SOCIB Balearic Islands Coastal Observing and Forecasting System

CRUISE REPORT

SOCIB Canales WINTER 2019:

5th to 6th March 2019

SOCIB_ENL_CANALES_MAR2019_WINTER

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Description:	A repeat seasonal hydrographic survey of the Balearic Sea, monitoring the Ibiza and Mallorca Channels. 18 CTD stations were carried out over 2 days; the stations forming one transect across the Ibiza Channel (IC) and one transect across the Mallorca Channel (MC).
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Objectives

The Canales cruises have the following objectives:

1. To make two complete SOCIB-Canales CTD sections across the Ibiza Channel (IC) and a RADMED CTD section across the Mallorca Channel (MC). 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.

2. To make continuous current profile sections of the IC and MC 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.

3. Check the status of the ibiza channel buoy (the buoy is out of service due to maintenance work during this cruise).

4. Perform tests with the 'glider against rosette intercomparison cast' (GARICAST) glider-CTD intercalibration system (GARICASTS will not be performed during this cruise).

5. Perform a synchronized CTD cast with the glider currently deployed in the Ibiza channel.

6. Deployment and recovery of Canales gliders as necessary.

7. Deployment of lagrangian platforms as necessary.

Onboard personnel

ID	Name	Role	Affiliation
1	Niko Wirth	Chief Scientist /Lead Technicians/ Drifter and Argo Floats	SOCIB

2	Josep Baeza Montals	Physics Tech/CTD	SOCIB
3	Pau Balaguer	Physics Tech/CTD	SOCIB
4	Andrea Cabornero	Lead Biogeochemical sampling and analysis	SOCIB
5	Bertille Lefevre	Biogeochemical sampling and analysis (Master student)	Sorbonne Université/ SOCIB
6	Sara Vieitez	Biogeochemical sampling and analysis (Master student)	UIB/SOCIB
7	Eduardo Rodríguez	Biogeochemical sampling and analysis (Master student)	UIB/SOCIB
8	Lara Díaz	Biogeochemical sampling and analysis	SOCIB
9	-	-	-

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Station plan

19 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 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.

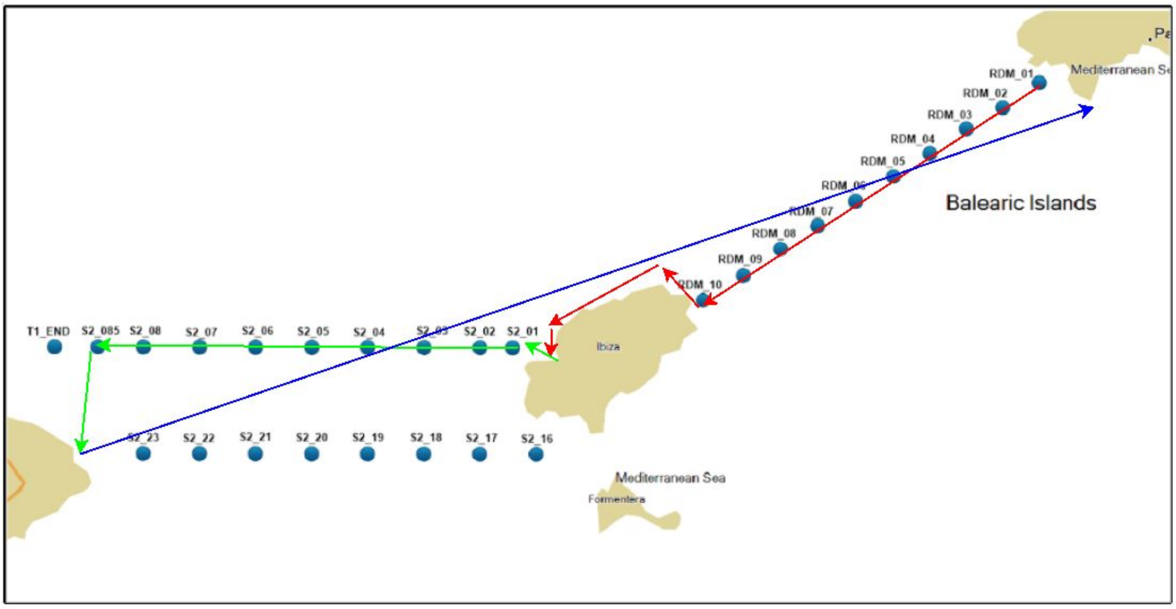


Fig. 1: Station plan

Cruise diary

Day 1 - 5th March 2019

Email sent by Nikolaus Wirth (Cruise leader) at the end of day 1:

We`ve just finished the Mallorca channel, all stations done and the NKE-profiler deployed.

The first stations in the morning were a little bit rough but after the midday it fairly ok, the motivation on board is fine and that counts.

Discussing with the captain, right now I've taken the decision of sailing directly to Denia (ETA 23:00 hora local) and starting tomorrow morning the northern line of the Ibiza channel (the glider one) from Denia. Having deployed the profiler and after the last CTD station we will continue directly to Palma with waves coming from SW (if the forecast models are right). You can imagine that I'm not very happy with skipping one channel line (and miss one night in Formentera) but like this I can be "sure" that we have at least one complete section of the ibiza channel and we do the second profiler deployment.

According to forecast the weather will get worse tomorrow afternoon, especially in the western part of the Ibiza channel stating growing waves by tomorrow afternoon. Starting from Sant Antoni I neither can’t be sure that we can do all stations on Wednesday nor start on Thursday morning with the southern line from Denia. Furthermore, Emma confirmed me that the HRF-antenna in Galf is out of service, so the deployment of the 2 SVPs don't make sense right now and will be delayed up to the next canales cruise.

Further arguments, less important but considerably, are

- the biochemical team can start analysing in port of Palma and will have it done by Thursday night.
- be sure we´re back before weekend, in order to avoid the risk of staying moored in Denia 1 whole day and doing biochemical analysis on Saturday
- reduce the risk of having problems with the A-frame, especially working under bad conditions. Next week they will repair before Calypso-Cruise.
- there are 4 new people on board (3 students and the new ETD) and would be nice to avoid that they get a terrible experience ... today was a little bit hard for some of them ...

I hope that is fine for you, I know it would be nice to have a perfect cruise according to the plan, but these are winter conditions and we are one and a have week before the Calypso cruise starts on the RV SOCIB.

Now, during the transit to Denia we will continue running the Thermosal and the ADCP.

Day 2 - 6th March 2019

Email sent by Nikolaus Wirth (Cruise leader) at the end of day 2:

Busy days the last two weeks but the canales winter cruise is done.

At the end we have done:

- in the Mallorca channel:
    - all Radmed stations
    - 2 ADCP tracks
    - 2 Termosal tracks
- in the Ibiza channel
    - S2_02 to S2_085 stations
    - 2 ADCP tracks
    - 2 Termosal tracks

All data is still on board, and as far as I know still in the individual PCs. The automatically backup is not yet installed. So ADCP data in PC-Lab4, CTD casts in PC-Lab1, Thermosal of both days in PC-Lab3. I had no time the last day to process the CTD data.

The biochemical samples and salinity bottles are all in IMEDEA.

The Logbook in paper format is in the laboratory for instrumentation.

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:	1023	
SOCIB Inventory:	SCB-SBE9001	
Deck Unit:	SBE11	
SOCIB Inventory:	SCB-SBE11001	

Sensor	Model	S/N	Calibration date
Temperature	SBE 3P	03P5391	31/10/2018
Temperature 2	SBE 3P	03P5425	31/10/2018
Conductivity	SBE4C	043718	27/09/2018
Conductivity 2	SBE4C	043907	18/10/2018
Pressure		1023	28/09/2018
Oxygen	SBE 43	1278 (UTM)	19/10/2018
Transmissometer	WET Labs C-Star 25-650	CST-1419DR	16/11/2018
Turbidity	STM Sea Point	12182	07/11/2018
Fluorometer	Seapoint 6000m	3259	07/11/2018
Irradiance	PAR Biospherical QCP-2300L-HP	70364	02/11/2018

Surface Irradiance	SPAR Superficie Biospherical QSR2200	20519	02/11/2018
Altimeter	Datasonics PSA-916D	69894	12/2018

Configuration

For controlling the CTD, the detail of the configuration file used is available in APPENDIX 2 of this report:

- RADMED_01.xmlcon

Thermo-salinometer

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

Configuration

Raw data is collected using NEREIDAS System and stored in the /datos/BaseDatosContinua/ORI/05-2019 directory. Raw hex data is under termosal.bin directory and ascii calibrated values under termosal.raw. Parsed data (.proc) files were created to support the dashboard but due to the limitations of the hardware/software architecture it was not possible to produce the required sample rate. Data will be reprocessed at DC after the campaign to fit the historical sample rates.

Weather Station

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

Configuration

Raw data is collected using NEREIDAS System and stored in the /datos/BaseDatosContinua/ORI/05-2019 directory. Raw hex data is under meteo.bin directory and ascii calibrated values under meteo.raw. Parsed data (.proc) files were created to support the dashboard but due to the limitations of the hardware/software architecture it was not possible to produce the required sample rate. Data will be reprocessed at DC after the campaign to fit the historical sample rates.

Scientific Reports

Physical data report

The following contains an overview of the physical data collected from the CTD and the VM-ADCP.

VM-ADCP

Throughout the entire cruise sections, a VM-ADCP was recording data about the movement of the upper 100-400 m of the water column. Generally penetration range was less than 200 m. The R/V SOCIB is equipped with a 150 kHz, RDI Ocean Surveyor, VM-ADCP (vessel-mounted Acoustic Doppler Current Profiler) transducer located in the port hull just forward of the accommodation bulkhead in front of the fuel tanks. Data is recorded and displayed real-time using the RDI developed software VmDas (RDI's data acquisition and playback software) and WinADCP (RDI's visualisation software).

Data processing: The basic data processing was carried out to SOCIB's VM-ADCP standard operating procedures (SOPs) within VM-DAS and WinADCP (refer to these documents for further details).

The initiation files for both bottom-tracking and water-tracking mode included the following settings:

- Transducer depth = 2 m
- Blank distance = 8 m
- Number of Bins = 50
- Bin thickness = 8 m
- Max range for bottom tracking = 400 m
- STA files (short term averaging) = 120 s
- LTA files (long term averaging) = 600 s

Calibration: The EA Heading alignment was set to 44.1° while the velocity scale factor for profile velocities was initially set to 1.0045. These values correct for misalignment between the VM-ADCP instrument and the ship. Throughout the cruise, a total of 1 transects was carried out in bottom-tracking mode for the purpose of misalignment calibration checks (as described in the SOPs).

CTD and water bottle sampling

Data acquisition: CTD casts were carried out at 19 stations encompassing 2 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.

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 10-AU 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 2, shows the potential temperature – salinity distribution of all stations of the entire water column, where colour indicates the longitude of the corresponding station.

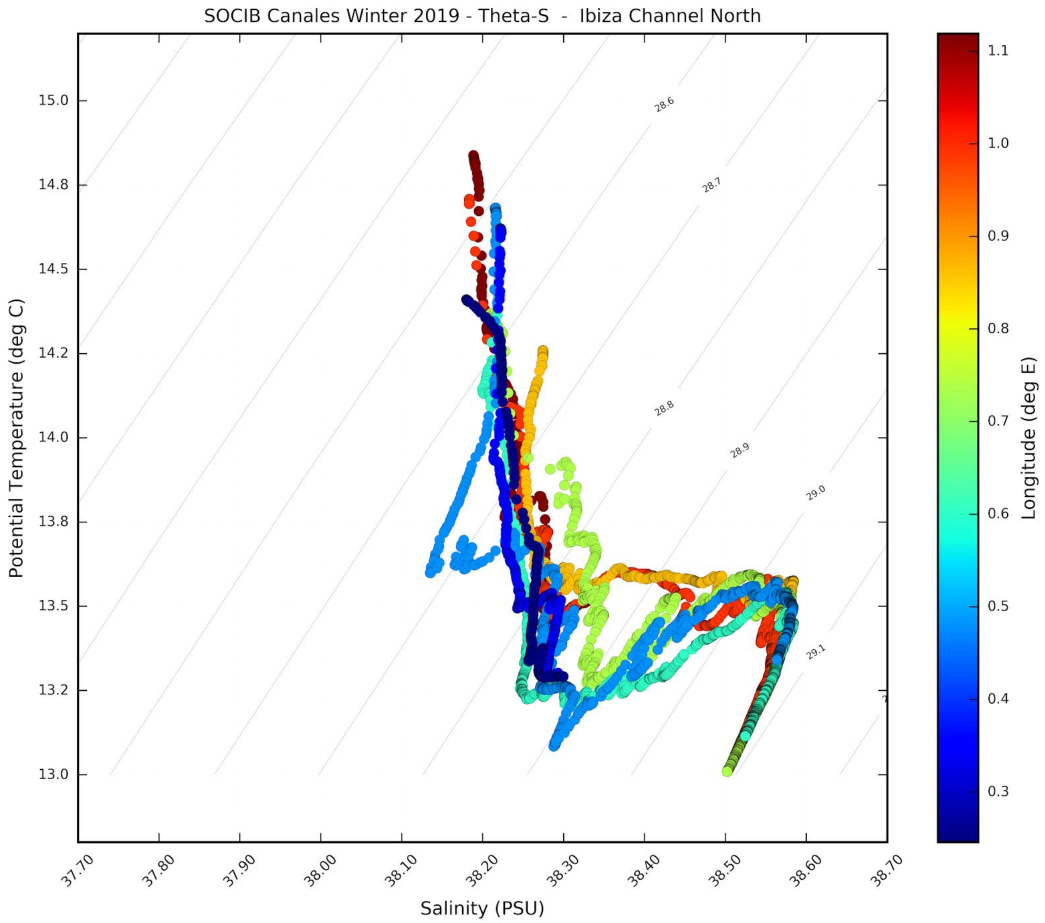


Fig 2a. T-S diagram of all ICN stations; the colour bar indicates the longitude of the station; thus the colour spectrum from red to blue corresponds to the ICN transect, from East to West.

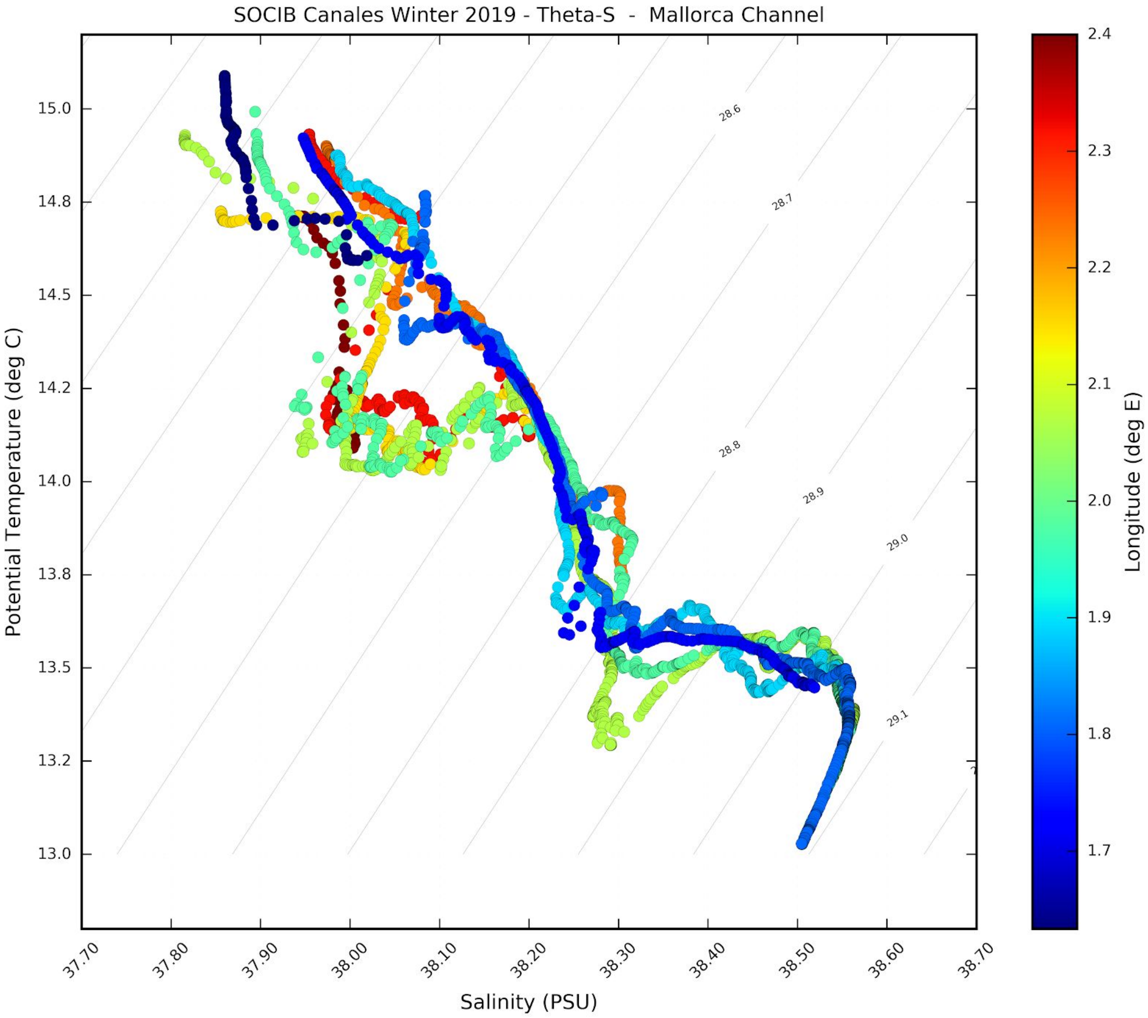
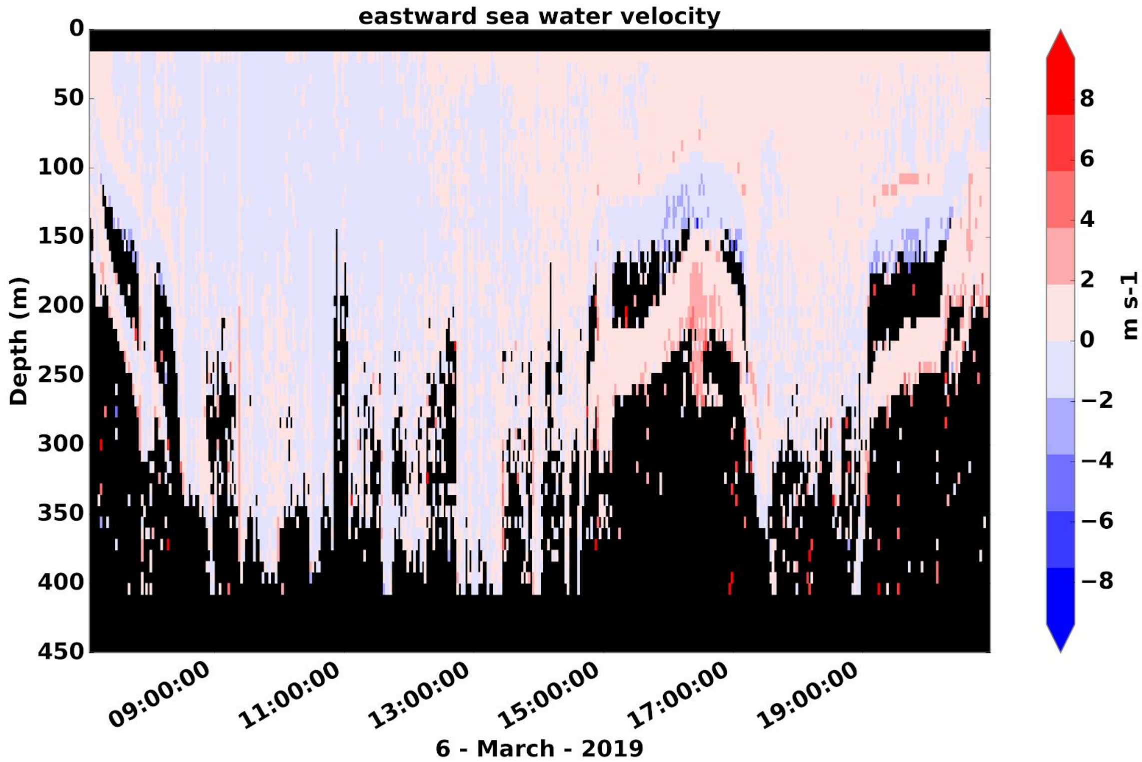


Fig 2b. T-S diagram of all MC stations; the colour bar indicates the longitude of the station; thus the colour spectrum from red to blue corresponds to the MC transect, from East to West.

2. Ibiza Channel: North

The figures presented in this section are showing the most northerly transect of the IC. Figure 3 shows the velocities u and v from the ADCP and their respective quality flags.



Data from instrument SCB-RDi001 on platform SOCIB RV   Teledyne RD Instruments Ocean Surveyor ADCP 150KHz s/n1878

Fig. 3a. east components of velocity (mm s^{-1}) plotted over time in the northern section of the IC during day 2.

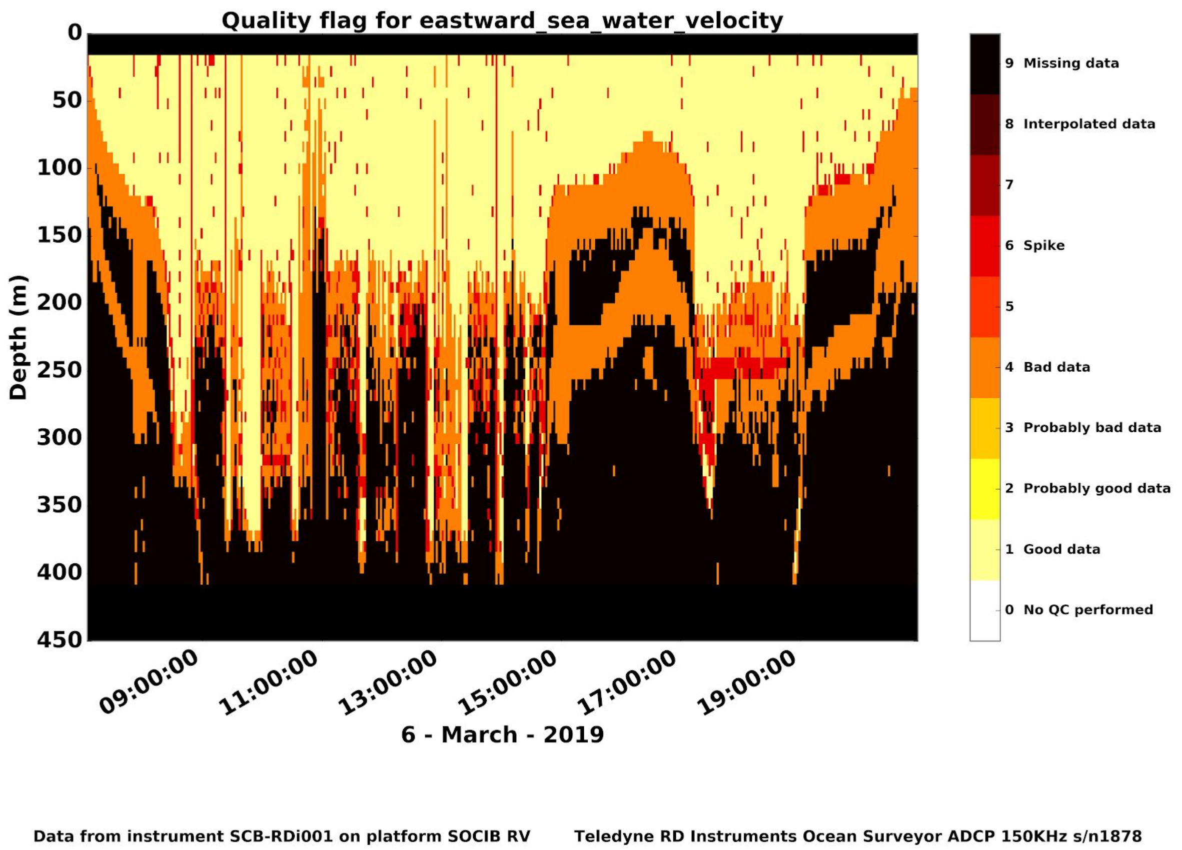


Fig. 3b. Quality flag for east components of velocity (mm s^{-1}) plotted over time in the northern section of the IC during day 2.

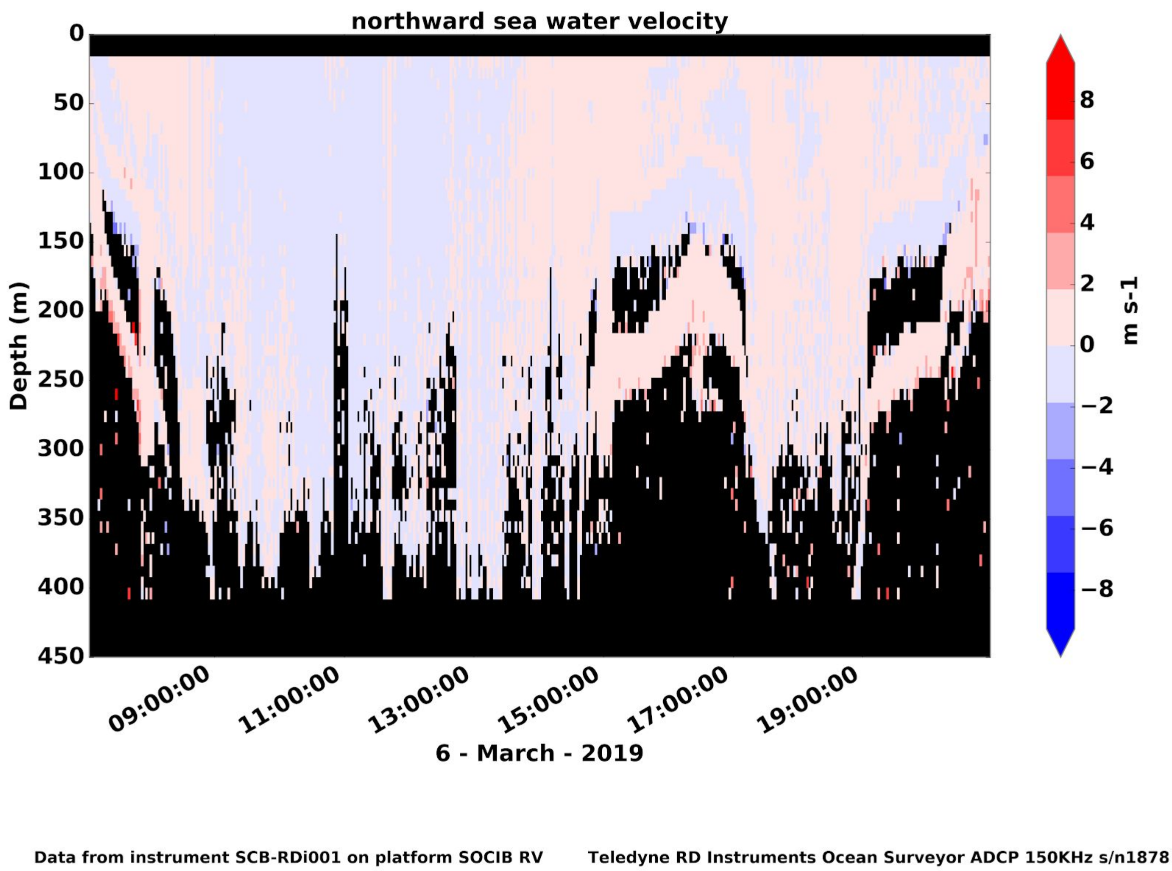


Fig. 3c. north components of velocity (mm s^{-1}) plotted over time in the northern section of the IC during day 2.

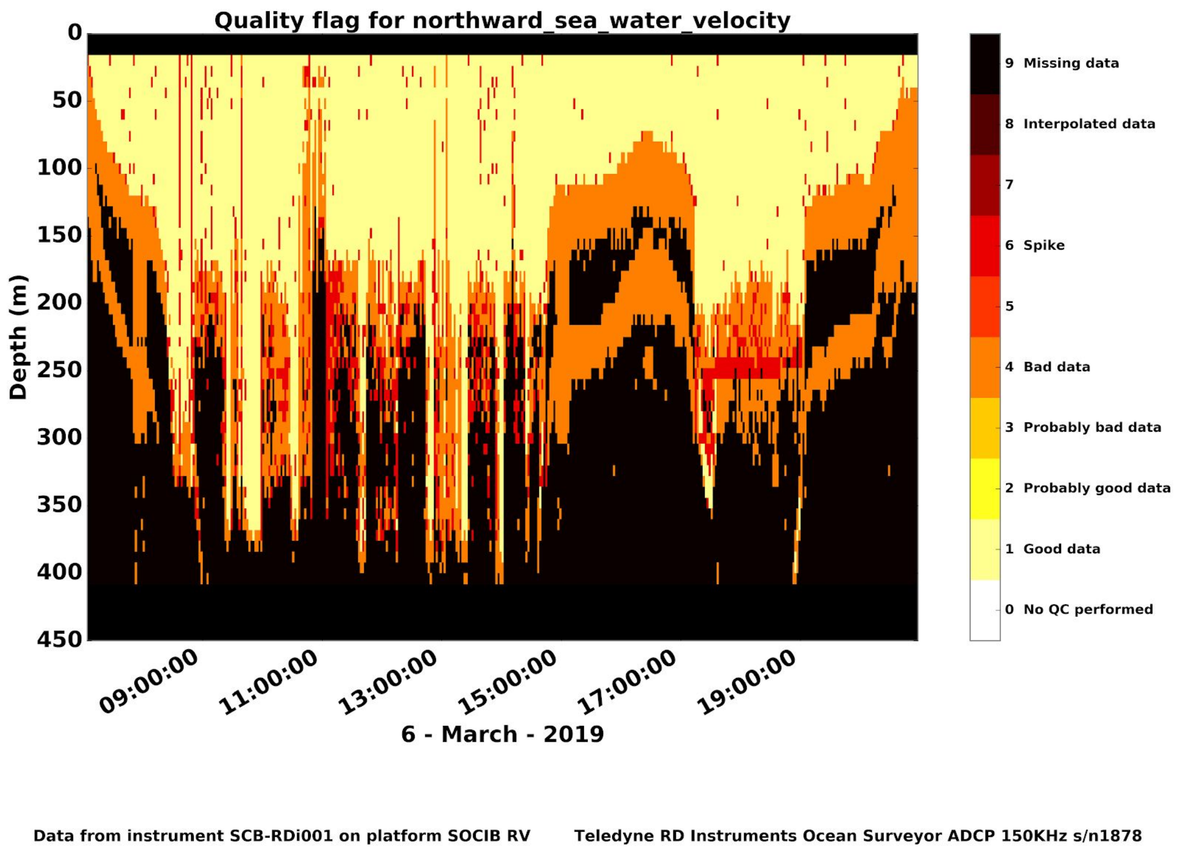


Fig. 3d. Quality flag for north components of velocity (mm s^{-1}) plotted over time in the northern section of the IC during day 2.

Figure 4 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).

Potential temperature (figure 4a) has an almost uniform vertical distribution presenting a weak temperature gradient between 13ºC and 15ºC. There is a stronger horizontal gradient in the western area (Peninsula shelf) from 0ºE until 0.7ºE.

Salinity (figure 4b) presents typical horizontal gradients on the continental shelves. Salinity vertical distribution range is 38.1 psu - 38.6 psu.

Density (figure 4c) also presents a typical winter vertical distribution characterized by weak vertical gradients.

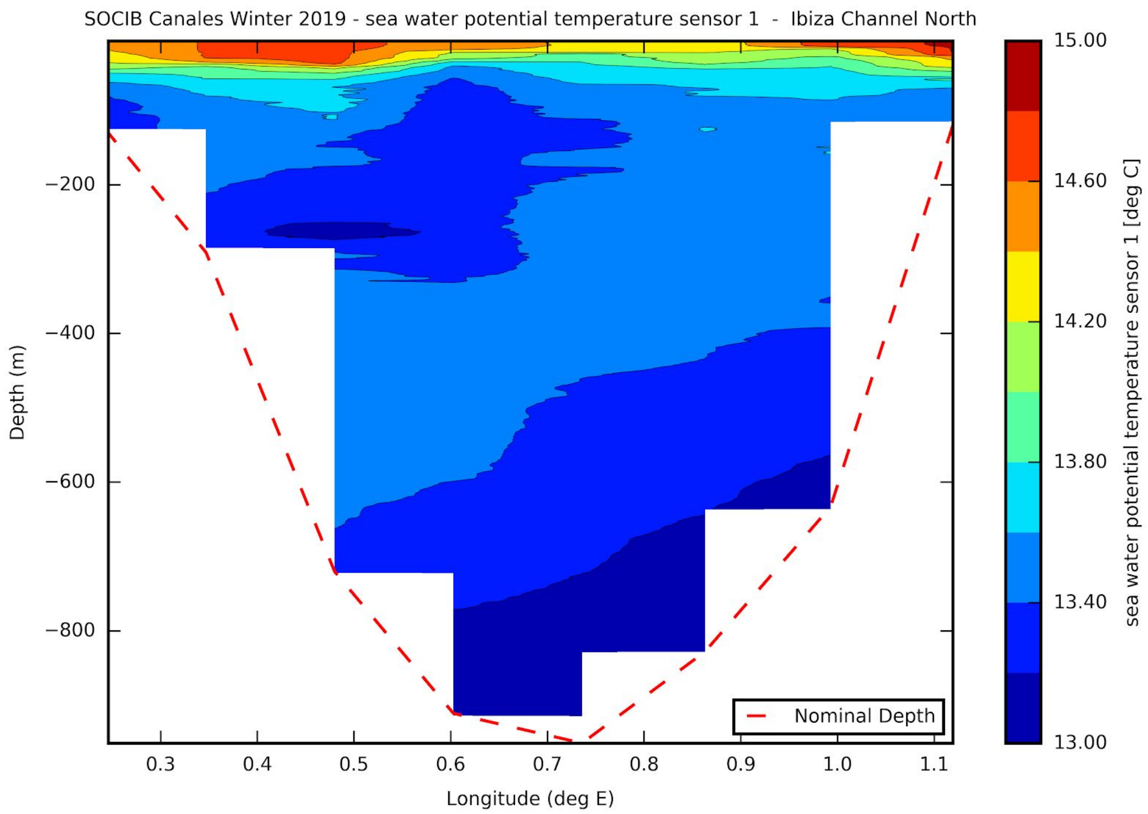


Fig. 4a. Potential Temperature (ºC) of the first (most northerly) transect of the IC.

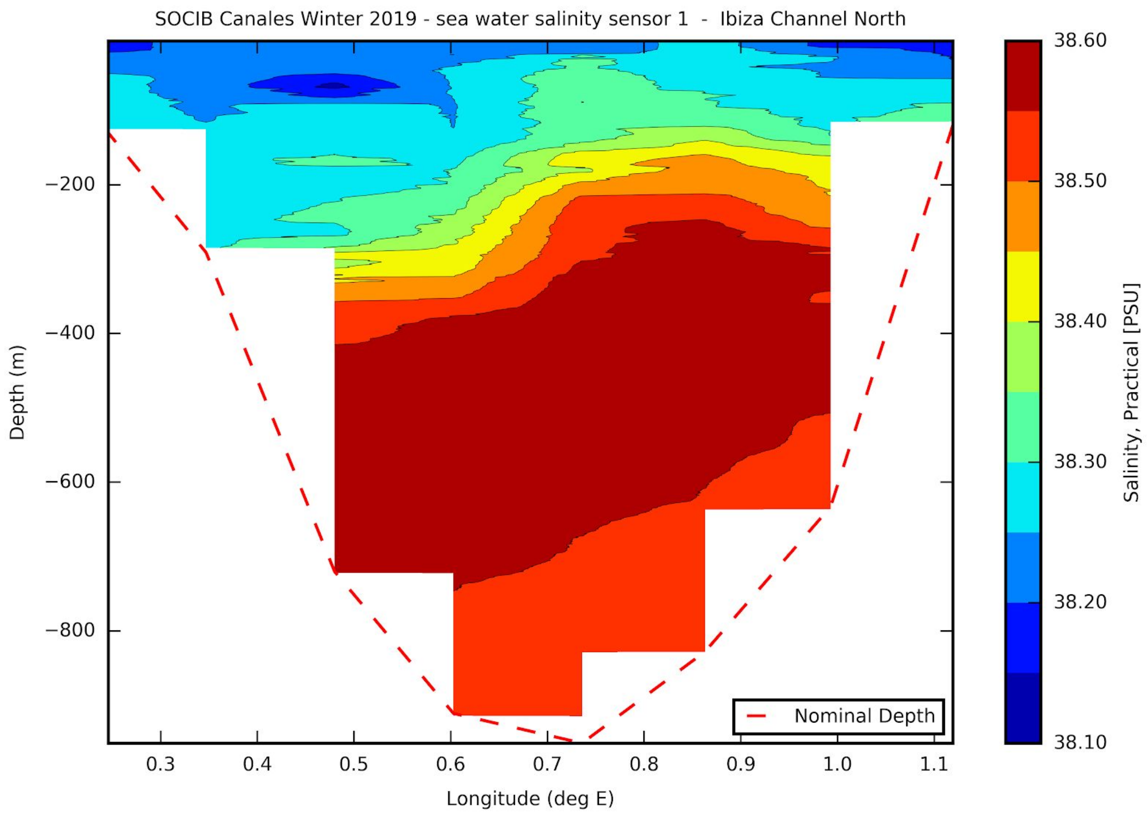


Fig. 4b. Salinity of the first (most northerly) transect of the IC.

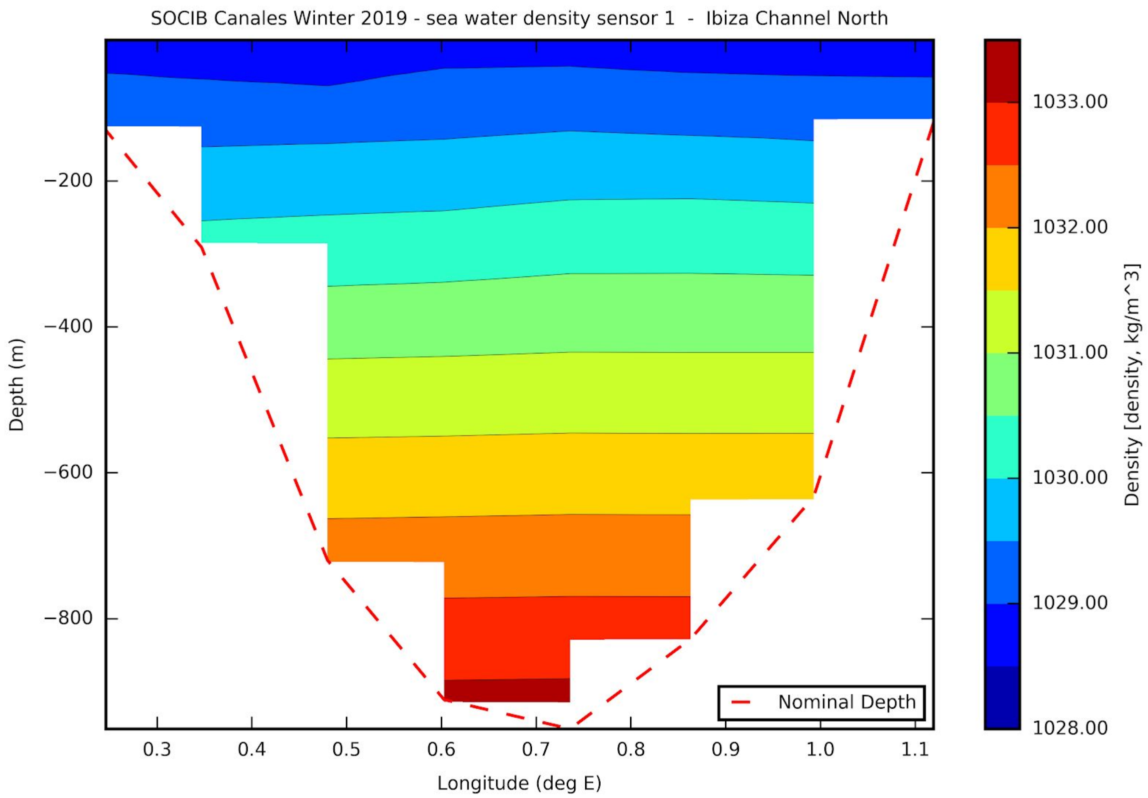
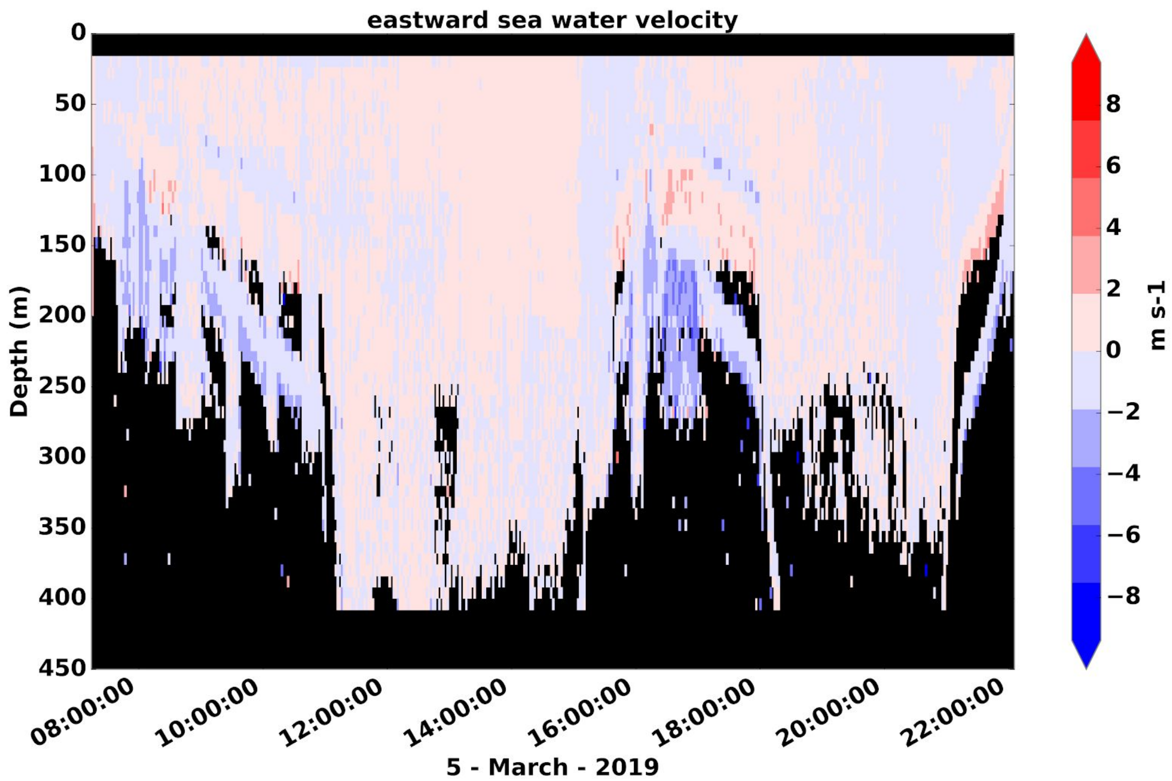


Fig. 4c. Density (kg m^{-3}) of the first (most northerly) transect of the IC.

4. Mallorca Channel

The figures presented in this section are showing the transect of the MC. Figure 5 shows the velocities u and v from the ADCP and their respective quality flags.



Data from instrument SCB-RDi001 on platform SOCIB RV   Teledyne RD Instruments Ocean Surveyor ADCP 150KHz s/n1878

Fig. 5a. East components of velocity (mm s^{-1}) plotted over time in the MC section during day 1.

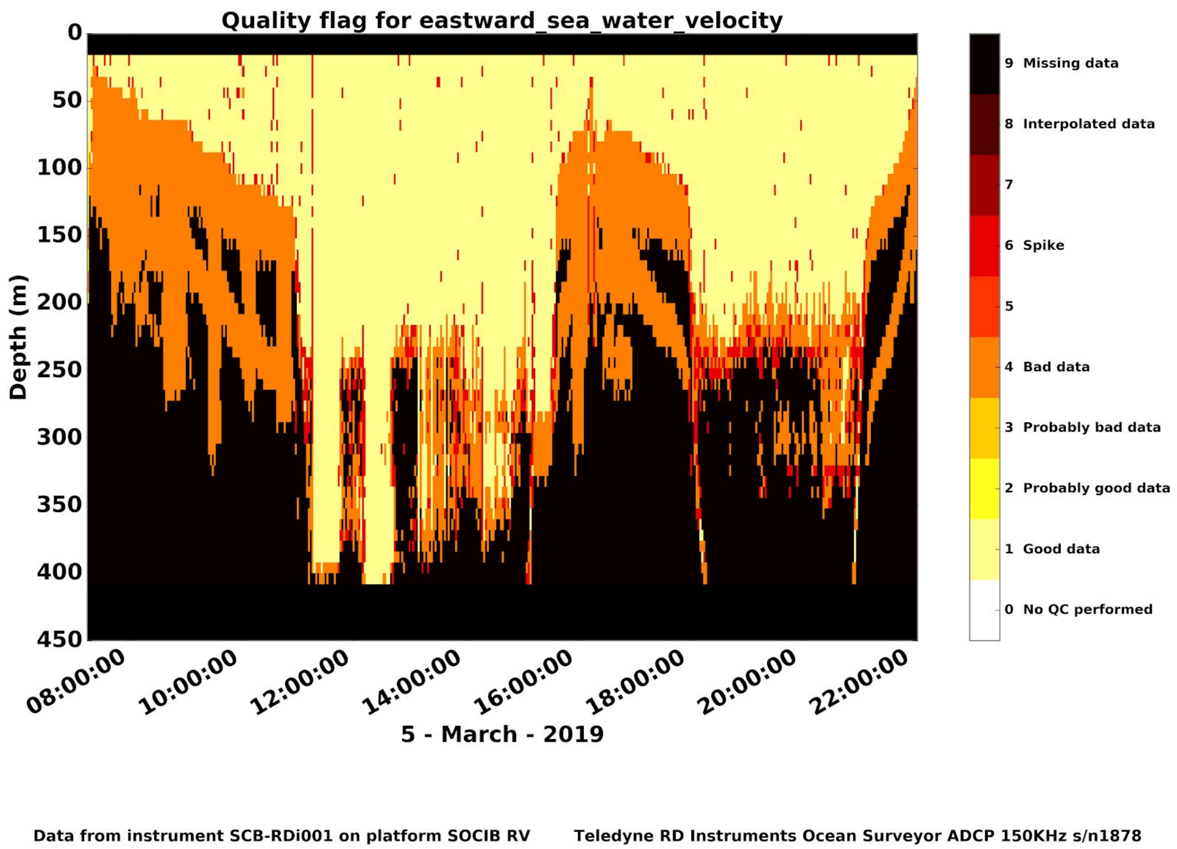


Fig. 5b. Quality flag for east components of velocity (mm s^{-1}) plotted over time in the MC section during day 1.

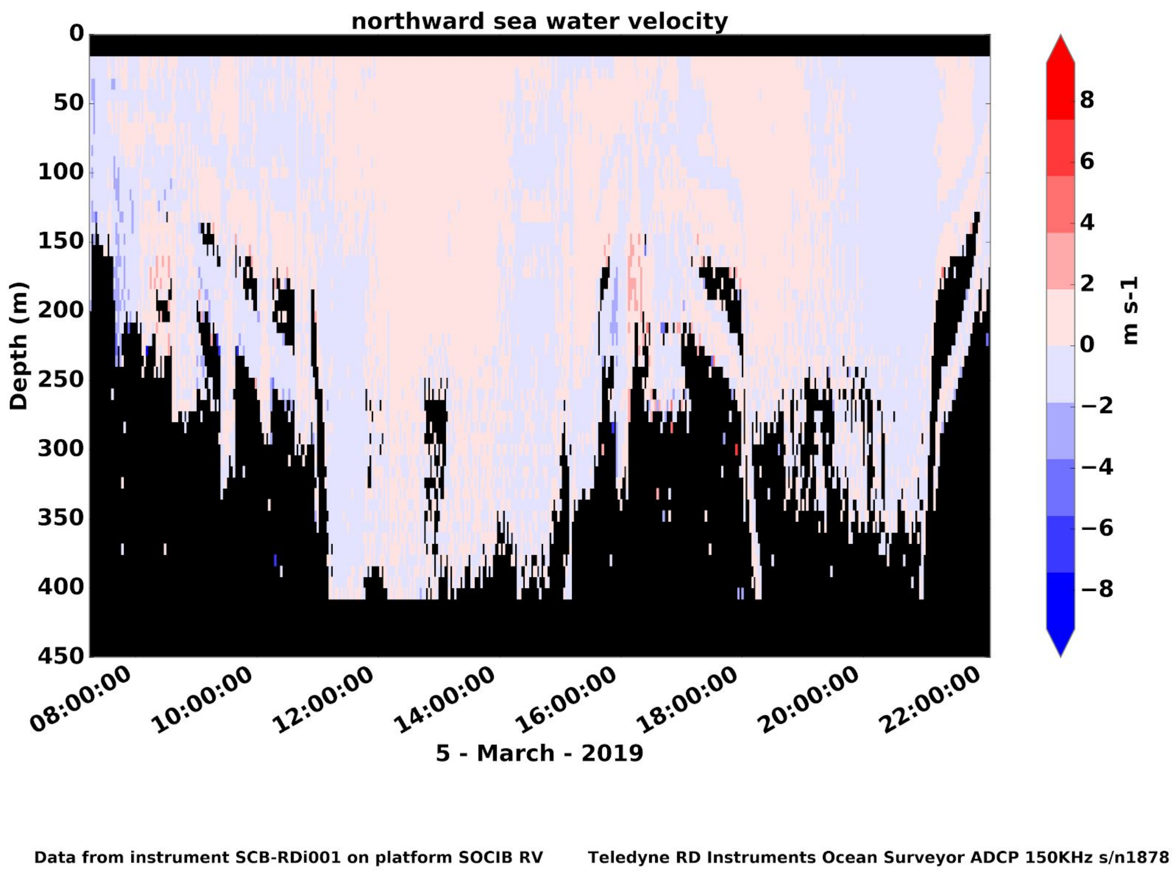


Fig. 5c. North components of velocity (mm s^{-1}) plotted over time in the MC section during day 1.

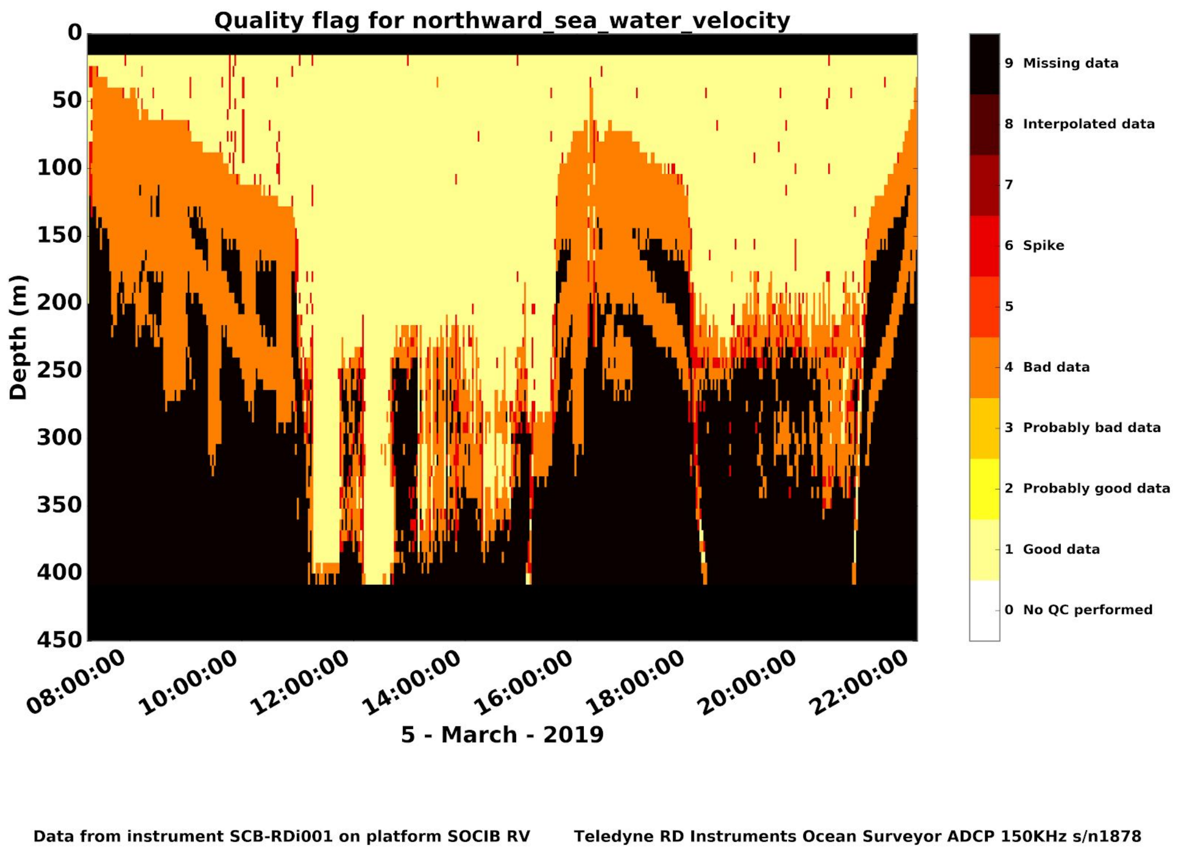


Fig. 5d. Quality flag for north components of velocity (mm s^{-1}) plotted over time in the MC section during day 1.

Figure 6 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).

Potential temperature (figure 6a) has an almost uniform horizontal distribution presenting a weak temperature gradient between 13ºC and 15ºC.

Salinity (figure 6b) 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 37.76psu - 38.56 psu.

Density (figure 6c) also presents a vertical distribution characterized by weak vertical gradients between 1028 and 1032 kgm-3.

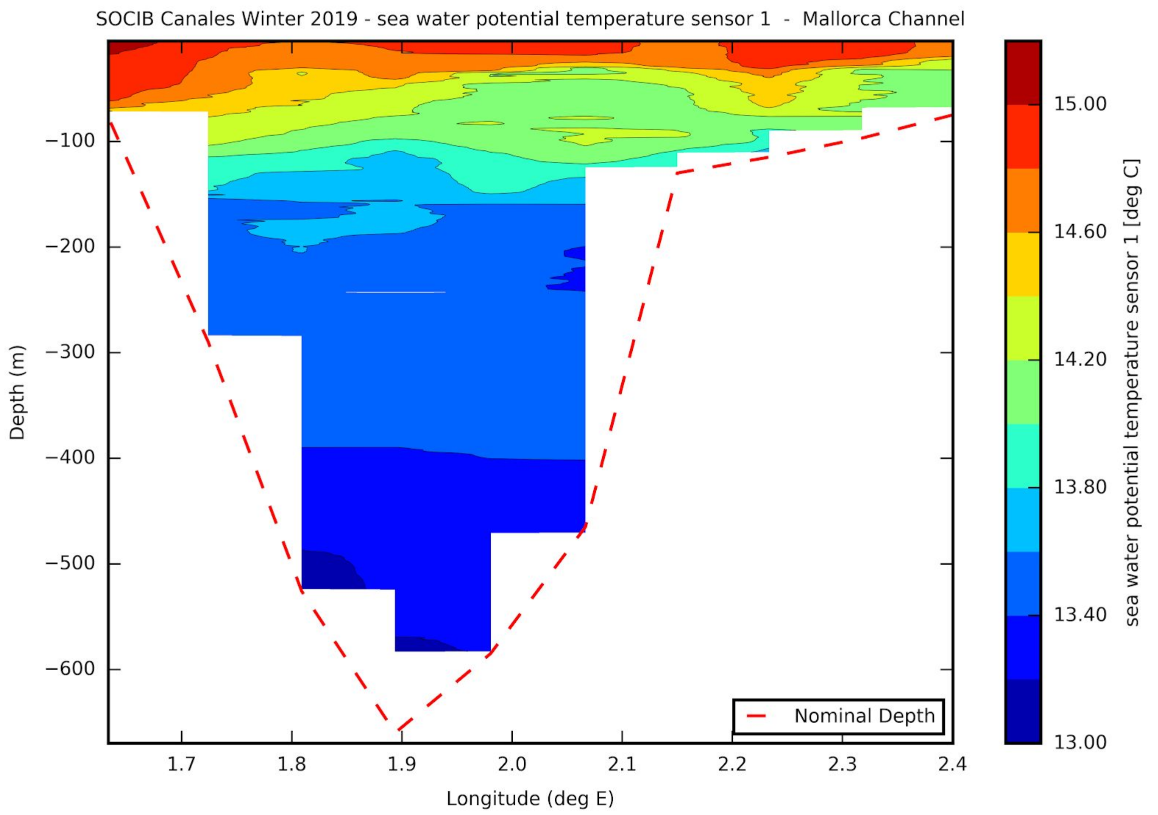


Fig. 6a. Potential temperature (ºC) of the MC cross-section (upper 200m section).

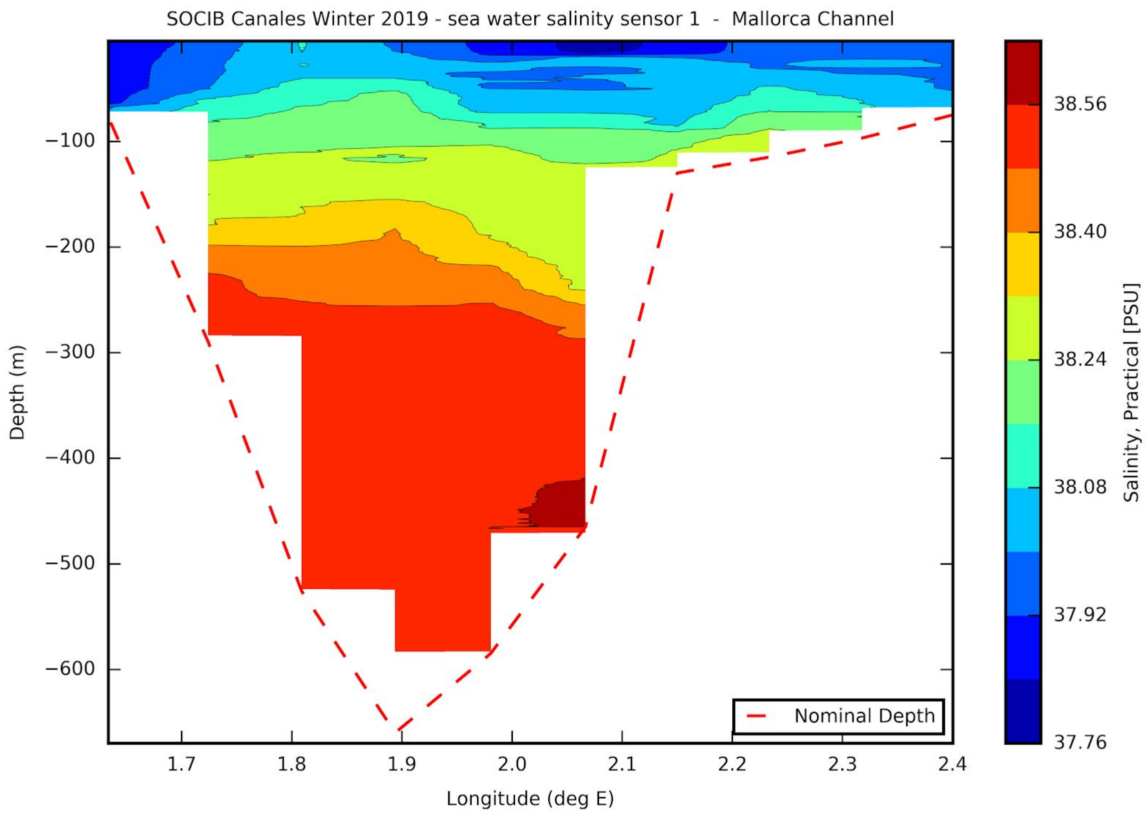


Fig. 6b. Salinity of the MC cross-section.

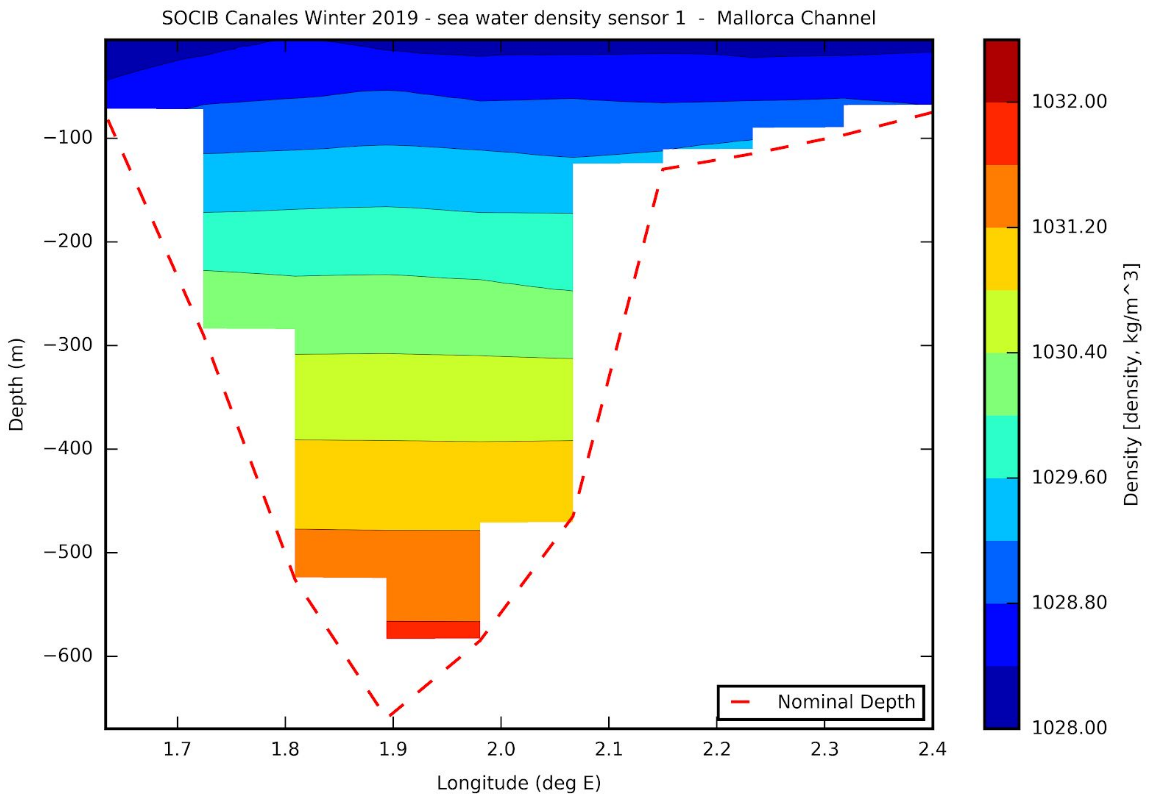


Fig. 6c. Density (kg m^{-3}) of the MC cross-section.

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. 7a) and *in vivo* fluorescence (Fig. 7b) of northernmost transect of the IC. The chlorophyll fluorescence maximum depth follows the temperature horizontal gradient shown if Fig. 4a with maximum values at depths > 50 m towards the peninsula shelf (and what seems two peaks) and shallower (< 50 m) towards the Ibiza shelf. The oxygen distribution follows hydrography as well with the maximum values (8 mg/l) encountered in the surface waters and also related to less saline waters (38.2 to 38.3 psu).

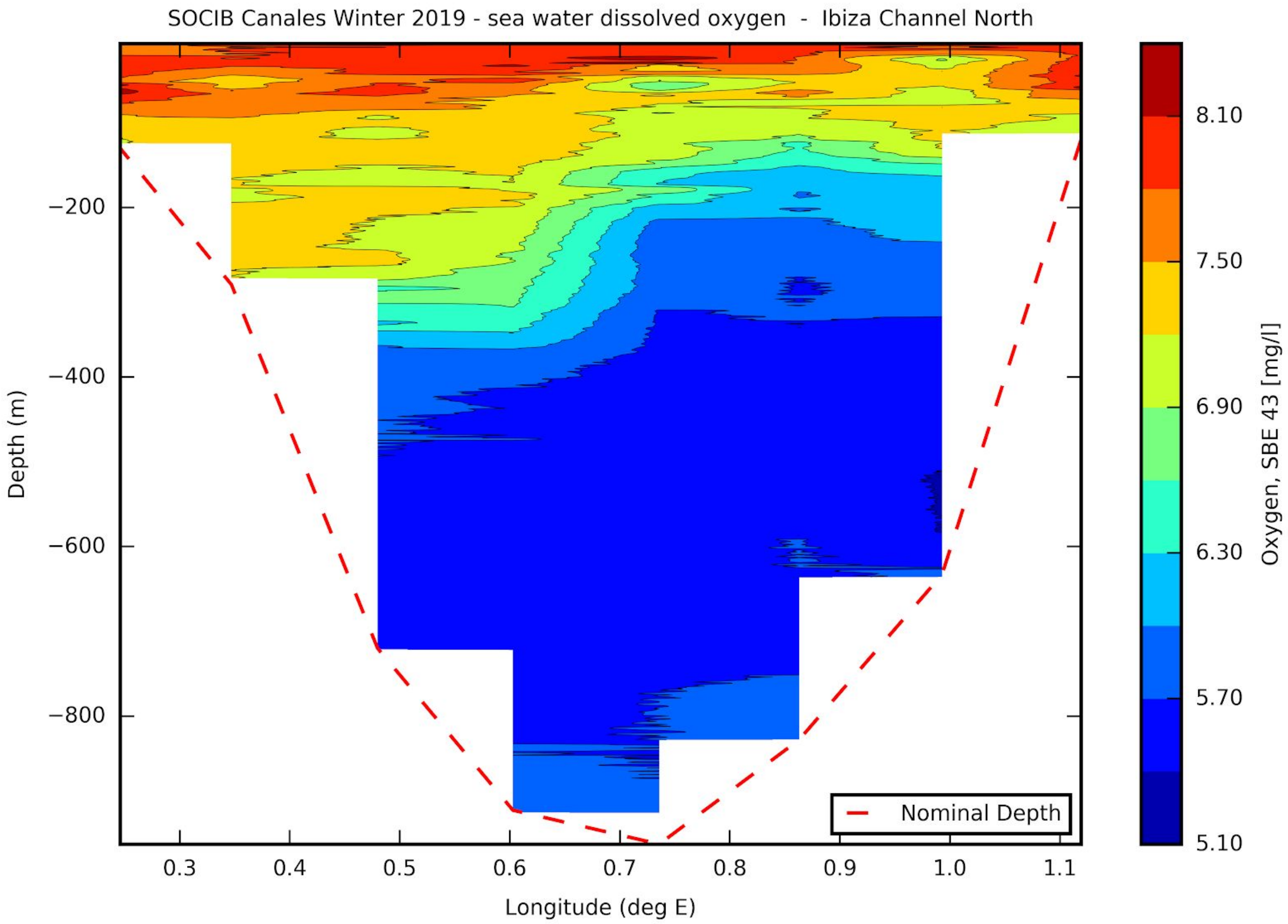


Fig. 7a: Initial figure for dissolved oxygen distribution obtained during the northern transect of the IC

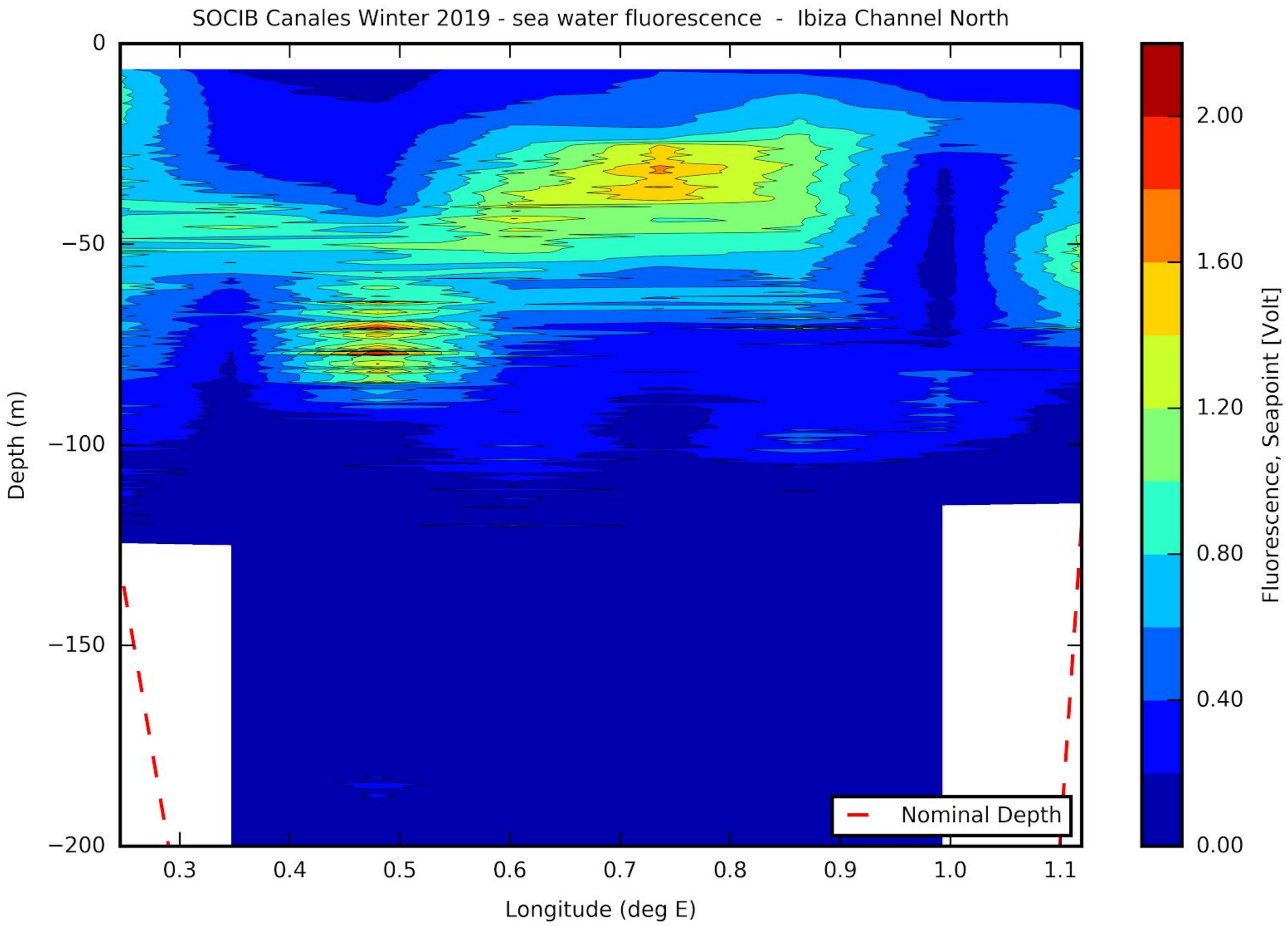


Fig. 7b: Initial figure for fluorescence distribution obtained during the northern transect of the IC

3. Mallorca Channel

The preliminary results obtained with the CTD sensors, indicate high oxygen values (7.5 to 8 mg/l) related with shallow waters of low salinities (37.7 to 38.08 psu) and with the highest values towards the shelfs (> 8 mg/l), 120 m depth around the Ibiza shelf (Fig. 8a). The chlorophyll distribution follows the density gradients and the maxima values are at around 50 m, however there is a very interesting feature, with high values at deeper depths (125 m at 1.8º and at around 100 m at 2.25º).

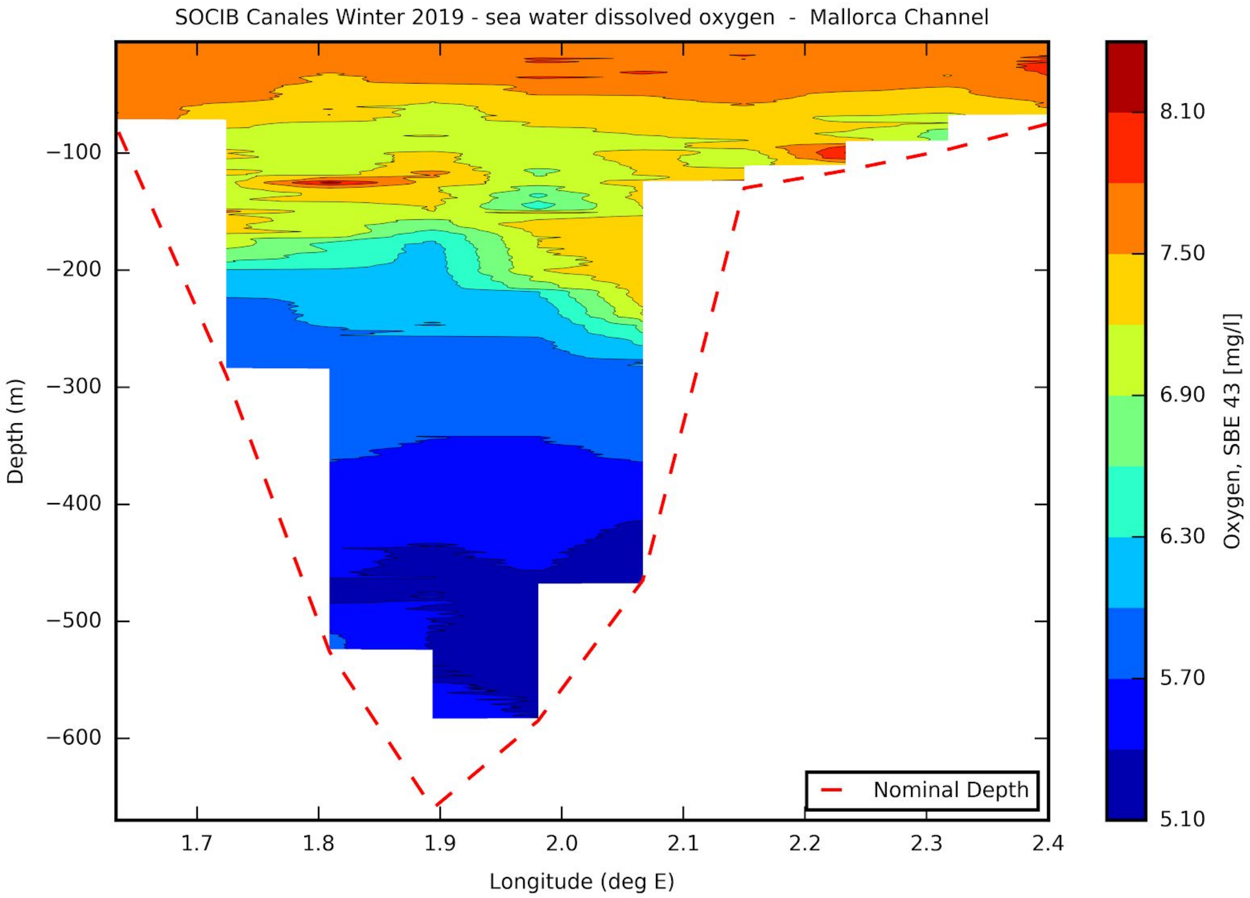


Fig. 8a: Initial figure for dissolved oxygen concentration distribution obtained on the Mallorca Channel cross-section.

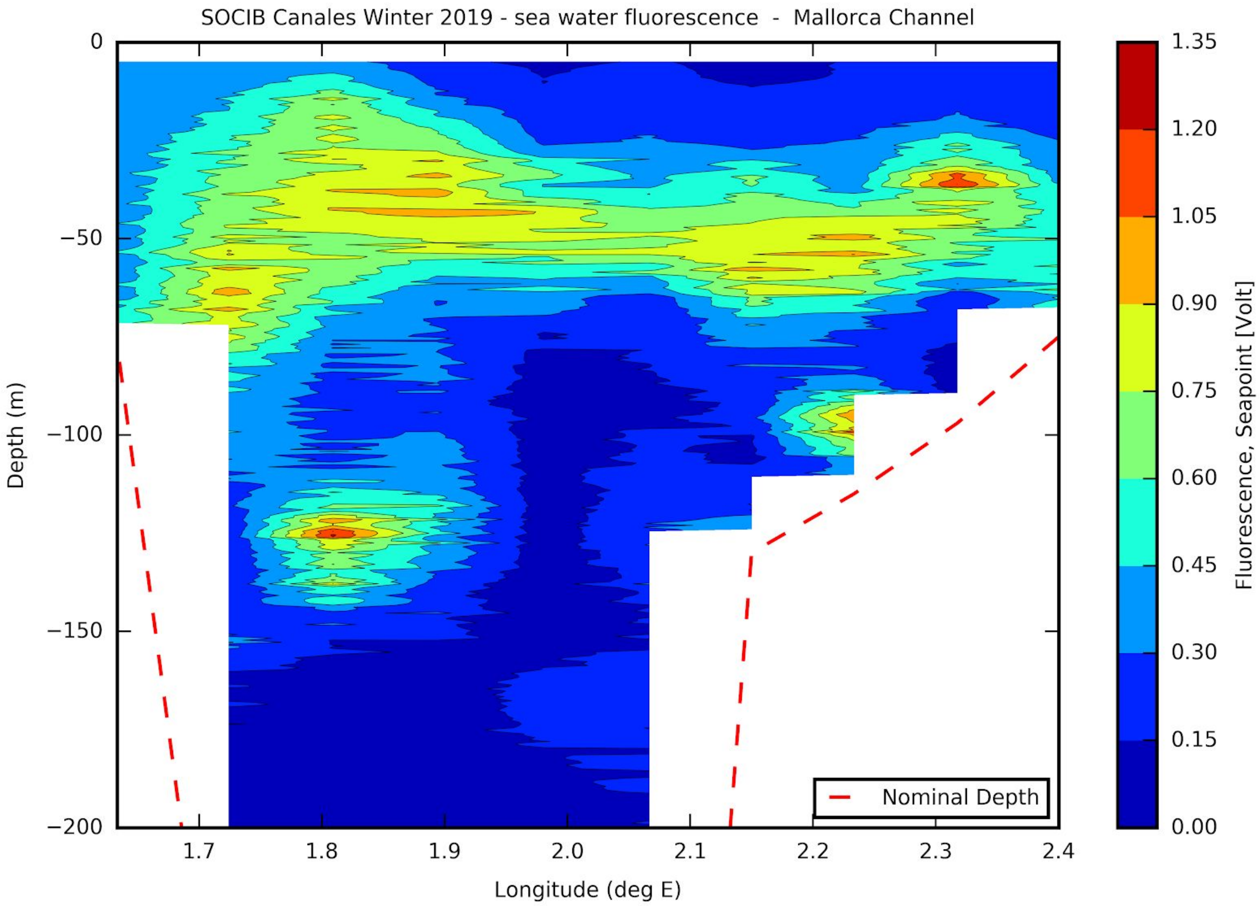


Fig. 8b: Initial figure for fluorescence distribution obtained on the the Mallorca Channel cross-section.

Problems encountered

- Nothing to report.

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=78985&v1=1

0&v2=2&pcode=

Processed Data Repository

Data Source	Thredds URL
Position	http://thredds.socib.es/thredds/catalog/research_vessel/gps/socib_rv-scb_pos001/L1/2019/03/catalog.html?dataset=research_vessel/gps/socib_rv-scb_pos001/L1/2019/03/dep0056_socib-rv_scb-pos001_L1_2019-03-05.nc
Thermosal	http://thredds.socib.es/thredds/catalog/research_vessel/thermosalinometer/socib_rv-scb_tsl001/L1/2019/03/catalog.html?dataset=research_vessel/thermosalinometer/socib_rv-scb_tsl001/L1/2019/03/dep0051_socib-rv_scb-tsl001_L1_2019-03-05.nc
Meteo Station	http://thredds.socib.es/thredds/catalog/research_vessel/weather_station/socib_rv-scb_met009/L1/2019/03/catalog.html?dataset=research_vessel/weather_station/socib_rv-scb_met009/L1/2019/03/dep0052_socib-rv_scb-met009_L1_2019-03-05.nc
CTD	http://thredds.socib.es/thredds/catalog/research_vessel/ctd/socib_rv-scb_sbe9001/L1/2019/catalog.html?dataset=research_vessel/ctd/socib_rv-scb_sbe9001/L1/2019/dep0012_socib-rv_scb-sbe9001_L1_2019-03-05.nc
VM-ADCP	http://thredds.socib.es/thredds/catalog/research_vessel/current_profiler/socib_rv-scb_rdi001/L1/2019/catalog.html?dataset=research_vessel/current_profiler/socib_rv-scb_rdi001/L1/2019/dep0024_socib-rv_scb-rdi001_L1_2019-03.nc

References

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

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APPENDIX 1: Activities through Canales Winter 2019

For a table of all ship activities logged during the campaign, refer to the cruise biogeochemical and CTD logbook.

APPENDIX 2: CTD configuration file in Canales Winter 2019

RADMED_01.XMLCON


```
<?xml version="1.0" encoding="UTF-8"?>
<SBE_InstrumentConfiguration SB_ConfigCTD_FileVersion="7.23.0.2" >
  <Instrument Type="8" >
        <Name>SBE 911plus/917plus CTD</Name>
        <FrequencyChannelsSuppressed>0</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>
<SensorArray Size="15" >
<Sensor index="0" SensorID="55" >
<TemperatureSensor SensorID="55" >
<SerialNumber>5391</SerialNumber>
<CalibrationDate>31-Oct-18</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>4.33142500e-003</G>
<H>6.26486476e-004</H>
<I>1.94602726e-005</I>
<J>1.42591432e-006</J>
<F0>1000.000</F0>
<Slope>1.00000000</Slope>
<Offset>0.0000</Offset>
</TemperatureSensor>
</Sensor>
<Sensor index="1" SensorID="3" >
<ConductivitySensor SensorID="3" >
<SerialNumber>3718</SerialNumber>
<CalibrationDate>27-Sep-18</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>-1.00651454e+001</G>
<H>1.34538336e+000</H>
<I>-2.21364165e-003</I>
<J>2.13478237e-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>1023</SerialNumber>
<CalibrationDate>28-Sep-18</CalibrationDate>
<C1>-4.979972e+004</C1>
<C2>7.716754e-001</C2>
<C3>1.594560e-002</C3>
<D1>3.855600e-002</D1>
<D2>0.000000e+000</D2>
<T1>3.000011e+001</T1>
<T2>-5.335740e-005</T2>
<T3>4.057330e-006</T3>
<T4>3.751370e-009</T4>
<Slope>0.99998358</Slope>
<Offset>-2.28428</Offset>
<T5>0.000000e+000</T5>
<AD590M>1.282500e-002</AD590M>
<AD590B>-9.474780e+000</AD590B>
</PressureSensor>
</Sensor>
<Sensor index="3" SensorID="55" >
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<SerialNumber>5425</SerialNumber>
<CalibrationDate>31-Oct-18</CalibrationDate>
<UseG_J>1</UseG_J>
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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>4.32807175e-003</G>
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</Sensor>
<Sensor index="4" SensorID="3" >
<ConductivitySensor SensorID="3" >
<SerialNumber>3907</SerialNumber>
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<CalibrationDate>17-Oct-18</CalibrationDate>
<UseG_J>1</UseG_J>
<!-- Cell const and series R are applicable only for wide range sensors. -->
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<ConductivityType>0</ConductivityType>
<Coefficients equation="0" >
<A>0.00000000e+000</A>
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<C>0.00000000e+000</C>
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</Coefficients>
<Coefficients equation="1" >
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<CPcor>-9.57000000e-008</CPcor>
<CTcor>3.2500e-006</CTcor>
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<M>21.6970</M>
<B>-1.7140</B>
<PathLength>0.250</PathLength>
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</Sensor>
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<NotInUse SensorID="27" >
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<CalibrationDate></CalibrationDate>
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<Free>1</Free>
</NotInUse>
</Sensor>
<Sensor index="7" SensorID="38" >
<OxygenSensor SensorID="38" >
<SerialNumber>2119</SerialNumber>
<CalibrationDate>19-Oct-18</CalibrationDate>
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<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>4.6176e-001</Soc>
<offset>-0.4789</offset>
<A>-4.7676e-003</A>
<B> 2.1219e-004</B>
<C>-2.9939e-006</C>
<D0> 2.5826e+000</D0>
<D1> 1.92634e-004</D1>
<D2>-4.64803e-002</D2>
<E> 3.6000e-002</E>
<Tau20> 1.2400</Tau20>
<H1>-3.3000e-002</H1>
<H2> 5.0000e+003</H2>
<H3> 1.4500e+003</H3>
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<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>07-Nov-18</CalibrationDate>
<!-- The following is an array index, not the actual gain setting. -->
<GainSetting>0</GainSetting>
<ScaleFactor>1.000</ScaleFactor>
</OBS_SeapointTurbiditySensor>
</Sensor>
<Sensor index="10" SensorID="11" >
<FluoroSeapointSensor SensorID="11" >
<SerialNumber>3259</SerialNumber>
<CalibrationDate>07-Nov-18</CalibrationDate>
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<!-- The following is an array index, not the actual gain setting. -->
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<Offset>0.000</Offset>
</FluoroSeapointSensor>
</Sensor>
<Sensor index="11" SensorID="0" >
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<ScaleFactor>15.000</ScaleFactor>
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</AltimeterSensor>
</Sensor>
<Sensor index="12" SensorID="42" >
<PAR_BiosphericalLicorChelseaSensor SensorID="42" >
<SerialNumber>70364</SerialNumber>
<CalibrationDate>02-Nov-18</CalibrationDate>
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<B>0.00000000</B>
<CalibrationConstant>17575000000.00000000</CalibrationConstant>
<Multiplier>1.00000000</Multiplier>
<Offset>-0.05720214</Offset>
</PAR_BiosphericalLicorChelseaSensor>
</Sensor>
<Sensor index="13" SensorID="27" >
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</Sensor>
<Sensor index="14" SensorID="51" >
<SPAR_Sensor SensorID="51" >
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<ConversionFactor>1443.22580000</ConversionFactor>
<RatioMultiplier>1.00000000</RatioMultiplier>
</SPAR_Sensor>
</Sensor>
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</Instrument>
</SBE_InstrumentConfiguration>