

SOCIB Glider Mission Summary Report

SOCIB_ENL_CANALES_JUL2020_U244_sdeep01

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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.

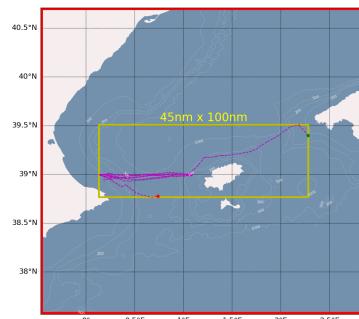


Figure 1.1: Map providing general overview of the Survey Area

1.1 Summary

Mission name	SOCIB_ENL_CANALES_JUL2020_U244_sdeep01
Platform model	G3 Electric
Platform ID / Name / WMO Code	U244/ sdeep01/ 68967
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	0076
SCI bay sn	1328
Mission duration	54.0 days
Mission start	2020-07-29 11:00:02
Mission end	2020-09-21 10:40:14
Total distance	903.39[km] 487.79[nm]
Deployment point [dd°mm.mmmm']	N 39°24.0345' E 02°16.8459'
Recovery point [dd°mm.mmmm']	N 38°46.5978' E 00°44.2614'
Battery Consumption (Ah)	280.9(from 6.2 to 287.1)
Battery specification	20200716 SN0042/ 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 sdeep01 in endurance line campaign Canales 2020 (SOCIB operational program), aiming the coverage of the Eivissa channel (7 transects) and Mallorca channel (1 transect) from JUL to SEP 2020, sampling physical and biogeochemical parameters (CTD, FLNTU and oxygen). Part of the mission took place during COVID19. Recovered due to massive biofouling on one side of the glider, unable to navigate properly. Mission finished due to a wrong behaviour on m_heading, probably a plastic This glider carries a PAM sensor: Marta Bolgan, Eric Parmentier
NAV events	<ul style="list-style-type: none"> ▪ Event 1: Recovered due to massive biofouling on one side of the glider, unable to navigate properly. Mission finished due to a wrong behaviour on m_heading, probably a plastic. This glider carries a PAM sensor, unable to recover data because it crashed. ▪ Event 2: Recovery performed by Salvamento Marítimo in Ibiza Channel. ▪ Event 3: Wired behavior on roll when climbing, it went higher with time. ▪ Event 4: Slower oil pump with time, see figure 2.26 and 2.23
SCI events	<ul style="list-style-type: none"> ▪ Event 1: The following obvious spikes have been observed, in temperature and conductivity we have 154 respectively, in oxygen 162, in turbidity and chl more than 10 spikes. ▪ Event 2: Low salinity waters below 37psu are present during the mission that are present up to 70m in the water column. This low salinity water is associated with waters that have temperatures above 26 C. At intermediate depths below 150 until 350 the relatively low salinity (38.1psu) that was observed is correlated with relatively high oxygen 210 ml/l. ▪ Event 3: Furthermore, the higher oxygen values during the mission were indicated in the DCM layer where located between 60m to 100m. ▪ Event 4: The PAR values show that the light penetrates up to 200m of the water column with the peak to be at 2 pm local time and the highest values to be 2.5 uE m-2 s-1

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	Internal
Partnership / Participation	<ul style="list-style-type: none">▪ SOCIB
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/jd07-sv9
Further Details	glider@socib.es

*Available netCDF data product:

- L0: https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep01-scb_sldeep001/L0/2020/dep0034_sdeep01_scb-sldeep001_L0_2020-07-29_data_dt.nc
- L1: https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep01-scb_sldeep001/L1/2020/dep0034_sdeep01_scb-sldeep001_L1_2020-07-29_data_dt.nc
- L2: https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep01-scb_sldeep001/L2/2020/dep0034_sdeep01_scb-sldeep001_L2_2020-07-29_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 guest + 1 GF (Field team) + 1 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
GPS	0	1	0
attitude rev	0	5	12
pitch motor	24	0	0
science super	13	1	0
digifin	1118	2	0
IRIDIUM	249	11	0
DE PUMP	19	0	0

- Communication Systems (see appendix for Iridium states):
 - Total number iridium calls [num]: 241
 - Iridium calls to secondary [num]: 10
 - ON overall iridium period [h]: 4.9
 - Iridium calls state from MODE NO CARRIER to MODE UNKNOWN [num]: 37
 - Iridium calls state from MODE CONNECT to MODE UNKNOWN [num]: 187
 - Iridium calls state from MODE BUSY to MODE UNKNOWN [num]: 1

- Iridium calls state from MODE UNKNOWN to MODE AWAITING OK [num]: 238
- Iridium calls state from MODE AWAITING OK to MODE UNKNOWN [num]: 13
- Drop calls (Iridium state from 2 to 99 with c iridium on = 1) [num]: 6
- Missed call detected on: 2020-08-07 05:09:02
- Unstable comms detected on: 2020-09-09 18:32:52
- Total time at surface [h]: 31.61
- Total time at surface [%]: 2.44
- Hull/Hydrodynamics: No signs of problems
- Recovery:
 - Vessel: Sasemar vessel
 - Personnel: Sasemar crew
 - Location: Mid Ibiza Channel



Figure 2.1: Biofouling on recovery

2.3 NAV plots

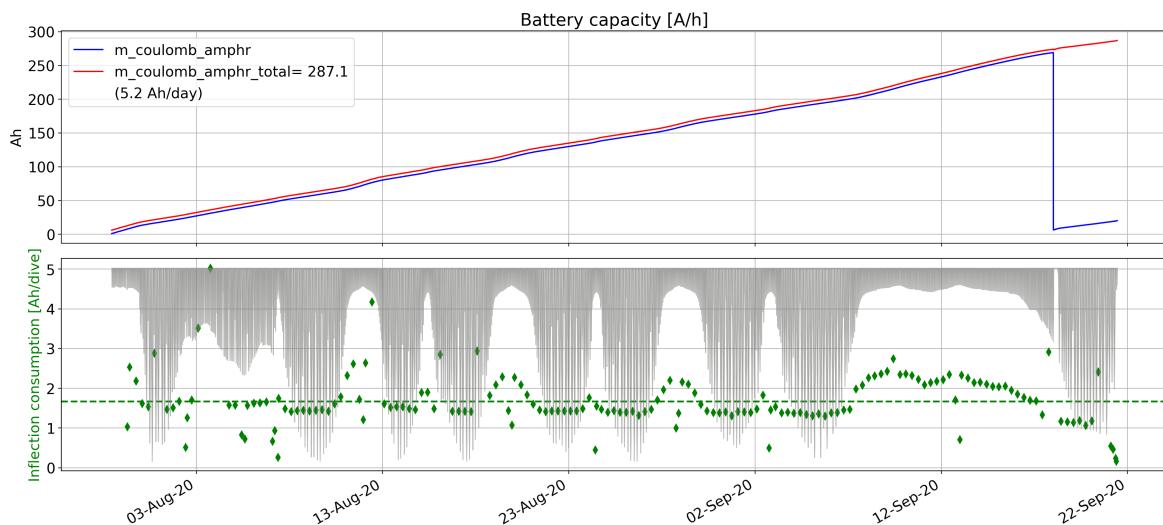


Figure 2.2: Battery capacity

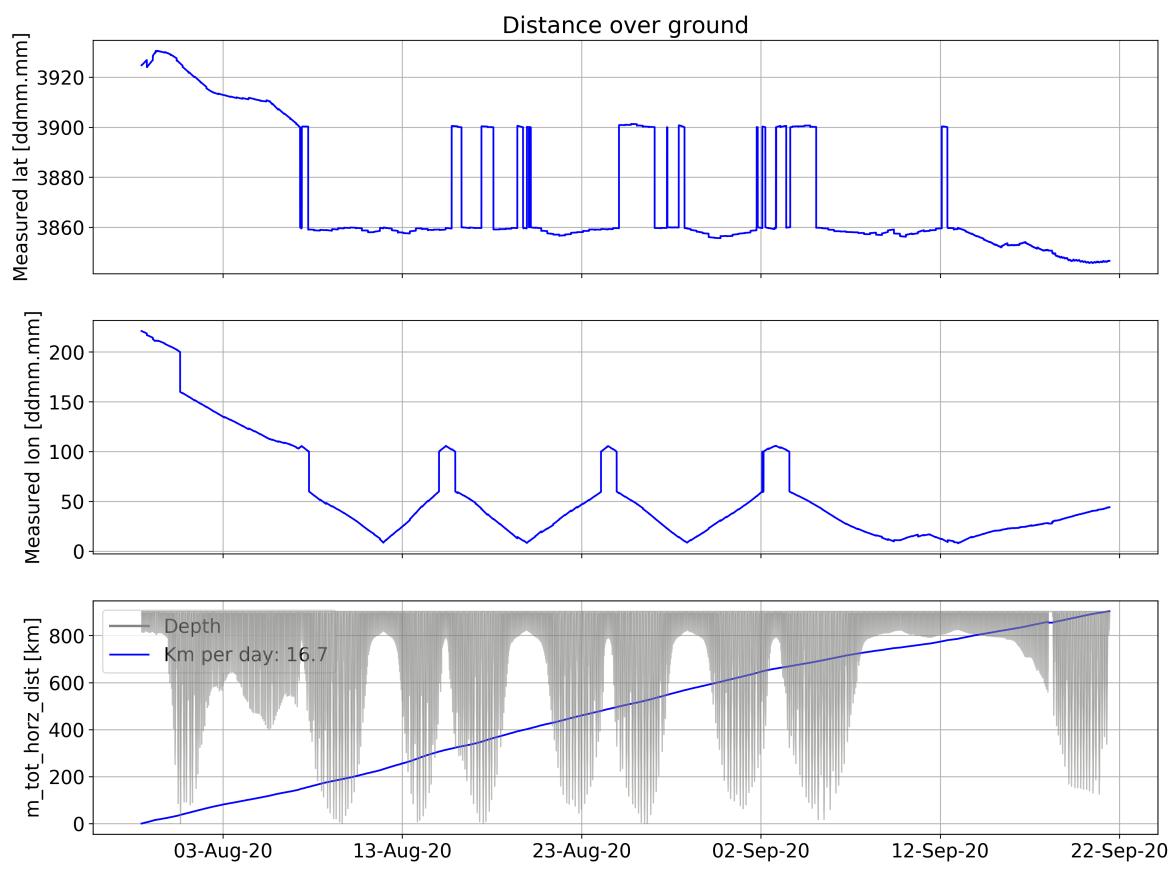


Figure 2.3: Distance over ground

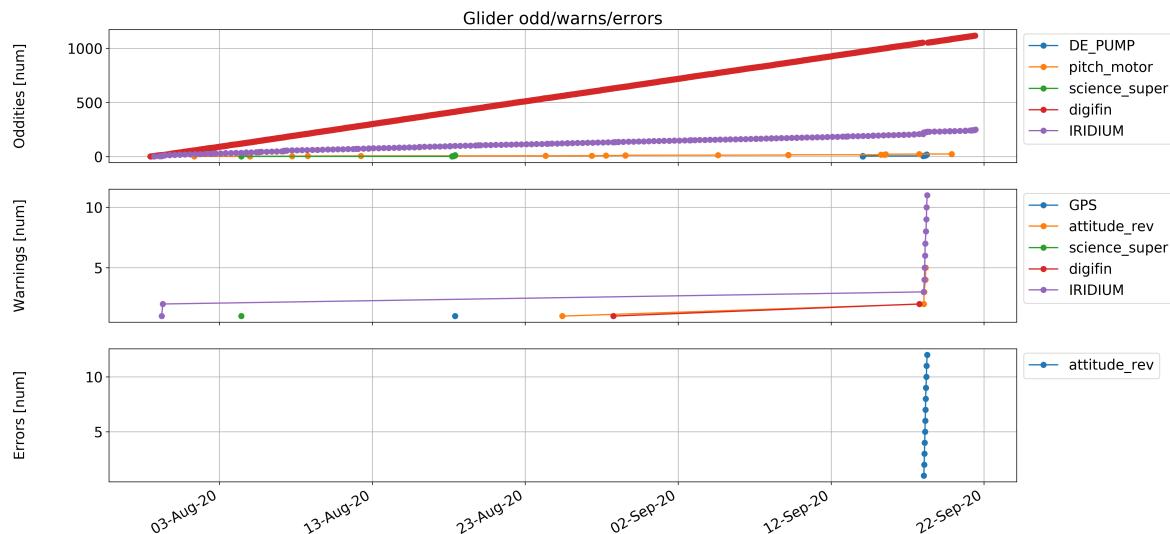


Figure 2.4: Glider Odd Warn and Err

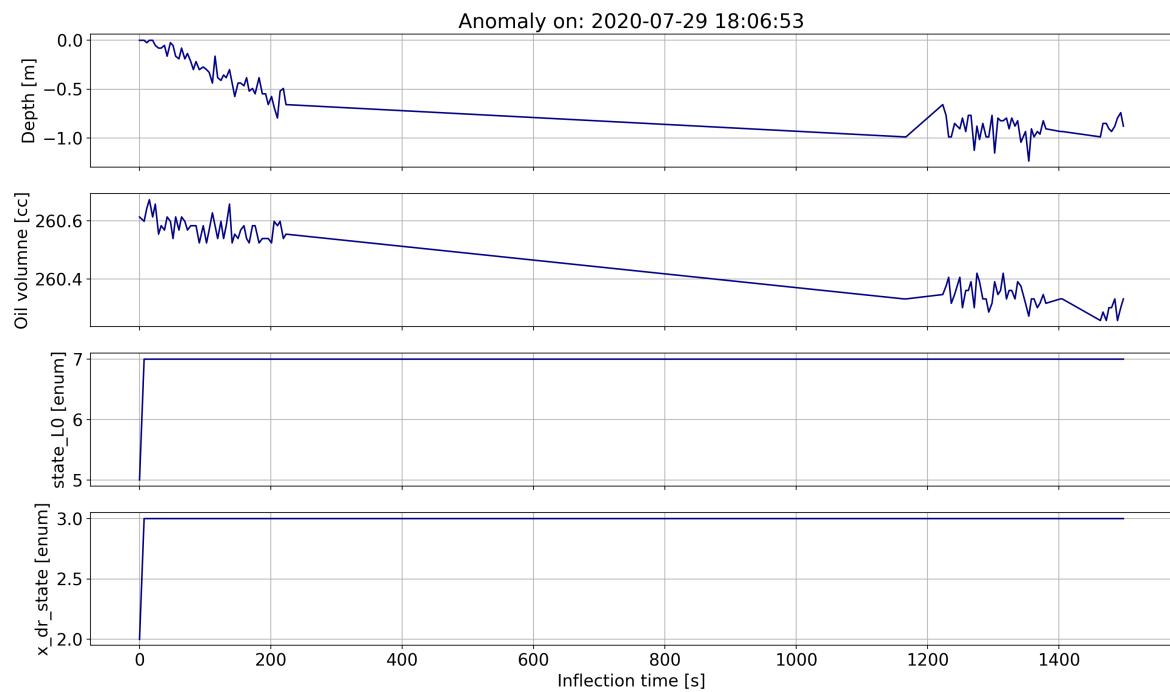


Figure 2.5: 20200729T180653 Anomaly 1

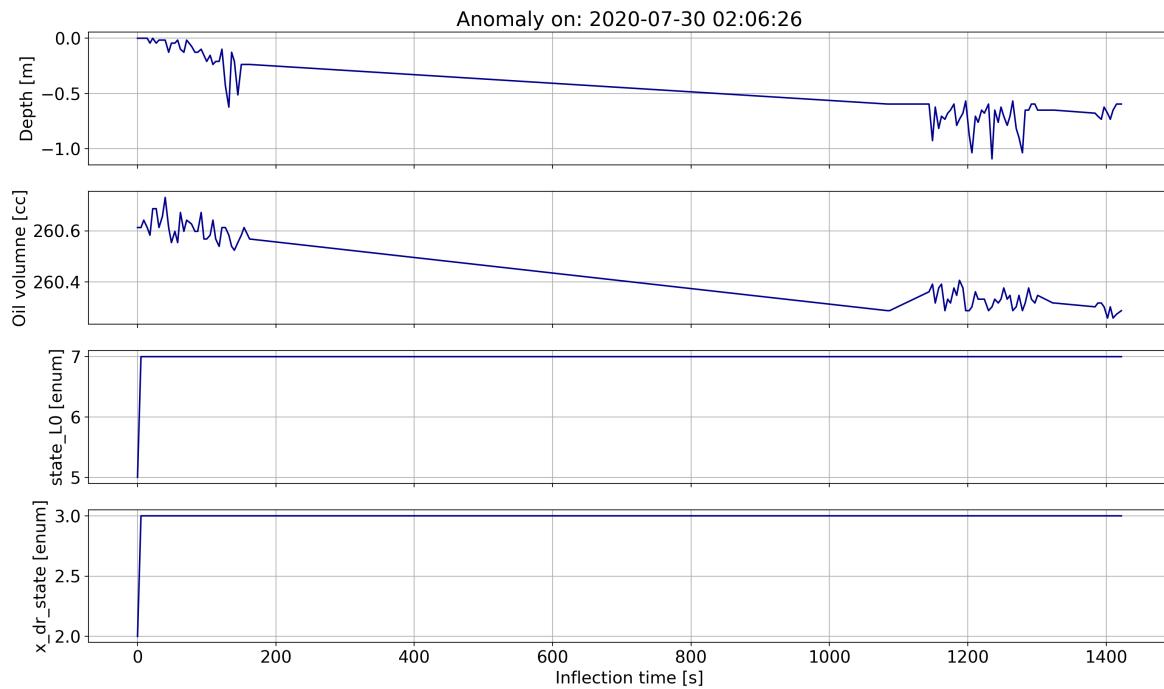


Figure 2.6: 20200730T020626 Anomaly 2

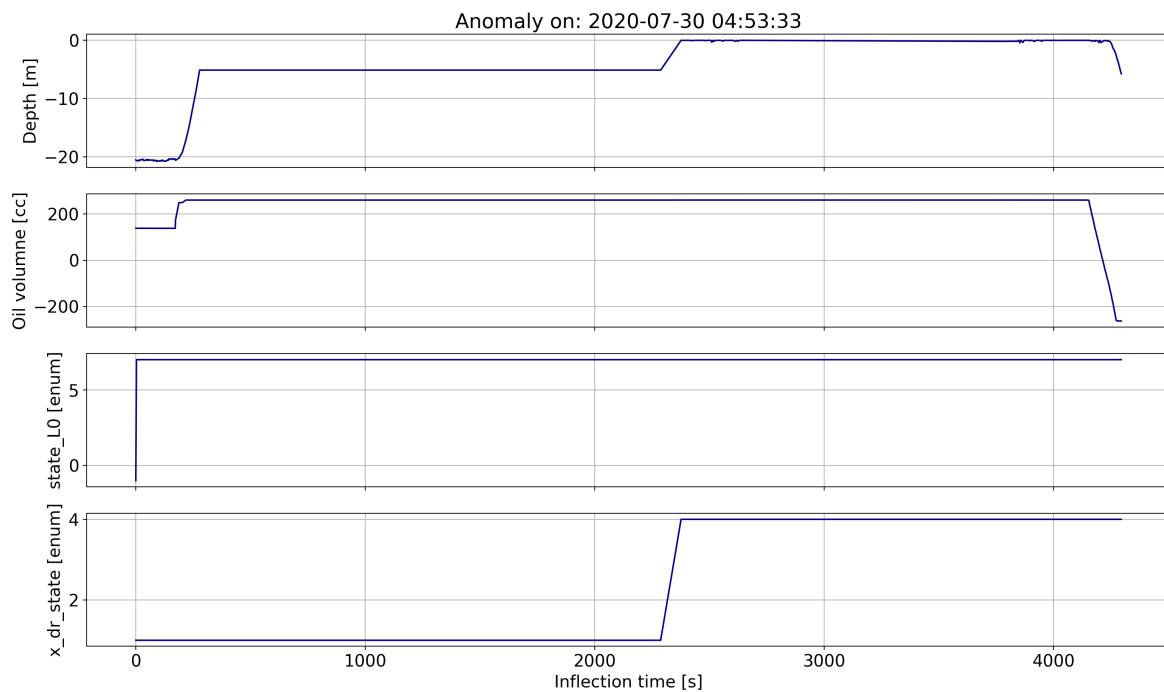


Figure 2.7: 20200730T045333 Anomaly 3

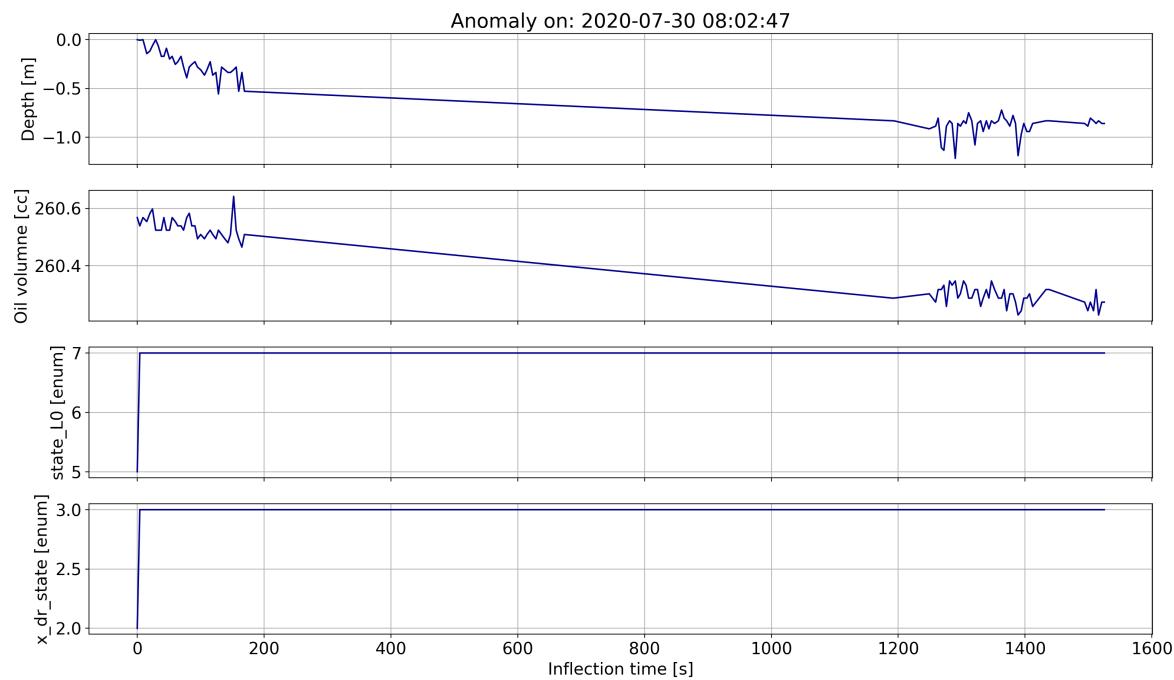


Figure 2.8: 20200730T080247 Anomaly 4

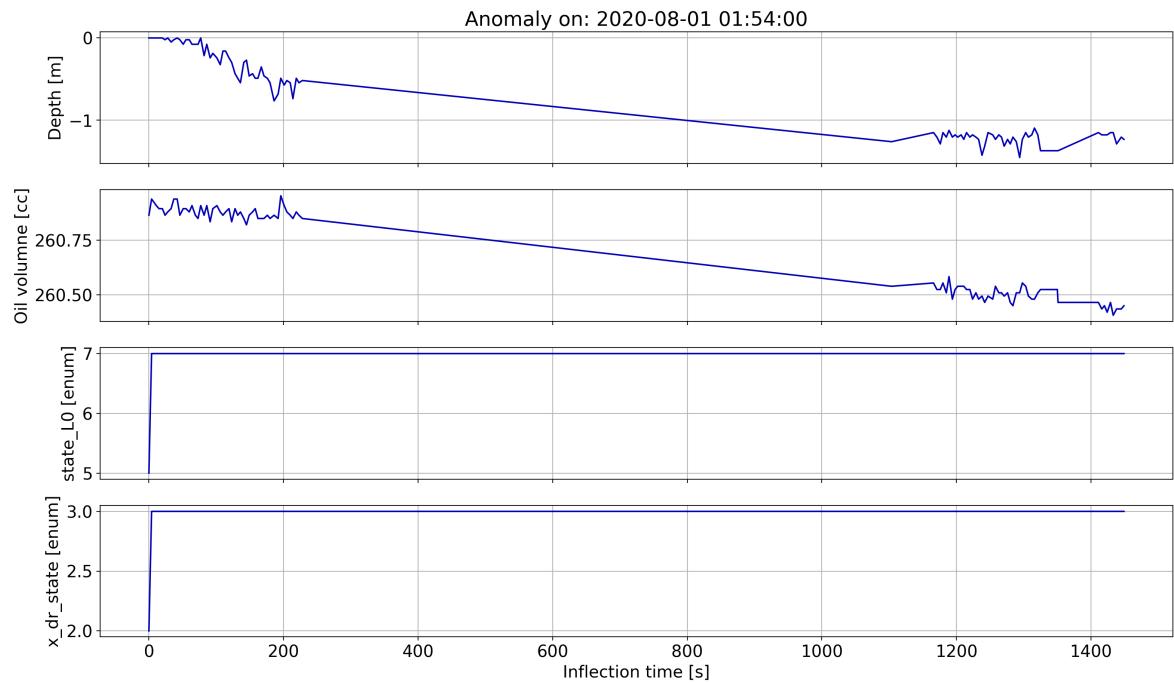


Figure 2.9: 20200801T015400 Anomaly 5

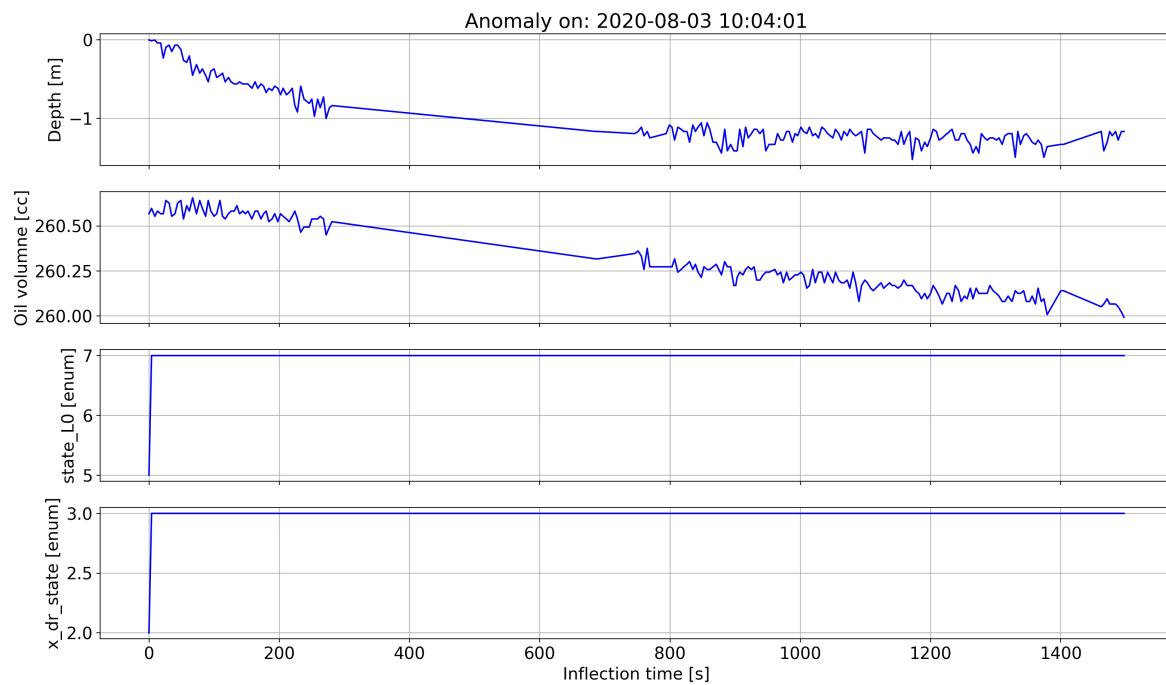


Figure 2.10: 20200803T100401 Anomaly 6

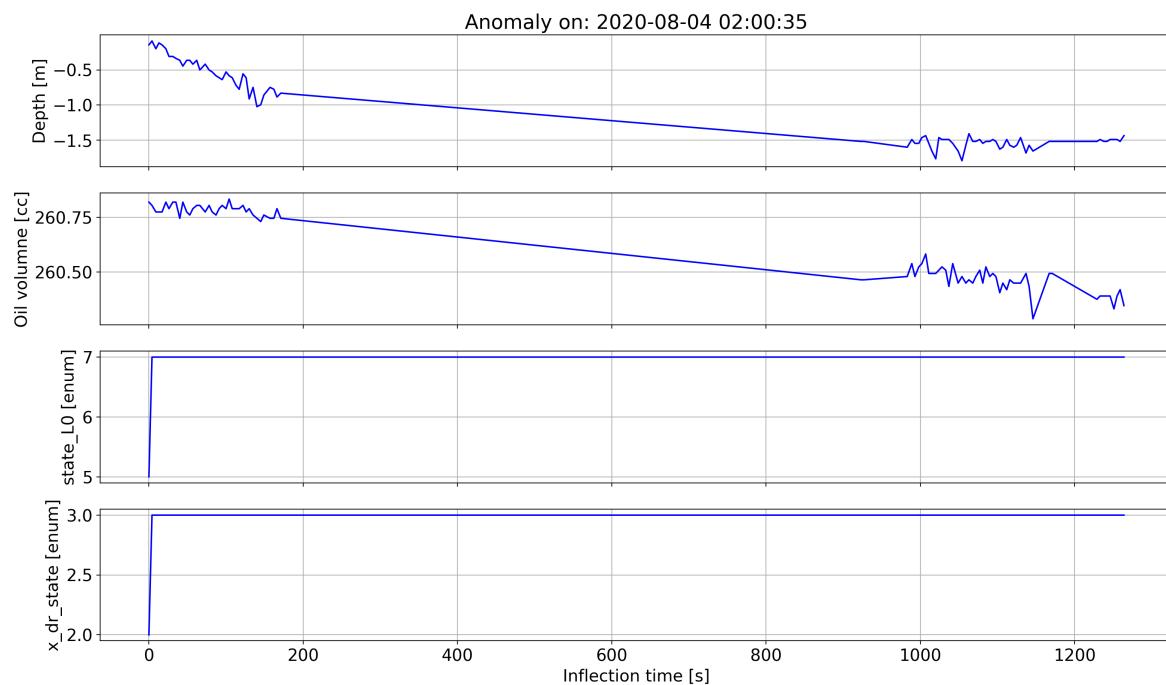


Figure 2.11: 20200804T020035 Anomaly 7

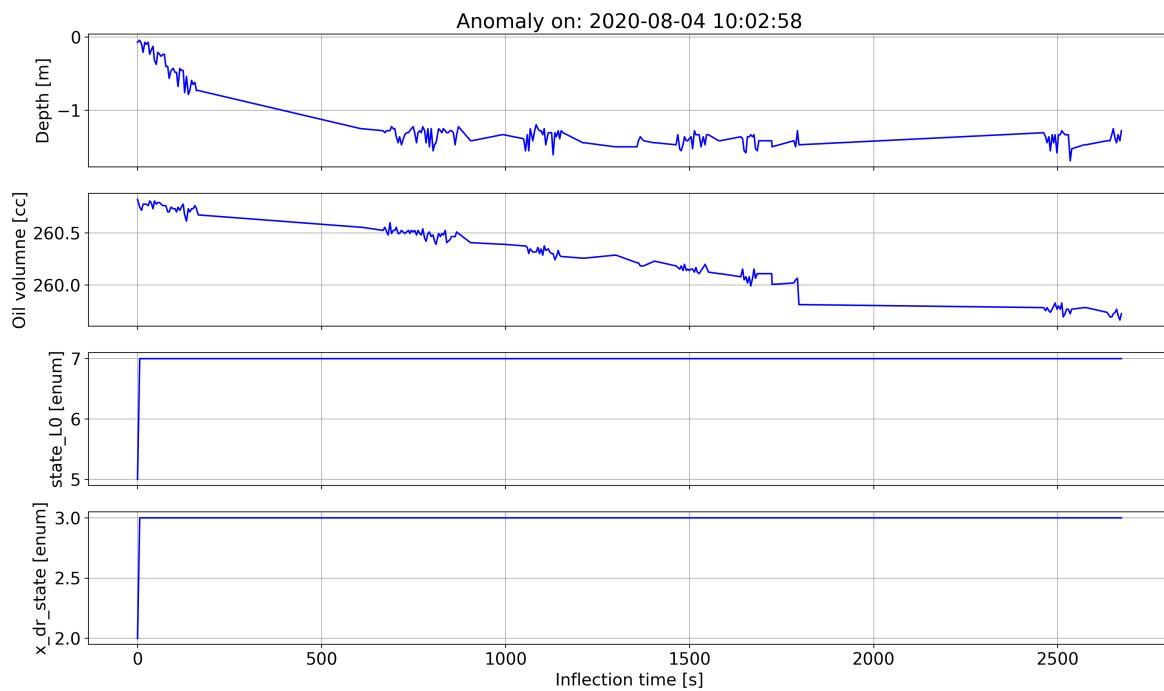


Figure 2.12: 20200804T100258 Anomaly 8

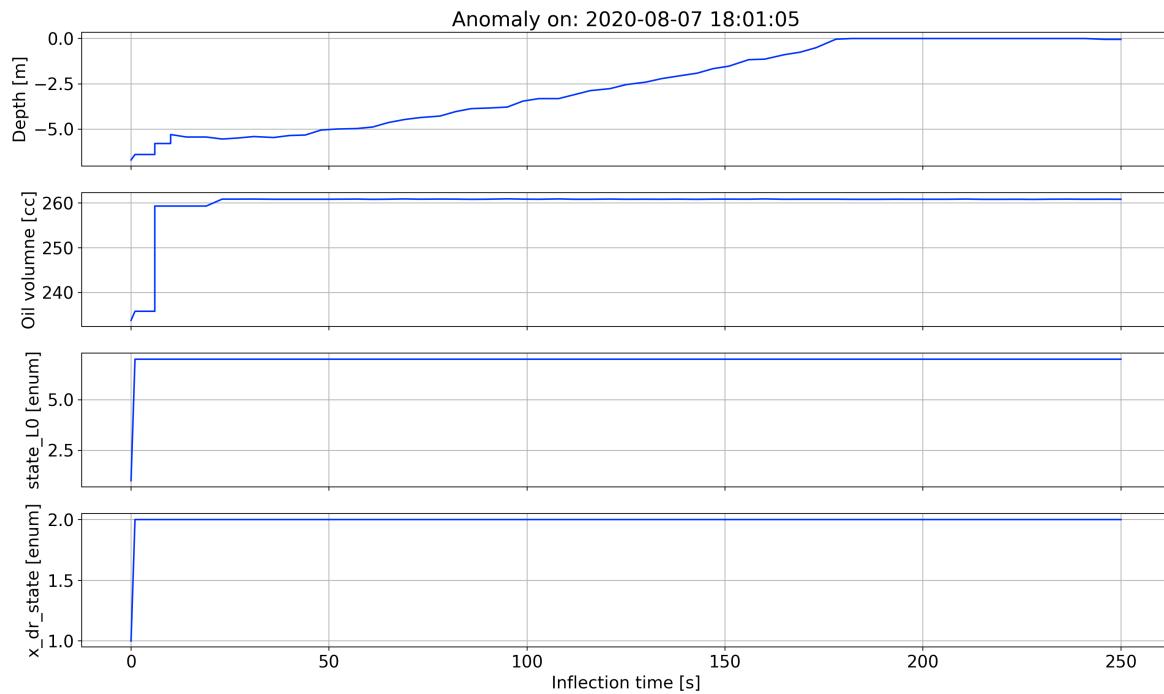


Figure 2.13: 20200807T180105 Anomaly 9

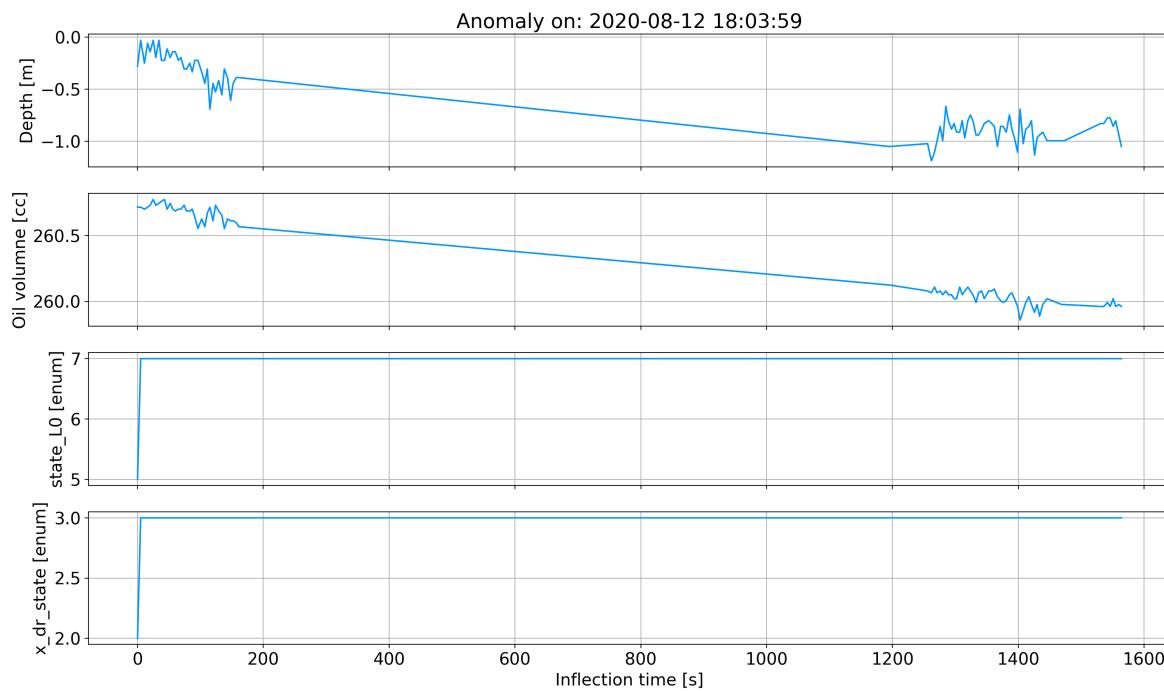


Figure 2.14: 20200812T180359 Anomaly 10

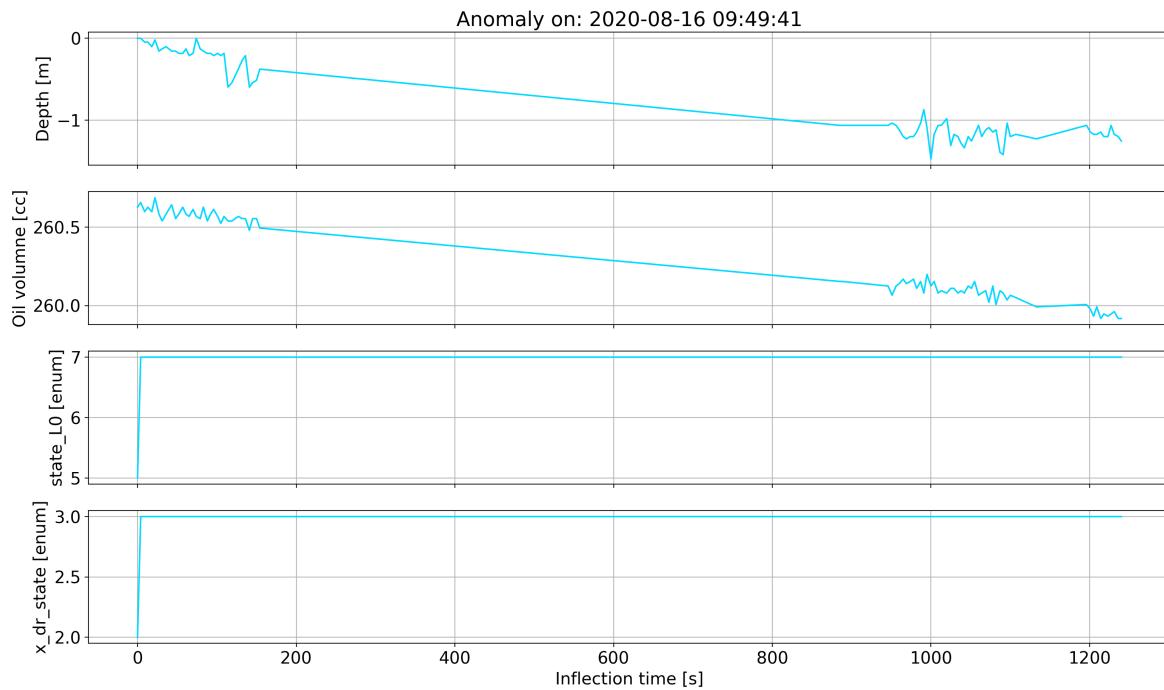


Figure 2.15: 20200816T094941 Anomaly 11

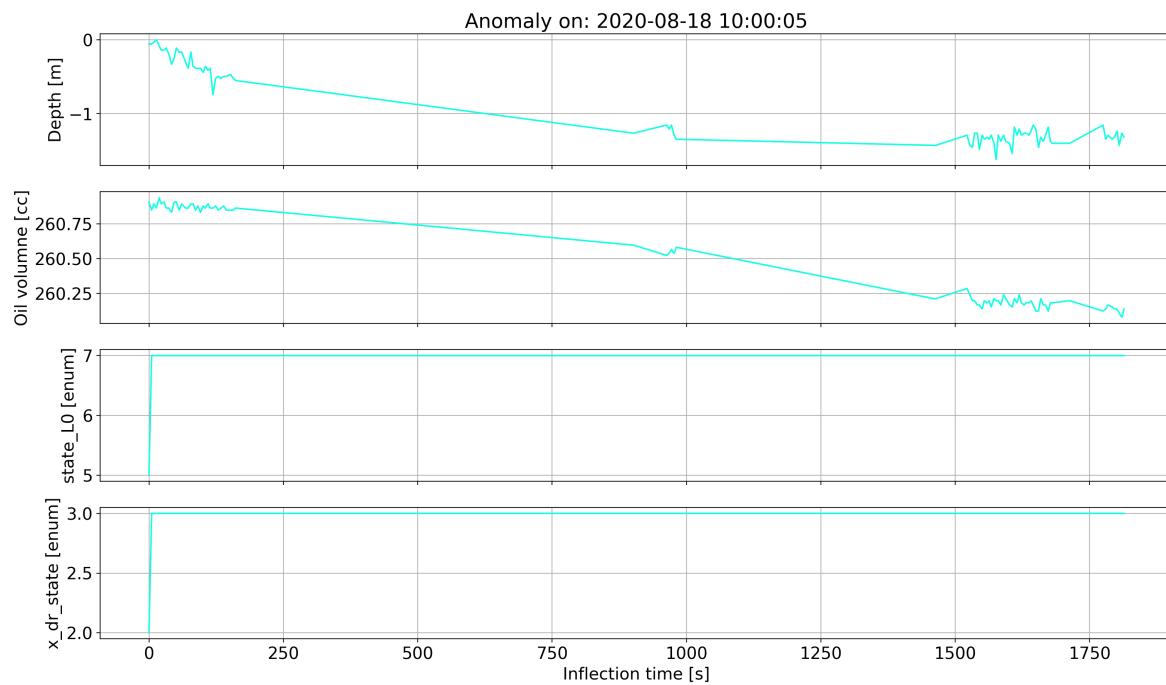


Figure 2.16: 20200818T100005 Anomaly 12

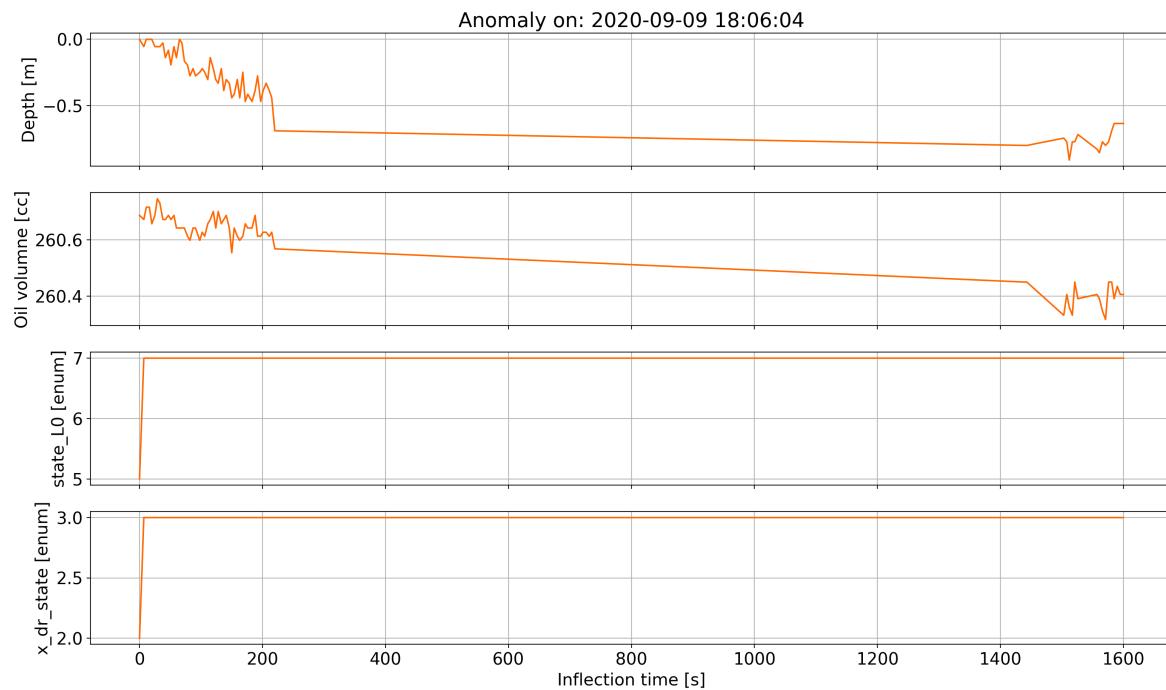


Figure 2.17: 20200909T180604 Anomaly 13

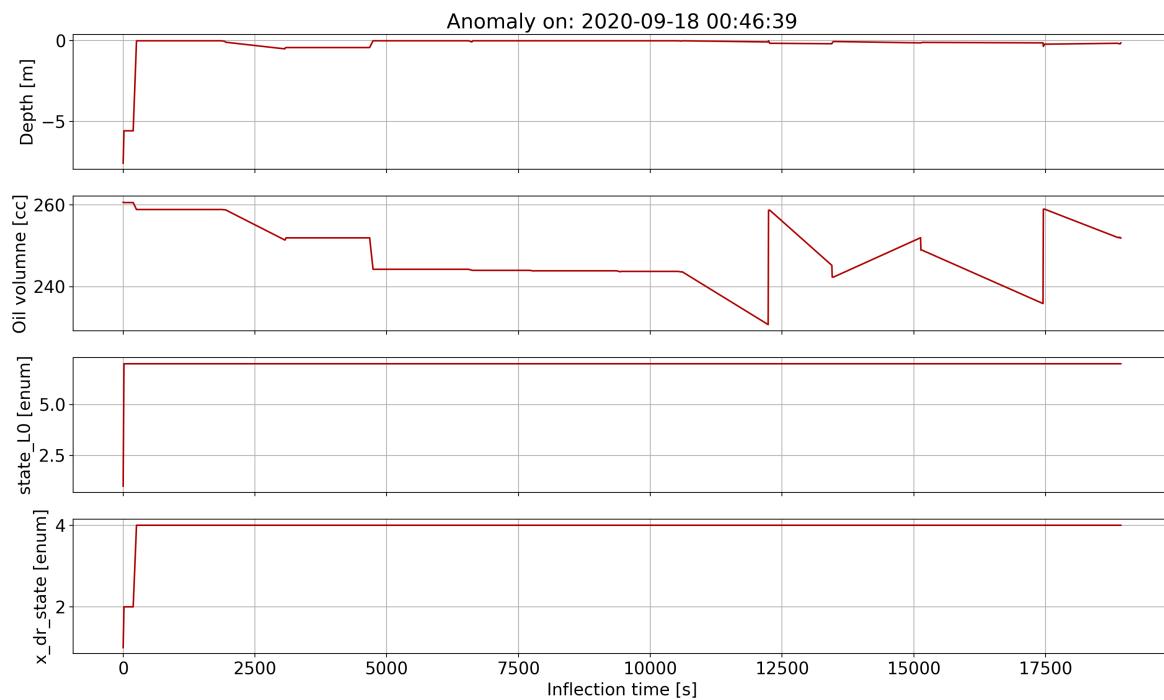


Figure 2.18: 20200918T004639 Anomaly 14

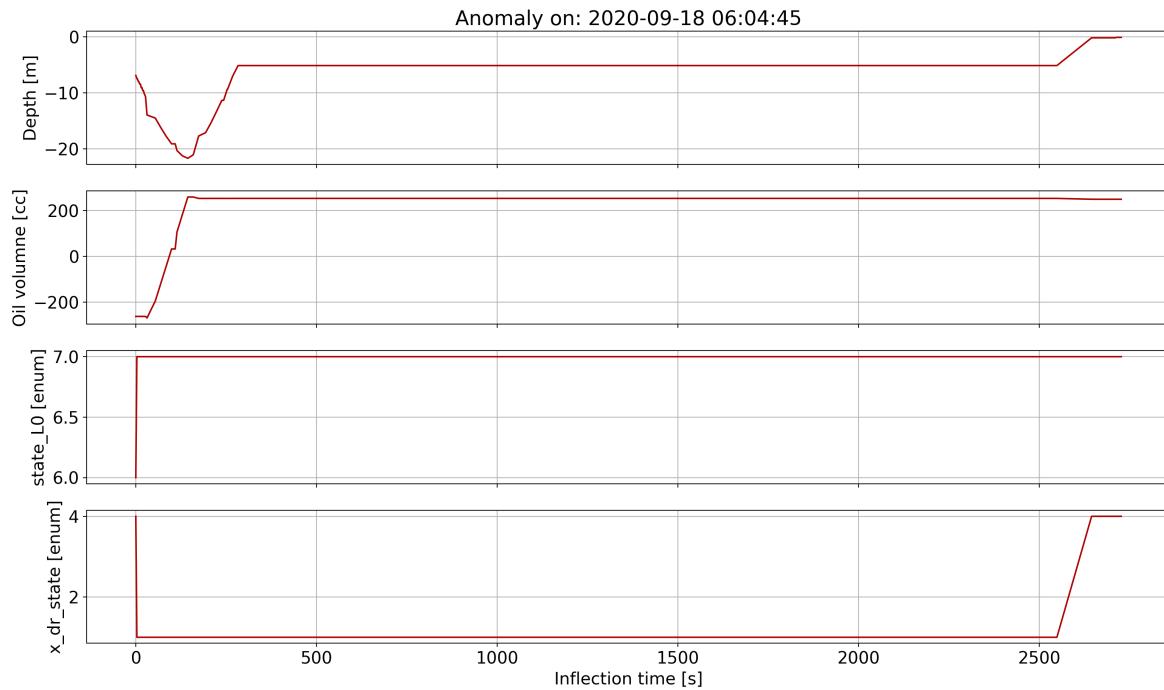


Figure 2.19: 20200918T060445 Anomaly 15

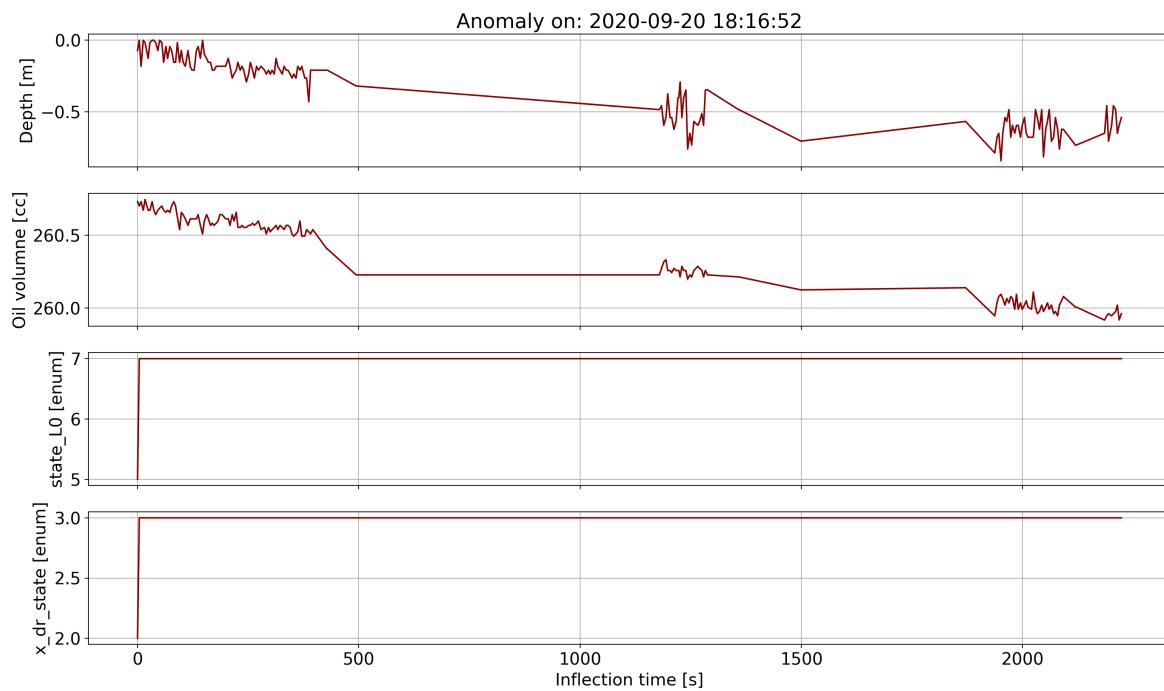


Figure 2.20: 20200920T181652 Anomaly 16

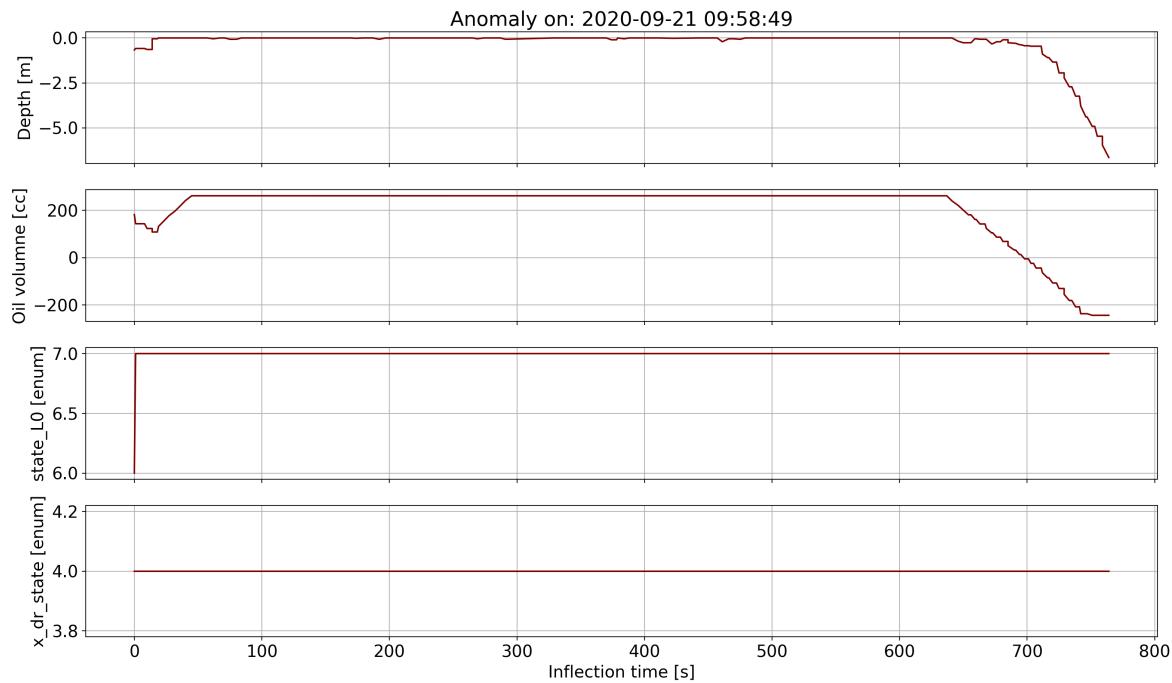


Figure 2.21: 20200921T095849 Anomaly 17

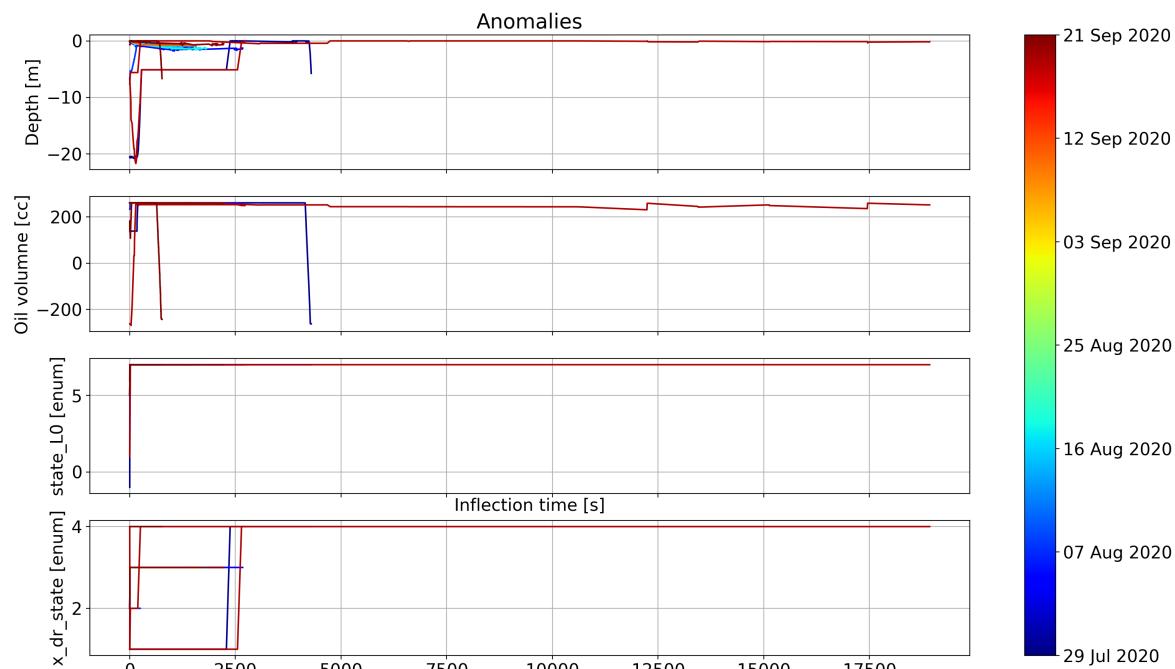


Figure 2.22: Anomalies (time)

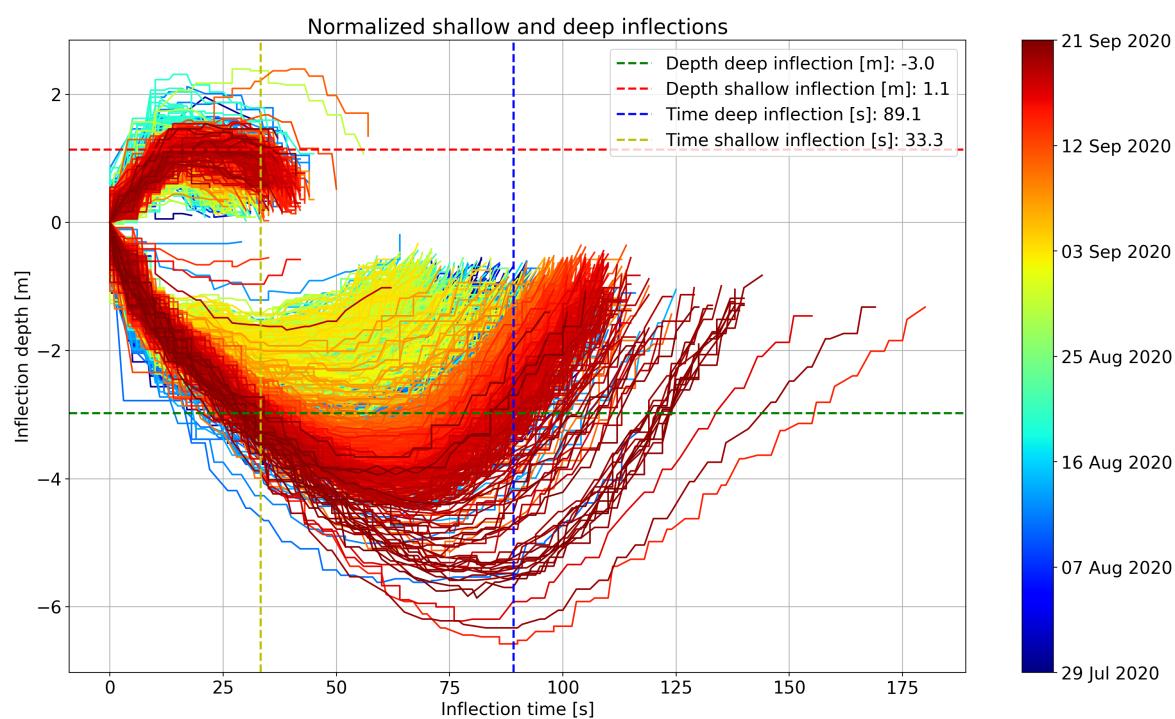


Figure 2.23: Depth inflections

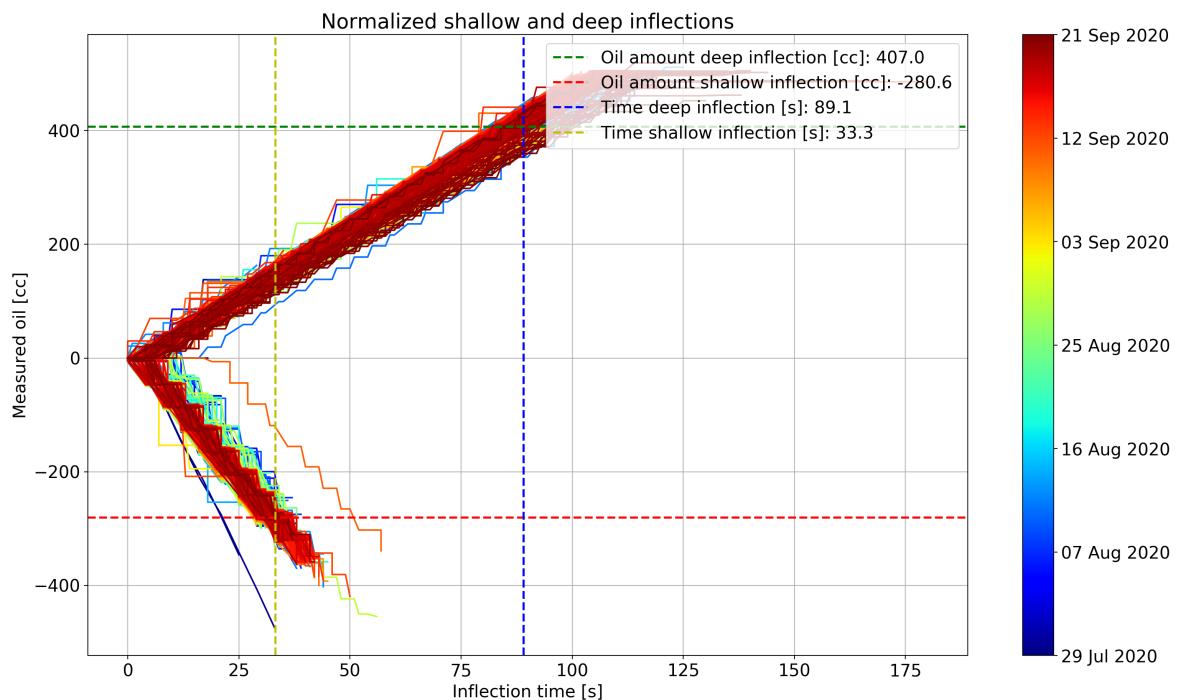


Figure 2.24: Oil inflections

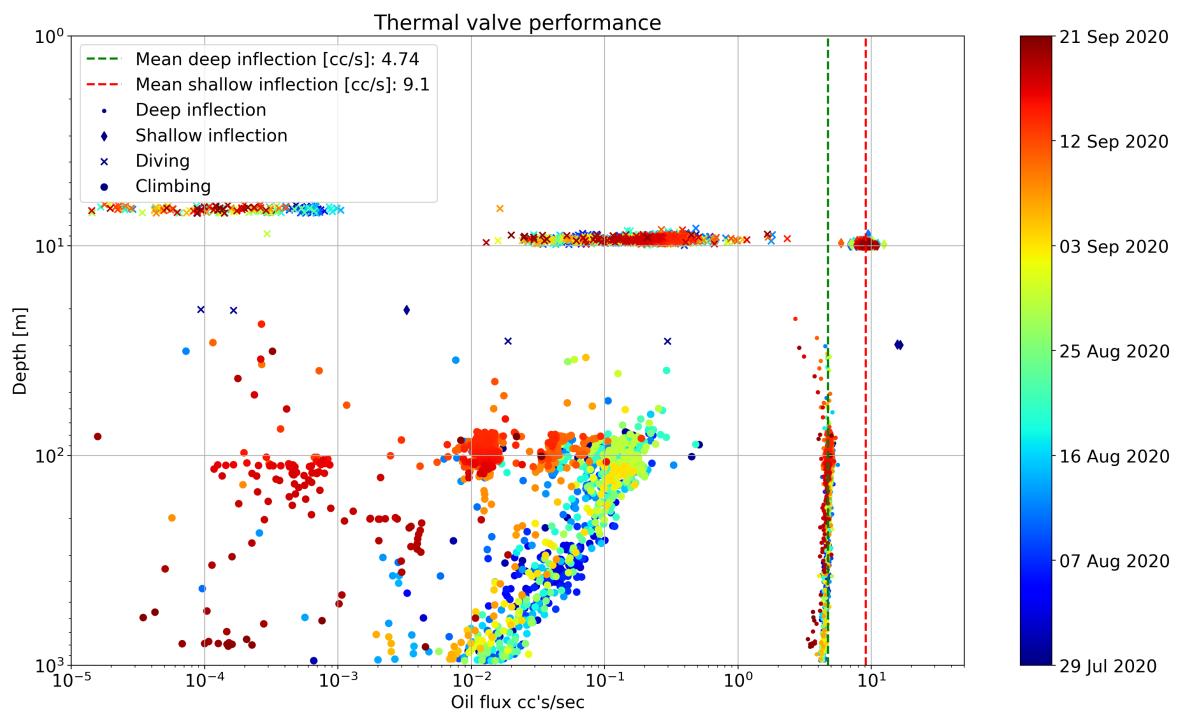


Figure 2.25: Oil flux

Normalized shallow and deep inflections

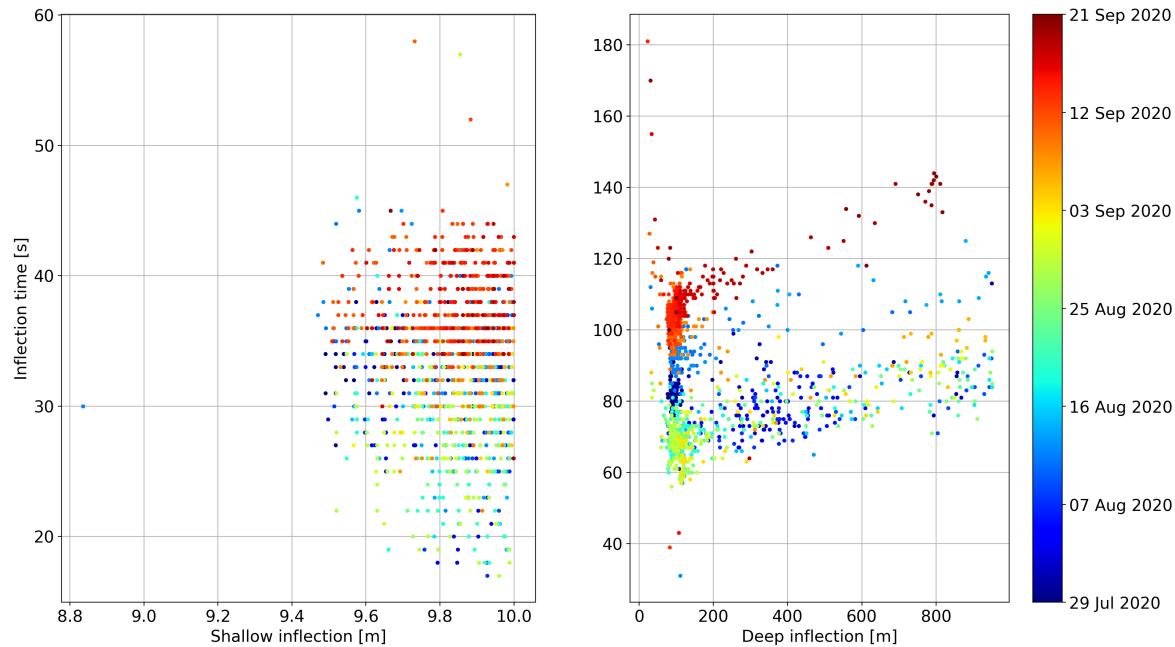


Figure 2.26: Duration inflections

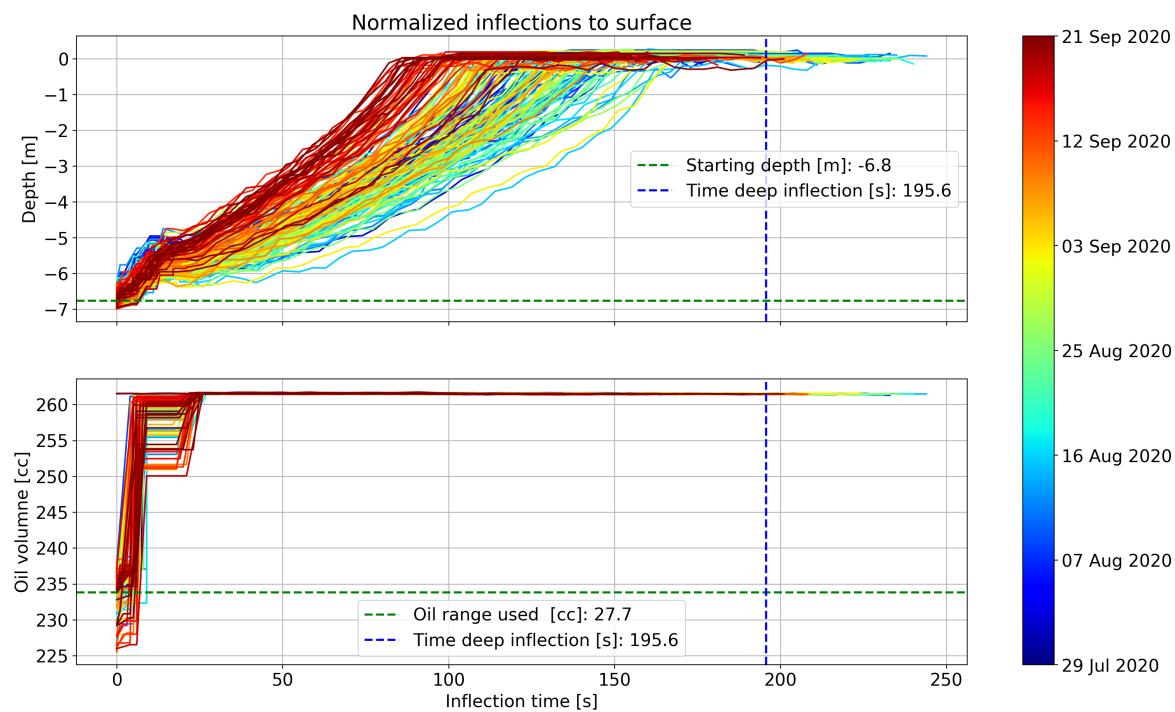


Figure 2.27: Surface Oil inflections

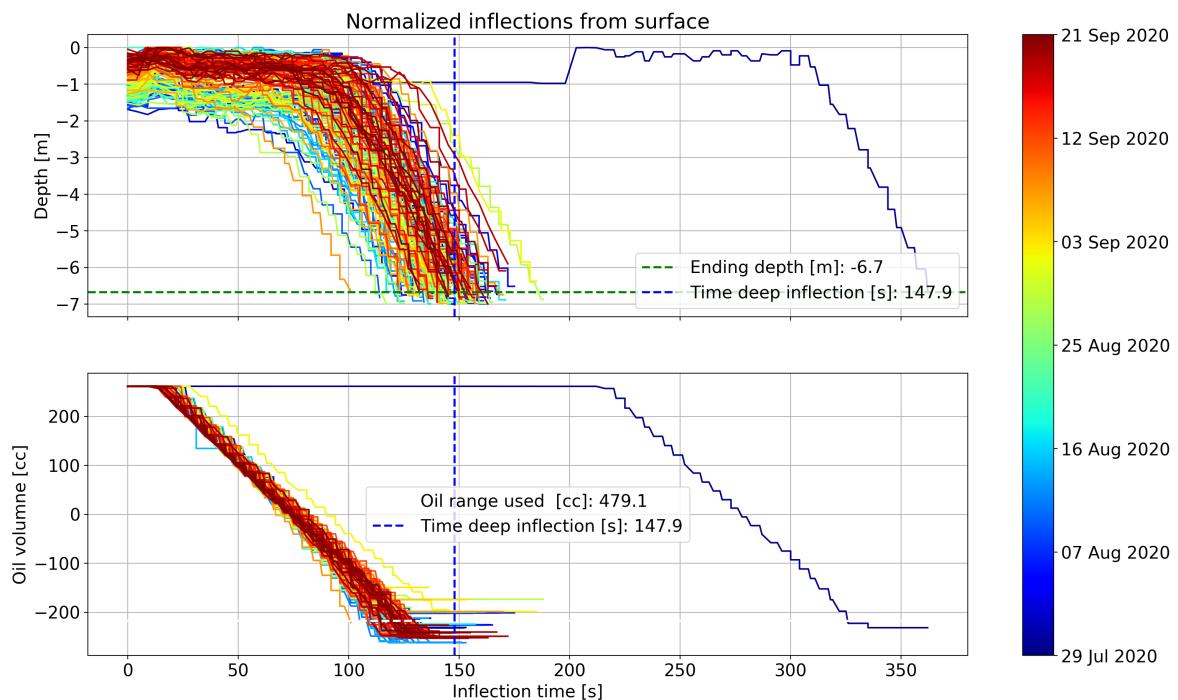


Figure 2.28: Surface Duration inflections

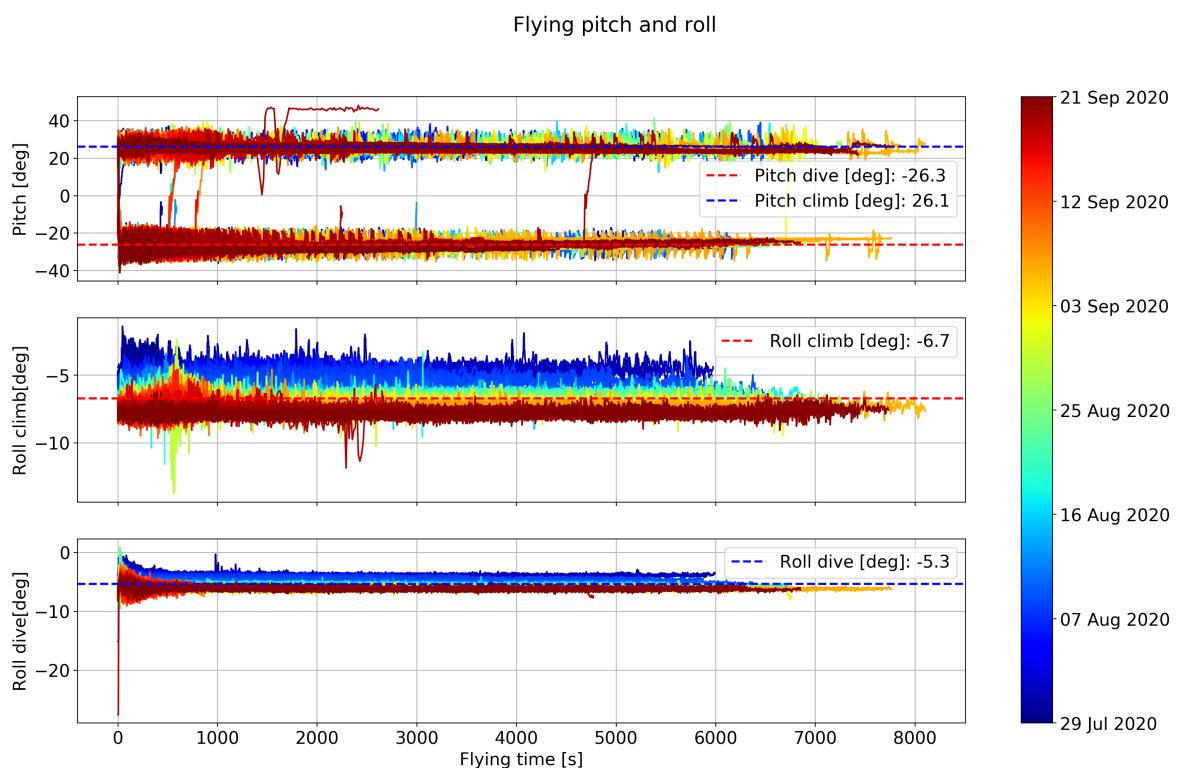


Figure 2.29: Pitch and roll, when climbing and diving

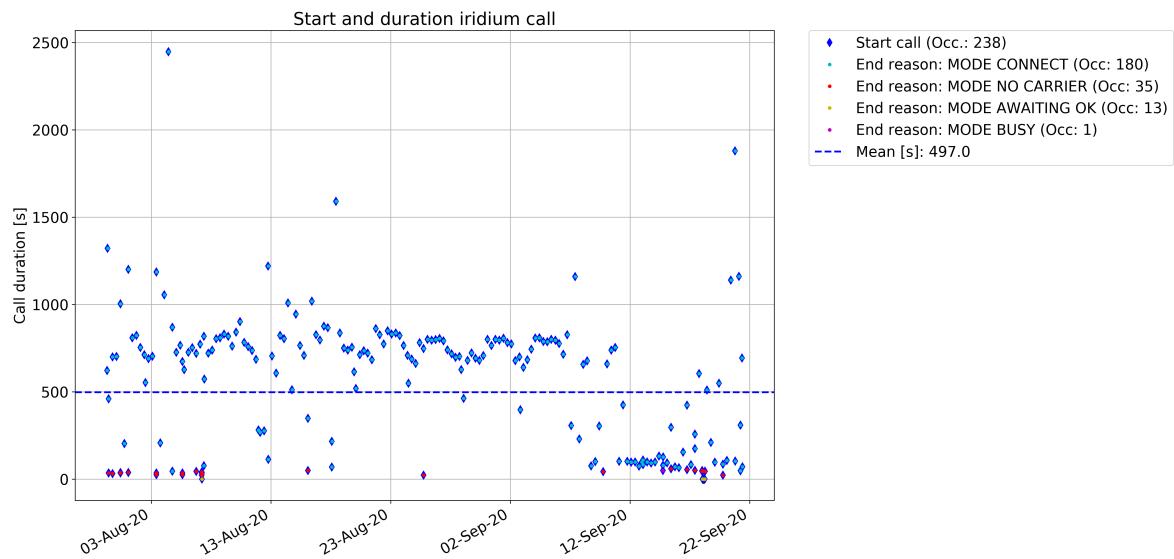


Figure 2.30: Iridium Status

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	9599	20190524	2797	2819	829918	5.273	590.0
FLNTU-FLBBCDSLC	6171	20200302	1364	2819	na	na	199.8
OXY 3-4	0825	20190815	2729	2819	689841	5.887	557.0
PAR	50310	20190823	1364	2819	174236	8.298	200.0
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	48
FLx	Turbidity dark count	50
FLx	CDOM dark count	na
FLx	BB700 dark count	na

3.2 SCI plots

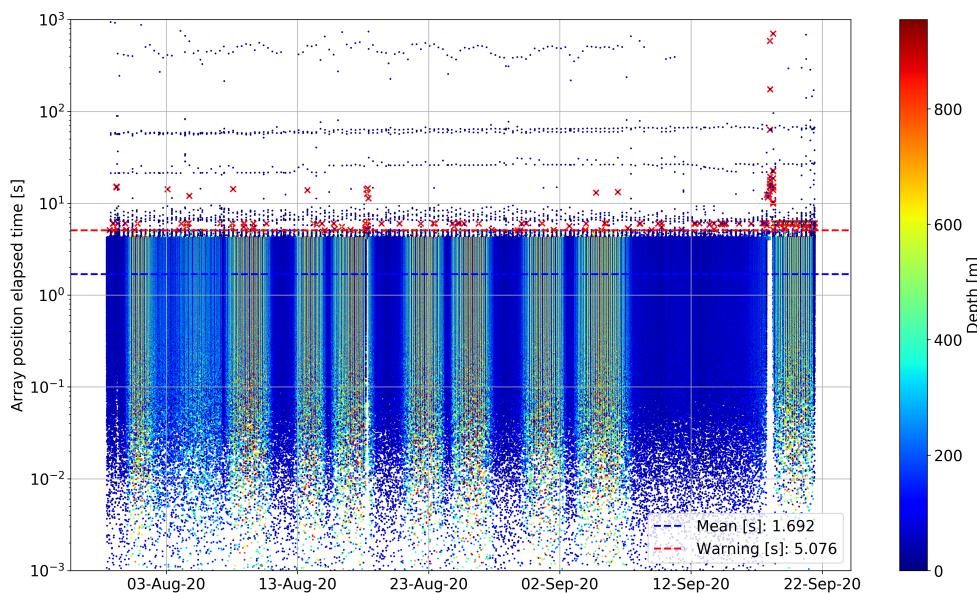


Figure 3.1: Array time

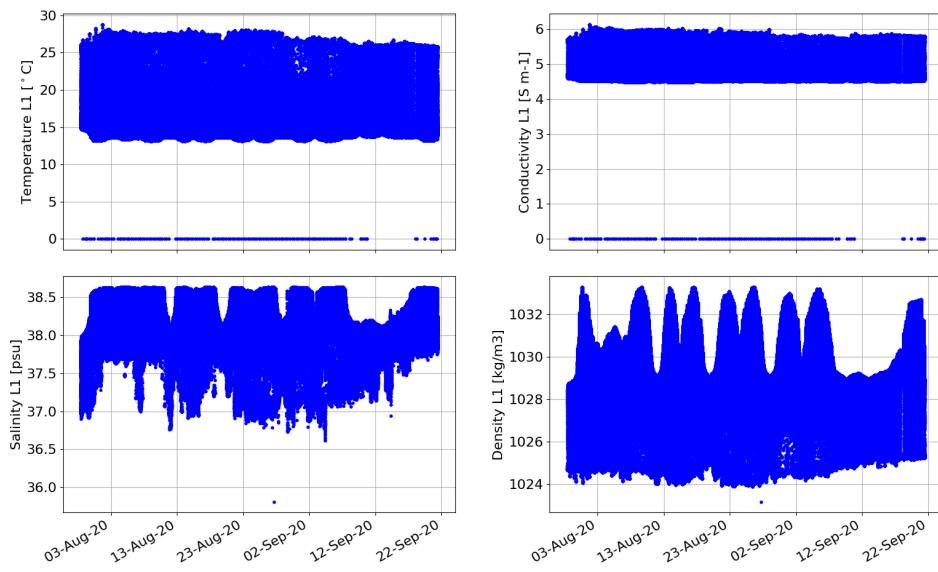


Figure 3.2: Raw CTD L1

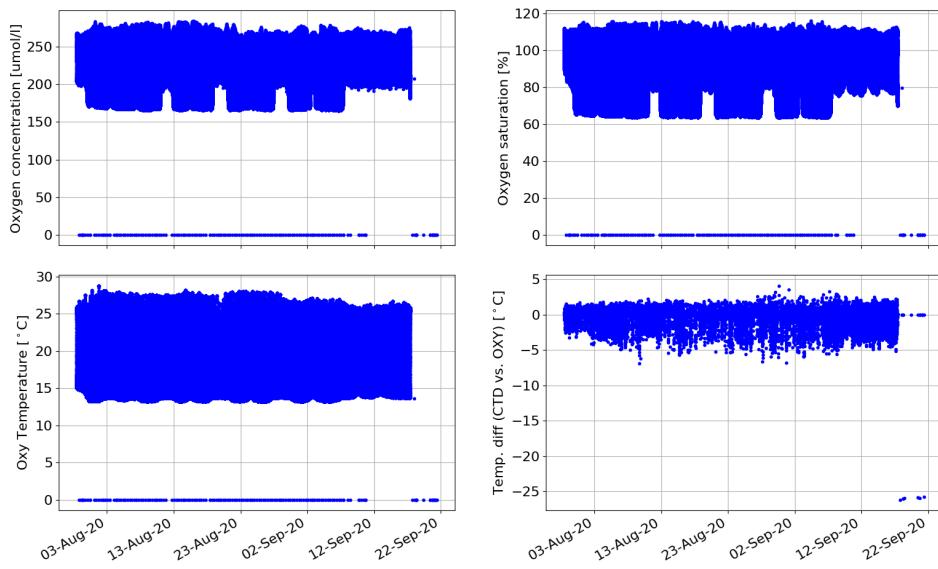


Figure 3.3: Raw OXY L1

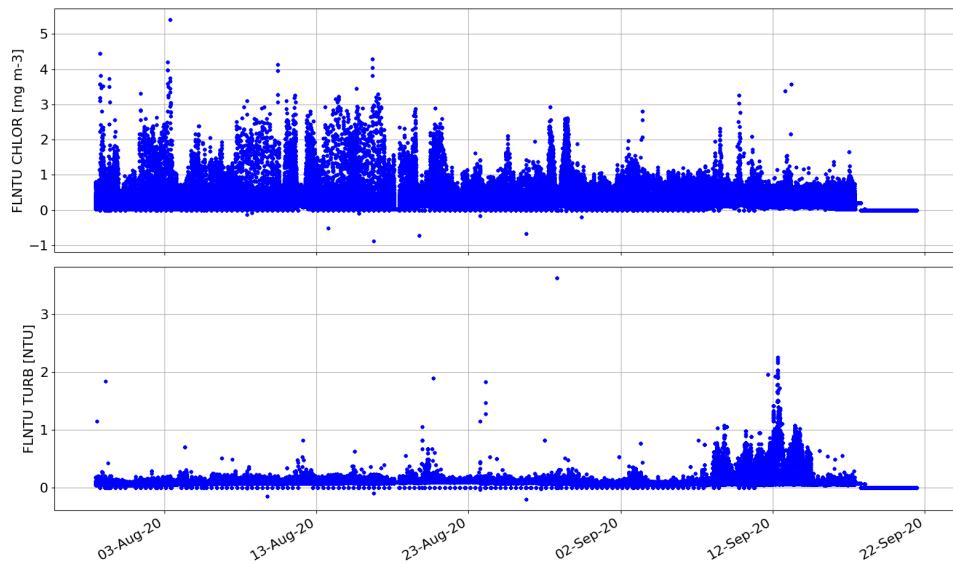


Figure 3.4: Raw FLNTU L1

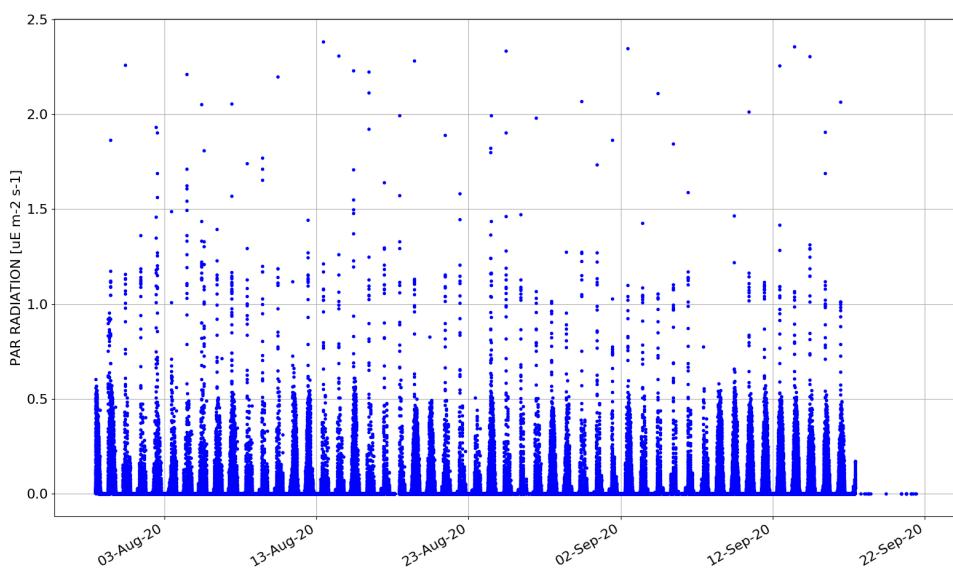


Figure 3.5: Raw PAR L1

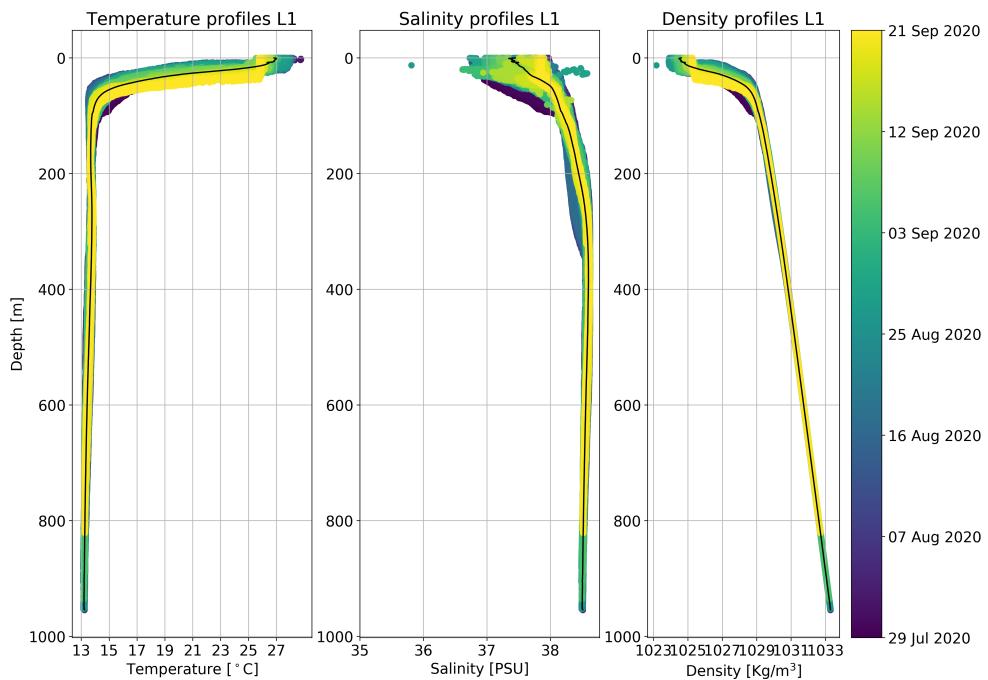


Figure 3.6: CTD profiles

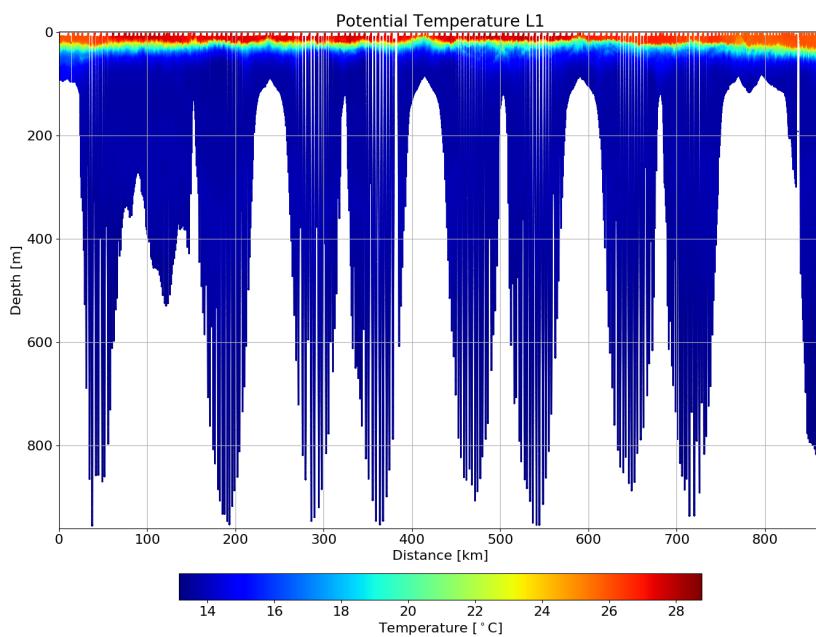


Figure 3.7: CTD temperature

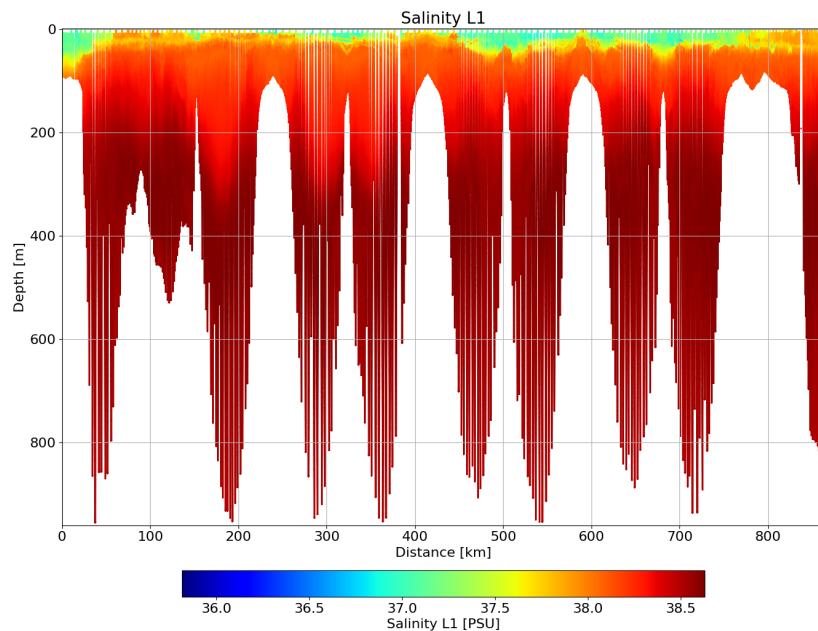


Figure 3.8: CTD Salinity

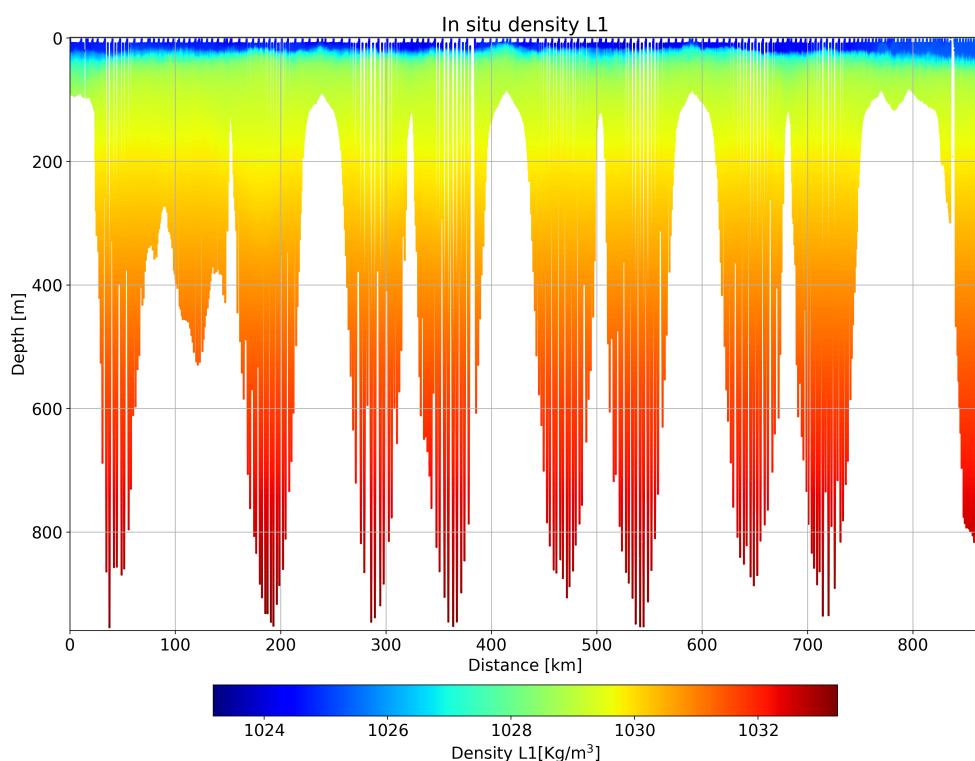


Figure 3.9: CTD Density

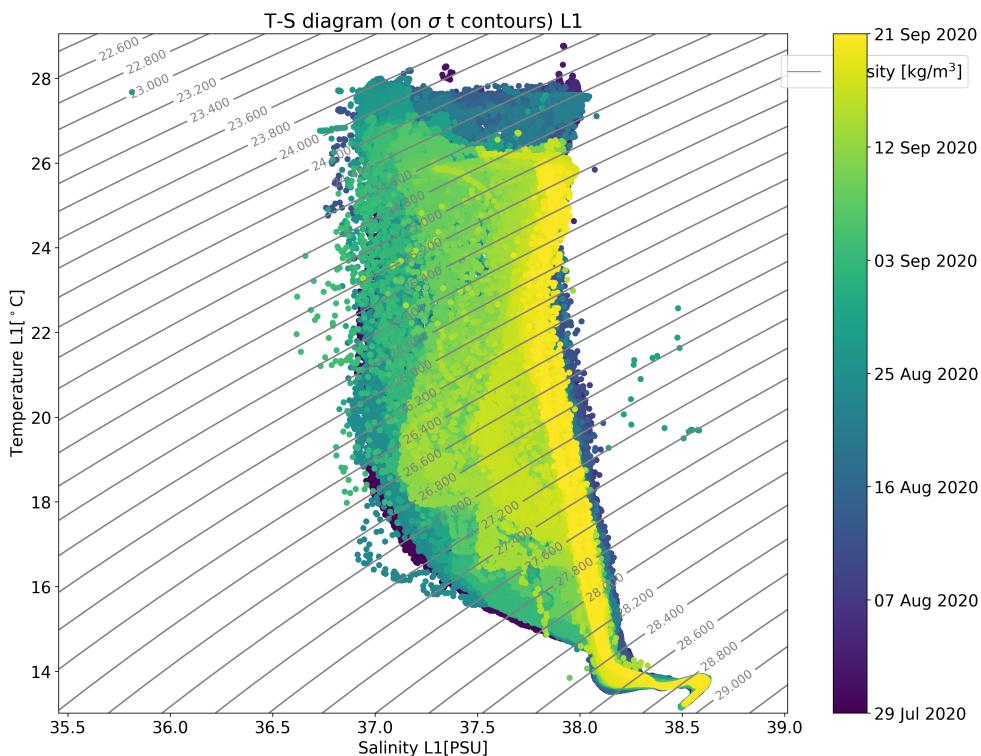


Figure 3.10: TS diagram (CTD)

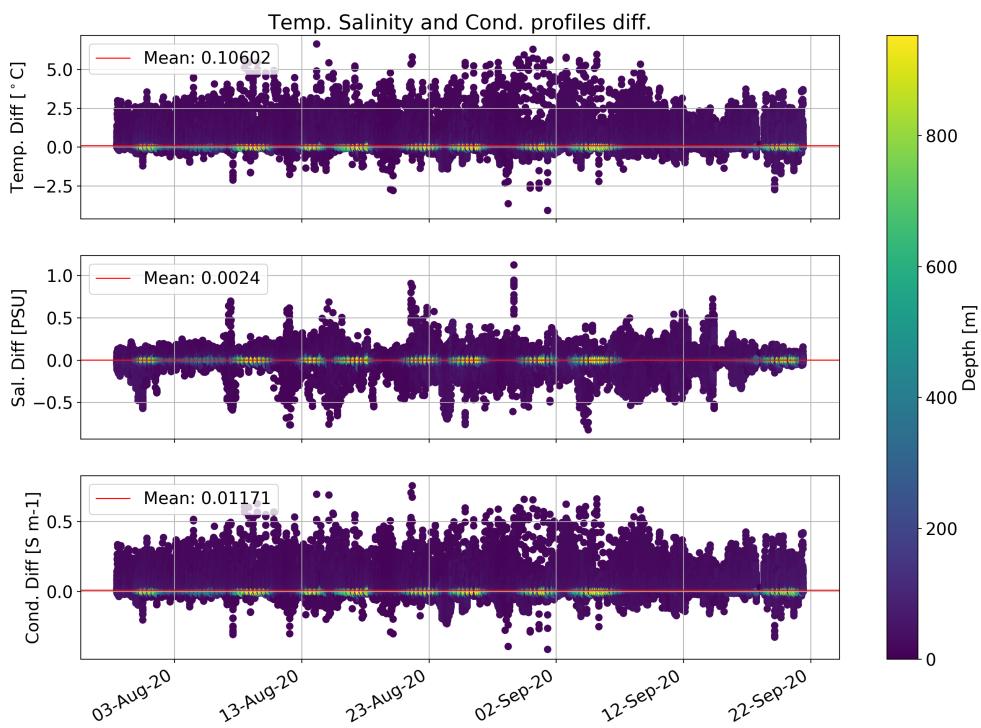


Figure 3.11: Profile consistency (CTD)

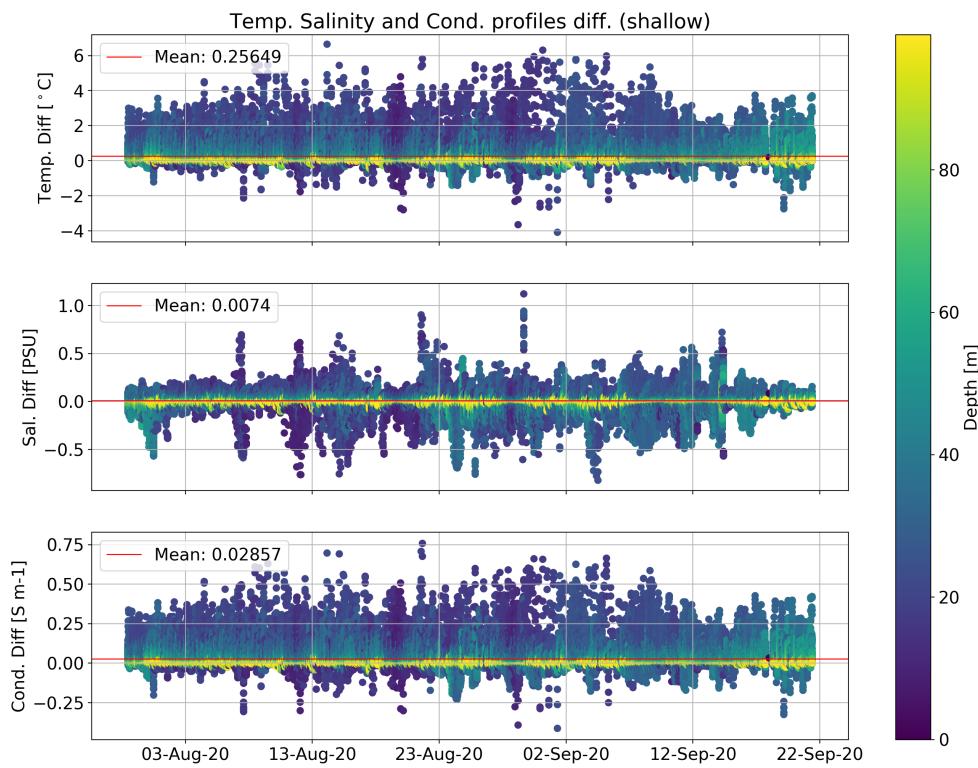


Figure 3.12: Profile consistency (CTD) zoom

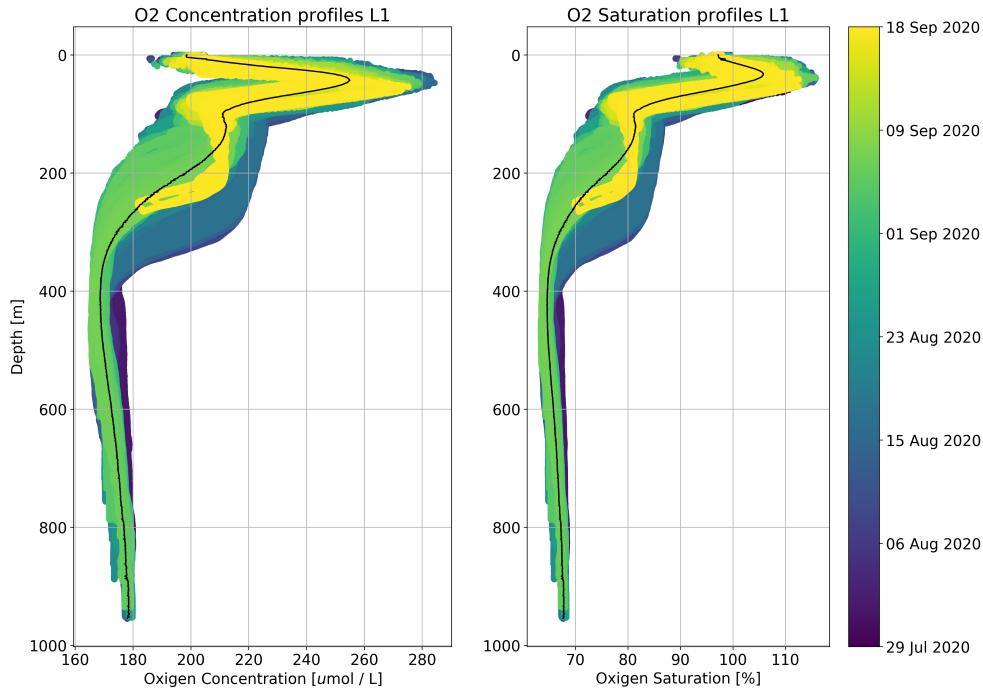


Figure 3.13: Oxygen profiles

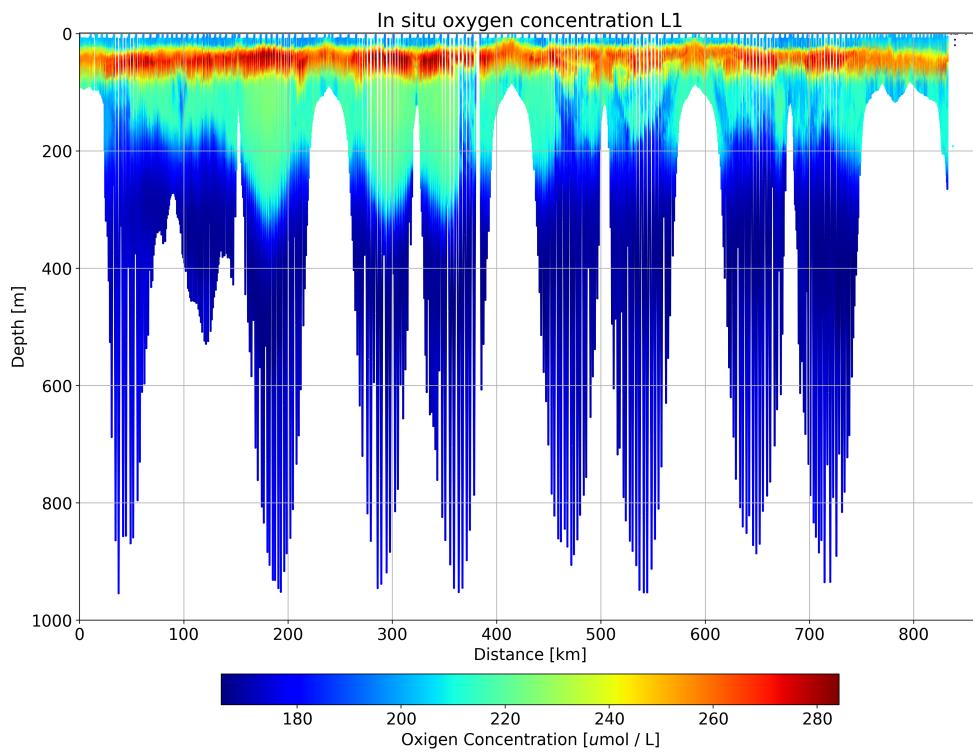


Figure 3.14: Oxygen Concentration

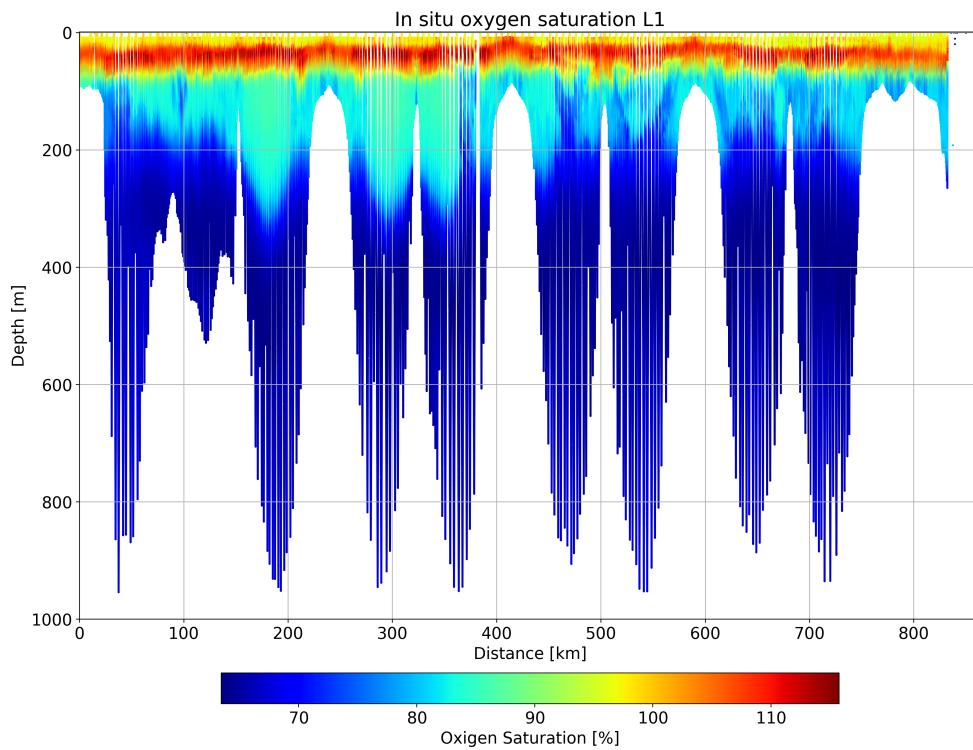


Figure 3.15: Oxygen Saturation

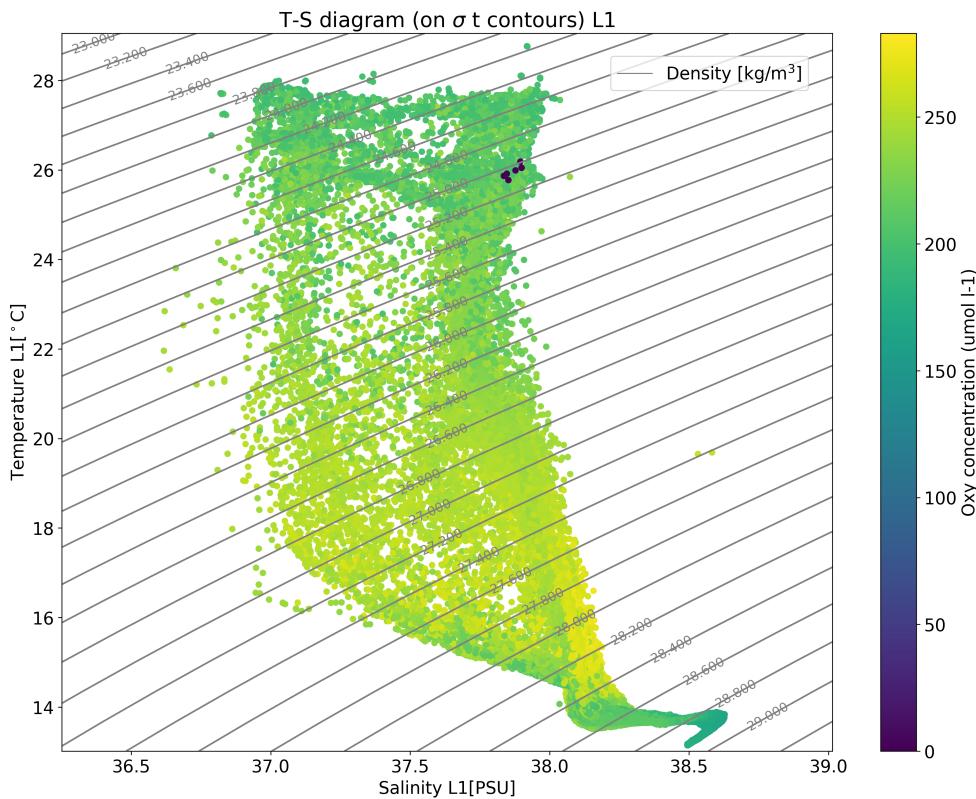


Figure 3.16: TS diagram (OXY)

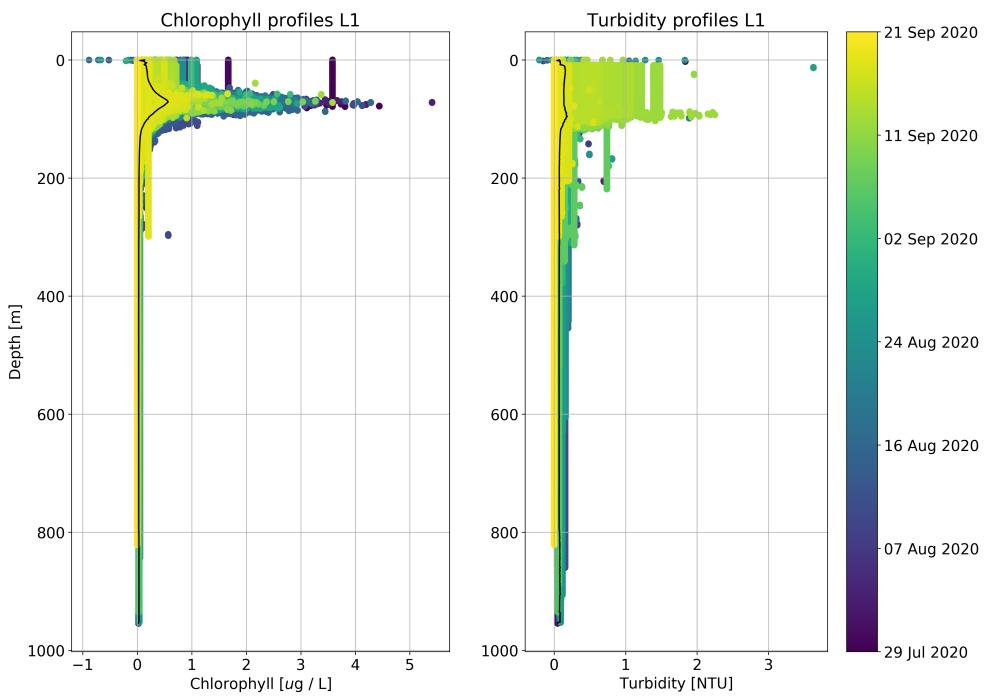


Figure 3.17: Chlorophyll-a and Turbidity profiles

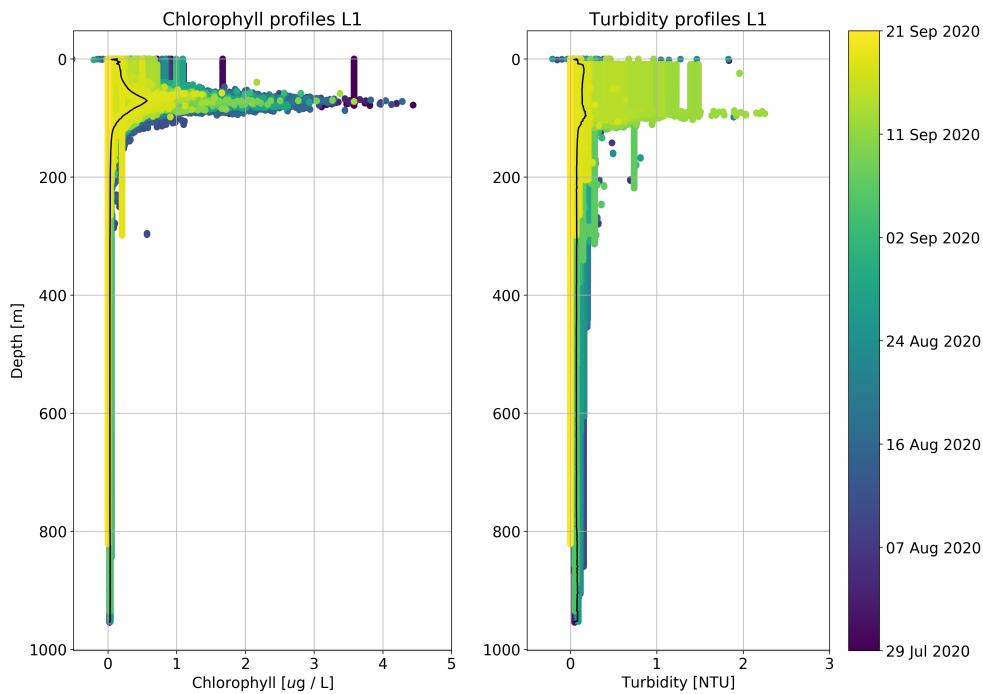


Figure 3.18: Chlorophyll-a and Turbidity profiles zoom

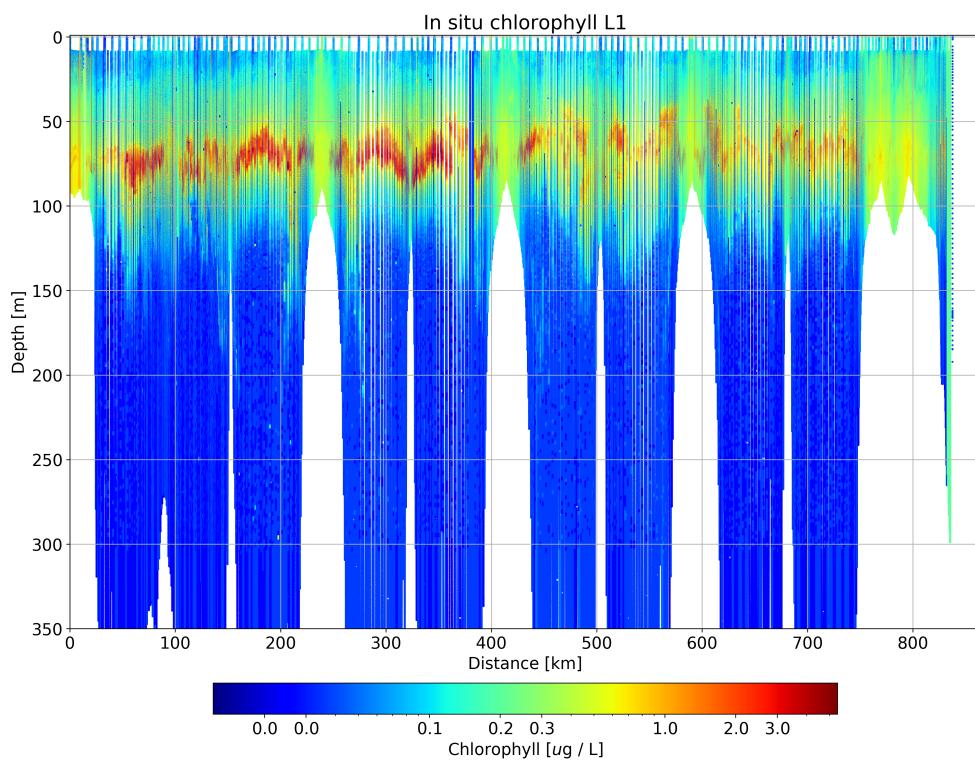


Figure 3.19: Chlorophyll-a

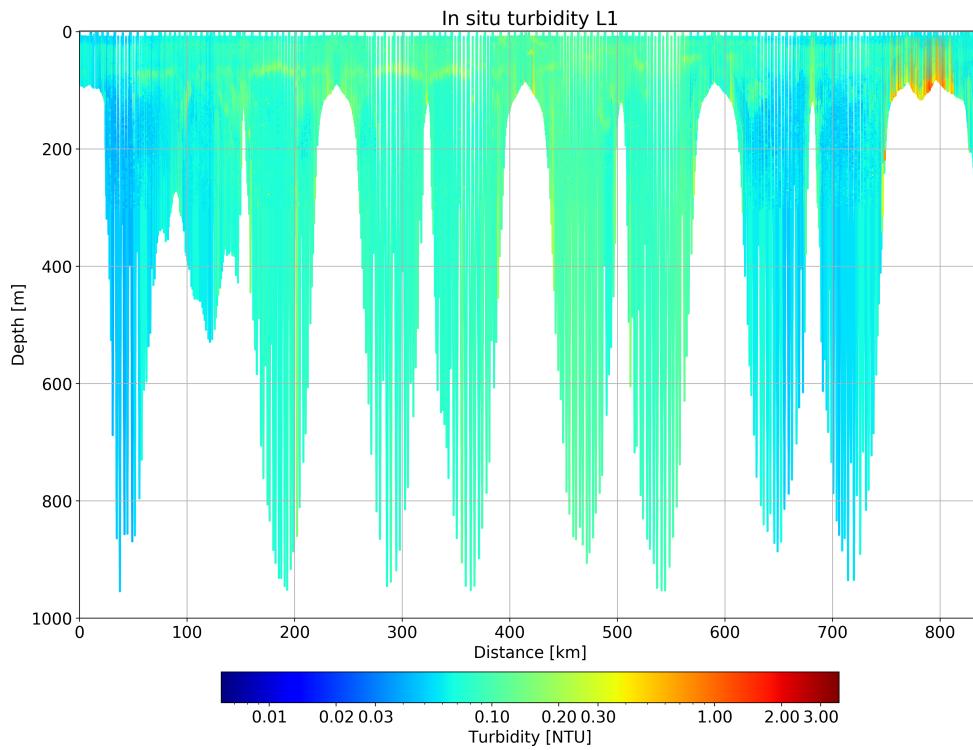


Figure 3.20: Turbidity

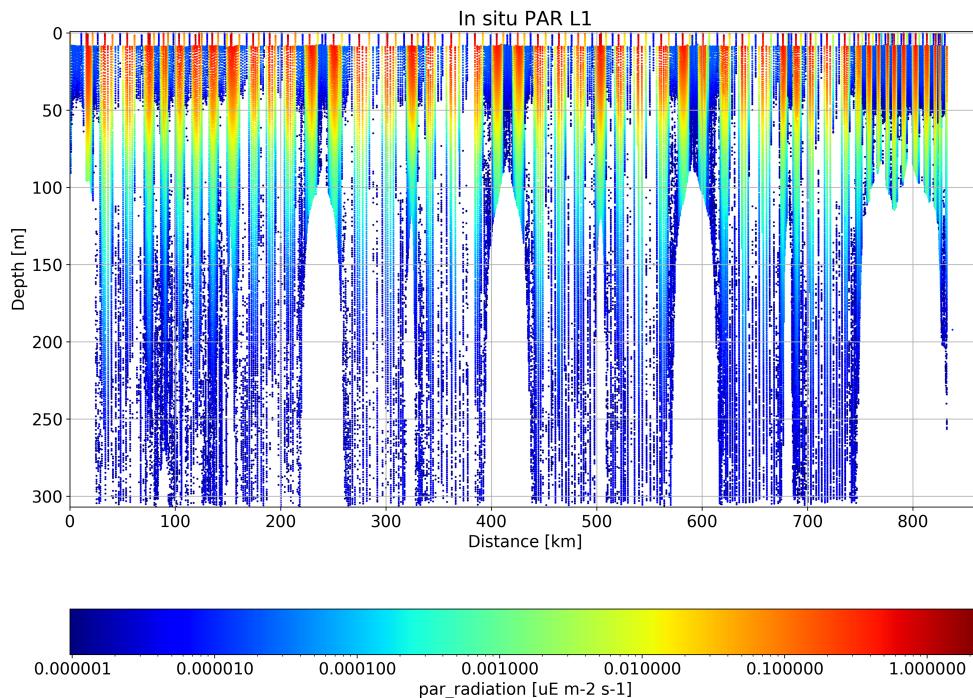


Figure 3.21: PAR radiation

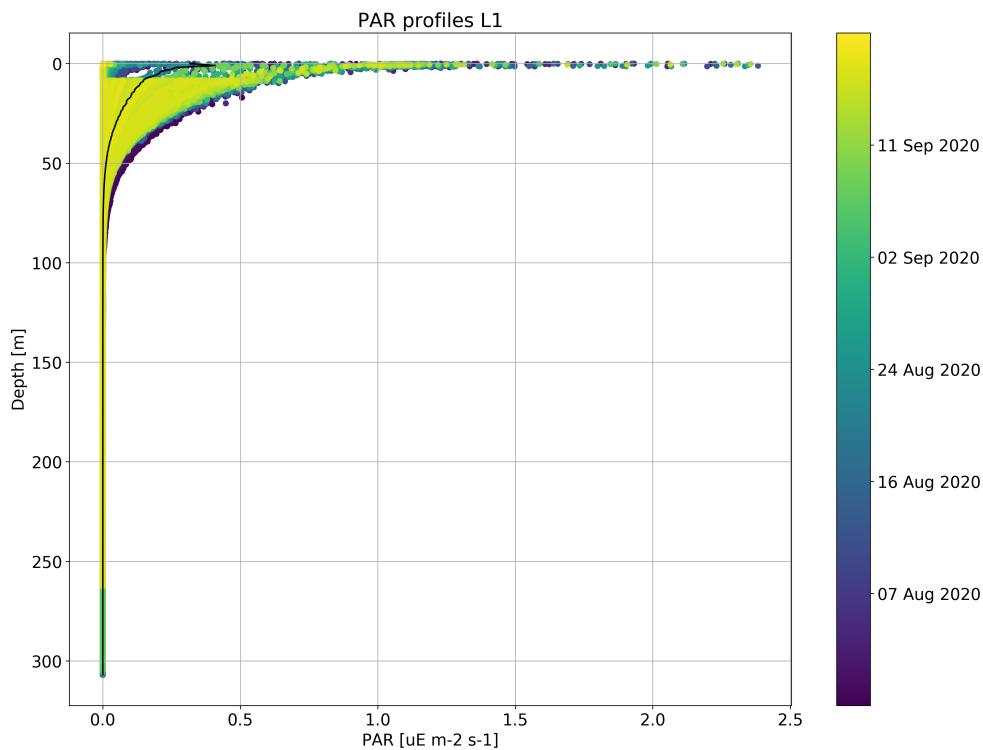


Figure 3.22: PAR profiles

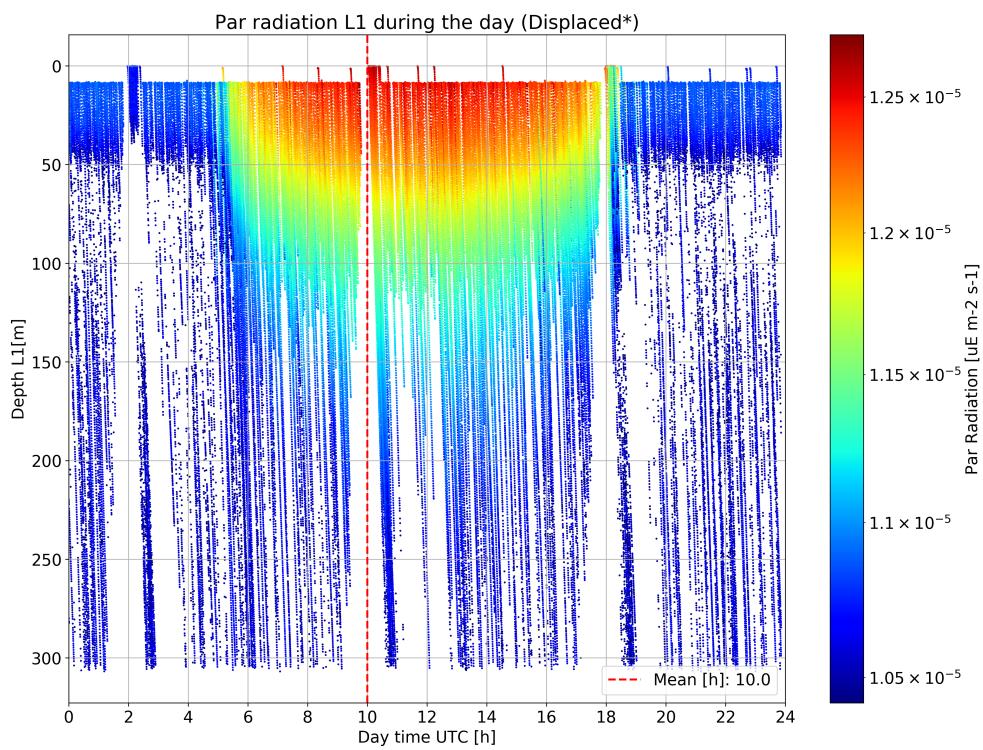


Figure 3.23: Daily par

4 Appendix

4.1 Glider behaviour

Showing changes on Sampling (behaviour 16):

- 29 Jul 2020 09:18:05 @ Sampling of: PAR(0m to -300m)
- 29 Jul 2020 09:18:05 @ Sampling state to sample set to: Diving
- 29 Jul 2020 09:18:05 @ Sampling argument: intersample time set to: 8.0 s
- 29 Jul 2020 09:18:05 @ Sampling nth yo to sample set to: 1.0 nodim
- 29 Jul 2020 09:18:05 @ Sampling argument: min depth set to: 0.0 m
- 29 Jul 2020 09:18:06 @ Sampling argument: max depth set to: 300.0 m
- 17 Sep 2020 10:16:04 @ Sampling argument: intersample time set to: -1.0 s

Showing changes on Sampling (behaviour 15):

- 29 Jul 2020 09:18:06 @ Sampling of: configuration for CANALES-AUG-2020 (GF-MR-0104)OXY4831-sn0825 SCI-BAY sn1328
- 29 Jul 2020 09:18:06 @ Sampling state to sample set to: Diving and climbing
- 29 Jul 2020 09:18:06 @ Sampling argument: intersample time set to: 4.0 s
- 29 Jul 2020 09:18:06 @ Sampling nth yo to sample set to: 1.0 nodim
- 29 Jul 2020 09:18:07 @ Sampling argument: min depth set to: -5.0 m
- 29 Jul 2020 09:18:07 @ Sampling argument: max depth set to: 2000.0 m
- 17 Sep 2020 10:16:05 @ Sampling argument: intersample time set to: -1.0 s

Showing changes on Sampling (behaviour 14):

- 29 Jul 2020 09:18:07 @ Sampling of: configuration for CANALES-AUG-2020 (GF-MR-0104)FLNTU-SLC sn6171 SCI-BAY sn1328
- 29 Jul 2020 09:18:07 @ Sampling state to sample set to: Diving
- 29 Jul 2020 09:18:07 @ Sampling argument: intersample time set to: 16.0 s
- 29 Jul 2020 09:18:07 @ Sampling nth yo to sample set to: 1.0 nodim
- 29 Jul 2020 09:18:08 @ Sampling argument: min depth set to: 150.0 m
- 29 Jul 2020 09:18:08 @ Sampling argument: max depth set to: 300.0 m
- 17 Sep 2020 10:16:06 @ Sampling argument: intersample time set to: -1.0 s

Showing changes on Sampling (behaviour 13):

- 29 Jul 2020 09:18:08 @ Sampling of: configuration for CANALES-AUG-2020 (GF-MR-0104)FLNTU-SLC sn6171 SCI-BAY sn1328
- 29 Jul 2020 09:18:08 @ Sampling state to sample set to: Diving
- 29 Jul 2020 09:18:08 @ Sampling argument: intersample time set to: 8.0 s
- 29 Jul 2020 09:18:08 @ Sampling nth yo to sample set to: 1.0 nodim
- 29 Jul 2020 09:18:08 @ Sampling argument: min depth set to: -5.0 m
- 29 Jul 2020 09:18:08 @ Sampling argument: max depth set to: 150.0 m
- 17 Sep 2020 10:16:06 @ Sampling argument: intersample time set to: -1.0 s

Showing changes on Sampling (behaviour 12):

- 29 Jul 2020 09:18:09 @ Sampling of: CTD(Profile)
- 29 Jul 2020 09:18:09 @ Sampling state to sample set to: Diving, climbing and hovering
- 29 Jul 2020 09:18:09 @ Sampling argument: intersample time set to: 4.0 s
- 29 Jul 2020 09:18:09 @ Sampling nth yo to sample set to: 1.0 nodim
- 29 Jul 2020 09:18:09 @ Sampling argument: min depth set to: -5.0 m
- 29 Jul 2020 09:18:09 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Yoing (behavior behavior yo 11):

- 29 Jul 2020 09:18:10 @ Yoing num half cycles to do(nodim) set to: 2.0
- 29 Jul 2020 09:18:10 @ Yoing d target depth(m) set to: 5.0
- 29 Jul 2020 09:18:10 @ Yoing d bpump value(X) set to: -230.0
- 29 Jul 2020 09:18:10 @ Yoing d target altitude(m) set to: 20.0
- 29 Jul 2020 09:18:10 @ Yoing d use pitch(enum) set to: 3.0

- 29 Jul 2020 09:18:10 @ Yoing d pitch value(X) set to: -0.453800
 - 29 Jul 2020 09:18:10 @ Yoing c use pitch(enum) set to: 3.0
 - 29 Jul 2020 09:18:10 @ Yoing c pitch value(X) set to: 0.453800
 - 29 Jul 2020 09:46:21 @ Yoing d target depth(m) set to: 950.0
 - 29 Jul 2020 10:18:42 @ Yoing num half cycles to do(nodim) set to: -1.0
 - 31 Jul 2020 10:19:10 @ Yoing d bpump value(X) set to: 400.0
 - 10 Aug 2020 10:16:20 @ Yoing d bpump value(X) set to: 500.0
 - 14 Aug 2020 10:26:22 @ Yoing d bpump value(X) set to: 400.0
 - 07 Sep 2020 10:18:06 @ Yoing d bpump value(X) set to: 500.0
 - 20 Sep 2020 10:21:03 @ Yoing d bpump value(X) set to: 400.0
 - 21 Sep 2020 02:29:31 @ Yoing d bpump value(X) set to: 500.0
 - 21 Sep 2020 02:29:31 @ Yoing d pitch value(X) set to: -0.523598
 - 21 Sep 2020 02:29:31 @ Yoing c pitch value(X) set to: 0.523598
 - 21 Sep 2020 08:33:15 @ Yoing num half cycles to do(nodim) set to: 2.0
 - 21 Sep 2020 08:33:15 @ Yoing d target depth(m) set to: 100.0
 - 21 Sep 2020 10:05:56 @ Yoing d target depth(m) set to: 80.0
- Showing changes on Altimeter set to (behaviour u alt min depth):
- 29 Jul 2020 09:28:11 @ Altimeter set to u alt min depth set to: 2
 - 07 Aug 2020 10:04:22 @ Altimeter set to u alt min depth set to: 50
 - 18 Sep 2020 10:13:57 @ Altimeter set to u alt min depth set to: 2

4.2 Installed devices (from autoexec.mi)

- Forward section assy _SN: 0305
- Payload bay assy _SN: 1328
- Aft electronic assy _SN: 0363
- Aft end cap assy _SN: 0148
- Diginfin _SN: 0966
- Strobe assy _SN: 1139
- Pressure transducer _SN: 86513
- Fwd hull _SN: 0078
- Aft hull _SN: 0075
- Freewave master _SN: 9517289
- Iridium sim card _SN: 8988169312003176066
- Argos ID _SN: 111291-Dec/6FE29BE-Hex
- Altimeter _SN: 3326125
- Pitch motor _SN: 0979
- 1000- Motor _SN: controller0199
- 1000- Front air pump _SN: 0197
- 1000- Pump assy _SN: 0181
- 1000- Valve assy _SN: 0181
- Science persistor _SN: 0452
- science motherboard _SN: jj00556
- Science flashcard _SN: 25221
- seabird CTD _SN: 9599
- Wetlabs FLNTU _SN: 6171
- Main board _SN: jj00328
- Communication board _SN: 0281
- Iridium phone _SN: 0716
- Main flashcard _SN: 25206
- Main persistor _SN: 0449
- Attitude sensor _SN: 34333
- Air pump _SN: 1092

- Communications Assy _SN: 0281
- Freewave Slave _SN: 8797296
- GPS _SN: 0806
- Argos X-cat _SN: 0536
- Air bladder _SN: 1058
- Aanderaa Optode _SN: 0825
- PAR _SN: 50310
- sensor specific for OXY4-4831 _SN: SN0825

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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2.14 20200812T180359 Anomaly 10	13
2.15 20200816T094941 Anomaly 11	13
2.16 20200818T100005 Anomaly 12	14
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