

# SOCIB Glider Mission Summary Report

CNR\_EXT-TNA-SMART4-FEB2020\_Teresa

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# SOCIB

Balearic Islands  
Coastal Observing  
and Forecasting System



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# 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                   | CNR_EXT-TNA-SMART4-FEB2020_Teresa  |
| Platform model                 | G2 Electric glider, with Microrider  |
| Platform ID / Name / WMO Code  | U518/ Teresa/ 6801666  |
| Software NAV version           | Version 8.2 Under Ice, Insitu Compass Cal, JASCO Observer  |
| Software SCI version           | Version 8.2 Under Ice, Insitu Compass Cal, JASCO Observer  |
| FWD bay sn                     | 0267   |
| SCI bay sn                     | 1149   |
| Mission duration               | 1.0 days   |
| Mission start                  | 2020-02-19 11:13:15  |
| Mission end                    | 2020-02-20 10:56:28  |
| Total distance                 | 19.1[km] 10.31[nm]   |
| Deployment point [dd°mm.mmmm'] | N 39° 35.3999' E 03° 31.9817'  |
| Recovery point [dd°mm.mmmm']   | N 39° 34.4213' E 03° 45.2884'  |
| Battery Consumption (Ah)       | 10.3(from 4.8 to 15.2)   |
| Battery specification          | CNR-Ismar/ Teledyne 35   |
| Survey area                    | Sardinia Channel   |
| Objective                      | The Mediterranean Sea (MS) has been identified as hot spot for climatic change, i.e., a region most impacted by ongoing warming trend and increase in extreme events. The MS provides a laboratory-type environment for documenting changes within it and for understanding the role of key processes involved making inferences on processes occurring also at the global scale.  |
| Abstract                       | 4th SMART mission, in the frame of the collaboration agreement between SOCIB and CNR-ISMAR. This two-leg mission begins in Sardinia (East side) and ends also there (round-trip mission). Working Glider is TERESA, owned by CNR-ISMAR and piloted/managed by SOCIB-GF. Glider aborted by forward section leak, during the first 24hours. Recovered 20-02-2020   |
| NAV events                     | <ul style="list-style-type: none"> <li>▪ Event 1: MicroRider probe damaged during deployment, replaced in-situ</li> <li>▪ Event 2: Early recovery because a leak on FWD section</li> <li>▪ Event 3: Malfunction on micro-rider software. Update micro-rider software after recovery (to ODAS5IR v4.0.0)</li> <li>▪ Event 4: Preparation with CNR</li> <li>▪ Event 5: Decided to do NOT upgrade to 8.4 nav/sci version</li> </ul> |
| SCI events                     | <ul style="list-style-type: none"> <li>▪ Event 1: The CTD and oxygen sensor recorded overall good data, despite the fact that we had 85 spikes in conductivity, 67 spikes in salinity, 18 spikes in temperature and oxygen, respectively.</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           | Colaborative   |
| Partnership / Participation    | <ul style="list-style-type: none"> <li>▪ CNRismar</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/zwmh-ap87">https://doi.org/10.25704/zwmh-ap87</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/teresa\\_cnr-teresa\\_L0/L0/-02-/dep0006\\_teresa\\_cnr-teresa\\_L0\\_2020-02-19\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/teresa_cnr-teresa_L0/L0/-02-/dep0006_teresa_cnr-teresa_L0_2020-02-19_data_dt.nc)
- L1: [https://thredds.socib.es/thredds/fileServer/auv/glider/teresa\\_cnr-teresa\\_L1/L1/-02-/dep0006\\_teresa\\_cnr-teresa\\_L1\\_2020-02-19\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/teresa_cnr-teresa_L1/L1/-02-/dep0006_teresa_cnr-teresa_L1_2020-02-19_data_dt.nc)
- L2: [https://thredds.socib.es/thredds/fileServer/auv/glider/teresa\\_cnr-teresa\\_L2/L2/-02-/dep0006\\_teresa\\_cnr-teresa\\_L2\\_2020-02-19\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/teresa_cnr-teresa_L2/L2/-02-/dep0006_teresa_cnr-teresa_L2_2020-02-19_data_dt.nc)

## 2 Engineering Review

### 2.1 Preparation

- Permission: ok
- Hardware: ok, CNR team involved on the entire preparation
- Batteries: ok
- Comms: ok
- Science: ok
- Ballasting: ok
- Sealing: ok
- Fileset: ok
- CEM: na
- Harbor check: ok
- Recovery: ok, recovery because a leak on FWD section
- Conclusion: ok

### 2.2 Mission Survey

- Deployment:
  - Vessel: Socib Valiant
  - Personnel: 1 ETD + 2 CNR + 1 GF (field team)+ 1 GF (piloting)
  - Location: Cala Millor - Arta
- Navigation: The glider responded well to the commanded target waypoints.
- Underwater Maneuvering: Performed well
- Engineering sensors:

| Sensor        | Oddities | Warnings | Errors |
|---------------|----------|----------|--------|
| attitude rev  | 0        | 3        | 0      |
| science super | 368      | 6        | 0      |
| digifin       | 16       | 4        | 0      |
| IRIDIUM       | 32       | 1        | 0      |
| DE PUMP       | 8        | 0        | 0      |

- Communication Systems (see appendix for Iridium states):
  - Total number iridium calls [num]: 32
  - Iridium calls to secondary [num]: 2
  - ON overall iridium period [h]: 0.6
  - Iridium calls state from MODE NO CARRIER to MODE UNKNOWN [num]: 9
  - Iridium calls state from MODE UNKNOWN to MODE CONNECT [num]: 1
  - Iridium calls state from MODE CONNECT to MODE UNKNOWN [num]: 21
  - Iridium calls state from MODE UNKNOWN to MODE AWAITING OK [num]: 30
  - Iridium calls state from MODE AWAITING OK to MODE UNKNOWN [num]: 1

- Total time at surface [h]: 3.25
- Total time at surface [%]: 13.68
- Hull/Hydrodynamics: No signs of problems
- Recovery:
  - Vessel: Socib Valiant
  - Personnel: 1 ETD + 1 GF (field team)+ 1 GF (piloting)
  - Location: Cala Millor - Arta

## 2.3 NAV plots

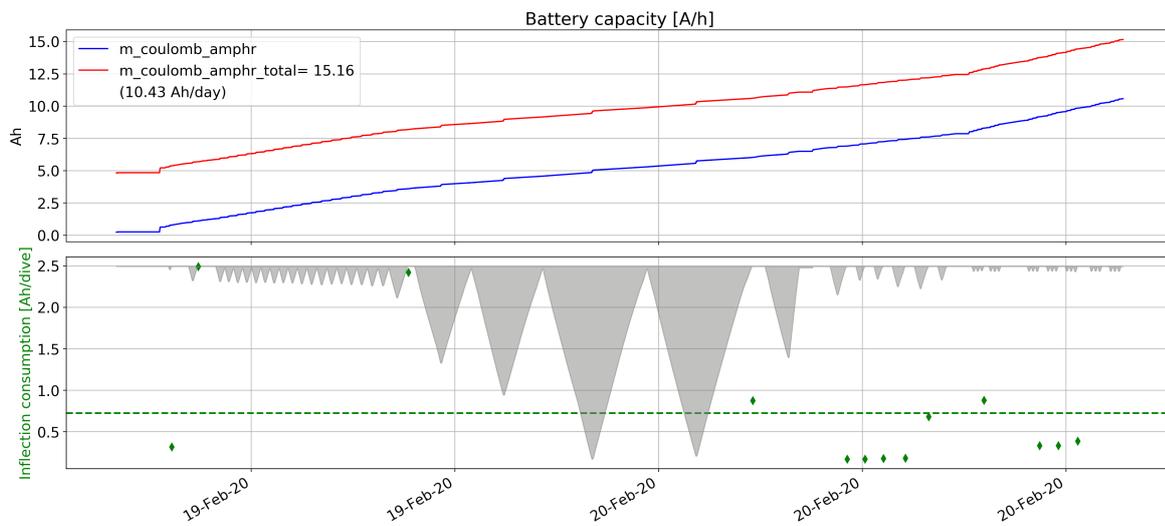


Figure 2.1: Battery capacity

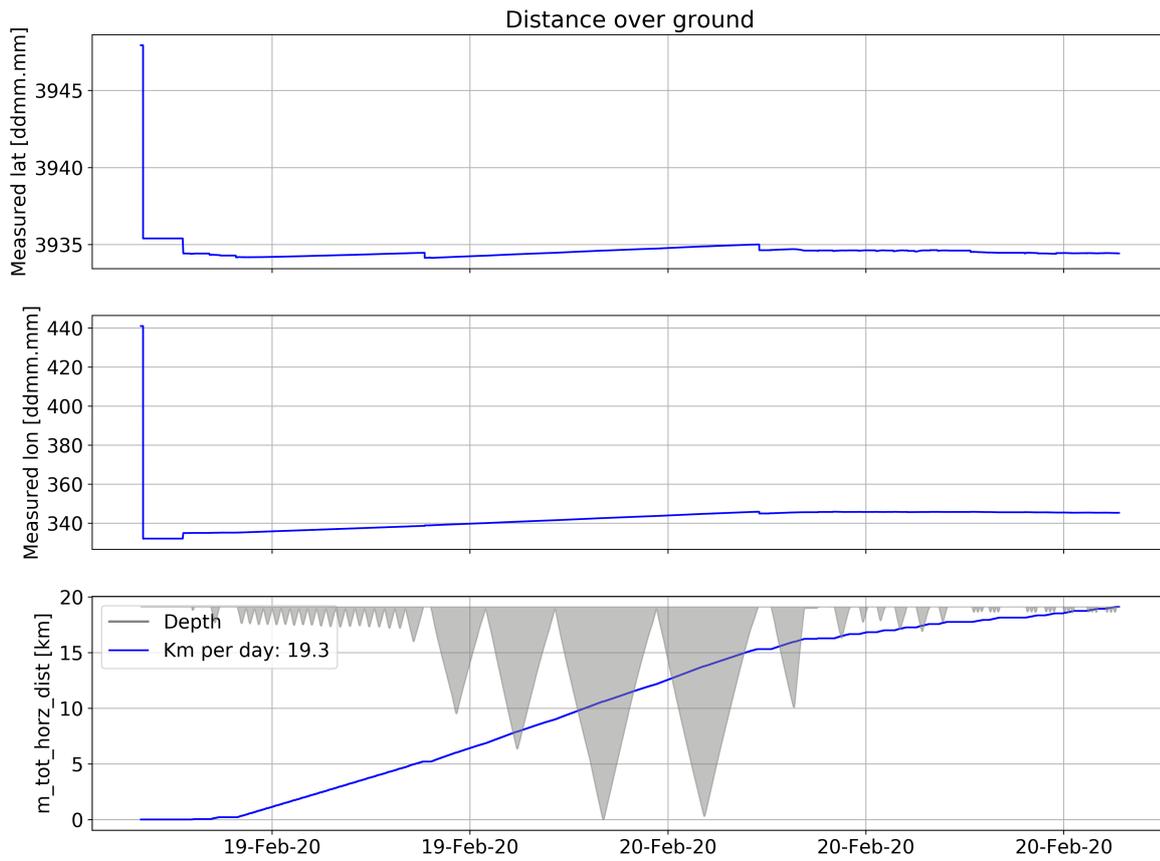


Figure 2.2: Distance over ground

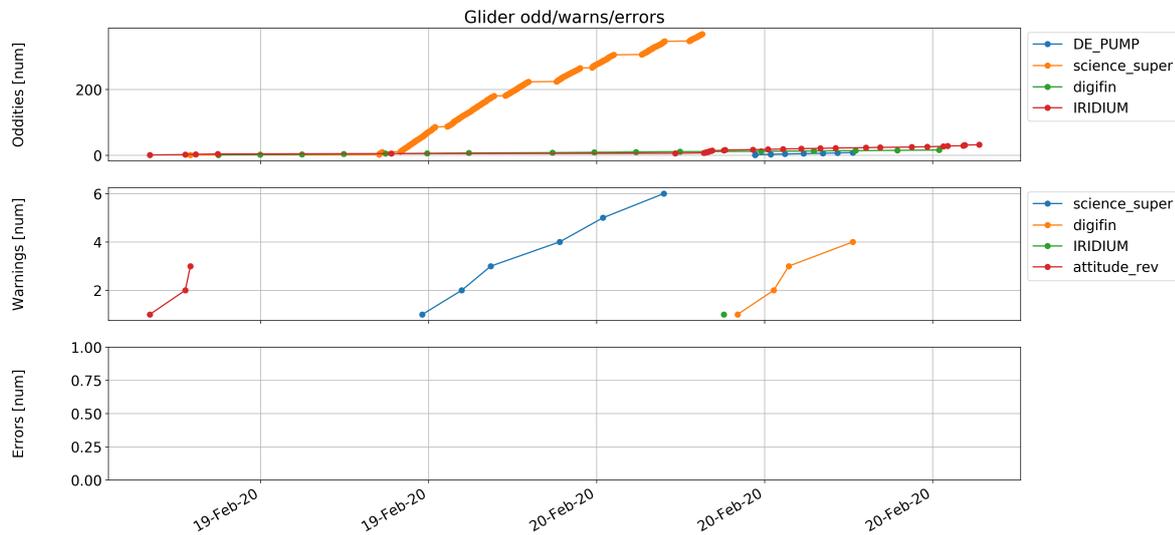


Figure 2.3: Glider Odd Warn and Err

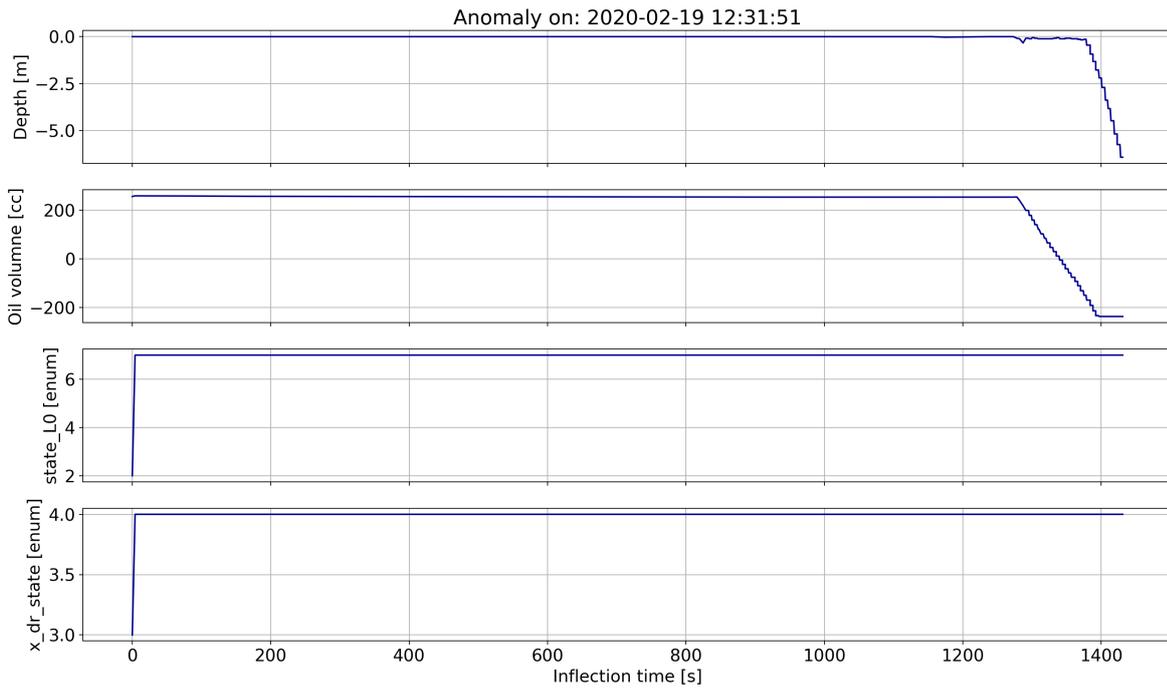


Figure 2.4: 20200219T123151 Anomaly 1

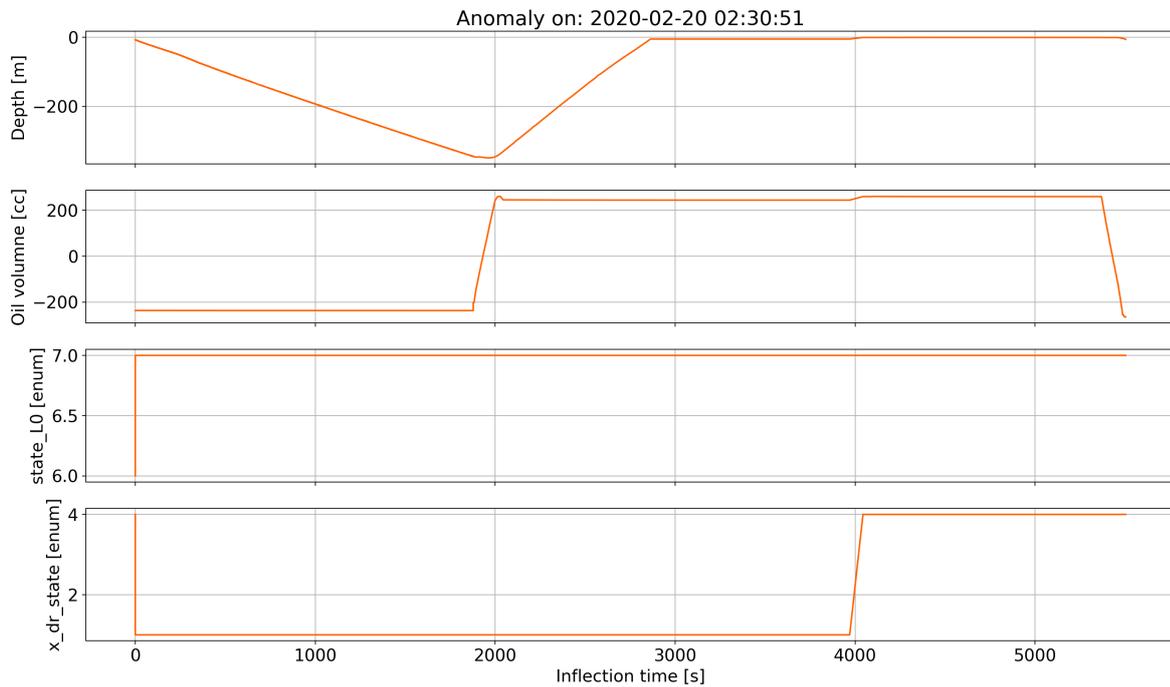


Figure 2.5: 20200220T023051 Anomaly 2

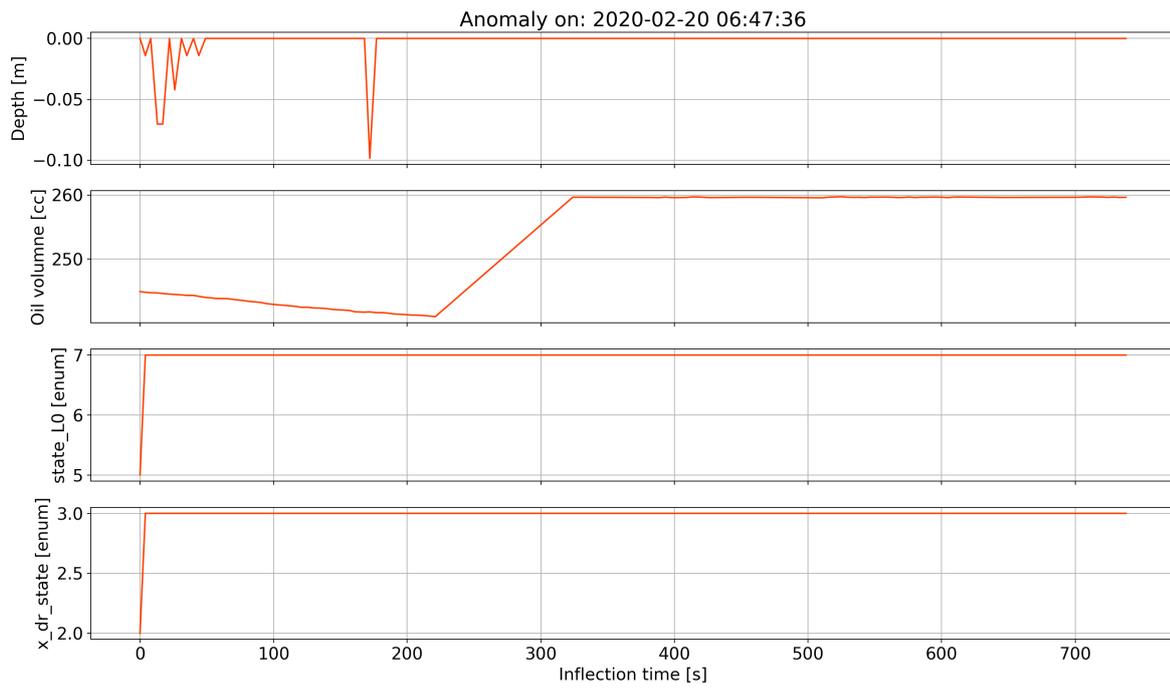


Figure 2.6: 20200220T064736 Anomaly 3

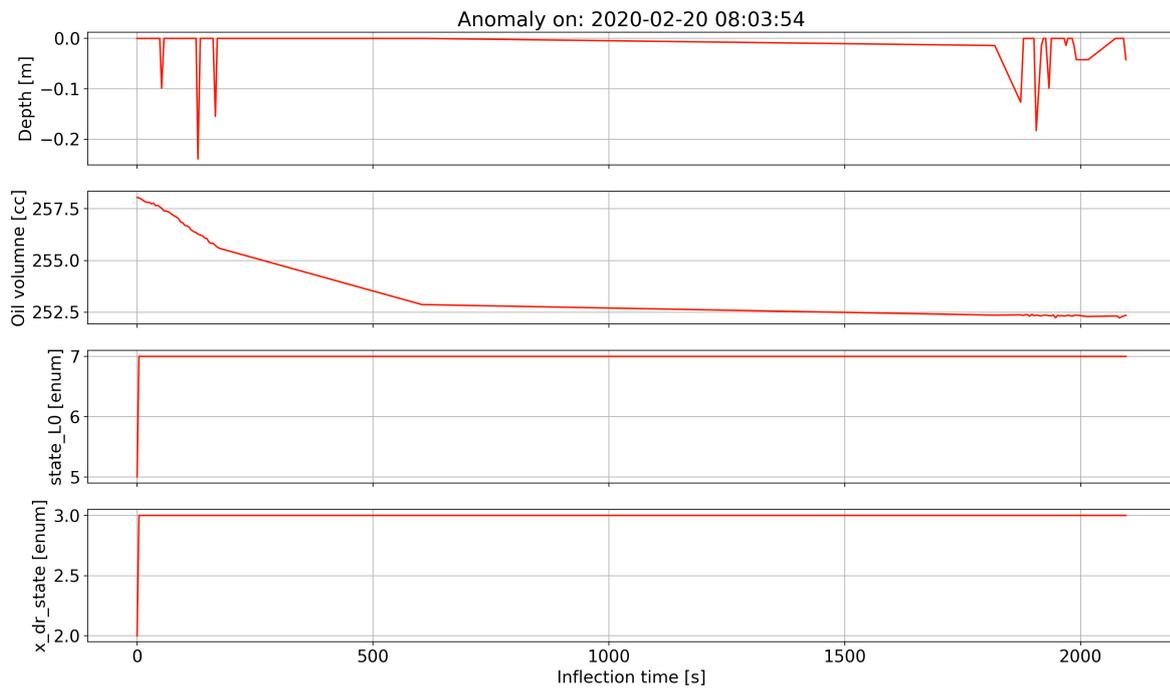


Figure 2.7: 20200220T080354 Anomaly 4

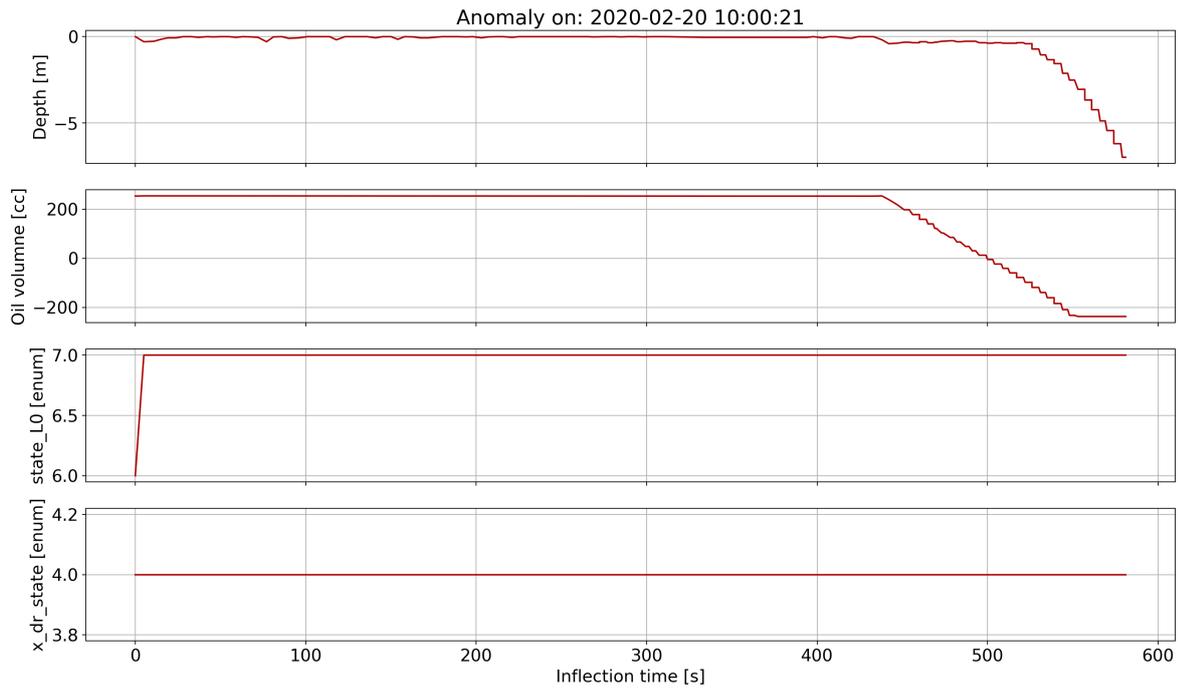


Figure 2.8: 20200220T100021 Anomaly 5

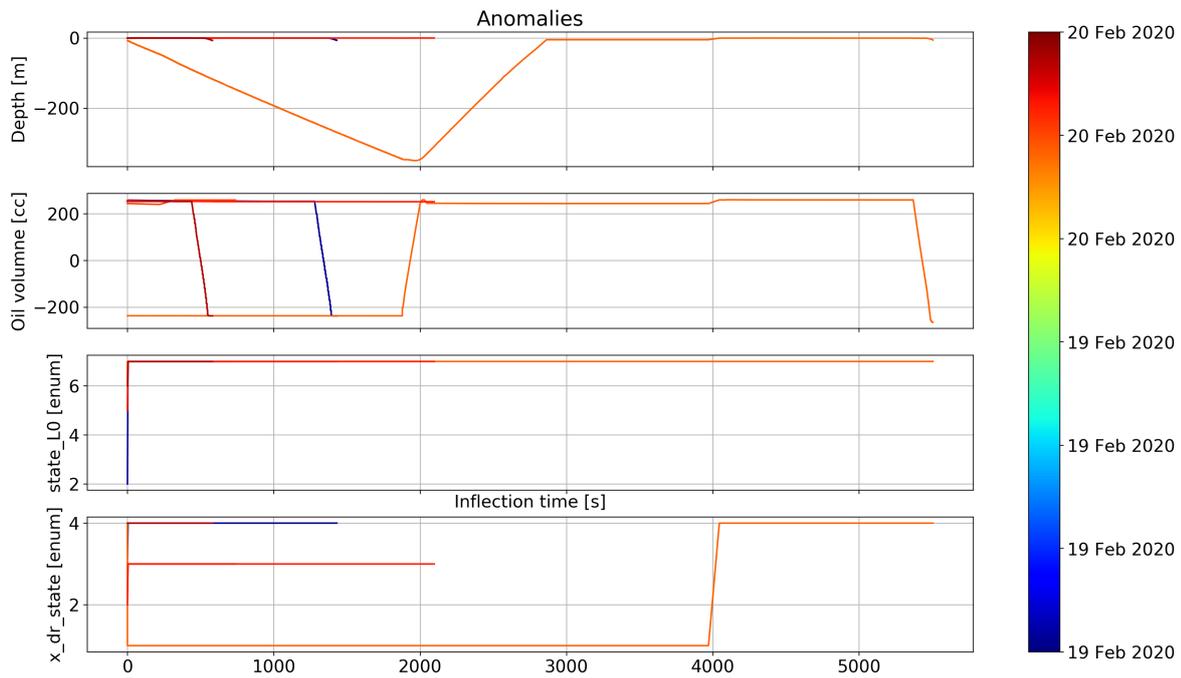


Figure 2.9: Anomalies (time)

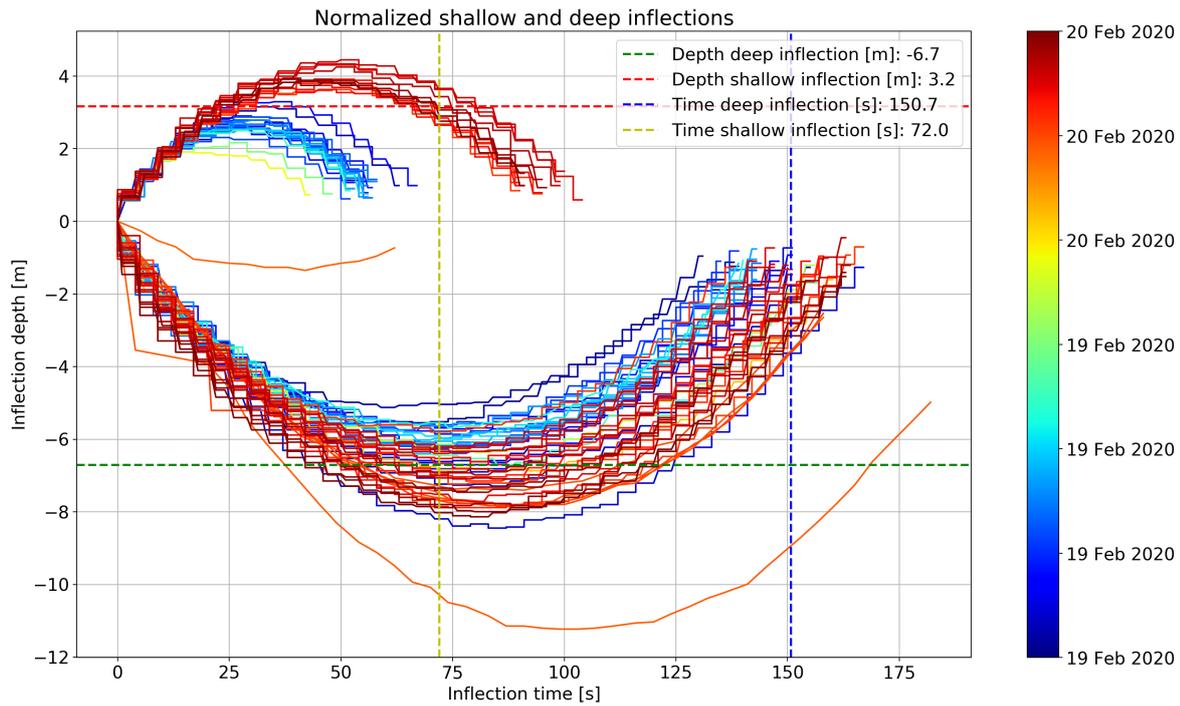


Figure 2.10: Depth inflections

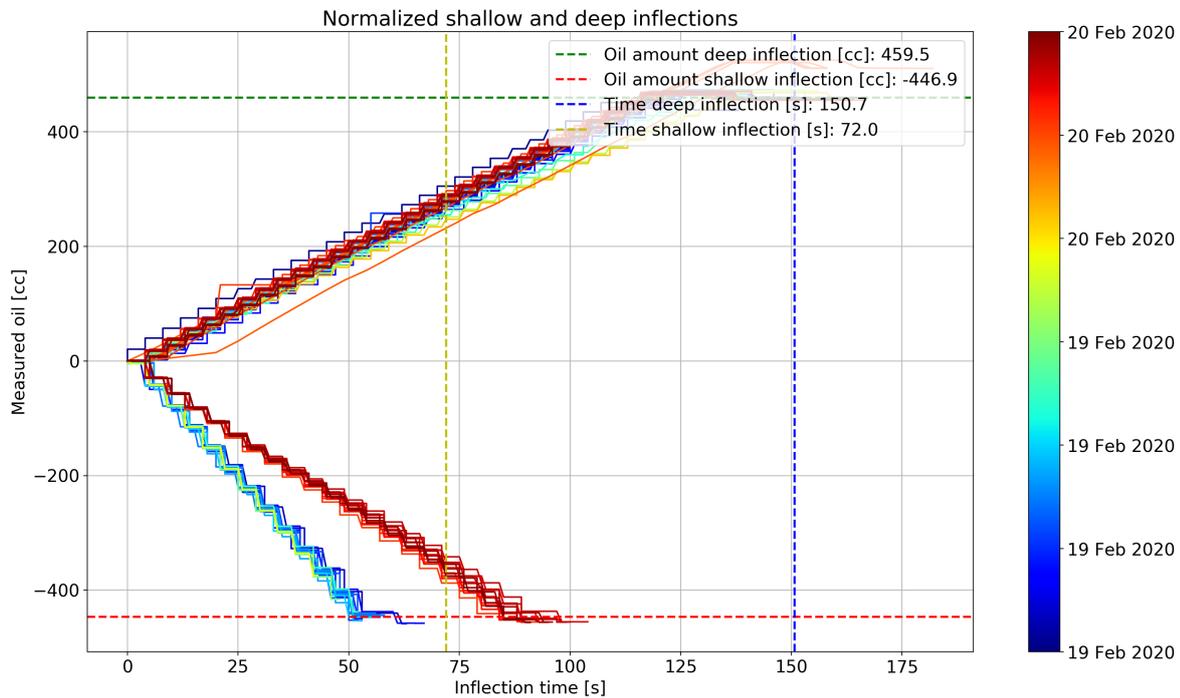


Figure 2.11: Oil inflections

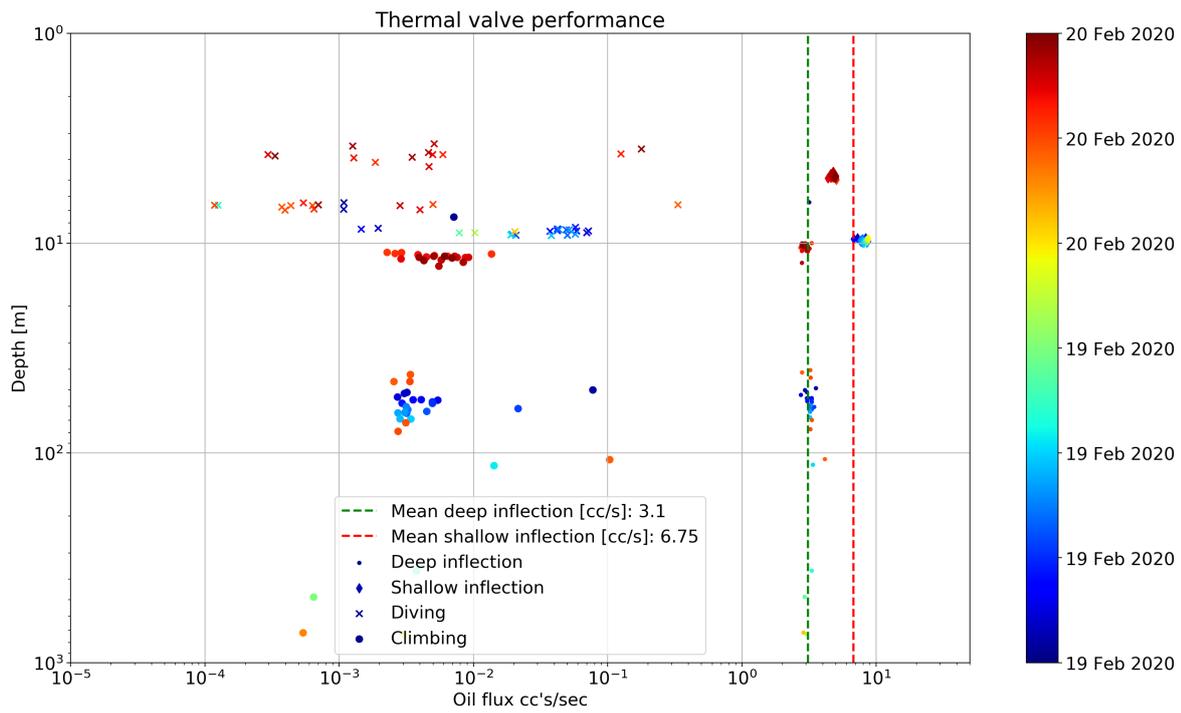


Figure 2.12: Oil flux

Normalized shallow and deep inflections

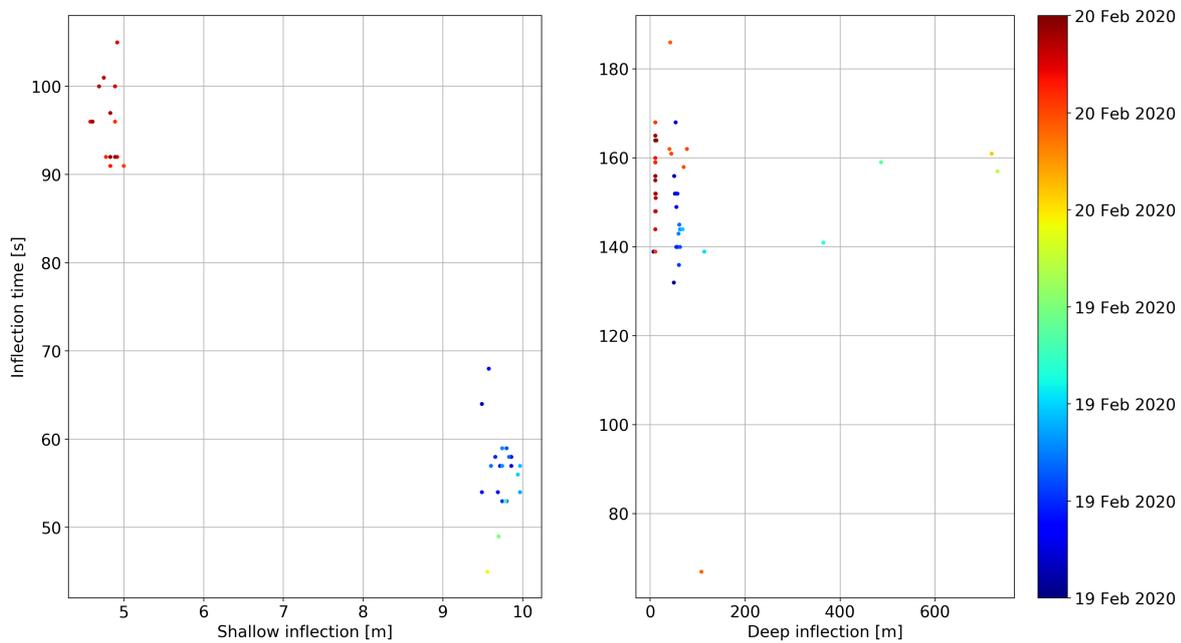


Figure 2.13: Duration inflections

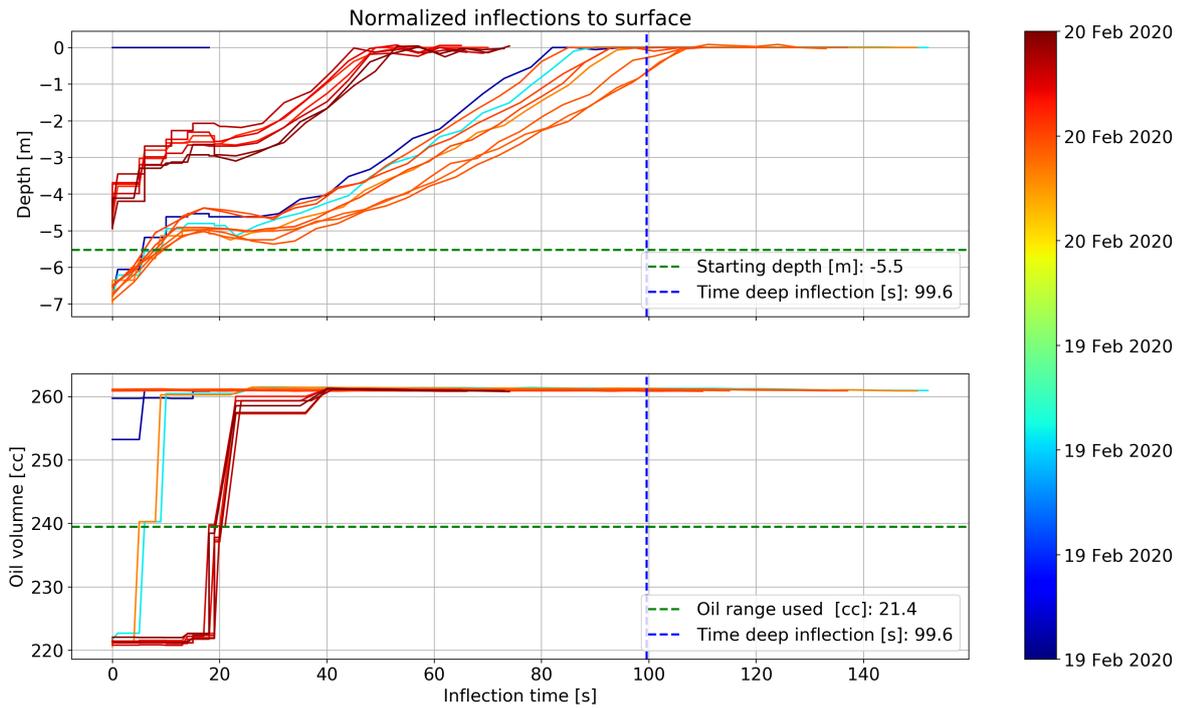


Figure 2.14: Surface Oil inflections

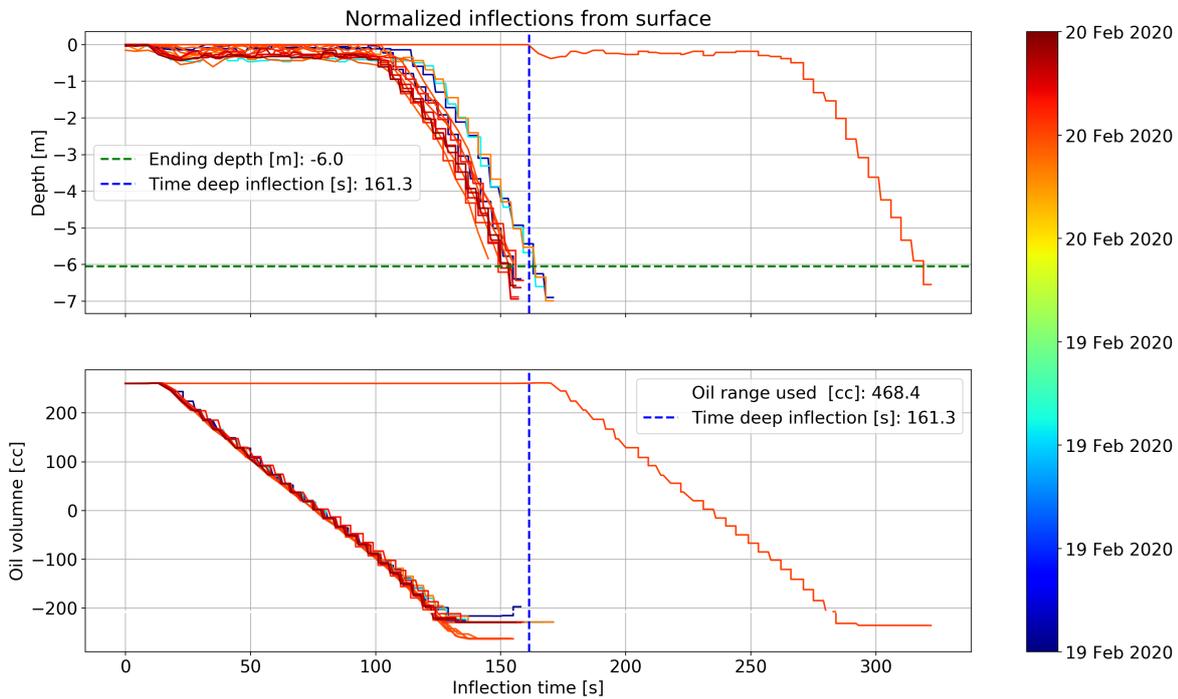


Figure 2.15: Surface Duration inflections

Flying pitch and roll

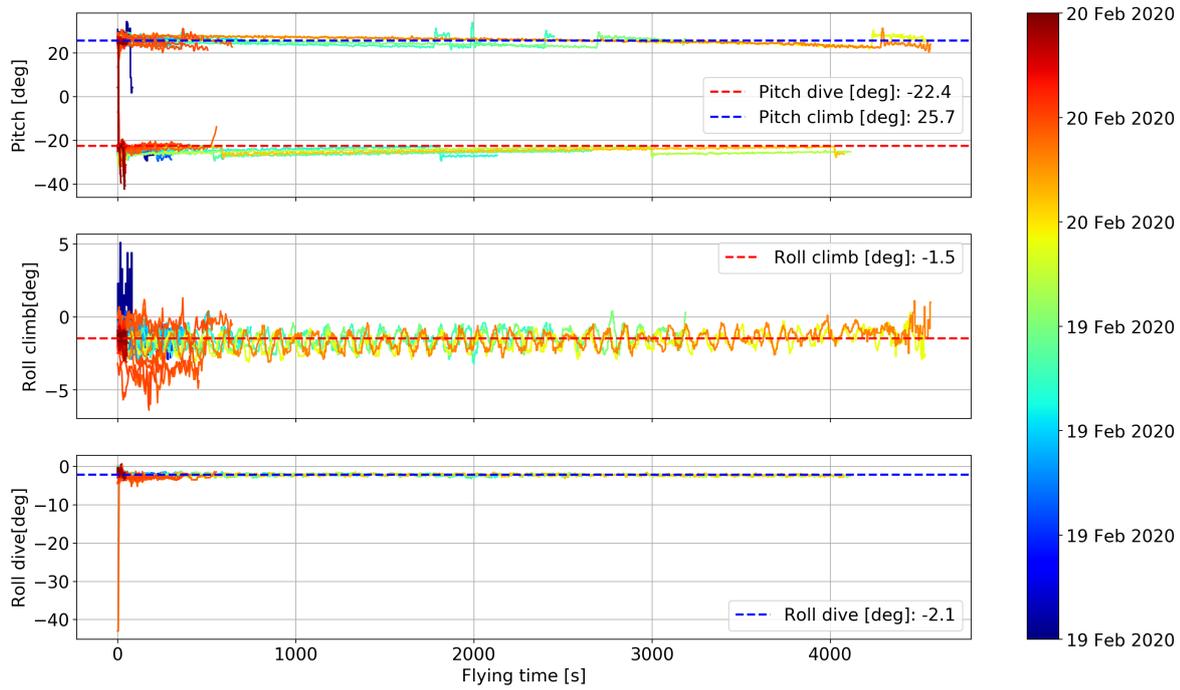


Figure 2.16: Pitch and roll, when climbing and diving

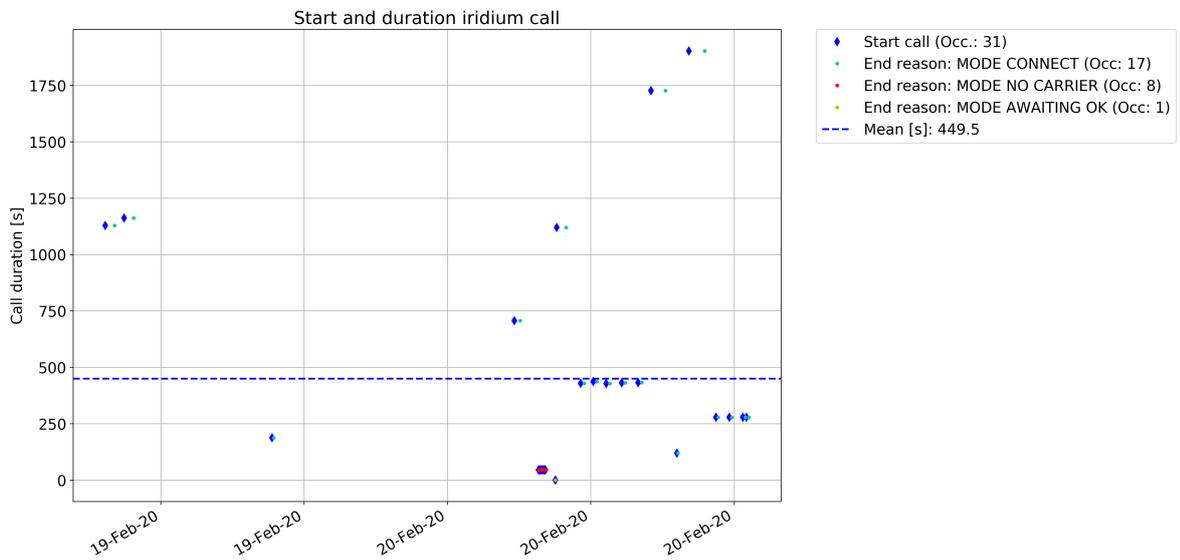


Figure 2.17: Iridium Status

### 3 Scientific Preliminary Review

#### 3.1 SCI Profiles

Calibration sheets available upon request to glider@socib.es

| Sensor         | Serial number | Calibration date | Casts | Half YOs | Samples | Intersample time [s]* | Sampled distance [km] |
|----------------|---------------|------------------|-------|----------|---------|-----------------------|-----------------------|
| CTD            | 9239          | 20191024         | 93    | 106      | 18427   | 2.965                 | 8.1                   |
| FLNTU-FLBBCDSL | na            | na               | na    | na       | na      | na                    | na                    |
| OXY 3-4        | 0360          | 20200106         | 93    | 106      | 5979    | 9.159                 | 8.1                   |
| PAR            | na            | na               | na    | na       | na      | na                    | na                    |
| Hydrophone     | na            | na               | na    | na       | na      | na                    | na                    |
| Microrider     | 0125          | 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 | na |
| FLx | Turbidity dark count   | na |
| FLx | CDOM dark count        | na |
| FLx | BB700 dark count       | na |

#### 3.2 SCI plots

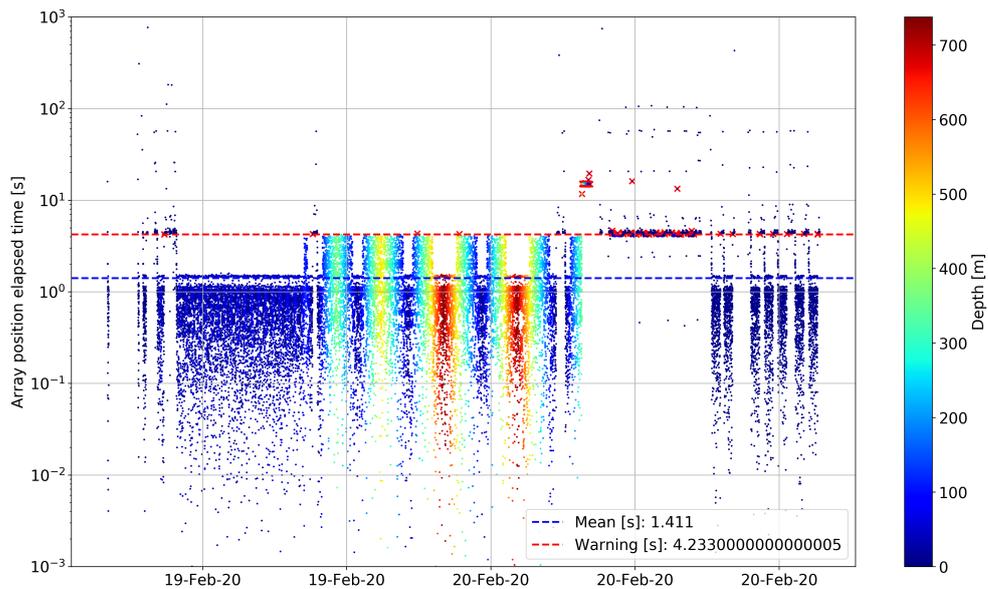


Figure 3.1: Array time

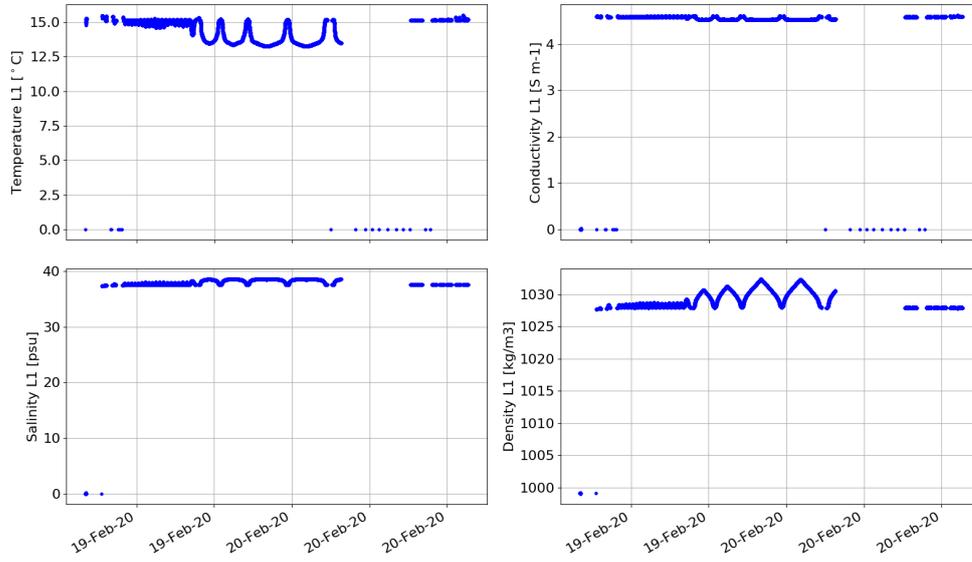


Figure 3.2: Raw CTD L1

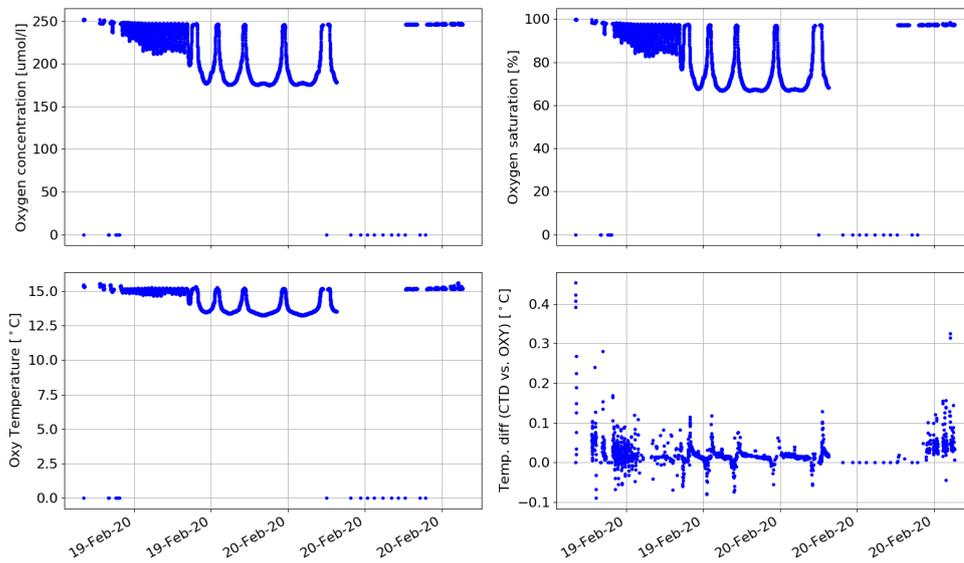


Figure 3.3: Raw OXY L1

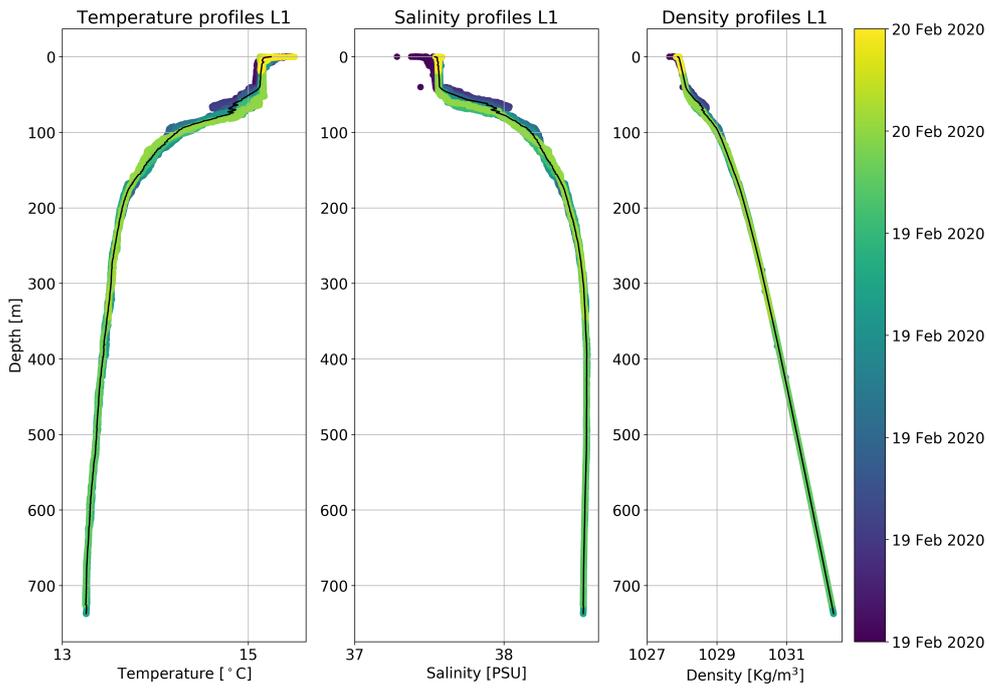


Figure 3.4: CTD profiles

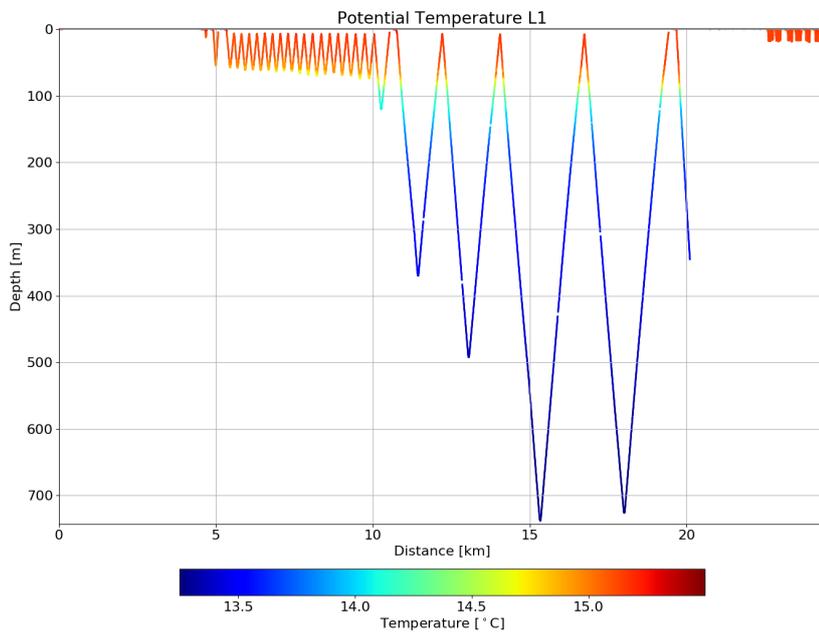


Figure 3.5: CTD temperature

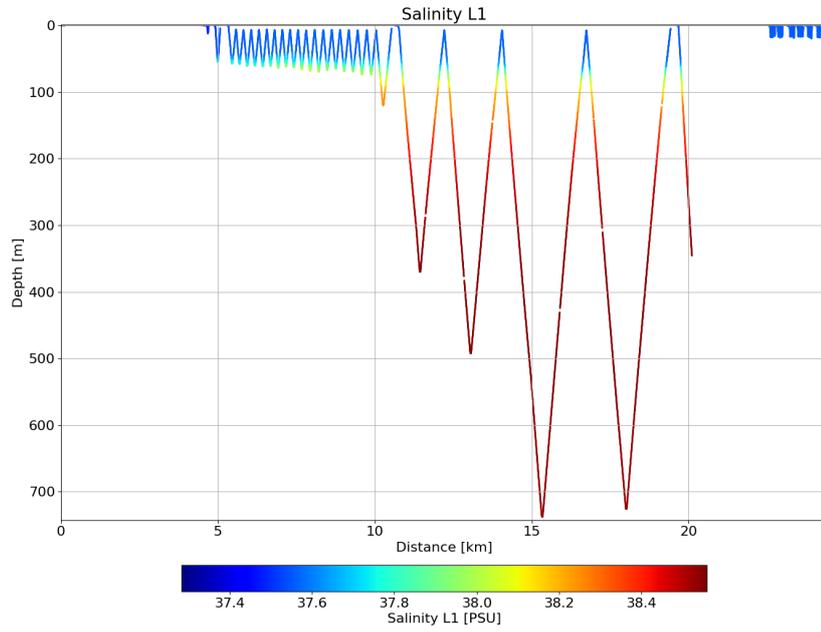


Figure 3.6: CTD Salinity

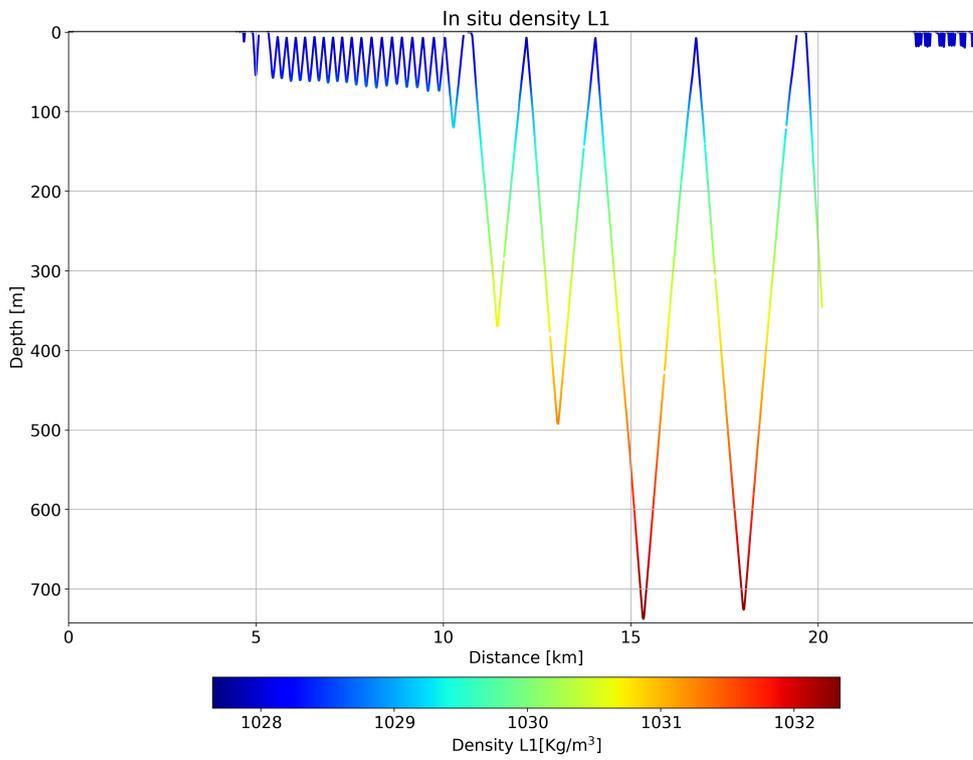


Figure 3.7: CTD Density

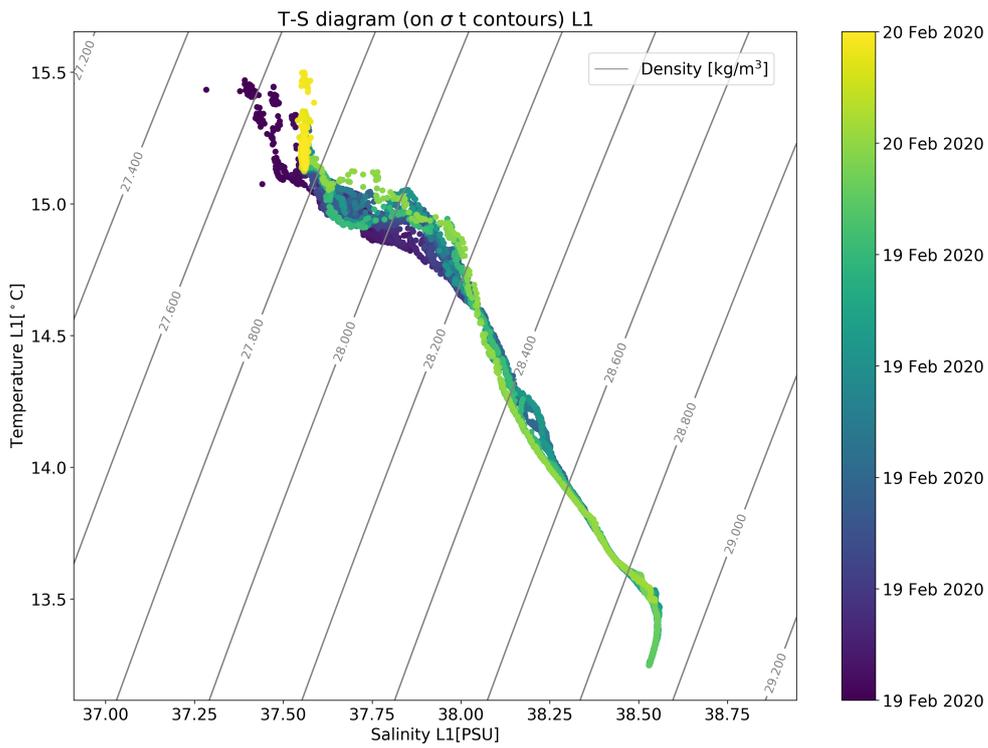


Figure 3.8: TS diagram (CTD)

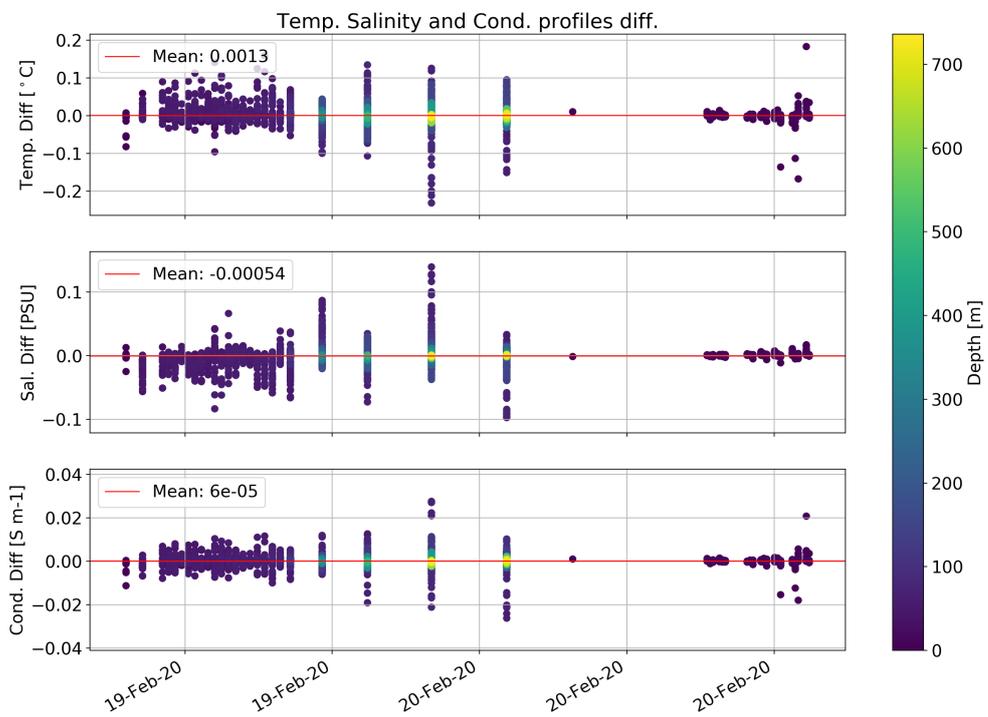


Figure 3.9: Profile consistency (CTD)

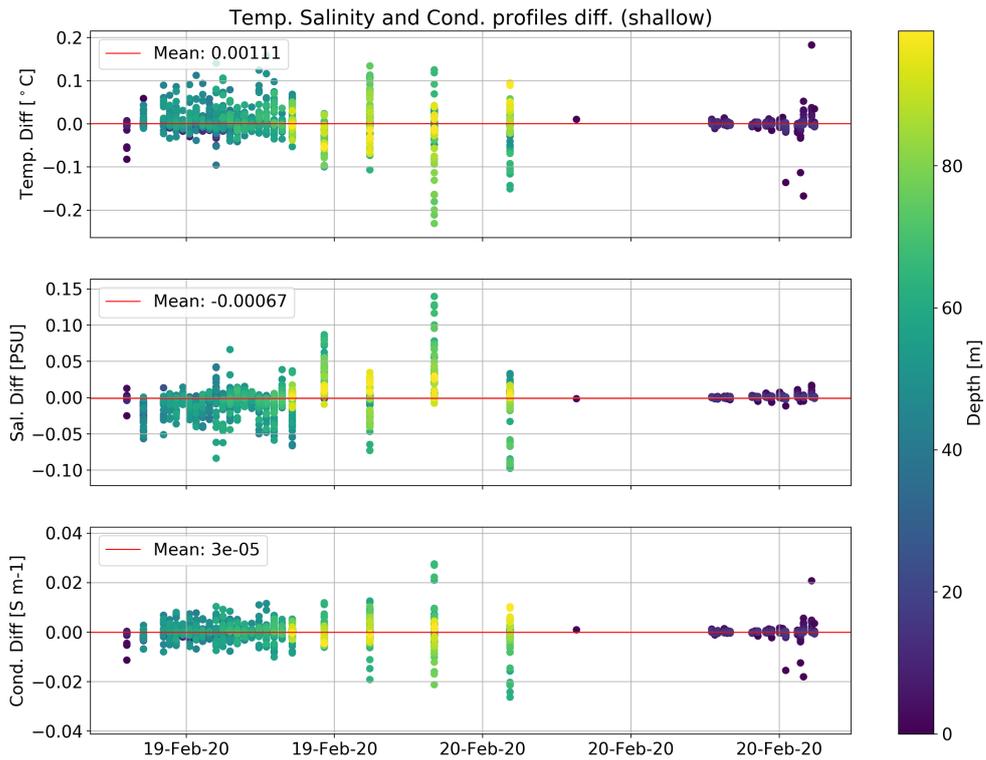


Figure 3.10: Profile consistency (CTD) zoom

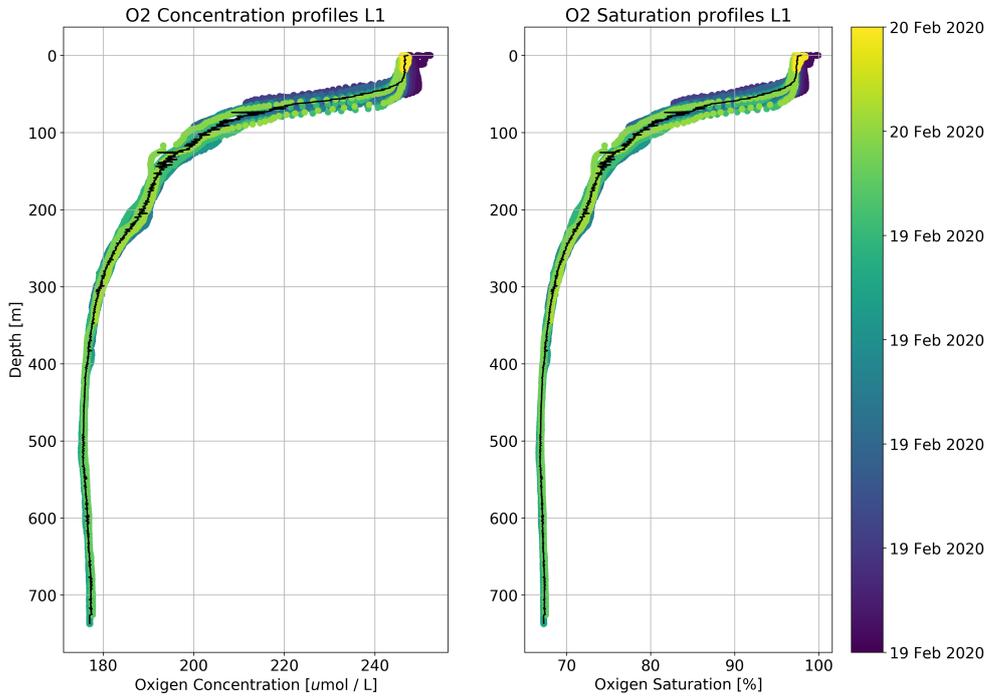


Figure 3.11: Oxygen profiles

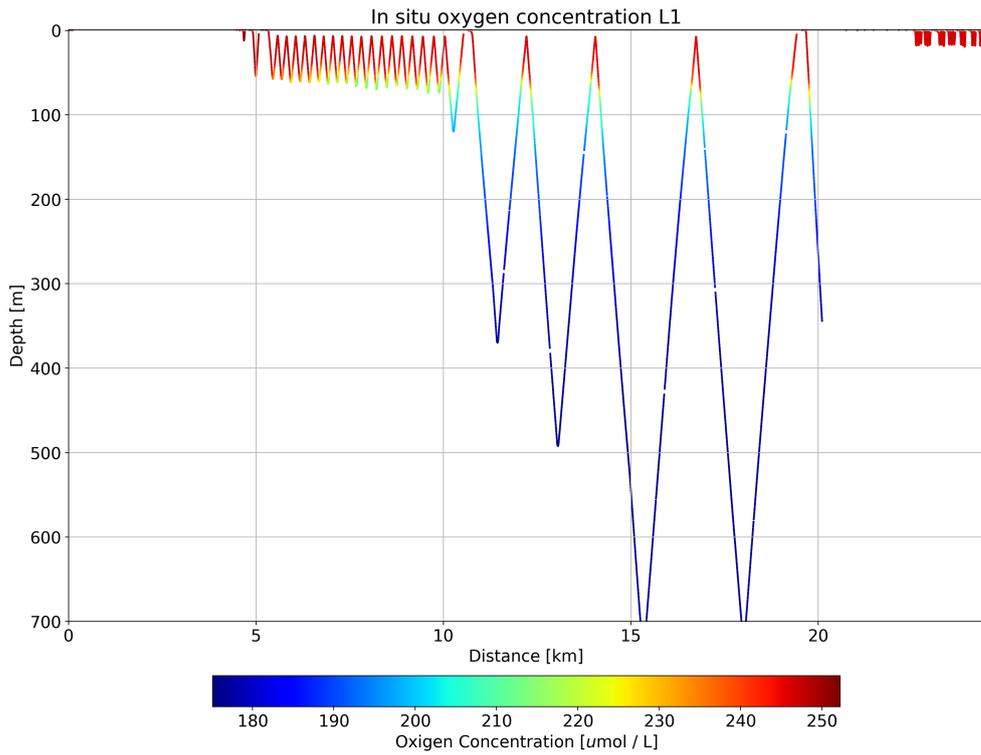


Figure 3.12: Oxygen Concentration

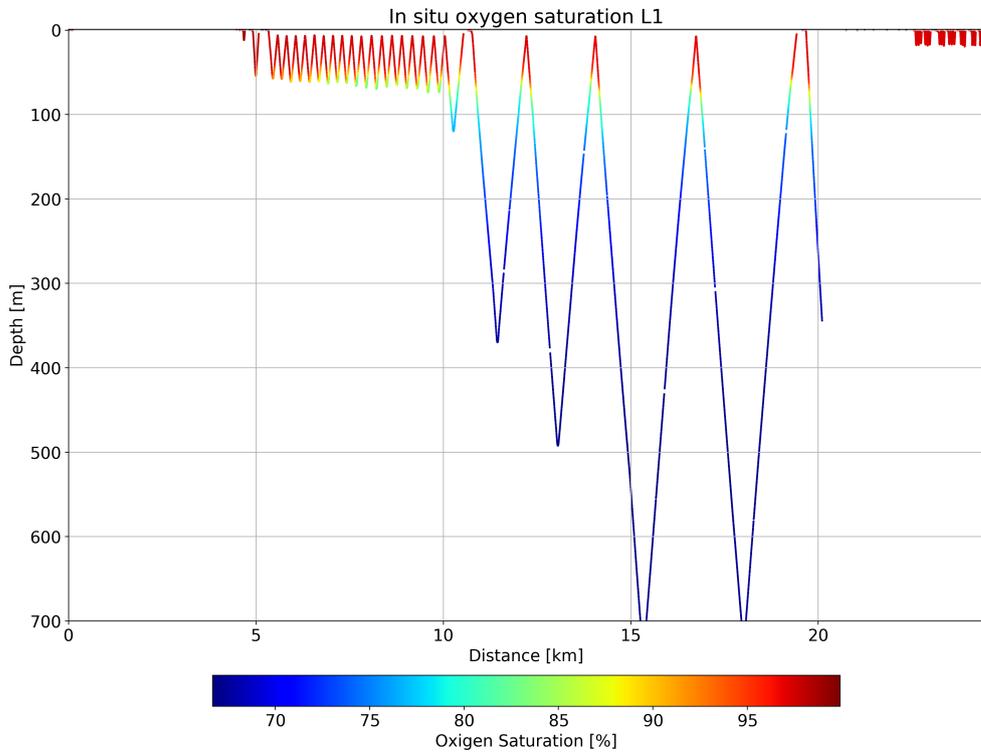


Figure 3.13: Oxygen Saturation

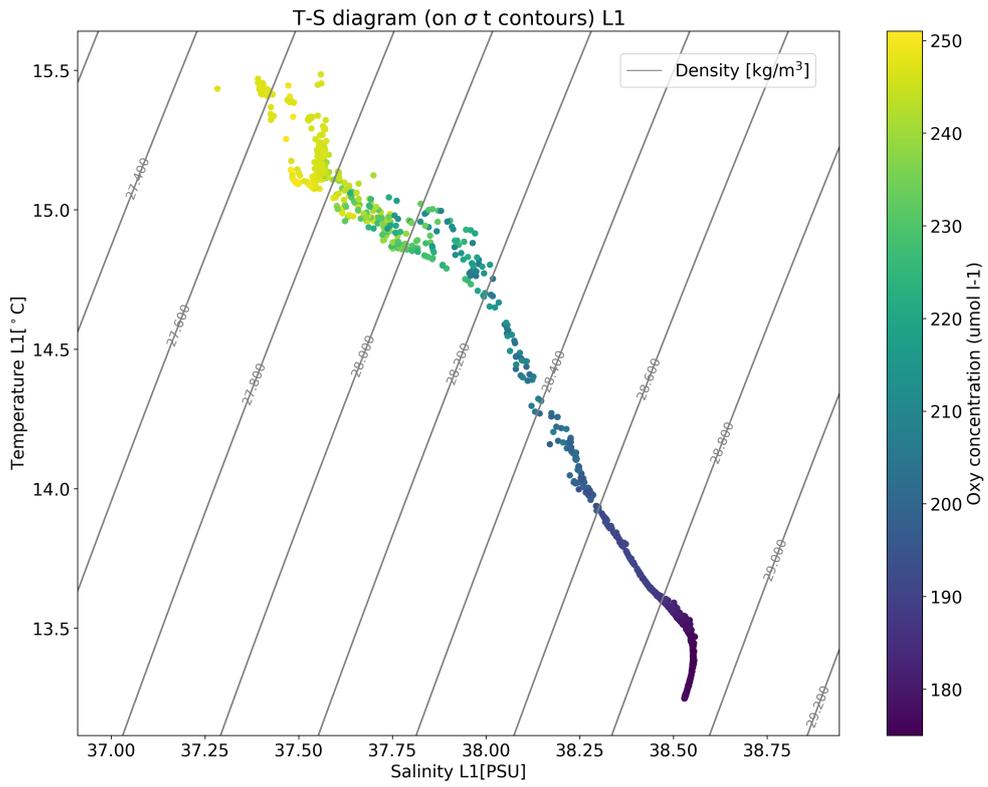


Figure 3.14: TS diagram (OXY)

## 4 Appendix

### 4.1 Glider behaviour

MLG FILES: Total MLG files: 38 Used: 18

Showing changes on Sampling :

- 19 Feb 2020 12:23:48 @ Sampling of: sample13.ma
- 19 Feb 2020 12:23:49 @ Sampling state to sample set to: Diving, climbing and hovering
- 19 Feb 2020 12:23:49 @ Sampling argument: intersample time set to: 0.0 s
- 19 Feb 2020 12:23:49 @ Sampling nth yo to sample set to: 1.0 nodim
- 19 Feb 2020 12:23:49 @ Sampling argument: min depth set to: -5.0 m
- 19 Feb 2020 12:23:49 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Sampling :

- 19 Feb 2020 12:23:50 @ Sampling of: sample12.ma
- 19 Feb 2020 12:23:50 @ Sampling state to sample set to: Diving and climbing
- 19 Feb 2020 12:23:50 @ Sampling argument: intersample time set to: 8.0 s
- 19 Feb 2020 12:23:50 @ Sampling nth yo to sample set to: 1.0 nodim
- 19 Feb 2020 12:23:50 @ Sampling argument: min depth set to: -5.0 m
- 19 Feb 2020 12:23:50 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Sampling :

- 19 Feb 2020 12:23:51 @ Sampling of: sample11.ma
- 19 Feb 2020 12:23:51 @ Sampling state to sample set to: Diving and climbing
- 19 Feb 2020 12:23:51 @ Sampling argument: intersample time set to: 2.0 s
- 19 Feb 2020 12:23:51 @ Sampling nth yo to sample set to: 1.0 nodim
- 19 Feb 2020 12:23:51 @ Sampling argument: min depth set to: -5.0 m
- 19 Feb 2020 12:23:51 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Yoing :

- 19 Feb 2020 12:23:52 @ Yoing num half cycles to do(nodim) set to: 2.0
- 19 Feb 2020 12:23:52 @ Yoing d target depth(m) set to: 5.0
- 19 Feb 2020 12:23:52 @ Yoing d bpump value(X) set to: -233.0
- 19 Feb 2020 12:23:52 @ Yoing d target altitude(m) set to: 40.0
- 19 Feb 2020 12:23:52 @ Yoing d use pitch(enum) set to: 3.0
- 19 Feb 2020 12:23:52 @ Yoing d pitch value(X) set to: -0.453700
- 19 Feb 2020 12:23:52 @ Yoing c use pitch(enum) set to: 3.0
- 19 Feb 2020 12:23:52 @ Yoing c pitch value(X) set to: 0.453700
- 19 Feb 2020 12:49:57 @ Yoing d target depth(m) set to: 950.0
- 19 Feb 2020 13:28:15 @ Yoing num half cycles to do(nodim) set to: -1.0
- 20 Feb 2020 07:19:24 @ Yoing num half cycles to do(nodim) set to: 6.0
- 20 Feb 2020 07:19:24 @ Yoing d target depth(m) set to: 10.0

Showing changes on Altimeter set to :

- 19 Feb 2020 12:32:49 @ Altimeter set to u alt min depth set to: 2

### 4.2 Installed devices (from autoexec.mi)

- Forward section assy \_SN: 0267
- Payload bay assy \_SN: 1149
- Aft section assy \_SN: 0860
- Aft electronic assy \_SN: 0858
- Aft end cap assy \_SN: 0861

- Digifin \_SN: 1557
- Strobe assy \_SN: 1234
- Pressure transducer \_SN: 96654
- Aft hull \_SN: 0944
- Fwd hull \_SN: 0935
- Freewave master \_SN: 862-6459
- Iridium sim card \_SN: 8988169214001025941
- Argos ID \_SN: 146191-dec/D96C8F2-hex
- Altimeter \_SN: 3070140
- Pitch motor \_SN: 1279
- 1000- Motor \_SN: controller0397
- 1000- Front air pump \_SN: 0380
- 1000- Pump assy \_SN: 0371
- 1000- Valve assy \_SN: 0379
- Science persistor \_SN: 1068
- science motherboard \_SN: jj02834
- Science flashcard \_SN: 0585
- seabird CTD \_SN: 9239
- Microrider \_SN: 0125
- Aanderaa Optode \_SN: 0360
- Main board \_SN: jj02686
- Communication board \_SN: jj02265
- Iridium phone \_SN: 0985
- Main flashcard \_SN: 0510
- Main persistor \_SN: 1051
- Attitude sensor \_SN: 36133
- Air pump \_SN: 1388
- Communications Assy \_SN: 0789
- Freewave Slave \_SN: 864-0702
- GPS \_SN: 1131
- Argos X-cat \_SN: 0862
- Air bladder \_SN: 1362

### 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

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