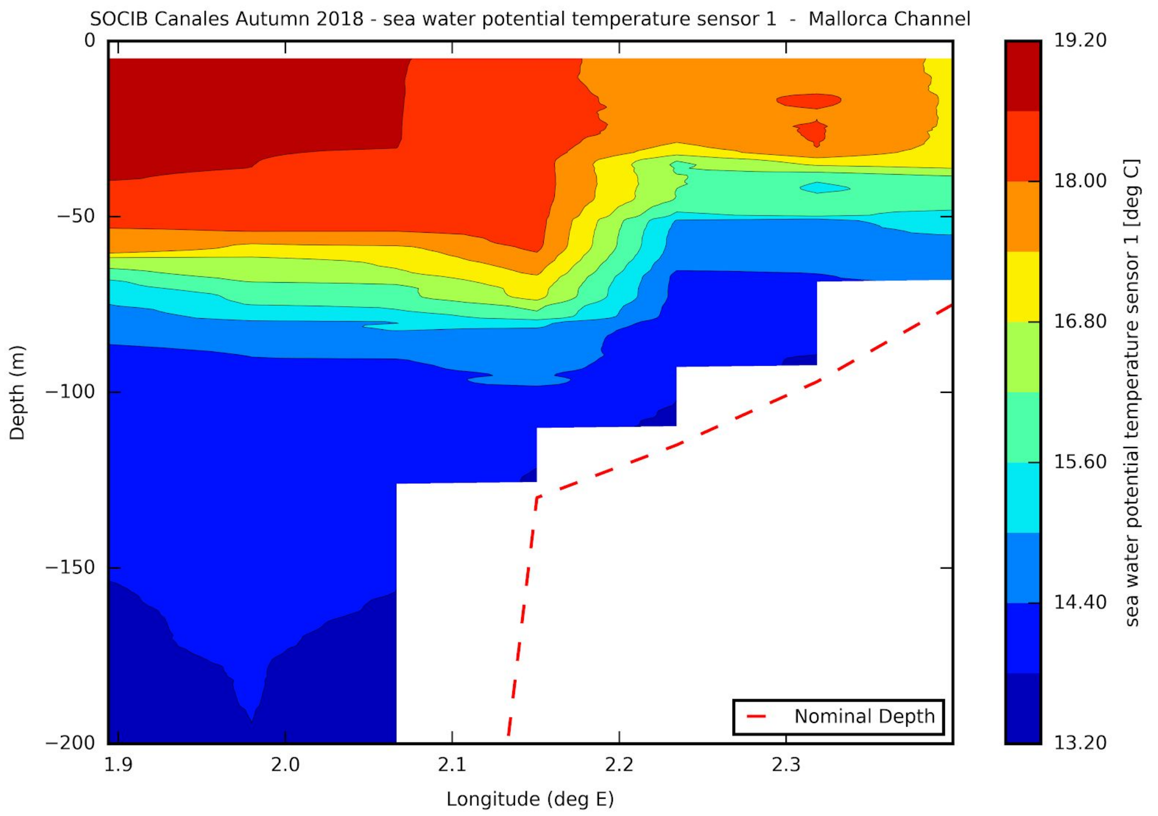

Fig. 8a. Temperature (ºC) of the MC cross-section (upper 200m section).

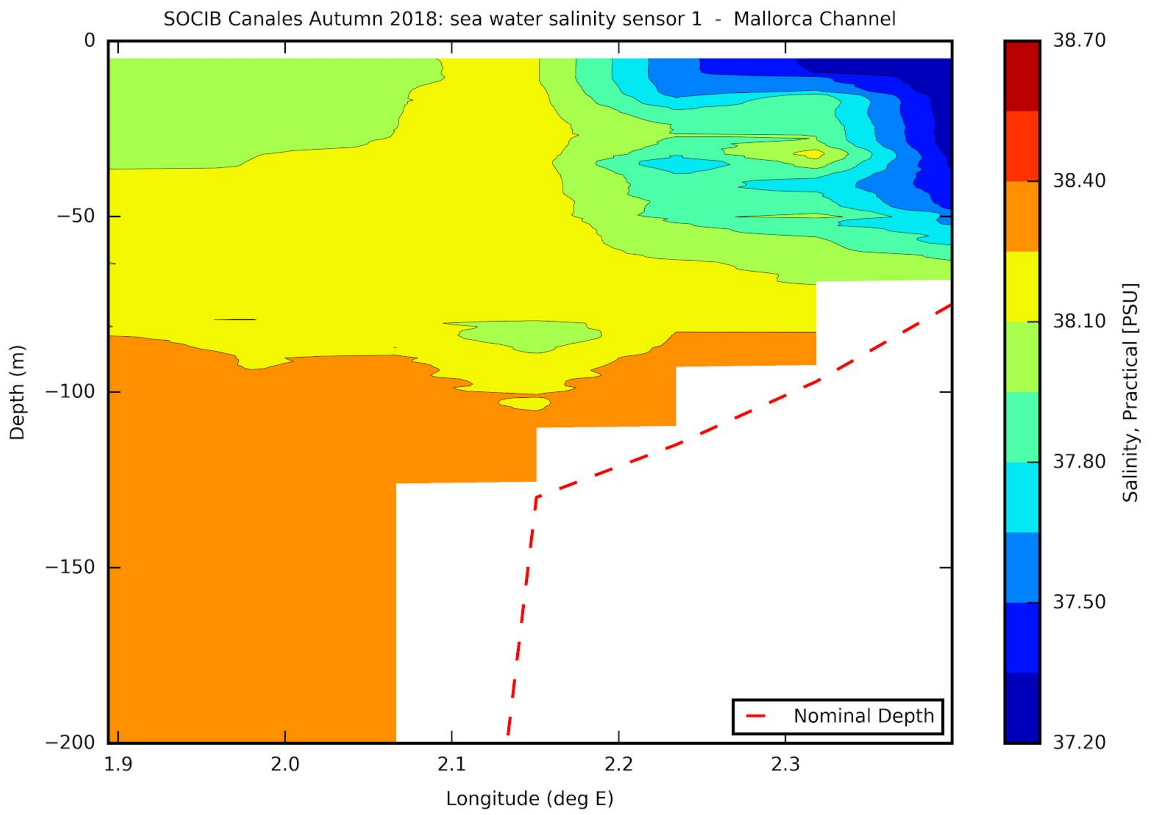

Fig. 8b. Salinity of the MC cross-section (upper 200m section).

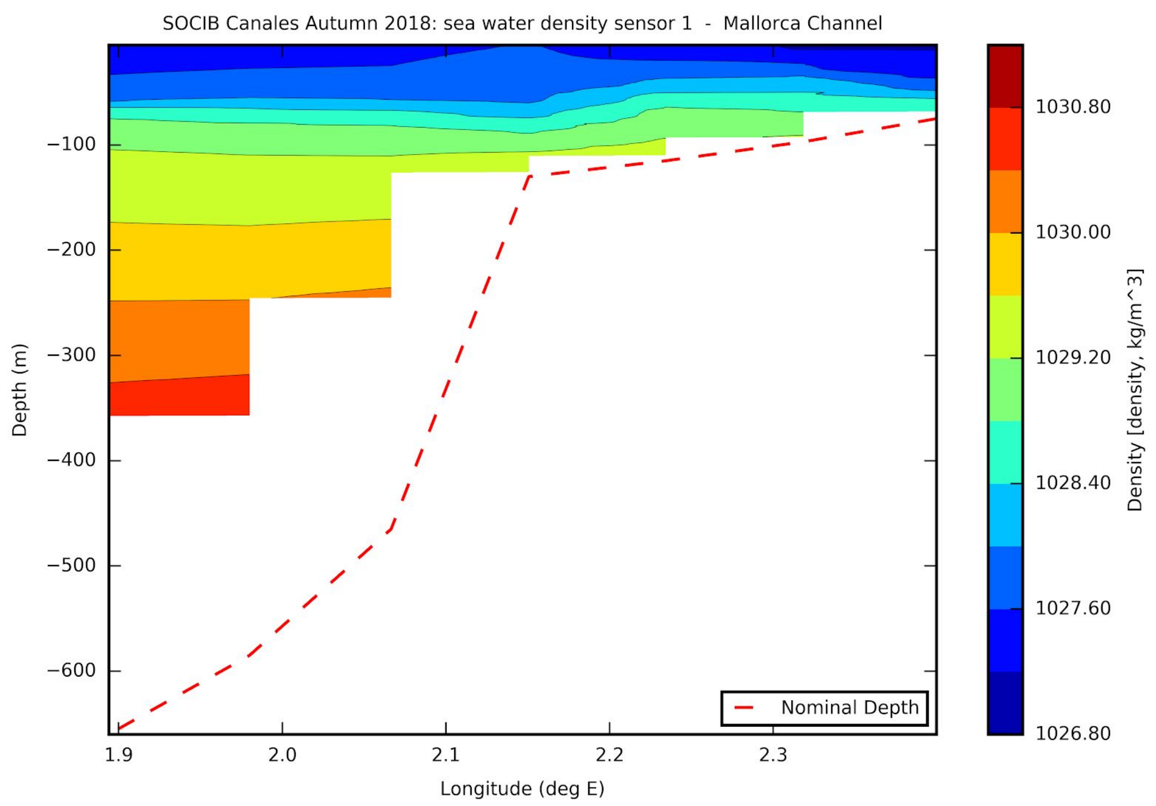

Fig. 8c. Density (kg m^{-3}) of the MC cross-section.

Preliminary biogeochemical results

The final biogeochemical dataset will be produced in due course following post-cruise analysis of the data.

1. Ibiza Channel: North

Below we present some preliminary results obtained with the CTD sensors for dissolved oxygen (Fig. 9a) and *in vivo* fluorescence (Fig. 9b) of northernmost transect of the IC. The chlorophyll fluorescence maximum depth is present at around 50 m (similarly to what we encountered in past years, see other reports). This relates to the maximum values encountered for dissolved oxygen (up to roughly 8 mg/l). However, while the maximum values of fluorescence are encountered near to the Ibiza coast the maximum oxygen values are encountered in the middle of the channel, indicating that this might be more related to the various water masses characteristics present (see Figs 6a and 6b).

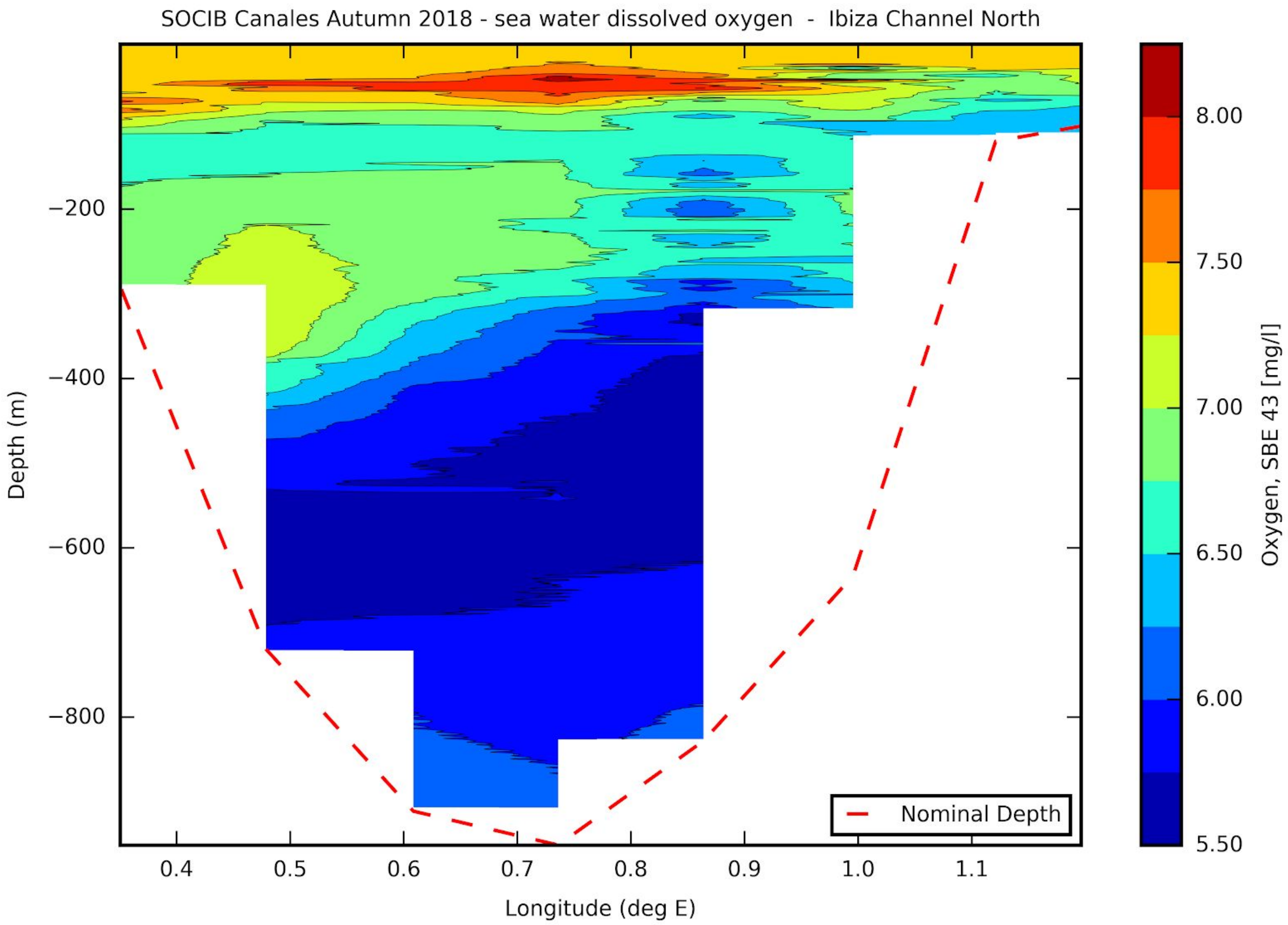

Fig. 9a: Initial figure for dissolved oxygen distribution obtained during the northern transect of the IC

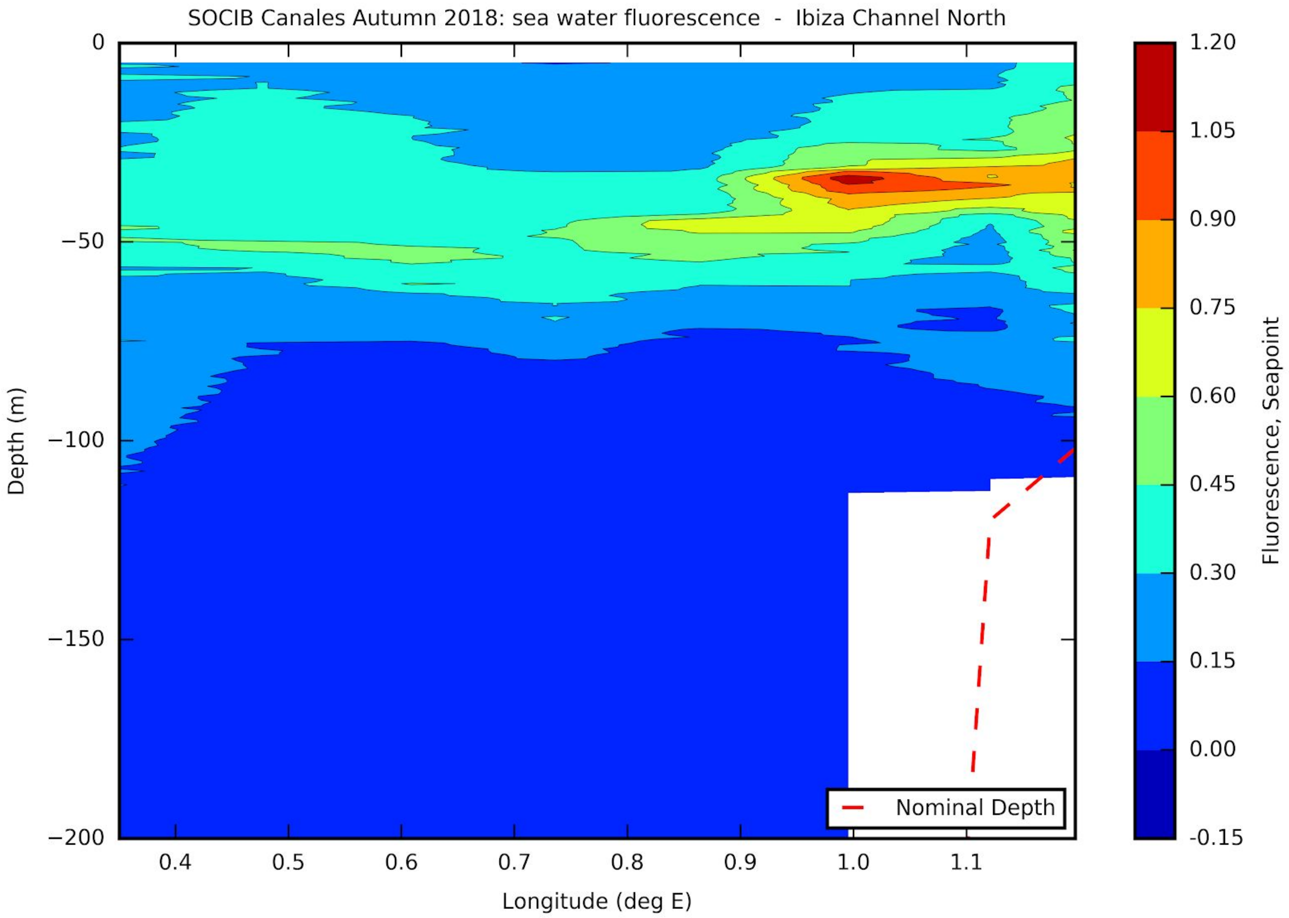

Fig. 9b: Initial figure for fluorescence distribution obtained during the northern transect of the IC

2. Ibiza Channel: South

In this most southern transect of the Ibiza Channel we found the maximum chl a fluorescence signal at around 40 m, with the higher values (1.2 mg/m3) associated to the Ibiza shelf side as for the oxygen (roughly 8 mg/l, see Figs. 10 a, b).

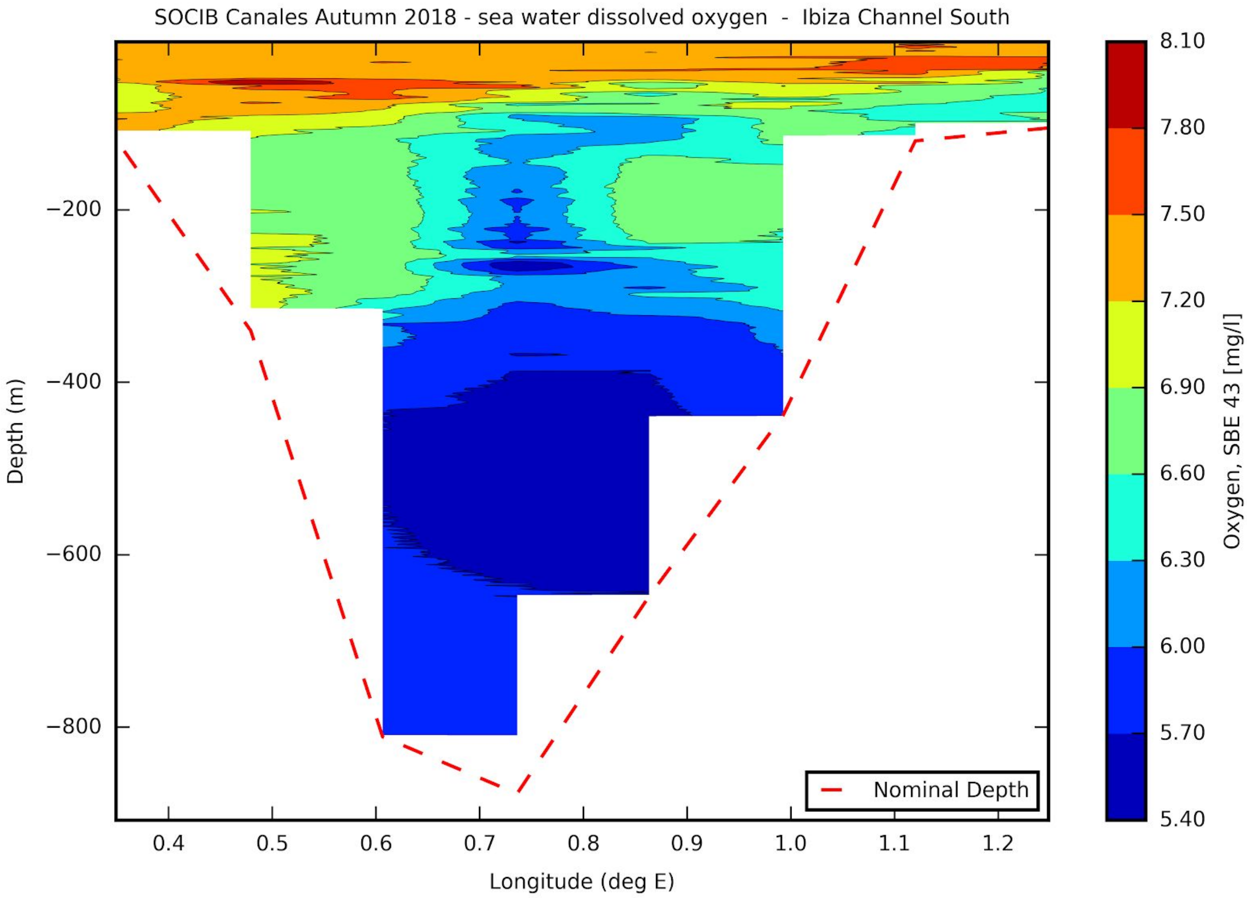

Fig. 10a: Initial figure for dissolved oxygen concentration distribution obtained on the southernmost IC cross-section.

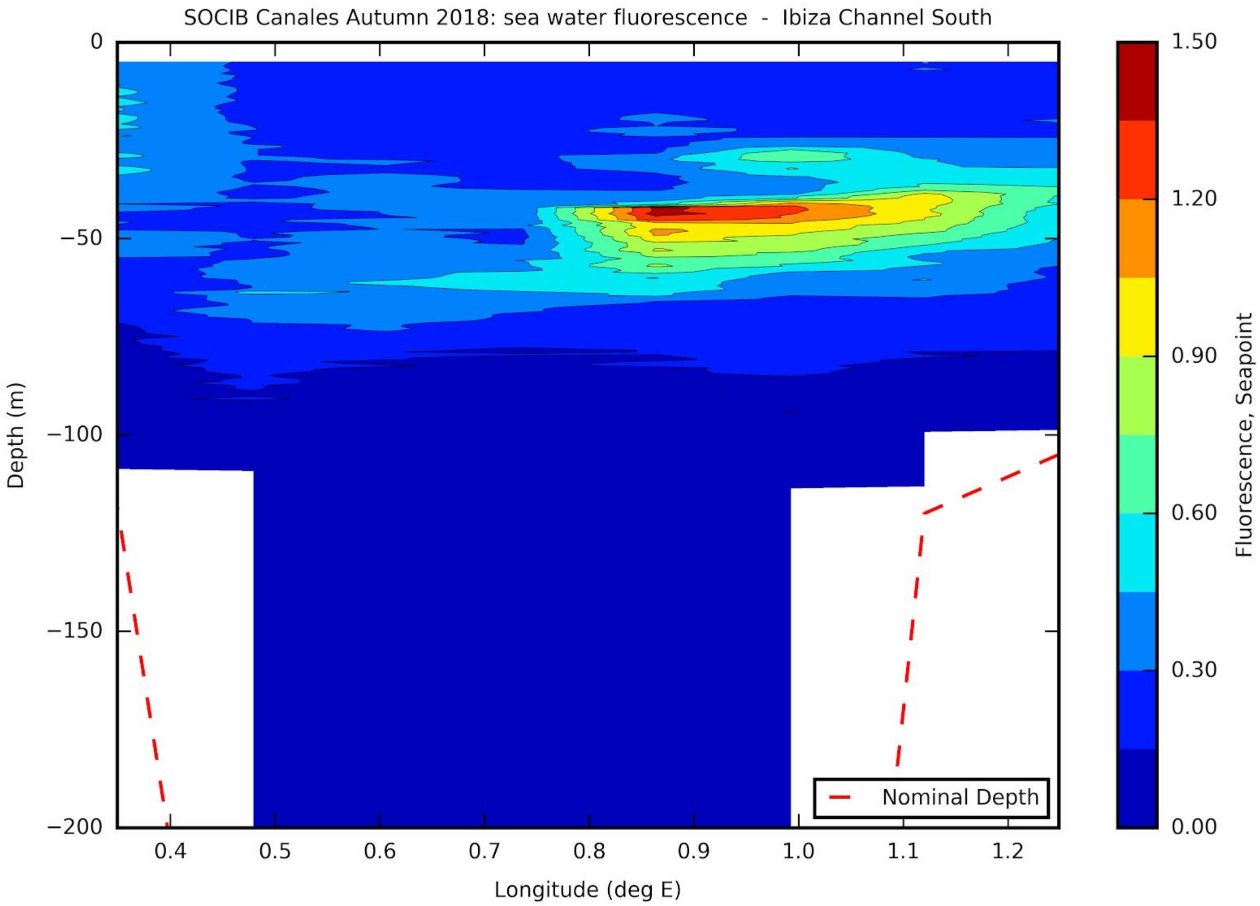

Fig. 10b: Initial figure for fluorescence distribution obtained on the the southernmost IC cross-section.

3. Mallorca Channel

The preliminary results obtained with the CTD sensors, indicate that the maximum chl *a* fluorescence depth in the Mallorca Channel-as for the Ibiza Channel- is around 40-50 m (see Fig. 11 b) and the maximum values for dissolved oxygen are found in the Mallorca shelf side (2.4- 2.2ºE).

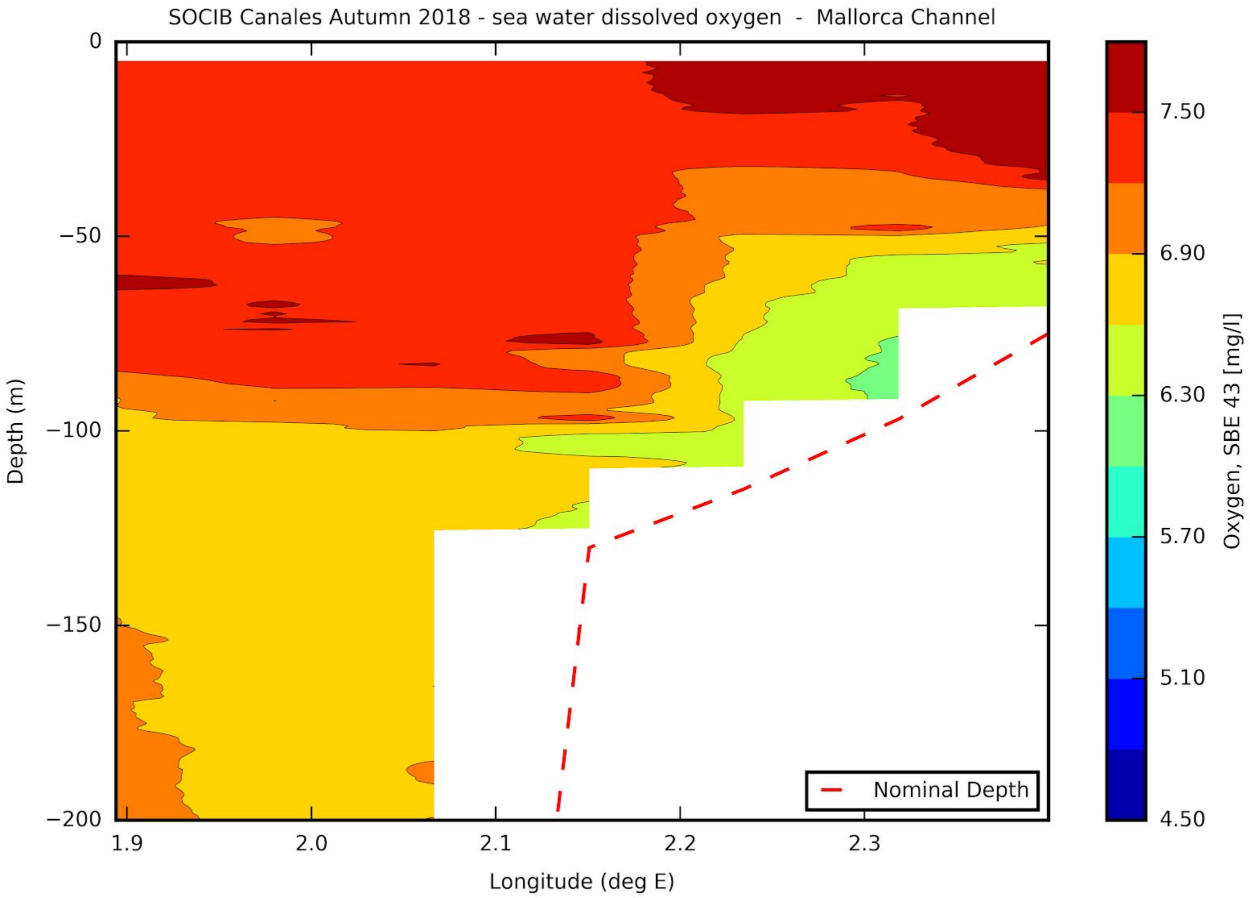

Fig. 11a: Initial figure for dissolved oxygen concentration distribution obtained on the Mallorca Channel cross-section.

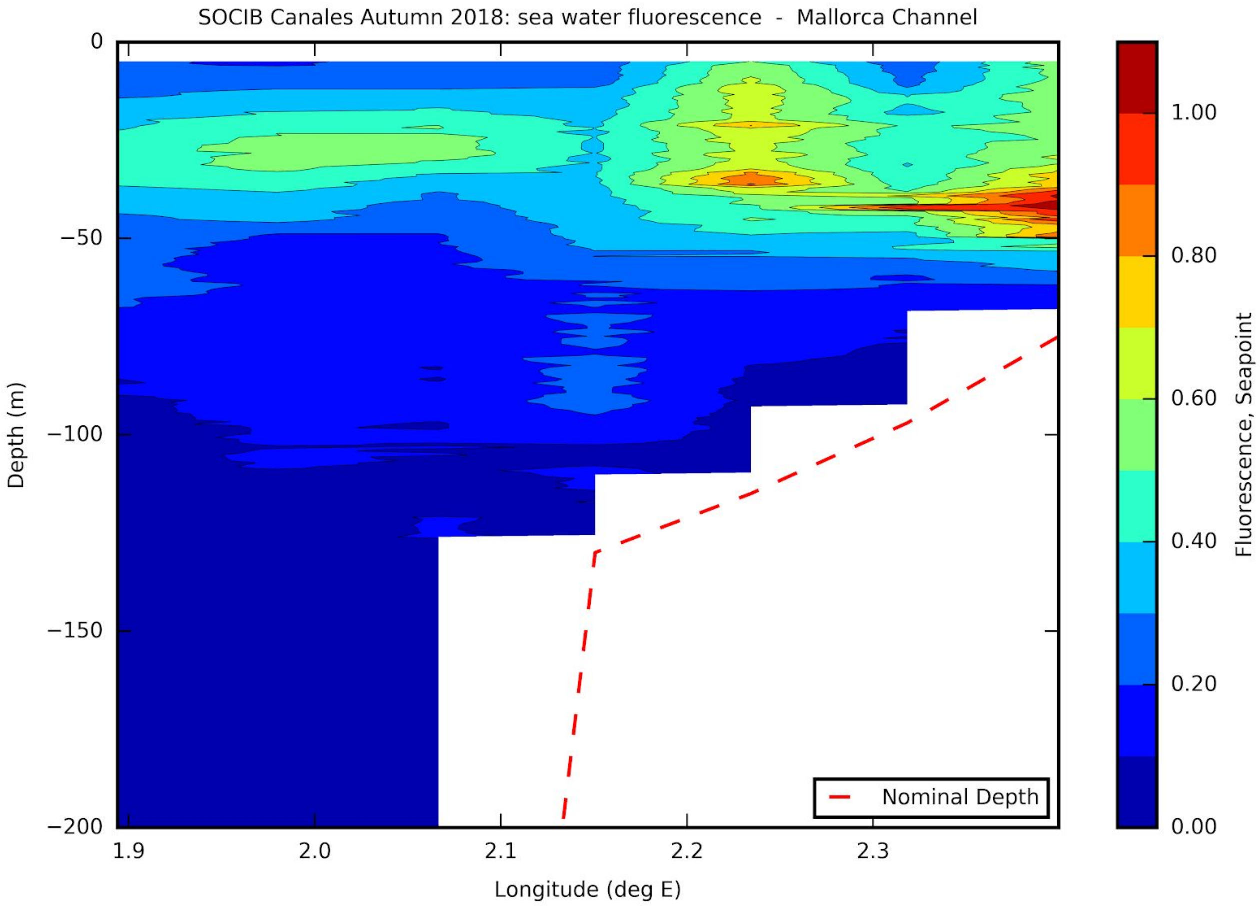

Fig. 11b: Initial figure for fluorescence distribution obtained on the the Mallorca Channel cross-section.

Problems encountered

Due to the missfunction occurred with the water pump of the CTD, the downcast profiles from the following files were cut at different depths (upcasts removed), where the pump failed, the upper layer profile of these files presents a normal distribution:

- Radmed_05bis: 245m
- Radmed_06: 357m
- Radmed_07: 472m
- Radmed_08: 160m
- S2_03: 323m

Seadatanet Cruise Summary Report Link

The SDN-ICES Cruise Summary Report that references to this cruise is available through the following link:

http://seadata.bsh.de/Cgi-csr/retrieve_sdn2/csrreport.pl?project=SDN&session=34055&v1=10&v2=3&pcode=

Processed Data Repository

Data Source	Thredds URL
Position	http://thredds.socib.es/thredds/catalog/research_vessel/gps/socib_rv-scb_pos001/L1/2018/11/catalog.html?dataset=research_vessel/gps/socib_rv-scb_pos001/L1/2018/11/dep0054_socib-rv_scb-pos001_L1_2018-11-13.nc
Thermosal	http://thredds.socib.es/thredds/catalog/research_vessel/thermosalinometer/socib_rv-scb_tsl001/L1/2018/11/catalog.html?dataset=research_vessel/thermosalinometer/socib_rv-scb_tsl001/L1/2018/11/dep0049_socib-rv_scb-tsl001_L1_2018-11-13.nc
Meteo Station	http://thredds.socib.es/thredds/catalog/research_vessel/weather_station/socib_rv-scb_met009/L1/2018/11/catalog.html?dataset=research_vessel/weather_station/socib_rv-scb_met009/L1/2018/11/dep0050_socib-rv_scb-met009_L1_2018-11-13.nc
CTD	http://thredds.socib.es/thredds/catalog/research_vessel/ctd/socib_rv-ems_sbe9001/L1/2018/catalog.html?dataset=research_vessel/ctd/socib_rv-ems_sbe9001/L1/2018/dep0013_socib-rv_ems-sbe9001_L1_2018-11-13.nc
VM-ADCP	-

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.

Pidcock R., Srokosz M., Allen J., Harman M., Painter S., Mowlem M., Hydes D., Martin A. (2010). Integration of an ultra-violet spectrophotometer on-board a towed vehicle for 3-D mapping of submesoscale nitrate variabililty. Journal of Ocean and Atmospheric Technology 27:1410–1416.

Pollard R., Read J. (1989). A method for calibrating shipmounted acoustic Doppler profilers and the limitations of gyro compasses. Journal of Atmospheric and Oceanic Technology 6:859–865.

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

APPENDIX 1: Activities through Canales Autumn 2018

For a table of all ship activities logged during the campaign, refer to the excel file, SHIP_LOGBOOK.

APPENDIX 2: CTD configuration files in Canales Autumn 2018

RADMED_01.XMLCON

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    <!-- 1 == SBE11plus Firmware Version < 5.0 -->
    <!-- 2 == SBE 17plus SEARAM -->
    <!-- 3 == None -->
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RADMED_08.XMLCON

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S2_01.XMLCON


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        <!-- 2 == SBE 17plus SEARAM -->
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<D1>3.930500e-002</D1>
<D2>0.000000e+000</D2>
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<T2>-3.774890e-004</T2>
<T3>4.089890e-006</T3>
<T4>2.639820e-009</T4>
<Slope>0.99998128</Slope>
<Offset>-0.97967</Offset>
<T5>0.000000e+000</T5>
<AD590M>1.281100e-002</AD590M>
<AD590B>-9.236760e+000</AD590B>
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</Sensor>
<Sensor index="3" SensorID="38" >
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<!-- Coefficients for Owens-Millard equation. -->
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<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>5.2307e-001</Soc>
<offset>-0.4839</offset>
<A>-4.0418e-003</A>
<B> 1.6399e-004</B>
<C>-2.4584e-006</C>
<D0> 2.5826e+000</D0>
<D1> 1.92634e-004</D1>
<D2>-4.64803e-002</D2>
<E> 3.6000e-002</E>
<Tau20> 1.3600</Tau20>
<H1>-3.3000e-002</H1>
<H2> 5.0000e+003</H2>
<H3> 1.4500e+003</H3>
</CalibrationCoefficients>
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</Sensor>
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<SerialNumber></SerialNumber>
<CalibrationDate></CalibrationDate>
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</NotInUse>
</Sensor>
<Sensor index="5" SensorID="20" >
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<SerialNumber>5187</SerialNumber>
<CalibrationDate>Sep 18</CalibrationDate>
<ScaleFactor>1.00000000e+001</ScaleFactor>
<!-- Dark output -->
<Vblank>0.0590</Vblank>
</FluoroWetlabECO_AFL_FL_Sensor>
</Sensor>
<Sensor index="6" SensorID="67" >
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<CalibrationDate>Sep 18</CalibrationDate>
<ScaleFactor>20.000000</ScaleFactor>
<!-- Dark output -->
<DarkVoltage>0.076000</DarkVoltage>
</TurbidityMeter>
</Sensor>
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<AltimeterSensor SensorID="0" >
<SerialNumber>74738</SerialNumber>
<CalibrationDate>Sep 18</CalibrationDate>
<ScaleFactor>15.000</ScaleFactor>
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</AltimeterSensor>
</Sensor>
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<SerialNumber></SerialNumber>
<CalibrationDate></CalibrationDate>
<OutputType>2</OutputType>
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</NotInUse>
</Sensor>
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<PAR_BiosphericalLicorChelseaSensor SensorID="42" >
<SerialNumber>4633</SerialNumber>
<CalibrationDate></CalibrationDate>
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<CalibrationConstant>2061855670.00000000</CalibrationConstant>
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<Offset>-0.69621238</Offset>
</PAR_BiosphericalLicorChelseaSensor>
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          <RatioMultiplier>1.00000000</RatioMultiplier>
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</SBE_InstrumentConfiguration>
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S2_04.XMLCON


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<?xml version="1.0" encoding="UTF-8"?>
<SBE_InstrumentConfiguration SB_ConfigCTD_FileVersion="7.23.0.2" >
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          <Name>SBE 911plus/917plus CTD</Name>
          <FrequencyChannelsSuppressed>2</FrequencyChannelsSuppressed>
          <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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<B>0.00000000e+000</B>
<C>0.00000000e+000</C>
<D>0.00000000e+000</D>
<F0_Old>0.000</F0_Old>
<G>4.34233085e-003</G>
<H>6.38176959e-004</H>
<I>2.15872372e-005</I>
<J>1.95907572e-006</J>
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<Slope>1.00000000</Slope>
<Offset>0.0000</Offset>
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<!-- Cell const and series R are applicable only for wide range sensors. -->
<SeriesR>0.0000</SeriesR>
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<ConductivityType>0</ConductivityType>
<Coefficients equation="0" >
<A>0.00000000e+000</A>
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</Coefficients>
<Coefficients equation="1" >
<G>-9.98949536e+000</G>
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<J>3.16551260e-004</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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<C3>1.565600e-002</C3>
<D1>3.930500e-002</D1>
<D2>0.000000e+000</D2>
<T1>2.988608e+001</T1>
<T2>-3.774890e-004</T2>
<T3>4.089890e-006</T3>
<T4>2.639820e-009</T4>
<Slope>0.99998128</Slope>
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<AD590B>-9.236760e+000</AD590B>
</PressureSensor>
</Sensor>
<Sensor index="3" SensorID="38" >
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<SerialNumber>3734</SerialNumber>
<CalibrationDate>01-Sep-18</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>5.2307e-001</Soc>
<offset>-0.4839</offset>
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<B> 1.6399e-004</B>
<C>-2.4584e-006</C>
<D0> 2.5826e+000</D0>
<D1> 1.92634e-004</D1>
<D2>-4.64803e-002</D2>
<E> 3.6000e-002</E>
<Tau20> 1.3600</Tau20>
<H1>-3.3000e-002</H1>
<H2> 5.0000e+003</H2>
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</Sensor>
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</NotInUse>
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<SerialNumber>5187</SerialNumber>
<CalibrationDate>Sep 18</CalibrationDate>
<ScaleFactor>1.00000000e+001</ScaleFactor>
<!-- Dark output -->
<Vblank>0.0590</Vblank>
</FluoroWetlabECO_AFL_FL_Sensor>
</Sensor>
<Sensor index="6" SensorID="67" >
<TurbidityMeter SensorID="67" >
<SerialNumber>5187</SerialNumber>
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<ScaleFactor>20.000000</ScaleFactor>
<!-- Dark output -->
<DarkVoltage>0.076000</DarkVoltage>
</TurbidityMeter>
</Sensor>
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            </SensorArray>
  </Instrument>
</SBE_InstrumentConfiguration>
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