

SOCIB Glider Mission Summary Report

SOCIB-PARTHENOPE_ABACUS_20210522_sdeep04_GFMR0116

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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	7
3	Scientific Preliminary Review	21
3.1	SCI Profiles	21
3.2	SCI plots	21
4	Appendix	32
4.1	Glider behaviour	32
4.2	Installed devices (from autoexec.mi)	33
4.3	Possible Iridium states	34
	List of figures	35

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.

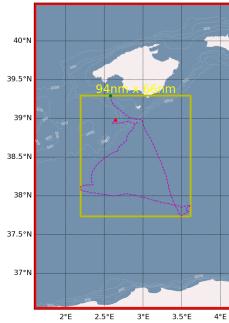


Figure 1.1: Map providing general overview of the Survey Area

1.1 Summary

Mission name	SOCIB-PARTHENOPE_ABACUS_20210522_sdeep04_GFMR0116
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	1036
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)
Battery specification	20210428 SN0050/ Saft lithium (329Ah)
Survey area	Algerian Channel
Objetive	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>THIS MISSION FAILED</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"> ▪ Event 1: The digifin was bend during the mission, on June 3rd. The rest of the mission was just for recover the glider, an animal collision bend the digifin. It make maneuvres dangerous and make the mission fails. See 2.1 and 2.2 figures ▪ Event 2: Acoustic data collected, Sperm whales and others species were detected ▪ Event 3: Altimeter malfunction detected on 31/may/2021. It was decided to proceed because the bathymetry was deep enough most of the time ▪ Event 4: The observed gap on the SCI data is due to an abort
SCI events	<ul style="list-style-type: none"> ▪ Event 1: Several zero values in all the sensors during the mission ▪ Event 2: CHL and TURB indicated that a subduction event take place between 3rd of June to 7 of June ▪ 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 (<36.8psu) in the upper 50m. Figure 3.7

1.2 Metadata

Principal Investigator	Prof. Joaquim Tintoré jtintore@socib.es (+34 971439821)
Institute	SOCIB
Project Affiliation (web-site)	http://www.socib.eu/
Campaign access type	External
Partnership / Participation	<ul style="list-style-type: none">▪ SOCIB▪ CNR - Parthenope
Data Retrieval	<ul style="list-style-type: none">▪ RT: sub-set via satellite link at each surface maneuver▪ DM: full/direct memory card backup after glider disassembly during Conclusion mission-phase
Data Available From*	http://thredds.socib.es/thredds/catalog/auv/glider/catalog.html
DOI (if available)	https://doi.org/10.25704/b200-3vf5
Further Details	glider@socib.es

*Available netCDF data product:

- L0: https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb_sdeep004/L0/2021/dep0021_sdeep04_scb-sdeep004_L0_2021-05-22_data_dt.nc
- L1: https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb_sdeep004/L1/2021/dep0021_sdeep04_scb-sdeep004_L1_2021-05-22_data_dt.nc
- L2: https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb_sdeep004/L2/2021/dep0021_sdeep04_scb-sdeep004_L2_2021-05-22_data_dt.nc

2 Engineering Review

2.1 Preparation

- Premission: ok
- Hardware: ok
- Batteries: ok
- Comms: ok
- Science: ok
- Ballasting: ok
- Sealing: ok
- Fileset: ok
- CEM: na
- Harbor check: ok
- Recovery: ok
- Conclusion: ok

2.2 Mission Survey

- Deployment:
 - Vessel: Socib I
 - Personnel: 1 ETD + 1 GF (field team)+ 1 GF (piloting)
 - Location: Cala Figuera
- Navigation: 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
- Recovery:
 - Vessel: Socib I
 - Personnel: 1 ETD + 1 GF (field team)+ 1 GF (piloting)
 - Location: Cala Figuera

2.3 NAV plots



Figure 2.1: Hull Scratches

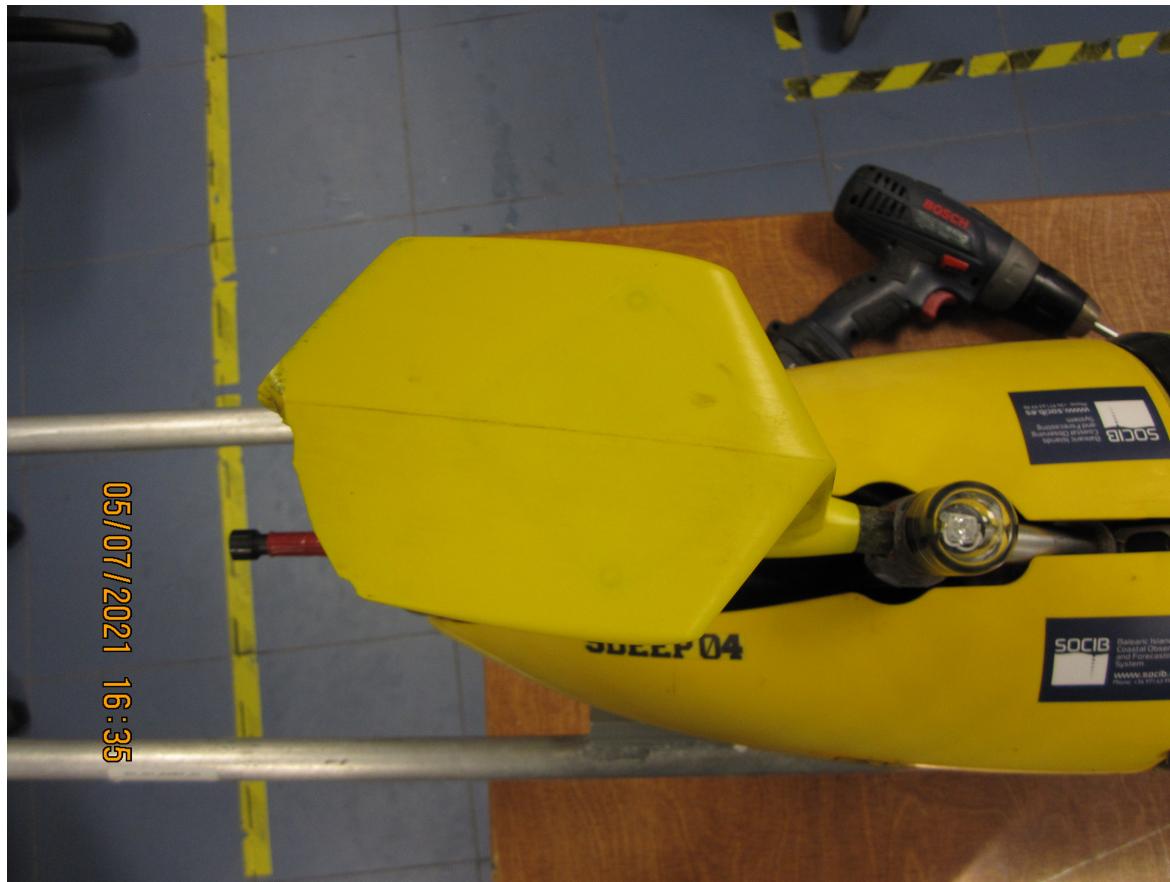


Figure 2.2: Bend digifin

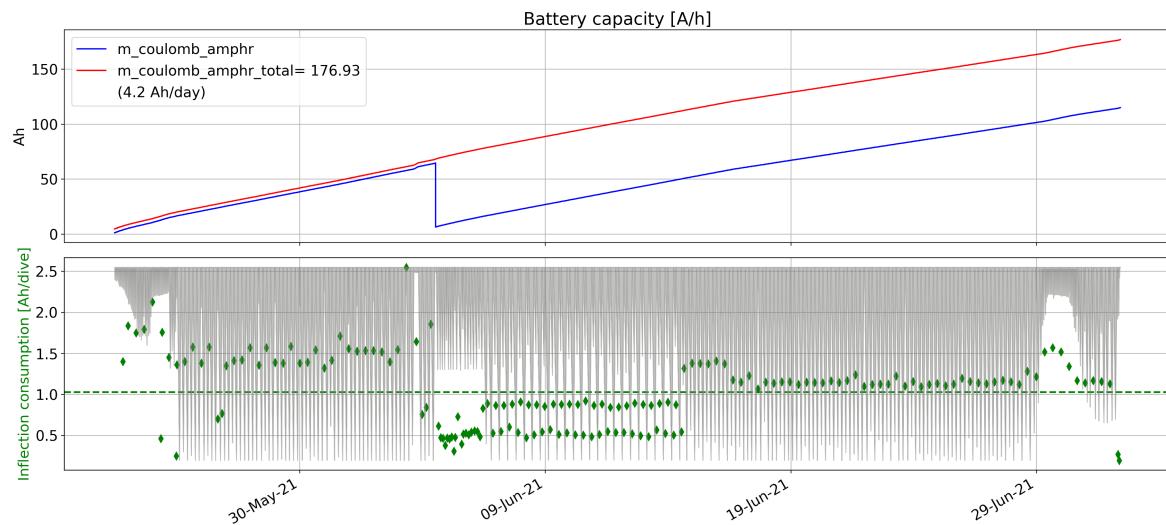


Figure 2.3: Battery capacity

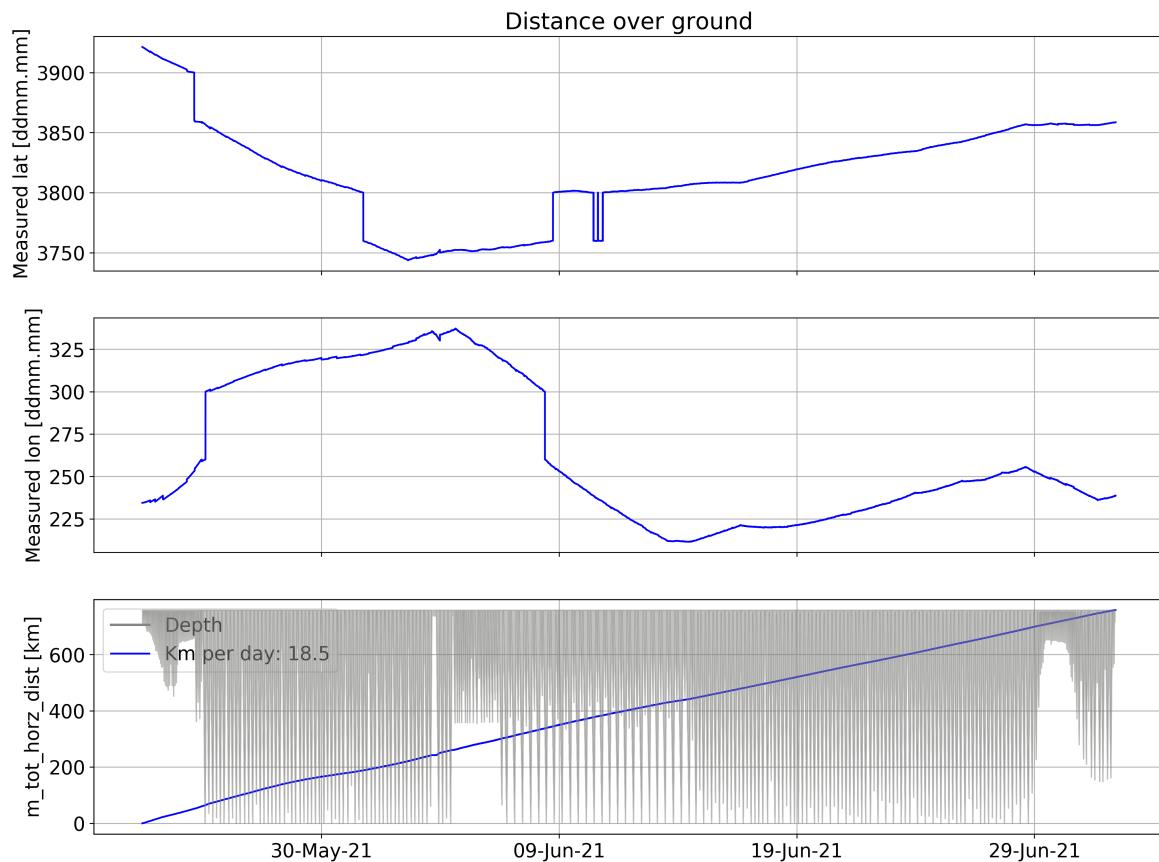


Figure 2.4: Distance over ground

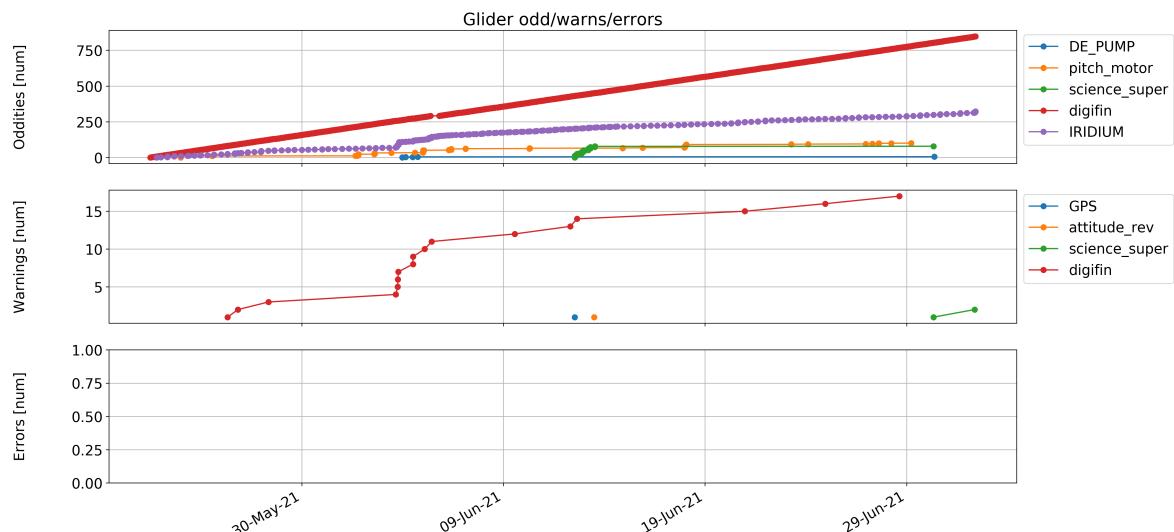


Figure 2.5: Glider Odd Warn and Err

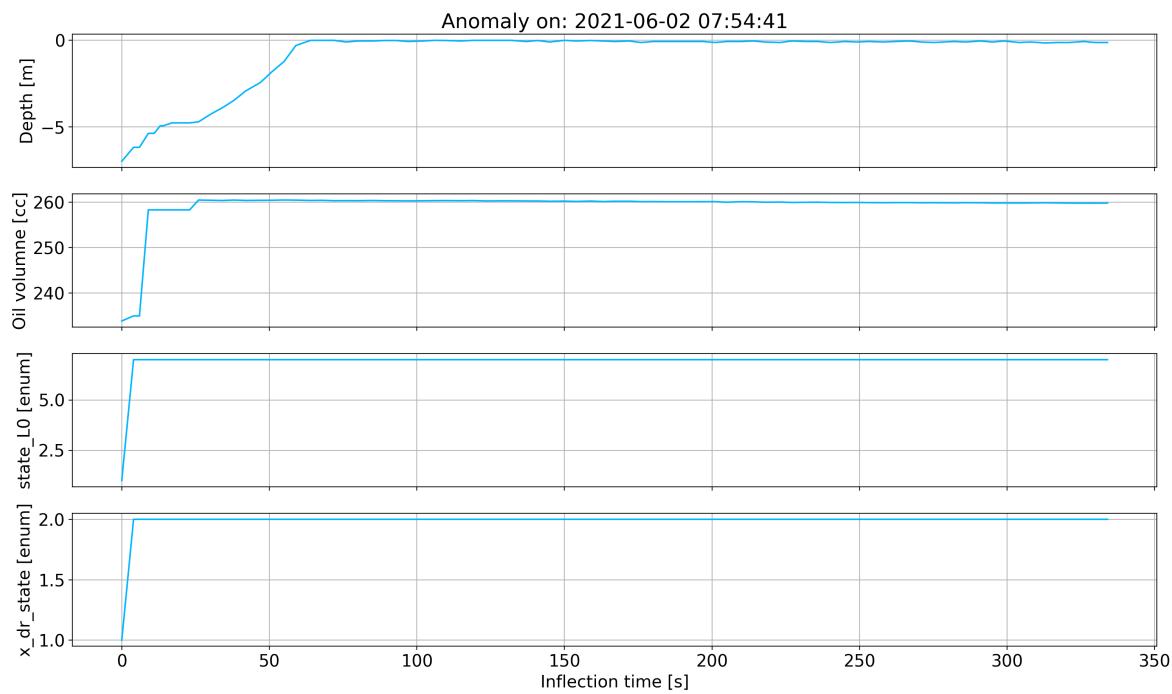


Figure 2.6: 20210602T075441 Anomaly 1

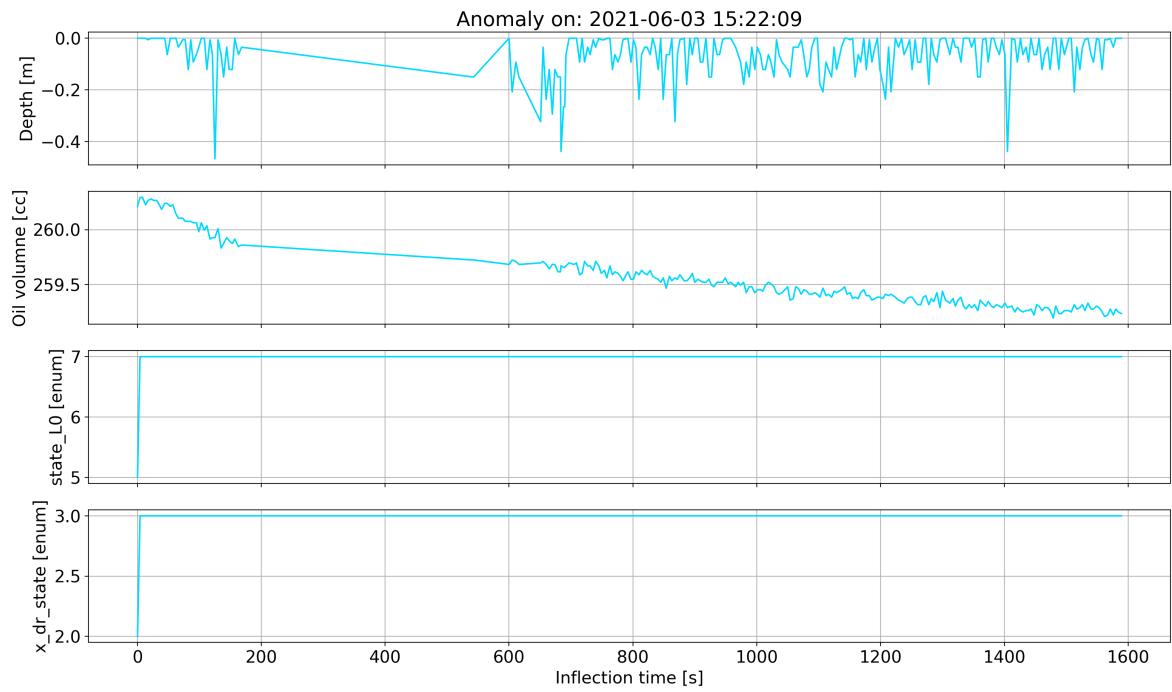


Figure 2.7: 20210603T152209 Anomaly 2

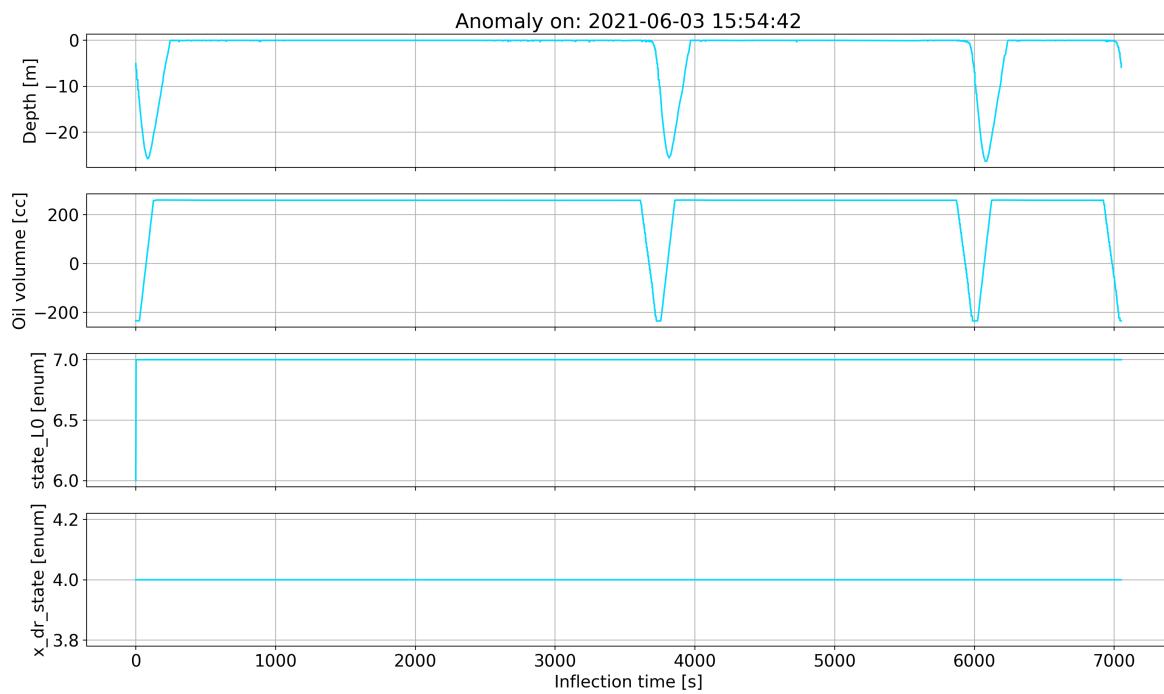


Figure 2.8: 20210603T155442 Anomaly 3

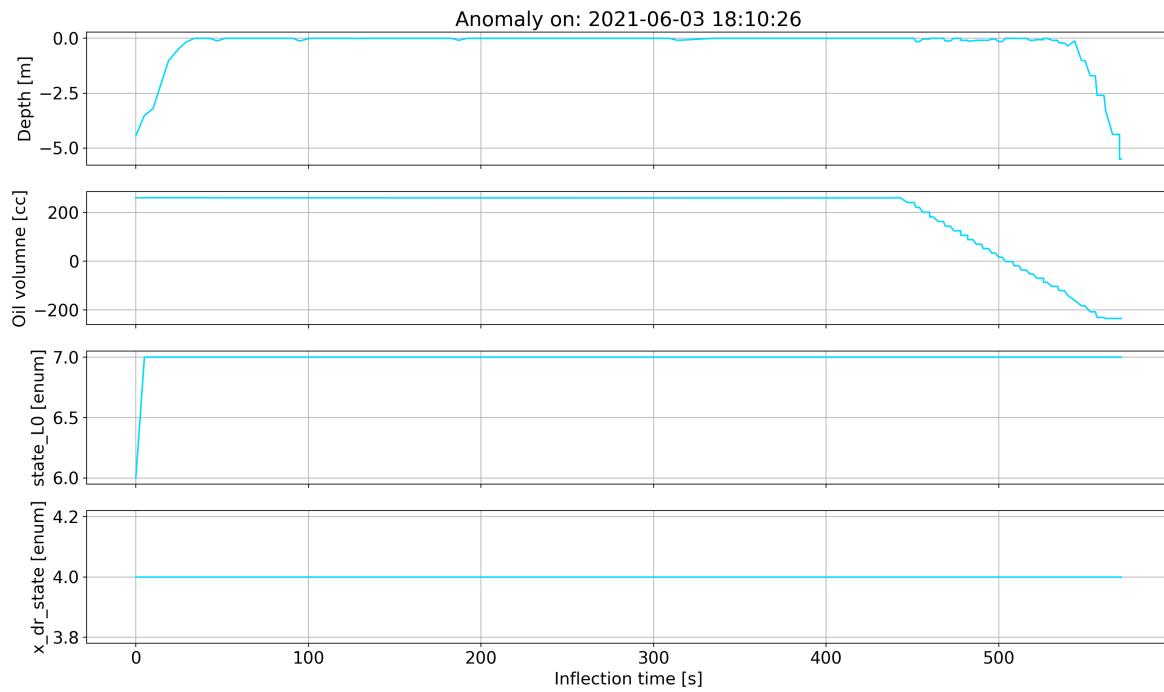


Figure 2.9: 20210603T181026 Anomaly 4

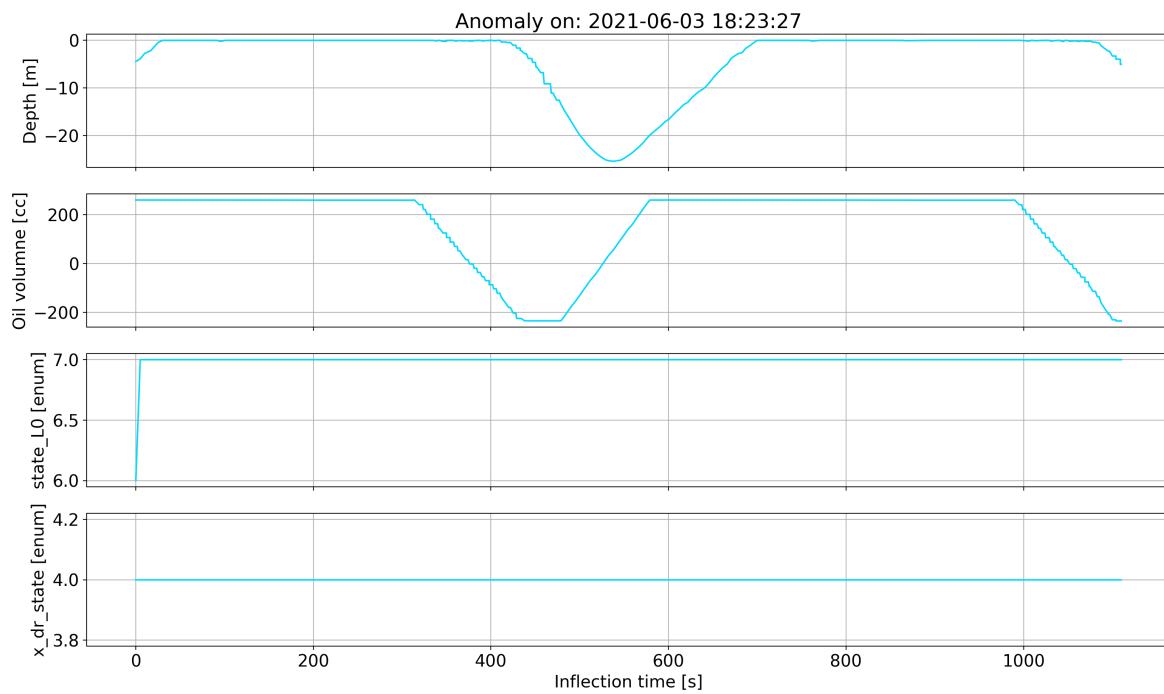


Figure 2.10: 20210603T182327 Anomaly 5

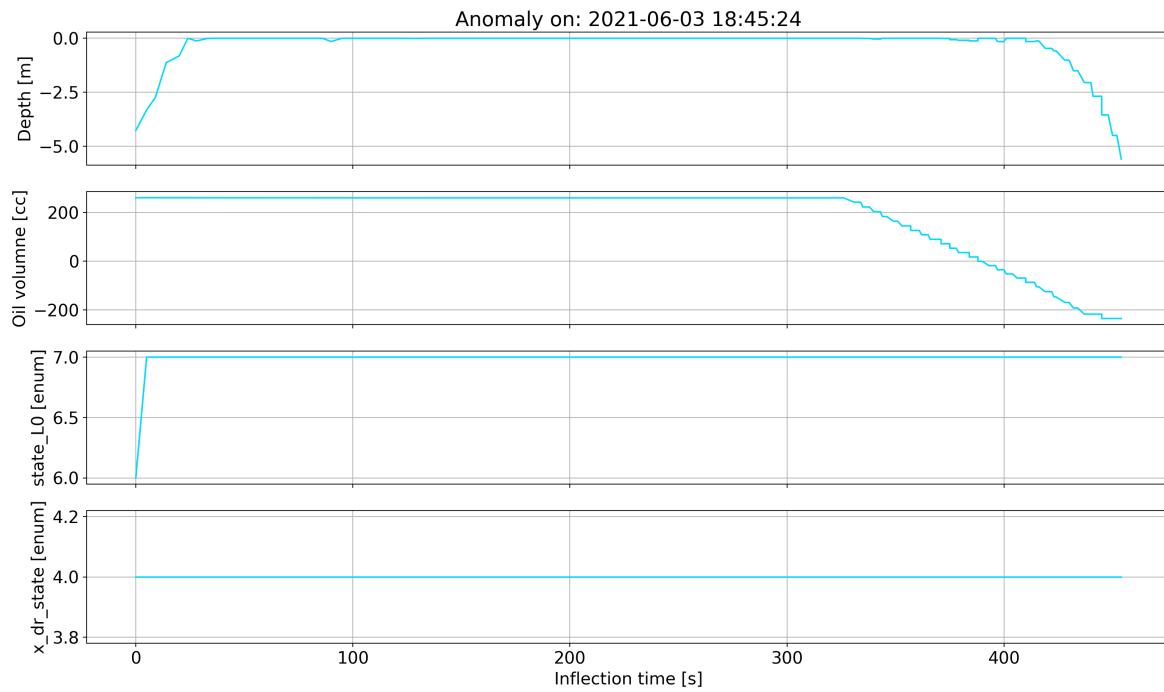


Figure 2.11: 20210603T184524 Anomaly 6

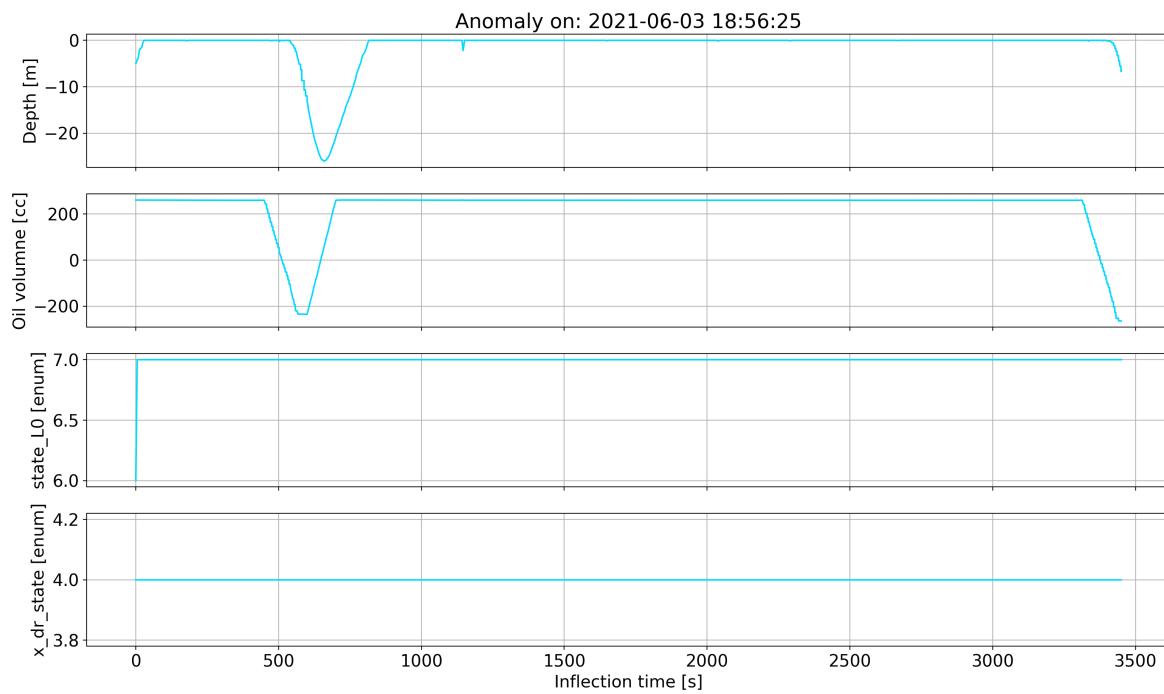


Figure 2.12: 20210603T185625 Anomaly 7

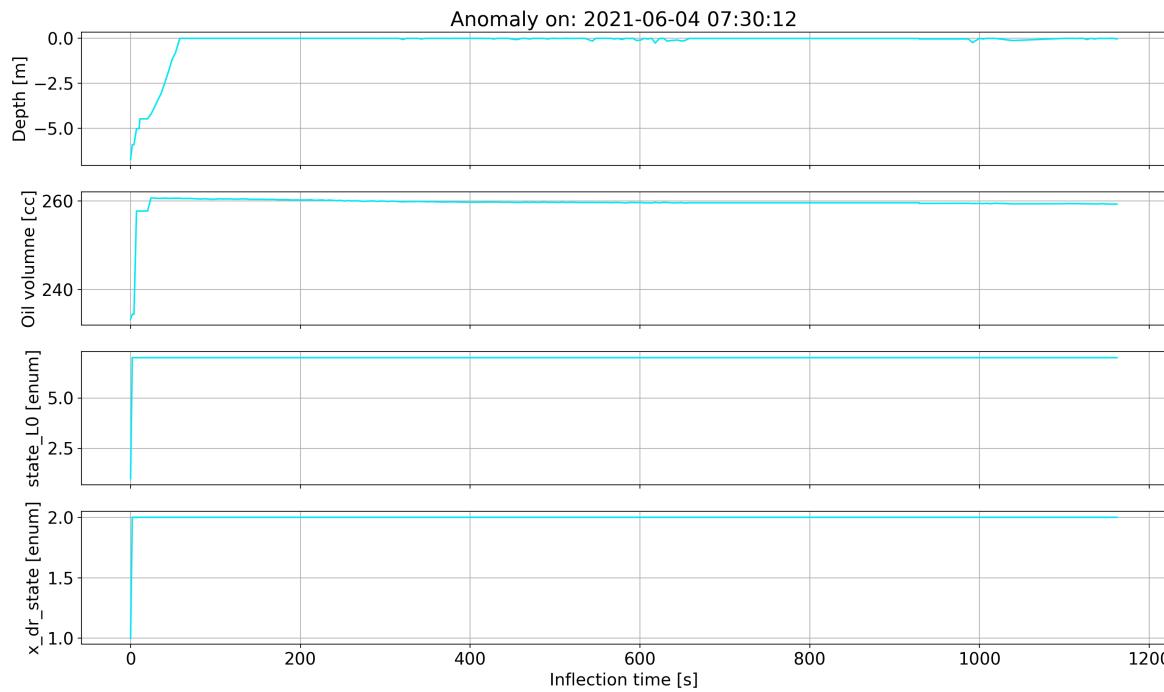


Figure 2.13: 20210604T073012 Anomaly 8

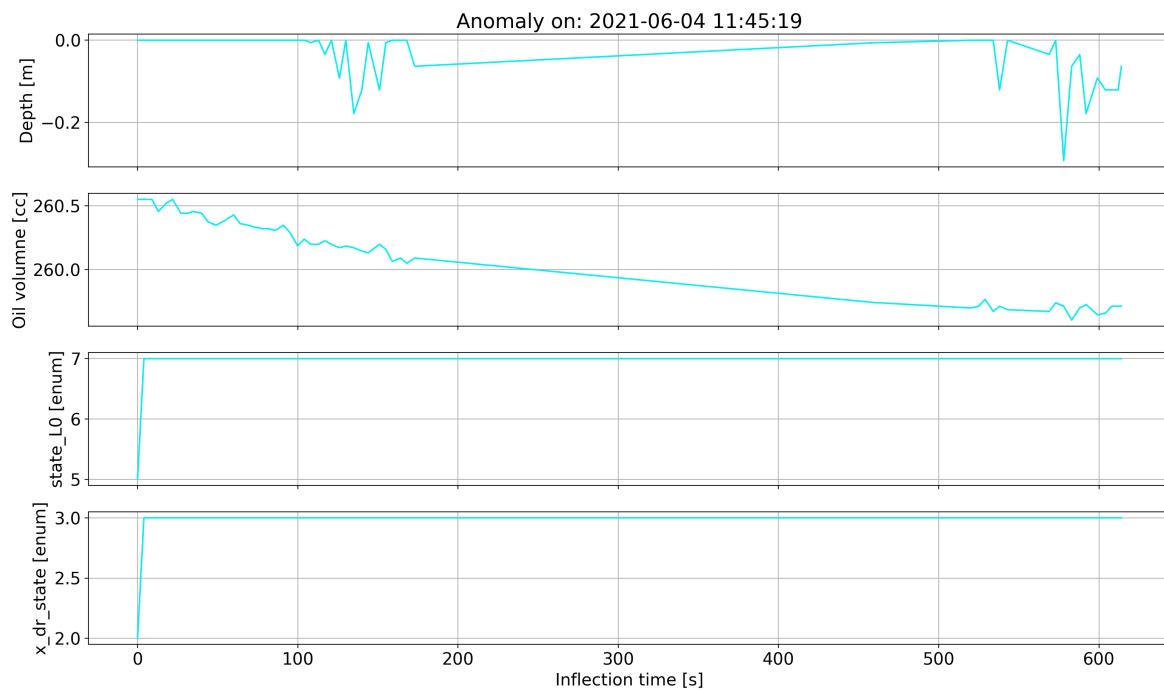


Figure 2.14: 20210604T114519 Anomaly 9

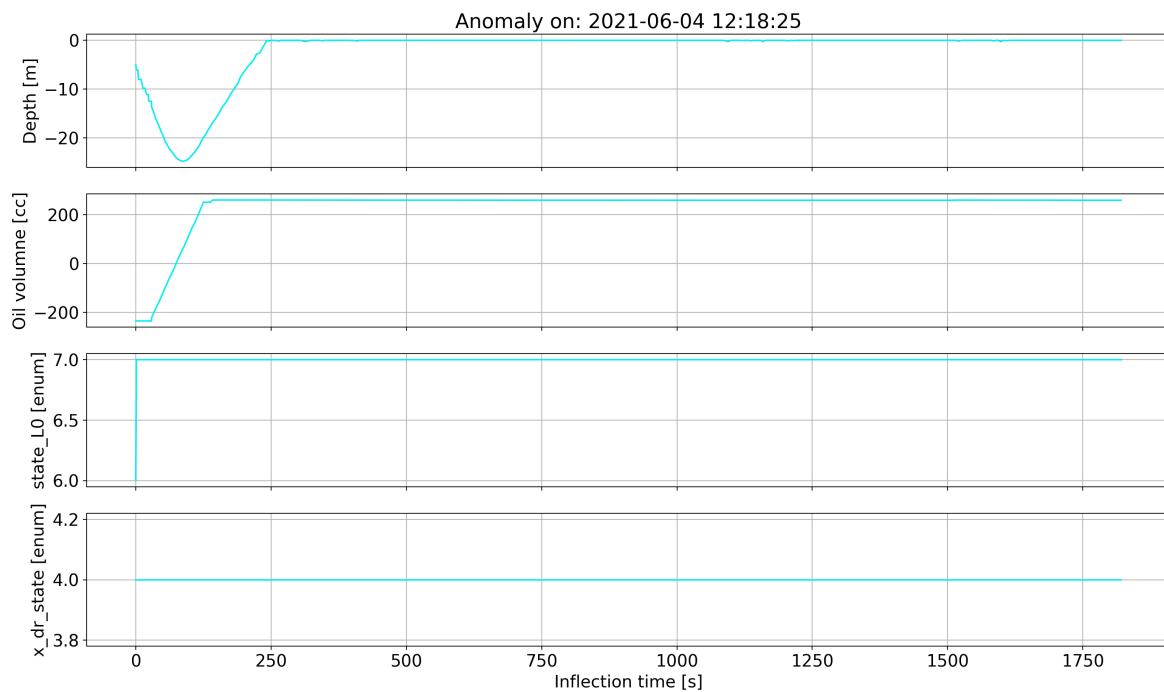


Figure 2.15: 20210604T121825 Anomaly 10

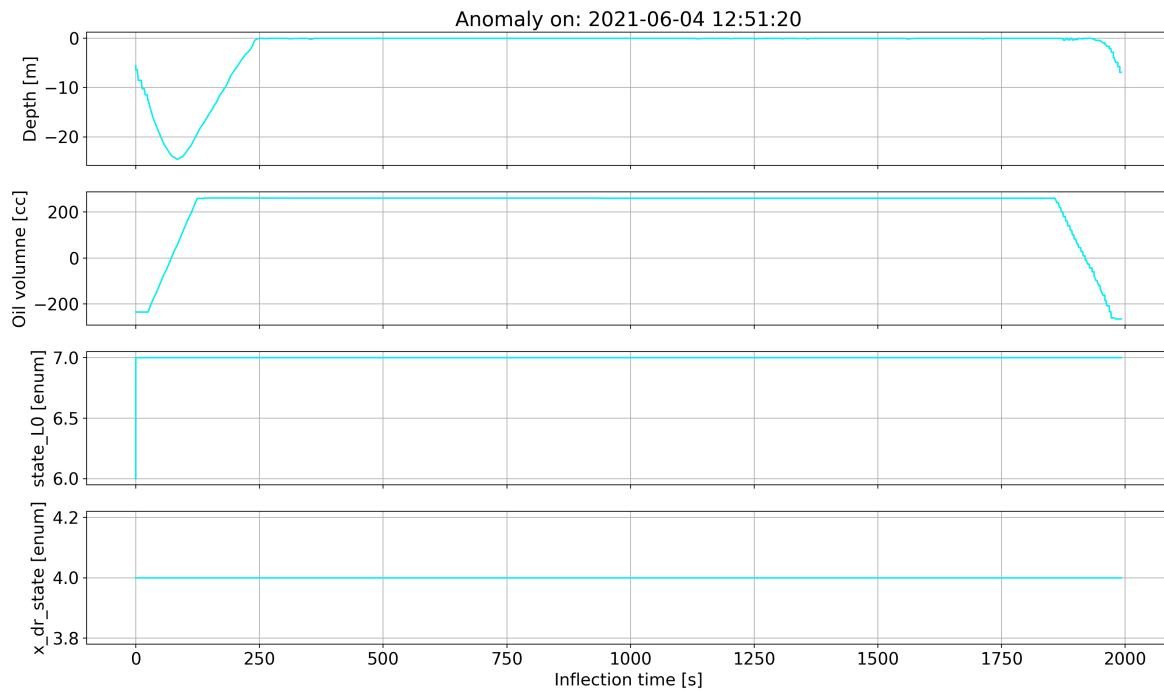


Figure 2.16: 20210604T125120 Anomaly 11

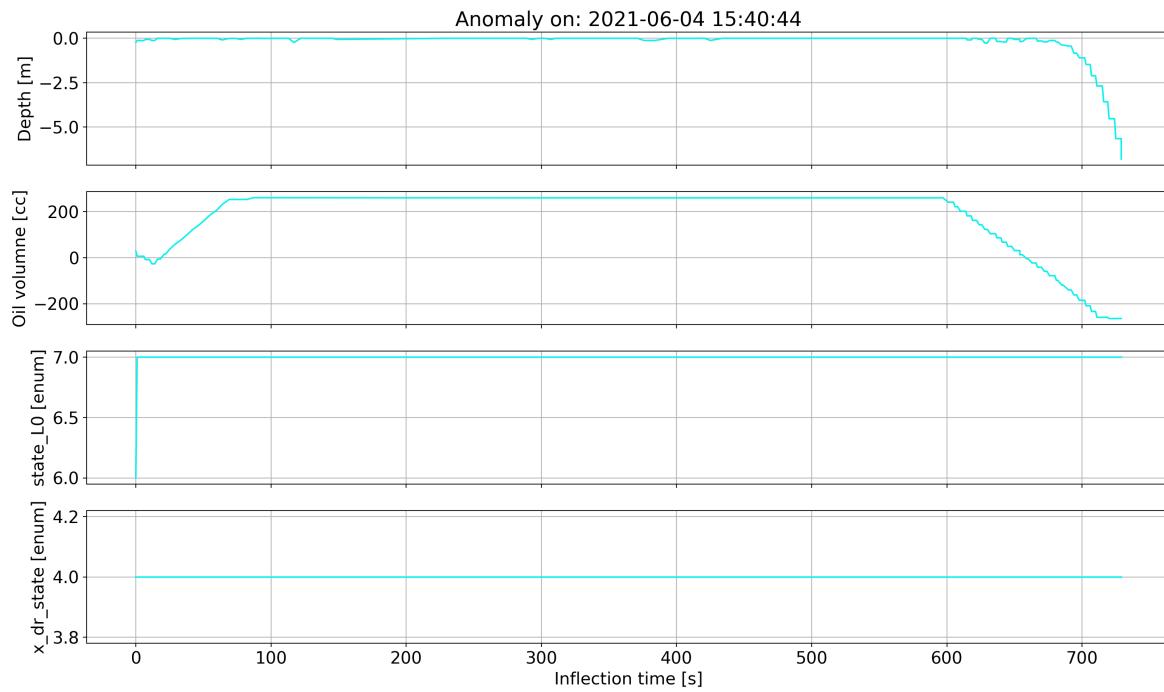


Figure 2.17: 20210604T154044 Anomaly 12

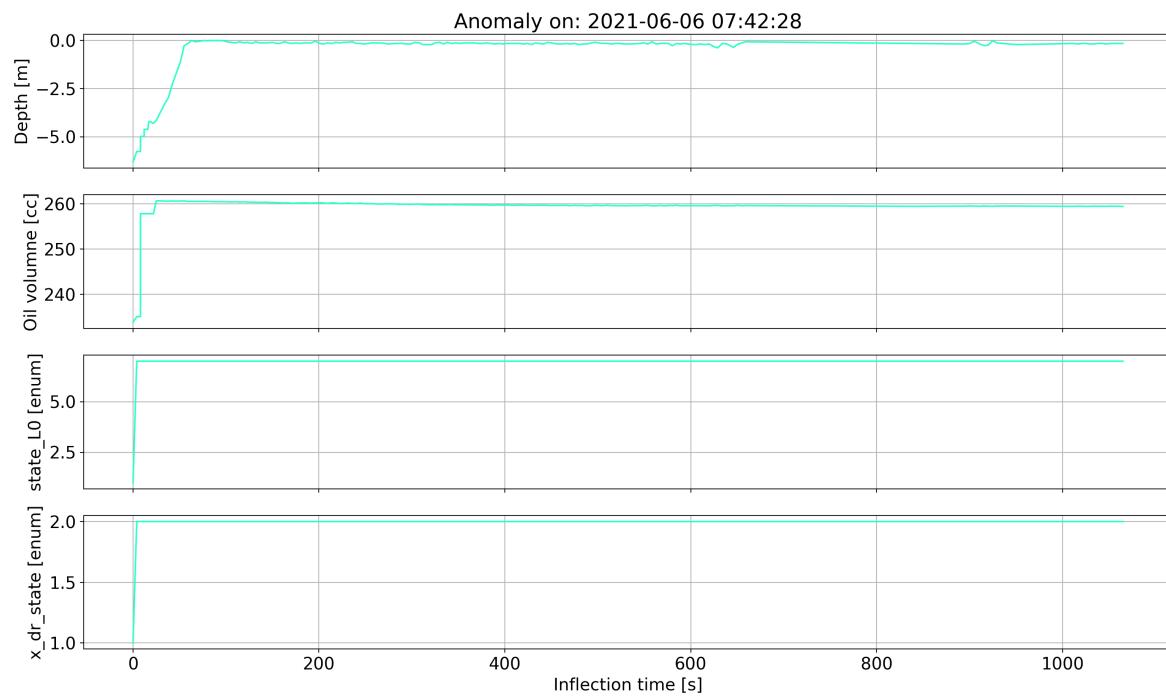


Figure 2.18: 20210606T074228 Anomaly 13

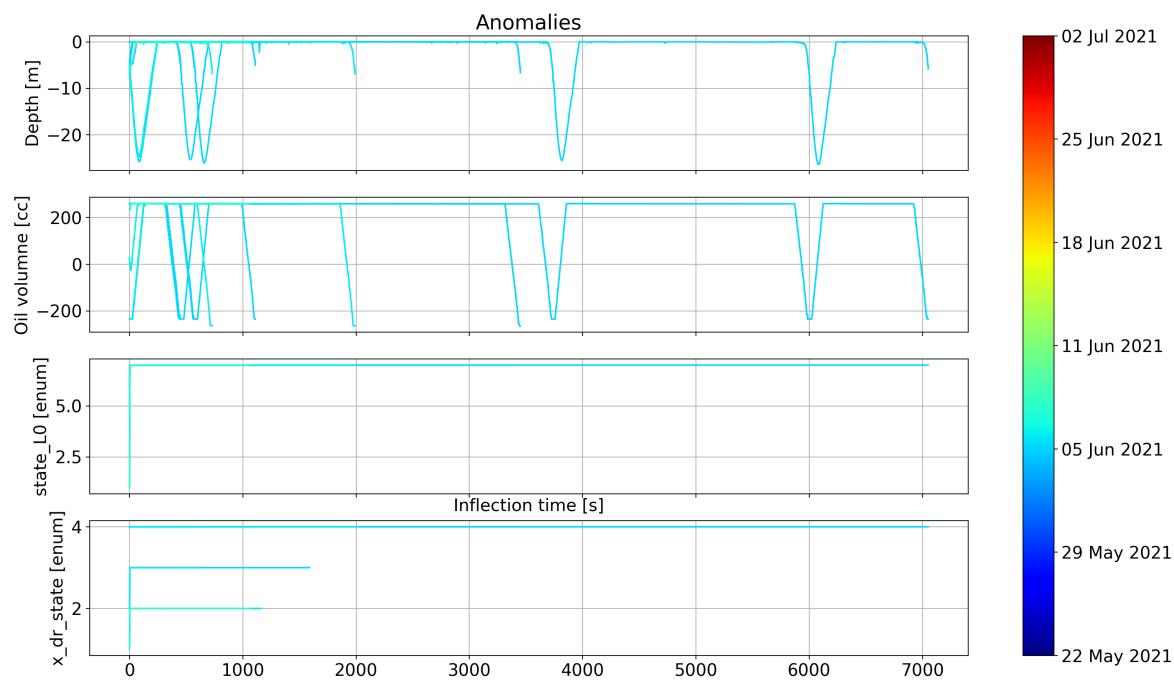


Figure 2.19: Anomalies (time)

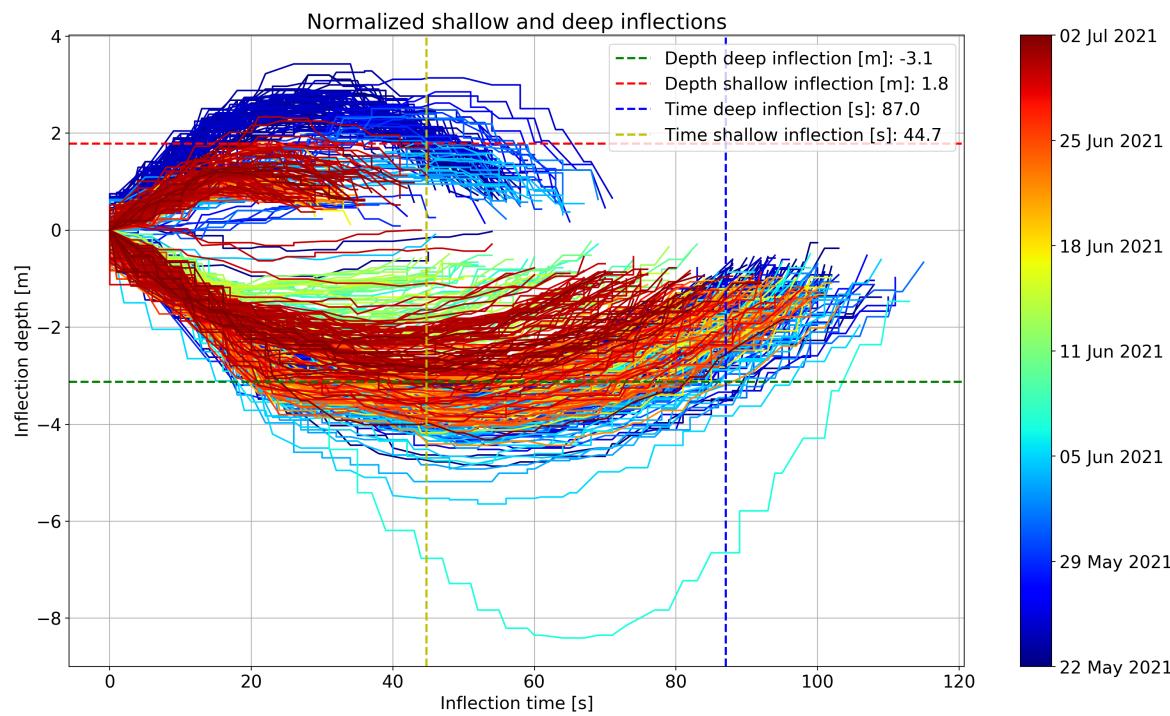


Figure 2.20: Depth inflections

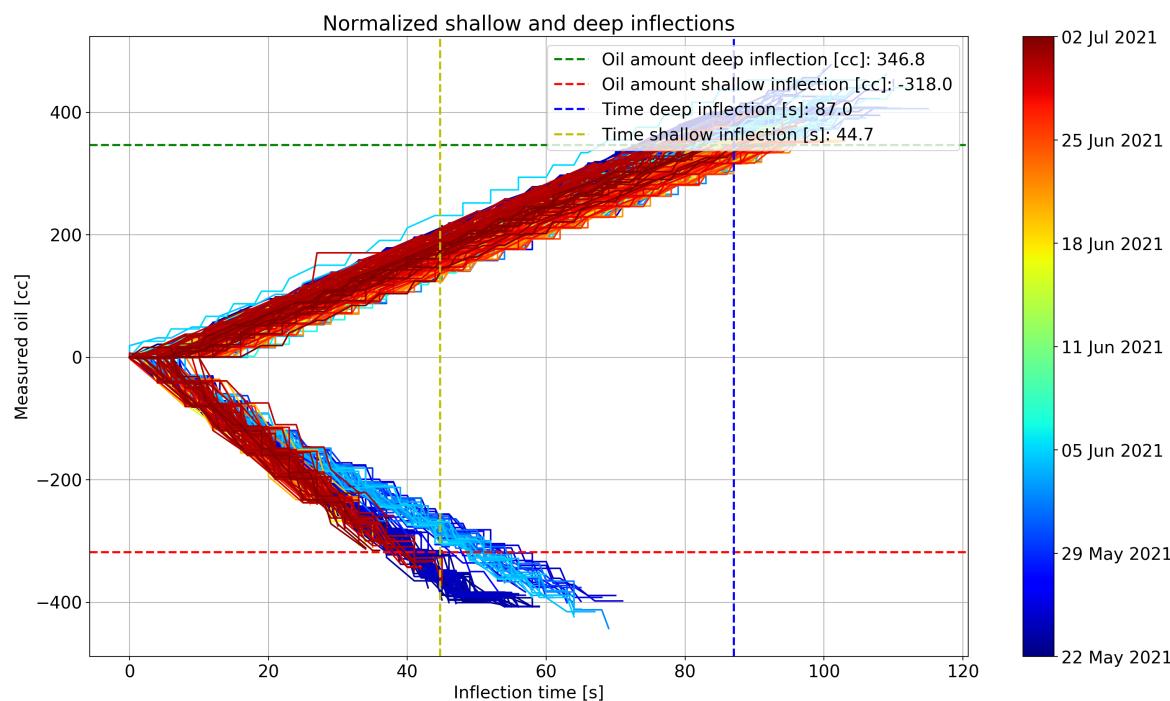


Figure 2.21: Oil inflections

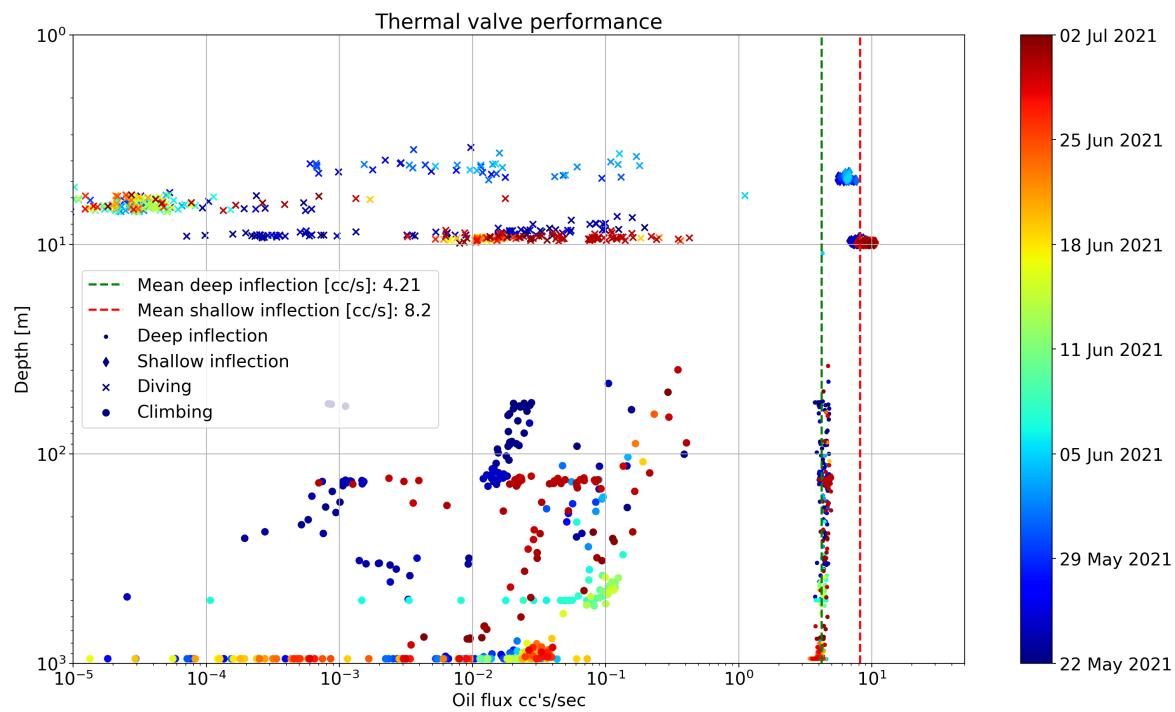


Figure 2.22: Oil flux

Normalized shallow and deep inflections

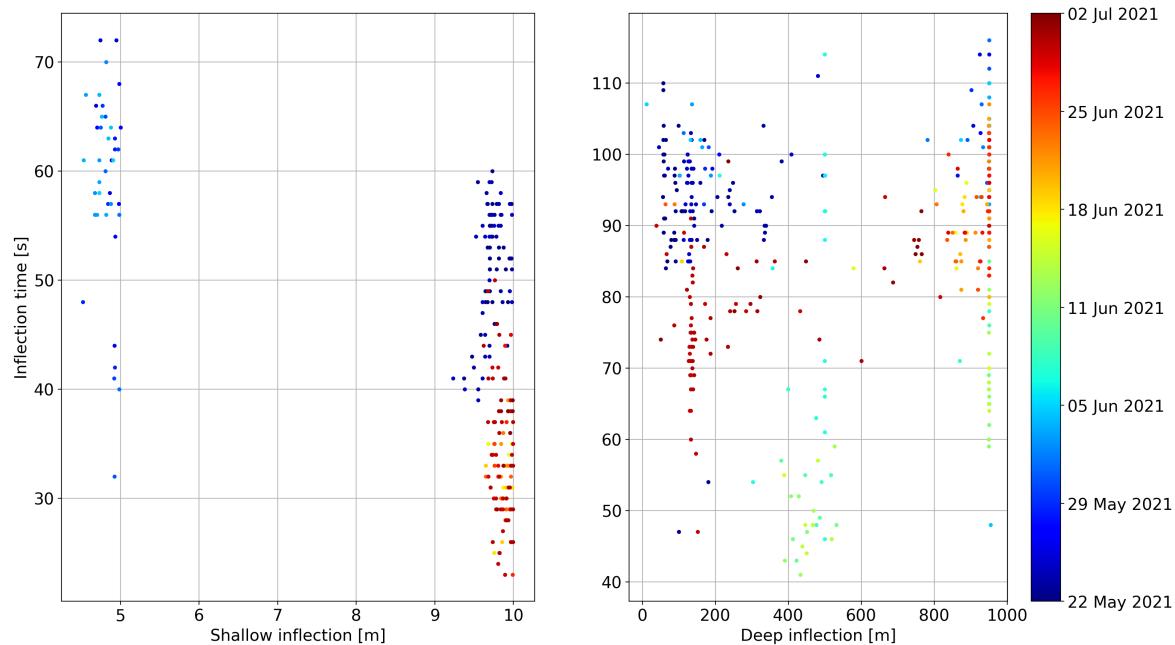


Figure 2.23: Duration inflections

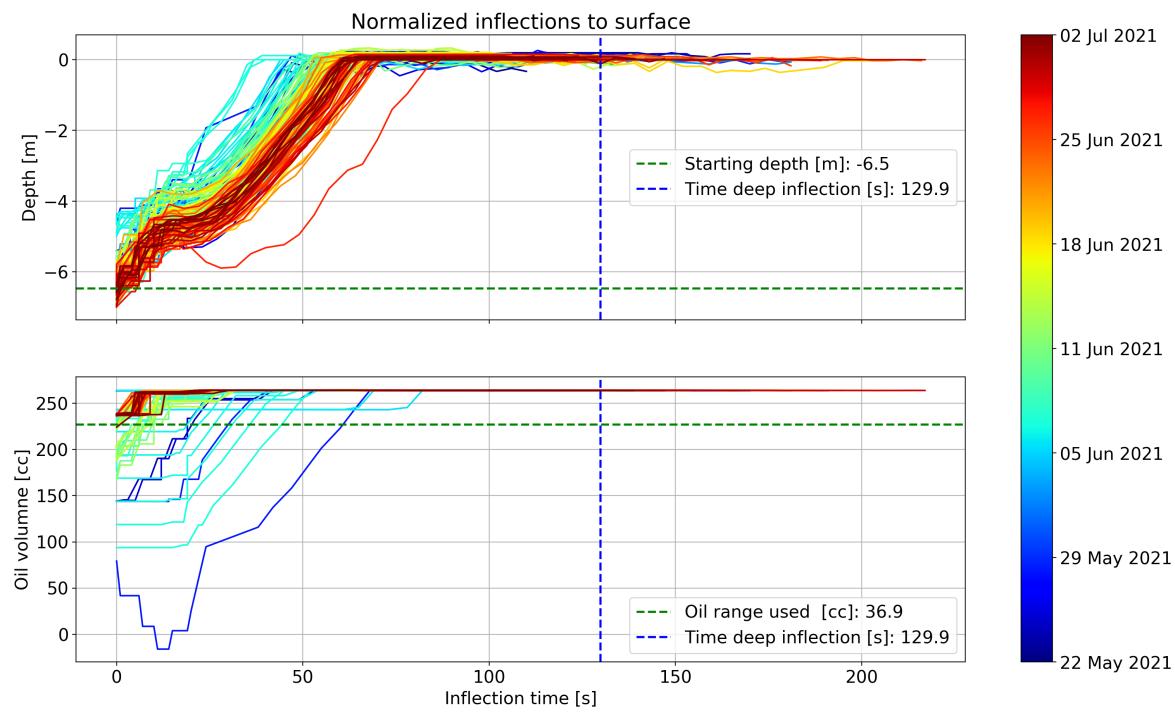


Figure 2.24: Surface Oil inflections

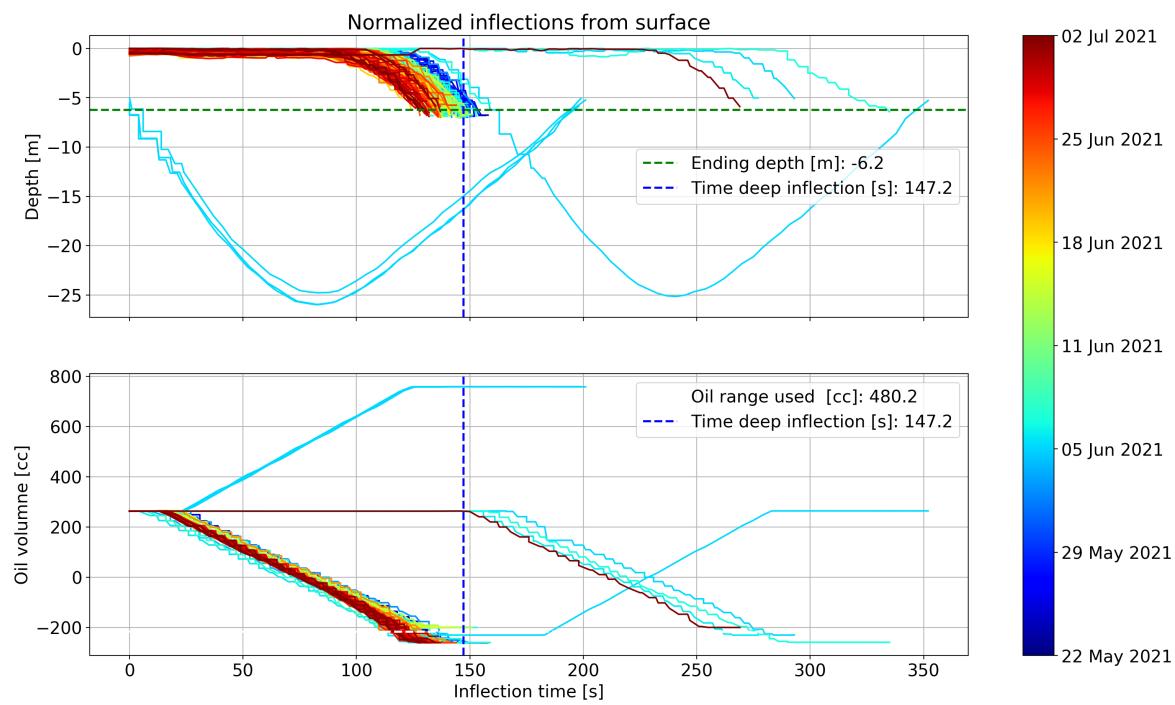


Figure 2.25: Surface Duration inflections

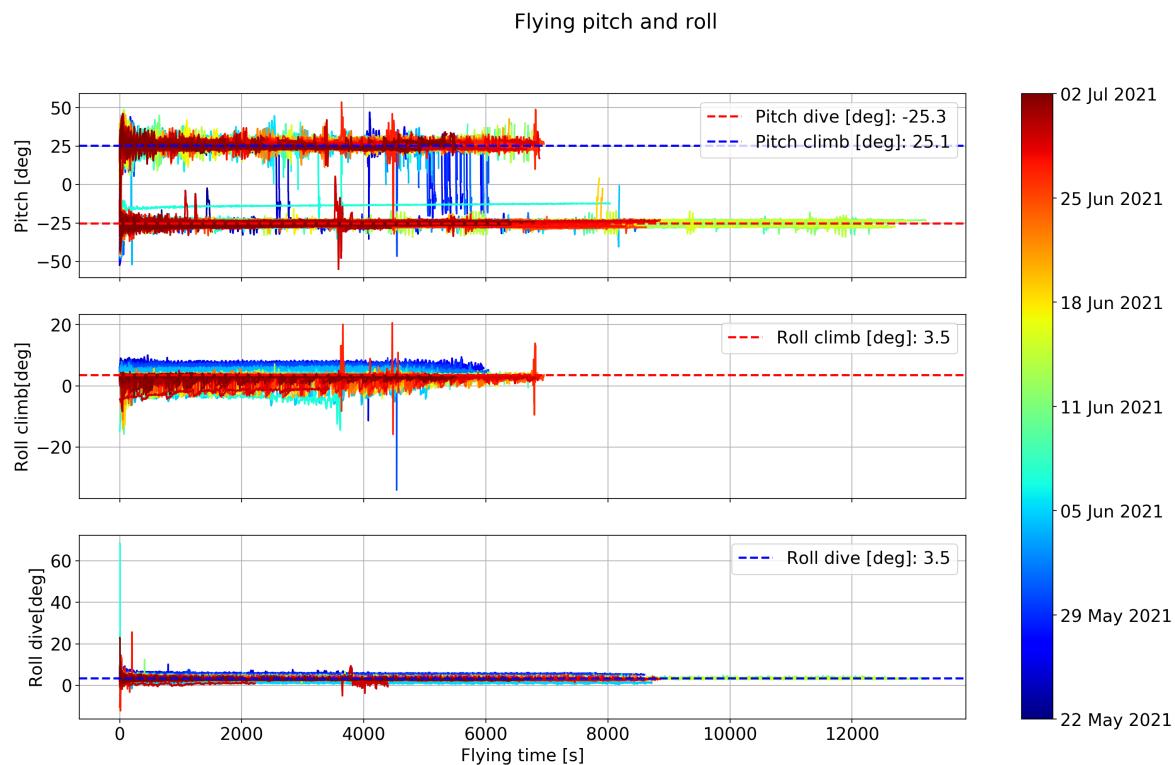


Figure 2.26: Pitch and roll, when climbing and diving

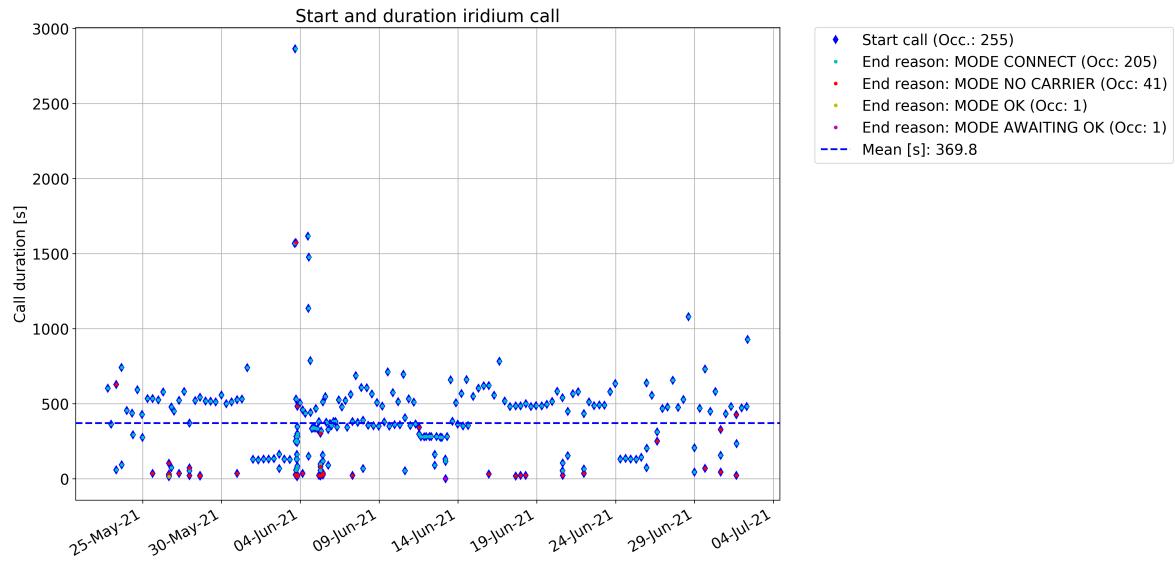


Figure 2.27: Iridium Status

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	0107	20201120	798	821	620048	5.261	421.2
FLNTU- FLBBCDSLC	4124	20201118	500	821	na	na	111.2
OXY 3-4	1410	20201012	502	821	328333	5.844	249.1
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	46
FLx	Turbidity dark count	50
FLx	CDOM dark count	na
FLx	BB700 dark count	na

3.2 SCI plots

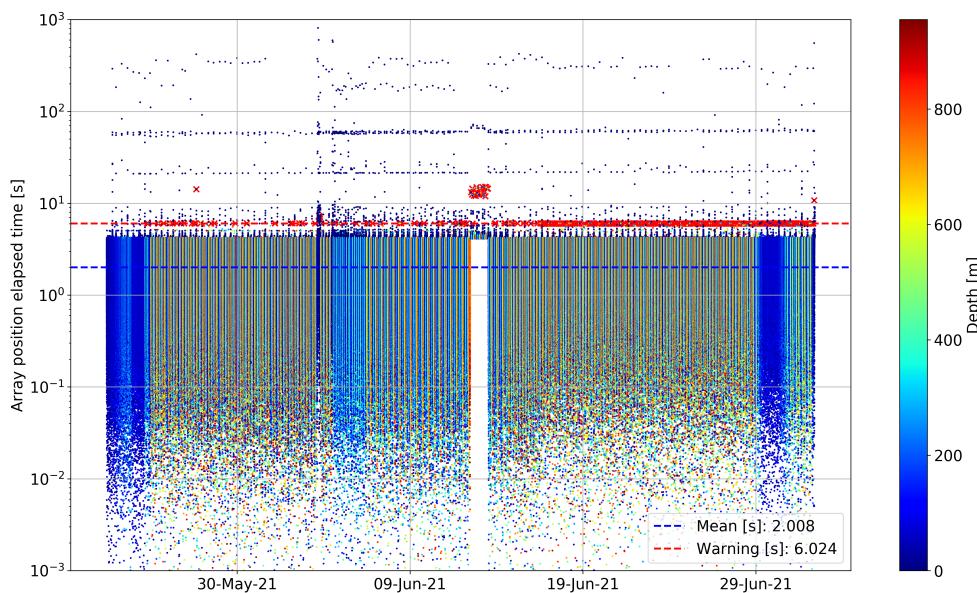


Figure 3.1: Array time

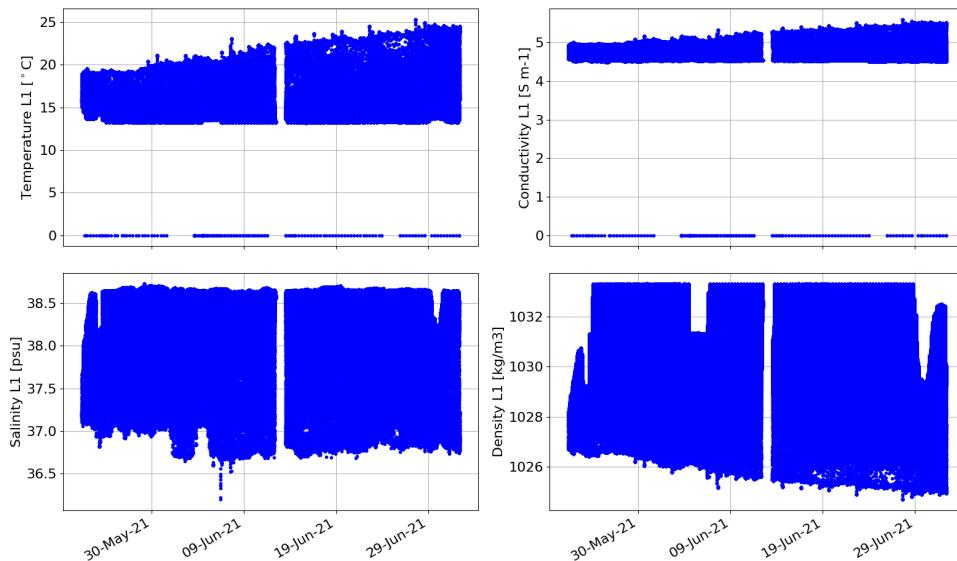


Figure 3.2: Raw CTD L1

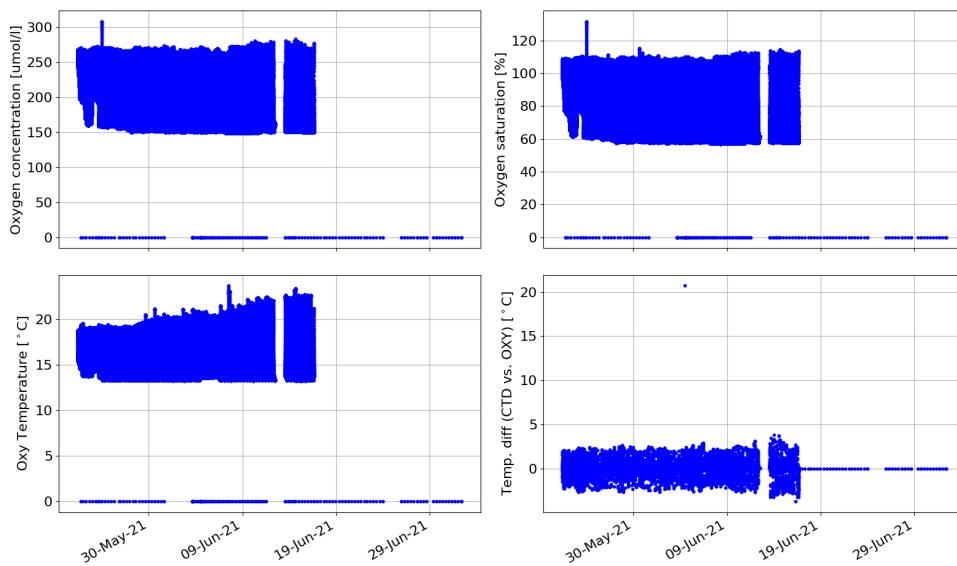


Figure 3.3: Raw OXY L1

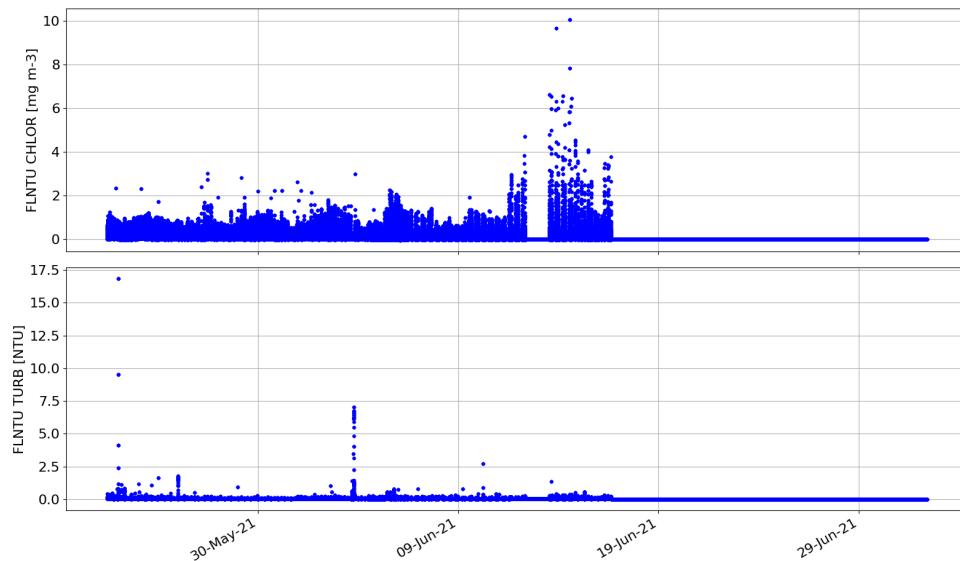


Figure 3.4: Raw FLNTU L1

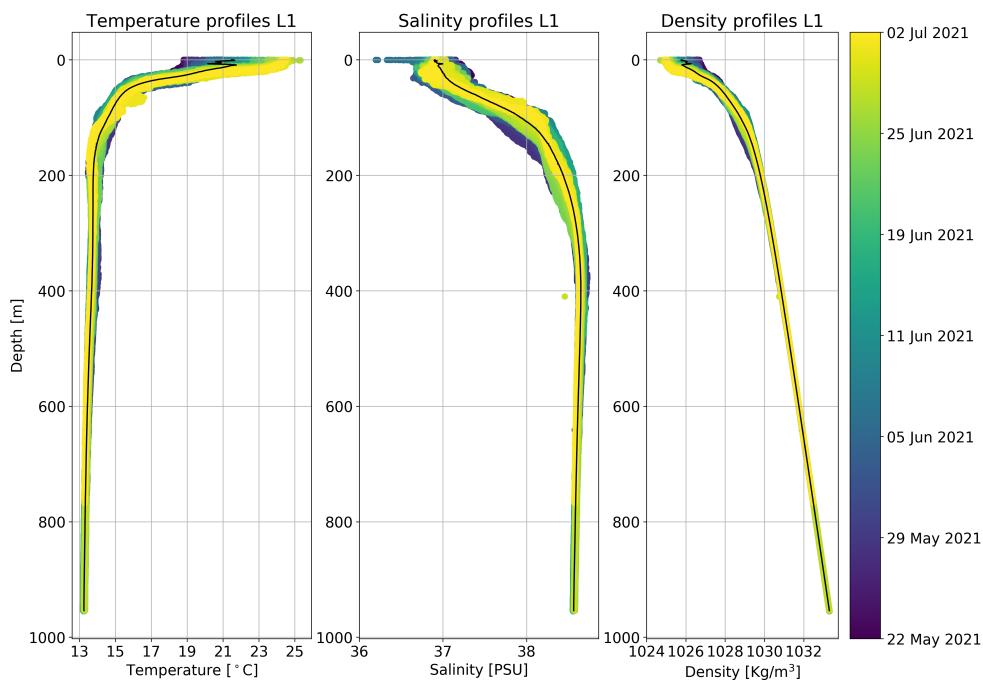


Figure 3.5: CTD profiles

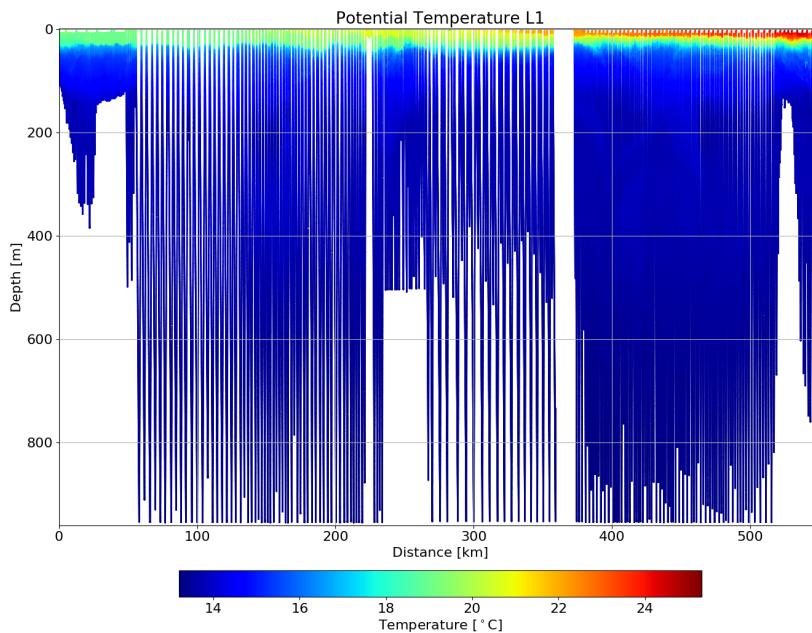


Figure 3.6: CTD temperature

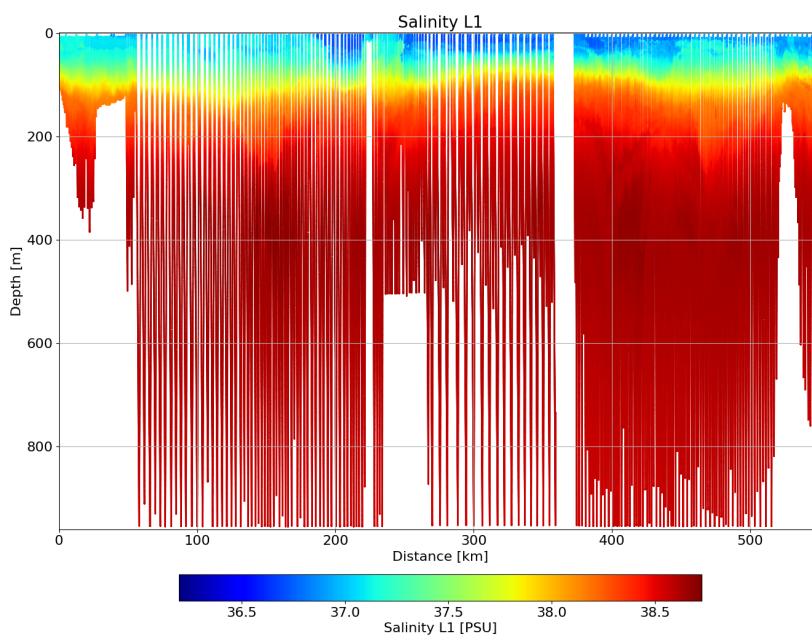


Figure 3.7: CTD Salinity

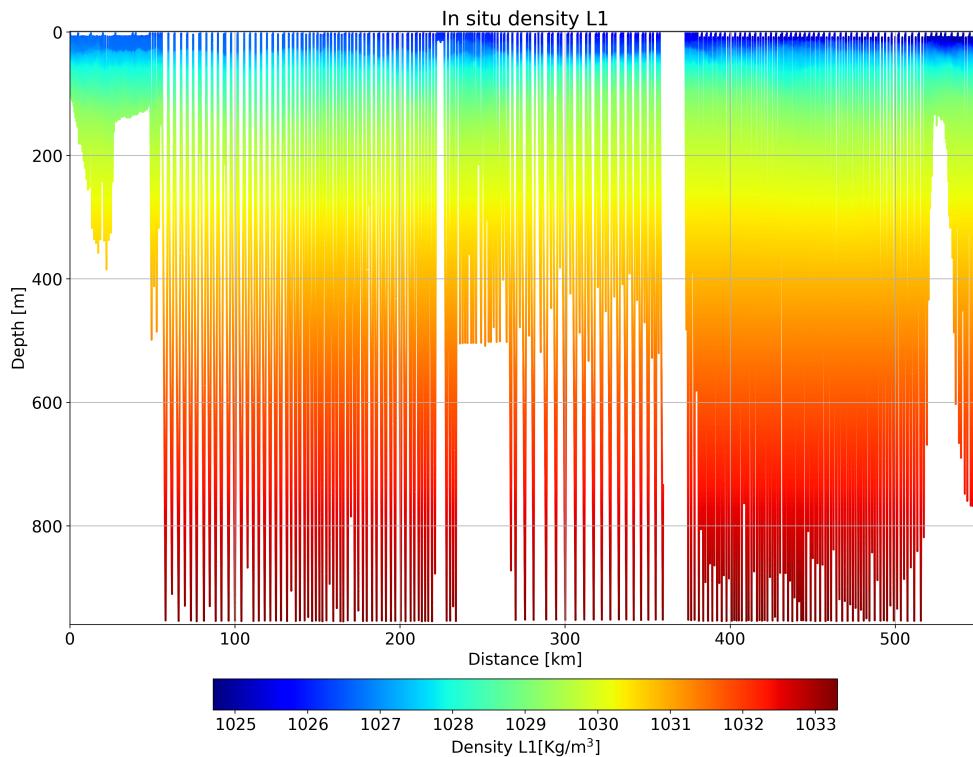


Figure 3.8: CTD Density

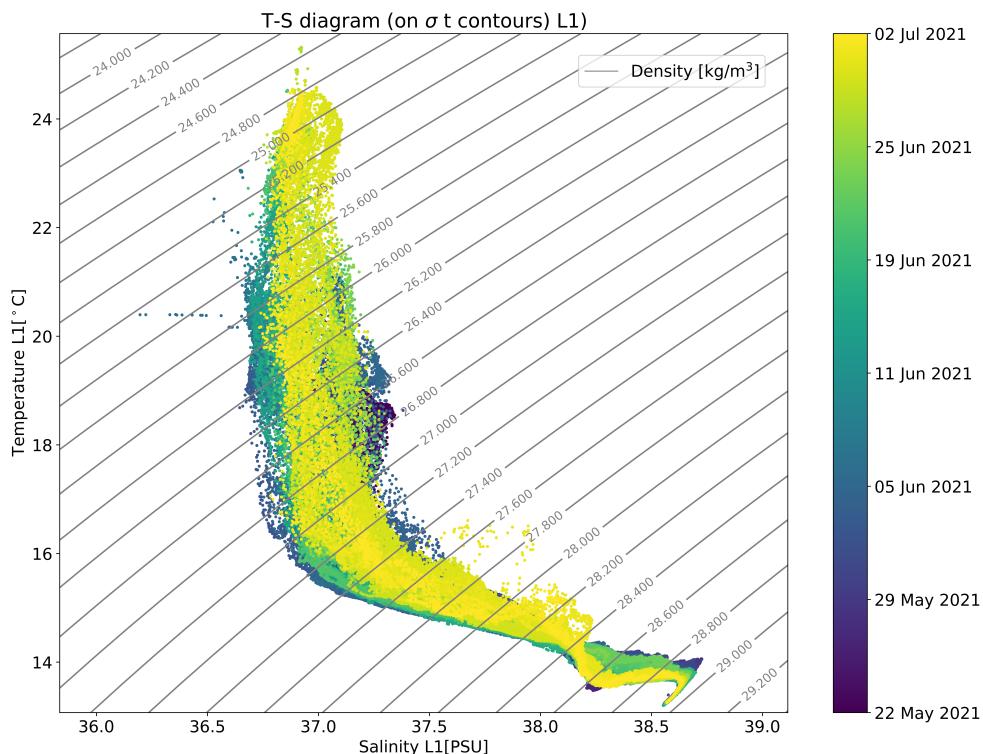


Figure 3.9: TS diagram (CTD)

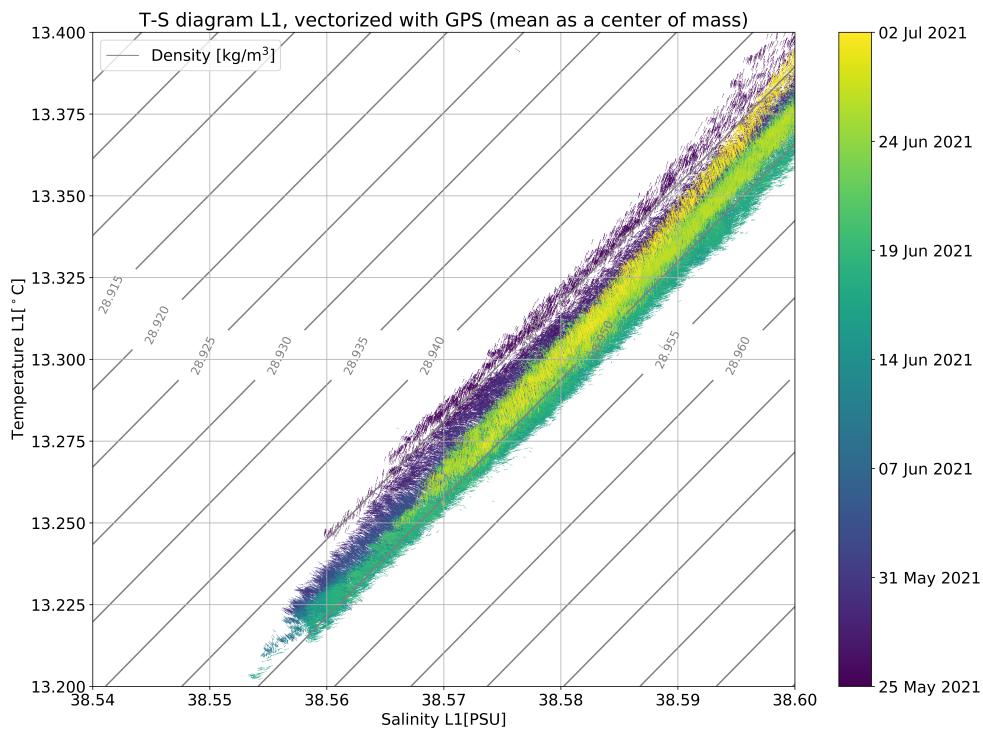


Figure 3.10: TS diagram (CTD)calib.png

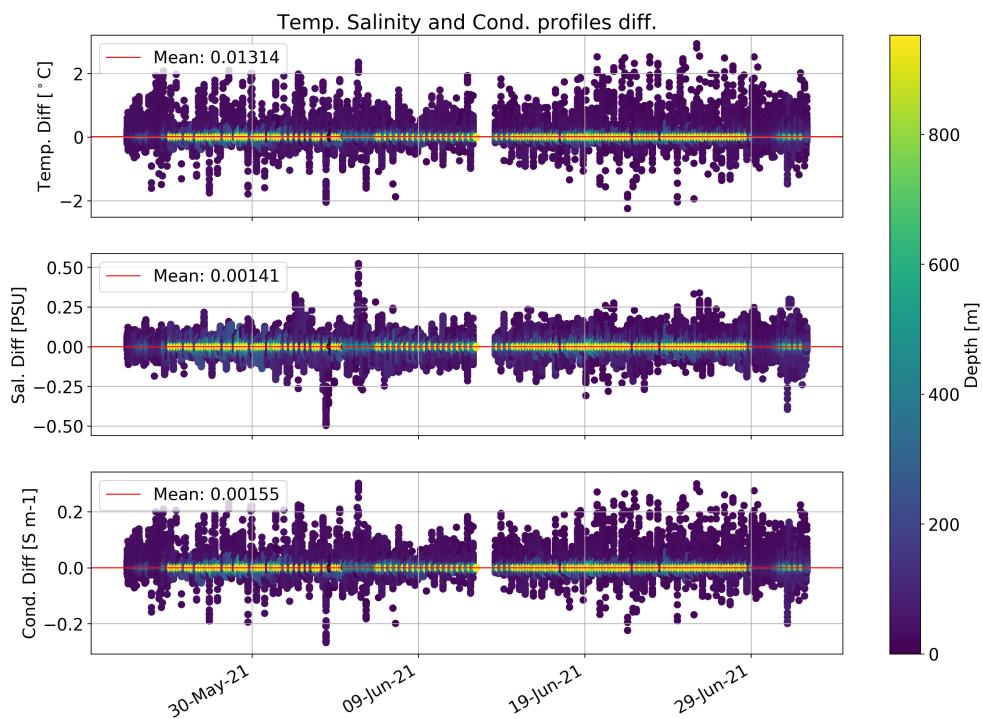


Figure 3.11: Profile consistency (CTD)

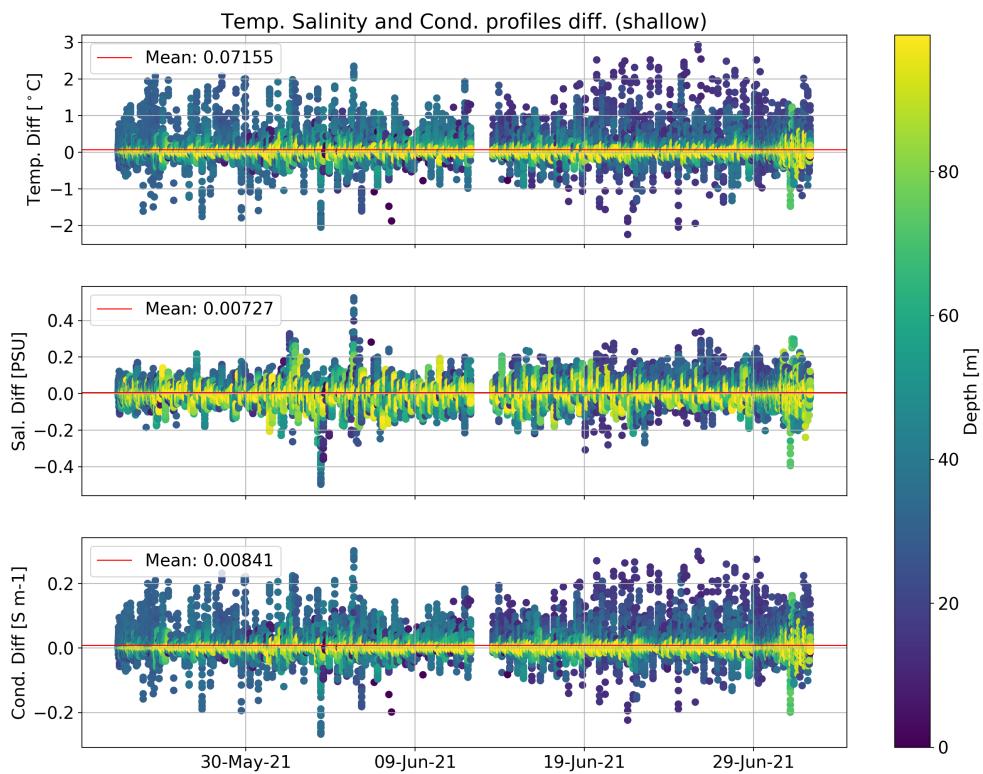


Figure 3.12: Profile consistency (CTD) zoom

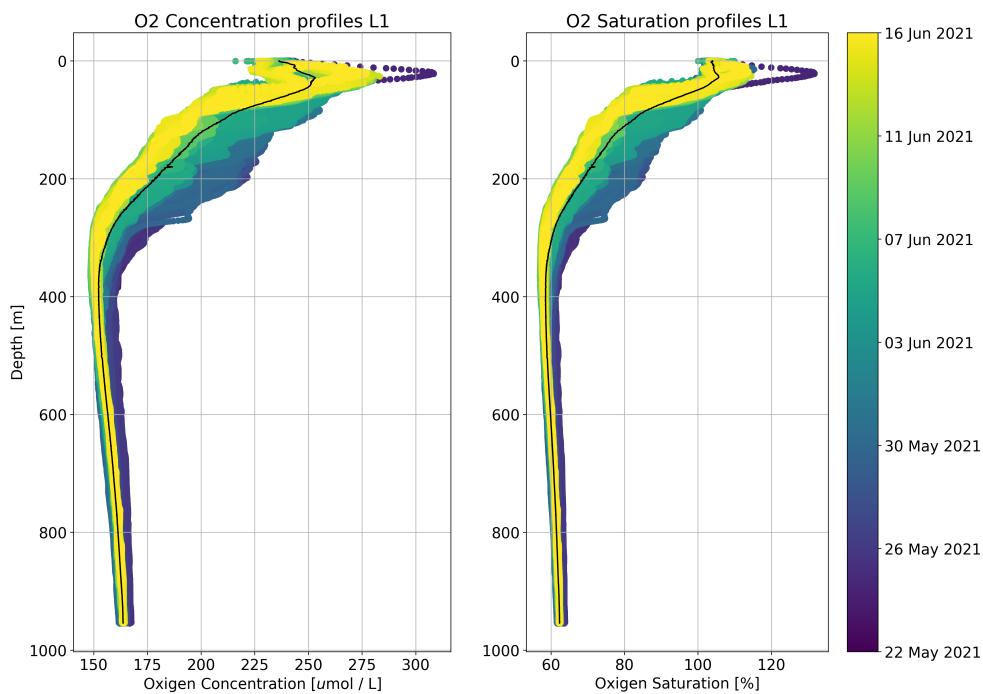


Figure 3.13: Oxygen profiles

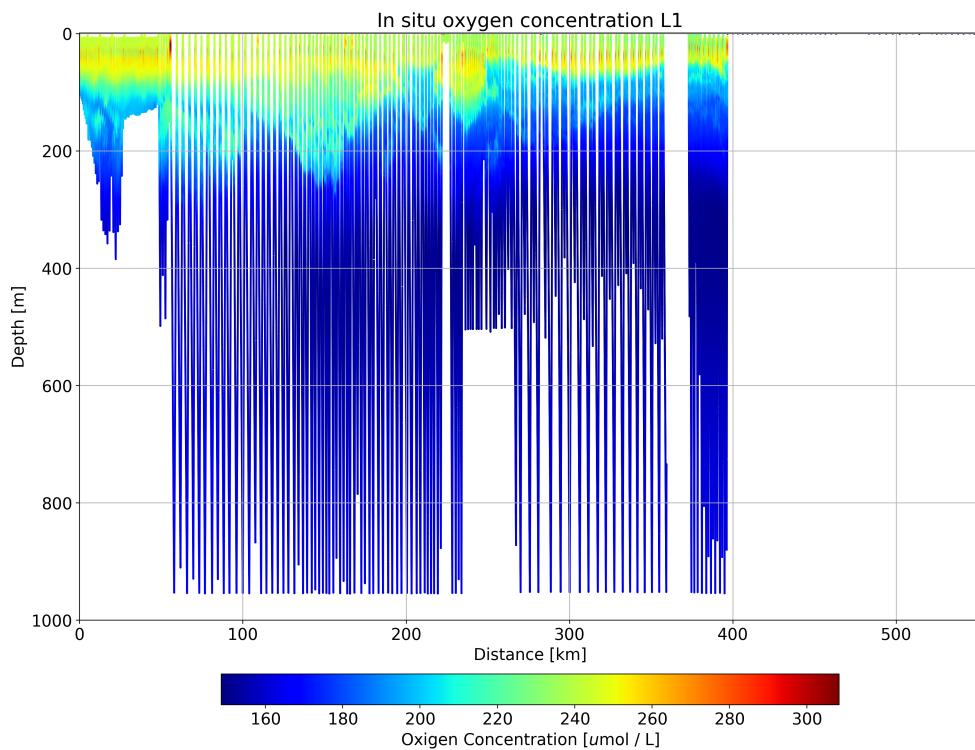


Figure 3.14: Oxygen Concentration

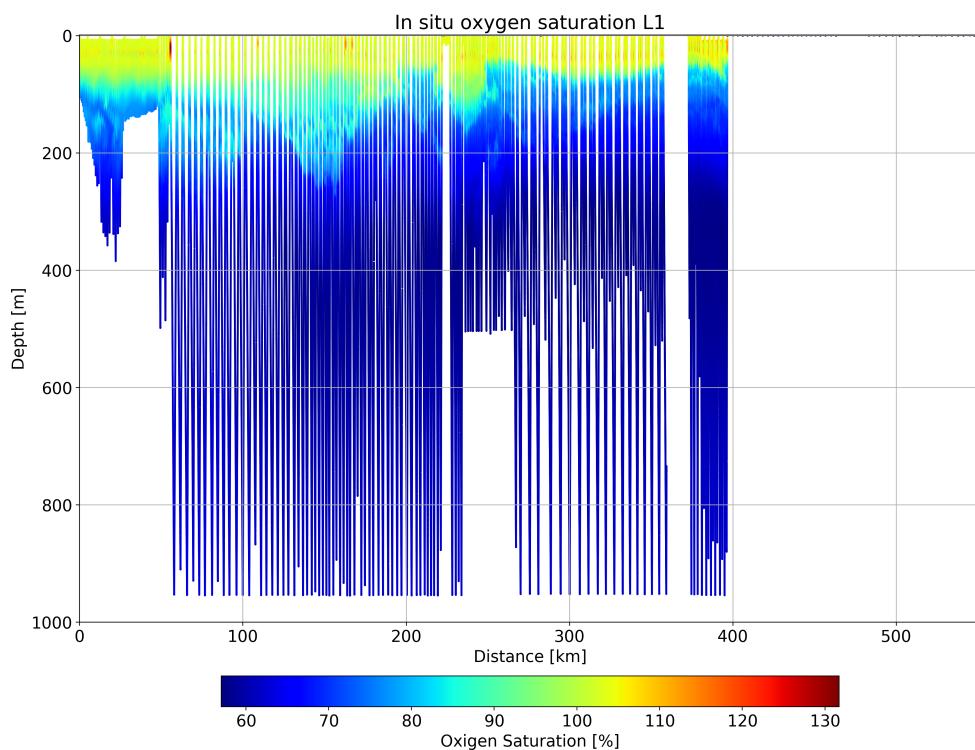


Figure 3.15: Oxygen Saturation

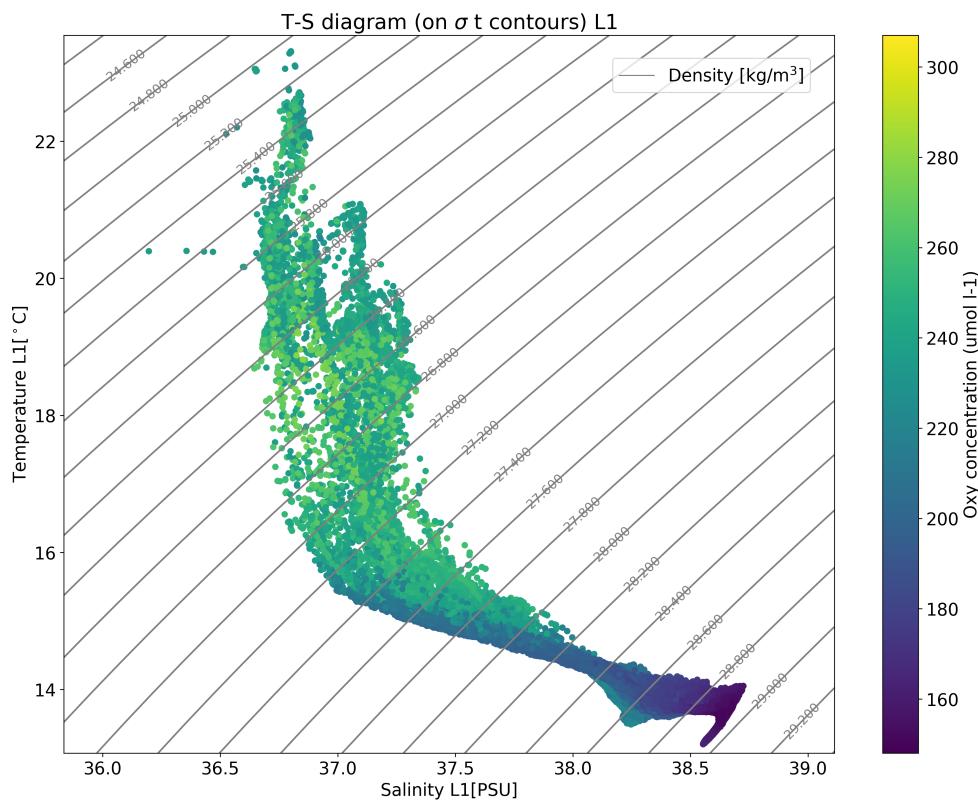


Figure 3.16: TS diagram (OXY)

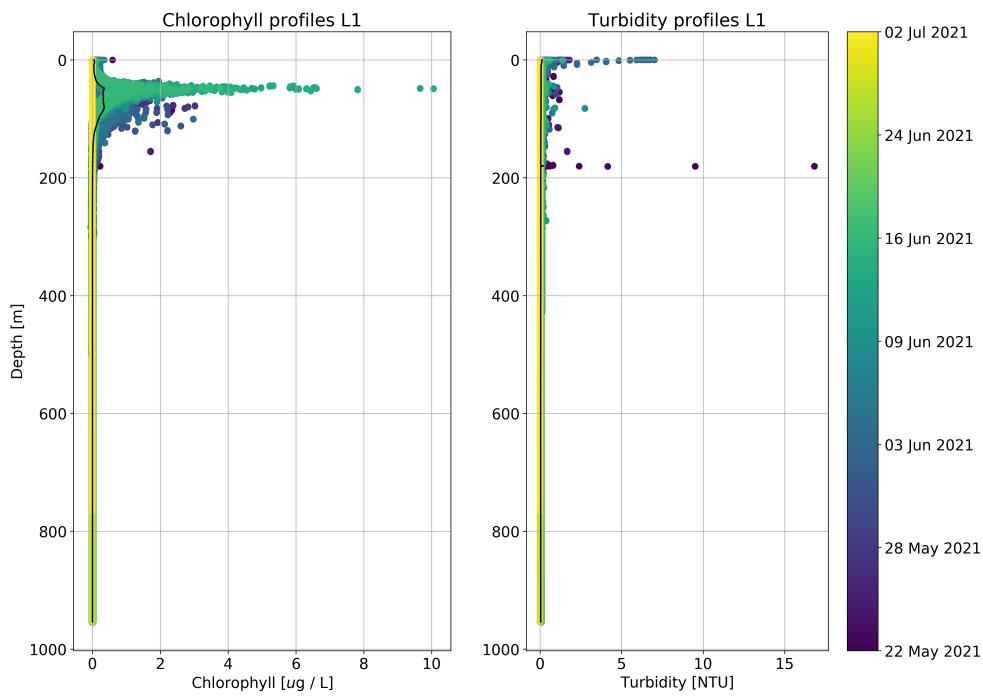


Figure 3.17: Chlorophyll-a and Turbidity profiles

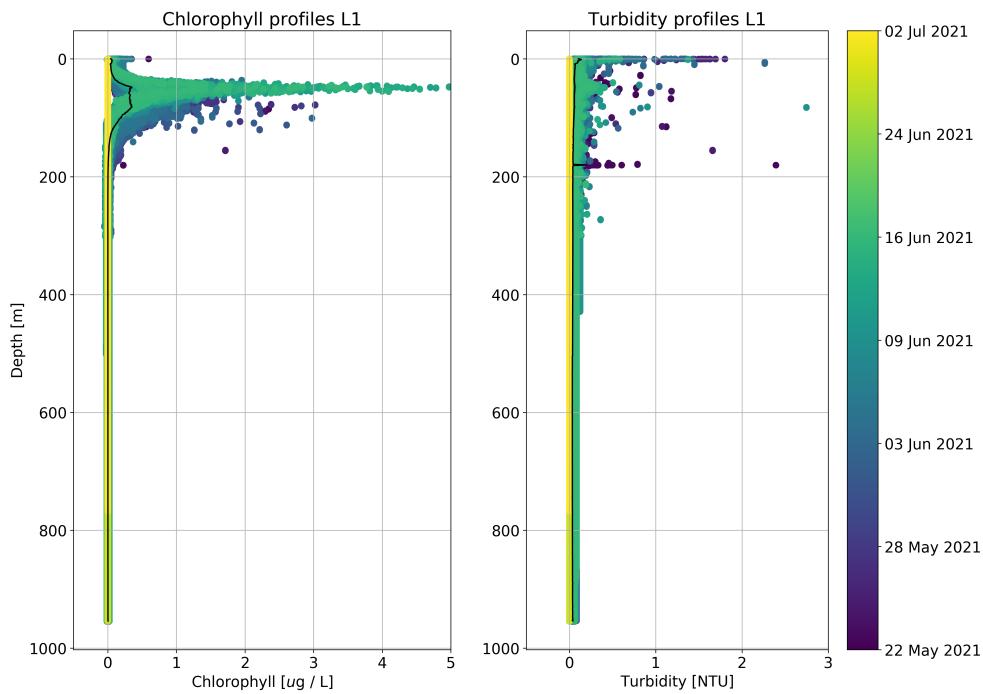


Figure 3.18: Chlorophyll-a and Turbidity profiles zoom

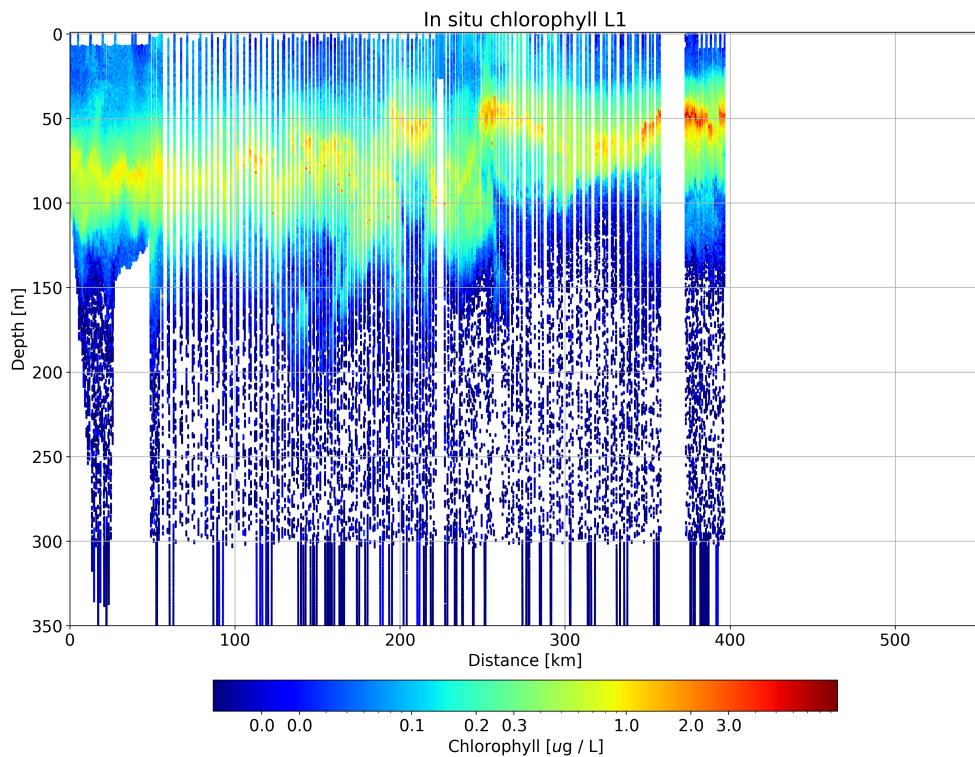


Figure 3.19: Chlorophyll-a

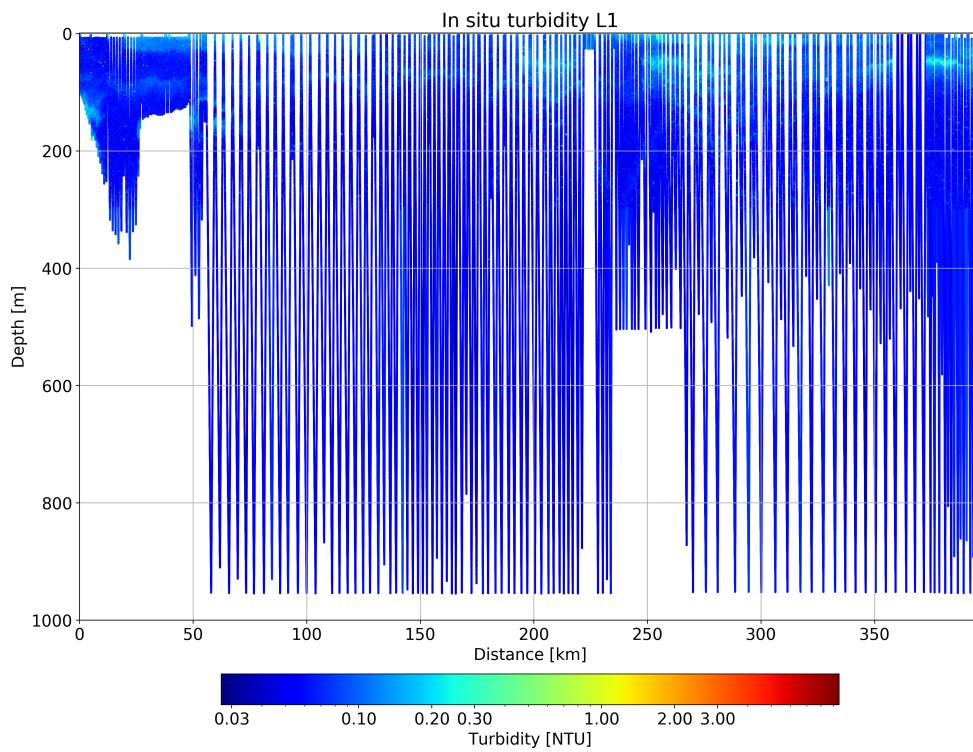


Figure 3.20: Turbidity

4 Appendix

4.1 Glider behaviour

Showing changes on Sampling (behaviour 15):

- 22 May 2021 09:07:51 @ Sampling of: SAMPLE13.MA OXY5013-sn1409
- 22 May 2021 09:07:51 @ Sampling state to sample set to: Diving, climbing and hovering
- 22 May 2021 09:07:51 @ Sampling argument: intersample time set to: 4.0 s
- 22 May 2021 09:07:51 @ Sampling nth yo to sample set to: 1.0 nodim
- 22 May 2021 09:07:51 @ Sampling argument: min depth set to: -5.0 m
- 22 May 2021 09:07:51 @ 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 Sampling (behaviour 14):

- 22 May 2021 09:07:52 @ Sampling of: SAMPLE14.MA FLNTU(-150m to -300m)
- 22 May 2021 09:07:52 @ Sampling state to sample set to: Diving, climbing and hovering
- 22 May 2021 09:07:52 @ Sampling argument: intersample time set to: 16.0 s
- 22 May 2021 09:07:52 @ Sampling nth yo to sample set to: 1.0 nodim
- 22 May 2021 09:07:52 @ Sampling argument: min depth set to: 150.0 m
- 22 May 2021 09:07:52 @ 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 Sampling (behaviour 13):

- 22 May 2021 09:07:53 @ Sampling of: SAMPLE12.MA FLNTU(surface to -150m)
- 22 May 2021 09:07:53 @ Sampling state to sample set to: Diving, climbing and hovering
- 22 May 2021 09:07:53 @ Sampling argument: intersample time set to: 8.0 s
- 22 May 2021 09:07:53 @ Sampling nth yo to sample set to: 1.0 nodim
- 22 May 2021 09:07:54 @ Sampling argument: min depth set to: -5.0 m
- 22 May 2021 09:07:54 @ 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 Sampling (behaviour 12):

- 22 May 2021 09:07:54 @ Sampling of: SAMPLE11.MA CTD(Profile)
- 22 May 2021 09:07:54 @ Sampling state to sample set to: Diving, climbing and hovering
- 22 May 2021 09:07:54 @ Sampling argument: intersample time set to: 4.0 s
- 22 May 2021 09:07:54 @ Sampling nth yo to sample set to: 1.0 nodim
- 22 May 2021 09:07:55 @ Sampling argument: min depth set to: -5.0 m
- 22 May 2021 09:07:55 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Yoing (behavior behavior yo 11):

- 22 May 2021 09:00:09 @ Yoing num half cycles to do(nodim) set to: 2.0
- 22 May 2021 09:00:09 @ Yoing d target depth(m) set to: 5.0
- 22 May 2021 09:00:09 @ Yoing d bpump value(X) set to: -230.0
- 22 May 2021 09:00:09 @ Yoing d target altitude(m) set to: 20.0
- 22 May 2021 09:00:09 @ Yoing d use pitch(enum) set to: 3.0
- 22 May 2021 09:00:09 @ Yoing d pitch value(X) set to: -0.453800
- 22 May 2021 09:00:10 @ Yoing c use pitch(enum) set to: 3.0
- 22 May 2021 09:00:10 @ 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
- 22 May 2021 09:36:34 @ Yoing d bpump value(X) set to: 400.0
- 31 May 2021 15:18:46 @ Yoing d bpump value(X) set to: 500.0
- 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 15:50:53 @ Yoing d bpump value(X) set to: -230.0
- 03 Jun 2021 19:46:39 @ Yoing d target depth(m) set to: 950.0

- 03 Jun 2021 19:46:40 @ Yoing d bpump value(X) set to: 500.0
 - 04 Jun 2021 12:14:51 @ Yoing d target depth(m) set to: 5.0
 - 04 Jun 2021 12:14:51 @ Yoing d bpump value(X) set to: -230.0
 - 04 Jun 2021 13:14:25 @ Yoing d target depth(m) set to: 500.0
 - 04 Jun 2021 13:14:25 @ Yoing d bpump value(X) set to: 500.0
 - 04 Jun 2021 15:47:22 @ Yoing d bpump value(X) set to: 300.0
 - 04 Jun 2021 23:58:35 @ Yoing d bpump value(X) set to: 250.0
 - 05 Jun 2021 10:30:05 @ Yoing d bpump value(X) set to: -260.0
 - 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 bpump value(X) set to: -200.0
 - 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
 - 14 Jun 2021 13:07:48 @ Yoing d bpump value(X) set to: 350.0
 - 02 Jul 2021 08:54:29 @ Yoing num half cycles to do(nodim) set to: 2.0
 - 02 Jul 2021 08:54:29 @ Yoing d target depth(m) set to: 50.0
 - 02 Jul 2021 08:54:29 @ Yoing d bpump value(X) set to: -200.0
- Showing changes on Altimeter set to (behaviour u alt min depth):
- 22 May 2021 09:02:11 @ Altimeter set to u alt min depth set to: 2

4.2 Installed devices (from autoexec.mi)

- OXY3835 _SN: 0141
- seabird CTD _SN: 0107
- Wetlabs FLNTU _SN: 4124
- name _SN: unit _567
- Forward section assy _SN: 0480
- Payload bay assy _SN: 1036
- Aft section assy _SN: 0881
- Aft electronic assy _SN: 0888
- Aft end cap assy _SN: 0884
- Diginfin _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 Hull Scratches	7
2.2 Bend digifin	8
2.3 Battery capacity	8
2.4 Distance over ground	9
2.5 Glider Odd Warn and Err	9
2.6 20210602T075441 Anomaly 1	10
2.7 20210603T152209 Anomaly 2	10
2.8 20210603T155442 Anomaly 3	11
2.9 20210603T181026 Anomaly 4	11
2.10 20210603T182327 Anomaly 5	12
2.11 20210603T184524 Anomaly 6	12
2.12 20210603T185625 Anomaly 7	13
2.13 20210604T073012 Anomaly 8	13
2.14 20210604T114519 Anomaly 9	14
2.15 20210604T121825 Anomaly 10	14
2.16 20210604T125120 Anomaly 11	15
2.17 20210604T154044 Anomaly 12	15
2.18 20210606T074228 Anomaly 13	16
2.19 Anomalies (time)	16
2.20 Depth inflections	17
2.21 Oil inflections	17
2.22 Oil flux	18
2.23 Duration inflections	18
2.24 Surface Oil inflections	19
2.25 Surface Duration inflections	19
2.26 Pitch and roll, when climbing and diving	20
2.27 Iridium Status	20
3.1 Array time	21
3.2 Raw CTD L1	22
3.3 Raw OXY L1	22
3.4 Raw FLNTU L1	23
3.5 CTD profiles	23
3.6 CTD temperature	24
3.7 CTD Salinity	24
3.8 CTD Density	25
3.9 TS diagram (CTD)	25
3.10 TS diagram (CTD)calib.png	26
3.11 Profile consistency (CTD)	26
3.12 Profile consistency (CTD) zoom	27
3.13 Oxygen profiles	27
3.14 Oxygen Concentration	28
3.15 Oxygen Saturation	28
3.16 TS diagram (OXY)	29
3.17 Chlorophyll-a and Turbidity profiles	29
3.18 Chlorophyll-a and Turbidity profiles zoom	30
3.19 Chlorophyll-a	30
3.20 Turbidity	31

*We research the sea;
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Balearic Islands
Coastal Observing
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