

# SOCIB Glider Mission Summary Report

SOCIB\_ENL\_CANALES\_SEP2020\_U567\_sdeep04

Authors: P. Rivera, M. Rubio, N. Zarokanellos, A. Miralles (SOCIB glider team)

Contributors: ETD and DC team

PI: J. Tintoré

Document generated on July 14, 2023



# SOCIB

Balearic Islands  
Coastal Observing  
and Forecasting System



# Contents

|     |                                      |    |
|-----|--------------------------------------|----|
| 1   | Introduction                         | 2  |
| 1.1 | Summary                              | 2  |
| 1.2 | Metadata                             | 4  |
| 2   | Engineering Review                   | 5  |
| 2.1 | Preparation                          | 5  |
| 2.2 | Mission Survey                       | 5  |
| 2.3 | NAV plots                            | 6  |
| 3   | Scientific Preliminary Review        | 17 |
| 3.1 | SCI Profiles                         | 17 |
| 3.2 | SCI plots                            | 17 |
| 4   | Appendix                             | 27 |
| 4.1 | Glider behaviour                     | 27 |
| 4.2 | Installed devices (from autoexec.mi) | 28 |
| 4.3 | Possible Iridium states              | 28 |
|     | List of figures                      | 30 |

# 1 Introduction

The aim of this document is to summarize the most significant technical and scientific events during the glider mission. It will explain engineering events that could affect the science data and also some fact from the science point of view.

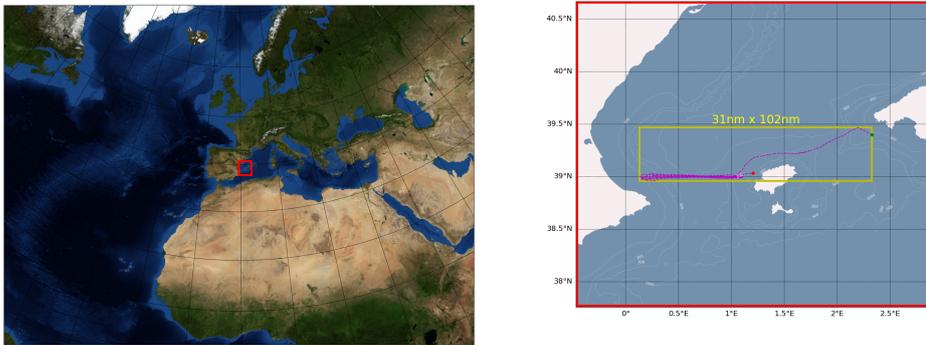


Figure 1.1: Map providing general overview of the Survey Area

## 1.1 Summary

|                                |  |
|--------------------------------|--|
| Mission name                   | SOCIB_ENL_CANALES_SEP2020_U567_sdeep04   |
| Platform model                 | G3 Electric  |
| Platform ID / Name / WMO Code  | U567/ sdeep04/ 68997   |
| Software NAV version           | Version 8.2 Under Ice, In-situ Compass Cal, JASCO Observer   |
| Software SCI version           | Version 8.2 Under Ice, In-situ Compass Cal, JASCO Observer   |
| FWD bay sn                     | 0480   |
| SCI bay sn                     | 1035   |
| Mission duration               | 38.0 days  |
| Mission start                  | 2020-09-29 09:11:00  |
| Mission end                    | 2020-11-06 08:04:08  |
| Total distance                 | 803.32[km] 433.76[nm]  |
| Deployment point [dd°mm.mmmm'] | N 39° 24.0633' E 02° 19.7045'  |
| Recovery point [dd°mm.mmmm']   | N 39° 02.0747' E 01° 12.1954'  |
| Battery Consumption (Ah)       | 202.2(from 56.2 to 258.4)  |
| Battery specification          | 20190604-SN0036/ TWR 3S lithium (702Ah)  |
| Survey area                    | Canales  |
| Objetive                       | Establishing the variability of the N/S exchange of water masses that occur through the Ibiza Channel(IC). Sampling standard transects across the Ibiza Channel several times using physical and biogeochemical sensors. No greater than 1 month gap in between consecutive iterations. The Mallorca Channel is also sampled when operationally practical.   |
| Abstract                       | Deployment of Slocum G2 deep glider sdeep04 in endurance line campaign Canales SEP2020 (SOCIB operational program), aiming the coverage of the Eivissa channel (8 transects) and Mallorca channel (1 transect) from SEP to NOV 2020, sampling physical and biogeochemical parameters (CTD, fluorescence and turbidity, and oxygen).<br>Intersampling with RV will be available   |
| NAV events                     | <ul style="list-style-type: none"> <li>▪ Event 1: During the recovery phase, it was set up the script "resume", reducing the surface time by a factor of 10. Because of this short time, the glider wasn't triggering "the good surface" so it was surfacing another time for "no comms for a while".</li> <li>▪ Event 2: Fail on Iridium system network</li> <li>▪ Event 3: Hard currents near Denia, 330°</li> <li>▪ Event 4: Hard surface currents during the recovery, up to 0.7m/s</li> </ul>   |
| SCI events                     | <ul style="list-style-type: none"> <li>▪ Event 1: During the summer to fall transition period we observed the surface temperature in the first 50m of the water column to drop from up to 5 degrees</li> <li>▪ Event 2: During the missions several spikes in salinity, turbidity and chl<sub>a</sub> appeared as the indicate in figures <a href="#">3.5</a> and <a href="#">3.16</a></li> <li>▪ Event 3: The oxygen data show hysteresis of the oxygen measurements and need further correction using the temperature of the CTD.</li> <li>▪ Event 4: The isopycnal has been elevated on 11 of October bringing up nutrients to the euphotic layer as enhancing the observed phytoplankton biomass</li> <li>▪ Event 5: Patches of high salinity and high temperature water observed in the Mallorca channel in the upper 50m between 3rd and 6th of October</li> </ul> |

## 1.2 Metadata

|                                |  |
|--------------------------------|--|
| Principal Investigator         | Prof. Joaquim Tintoré jtintore@socib.es (+34 971439821)  |
| Institute                      | SOCIB  |
| Project Affiliation (web-site) | <a href="http://www.socib.eu/">http://www.socib.eu/</a>  |
| Campaign access type           | Internal   |
| Partnership / Participation    | <ul style="list-style-type: none"> <li>▪ SOCIB</li> </ul>  |
| Data Retrieval                 | <ul style="list-style-type: none"> <li>▪ RT: sub-set via satellite link at each surface maneuver</li> <li>▪ DM: full/direct memory card backup after glider disassembly during Conclusion mission-phase</li> </ul> |
| Data Available From*           | <a href="http://thredds.socib.es/thredds/catalog/auv/glider/catalog.html">http://thredds.socib.es/thredds/catalog/auv/glider/catalog.html</a>  |
| DOI (if available)             | <a href="https://doi.org/10.25704/jd07-sv9">https://doi.org/10.25704/jd07-sv9</a>  |
| Further Details                | <a href="mailto:glider@socib.es">glider@socib.es</a>   |

\*Available netCDF data product:

- L0: [https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb\\_sldeep004/L0/2020/dep0019\\_sdeep04\\_scb-sldeep004\\_L0\\_2020-09-29\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb_sldeep004/L0/2020/dep0019_sdeep04_scb-sldeep004_L0_2020-09-29_data_dt.nc)
- L1: [https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb\\_sldeep004/L1/2020/dep0019\\_sdeep04\\_scb-sldeep004\\_L1\\_2020-09-29\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb_sldeep004/L1/2020/dep0019_sdeep04_scb-sldeep004_L1_2020-09-29_data_dt.nc)
- L2: [https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb\\_sldeep004/L2/2020/dep0019\\_sdeep04\\_scb-sldeep004\\_L2\\_2020-09-29\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb_sldeep004/L2/2020/dep0019_sdeep04_scb-sldeep004_L2_2020-09-29_data_dt.nc)

## 2 Engineering Review

### 2.1 Preparation

- Premission: ok
- Hardware: ok, installed new oxy cable
- Batteries: ok
- Comms: ok
- Science: ok, intersampling with RV is aviable
- Ballasting: ok
- Sealing: ok
- Fileset: ok
- CEM: na
- Harbor check: ok
- Recovery: ok, because undervolts abort
- Conclusion: ok

### 2.2 Mission Survey

- Deployment:
  - Vessel: SOCIB I
  - Personnel: 1 ETD + 2 GF (piloting)
  - Location: Palma Bay
- Navigation: The glider responded well to the commanded target waypoints.
- Underwater Maneuvering: Performed well
- Engineering sensors:

| Sensor        | Oddities | Warnings | Errors |
|---------------|----------|----------|--------|
| attitude rev  | 0        | 1        | 0      |
| pitch motor   | 12       | 0        | 0      |
| science super | 27       | 0        | 0      |
| digifin       | 793      | 4        | 0      |
| IRIDIUM       | 159      | 1        | 0      |

- Communication Systems (see appendix for Iridium states):
  - Total number iridium calls [num]: 138
  - Iridium calls to secondary [num]: 4
  - ON overall iridium period [h]: 3.5
  - Iridium calls state from MODE NO CARRIER to MODE UNKNOWN [num]: 18
  - Iridium calls state from MODE CONNECT to MODE UNKNOWN [num]: 137
  - Iridium calls state from MODE UNKNOWN to MODE AWAITING OK [num]: 156
  - Drop calls (Iridium state from 2 to 99 with c iridium on = 1) [num]: 1

- Total time at surface [h]: 16.5
- Total time at surface [%]: 1.81
- Hull/Hydrodynamics: No signs of problems
- Recovery:
  - Vessel: Socib RV
  - Personnel: 3 ETD + 1 GF
  - Location: Sant Antoni, IB

## 2.3 NAV plots

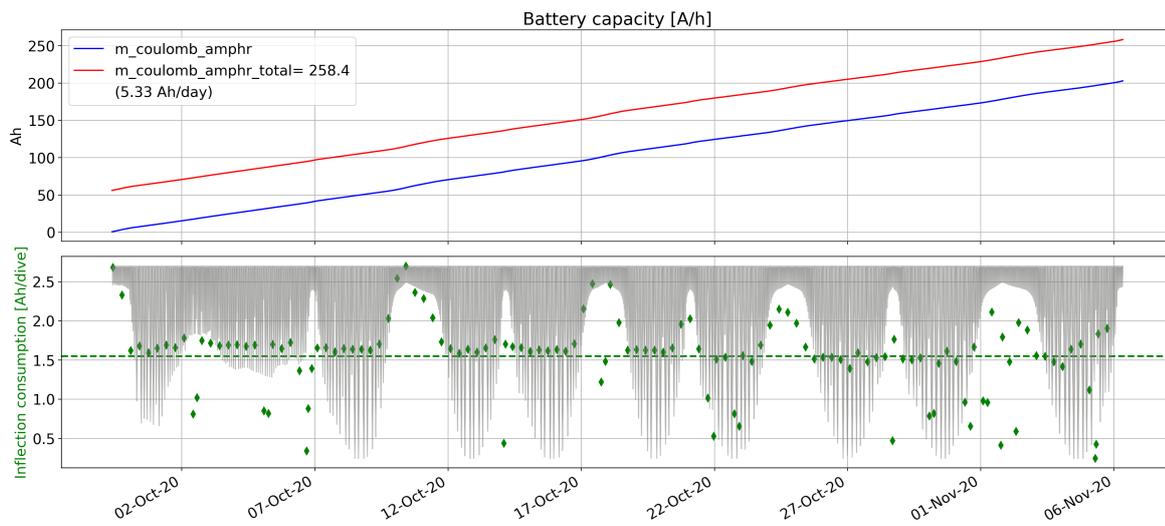


Figure 2.1: Battery capacity

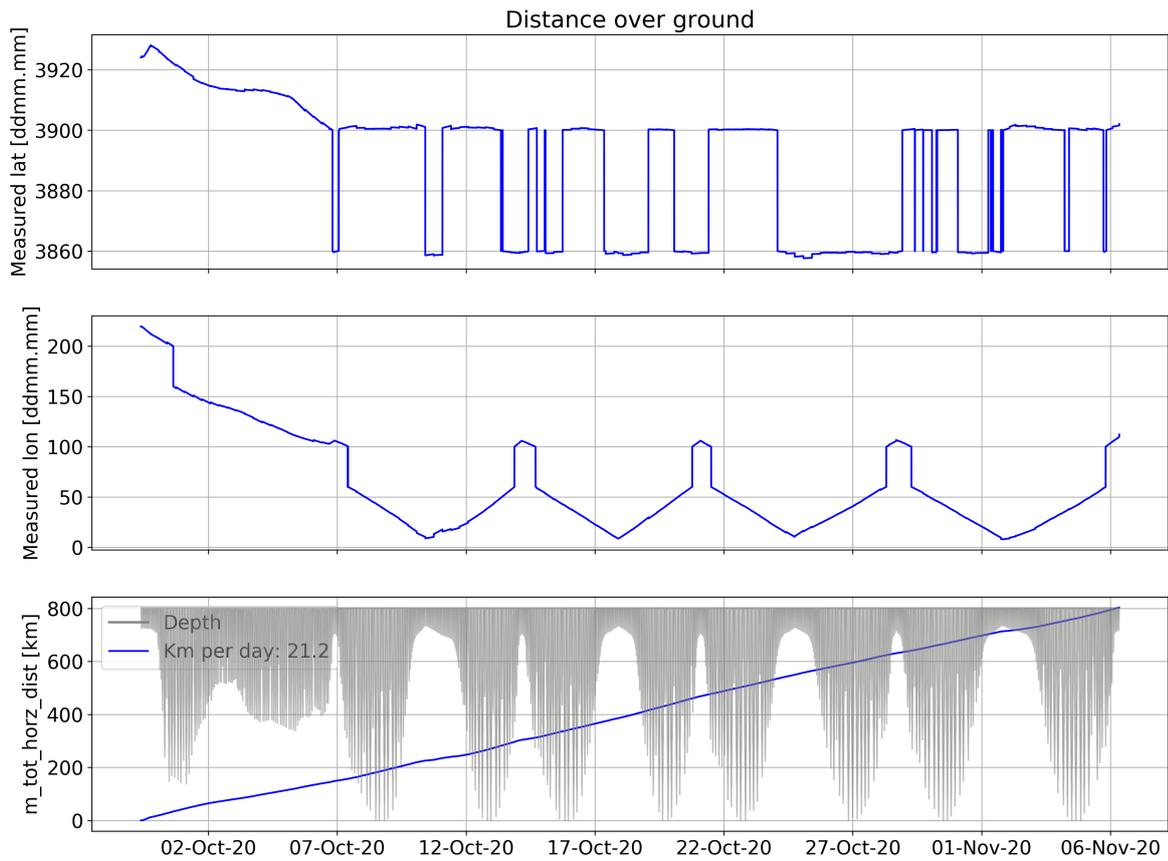


Figure 2.2: Distance over ground

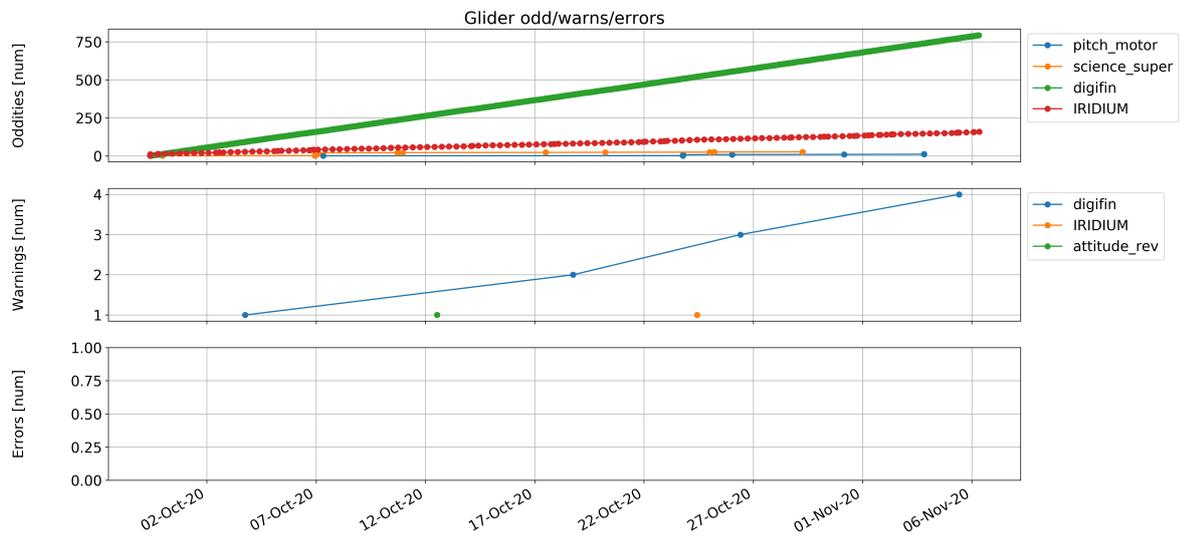


Figure 2.3: Glider Odd Warn and Err

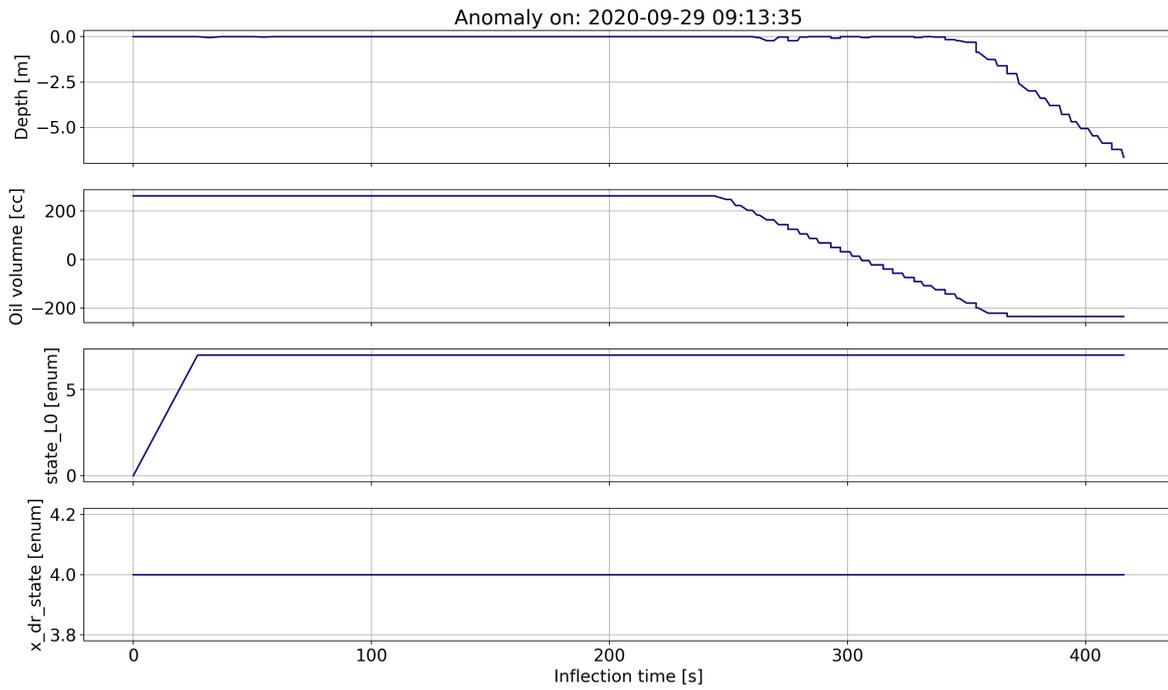


Figure 2.4: 20200929T091335 Anomaly 1

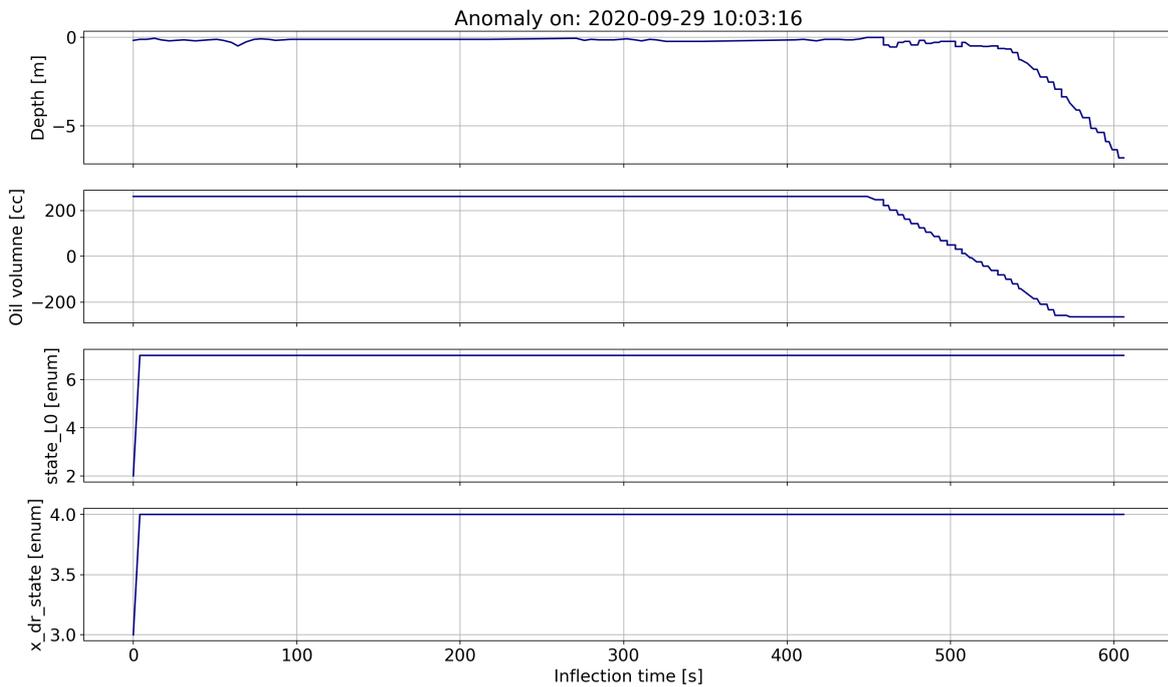


Figure 2.5: 20200929T100316 Anomaly 2

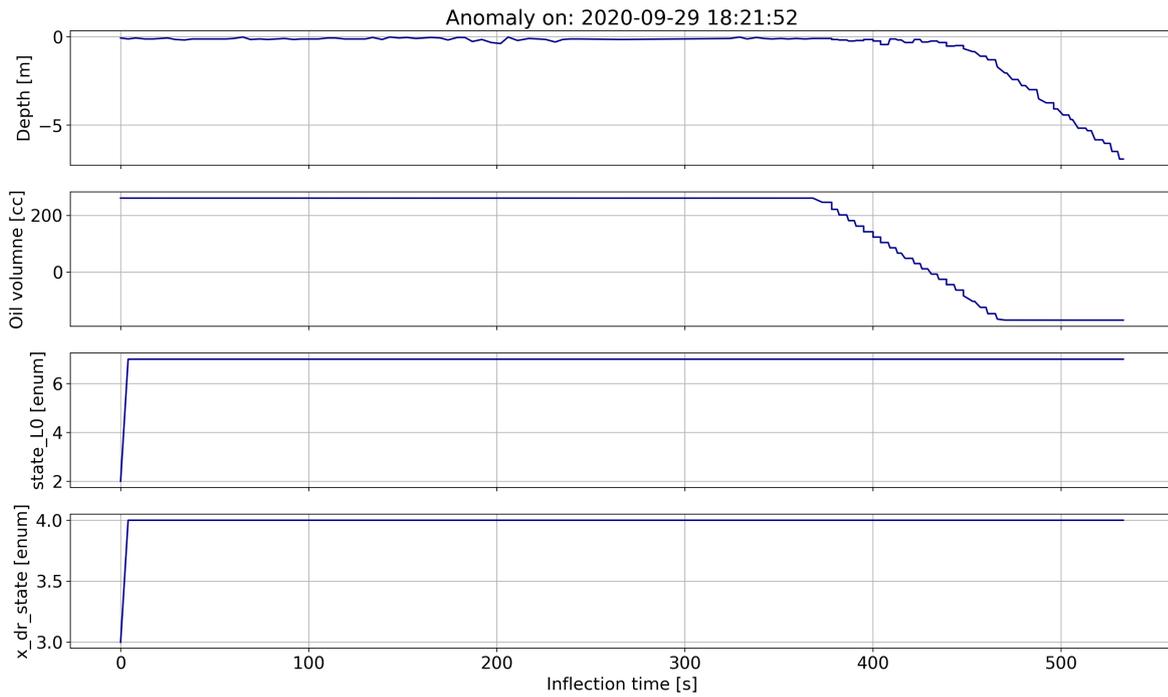


Figure 2.6: 20200929T182152 Anomaly 3

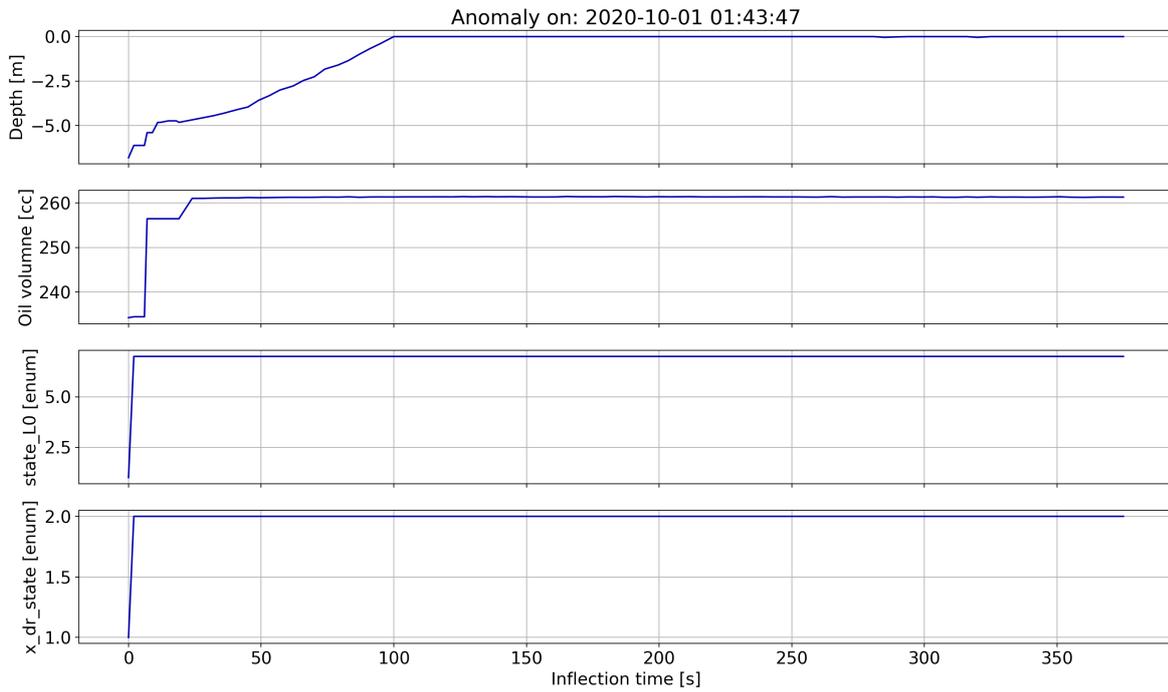


Figure 2.7: 20201001T014347 Anomaly 4

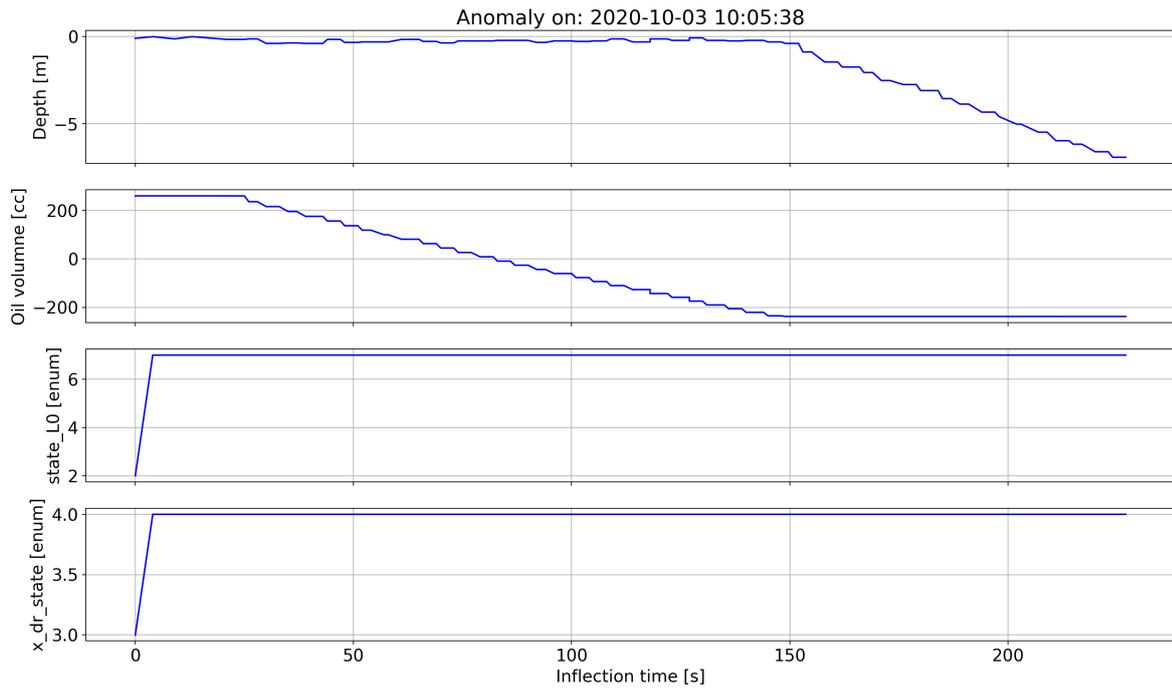


Figure 2.8: 20201003T100538 Anomaly 5

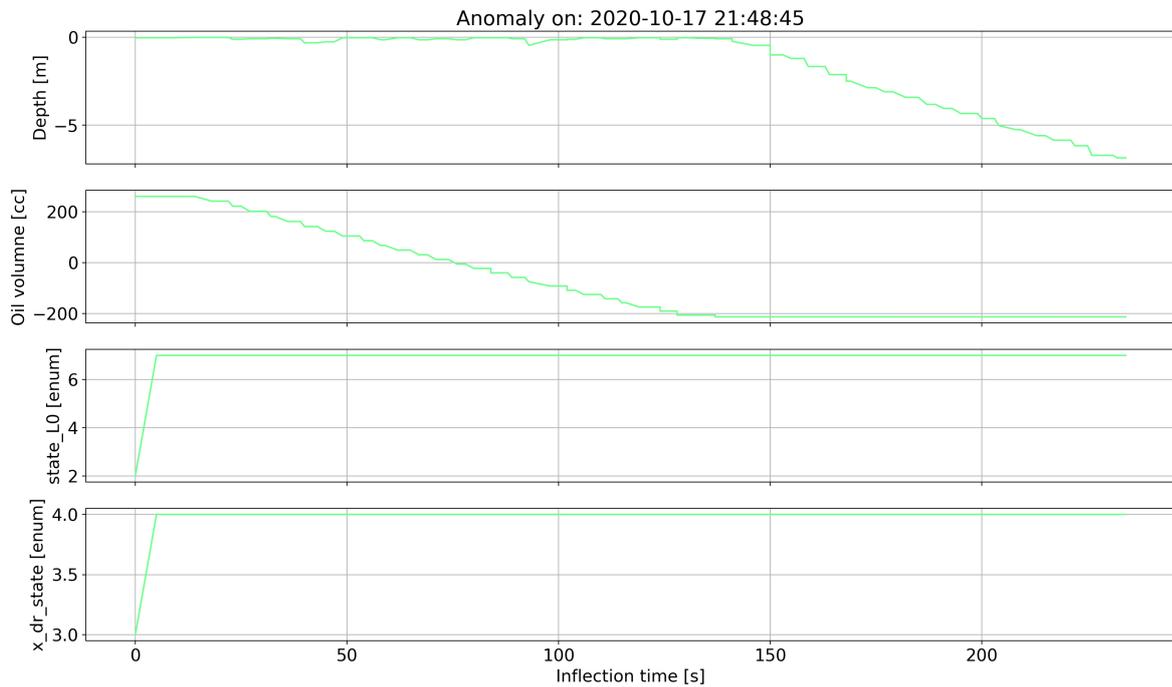


Figure 2.9: 20201017T214845 Anomaly 6

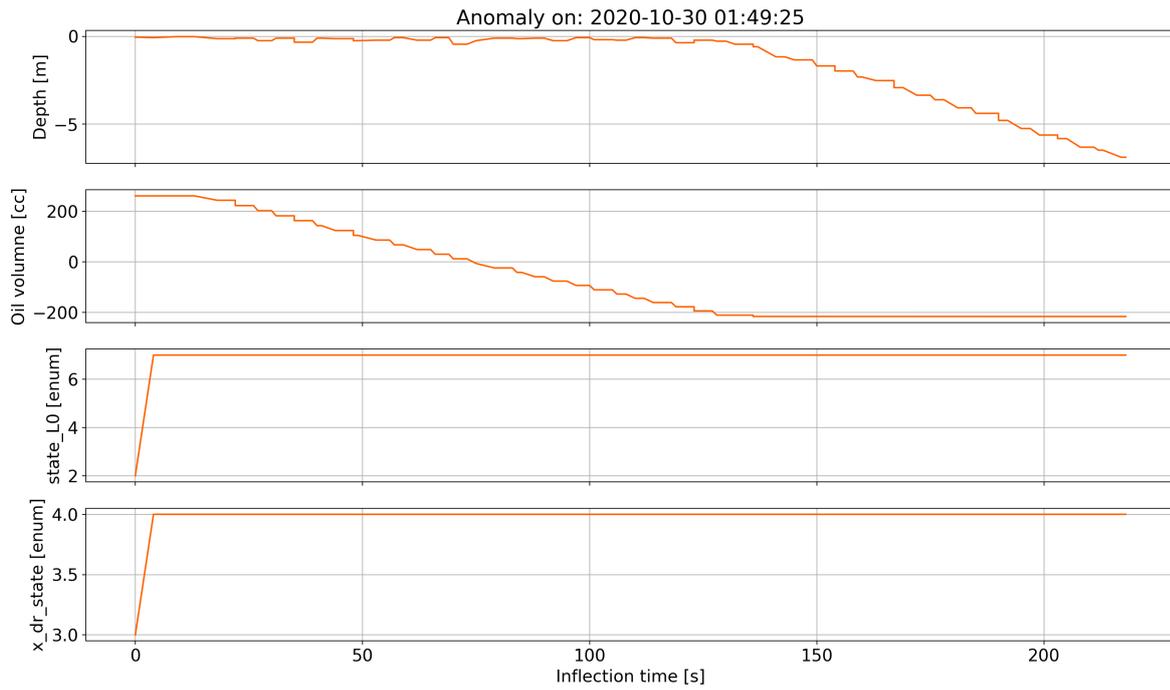


Figure 2.10: 20201030T014925 Anomaly 7

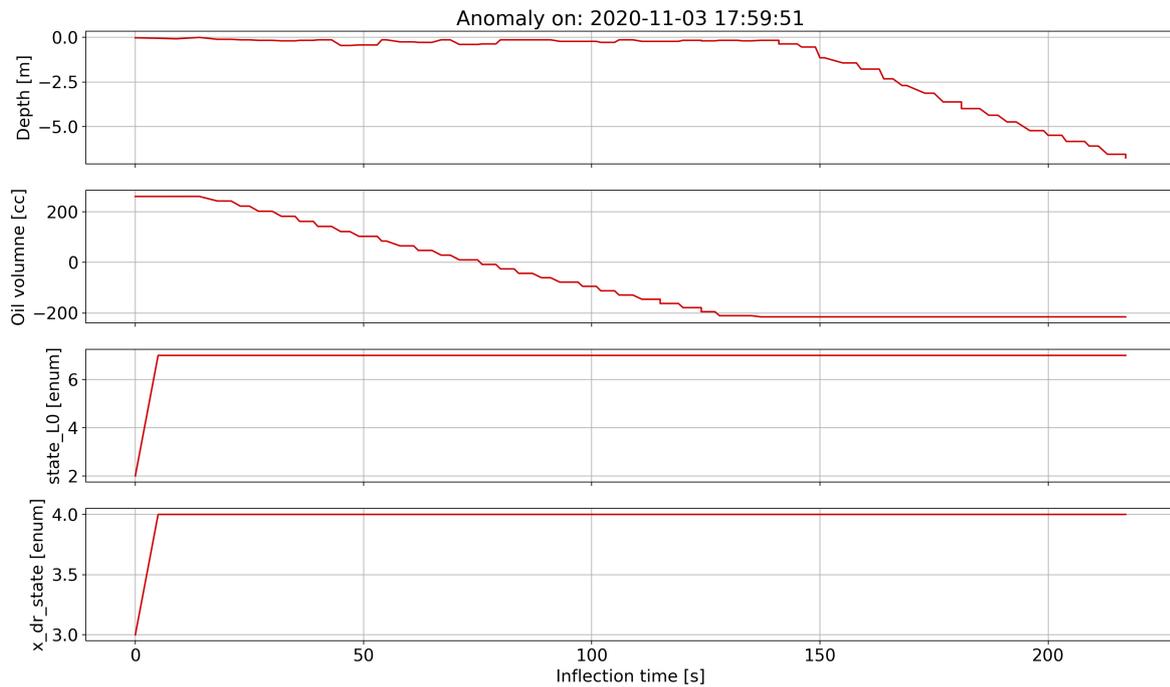


Figure 2.11: 20201103T175951 Anomaly 8

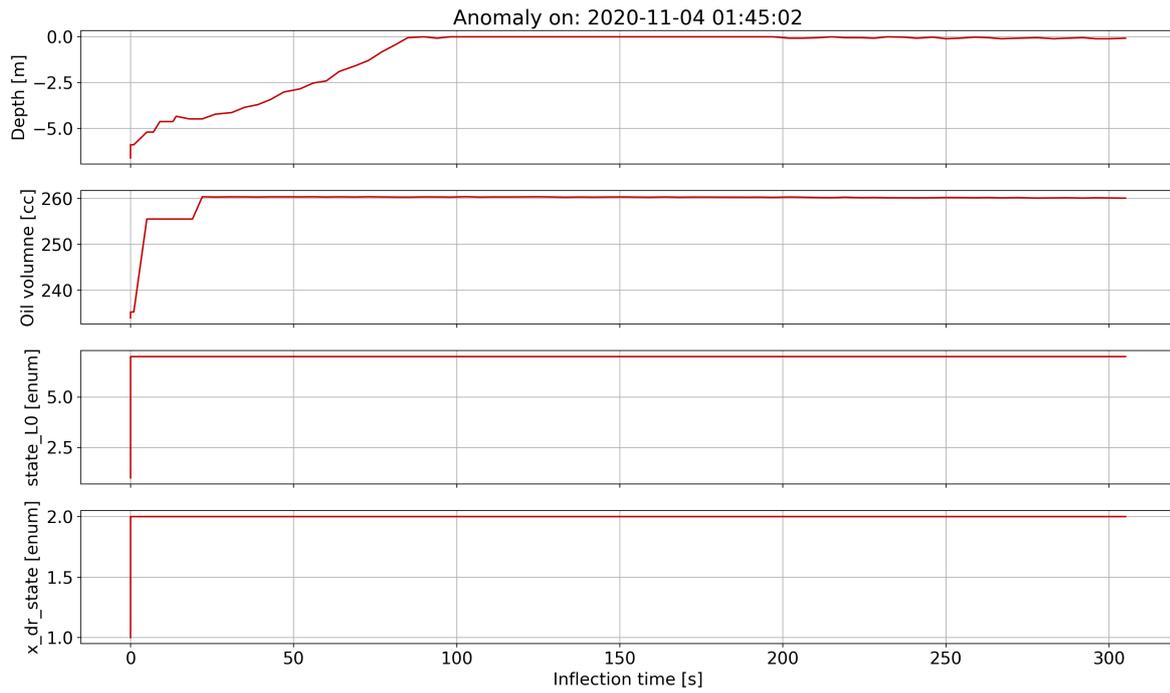


Figure 2.12: 20201104T014502 Anomaly 9

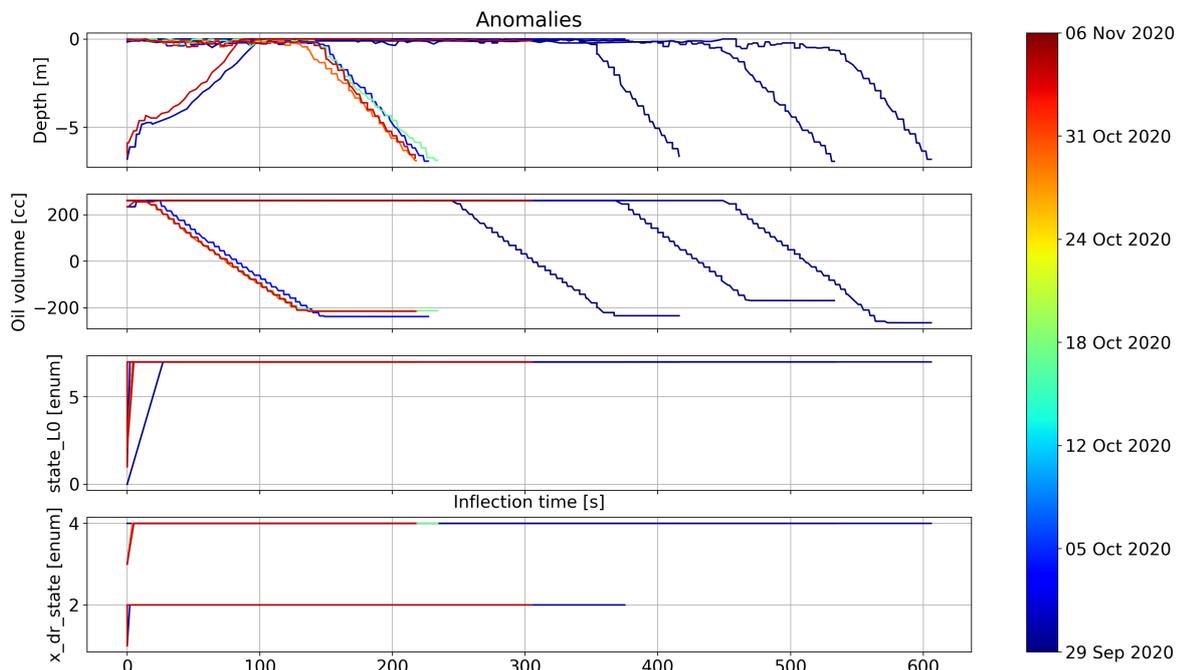


Figure 2.13: Anomalies (time)

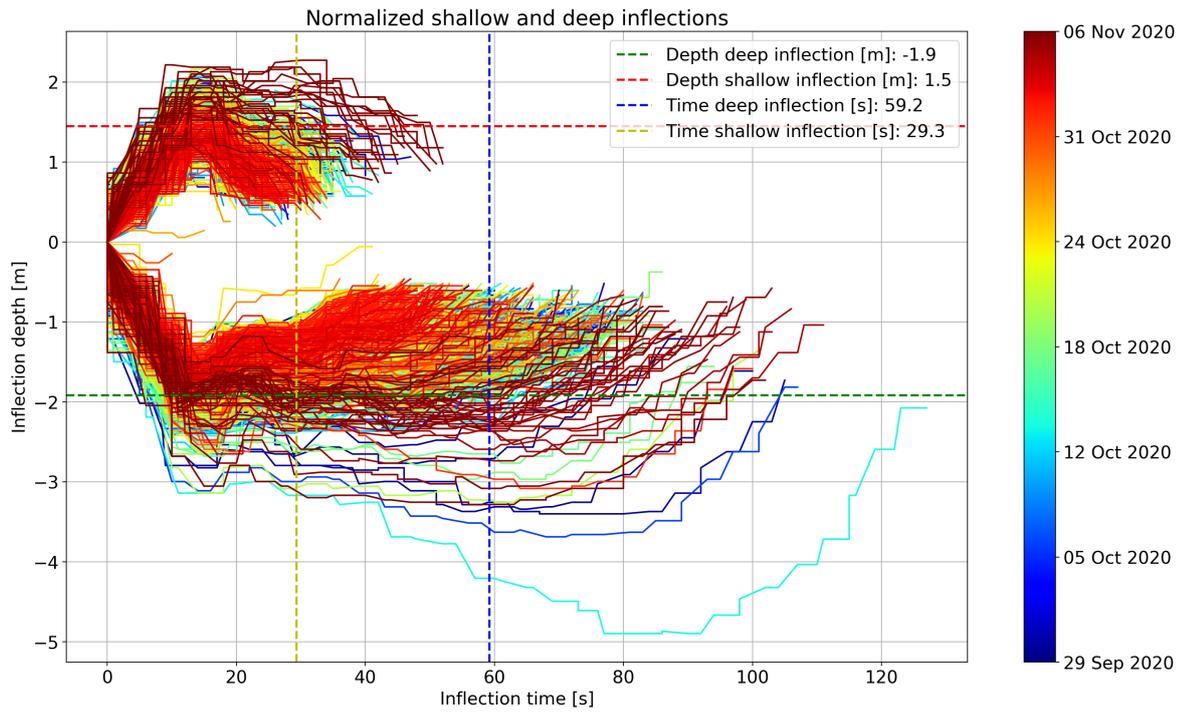


Figure 2.14: Depth inflections

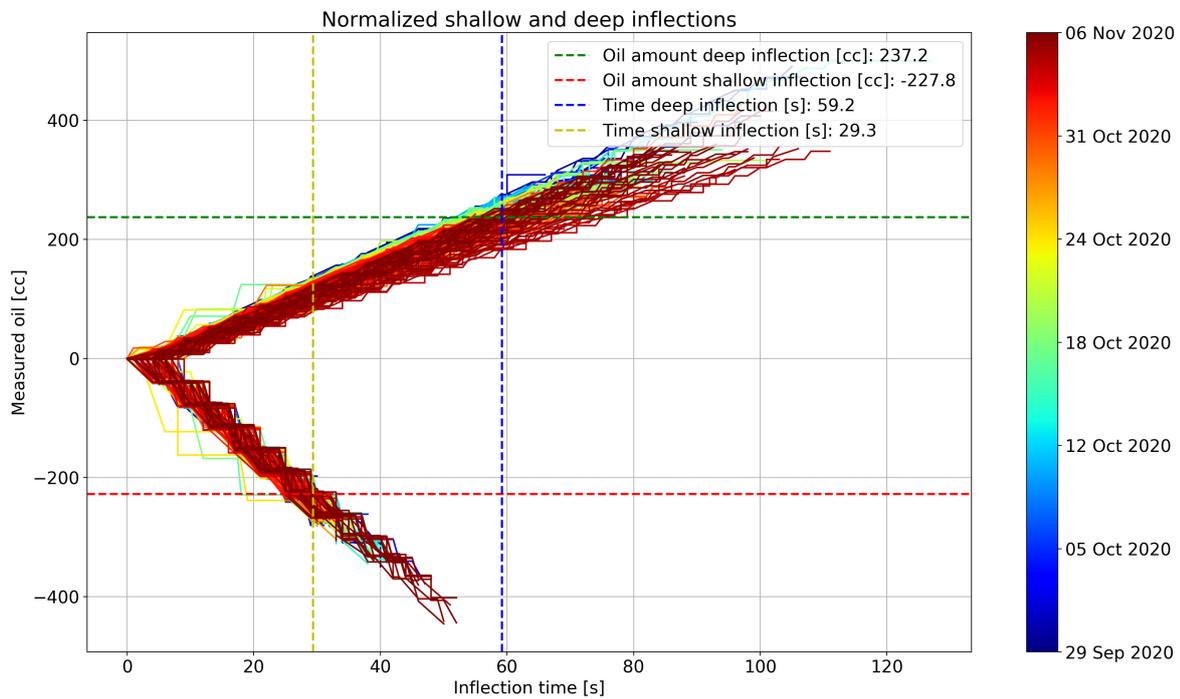


Figure 2.15: Oil inflections

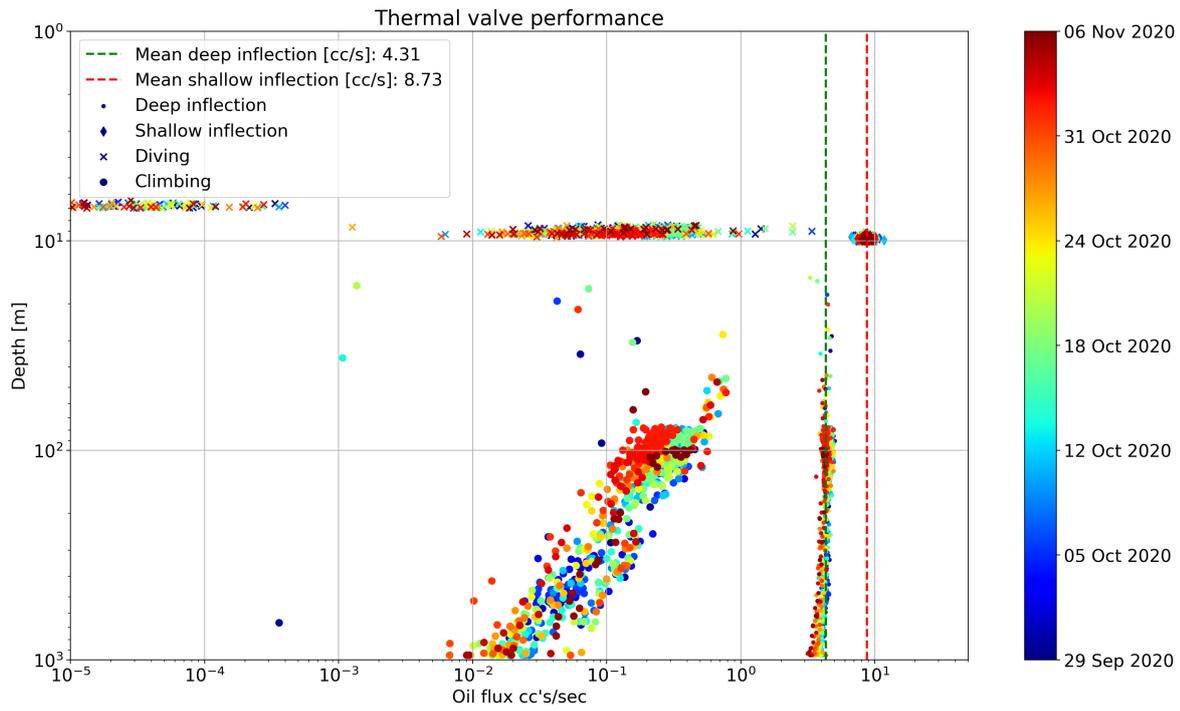


Figure 2.16: Oil flux

Normalized shallow and deep inflections

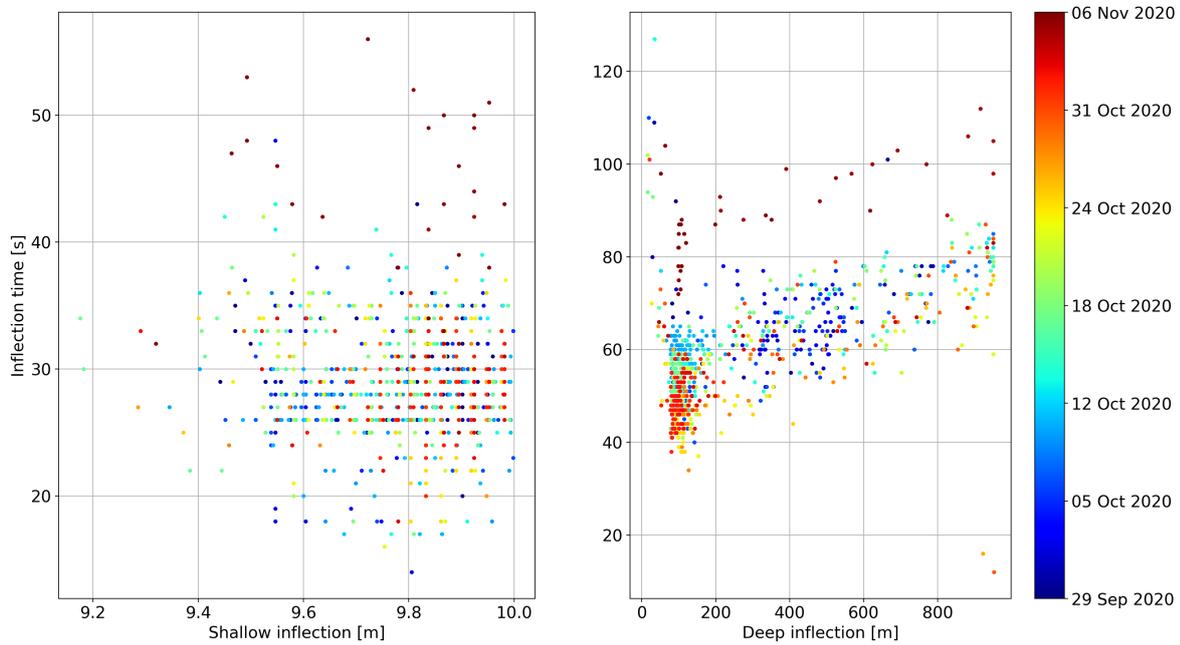


Figure 2.17: Duration inflections

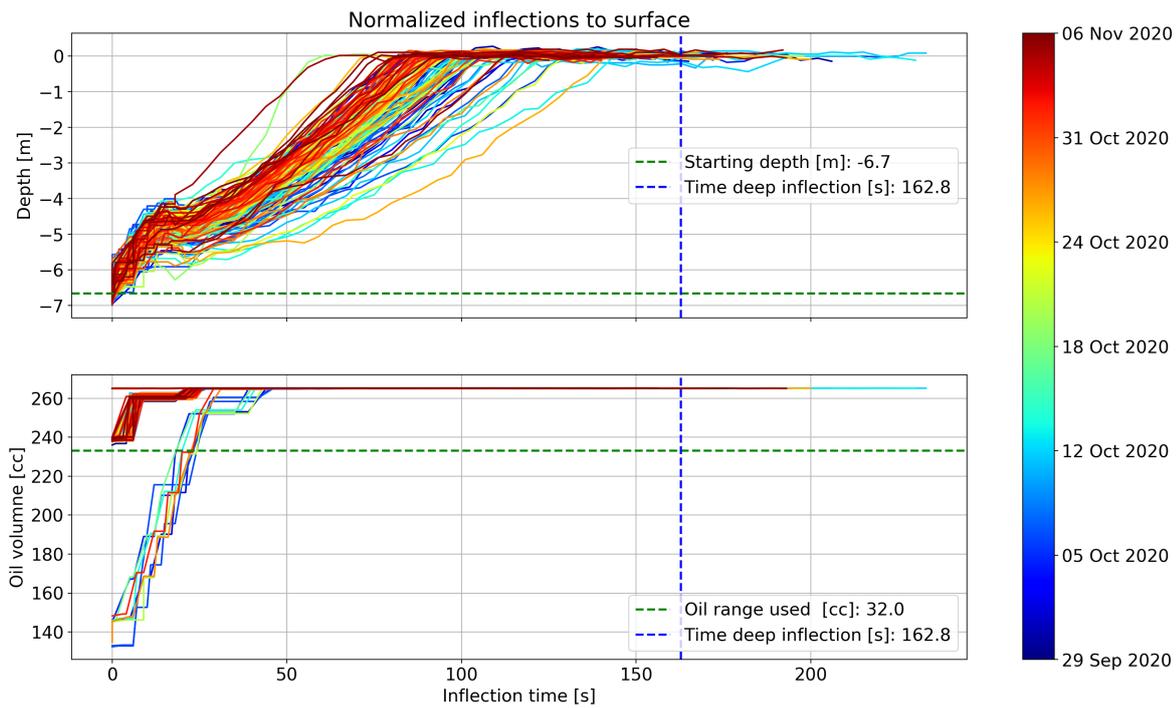


Figure 2.18: Surface Oil inflections

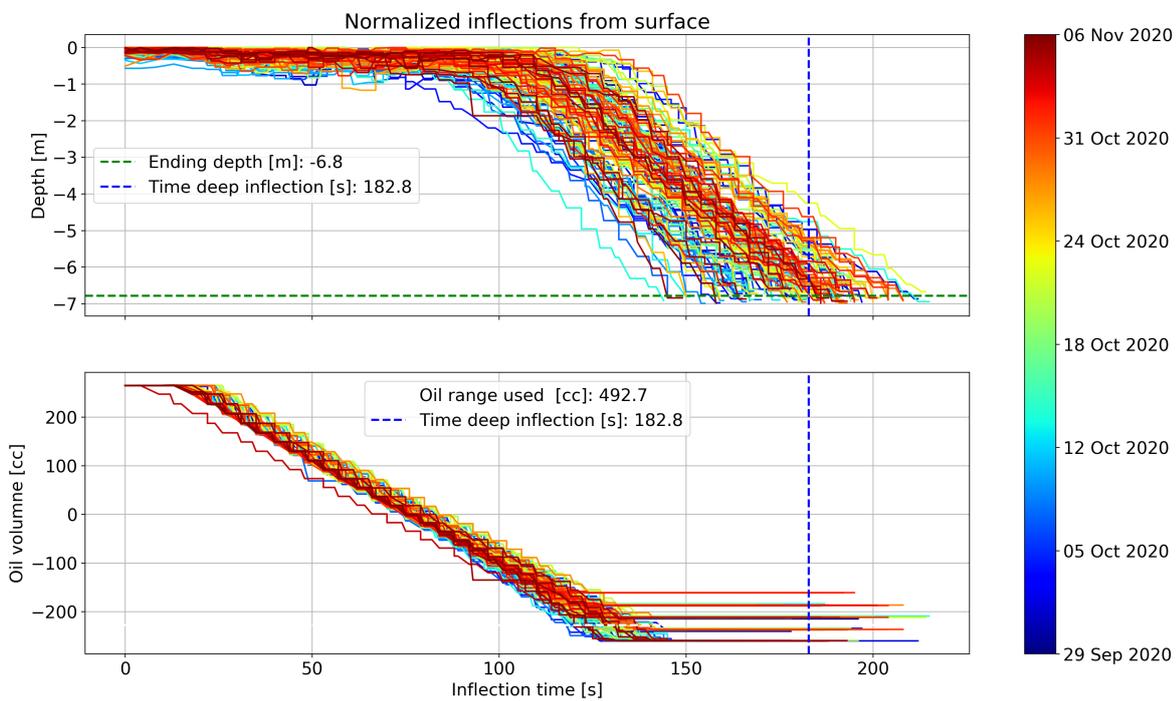


Figure 2.19: Surface Duration inflections

Flying pitch and roll

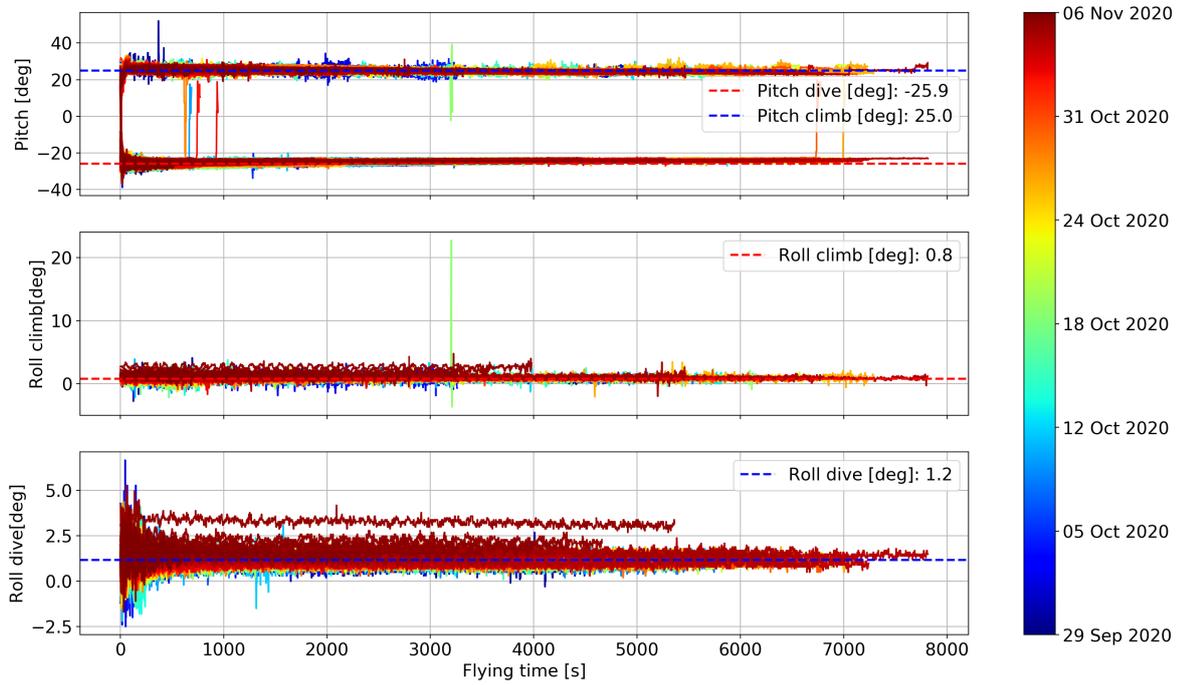


Figure 2.20: Pitch and roll, when climbing and diving

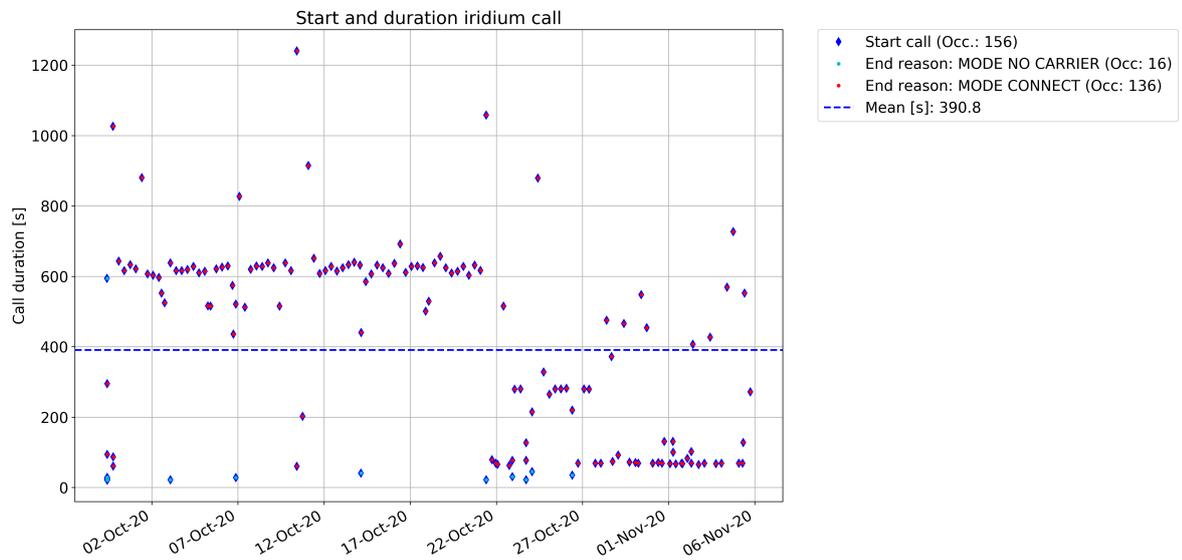


Figure 2.21: Iridium Status

### 3 Scientific Preliminary Review

#### 3.1 SCI Profiles

Calibration sheets available upon request to [glider@socib.es](mailto:glider@socib.es)

| Sensor         | Serial number | Calibration date | Casts | Half YOs | Samples | Intersample time [s]* | Sampled distance [km] |
|----------------|---------------|------------------|-------|----------|---------|-----------------------|-----------------------|
| CTD            | 0064          | 20190627         | 1757  | 1776     | 573367  | 5.468                 | 474.7                 |
| FLNTU-FLBBCDSL | sn3711        | 20190627         | 878   | 1776     | na      | na                    | 153.3                 |
| OXY 3-4        | 1409          | 20190715         | 1758  | 1776     | 535701  | 5.854                 | 474.7                 |
| PAR            | na            | na               | na    | na       | na      | na                    | na                    |
| Hydrophone     | na            | na               | na    | na       | na      | na                    | na                    |
| Microrider     | na            | na               | na    | na       | na      | na                    | na                    |

\* See appendix for sampling strategy details and changes during the mission

Sensor parameters set:

|     |                        |    |
|-----|------------------------|----|
| CTD | CC's per second        | na |
| FLx | Chlorophyll dark count | 45 |
| FLx | Turbidity dark count   | 50 |
| FLx | CDOM dark count        | na |
| FLx | BB700 dark count       | na |

#### 3.2 SCI plots

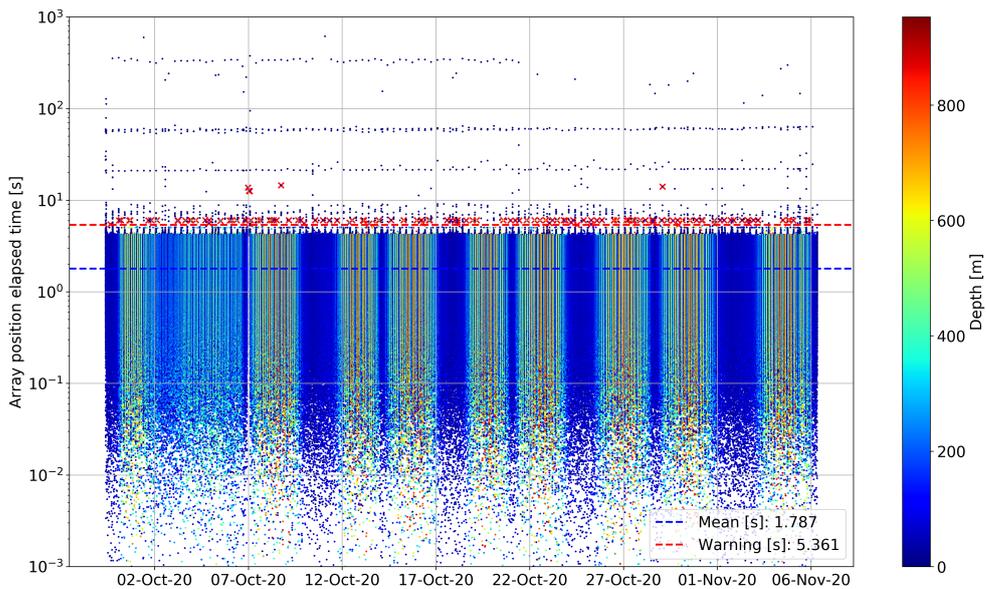


Figure 3.1: Array time

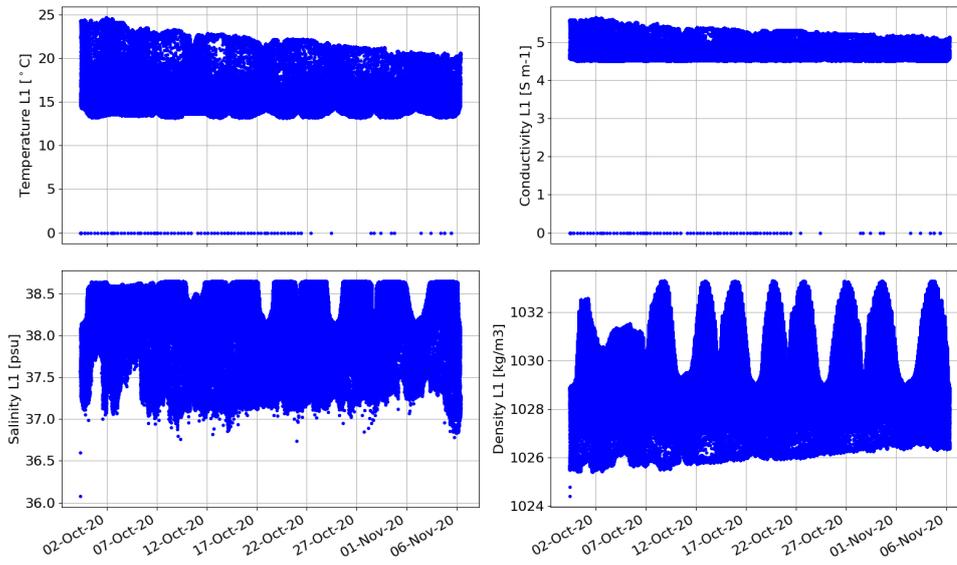


Figure 3.2: Raw CTD L1

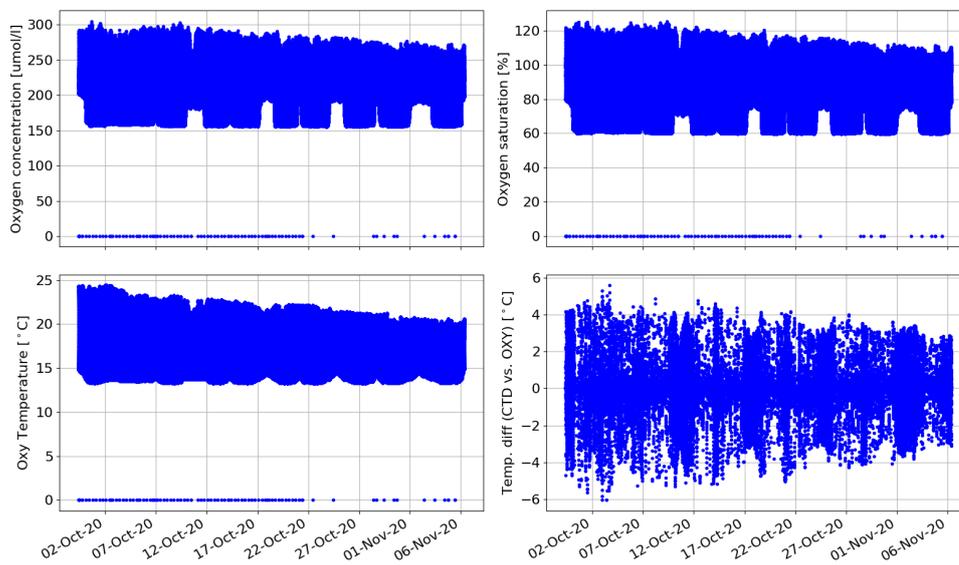


Figure 3.3: Raw OXY L1

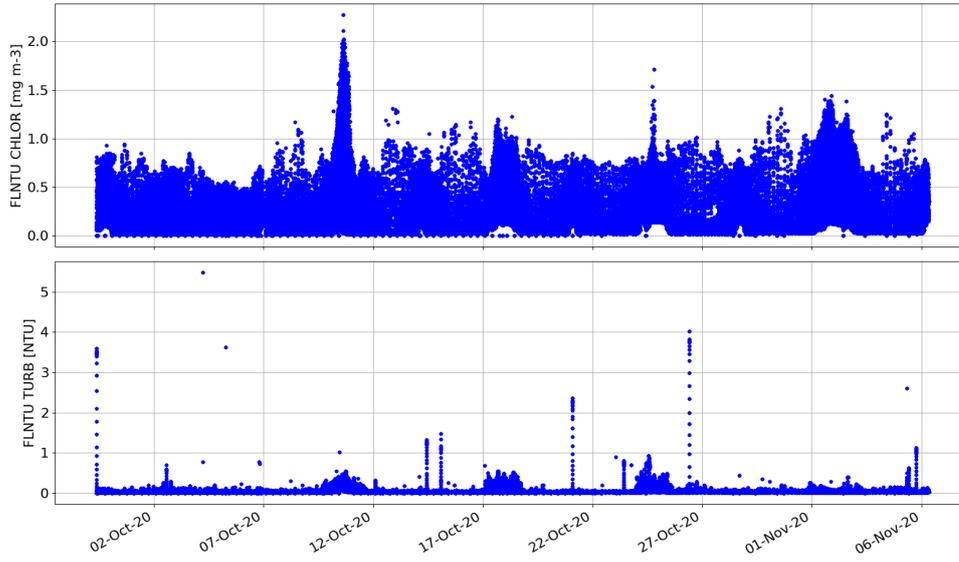


Figure 3.4: Raw FLNTU L1

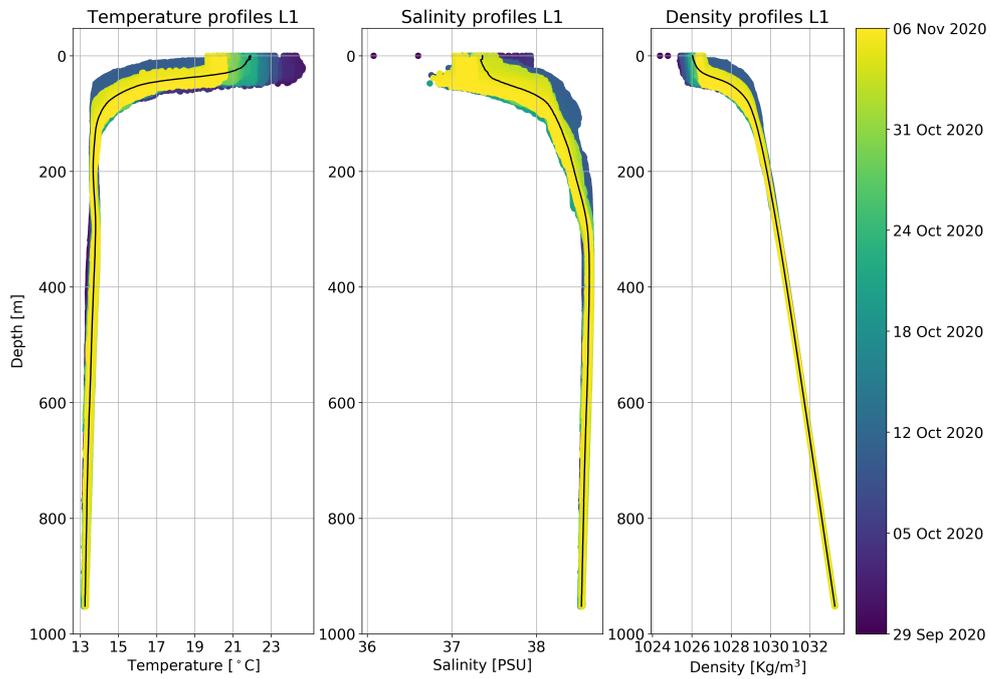


Figure 3.5: CTD profiles

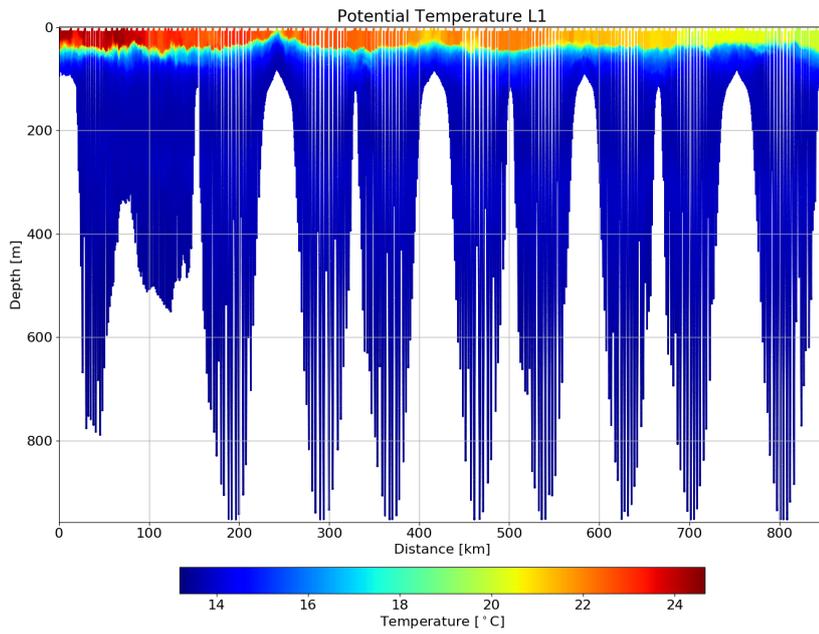


Figure 3.6: CTD temperature

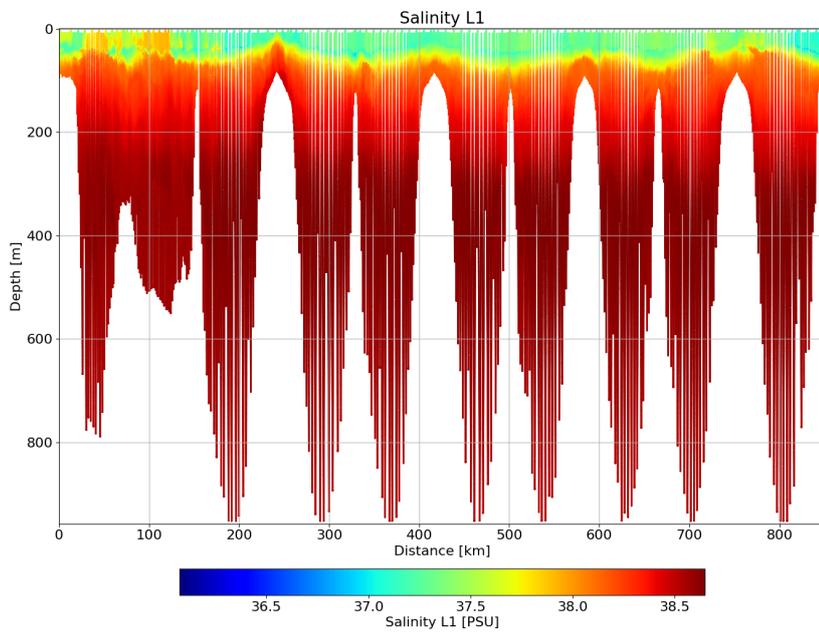


Figure 3.7: CTD Salinity

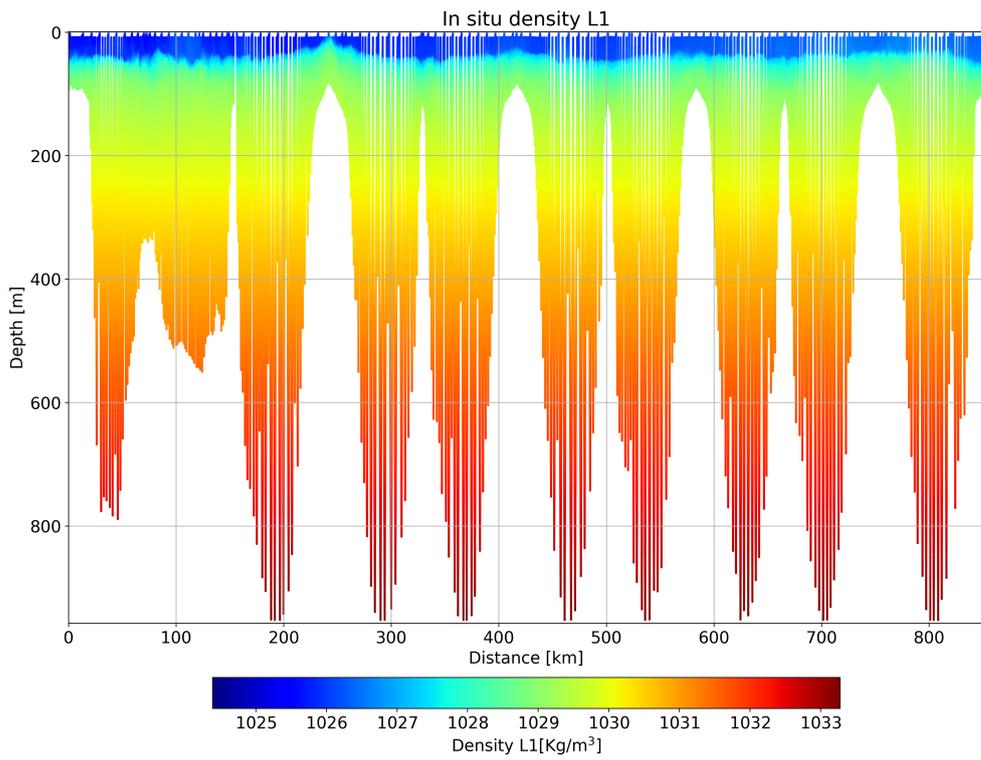


Figure 3.8: CTD Density

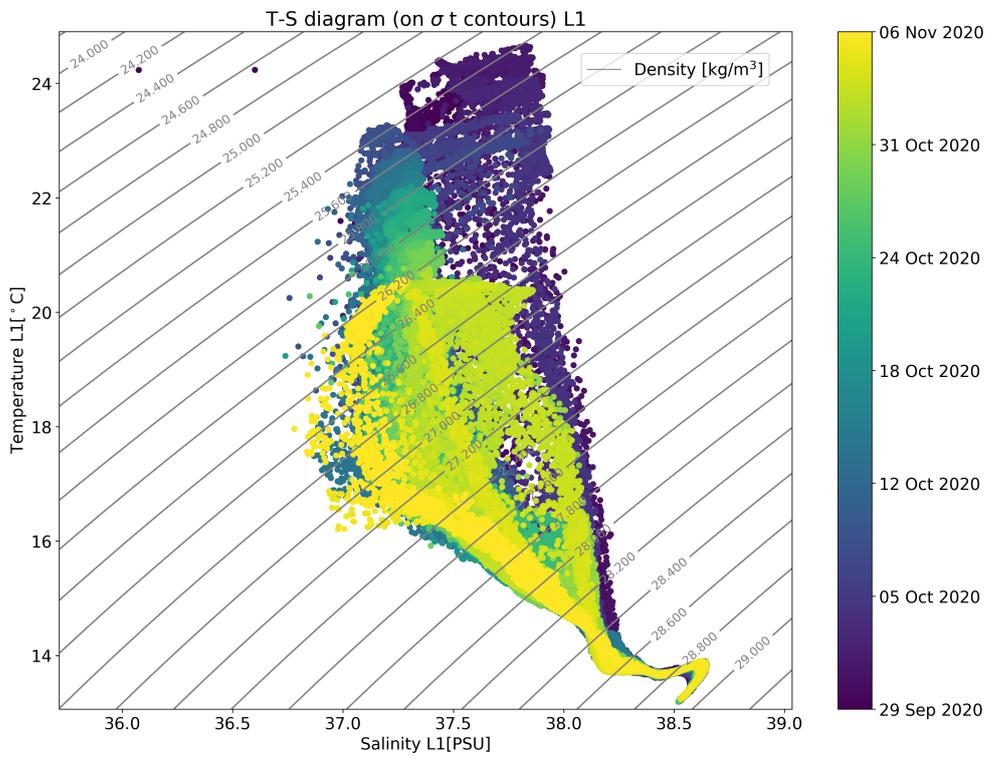


Figure 3.9: TS diagram (CTD)

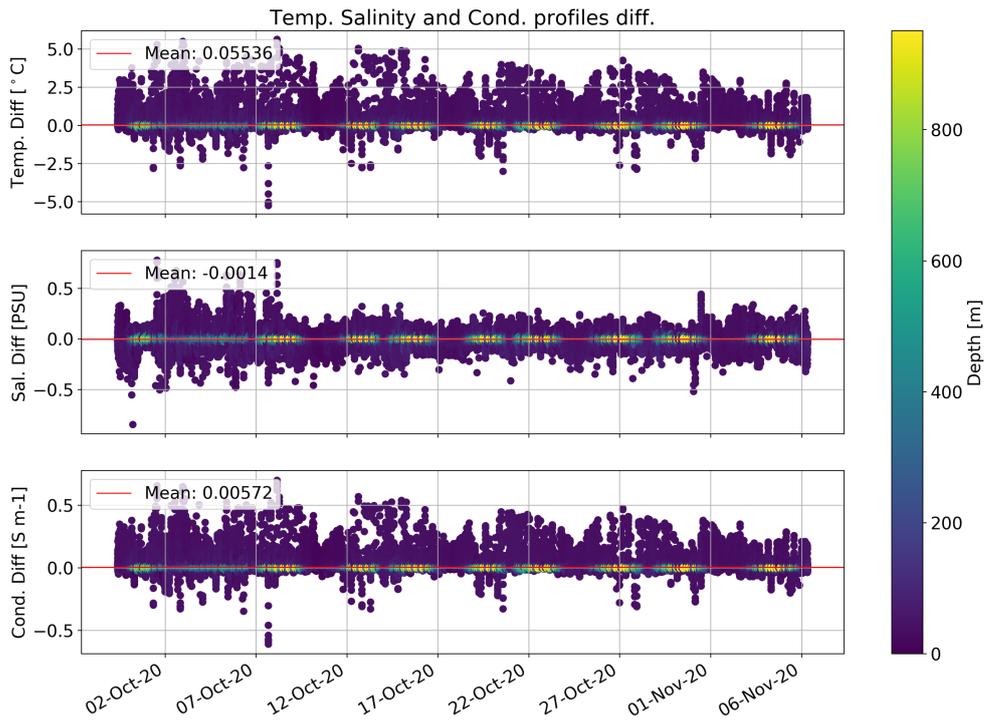


Figure 3.10: Profile consistency (CTD)

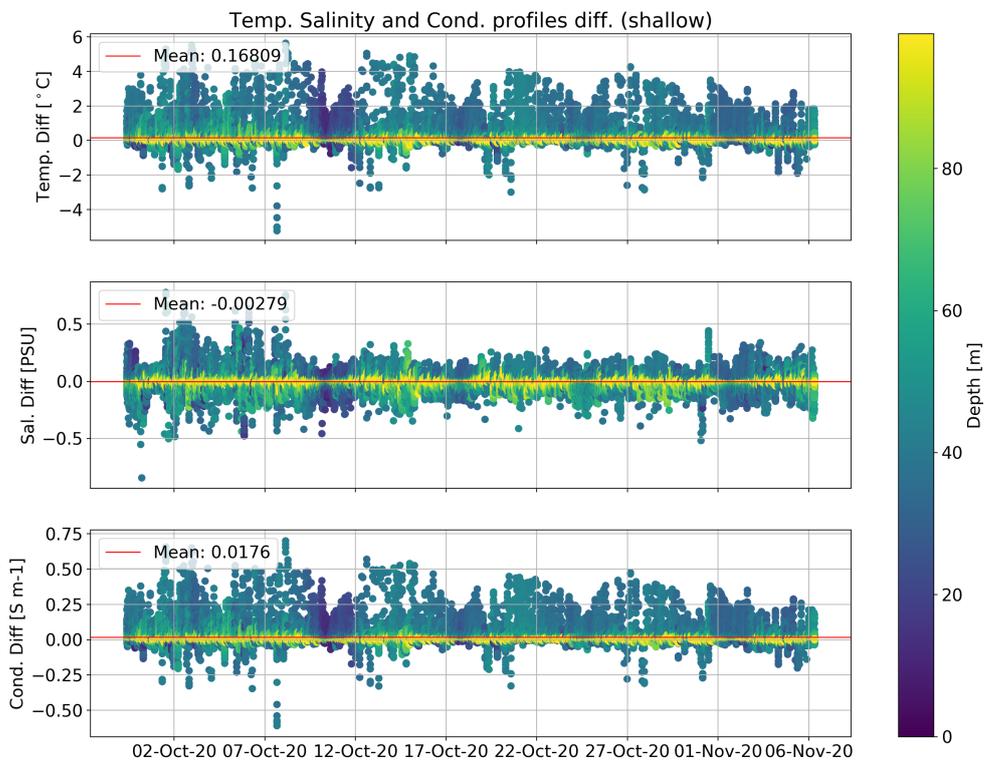


Figure 3.11: Profile consistency (CTD) zoom

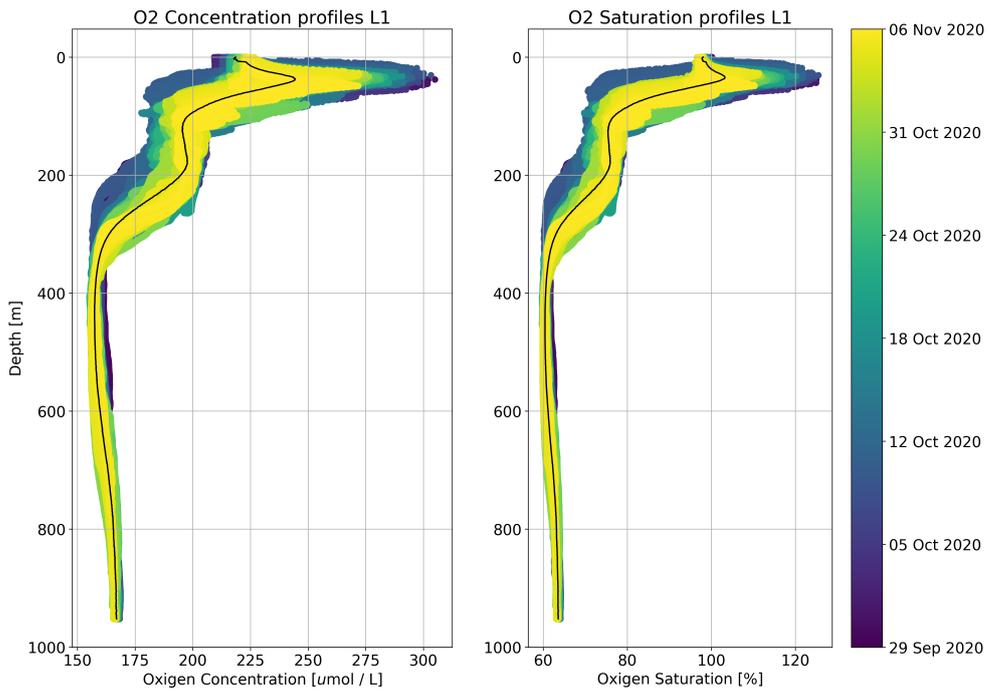


Figure 3.12: Oxygen profiles

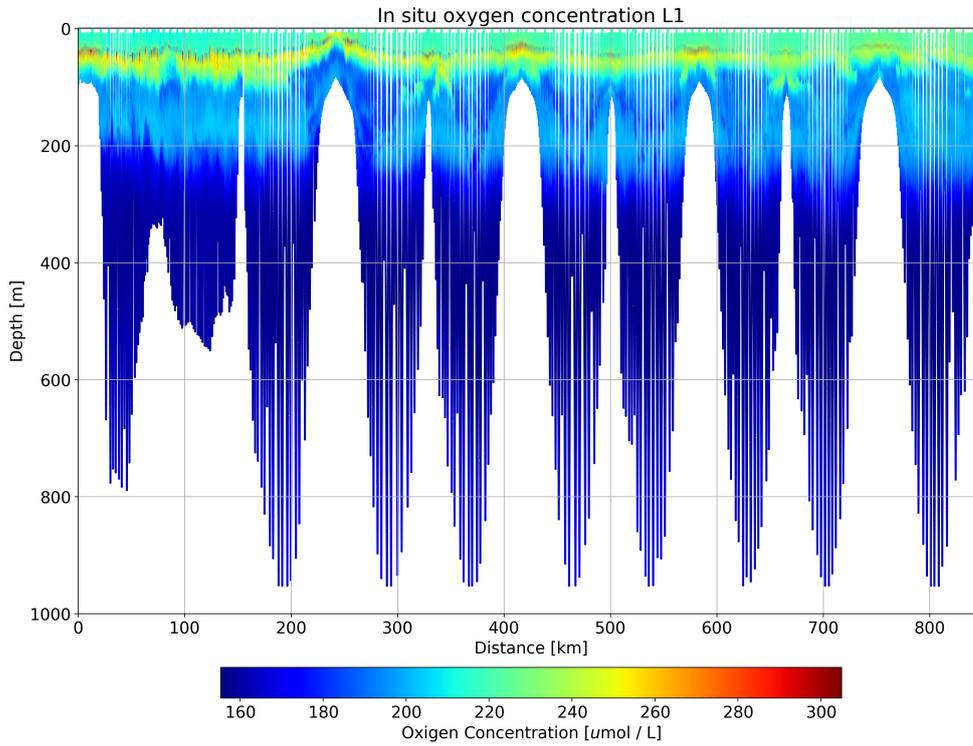


Figure 3.13: Oxygen Concentration

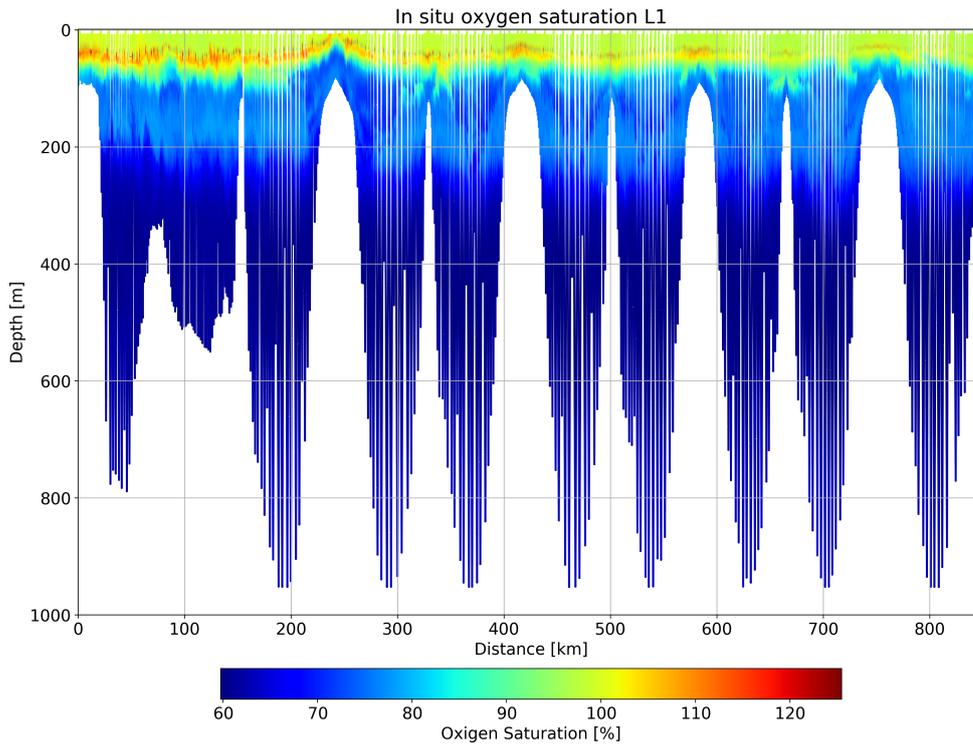


Figure 3.14: Oxygen Saturation

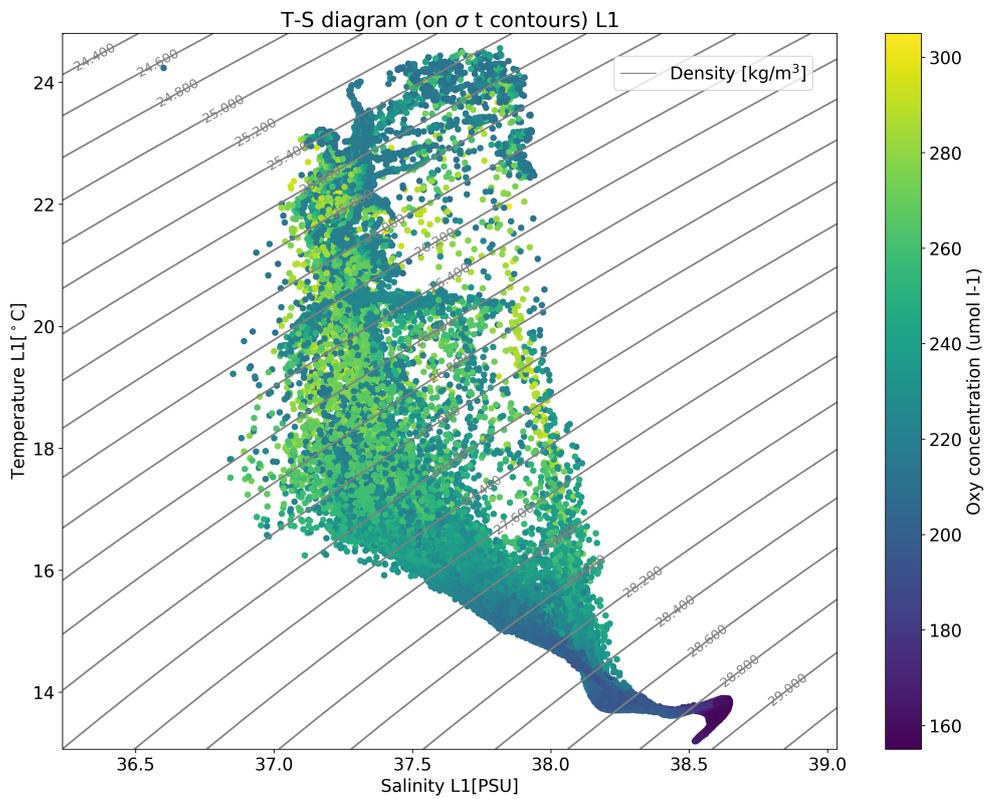


Figure 3.15: TS diagram (OXY)

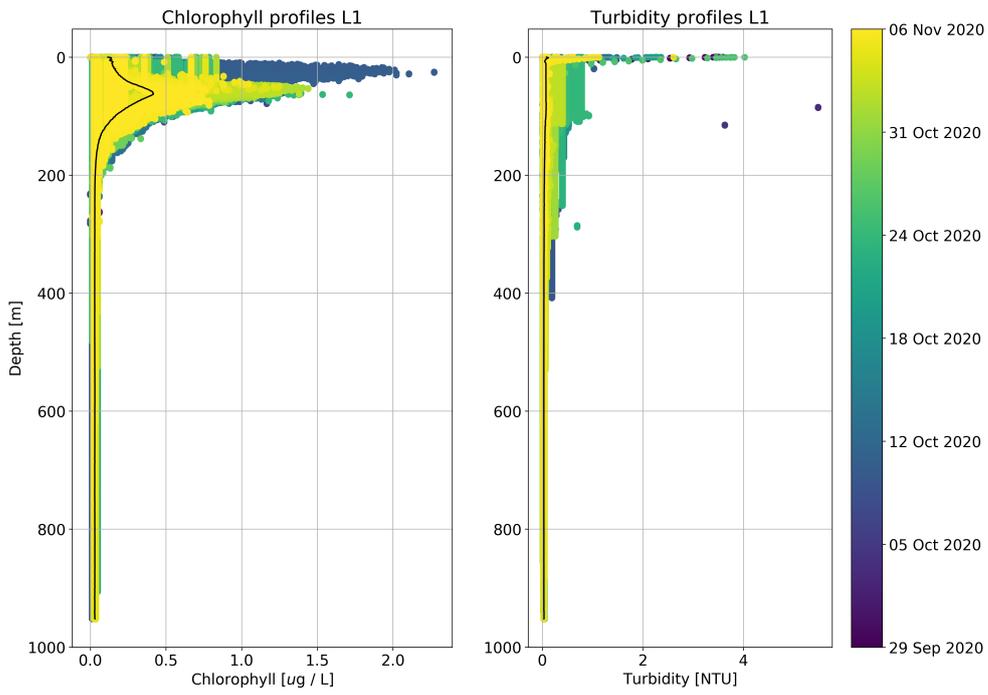


Figure 3.16: Chlorophyll-a and Turbidity profiles

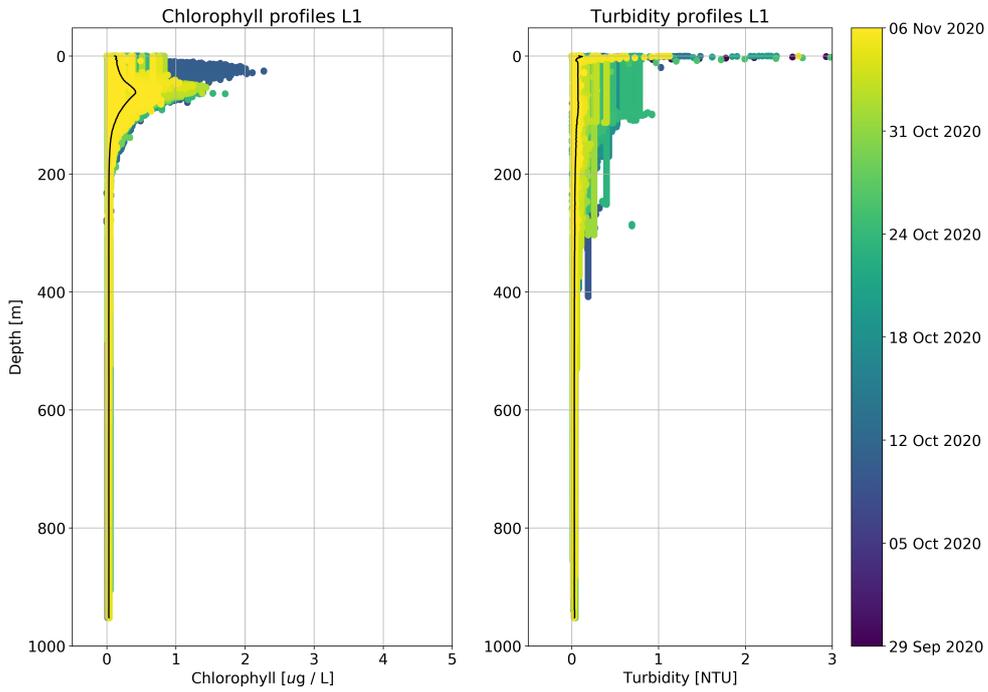


Figure 3.17: Chlorophyll-a and Turbidity profiles zoom

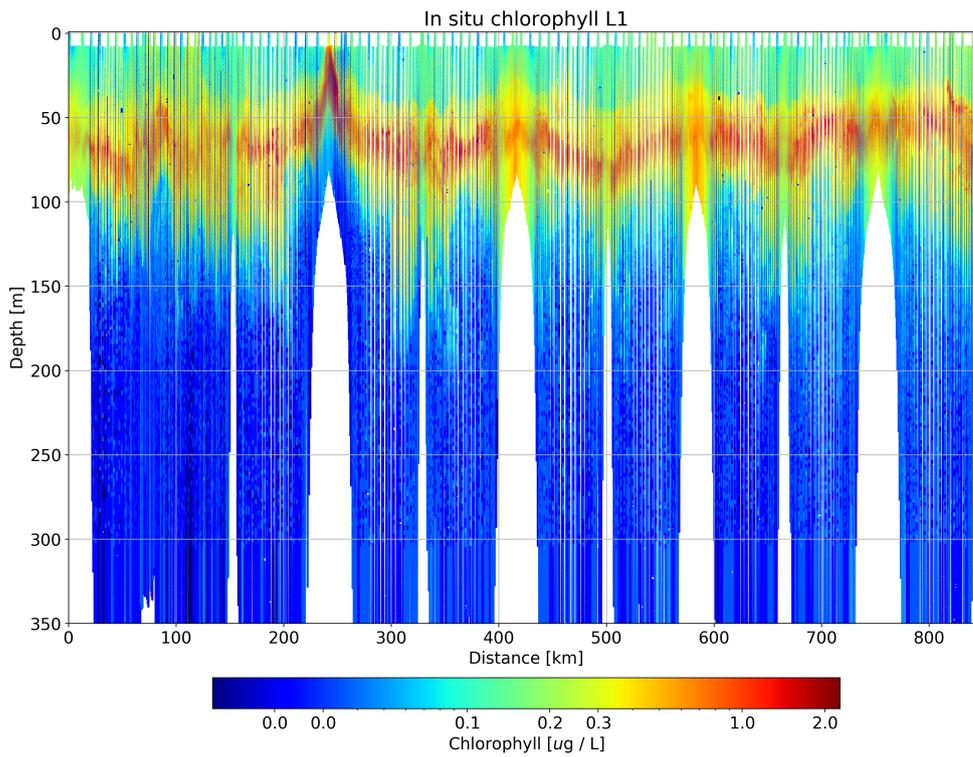


Figure 3.18: Chlorophyll-a

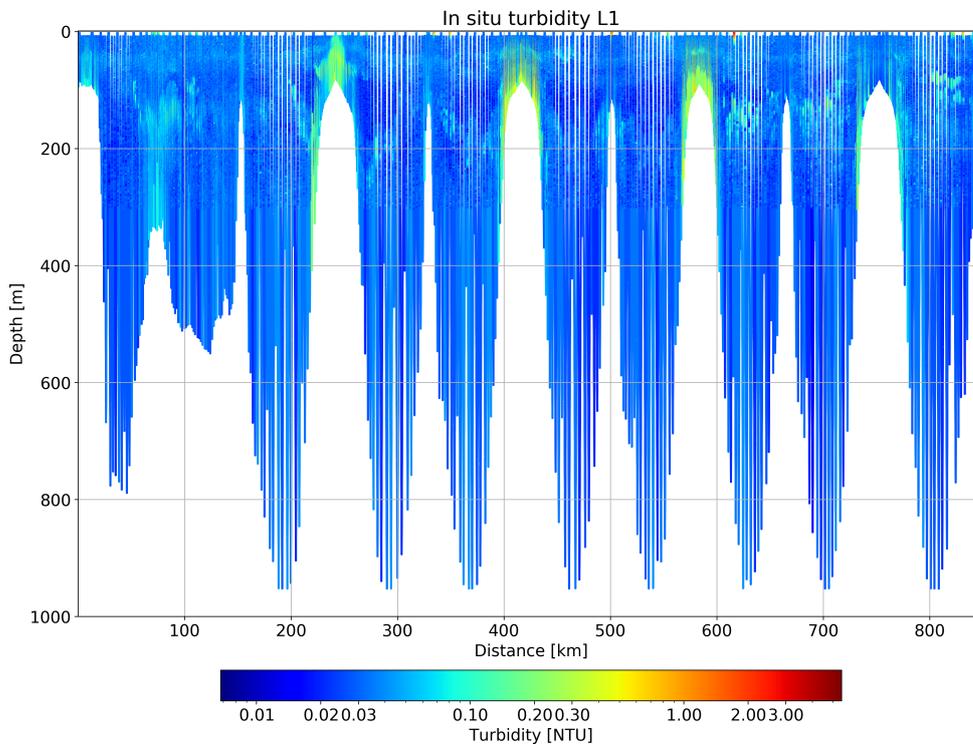


Figure 3.19: Turbidity

## 4 Appendix

### 4.1 Glider behaviour

Showing changes on Sampling (behaviour 15):

- 29 Sep 2020 08:47:24 @ Sampling of: SAMPLE13.MA OXY5013-sn1409
- 29 Sep 2020 08:47:25 @ Sampling state to sample set to: Diving and climbing
- 29 Sep 2020 08:47:25 @ Sampling argument: intersample time set to: 4.0 s
- 29 Sep 2020 08:47:25 @ Sampling nth yo to sample set to: 1.0 nodim
- 29 Sep 2020 08:47:25 @ Sampling argument: min depth set to: -5.0 m
- 29 Sep 2020 08:47:25 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Sampling (behaviour 14):

- 29 Sep 2020 08:47:25 @ Sampling of: SAMPLE14.MA FLNTU(-150m to -300m)
- 29 Sep 2020 08:47:26 @ Sampling state to sample set to: Diving
- 29 Sep 2020 08:47:26 @ Sampling argument: intersample time set to: 16.0 s
- 29 Sep 2020 08:47:26 @ Sampling nth yo to sample set to: 1.0 nodim
- 29 Sep 2020 08:47:26 @ Sampling argument: min depth set to: 150.0 m
- 29 Sep 2020 08:47:26 @ Sampling argument: max depth set to: 300.0 m

Showing changes on Sampling (behaviour 13):

- 29 Sep 2020 08:47:26 @ Sampling of: SAMPLE12.MA FLNTU(surface to -150m)
- 29 Sep 2020 08:47:27 @ Sampling state to sample set to: Diving
- 29 Sep 2020 08:47:27 @ Sampling argument: intersample time set to: 8.0 s
- 29 Sep 2020 08:47:27 @ Sampling nth yo to sample set to: 1.0 nodim
- 29 Sep 2020 08:47:27 @ Sampling argument: min depth set to: -5.0 m
- 29 Sep 2020 08:47:27 @ Sampling argument: max depth set to: 150.0 m

Showing changes on Sampling (behaviour 12):

- 29 Sep 2020 08:47:27 @ Sampling of: SAMPLE11.MA CTD(Profile)
- 29 Sep 2020 08:47:28 @ Sampling state to sample set to: Diving, climbing and hovering
- 29 Sep 2020 08:47:28 @ Sampling argument: intersample time set to: 4.0 s
- 29 Sep 2020 08:47:28 @ Sampling nth yo to sample set to: 1.0 nodim
- 29 Sep 2020 08:47:28 @ Sampling argument: min depth set to: -5.0 m
- 29 Sep 2020 08:47:28 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Yoing (behaviour behavior yo 11):

- 29 Sep 2020 08:47:28 @ Yoing num half cycles to do(nodim) set to: 2.0
- 29 Sep 2020 08:47:28 @ Yoing d target depth(m) set to: 5.0
- 29 Sep 2020 08:47:28 @ Yoing d bpump value(X) set to: -230.0
- 29 Sep 2020 08:47:28 @ Yoing d target altitude(m) set to: 20.0
- 29 Sep 2020 08:47:28 @ Yoing d use pitch(enum) set to: 3.0
- 29 Sep 2020 08:47:28 @ Yoing d pitch value(X) set to: -0.453800
- 29 Sep 2020 08:47:29 @ Yoing c use pitch(enum) set to: 3.0
- 29 Sep 2020 08:47:29 @ Yoing c pitch value(X) set to: 0.453800
- 29 Sep 2020 09:13:39 @ Yoing d target depth(m) set to: 950.0
- 29 Sep 2020 09:52:17 @ Yoing num half cycles to do(nodim) set to: -1.0
- 29 Sep 2020 09:52:17 @ Yoing d bpump value(X) set to: 400.0
- 21 Oct 2020 10:06:47 @ Yoing d bpump value(X) set to: 330.0
- 04 Nov 2020 18:10:39 @ Yoing d bpump value(X) set to: 450.0
- 05 Nov 2020 10:00:34 @ Yoing d bpump value(X) set to: 500.0

Showing changes on Altimeter set to (behaviour u alt min depth):

- 29 Sep 2020 08:57:24 @ Altimeter set to u alt min depth set to: 2

## 4.2 Installed devices (from autoexec.mi)

- OXY3835 \_SN: 1409
- seabird CTD \_SN: 0064
- Wetlabs FLNTU \_SN: 3711
- name \_SN: unit \_567
- Forward section assy \_SN: 0480
- Payload bay assy \_SN: 1179
- Aft section assy \_SN: 0881
- Aft electronic assy \_SN: 0888
- Aft end cap assy \_SN: 0884
- Digifin \_SN: 1646
- Strobe assy \_SN: 1269
- Pressure transducer \_SN: 104634
- Aft hull \_SN: 1123
- Fwd hull \_SN: 1121
- Freewave master \_SN: 936-3179
- Iridium sim card \_SN: 8988169234002513216
- Argos ID \_SN: 152089 -DEC / E3A7698 -HEX
- Altimeter \_SN: 41-386-1-01
- Pitch motor \_SN: 1365
- 1000- Motor \_SN: controller0062
- 1000- Front air pump \_SN: 0528
- 1000- Pump assy \_SN: 0599
- 1000- Valve assy \_SN: 0604
- Science persistor \_SN: 1195
- science motherboard \_SN: JJ03245
- Science flashcard \_SN: 0708
- Main board \_SN: JJ02780
- Communication board \_SN: JJ028039
- Iridium phone \_SN: 1047
- Main flashcard \_SN: 0694
- Main persistor \_SN: 1199
- Attitude sensor \_SN: 36695
- Air pump \_SN: 1443
- Communications Assy \_SN: 0818
- Freewave Slave \_SN: 864-0234
- GPS \_SN: 1150
- Argos X-cat \_SN: 0909
- Air bladder \_SN: 1420

## 4.3 Possible Iridium states

- MODEM NO CARRIER = 0
- MODEM OK = 1
- MODEM CONNECT = 2
- MODEM ERROR = 3
- MODEM NO ANSWER = 4
- MODEM BUSY = 5
- MODEM NO DIALTONE = 6
- LOGGING IN = 7
- LOGGED ON = 8

- MODEM AWAITING OK = 10
- MODEM AWAITING CONNECTION = 11
- MODEM TIMEOUT = 12
- MODEM UNKNOWN = 99
- NO CHARS TIMEOUT = 100

# List of Figures

|      |   |    |
|------|---|----|
| 1.1  | Map providing general overview of the Survey Area | 2  |
| 2.1  | Battery capacity                                  | 6  |
| 2.2  | Distance over ground                              | 7  |
| 2.3  | Glider Odd Warn and Err                           | 7  |
| 2.4  | 20200929T091335 Anomaly 1                         | 8  |
| 2.5  | 20200929T100316 Anomaly 2                         | 8  |
| 2.6  | 20200929T182152 Anomaly 3                         | 9  |
| 2.7  | 20201001T014347 Anomaly 4                         | 9  |
| 2.8  | 20201003T100538 Anomaly 5                         | 10 |
| 2.9  | 20201017T214845 Anomaly 6                         | 10 |
| 2.10 | 20201030T014925 Anomaly 7                         | 11 |
| 2.11 | 20201103T175951 Anomaly 8                         | 11 |
| 2.12 | 20201104T014502 Anomaly 9                         | 12 |
| 2.13 | Anomalies (time)                                  | 12 |
| 2.14 | Depth inflections                                 | 13 |
| 2.15 | Oil inflections                                   | 13 |
| 2.16 | Oil flux  | 14 |
| 2.17 | Duration inflections                              | 14 |
| 2.18 | Surface Oil inflections                           | 15 |
| 2.19 | Surface Duration inflections                      | 15 |
| 2.20 | Pitch and roll, when climbing and diving          | 16 |
| 2.21 | Iridium Status                                    | 16 |
| 3.1  | Array time  | 17 |
| 3.2  | Raw CTD L1  | 18 |
| 3.3  | Raw OXY L1  | 18 |
| 3.4  | Raw FLNTU L1                                      | 19 |
| 3.5  | CTD profiles                                      | 19 |
| 3.6  | CTD temperature                                   | 20 |
| 3.7  | CTD Salinity                                      | 20 |
| 3.8  | CTD Density                                       | 21 |
| 3.9  | TS diagram (CTD)                                  | 21 |
| 3.10 | Profile consistency (CTD)                         | 22 |
| 3.11 | Profile consistency (CTD) zoom                    | 22 |
| 3.12 | Oxygen profiles                                   | 23 |
| 3.13 | Oxygen Concentration                              | 23 |
| 3.14 | Oxygen Saturation                                 | 24 |
| 3.15 | TS diagram (OXY)                                  | 24 |
| 3.16 | Chlorophyll-a and Turbidity profiles              | 25 |
| 3.17 | Chlorophyll-a and Turbidity profiles zoom         | 25 |
| 3.18 | Chlorophyll-a                                     | 26 |
| 3.19 | Turbidity   | 26 |

*We research the sea;  
we share the future*

 **SOCIB** Balearic Islands  
Coastal Observing  
and Forecasting System



MINISTERIO  
DE CIENCIA  
E INNOVACIÓN

 **CSIC**  
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS



GOVERN  
ILLES  
BALEARS



Isaac Newton St., Naorte Building,  
Block A, Floor 2, Door 3. ParcBit | 07121 Palma  
Balearic Islands, Spain | Tel. +034 971 43 99 98



[socib.es](http://socib.es)



[@socib\\_icts](https://twitter.com/socib_icts)



[ICTS SOCIB](https://www.facebook.com/ICTS.SOCIB)