CRUISE REPORT

SOCIB Canales SPRING 2019:

7th to 9th May 2019

SOCIB_ENL_CANALES_MAY2019_SPRING

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Description:	A repeat seasonal hydrographic survey of the Balearic Sea, monitoring the Ibiza and Mallorca Channels. 28 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). Three surface drifters SVP were also deployed in the Ibiza Channel.
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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 Lagrangian platforms.

Onboard personnel

ID	Name	Role	Affiliation
1	Cristian Muñoz	Principal Scientist	SOCIB
2	Irene Lizarán	Lead instrumentation technicians/CTD	SOCIB
3	Andrea Cabornero	Biogeochemical sampling and analysis lead	SOCIB
4	John Allen	Physics lead/Salinity sampling	SOCIB
5	Lara Díaz	Biogeochemical sampling and analysis	SOCIB
6	Josep Baeza	Instrumentation technician/CTD	SOCIB
7	Bertille Lefevre	Biogeochemical sampling and analysis	Sorbonne Université
8	Enrique Sánchez	Biogeochemical sampling and analysis/CTD	Univ Salamanca
9	Maria Simonet	Biogeochemical sampling and analysis	SOCIB

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Station plan

28 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 CTD and drifter deployment 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 - 7th MAY 2019

SOCIB RV left Palma harbor at 06.07 UTC. First CTD station RDM_01 started at 07.37 UTC.After the first station we realized that the CTD alarm on the deck unit was disabled. After re-configuring the alarms, everything came back to normality.

RDM_02 station was performed from 08.19 UTC to 08.34 UTC with total normality. At that moment we had a sunny day with moderate breeze coming from S-SW and 0.6m wave height.

RDM_03 station was undertaken from 09.00 to 09.12 UTC. RDM_04 and RDM_05 we also performed with no remarkable incidents.

We started RDM_06 at 13.24 UTC. We finished the profile at 14.05 UTC. Bottles firing device was not available for unknown reasons and bottles had to be fired manually from the deck unit. CTD recovery was also a bit complicated, as the A frame came in too early and the rossette was driven below the backdeck. Fortunately no incidents occurred.

While heading towards RDM_07 station, we stopped at 12.35 UTC to fix the apparent problem on the carroussel cable and perform a SBE25 profile-test while fixing it.

At 13.26 UTC SBE25 was out of the water. We could not find the problem with the SBE911. It seemed that the troubles had to be caused from the bottle sampler. We started heading towards Sant Antonio harbor to work on the SBE911 CTD.

At 13.35 UTC the problem was solved thanks to a call with Benja, the PC connector was a bit loose due to the boat vibrations, so that we changed our track heading to RDM_07. Everything was ahead of time despite of all the occurred.

We arrived RDM_08 station at 14.47 UTC. AT 15.13 the CTD was onboard. Tricky recovery, the CTD slightly hit the deck in one of the base weights while getting it on board.

Last station ended at 16.54 UTC and started heading towards Sant Antoni harbor, where we finally arrived at 18.58 UTC.

It was a very good first day. We reminded ourselves that attention into the little details count. Many crew members were new on board, so that they had to get familiar with the CTD operations. However there was a very good connection among scientific personnel and crew members.

Fig. 2: Canales Spring 2019 cruise members.

DAY 2 - 8th MAY 2019

RV SOCIB left Sant Antoni harbor at 06.04 UTC heading towards S2_01. At 06.28 UTC S2_01 station started. The morning was cloudy with moderate breeze again. At 06.40 UTC, CTD was recovered with a little struggling. It hit deck while taking it out due to too much extraction angle. A-frame operator gave order to recover too early, he became aware on that so next profile would work better.

CTD was recovered from S2_02 at 07.02 UTC. This time recovery was perfect.

At 09.51 UTC we entered in a dense fog bank with 100m visibility, still moderate breeze from S-SW and short period 0.6m height waves. Everything till now was working fine and ahead of time.

At 11.00 UTC upcast profile from S2_05 presented a lot of noise in turbidity measurements. Irene cleanead the connector and cable of the sensor and the problem seemed not to appear again. Argo profiler was not deployed due to the lack of confirmation of data

transmission .

At 14.30 UTC S2_08 upcast salinity profile presented differences between sensors greater than 0.01 psu due to some stingers into one of the conductivity cells. Conductivity cells were flushed thoroughly after recovery and the problem disappeared during the following profiles.

The evening was quite sunny with no extra complications. Arrival into Denia harbor was at 16.45 UTC.

We had an interesting conversation with Emma Reyes and John Allen about where to finally deploy the drifters the following day. Final positions would be confirmed during the following morning.

Andrea spent the night from 20.00 UTC to 00.00 UTC analyzing the oxygen samples from day 1.

Fig. 3: CTD recovery operation and chlorophyll sample filtration.

DAY 3 - 9th MAY 2019

RV SOCIB left Denia harbor at 05.56 UTC. Cloudy day with light breeze and 0.3 m height waves. At 07.05 UTC started the S2_23 station 400m away from nominal position due to the track of a merchant ship passing through the station position.

At 11.12 UTC changed plans after talking to Emma Reyes in order to deploy the drifters

drifters 5 miles southwards from S2_18.

At 12.17 UTC, S2_18 finished and started heading towards drifters launching point. SVP036, SVP037 and SVP039 were prepared and launched by Irene and Josep. Maria made an excellent work taking care about times and deployment coordinates of each drifter deployment.

Last drifter was deployed at 13.13 UTC and started heading back to S2_17 CTD station. At 14.40 UTC we finished last CTD in S2_16 and began our way back towards Palma harbor where we arrived at 21.30 UTC. Andrea and Lara processed the rest of the oxygen samples during that night.
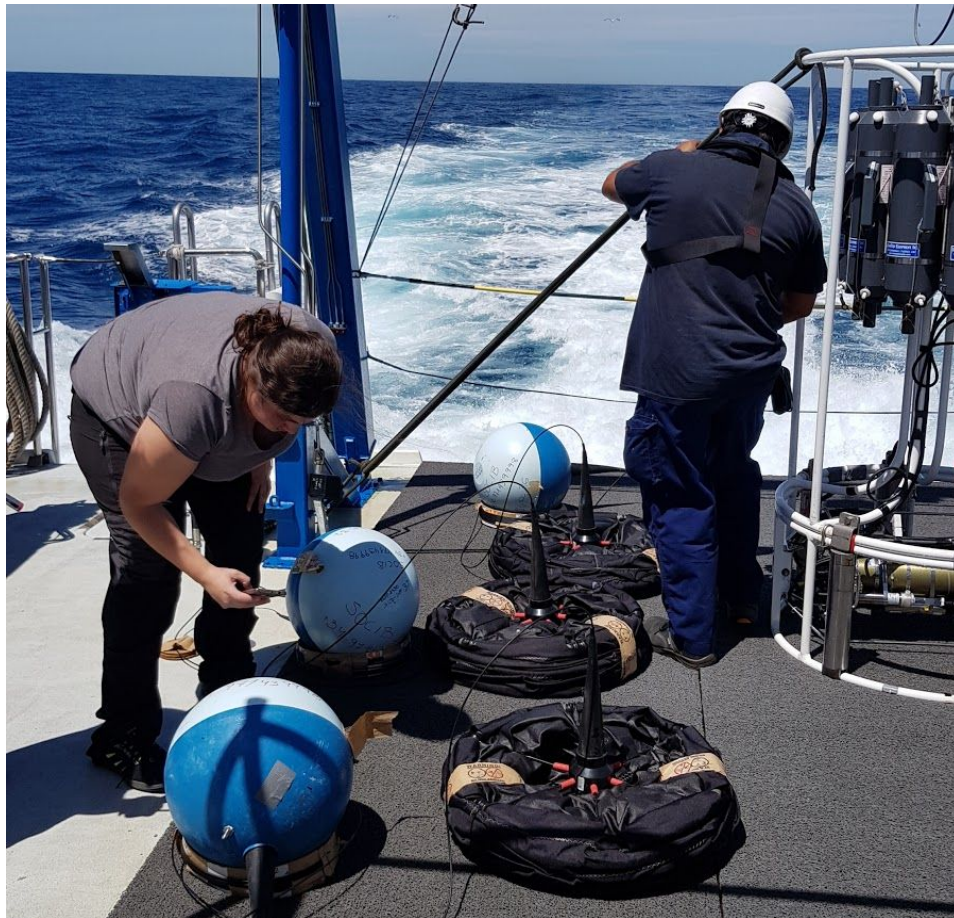

Fig. 4: Preparation for drifters deployment.

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 following file was used:

- RADMED_01.xmlcon.

Thermo-salinometer

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

Configuration

The data were collected using the NEREIDAS system and acquisition backup was performed using seasave software. The data were stored directly in the vessel server and processed 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 were collected using the NEREIDAS System. The data were stored directly in the vessel server and processed processed through the SOCIB-DC system.

Acoustic doppler profiler

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

SVP Surface Drifters

Manufacturer:	DBi
Model:	SVP
S/N:	300234066303110 300234066302430 300234066301420
SOCIB Inventory:	SCB-SVP039 SCB-SVP037 SCB-SVP036
Calibration date:	

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 RV 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 28 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 preserved 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.

SOCIB Canales Spring 2019 - Theta-S - Ibiza Channel North
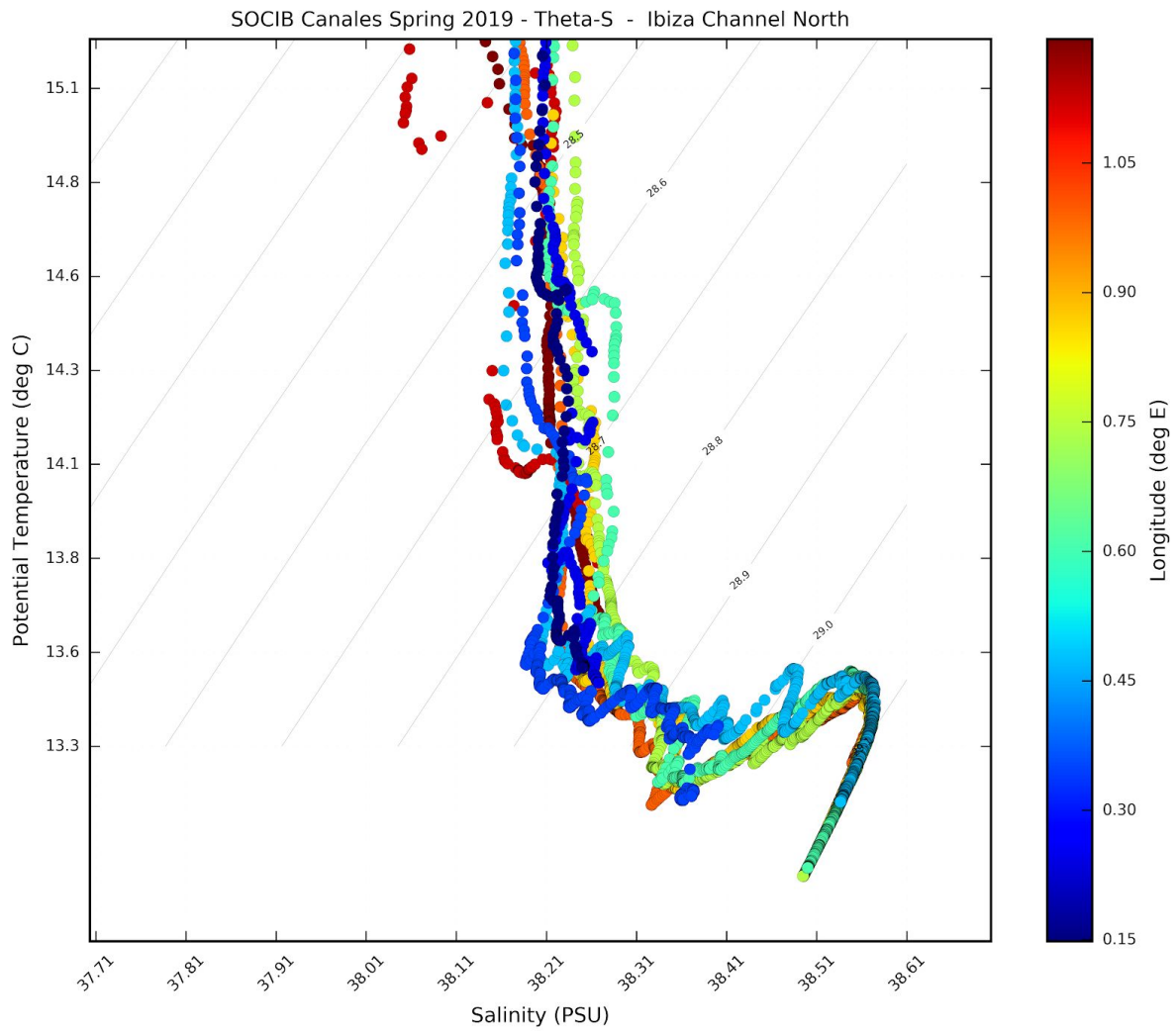
Fig 5a. T-S diagram of all ICN stations; the colour bar indicates the longitude of the station; thus the colour spectrum from red to blue corresponds to the ICN transect, from East to West.
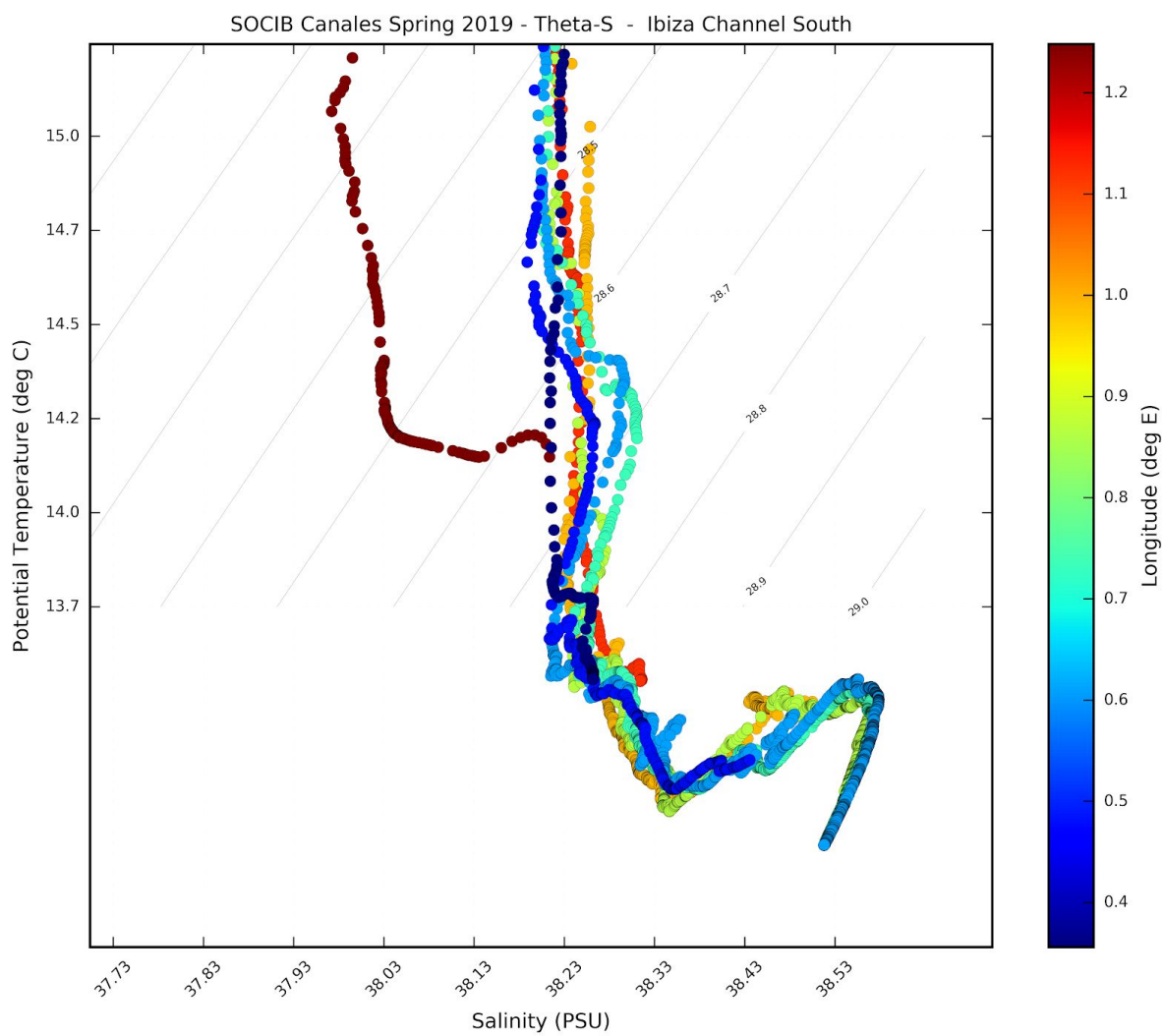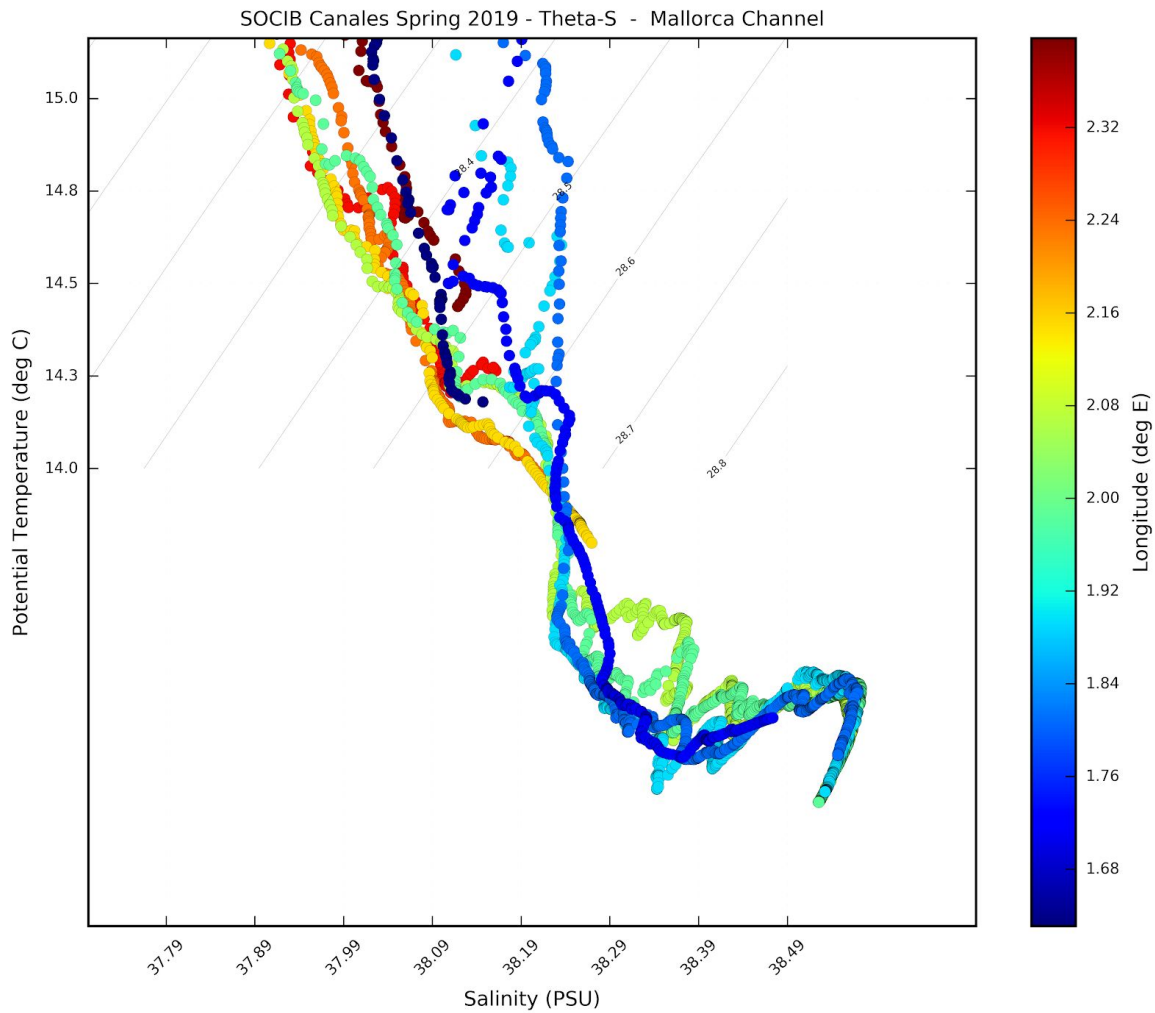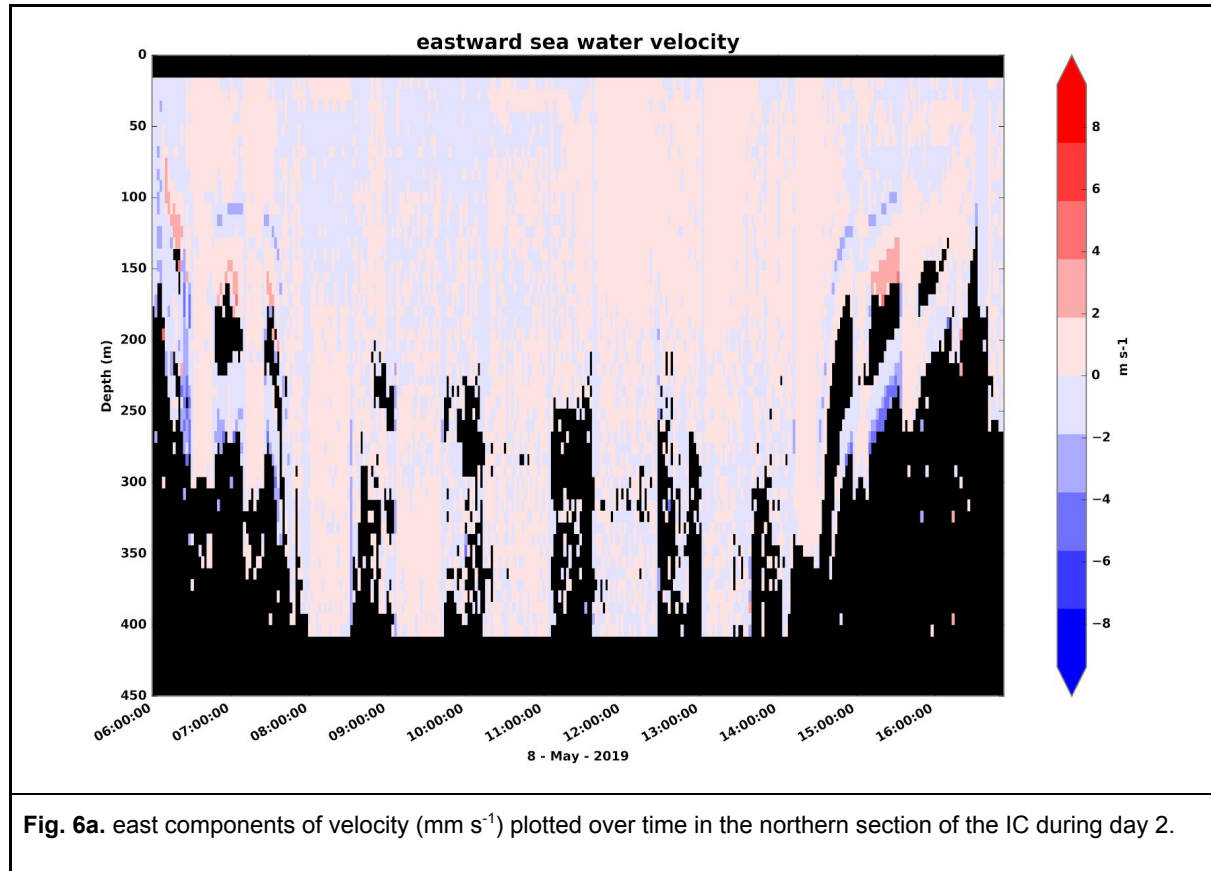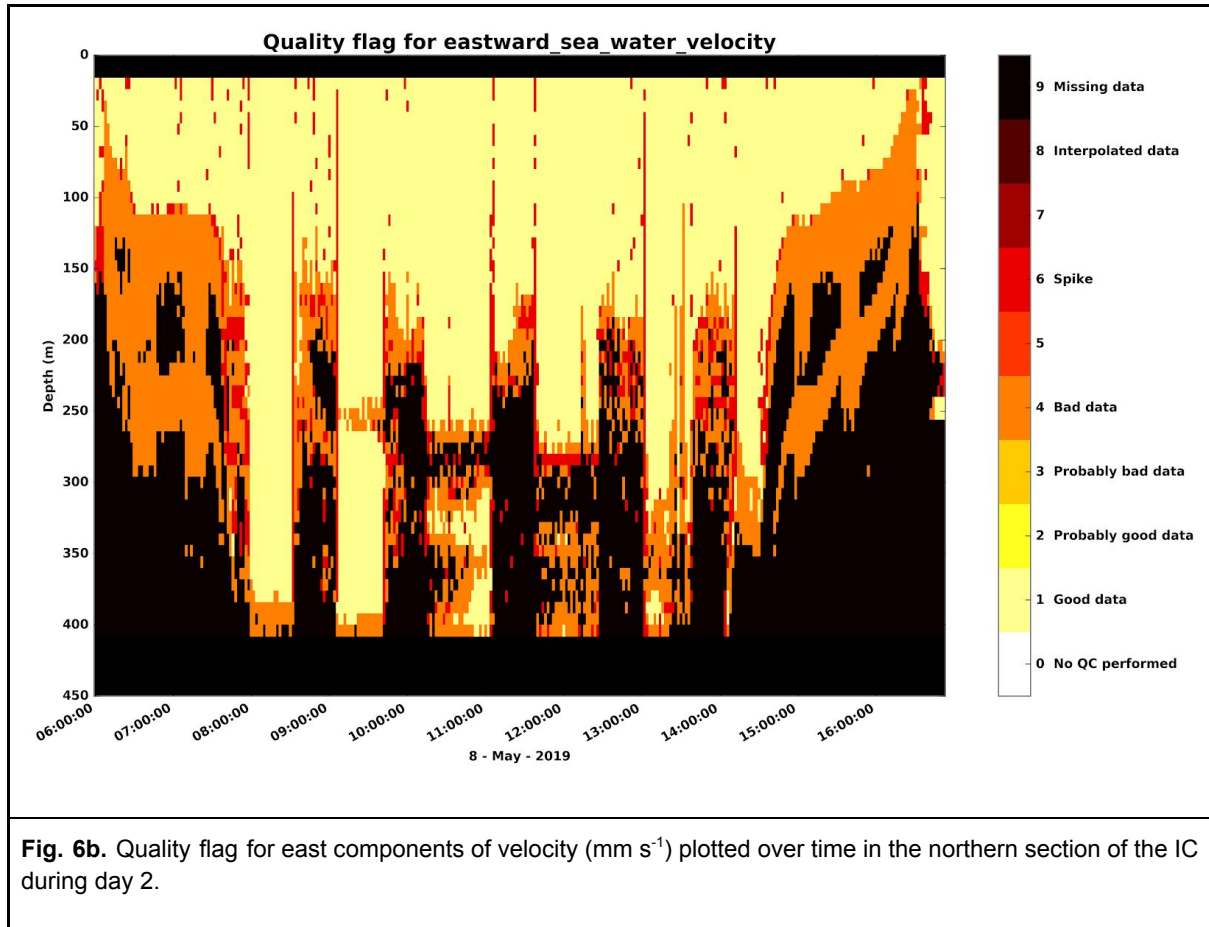
Fig 5b. T-S diagram of all ICS stations; the colour bar indicates the longitude of the station; thus the colour spectrum from red to blue corresponds to the ICS transect, from East to West.
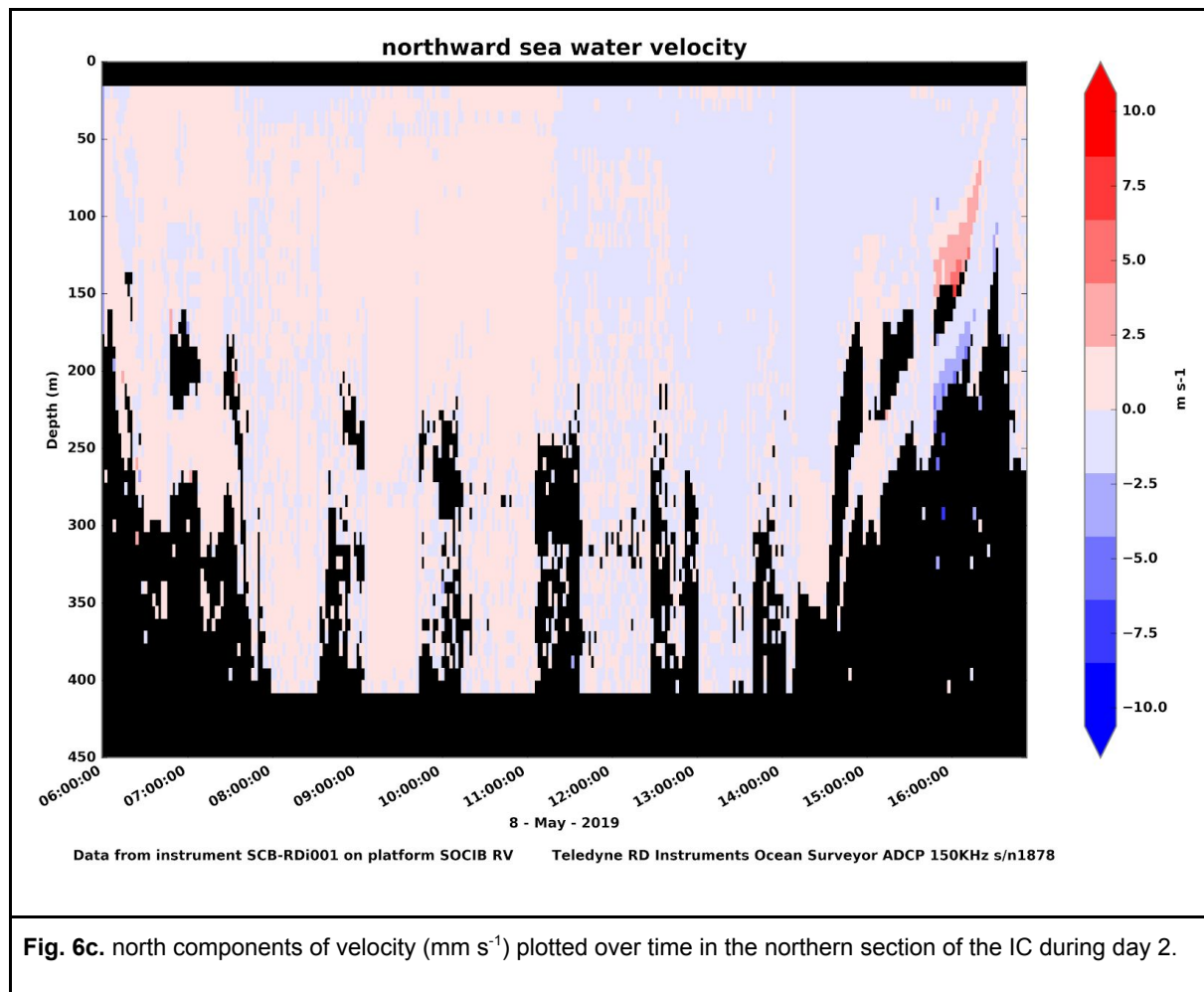
SOCIB Canales Spring 2019 - Theta-S - Mallorca Channel

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 most northerly transect of the IC. Figure 6 shows the velocities u and v from the ADCP and their respective quality flags.
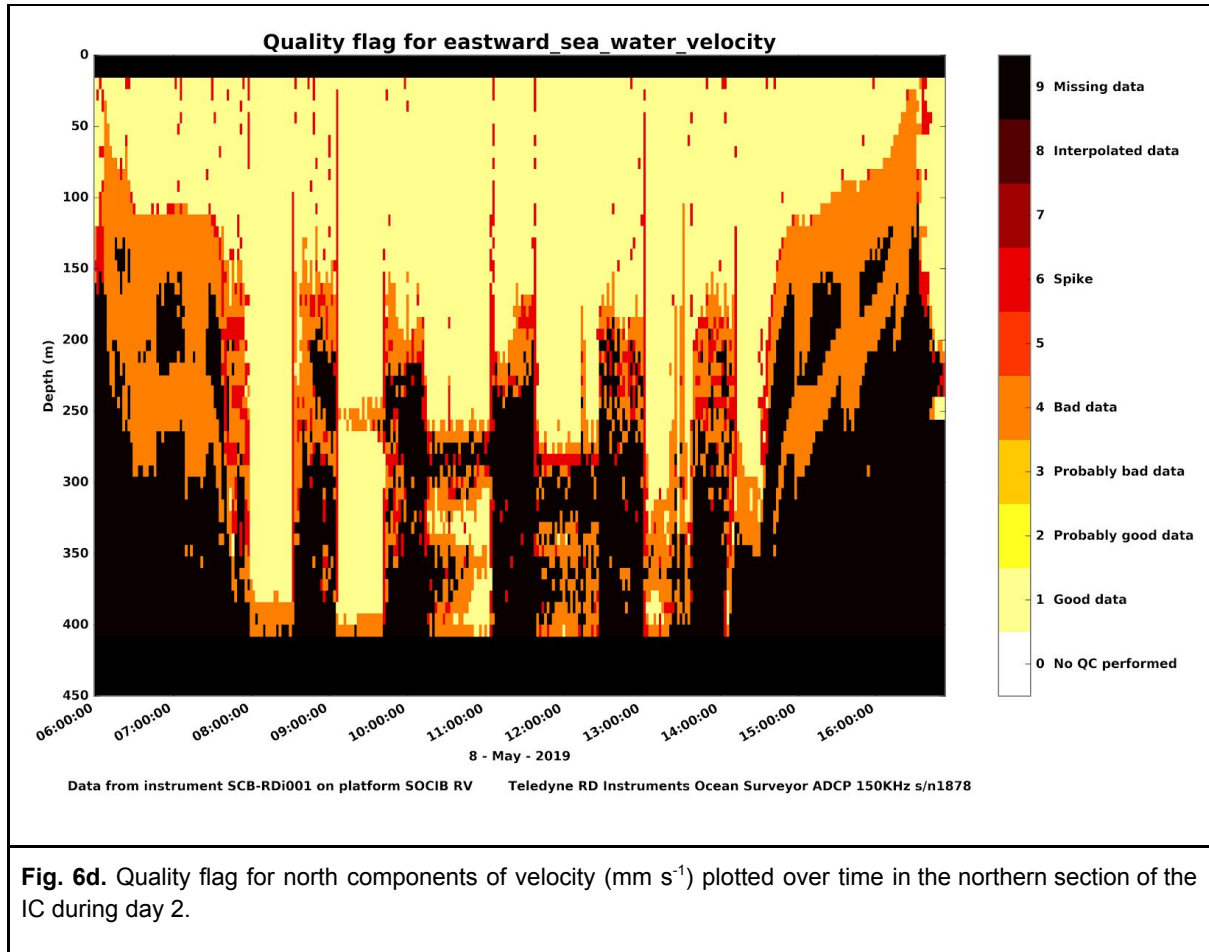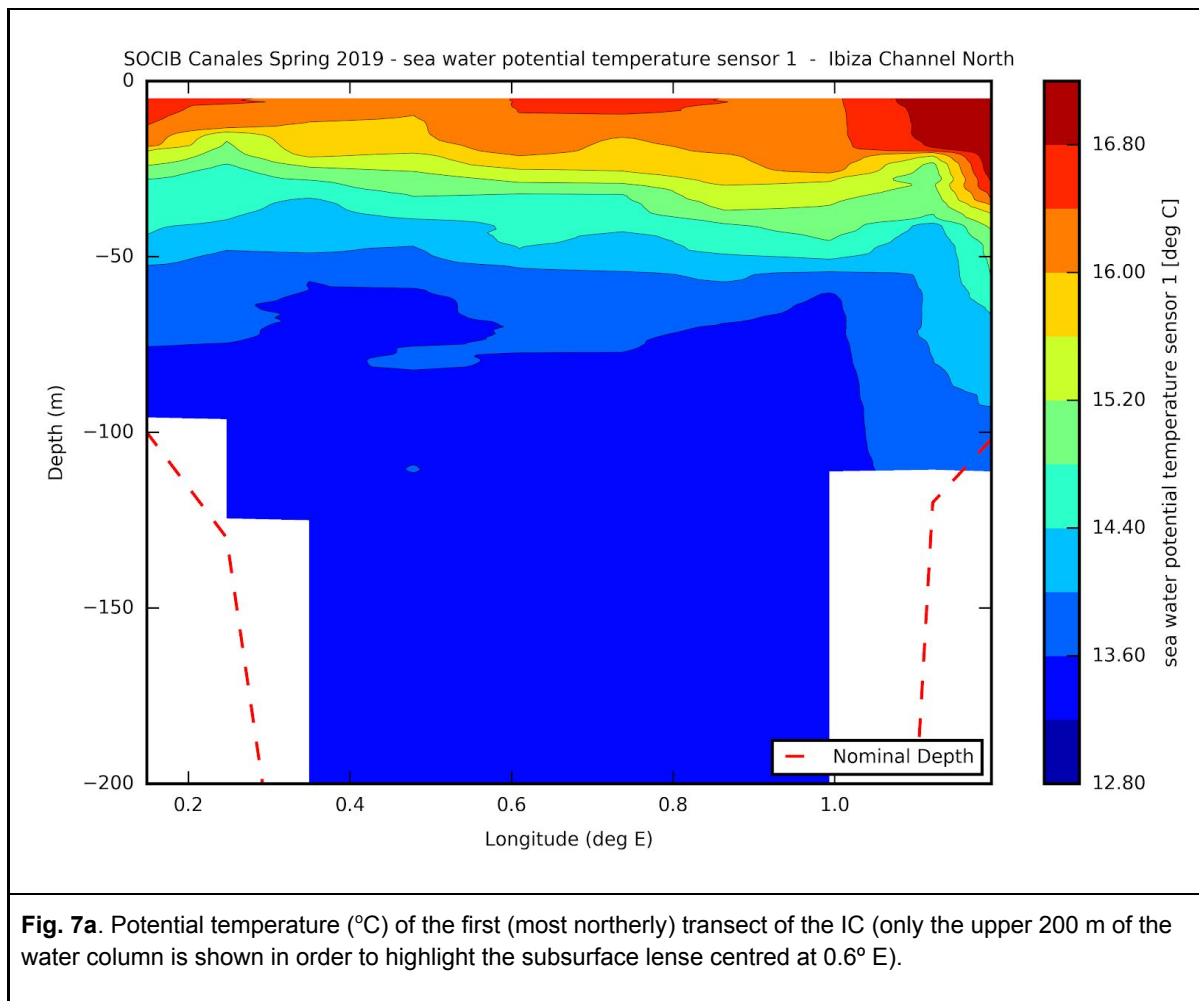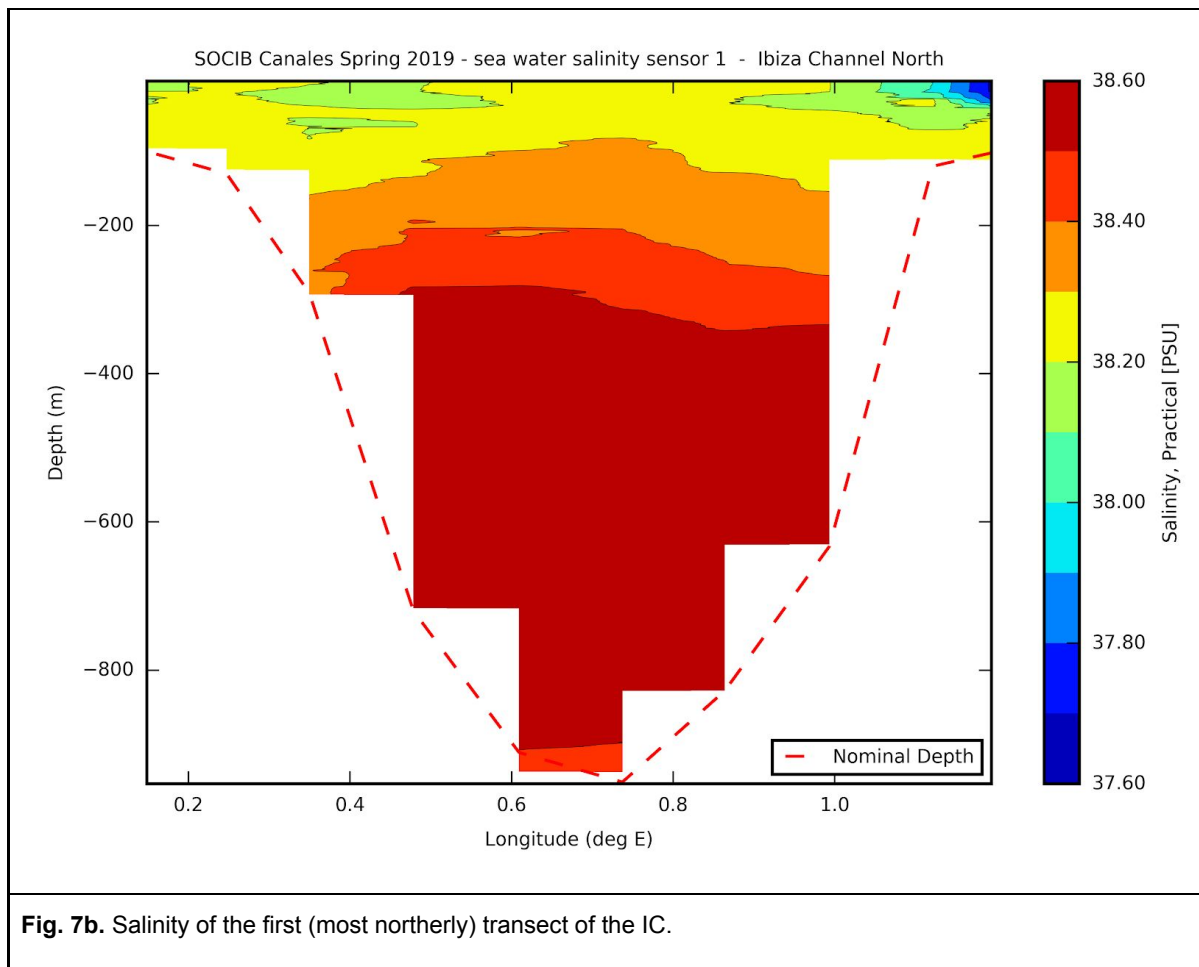
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Fig. 6a. east components of velocity (mm s^{-1}) plotted over time in the northern section of the IC during day 2.

Fig. 6b. Quality flag for east components of velocity (mm s^{-1}) plotted over time in the northern section of the IC during day 2.

Fig. 6c. north components of velocity (mm s^{-1}) plotted over time in the northern section of the IC during day 2.

Quality flag for eastward_sea_water_velocity

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

Fig. 6d. Quality flag for north components of velocity (mm s^{-1}) plotted over time in the northern section of the IC during day 2.

Figure 7 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.
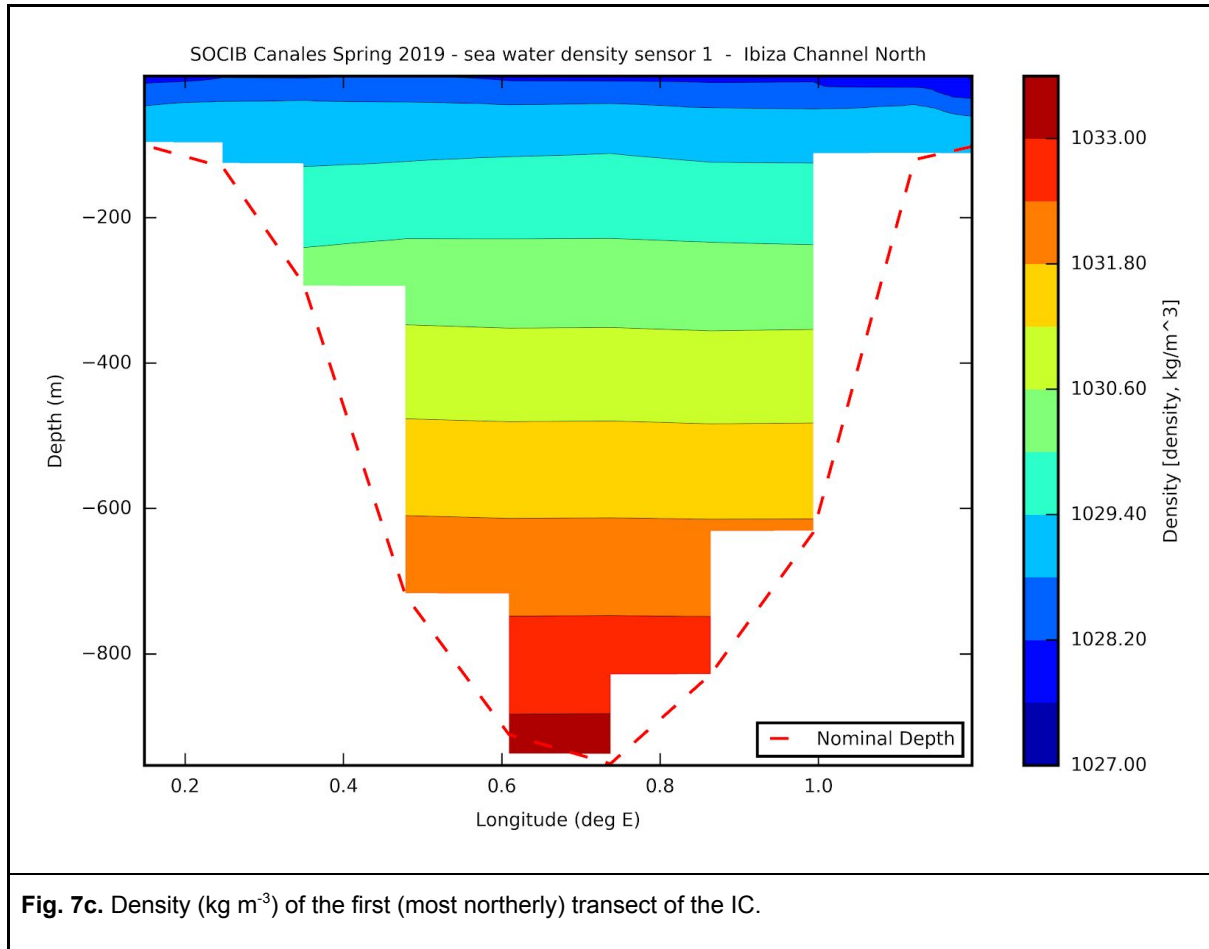
Potential temperature (figure 7a) has an almost uniform vertical distribution presenting a weak temperature gradient between 12.80ºC and 17.20ºC that is stronger in the Ibiza shelf.

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 37.60psu - 38.60 psu.

Density (figure 7c) also presents a vertical distribution characterized by weak vertical gradients between 1027 and 1034 kgm-3.
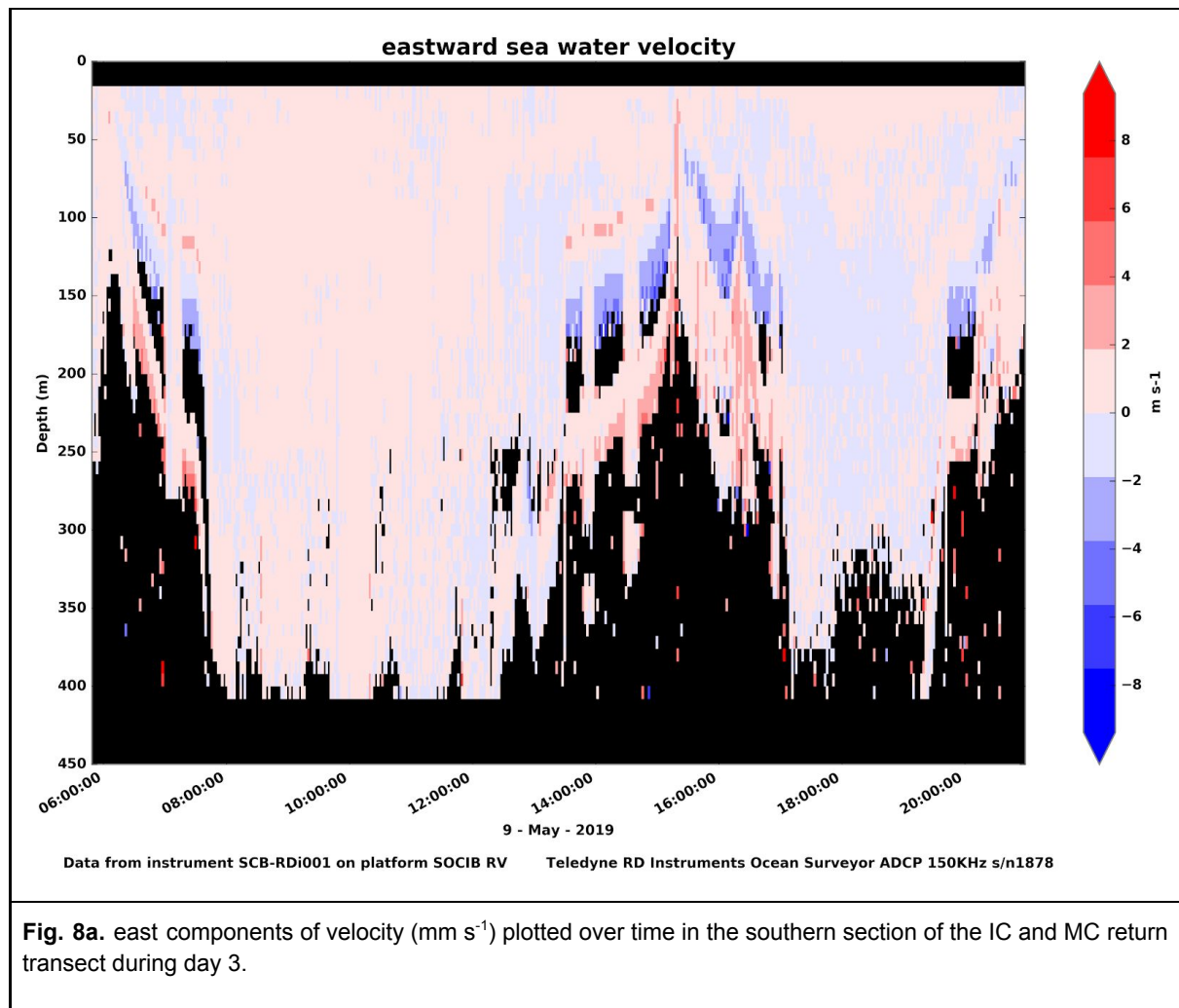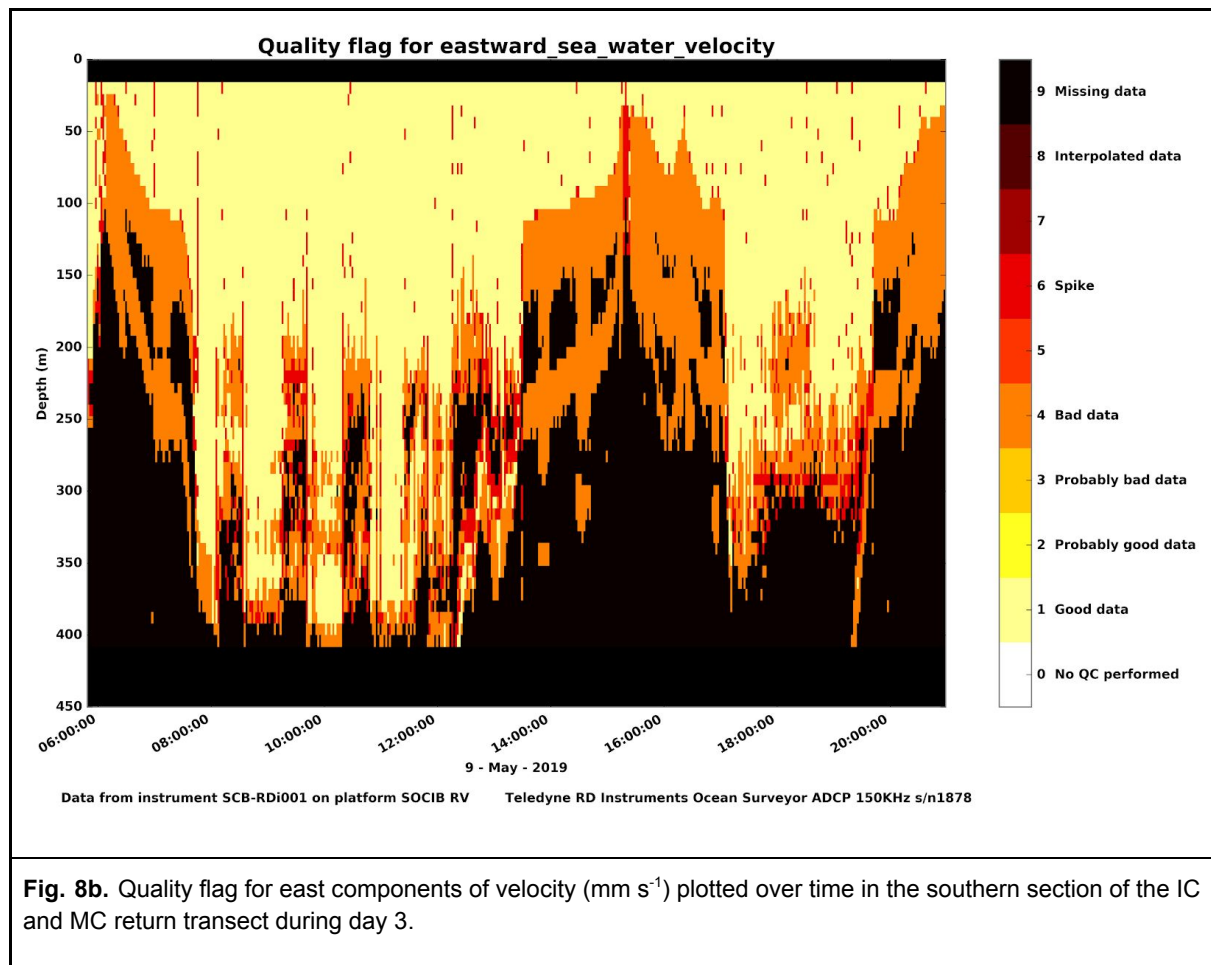
Fig. 7a. Potential temperature (ºC) of the first (most northerly) transect of the IC (only the upper 200 m of the water column is shown in order to highlight the subsurface lense centred at 0.6º E).

Fig. 7b. Salinity of the first (most northerly) transect of the IC.

Fig. 7c. Density (kg m^{-3}) of the first (most northerly) transect of the IC.
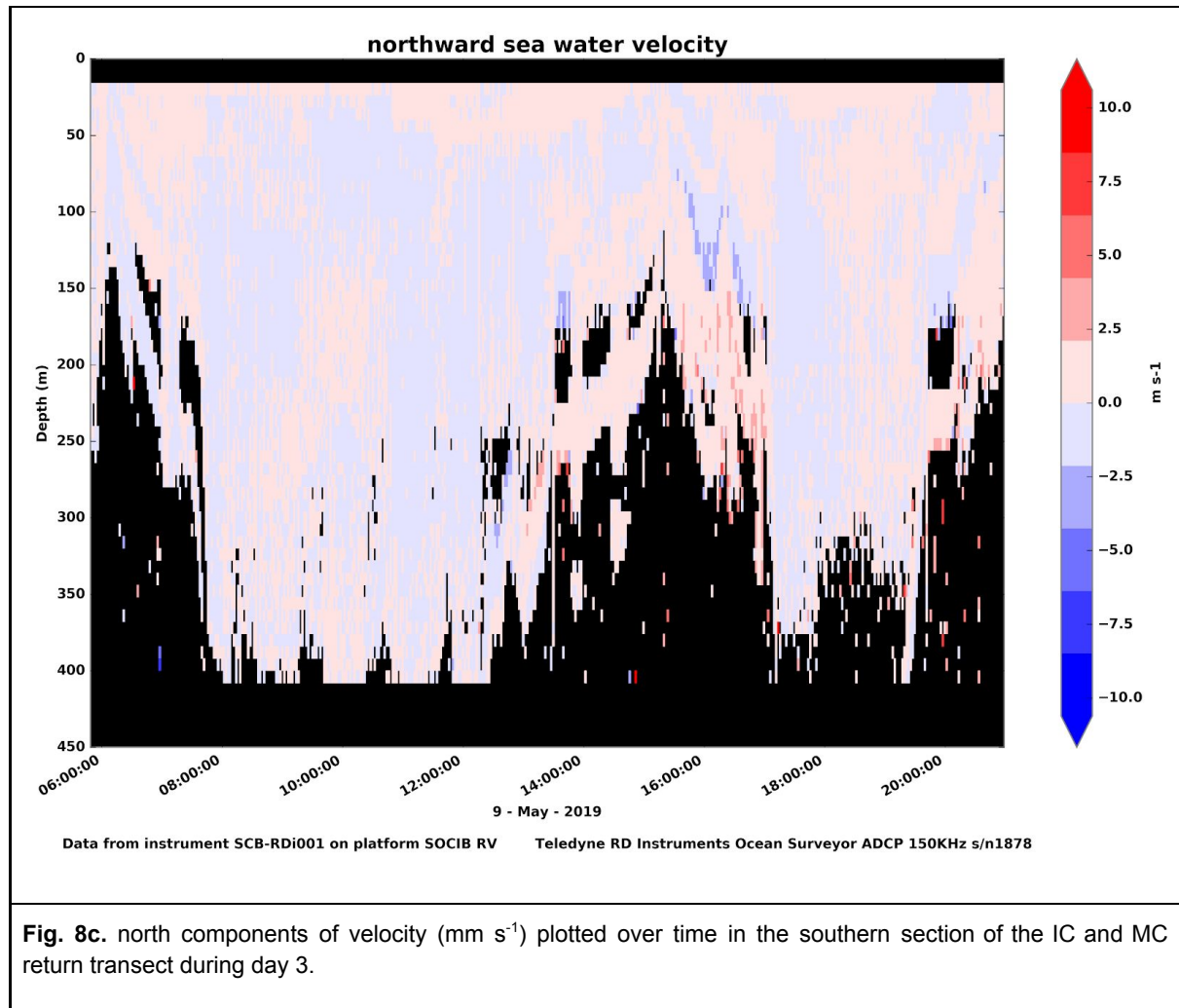
3. Ibiza Channel: South

The figures presented in this section are showing the southern transect of the IC and the return transect of the MC. Figure 8 shows the velocities u and v from the ADCP and their respective quality flags.
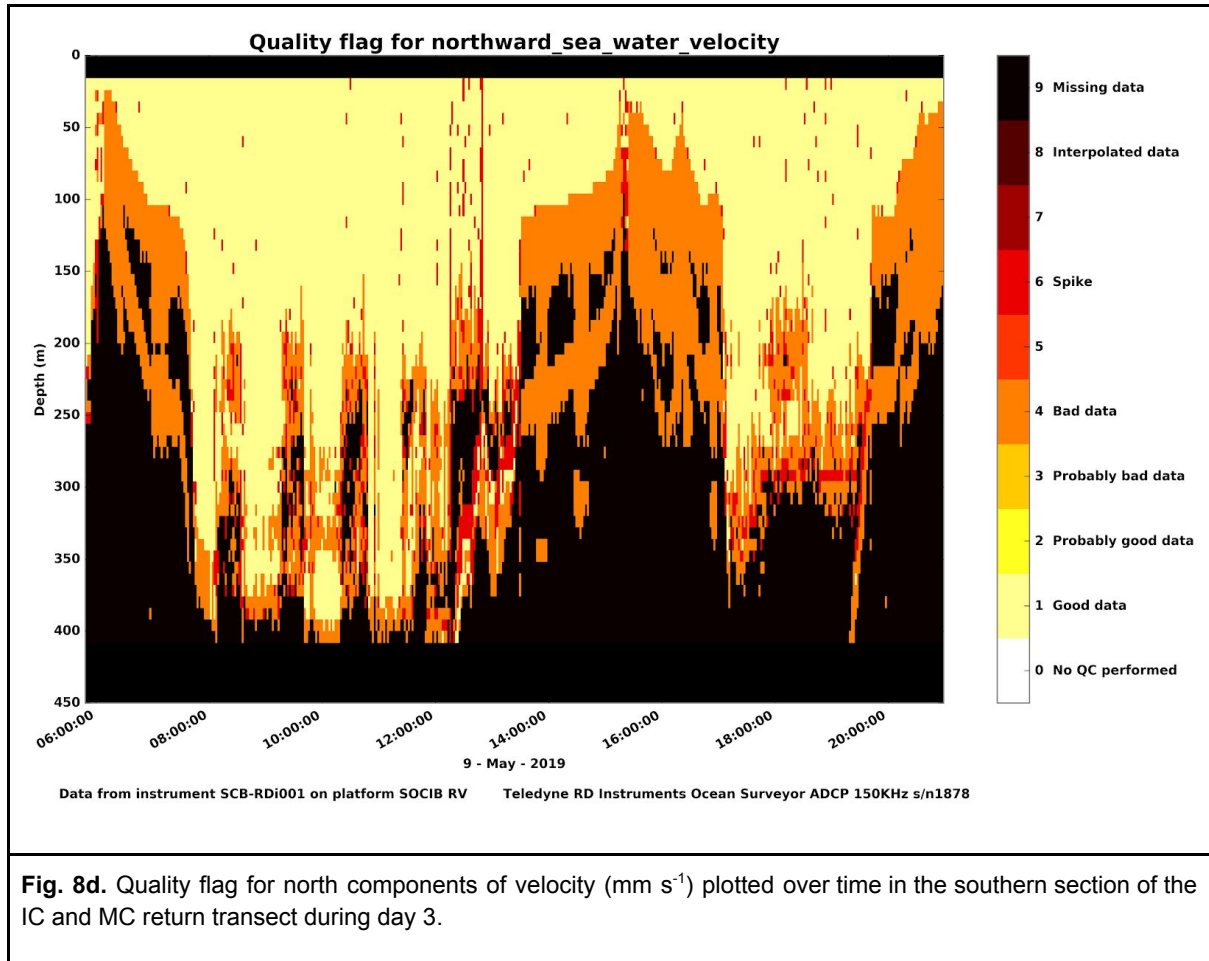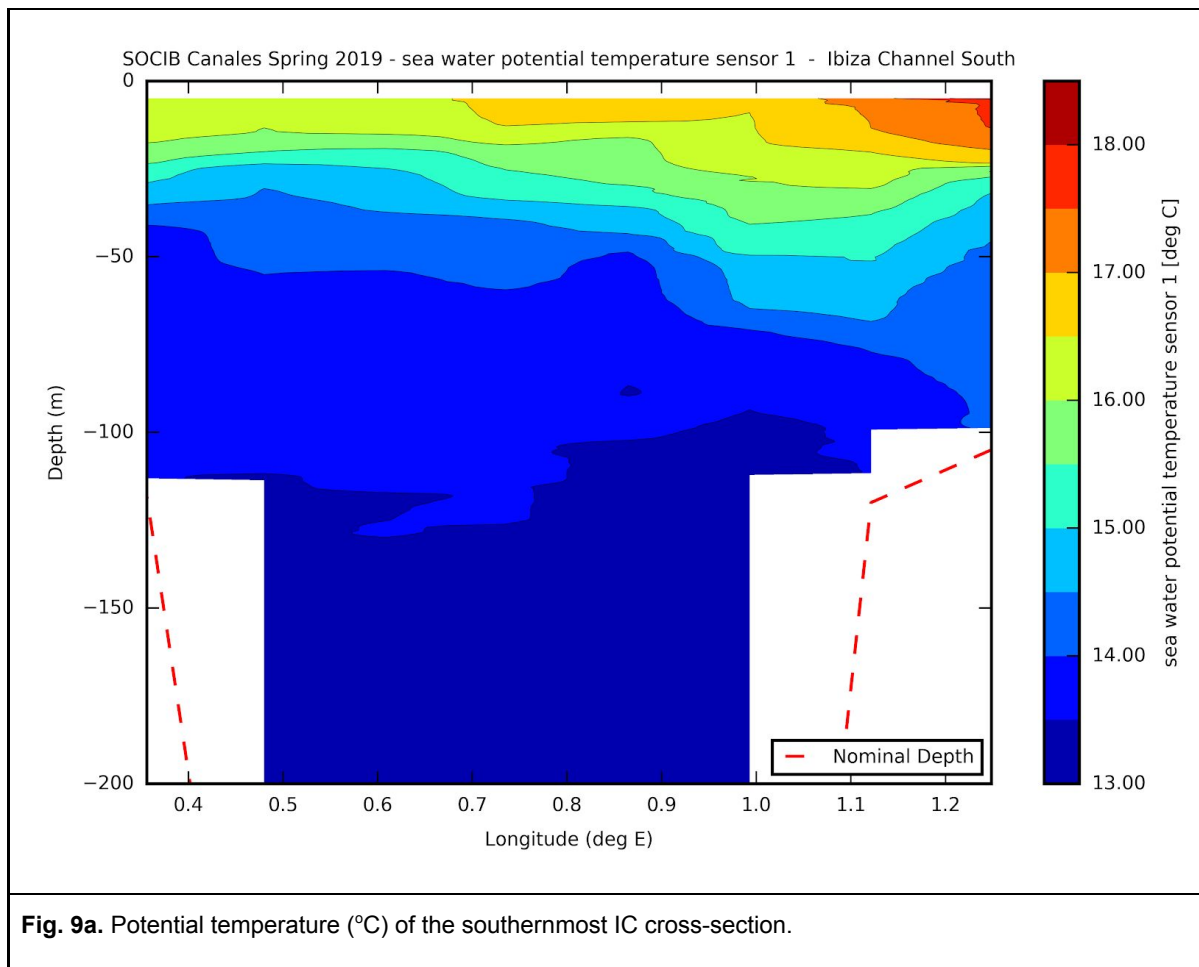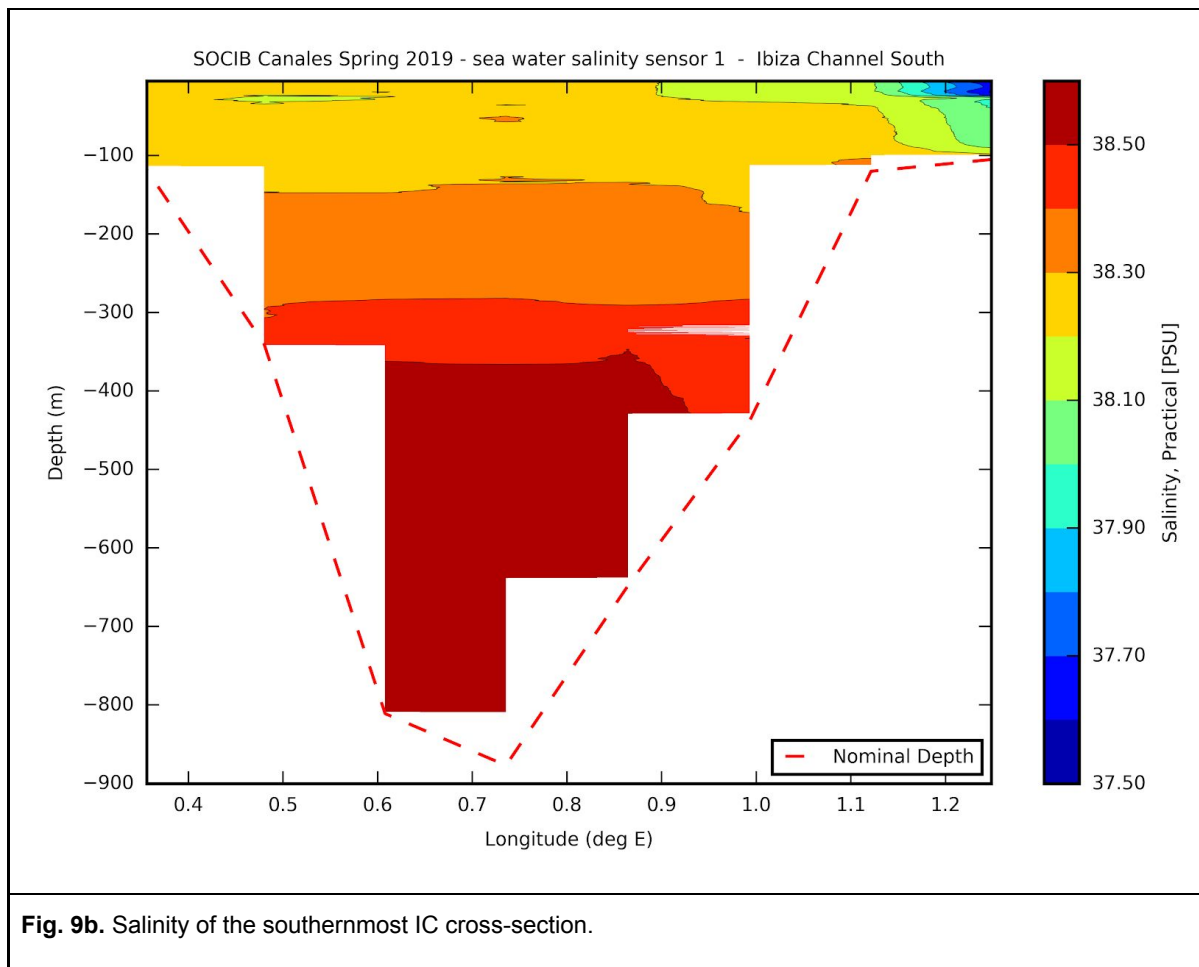
Fig. 8a. east components of velocity (mm s^{-1}) plotted over time in the southern section of the IC and MC return transect during day 3.

Fig. 8b. Quality flag for east components of velocity (mm s^{-1}) plotted over time in the southern section of the IC and MC return transect during day 3.

Fig. 8c. north components of velocity (mm s⁻¹) plotted over time in the southern section of the IC and MC return transect during day 3.

Fig. 8d. Quality flag for north components of velocity (mm s^{-1}) plotted over time in the southern section of the IC and MC return transect during day 3.

Figure 9 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.
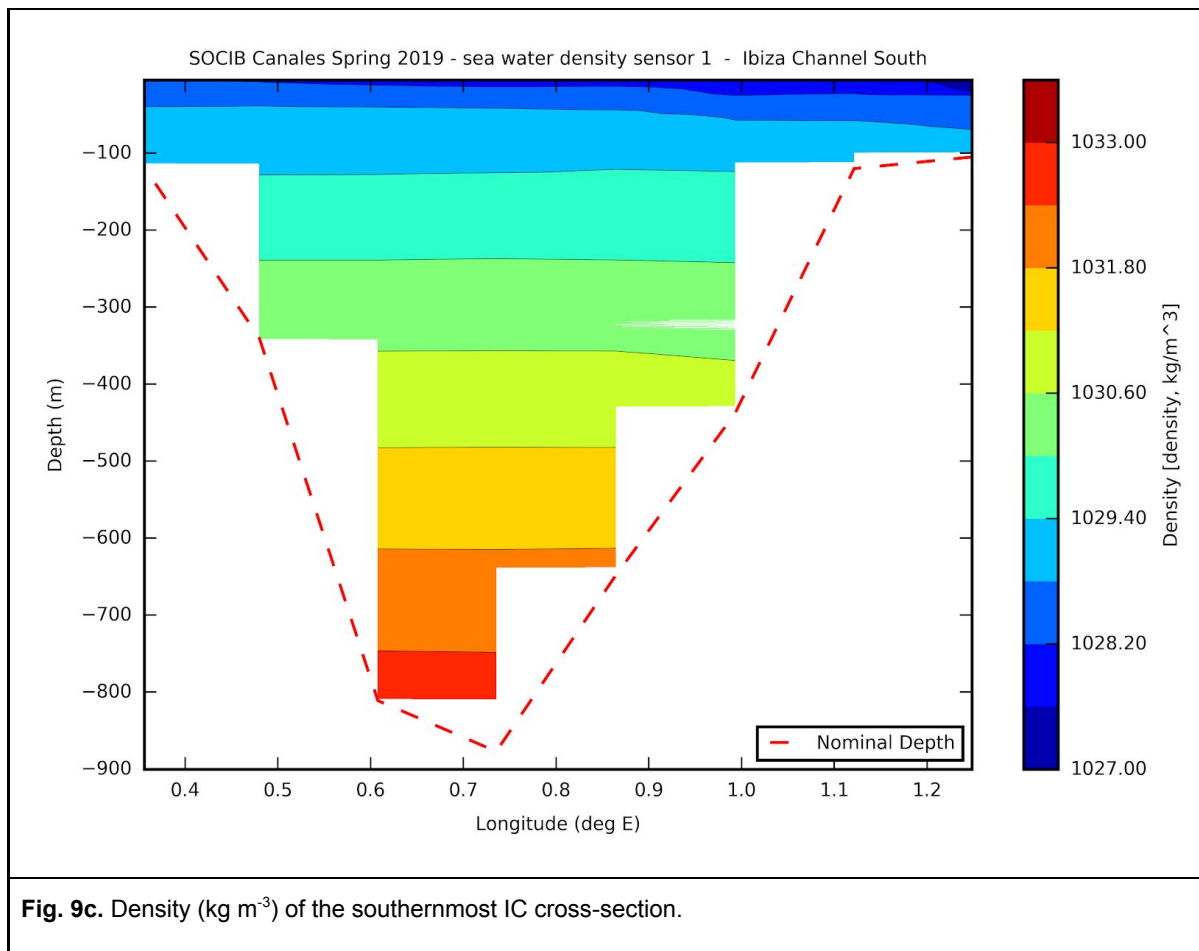
Potential temperature (figure 9a) has an almost uniform vertical distribution presenting a weak temperature gradient between 13ºC and 18ºC that is stronger in the Ibiza shelf.

Salinity (figure 9b) 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 37.50 psu - 38.60 psu.

Density (figure 9c) also presents a vertical distribution characterized by weak vertical gradients between 1027 and 1034 kgm-3.

Fig. 9a. Potential temperature (°C) of the southernmost IC cross-section.

Fig. 9b. Salinity of the southernmost IC cross-section.

Fig. 9c. Density (kg m^{-3}) of the southernmost IC cross-section.
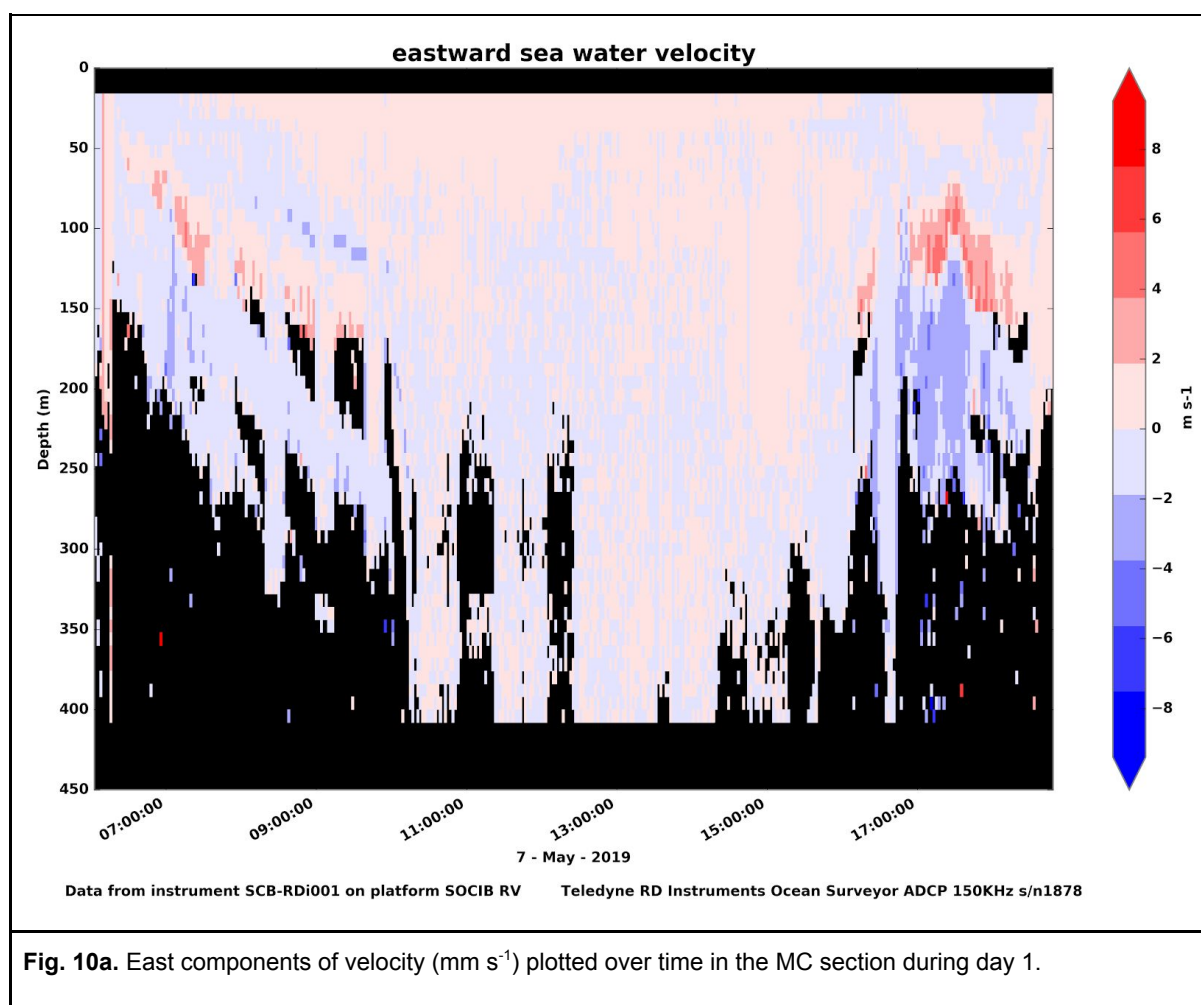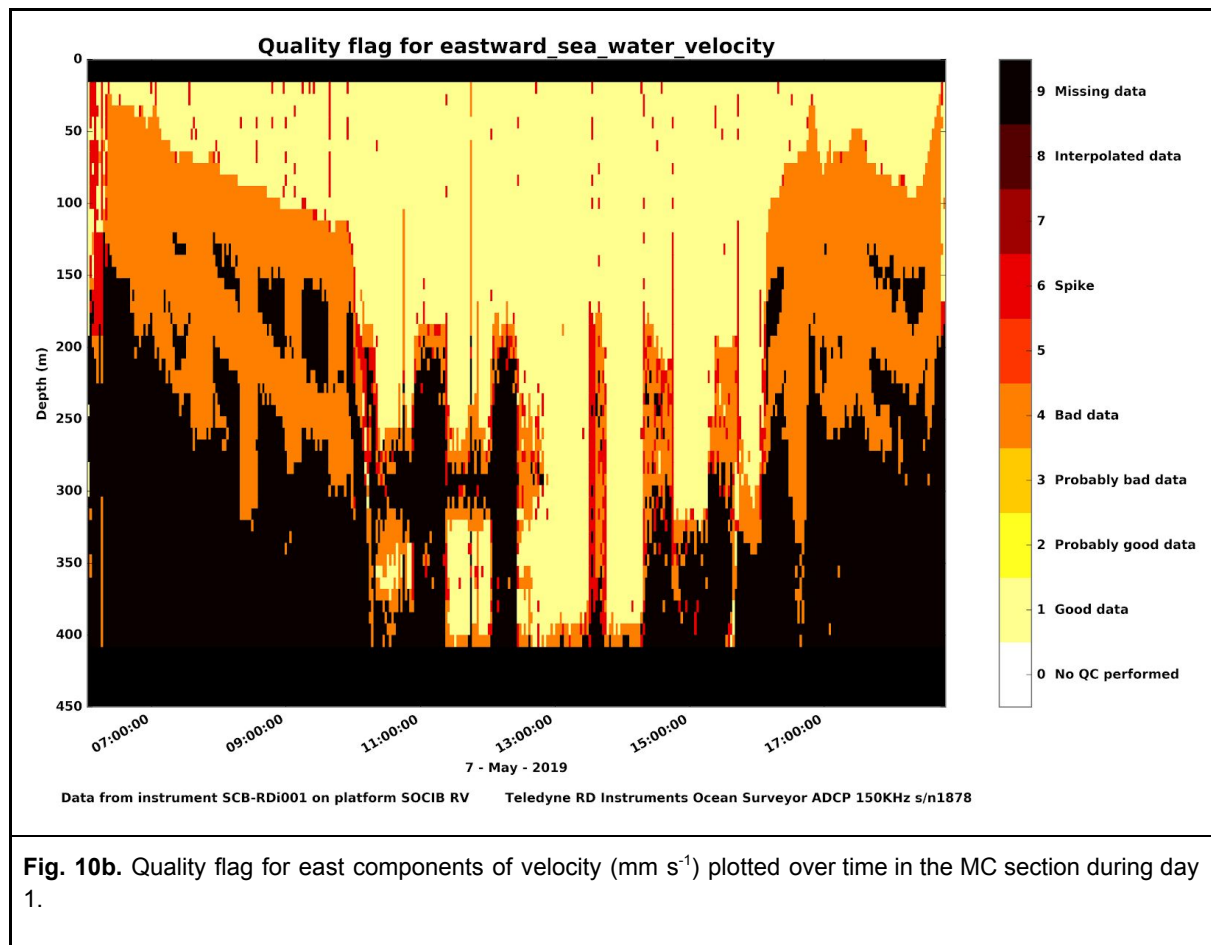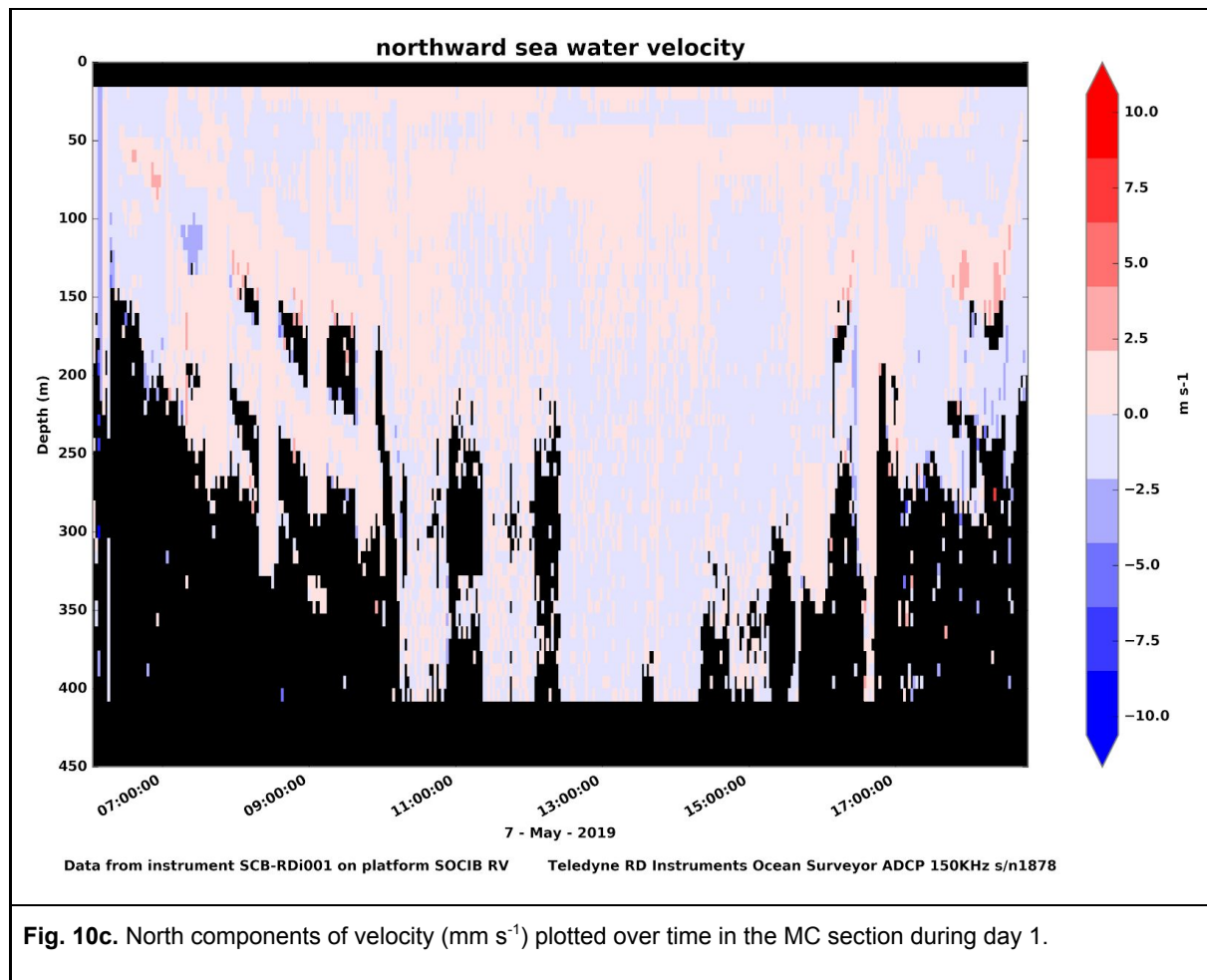
4. Mallorca Channel

The figures presented in this section are showing the transect of the MC. Figure 10 shows the velocities u and v from the ADCP and their respective quality flags.
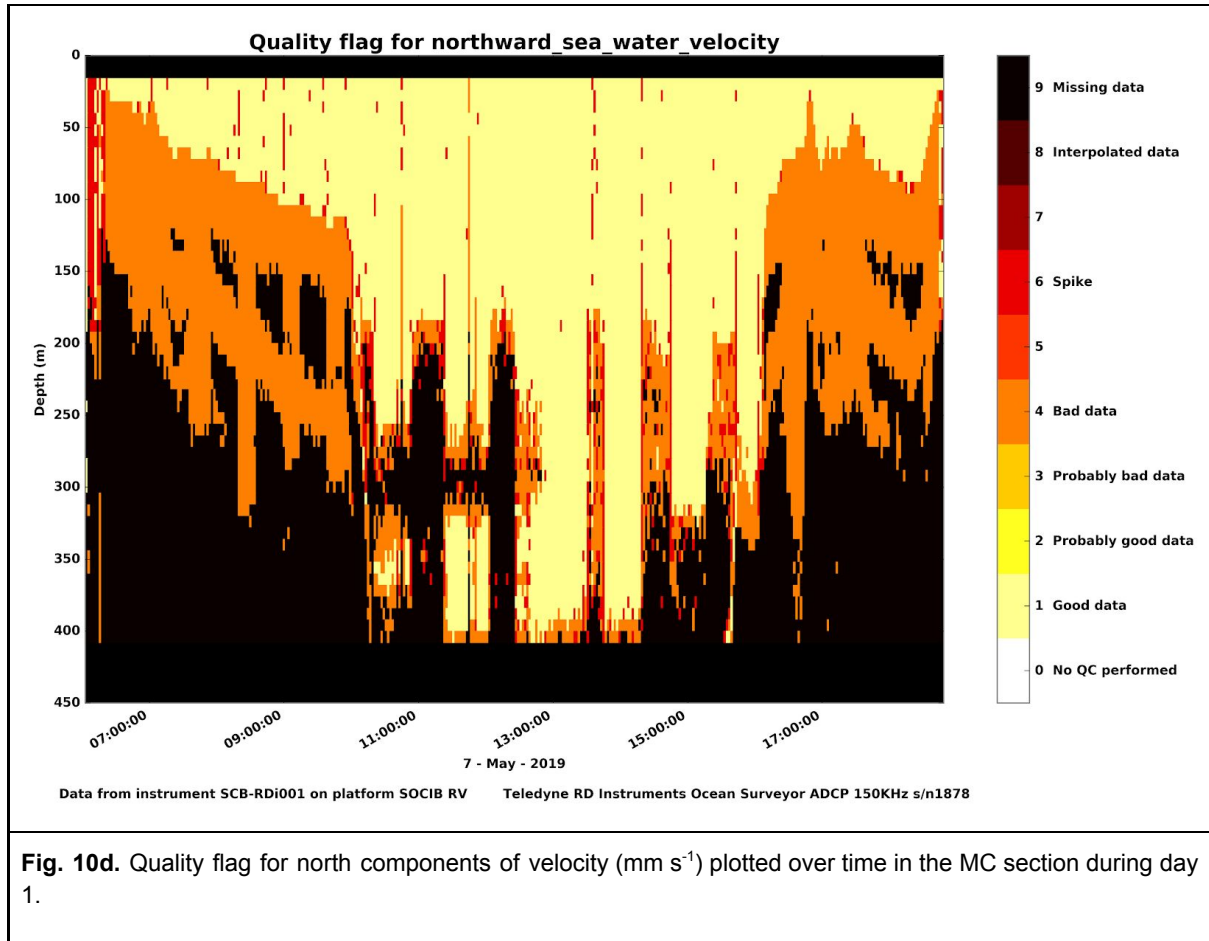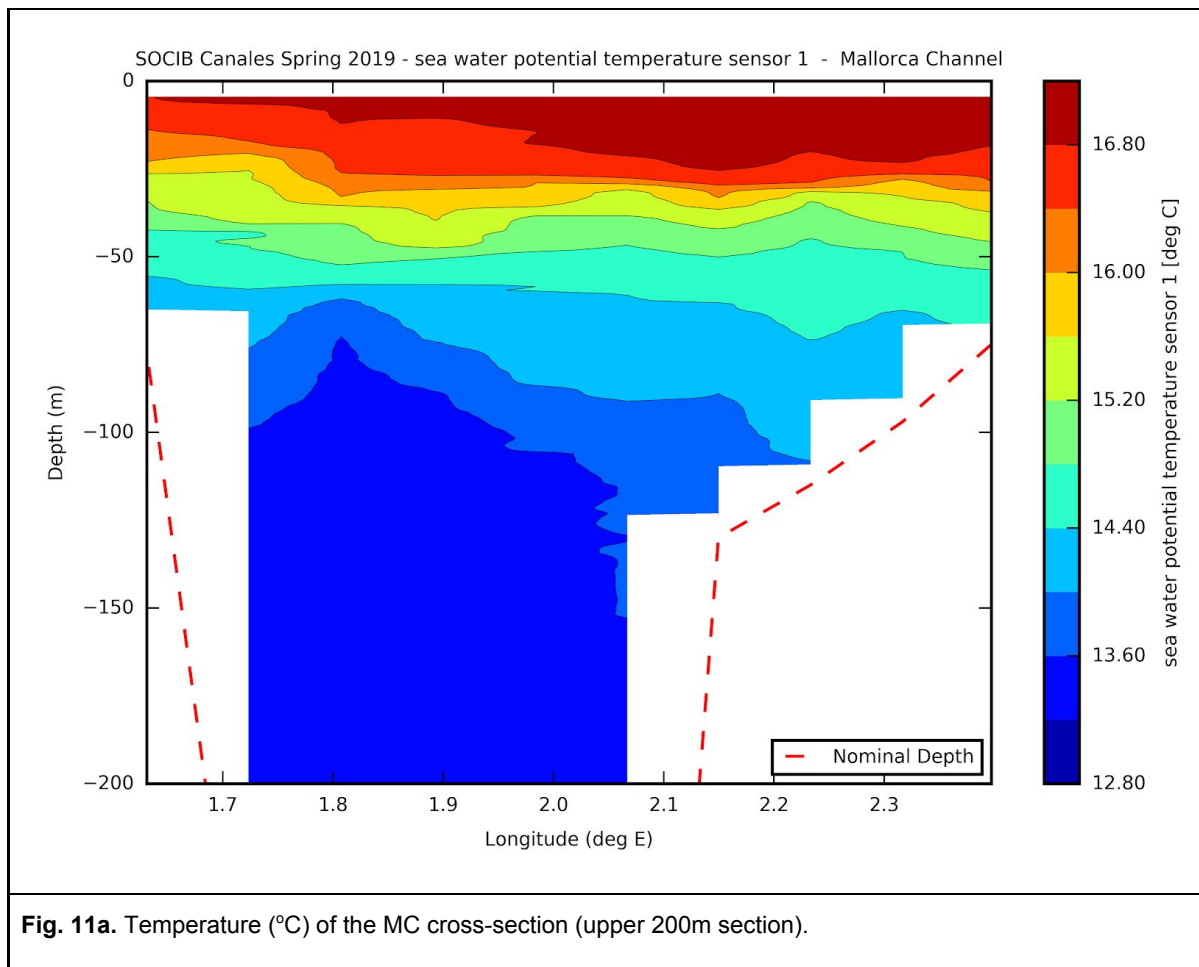

Fig. 10a. East components of velocity (mm s^{-1}) plotted over time in the MC section during day 1.

Fig. 10b. Quality flag for east components of velocity (mm s^{-1}) plotted over time in the MC section during day 1.

Fig. 10c. North components of velocity (mm s^{-1}) plotted over time in the MC section during day 1.

Fig. 10d. Quality flag for north components of velocity (mm s^{-1}) plotted over time in the MC section during day 1.
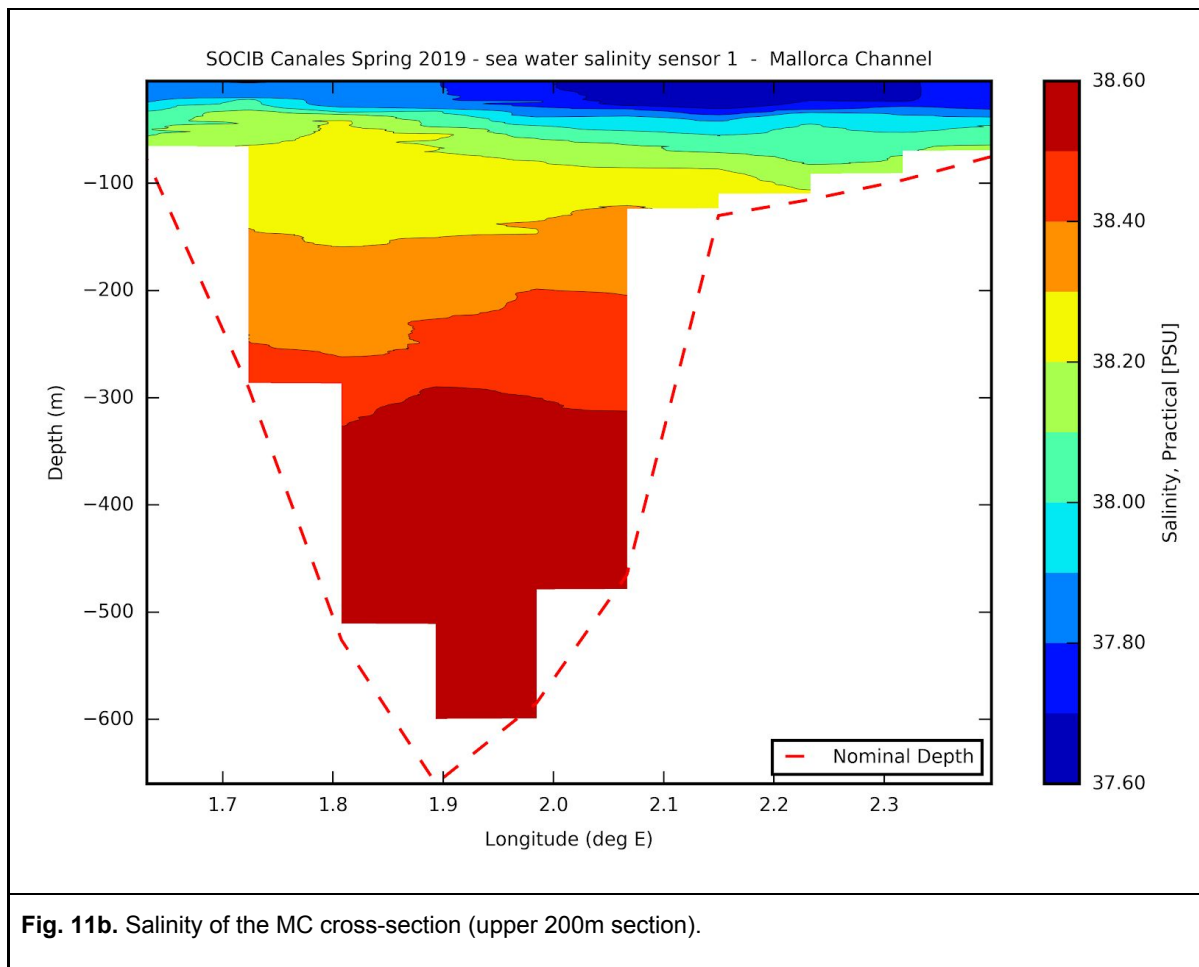
Figure 11 shows the different variables acquired through the CTD profiles across the Mallorca Channel covering from 1.9º E (Ibiza shelf) til 2.4º E (Mallorca shelf).
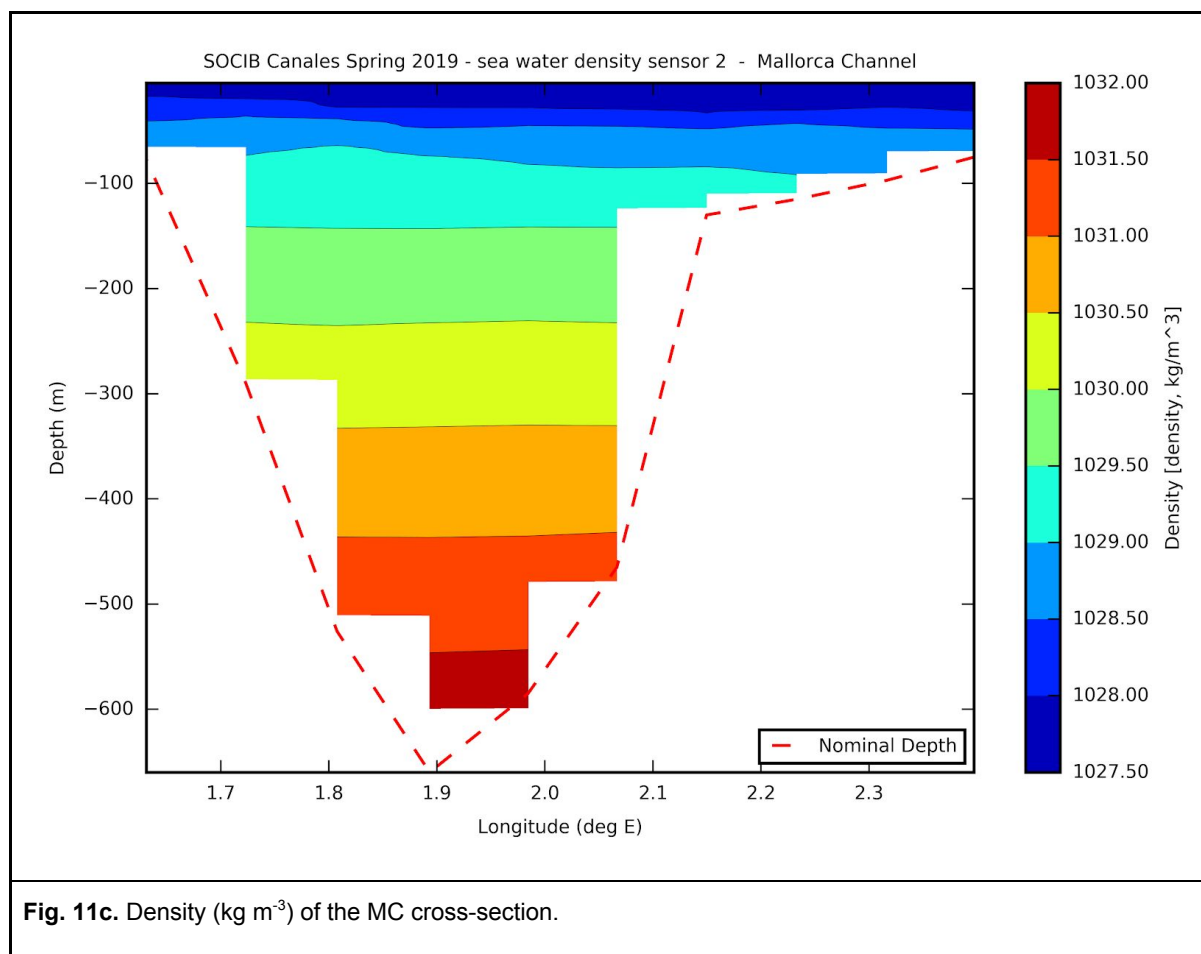
Potential temperature (figure 11a) has an almost uniform vertical distribution presenting a weak temperature gradient between 12.8ºC and 17.2ºC.

Salinity (figure 11b) 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 37.60psu - 38.60 psu.

Density (figure 11c) also presents a vertical distribution characterized by weak vertical gradients between 1027 and 1032 kgm-3.

Fig. 11a. Temperature (ºC) of the MC cross-section (upper 200m section).

Fig. 11b. Salinity of the MC cross-section (upper 200m section).

Fig. 11c. 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. 12a) and *in vivo* fluorescence (Fig. 12b) 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 distribution follows the temperature and relates to maximum values encountered for dissolved oxygen (up to 8 mg/l).
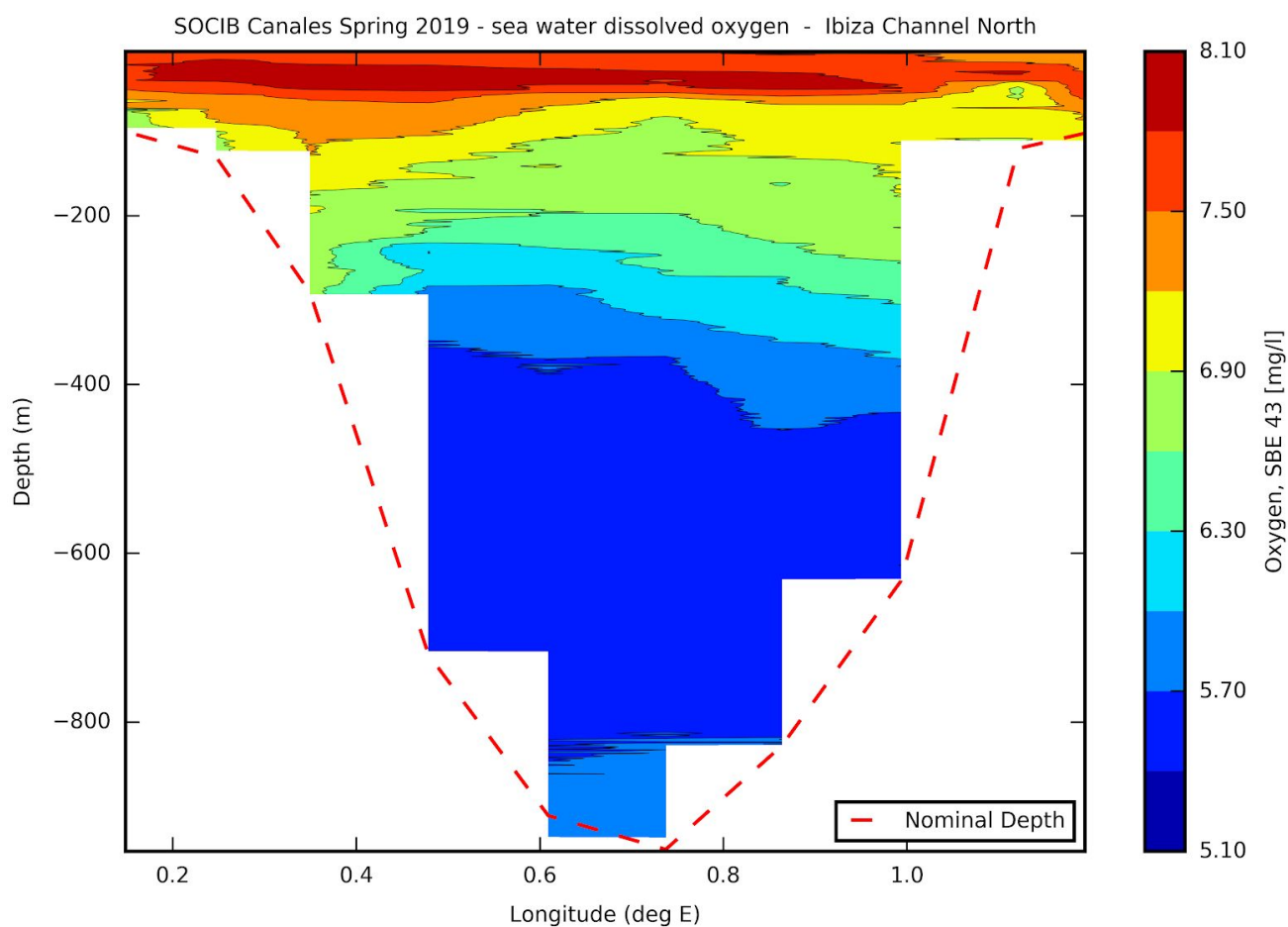
Fig. 12a: Initial figure for dissolved oxygen distribution obtained during the northern transect of the IC
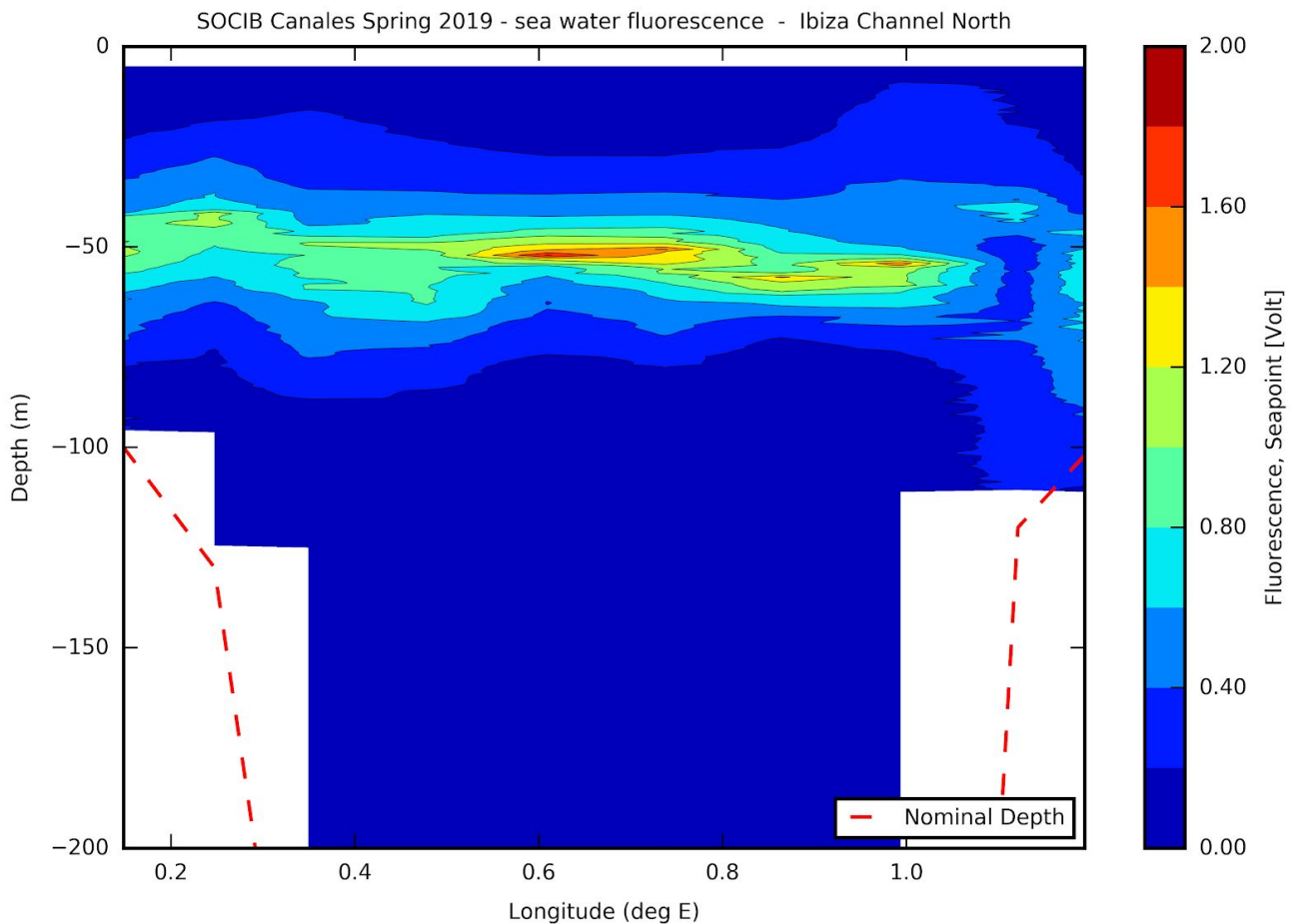
Fig. 12b: Initial figure for fluorescence distribution obtained during the northern transect of the IC

2. Ibiza Channel: South

In this most southern transect of the Ibiza Channel we found the maximum chl *a* fluorescence signal (2 mg/m3) at around 50 m as well, together with the highest values for dissolved oxygen (see Figs. 13 a, b).
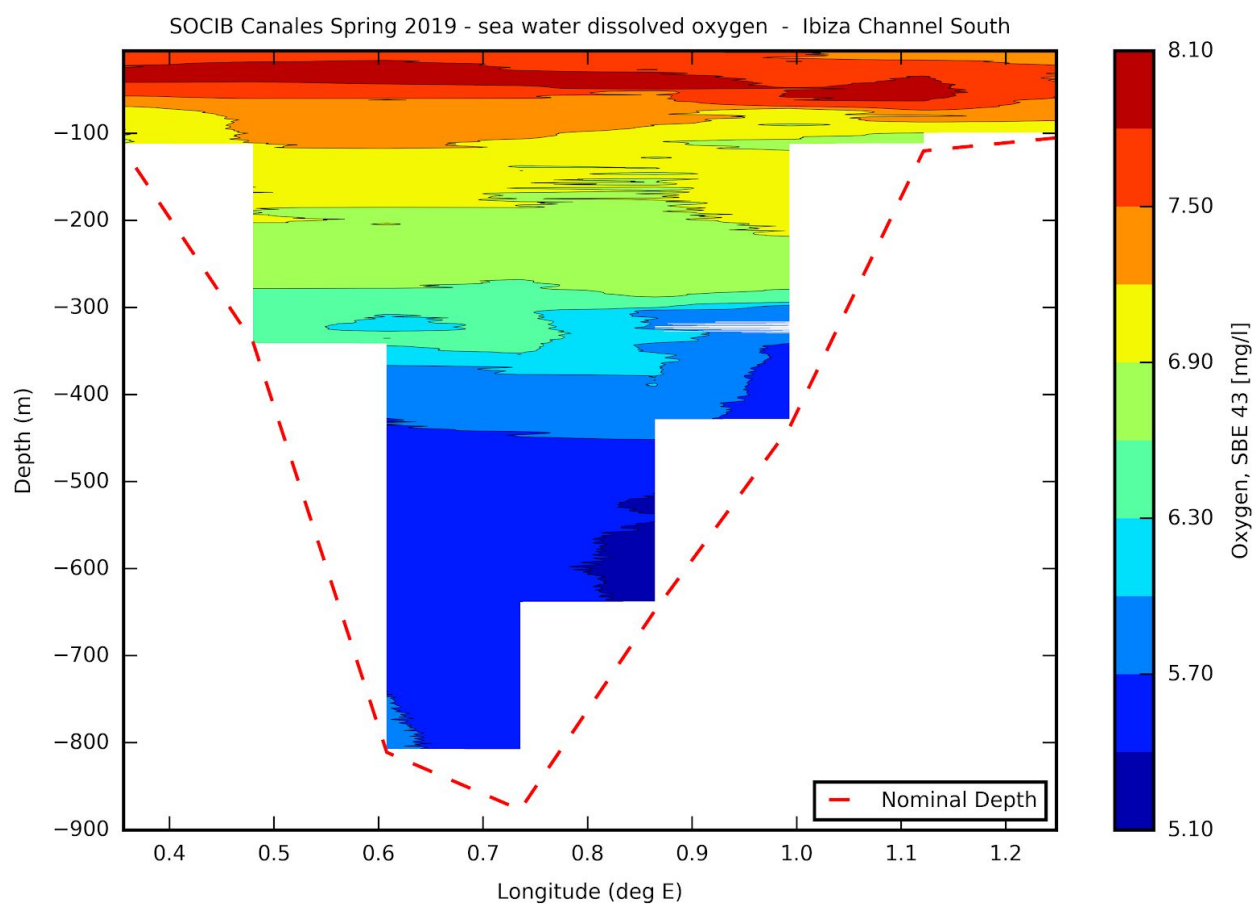
Fig. 13a: Initial figure for dissolved oxygen concentration distribution obtained on the southernmost IC cross-section.
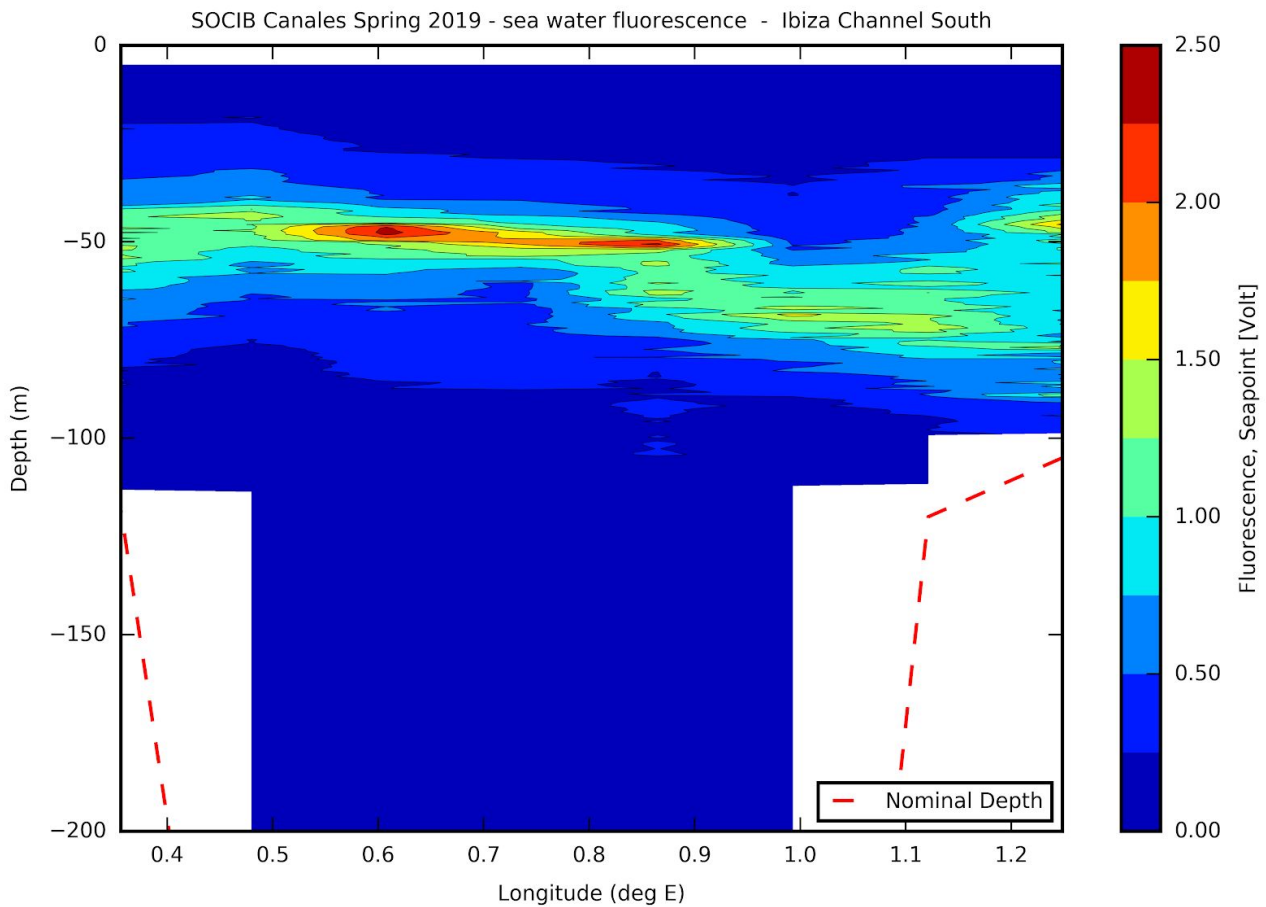
Fig. 13b: Initial figure for fluorescence distribution obtained on the the southernmost IC cross-section.

3. Mallorca Channel

The preliminary results obtained with the CTD sensors, indicate that the maximum chl *a* fluorescence depth in the Mallorca Channel is around 50 -as for the Ibiza Channel- and deeper (60 m, Fig. 14 b) and the maximum values for dissolved oxygen are found in the Ibiza shelf side (1.7- 1.9ºE).
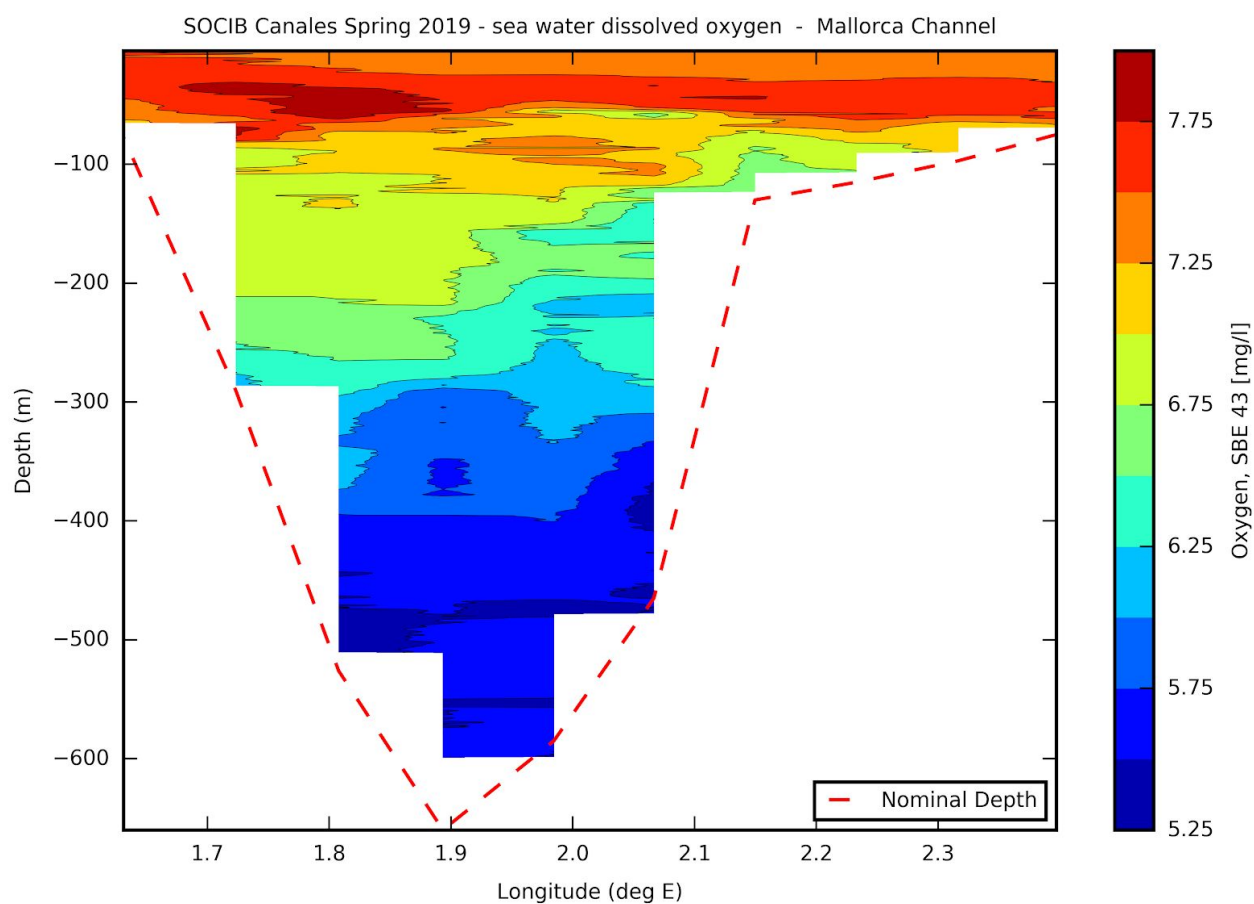
Fig. 14a: Initial figure for dissolved oxygen concentration distribution obtained on the Mallorca Channel cross-section.
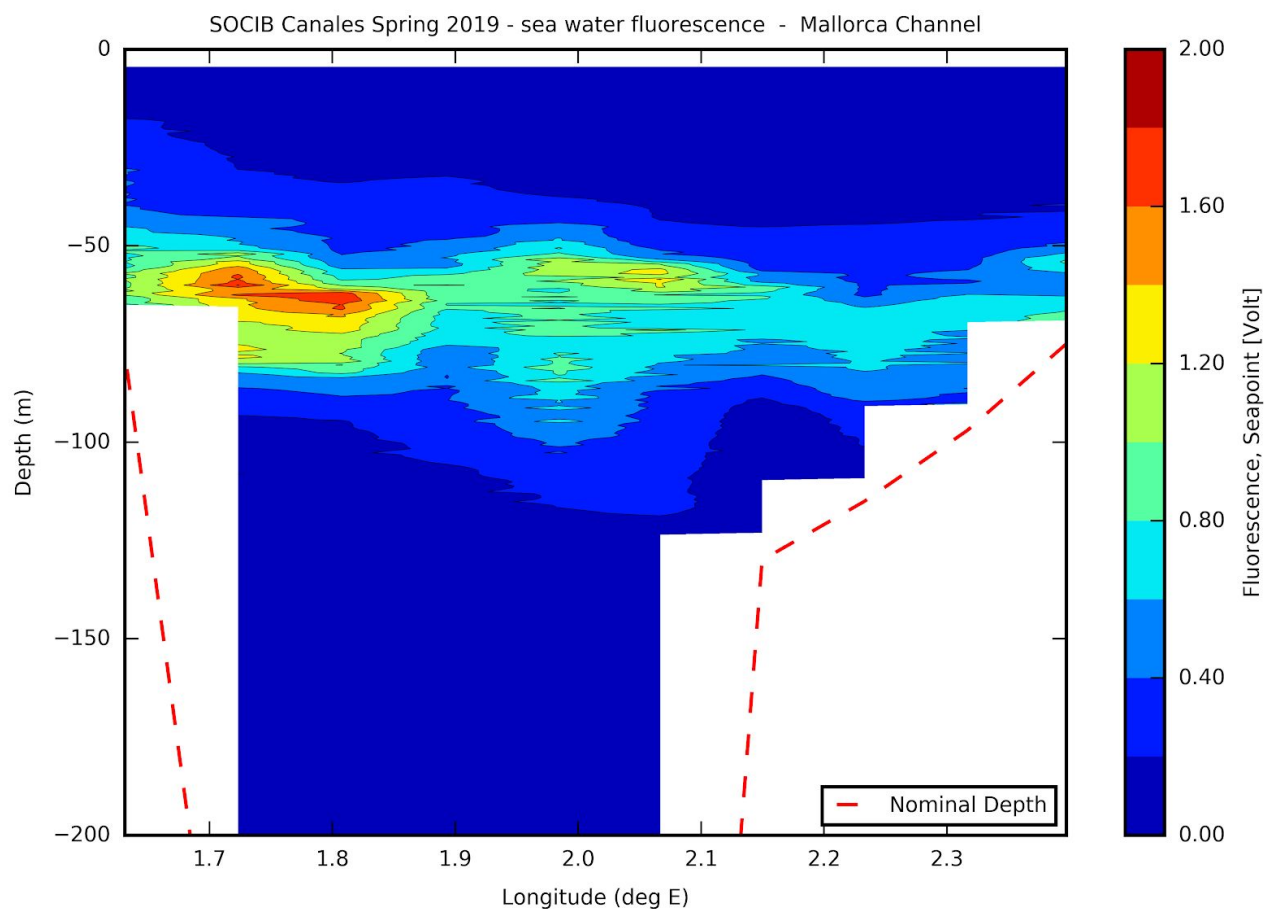
Fig. 14b: Initial figure for fluorescence distribution obtained on the the Mallorca Channel cross-section.

Problems encountered

As already mentioned above in this report, the upcast profile from S2_05 presented a lot of noise in the measurements for turbidity. Once the cable was cleaned, the problem seemed to be solved. Days later it was discovered that there was a plastic label attached to the cable that was causing the interferences during the upcast on the optical area of the turbidity sensor.

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 Spring 2019

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 Spring 2019

RADMED_01.XMLCON

```
<?xml version="1.0" encoding="UTF-8"?>
```

www.socib.es

```xml
<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>
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        <Sensor index="0" SensorID="55" >
        <TemperatureSensor SensorID="55" >
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        <CalibrationDate>31-Oct-18</CalibrationDate>
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        <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>
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        <A>0.00000000e+000</A>
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<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>
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</Coefficients>
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<Offset>0.00000</Offset>
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</Sensor>
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<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>
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<AD590M>1.282500e-002</AD590M>
<AD590B>-9.474780e+000</AD590B>
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</Sensor>
<Sensor index="3" SensorID="55" >
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<SerialNumber>5425</SerialNumber>
<CalibrationDate>31-Oct-18</CalibrationDate>
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<F0_Old>0.000</F0_Old>
<G>4.32807175e-003</G>
<H>6.26530273e-004</H>
<I>1.95901261e-005</I>
<J>1.48494602e-006</J>
<F0>1000.000</F0>
<Slope>1.00000000</Slope>
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</Sensor>
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<ConductivitySensor SensorID="3" >
<SerialNumber>3907</SerialNumber>
<CalibrationDate>17-Oct-18</CalibrationDate>
<UseG_J>1</UseG_J>
<!-- Cell const and series R are applicable only for wide range sensors. -->
<SeriesR>0.0000</SeriesR>
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<D>0.00000000e+000</D>
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<CPcor>-9.57000000e-008</CPcor>
</Coefficients>
<Coefficients equation="1" >
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<H>1.39010276e+000</H>
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<J>7.95984096e-005</J>
<CPcor>-9.57000000e-008</CPcor>
<CTcor>3.2500e-006</CTcor>
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</Sensor>
<Sensor index="5" SensorID="71" >
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<CalibrationDate>16-Nov-18</CalibrationDate>
<M>21.6970</M>
<B>-1.7140</B>
<PathLength>0.250</PathLength>
</WET_LabsCStar>
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<NotInUse SensorID="27" >
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</NotInUse>
</Sensor>
<Sensor index="7" SensorID="38" >
<OxygenSensor SensorID="38" >
<SerialNumber>2119</SerialNumber>
<CalibrationDate>19-Oct-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>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>
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<H2> 5.0000e+003</H2>
<H3> 1.4500e+003</H3>
</CalibrationCoefficients>
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</Sensor>
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<NotInUse SensorID="27" >
<SerialNumber></SerialNumber>
<CalibrationDate></CalibrationDate>
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<Free>1</Free>
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<SerialNumber>12182</SerialNumber>
<CalibrationDate>07-Nov-18</CalibrationDate>
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<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>
<!-- The following is an array index, not the actual gain setting. -->
<GainSetting>1</GainSetting>
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</FluoroSeapointSensor>
</Sensor>
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<AltimeterSensor SensorID="0" >
<SerialNumber>69894</SerialNumber>
<CalibrationDate>2018-12</CalibrationDate>
<ScaleFactor>15.000</ScaleFactor>
<Offset>0.000</Offset>
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<Sensor index="12" SensorID="42" >
<PAR_BiosphericalLicorChelseaSensor SensorID="42" >
<SerialNumber>70364</SerialNumber>
<CalibrationDate>02-Nov-18</CalibrationDate>
<M>1.00000000</M>
<B>0.00000000</B>
<CalibrationConstant>17575000000.00000000</CalibrationConstant>
<Multiplier>1.00000000</Multiplier>
<Offset>-0.05720214</Offset>
</PAR_BiosphericalLicorChelseaSensor>
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<OutputType>0</OutputType>
<Free>0</Free>
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</Sensor>
<Sensor index="14" SensorID="51" >
<SPAR_Sensor SensorID="51" >
<SerialNumber>20395</SerialNumber>
<CalibrationDate>02-nov-2018</CalibrationDate>
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        <ConversionFactor>1443.22580000</ConversionFactor>
        <RatioMultiplier>1.00000000</RatioMultiplier>
        </SPAR_Sensor>
        </Sensor>
        </SensorArray>
  </Instrument>
</SBE_InstrumentConfiguration>
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