

# SOCIB Glider Mission Summary Report

GF-MR-0116-SOCIB-TNA-ABACUS21-U567

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Balearic Islands  
Coastal Observing  
and Forecasting  
System

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## 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.

# 1. Engineering Review

## 1.1 Summary

Mission name	GF-MR-0116-SOCIB-TNA-ABACUS21-U567
Platform Model	Slocum 1000m G2
Platform ID / Name / WMO Code	U567 / sdeep04 / 68997
NAV software ver.	Version 8.2 Under Ice, In situ Compass Cal, JASCO Observer
SCI software ver.	Version 8.2 Under Ice, In-situ Compass Cal, JASCO Observer
Mission duration	41.0 days
Mission start	2021-05-22 11:00:00
Mission end	2021-07-02 09:59:39
Total distance	758.34[km] 409.47[nm]
Deployment point [dd°mm.mmmm']	N 39°17.4998' E 02°34.8068'
Recovery point [dd°mm.mmmm']	N 38°58.6944' E 02°38.7235'
Battery Consumption (Ah)	172.2(from 4.8 to 176.9)
Survey Area	Mediterranean Sea
Objective(s)	The proposed research focuses on the characteristics of the Algerian Basin (AB) circulation. The AB is dominated by the presence of energetic mesoscale structures that usually develop from meanders of the Algerian Current to isolated cyclonic and anti-cyclonic eddies.
Abstract	<p>The project aims at confirming the importance of the ABACUS monitoring line across the AB between Palma de Mallorca and the southern part of the Algerian basin, and contribute to data collection in The Southern European Seas, one of the main EU maritime policy objectives, as outlined in the Marine Strategy Framework Directive (MSFD). ABACUS-2021 will allow us to realize 2 glider missions, in the study area during May-June and November-December 2021. The first leg (2021.S) will last about 40 days and will be useful for improving the study of the spring interannual variability along the ABACUS transect. The second one (2021.F) will last 20 days providing continuity with the 2014-2017 ABACUS surveys.</p> <p><b>THIS MISSION FAILED</b></p> <p>The Research leading to these results has received funding from the European Union's H2020 Framework Programme (H2020-INFRAIA) under grant agreement n°871153, JERICO-S3.</p>
NAV events	<ul style="list-style-type: none"> <li>• Event 1: Altimeter malfunction detected on 31/may/2021. It was decided to proceed because the bathymetry was deep enough most of the time</li> <li>• Event 2: In the middle of the channel, an animal collision bend the digifin. It make maneuvers dangerous and make the mission fails. See figures <a href="#">1.2</a> and <a href="#">1.3</a></li> <li>• Event 3: Available hydrophone data</li> <li>• Event 4: The observed gap on the SCI data is due to an abort</li> </ul>
SCI events	<ul style="list-style-type: none"> <li>• Event 1: Several spikes zero values in all the sensors) during the mission</li> <li>• Event 2: CHL and TURB indicated that a subduction event take place between 3rd of June to 7 of June</li> <li>• Event 3: The stratification has been increased in the upper 40 m of the water column from the beginning on June and onwards which is associated also with the present of low salinity water (&lt;36.8psu) in the upper 50m. Figure <a href="#">2.32</a></li> </ul>

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Figure 1.1: Map providing general overview of the Survey Area

## 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> <li>• IMEDEA(CSIC-UIB)</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	glider@socib.es

\*Available netCDF data product:

- L0: [https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb\\_sldeep004/L0/2021/dep0021\\_sdeep04\\_scb\\_sldeep004\\_L0\\_2021-05-22\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb_sldeep004/L0/2021/dep0021_sdeep04_scb_sldeep004_L0_2021-05-22_data_dt.nc)
- L1: [https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb\\_sldeep004/L1/2021/dep0021\\_sdeep04\\_scb\\_sldeep004\\_L1\\_2021-05-22\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb_sldeep004/L1/2021/dep0021_sdeep04_scb_sldeep004_L1_2021-05-22_data_dt.nc)
- L2: [https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb\\_sldeep004/L2/2021/dep0021\\_sdeep04\\_scb\\_sldeep004\\_L2\\_2021-05-22\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb_sldeep004/L2/2021/dep0021_sdeep04_scb_sldeep004_L2_2021-05-22_data_dt.nc)

## 1.3 Preparation

- Premission: ok
- HardWare: ok
- Batteries: Pack: 20210428 SN0050. Type: Saft lithium (329Ah)
- Comm: ok
- SCI: ok
- Ballasting: Target density: 1027,683 gr/L Tank density: 1021,24 gr/L
- Sealing: ok
- Fileset: ok
- CEM: na
- Calanova: ok
- Deployment: ok
- Deployment Notification: ok
- Recovery: ok
- Conclusion: ok

## 1.4 Mission Survey

- Deployment:
  - Vessel: Socib I
  - Personnel: 1 ETD + 1 GF

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- Location: Cala Figuera
- Navigation: It was satisfactory during most mission time. The glider responded well to the commanded target waypoints.
- Underwater Maneuvering: Performed well
- Engineering sensors:

Sensor	Oddities	Warnings	Errors
GPS	0	1	0
attitude rev	0	1	0
pitch motor	101	0	0
science super	79	2	0
digifin	847	17	0
IRIDIUM	323	0	0
DE PUMP	6	0	0

- Communication Systems (see appendix for Iridium states):
  - Total number iridium calls [num]: 242
  - Iridium calls to secondary [num]: 7
  - ON overall iridium period [h]: 5.6
  - Iridium calls state from MODE NO CARRIER to MODE UNKNOWN [num]: 43
  - Iridium calls state from MODE OK to MODE UNKNOWN [num]: 1
  - Iridium calls state from MODE CONNECT to MODE UNKNOWN [num]: 210
  - Iridium calls state from MODE UNKNOWN to MODE AWAITING OK [num]: 255
  - Iridium calls state from MODE AWAITING OK to MODE UNKNOWN [num]: 1
  - Drop calls (Iridium state from 2 to 99 with c iridium on = 1) [num]: 20
  - Missed call detected on: 2021-06-06 08:00:17
  - Unstable comms detected on: 2021-06-06 08:00:17
  - Total time at surface [h]: 25.47
  - Total time at surface [%]: 2.59
- Hull/Hydrodynamics: No signs of problems
- Mission Runs: 2 SCI abort
- Recovery:
  - Vessel: Socib I
  - Personnel: 1 ETD + 1 GF
  - Location: Cala Figuera

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## 1.5 NAV plots



Figure 1.2: Hull Scratches

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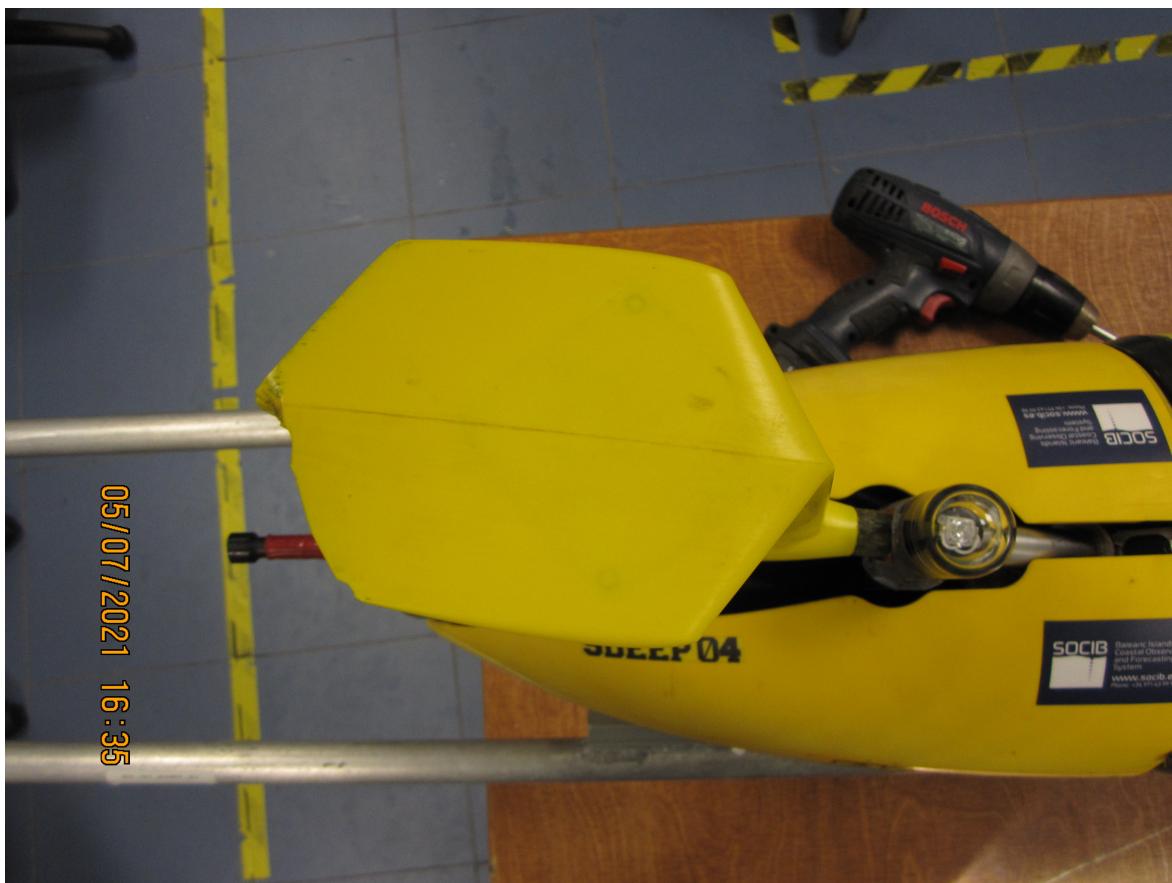


Figure 1.3: Bend digifin

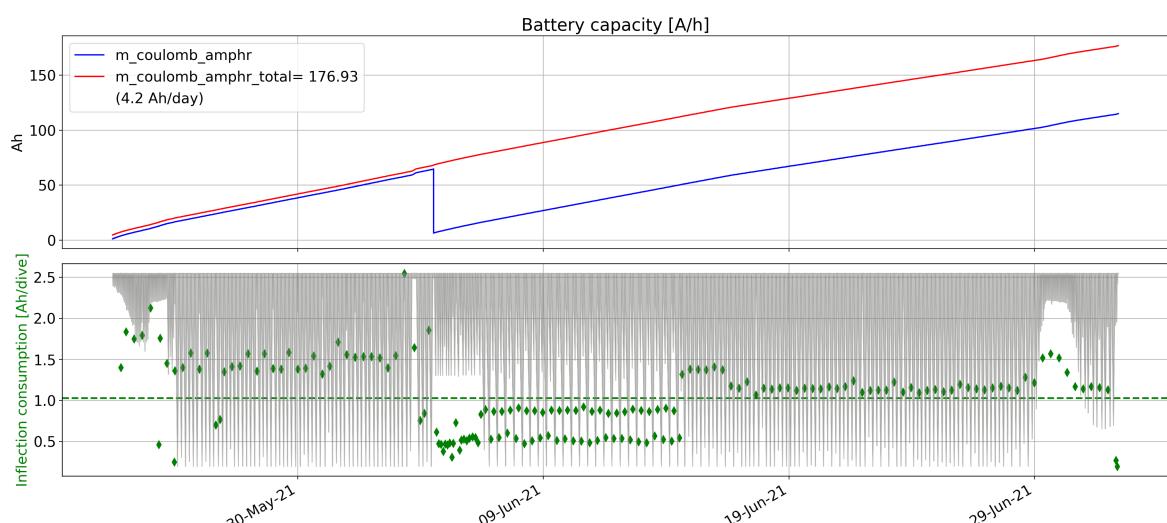


Figure 1.4: Battery capacity

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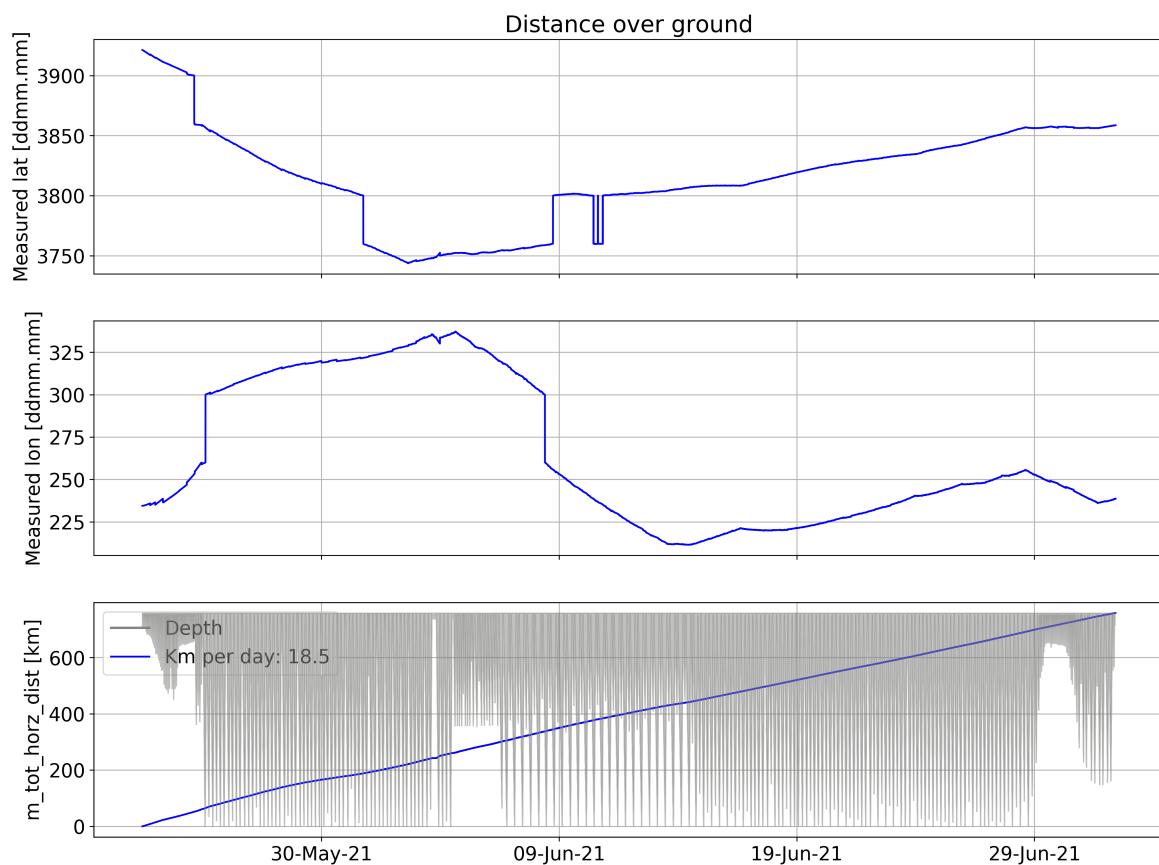


Figure 1.5: Distance over ground

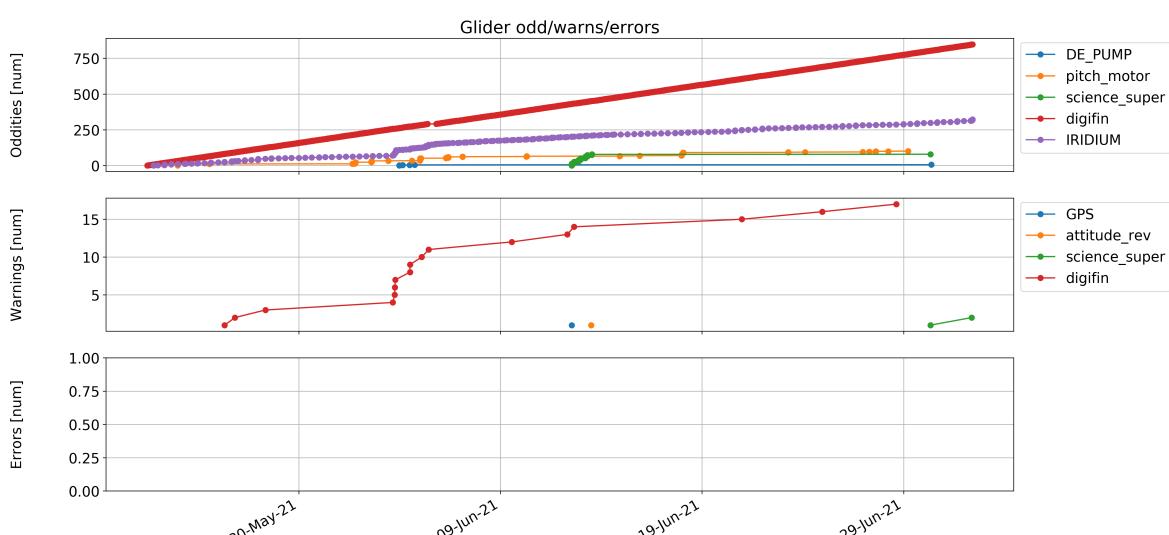


Figure 1.6: Glider Odd Warn and Err

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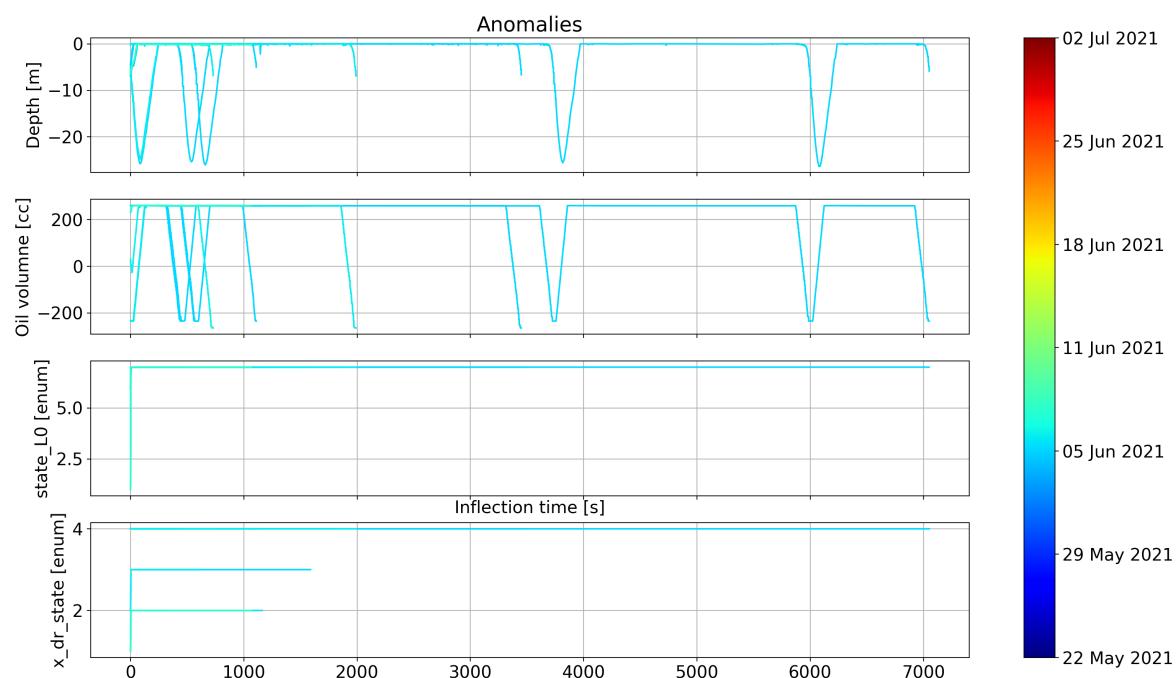


Figure 1.7: Anomalies (time)

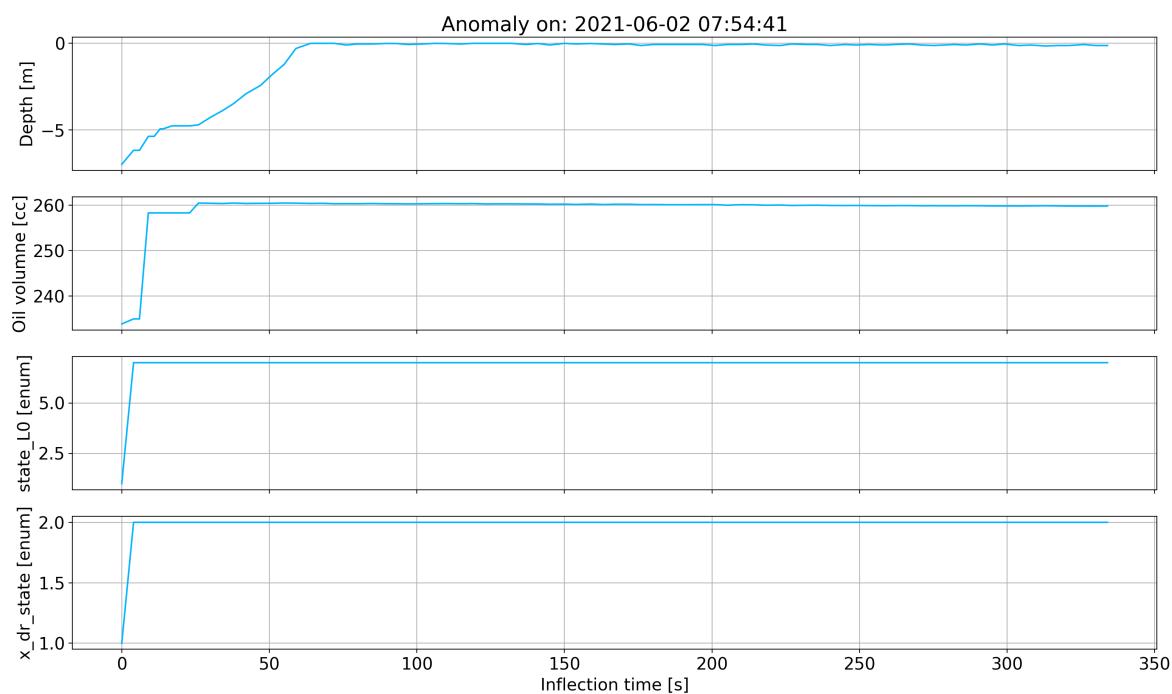


Figure 1.8: 20210602T075441 Anomaly 1

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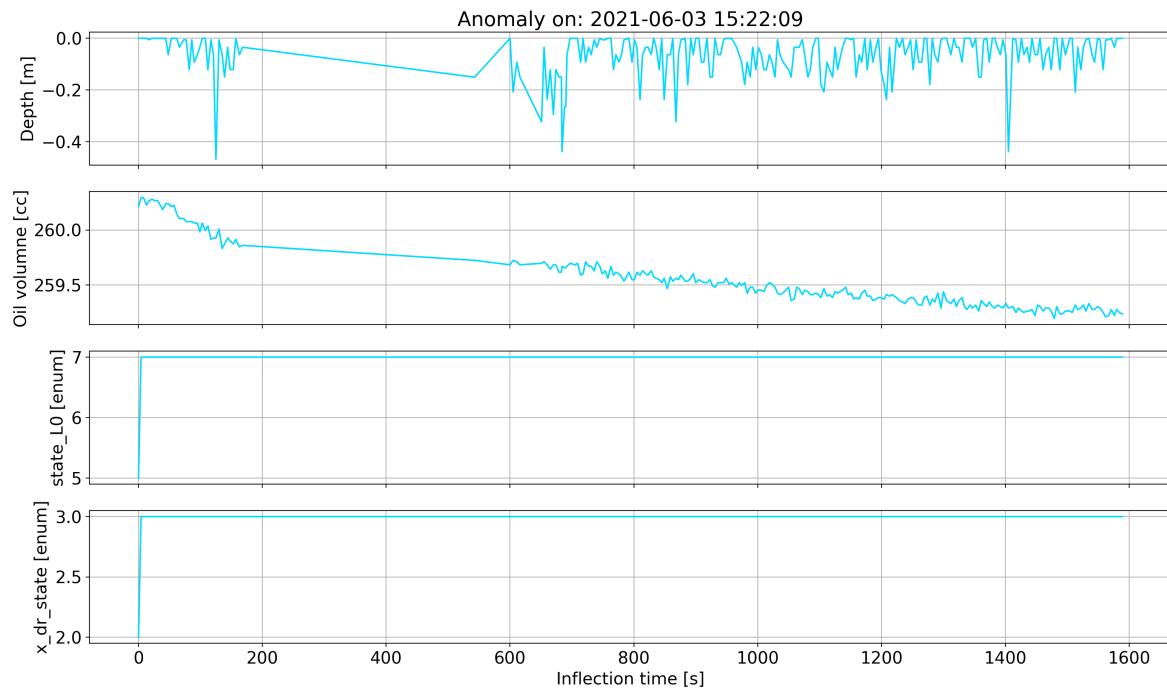


Figure 1.9: 20210603T152209 Anomaly 2

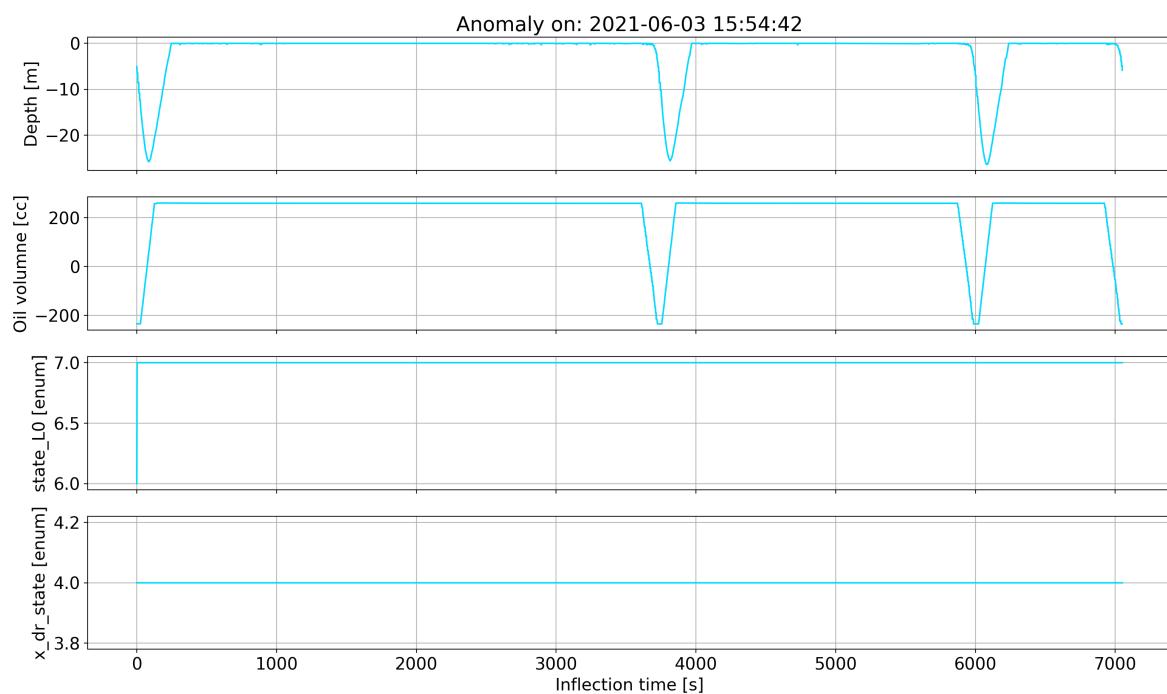


Figure 1.10: 20210603T155442 Anomaly 3

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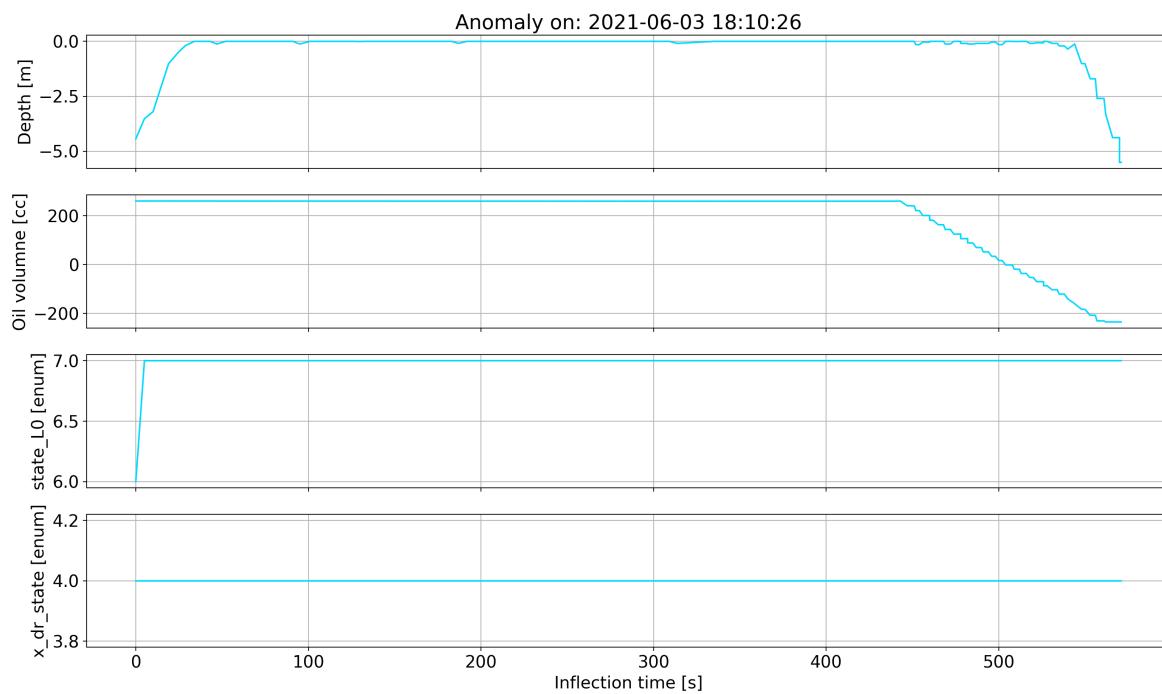


Figure 1.11: 20210603T181026 Anomaly 4

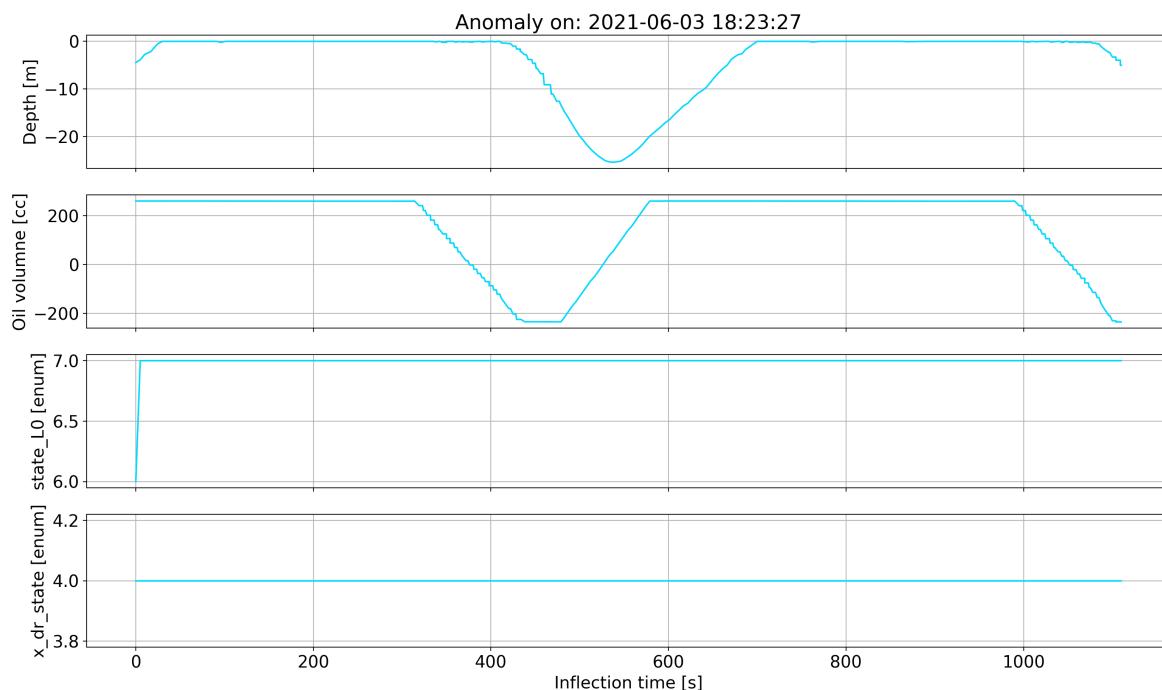


Figure 1.12: 20210603T182327 Anomaly 5

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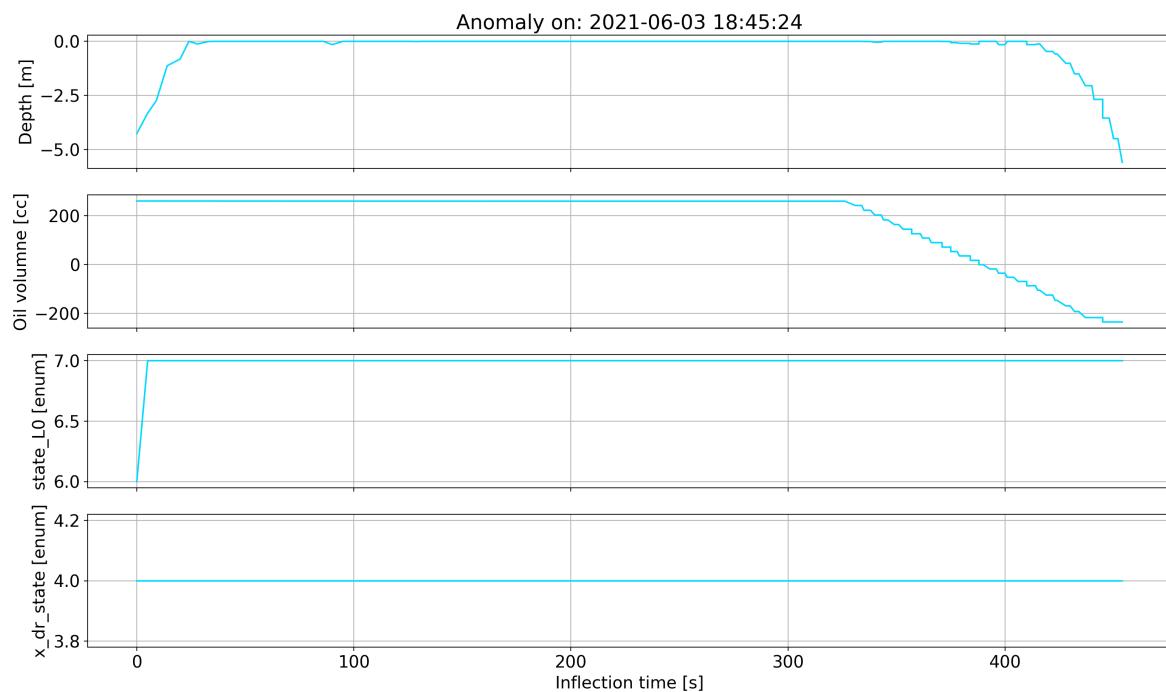


Figure 1.13: 20210603T184524 Anomaly 6

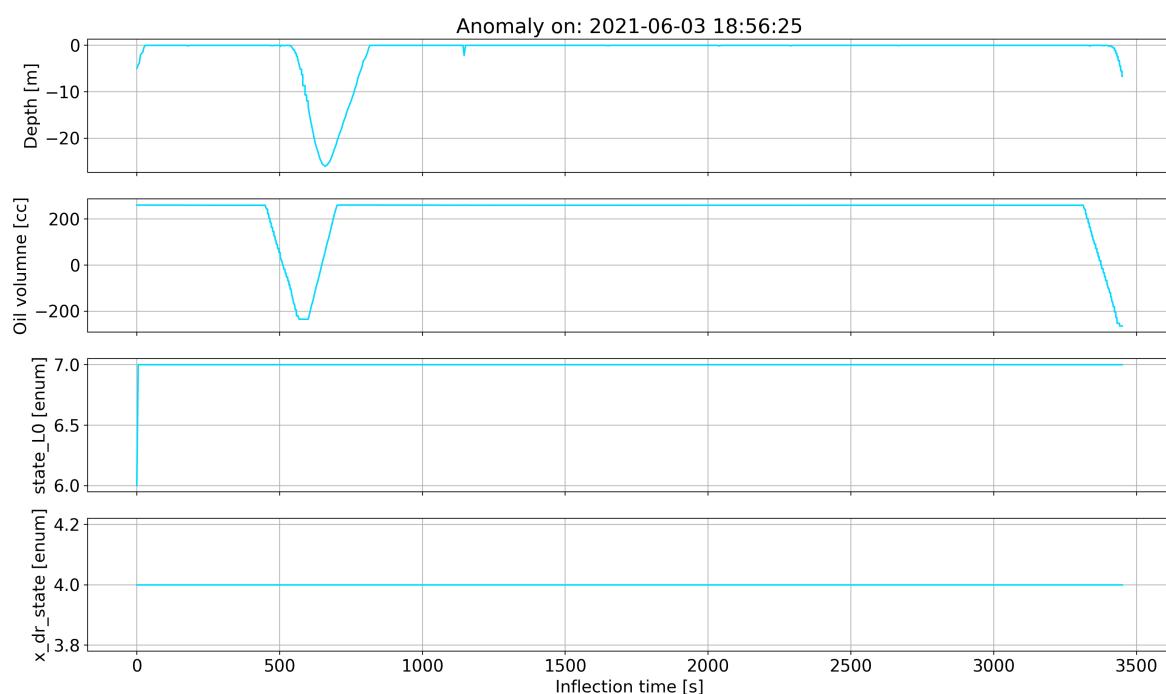


Figure 1.14: 20210603T185625 Anomaly 7

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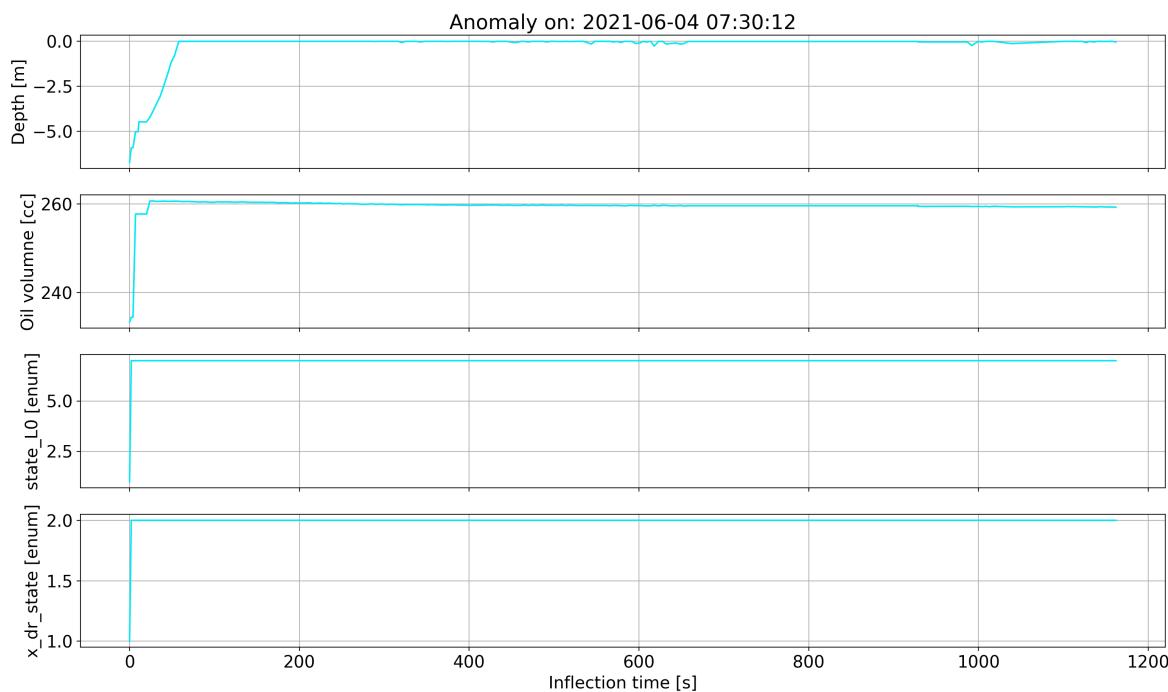


Figure 1.15: 20210604T073012 Anomaly 8

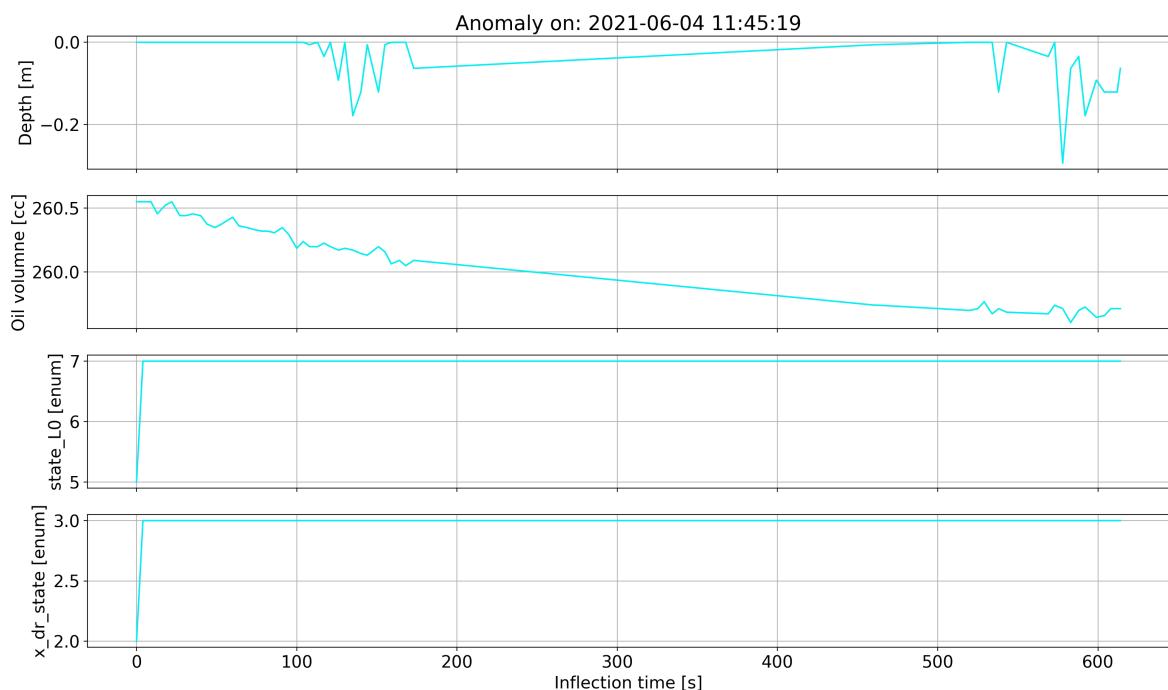


Figure 1.16: 20210604T114519 Anomaly 9

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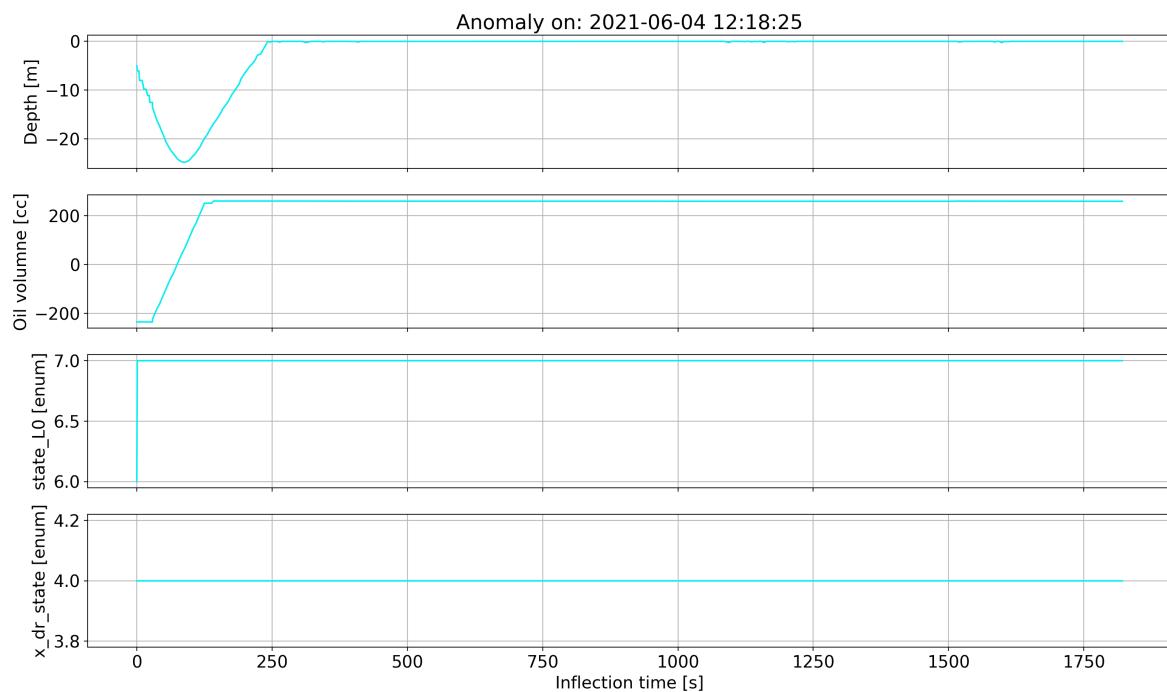


Figure 1.17: 20210604T121825 Anomaly 10

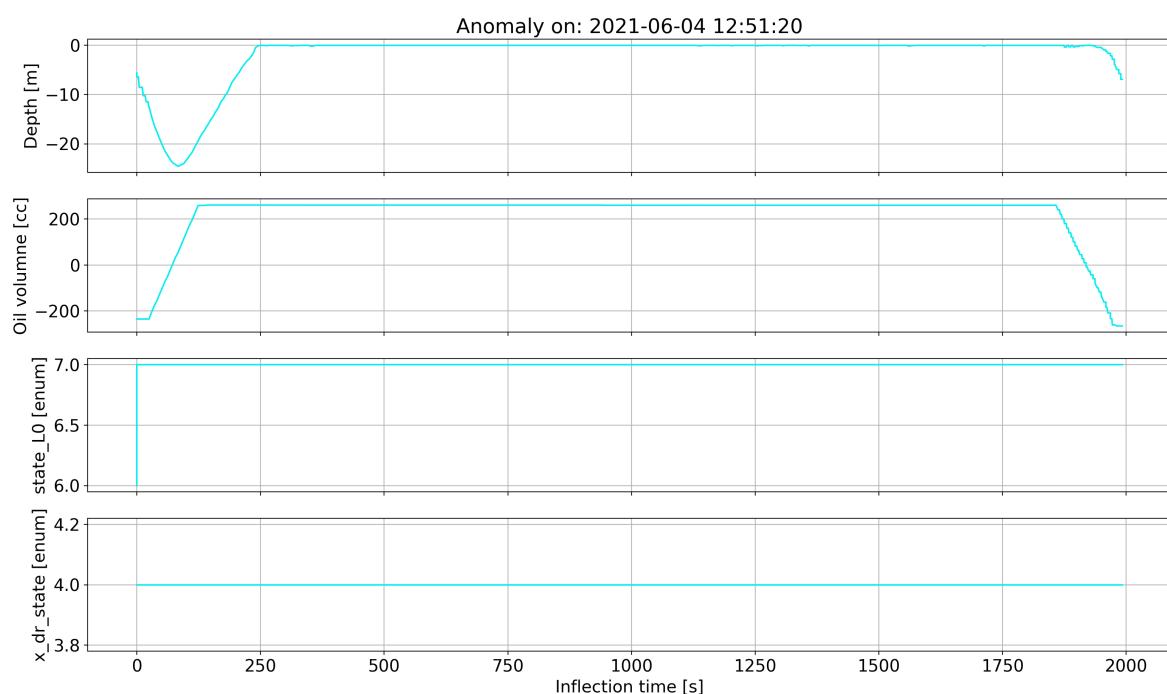


Figure 1.18: 20210604T125120 Anomaly 11

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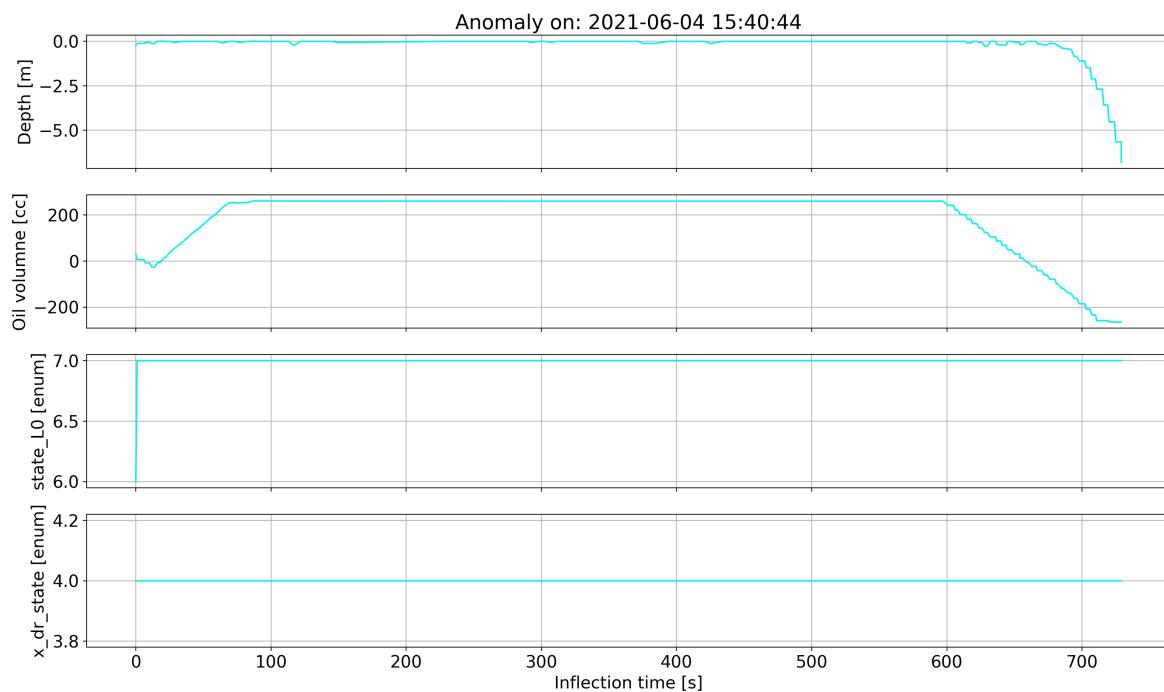


Figure 1.19: 20210604T154044 Anomaly 12

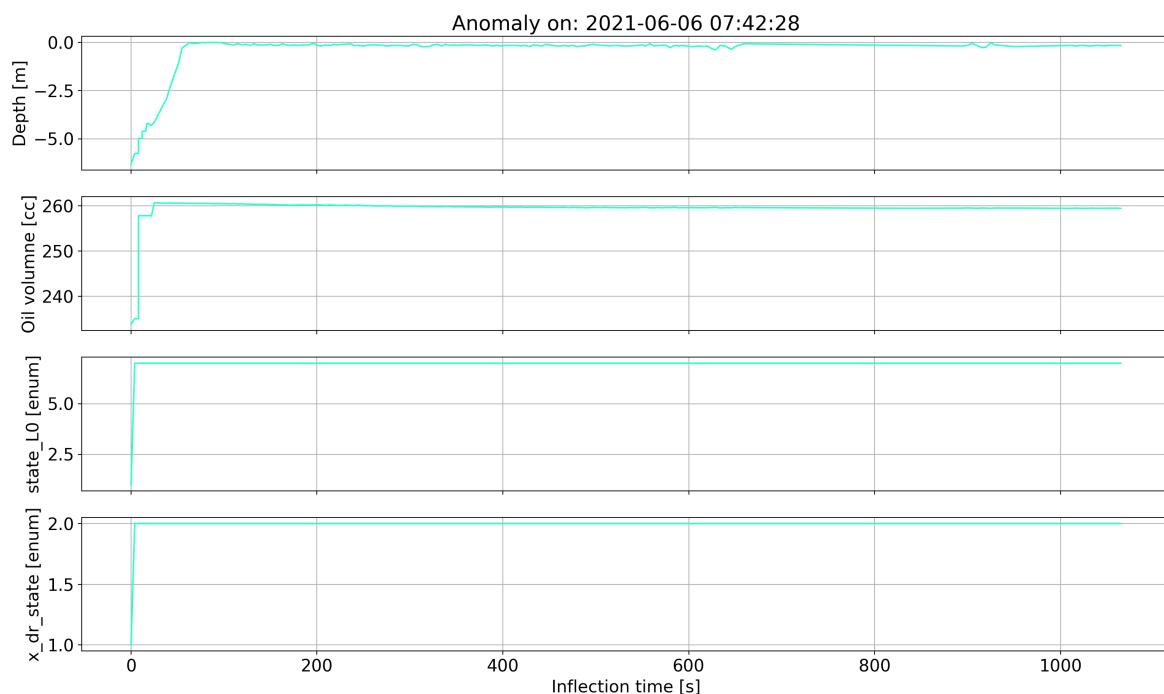


Figure 1.20: 20210606T074228 Anomaly 13

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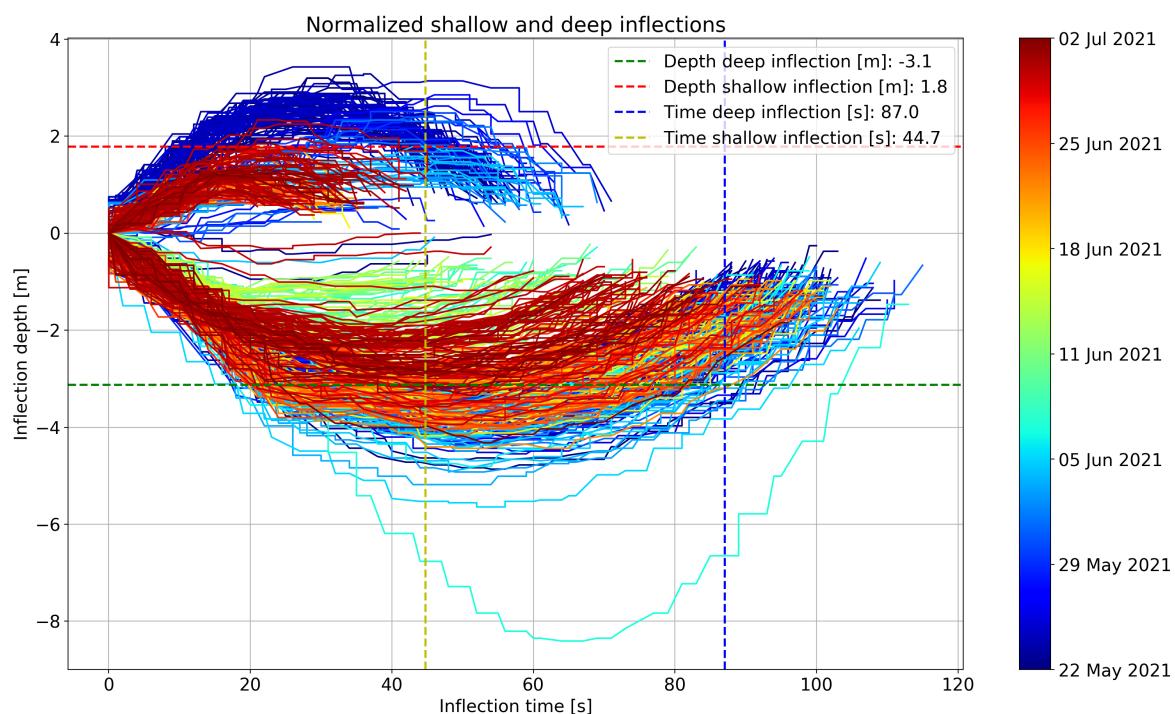


Figure 1.21: Depth inflections

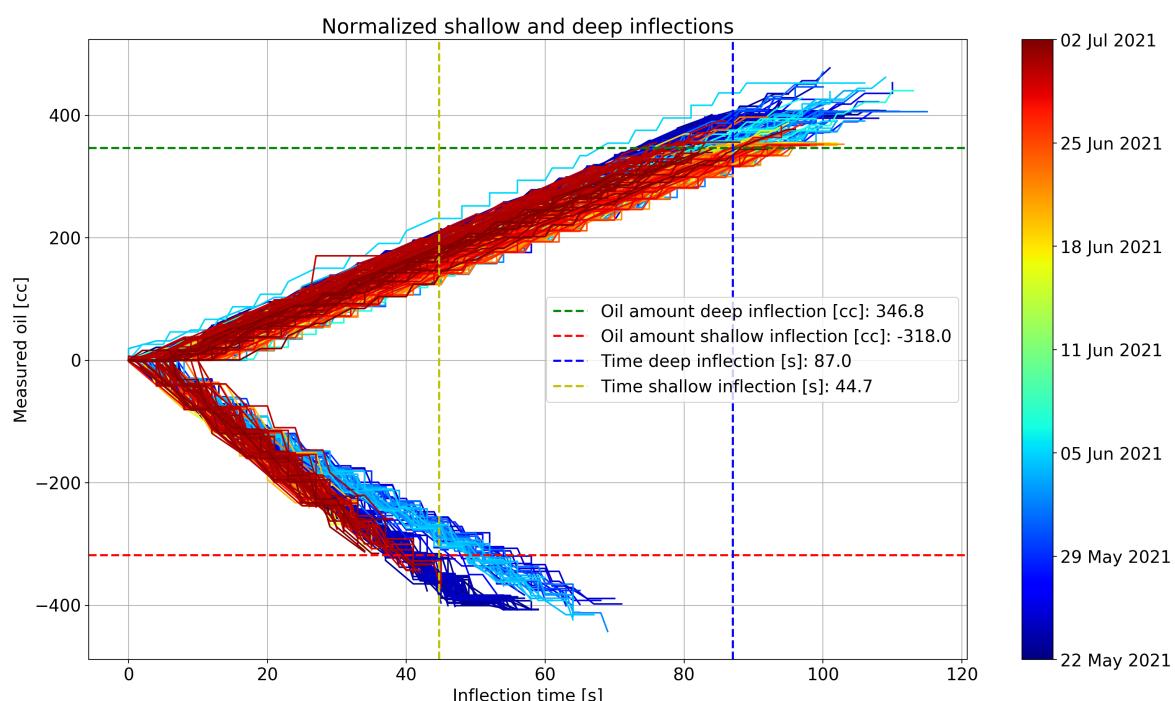


Figure 1.22: Oil inflections

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Normalized shallow and deep inflections

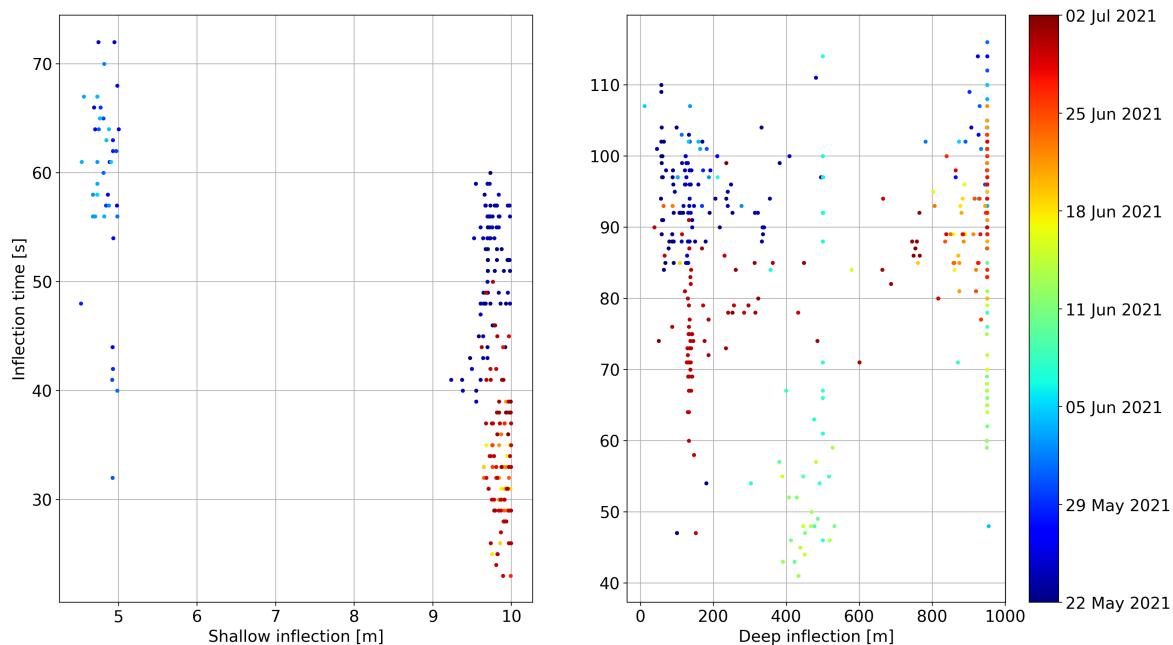


Figure 1.23: Duration inflections

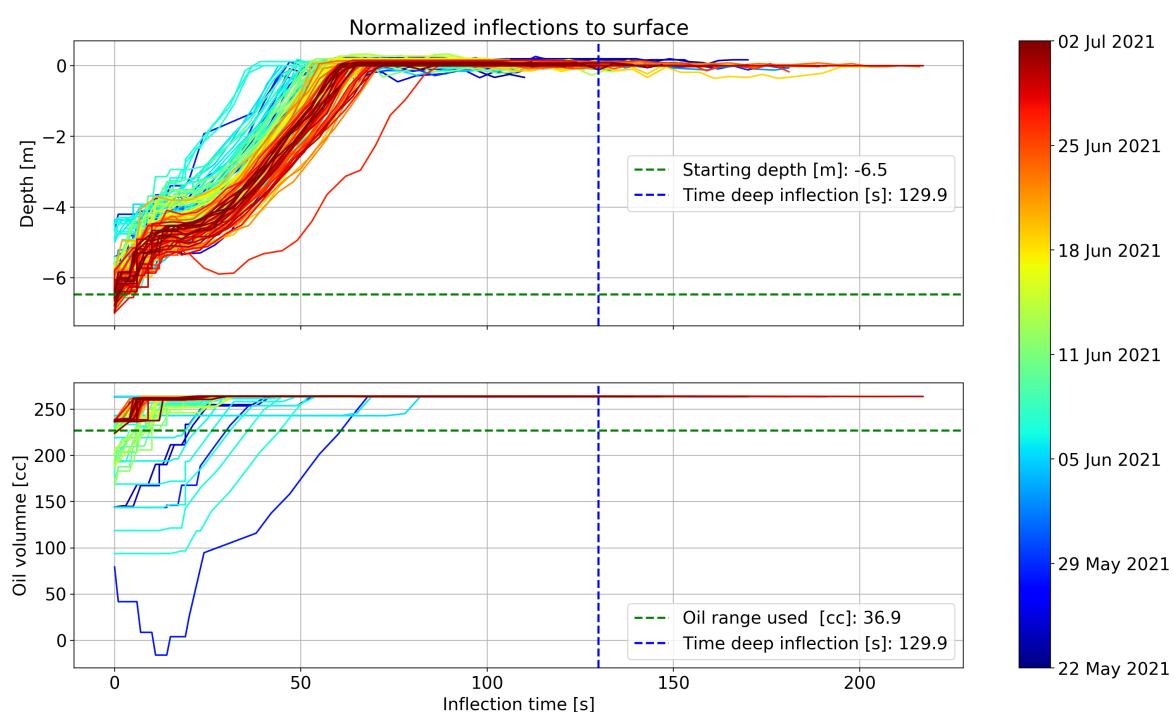


Figure 1.24: Surface Oil inflections

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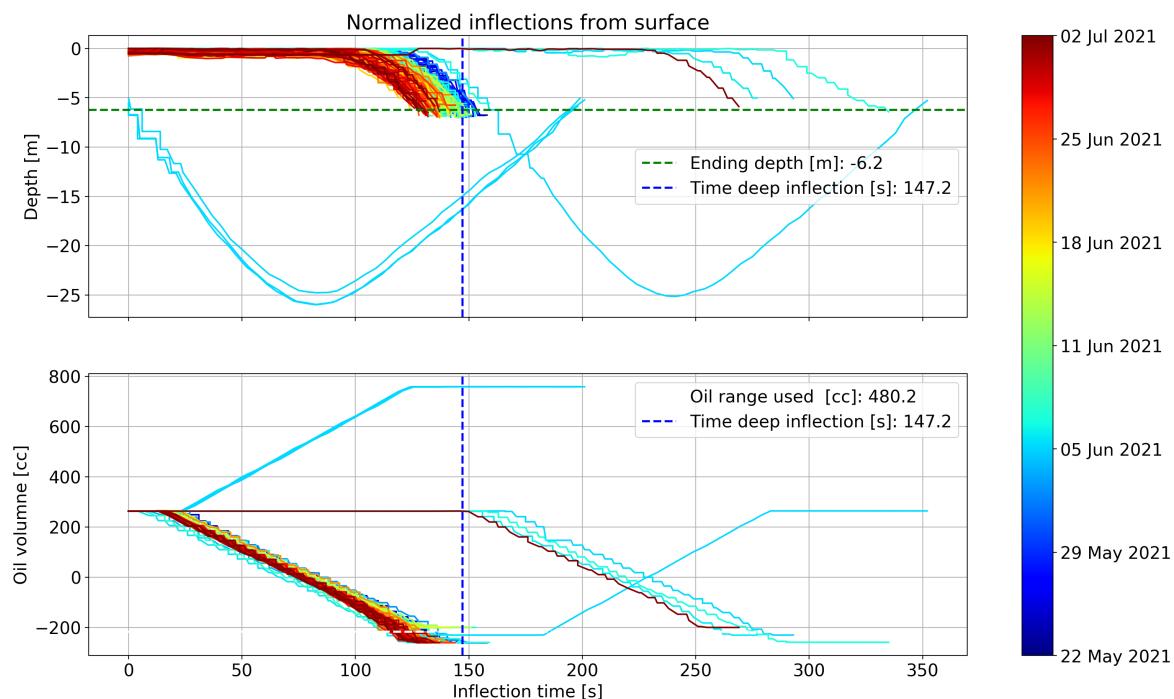


Figure 1.25: Surface Duration inflections

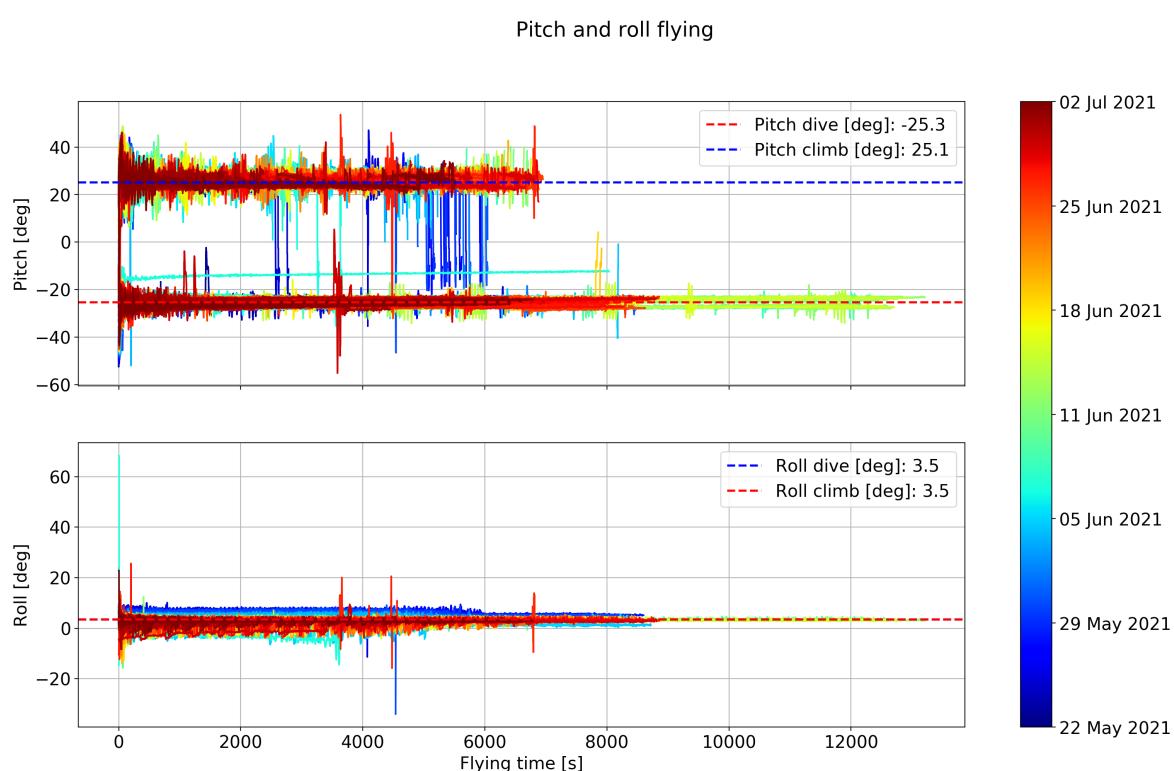


Figure 1.26: Pitch and roll, when climbing and diving

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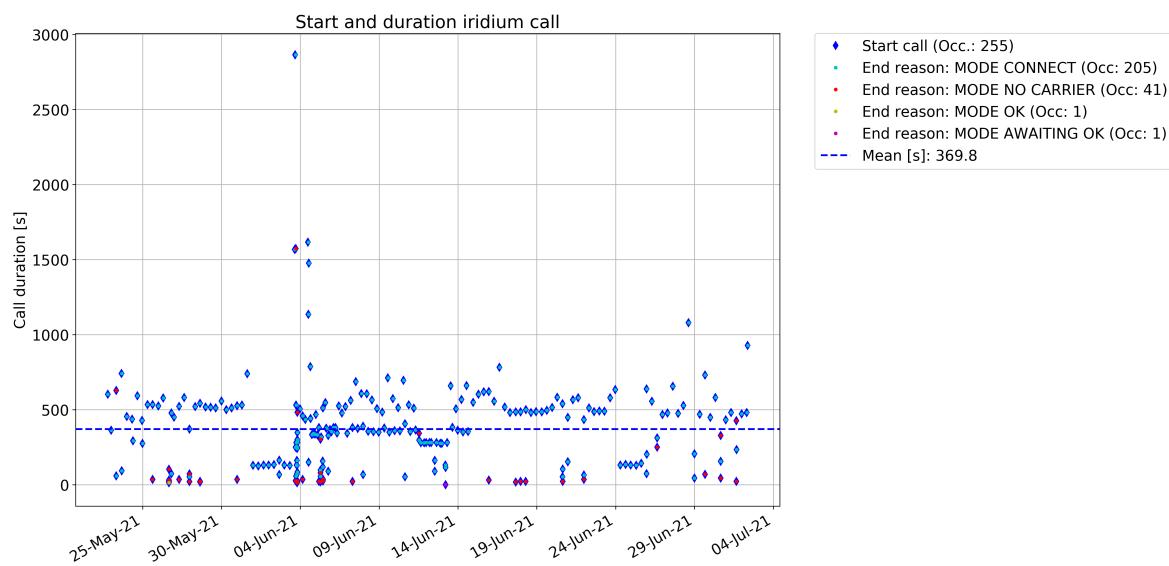


Figure 1.27: Iridium Status

## 2. Scientific Preliminary Review

### 2.1 SCI Profiles

Calibration sheets available upon request to [glider@socib.es](mailto:glider@socib.es)  
See appendix for sampling strategy details

Sensor Type	CTD	FLNTU	OXY	PAR
Serial number	CTD sn0064 p	FLNTU sn3711 for- mer2280	OXY sn1409	na
Calibration date	27/06/2019	27/6/2019	15/07/2019	na
Casts	798	500	502	na
Half Yos	821	821	821	na
Samples	620048	76812	328333	na
Intersample time [s]*	5.261	10.958	5.844	na
Sampled distance [km]	421.2	111.2	249.1	na

\* See appendix for changes during the mission

### 2.2 SCI plots

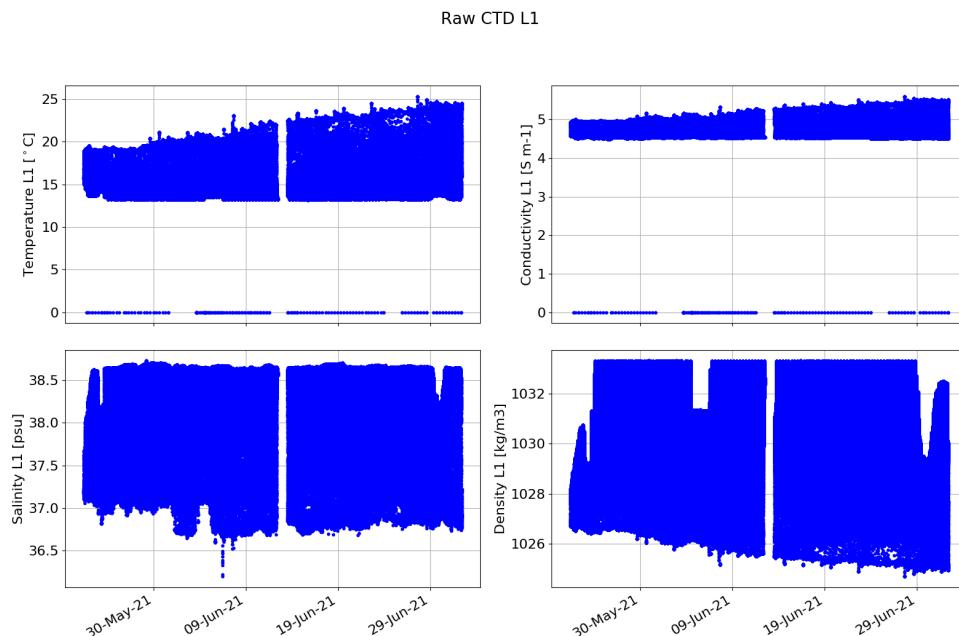


Figure 2.28: Raw CTD L1

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Raw Oxy L1

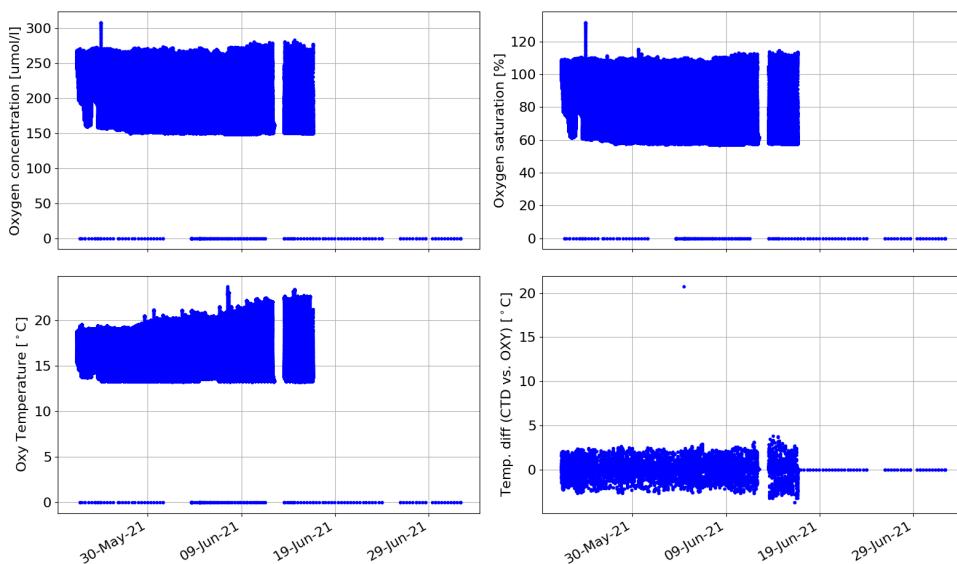


Figure 2.29: Raw OXY L1

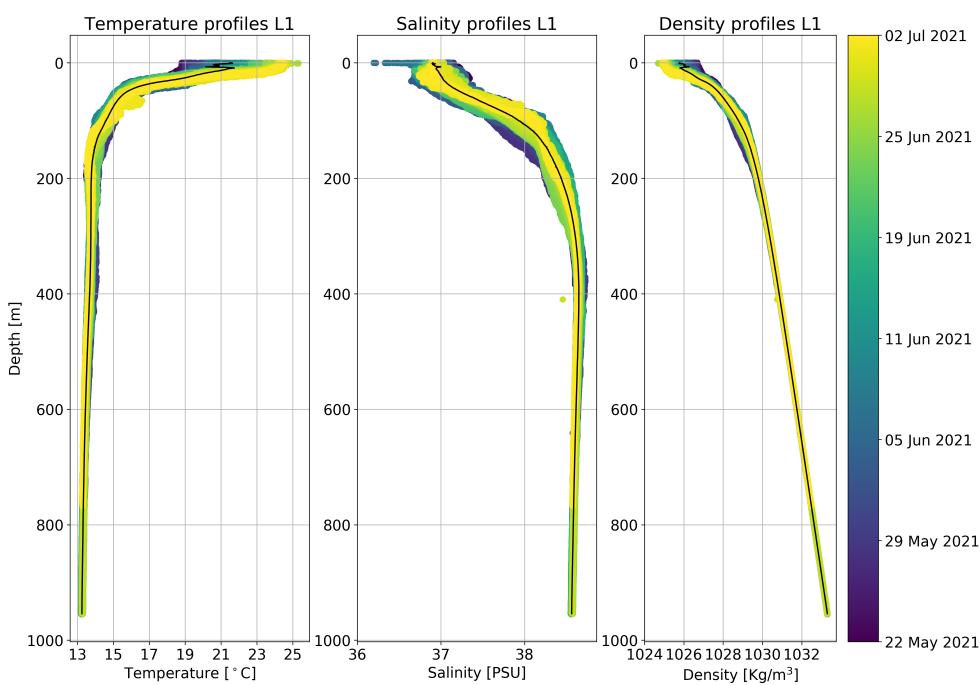


Figure 2.30: CTD profiles

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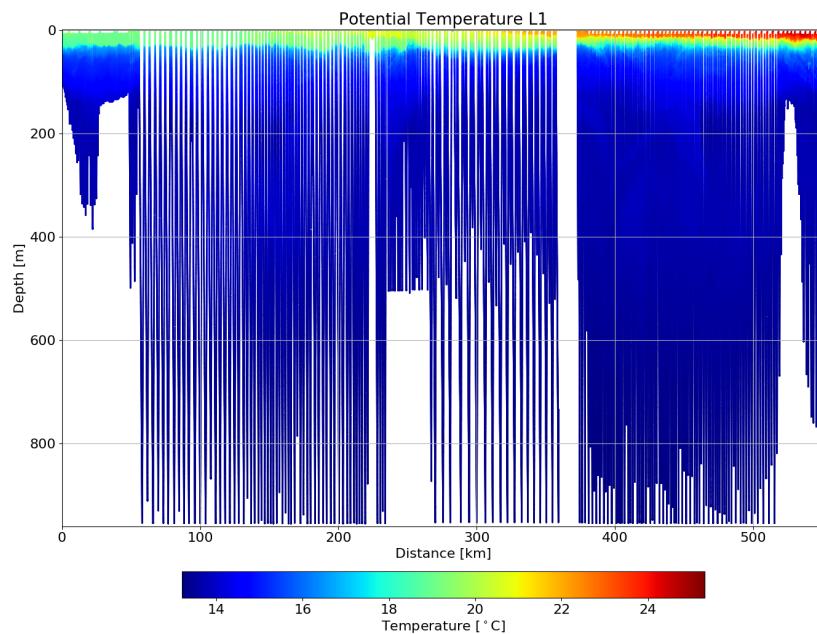


Figure 2.31: CTD temperature

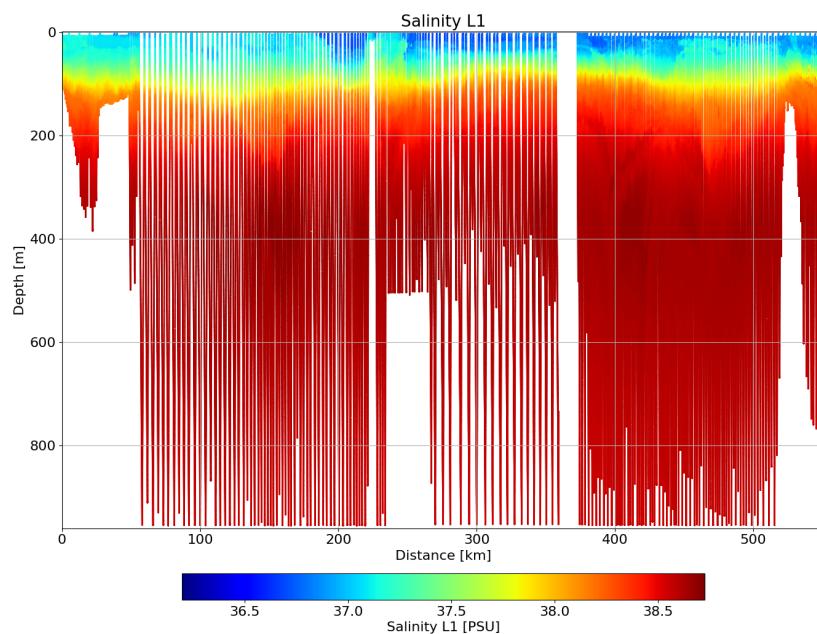


Figure 2.32: CTD Salinity

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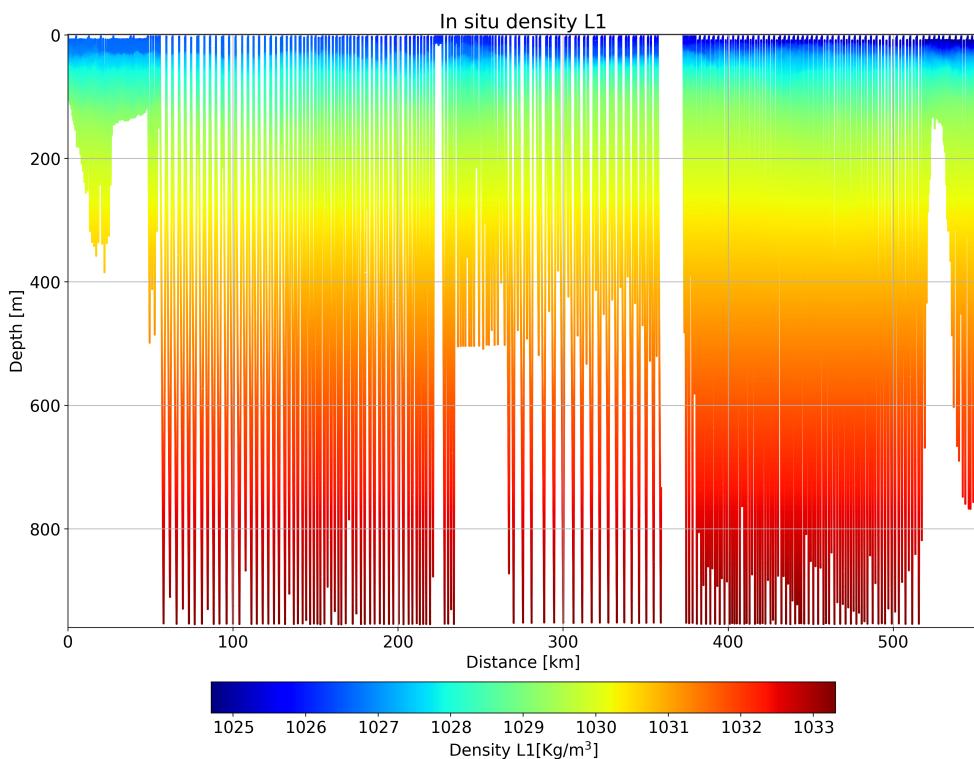


Figure 2.33: CTD Density

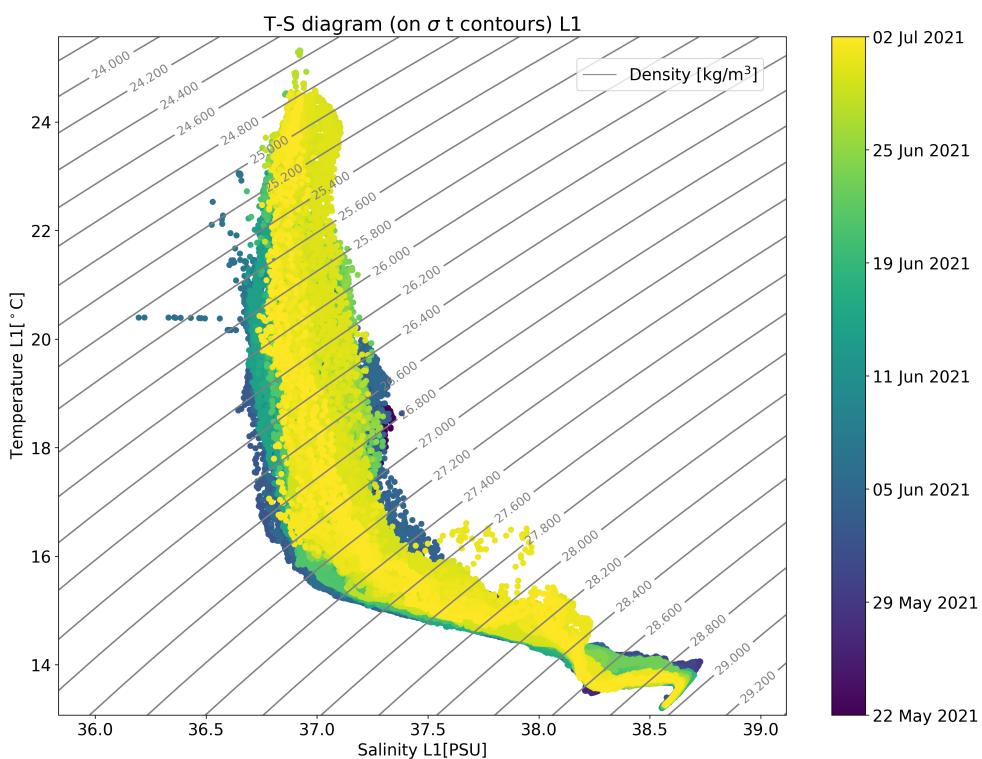


Figure 2.34: TS diagram (CTD)

GF-MR-0116-SOCIB-TNA-ABACUS21-U567

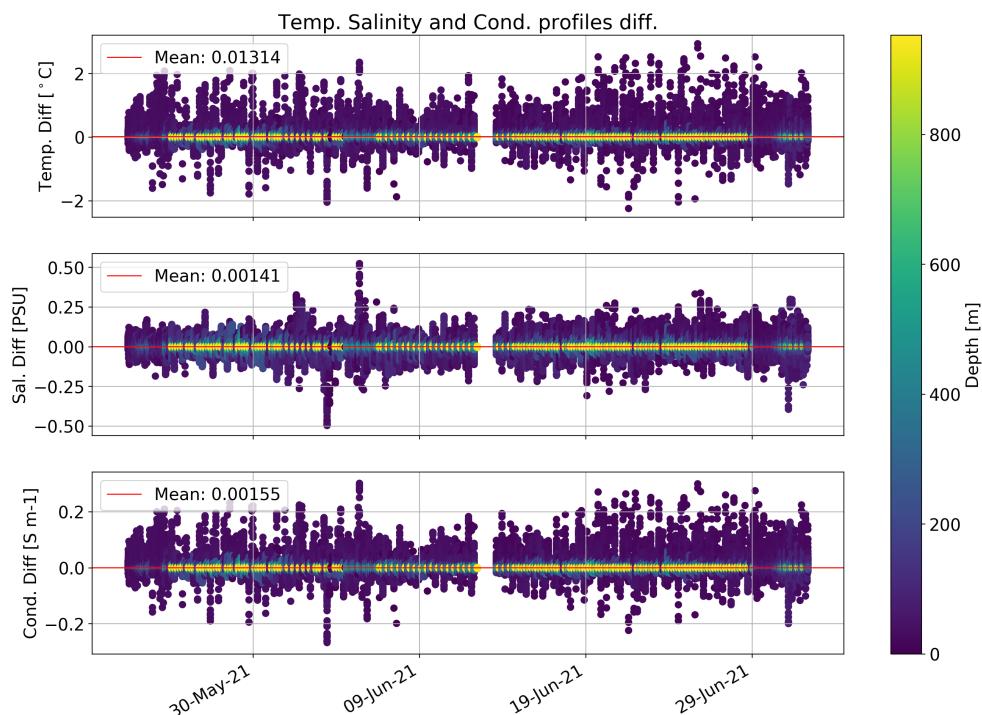


Figure 2.35: Profile consistency (CTD)



Figure 2.36: Profile consistency (CTD) zoom

GF-MR-0116-SOCIB-TNA-ABACUS21-U567

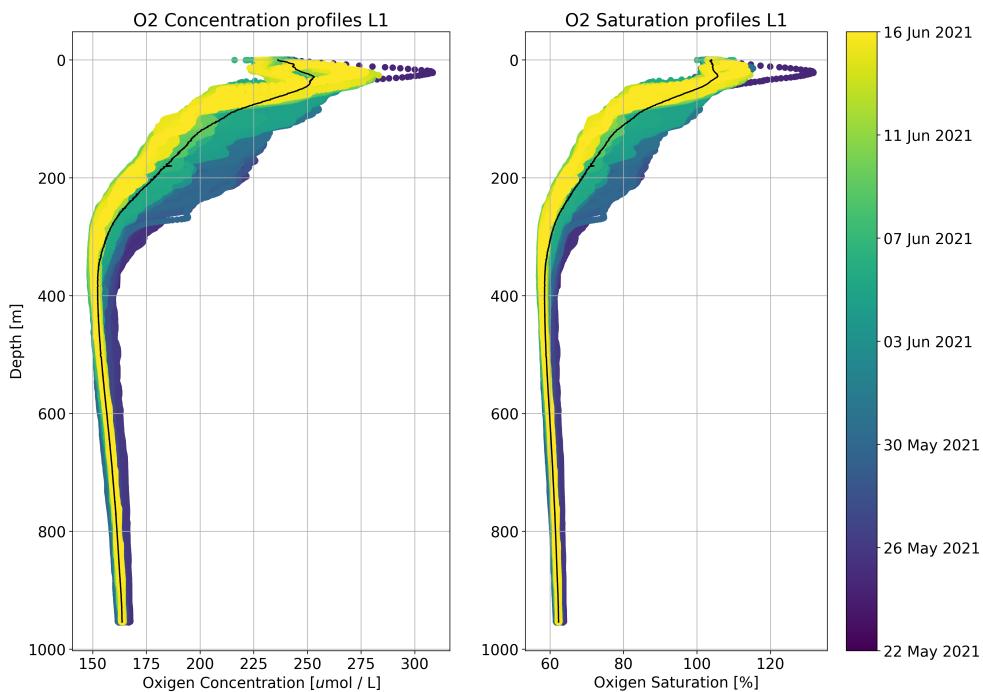


Figure 2.37: Oxygen profiles

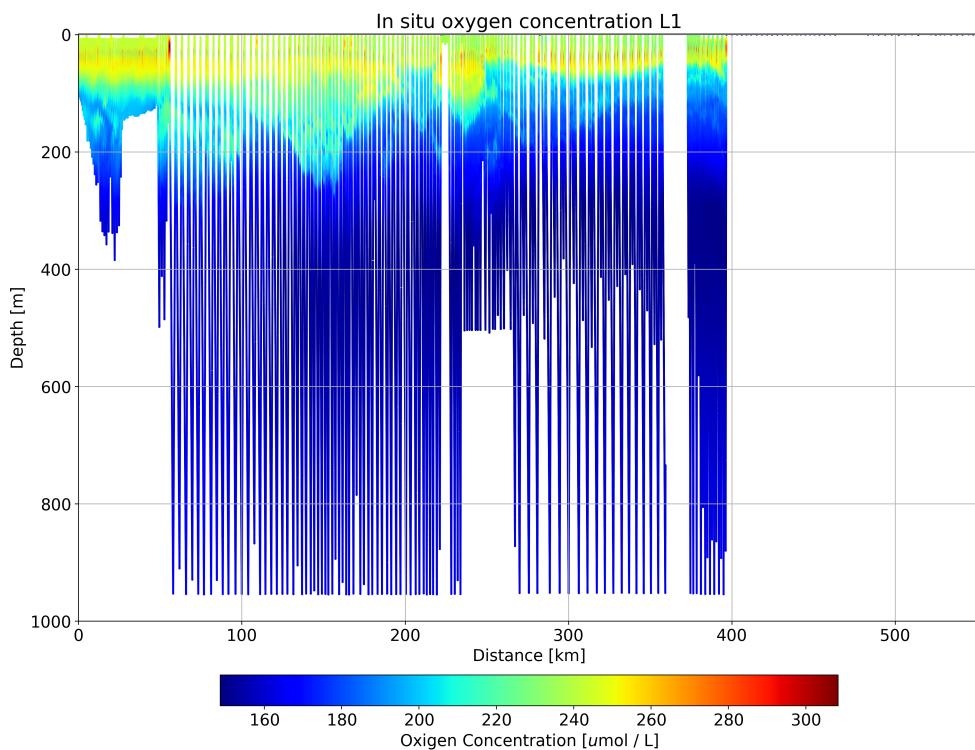


Figure 2.38: Oxygen Concentration

GF-MR-0116-SOCIB-TNA-ABACUS21-U567

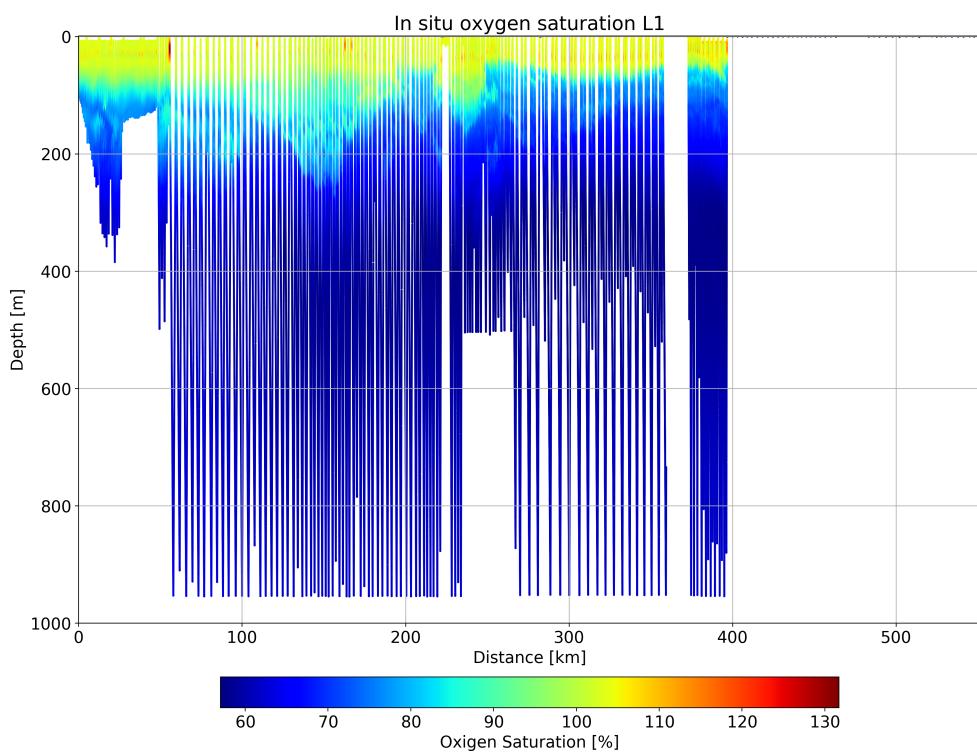


Figure 2.39: Oxygen Saturation

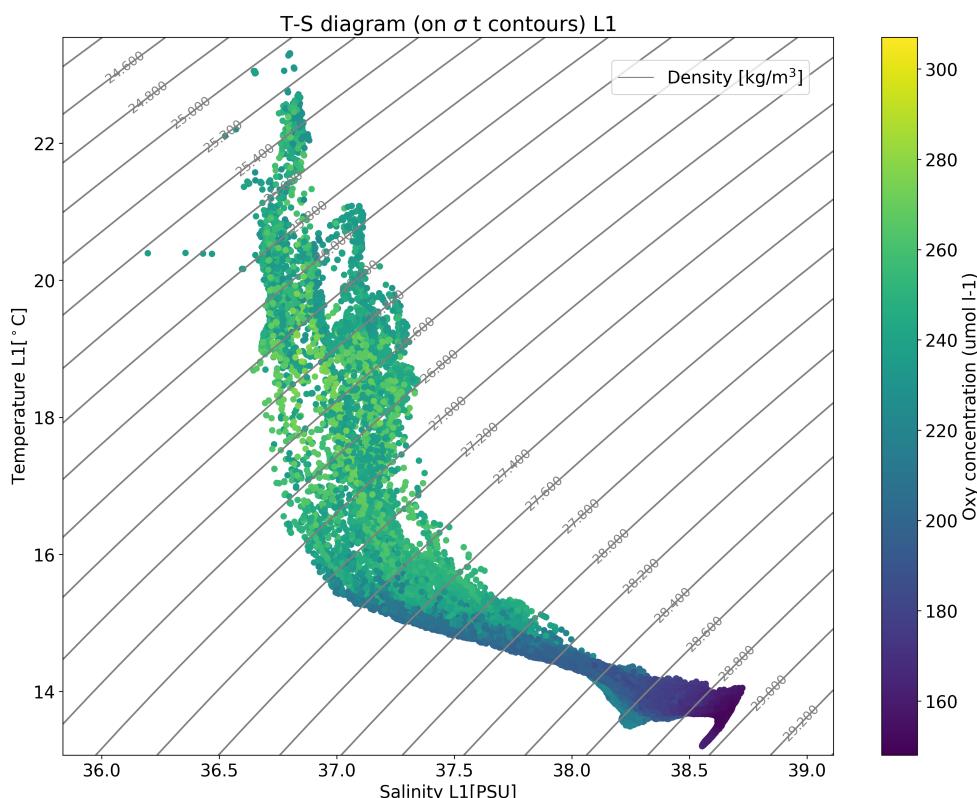


Figure 2.40: TS diagram (OXY)

GF-MR-0116-SOCIB-TNA-ABACUS21-U567

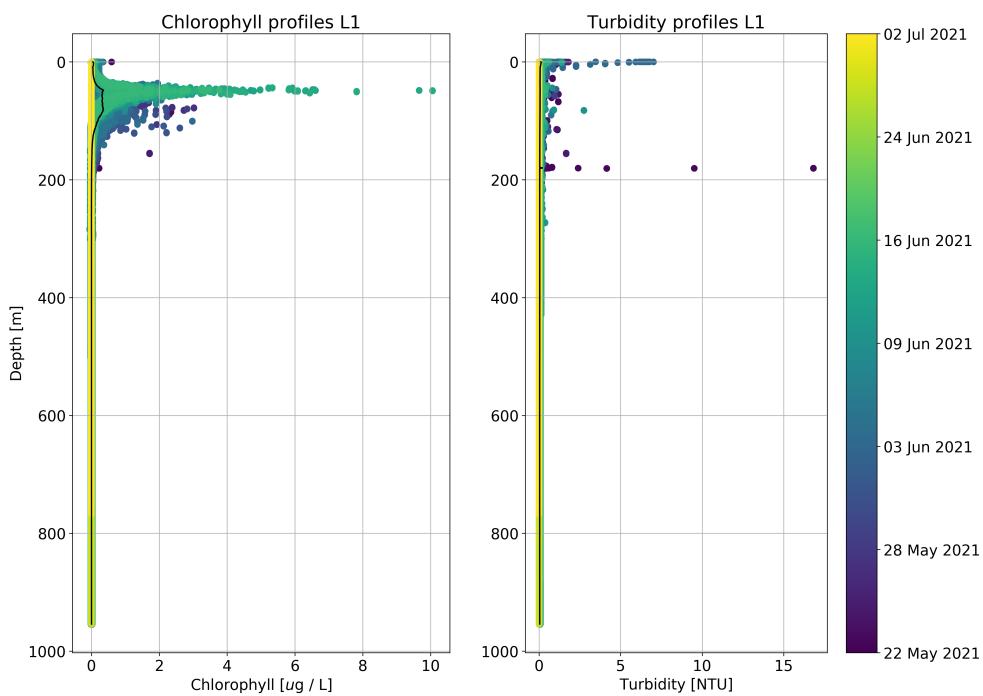


Figure 2.41: Chlorophyll-a and Turbidity profiles

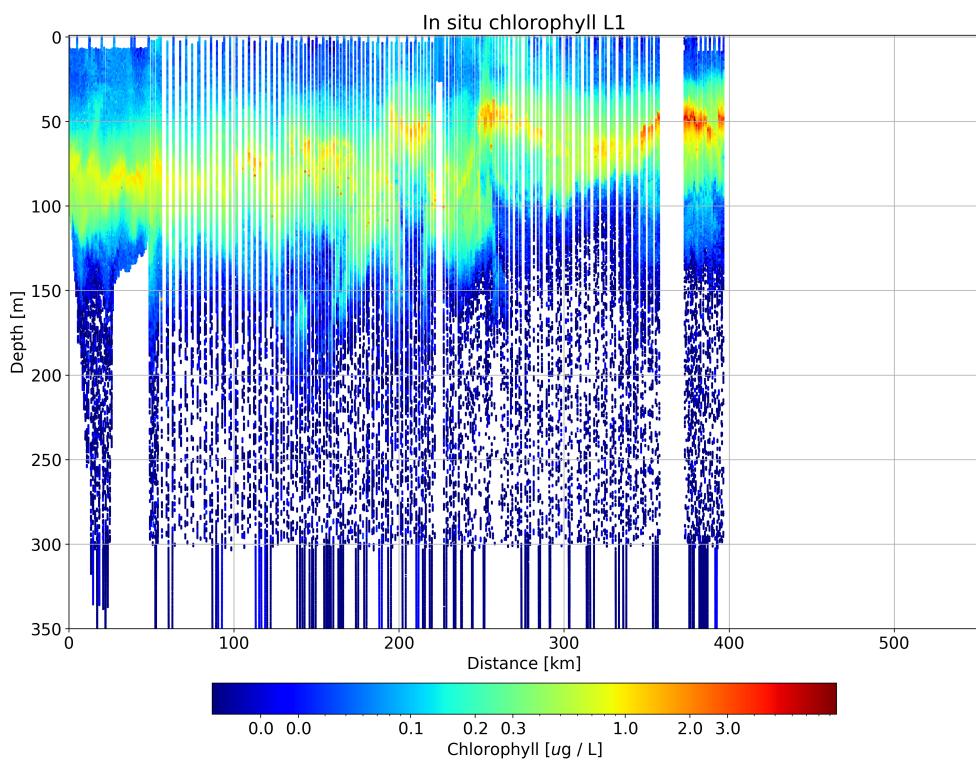


Figure 2.42: Chlorophyll-a

GF-MR-0116-SOCIB-TNA-ABACUS21-U567

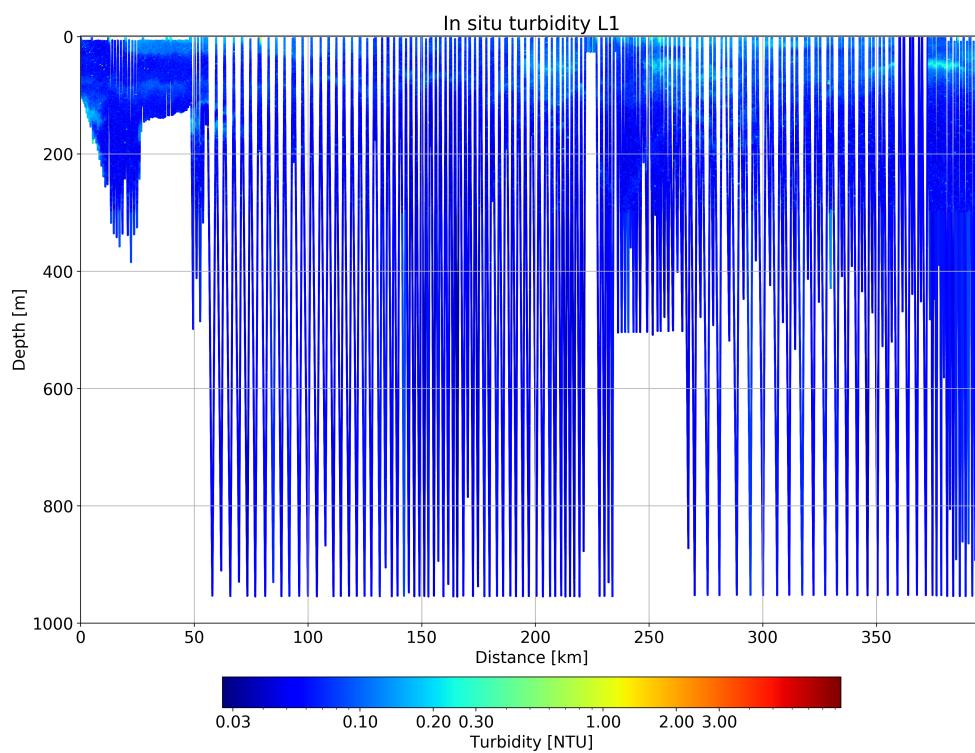


Figure 2.43: Turbidity

## Appendix

Glider behaviour.

Showing changes on behaviour 15:

- 21 May 2021 11:38:02 @ Sampling of: SAMPLE13.MA OXY5013-sn1409
- 21 May 2021 11:38:02 @ Sampling state to sample set to: Diving, climbing and hovering
- 21 May 2021 11:38:02 @ Sampling argument: intersample time set to: 4.0 s
- 21 May 2021 11:38:02 @ Sampling nth yo to sample set to: 1.0 nodim
- 21 May 2021 11:38:02 @ Sampling argument: min depth set to: -5.0 m
- 21 May 2021 11:38:02 @ Sampling argument: max depth set to: 2000.0 m
- 16 Jun 2021 15:20:56 @ Sampling argument: intersample time set to: -1.0 s

Showing changes on behaviour 14:

- 21 May 2021 11:38:02 @ Sampling of: SAMPLE14.MA FLNTU(-150m to -300m)
- 21 May 2021 11:38:03 @ Sampling state to sample set to: Diving, climbing and hovering
- 21 May 2021 11:38:03 @ Sampling argument: intersample time set to: 16.0 s
- 21 May 2021 11:38:03 @ Sampling nth yo to sample set to: 1.0 nodim
- 21 May 2021 11:38:03 @ Sampling argument: min depth set to: 150.0 m
- 21 May 2021 11:38:03 @ Sampling argument: max depth set to: 300.0 m
- 16 Jun 2021 15:20:57 @ Sampling argument: intersample time set to: -1.0 s

Showing changes on behaviour 13:

- 21 May 2021 11:38:03 @ Sampling of: SAMPLE12.MA FLNTU(surface to -150m)
- 21 May 2021 11:38:03 @ Sampling state to sample set to: Diving, climbing and hovering
- 21 May 2021 11:38:04 @ Sampling argument: intersample time set to: 8.0 s
- 21 May 2021 11:38:04 @ Sampling nth yo to sample set to: 1.0 nodim
- 21 May 2021 11:38:04 @ Sampling argument: min depth set to: -5.0 m
- 21 May 2021 11:38:04 @ Sampling argument: max depth set to: 150.0 m
- 16 Jun 2021 15:20:58 @ Sampling argument: intersample time set to: -1.0 s

Showing changes on behaviour 12:

- 21 May 2021 11:38:04 @ Sampling of: SAMPLE11.MA CTD(Profile)
- 21 May 2021 11:38:04 @ Sampling state to sample set to: Diving, climbing and hovering
- 21 May 2021 11:38:04 @ Sampling argument: intersample time set to: 4.0 s
- 21 May 2021 11:38:04 @ Sampling nth yo to sample set to: 1.0 nodim
- 21 May 2021 11:38:04 @ Sampling argument: min depth set to: -5.0 m
- 21 May 2021 11:38:04 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on behaviour behavior yo 11:

- 21 May 2021 11:38:05 @ Yoing num half cycles to do(nodim) set to: 2.0
- 21 May 2021 11:38:05 @ Yoing d target depth(m) set to: 5.0
- 21 May 2021 11:38:05 @ Yoing d target altitude(m) set to: 20.0
- 21 May 2021 11:38:05 @ Yoing d use pitch(enum) set to: 3.0
- 21 May 2021 11:38:05 @ Yoing d pitch value(X) set to: -0.453800
- 21 May 2021 11:38:05 @ Yoing c use pitch(enum) set to: 3.0
- 21 May 2021 11:38:05 @ Yoing c pitch value(X) set to: 0.453800
- 22 May 2021 09:07:55 @ Yoing d target depth(m) set to: 950.0
- 22 May 2021 09:36:34 @ Yoing num half cycles to do(nodim) set to: -1.0
- 03 Jun 2021 15:50:53 @ Yoing num half cycles to do(nodim) set to: 2.0
- 03 Jun 2021 15:50:53 @ Yoing d target depth(m) set to: 5.0
- 03 Jun 2021 19:46:39 @ Yoing d target depth(m) set to: 950.0
- 04 Jun 2021 12:14:51 @ Yoing d target depth(m) set to: 5.0
- 04 Jun 2021 13:14:25 @ Yoing d target depth(m) set to: 500.0

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- 05 Jun 2021 10:30:05 @ Yoing d use pitch(enum) set to: 1.0
- 05 Jun 2021 10:30:05 @ Yoing d pitch value(X) set to: -0.7
- 05 Jun 2021 10:30:05 @ Yoing c use pitch(enum) set to: 1.0
- 05 Jun 2021 10:30:05 @ Yoing c pitch value(X) set to: 0.7
- 05 Jun 2021 14:08:06 @ Yoing d use pitch(enum) set to: 3.0
- 05 Jun 2021 14:08:06 @ Yoing d pitch value(X) set to: -0.453800
- 05 Jun 2021 14:08:06 @ Yoing c use pitch(enum) set to: 3.0
- 05 Jun 2021 14:08:06 @ Yoing c pitch value(X) set to: 0.453800
- 06 Jun 2021 10:54:09 @ Yoing d target depth(m) set to: 950.0
- 14 Jun 2021 13:07:48 @ Yoing num half cycles to do(nodim) set to: -1.0
- 08 Jun 2021 03:12:13 @ Yoing num half cycles to do(nodim) set to: 2.0
- 08 Jun 2021 03:12:13 @ Yoing d target depth(m) set to: 50.0 [H]

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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