

# SOCIB Glider Mission Summary Report

SOCIB\_preCALYPSO21.A2\_20210308\_sdeep01\_GFMR0113

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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_preCALYPSO21.A2_20210308_sdeep01_GFMR0113
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 Observe
Software SCI version	Version 8.2 Under Ice, In-situ Compass Cal, JASCO Observe
FWD bay sn	0305
SCI bay sn	1328
Mission duration	80.8 days
Mission start	2021-03-08 12:00:00
Mission end	2021-05-28 08:17:05
Total distance	1781.68[km] 962.03[nm]
Deployment point [dd°mm.mmmm']	N 39°52.3666' E 02°39.8461'
Recovery point [dd°mm.mmmm']	N 39°20.0391' E 02°09.6024'
Battery Consumption (Ah)	355.1(from 30.3 to 385.4)
Battery specification	20210111 SN0047/ TWR 3S lithium (702)
Survey area	North Soller
Objetive	The broad objective is to optimize multi-platform observing and analyze high-resolution simulations to quantitatively determine the three-dimensional coherent pathways for the transport of both passive and active water properties between the surface and the deep ocean.
Abstract	Deployment of Slocum G2 deep glider sdeep01 in FUTURE endurance line GIRONA MAR2021 (SOCIB operational program), aiming the coverage of the Girona channel (8 transects) from MAR to MAY 2021, sampling physical and biogeochemical parameters (CTD, fluorescence and turbidity, oxygen, and PAR). A delayed intercalibration with the RV will be available on RADMED 06
NAV events	<ul style="list-style-type: none"> <li>▪ Event 1: Sporadic underwater reset on 20210427 08.00 LT</li> <li>▪ Event 2: Leaky thermal valve</li> <li>▪ Event 3: Seabed hit on March 17th, with no abort, over 2.7h laying on the bottom, see figure 2.4</li> </ul>
SCI events	<ul style="list-style-type: none"> <li>▪ Event 1: Increase of temperature difference between CTD and OYX sensor, see figure 3.3</li> <li>▪ Event 2: During the Calypso pilot mission, two spikes in conductivity were detected, and 216 in oxygen and temperature. In addition, some concerns exist for two turbidity profiles.</li> <li>▪ Event 3: The mission we observed in the middle of April a slow increase in the stratification during the transition from winter to spring period.</li> <li>▪ Event 4: The mission has been performed and captured the Balearic current where strong gradients in density up to 0.35 kg/m<sup>3</sup> at the edge of the boundary current. This gradient exists and expands vertically from the surface up to 70m.</li> <li>▪ Event 5: In chl distribution, in several cases, we see an enhancement of chl in the frontal areas and two deep subduction events that took place on 25/03 and 15/05, which are also present in the vertical distribution of turbidity.</li> <li>▪ Event 6: Enhancement of oxygen is taken place in the DCM and in the frontal areas where we have an enhance of chl.</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>▪ SOCIB</li> </ul>
Data Retrieval	<ul style="list-style-type: none"> <li>▪ RT: sub-set via satellite link at each surface maneuver</li> <li>▪ DM: full/direct memory card backup after glider disassembly during Conclusion mission-phase</li> </ul>
Data Available From*	<a href="http://thredds.socib.es/thredds/catalog/auv/glider/catalog.html">http://thredds.socib.es/thredds/catalog/auv/glider/catalog.html</a>
DOI (if available)	<a href="https://doi.org/10.25704/qmzf-vv36">https://doi.org/10.25704/qmzf-vv36</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/sdeep01-scb\\_sldeep001/L0/2021/dep0035\\_sdeep01\\_scb-sldeep001\\_L0\\_2021-03-08\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep01-scb_sldeep001/L0/2021/dep0035_sdeep01_scb-sldeep001_L0_2021-03-08_data_dt.nc)
- L1: [https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep01-scb\\_sldeep001/L1/2021/dep0035\\_sdeep01\\_scb-sldeep001\\_L1\\_2021-03-08\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep01-scb_sldeep001/L1/2021/dep0035_sdeep01_scb-sldeep001_L1_2021-03-08_data_dt.nc)
- L2: [https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep01-scb\\_sldeep001/L2/2021/dep0035\\_sdeep01\\_scb-sldeep001\\_L2\\_2021-03-08\\_data\\_dt.nc](https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep01-scb_sldeep001/L2/2021/dep0035_sdeep01_scb-sldeep001_L2_2021-03-08_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	5	0	0
attitude rev	0	1	0
pitch motor	41	0	0
science super	10	0	0
digifin	1682	0	0
IRIDIUM	315	0	0
DE PUMP	384	0	0

- Communication Systems (see appendix for Iridium states):
  - Total number iridium calls [num]: 287
  - Iridium calls to secondary [num]: 11
  - ON overall iridium period [h]: 5.2
  - Iridium calls state from MODE NO CARRIER to MODE UNKNOWN [num]: 16
  - Iridium calls state from MODE CONNECT to MODE UNKNOWN [num]: 278
  - Iridium calls state from MODE UNKNOWN to MODE AWAITING OK [num]: 294

- Drop calls (Iridium state from 2 to 99 with c iridium on = 1) [num]: 6
- Total time at surface [h]: 35.77
- Total time at surface [%]: 1.84
- 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

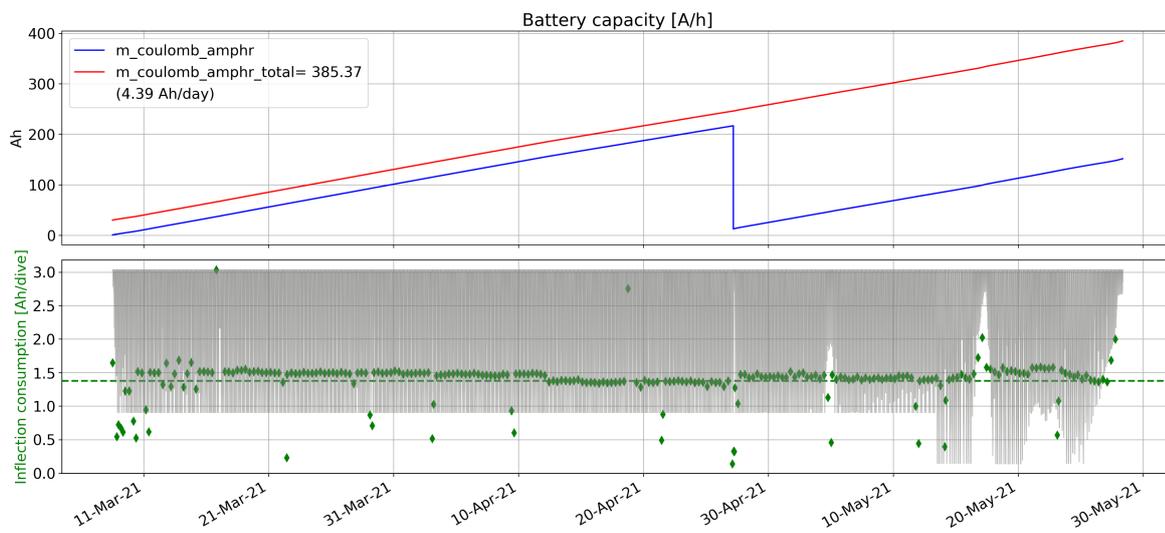


Figure 2.1: Battery capacity

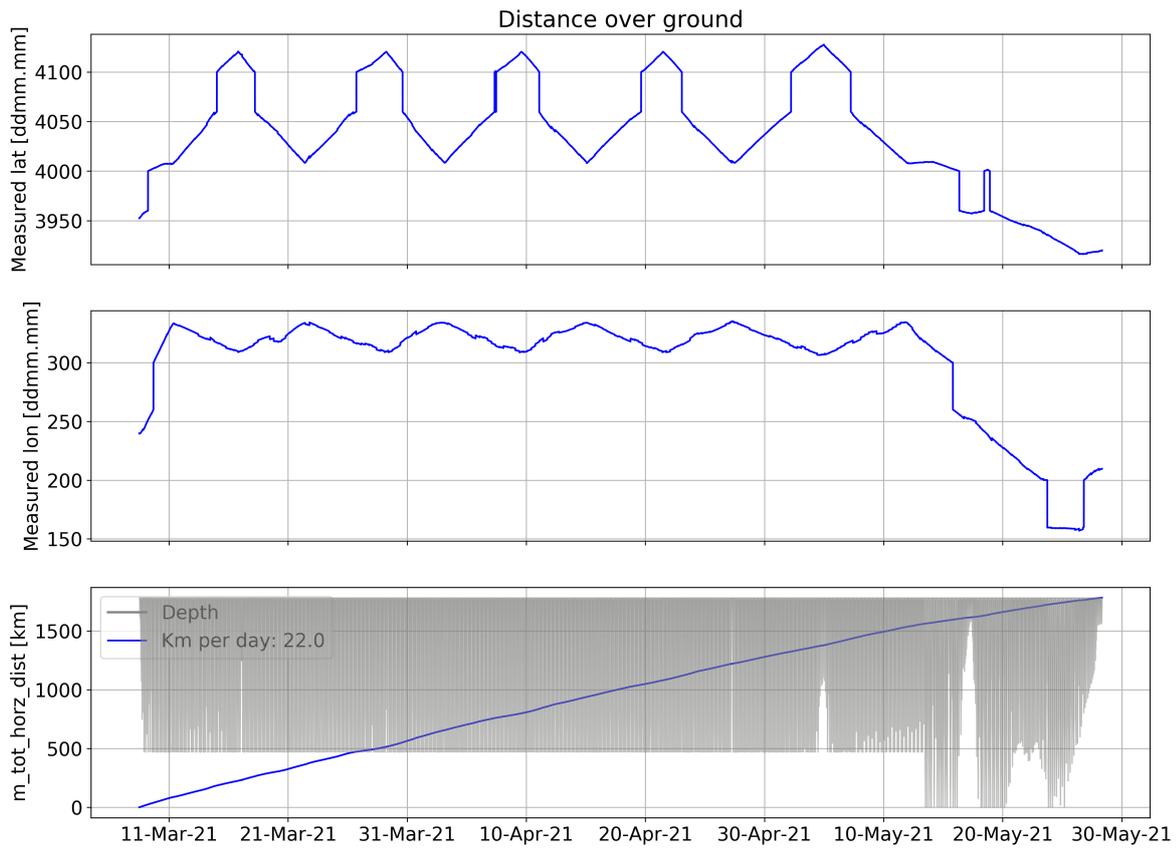


Figure 2.2: Distance over ground

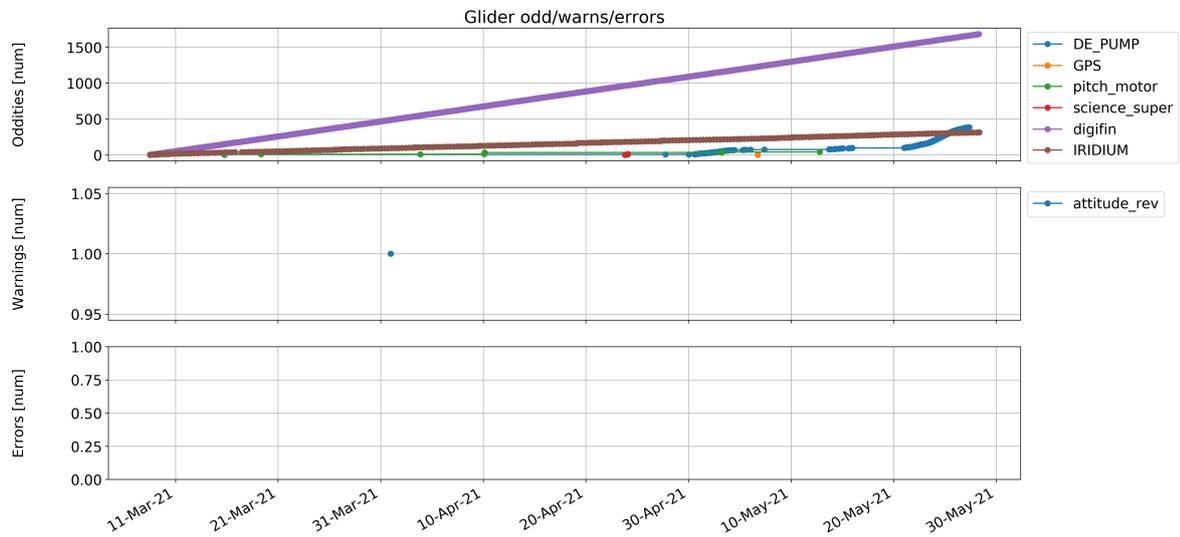


Figure 2.3: Glider Odd Warn and Err

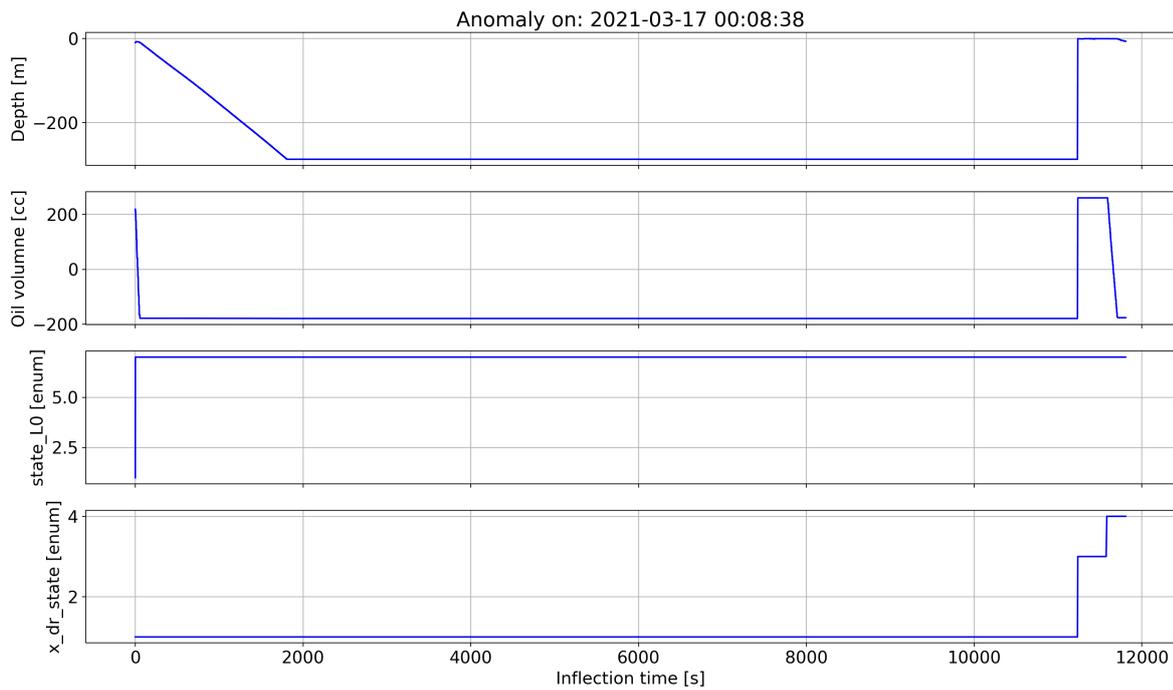


Figure 2.4: 20210317T000838 Anomaly 13

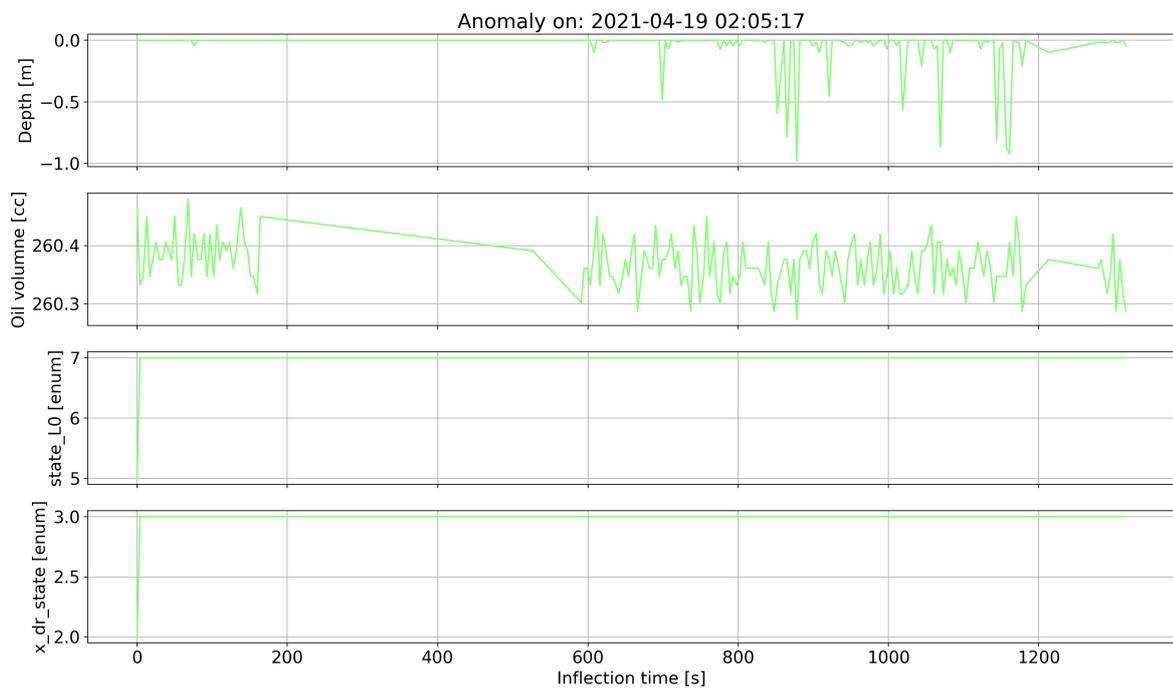


Figure 2.5: 20210419T020517 Anomaly 50

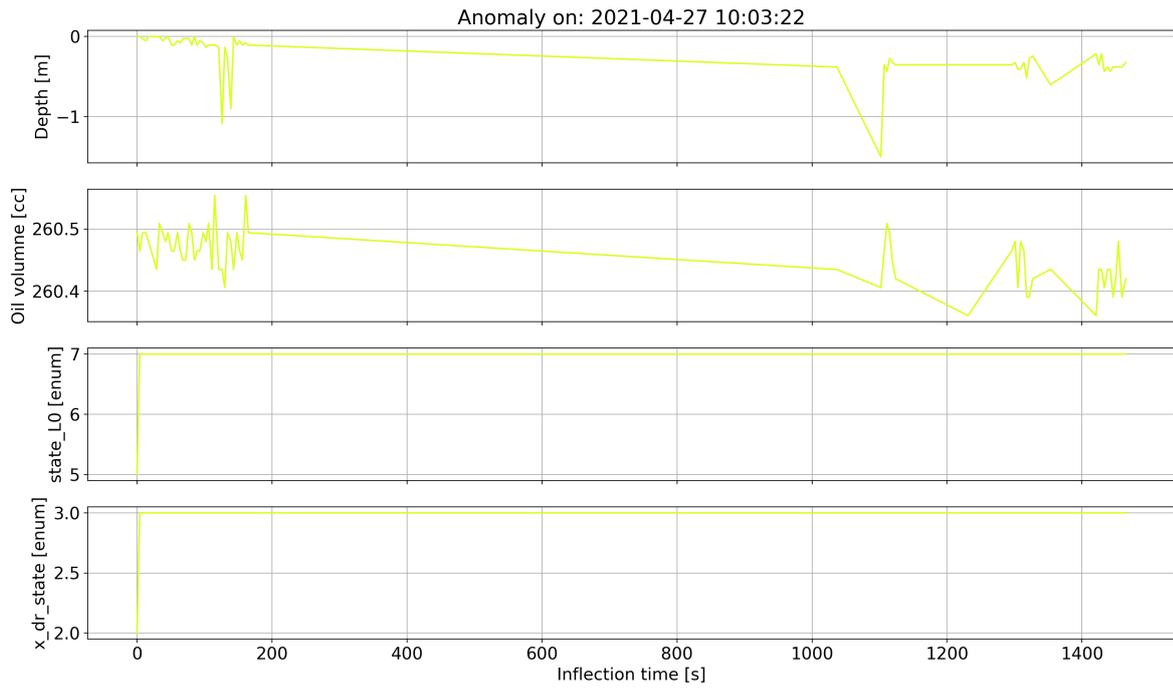


Figure 2.6: 20210427T100322 Anomaly 58

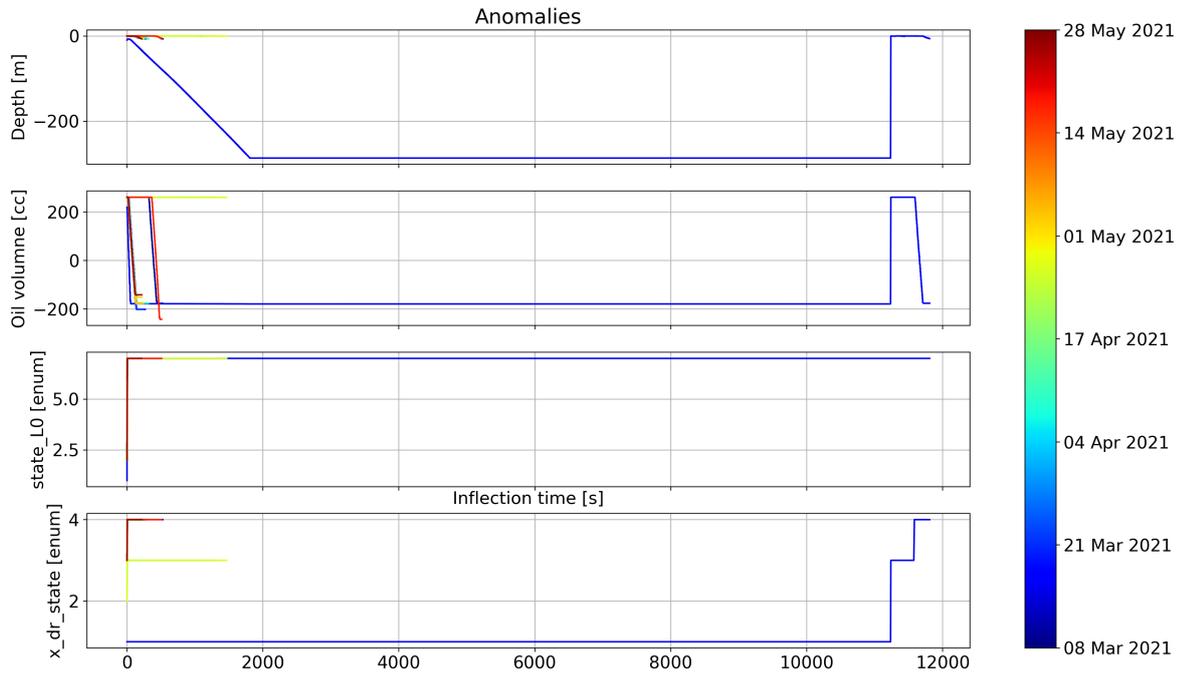


Figure 2.7: Anomalies (time)

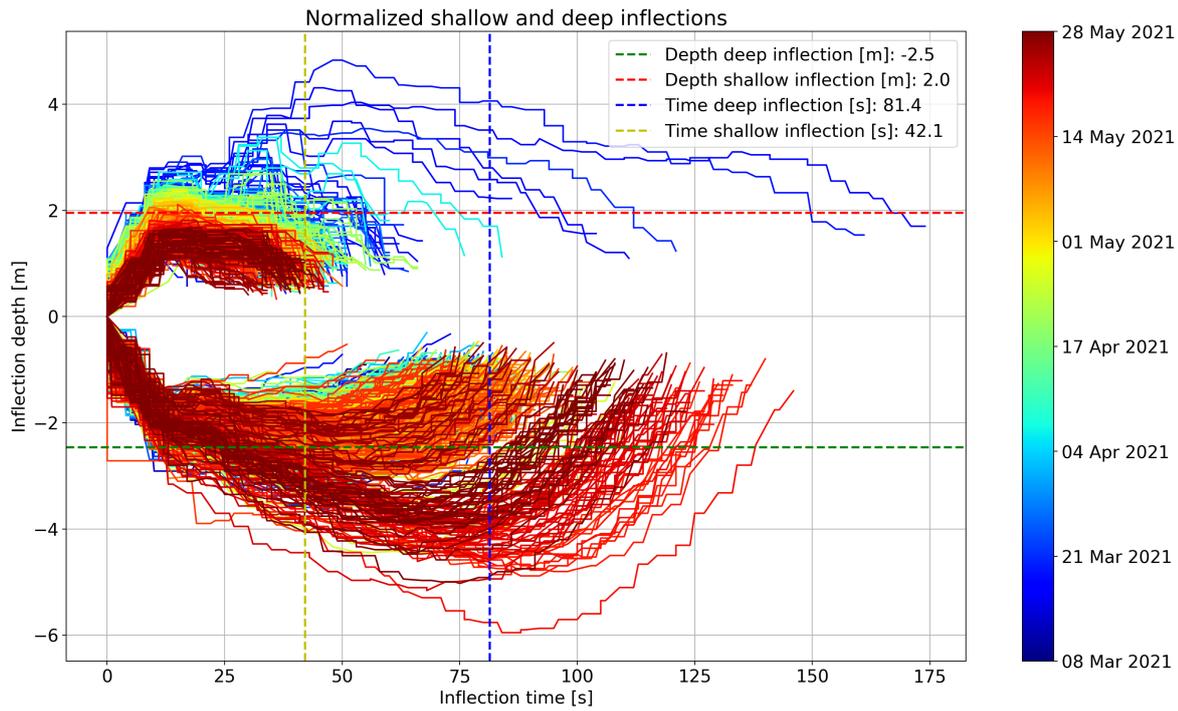


Figure 2.8: Depth inflections

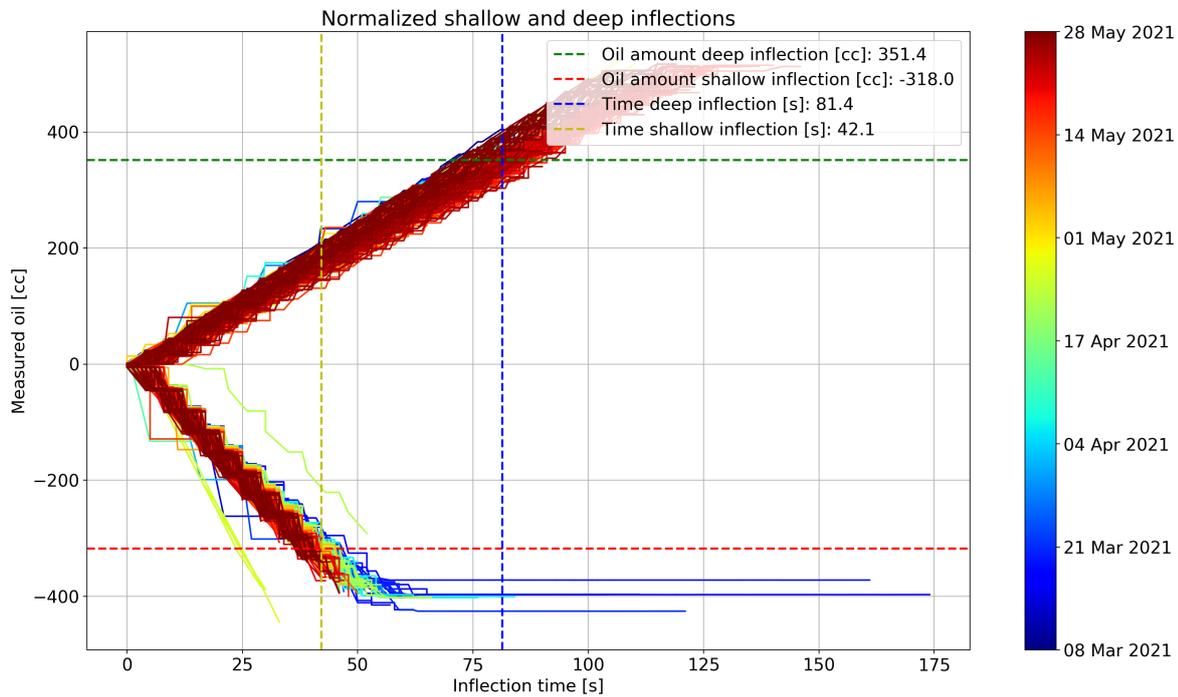


Figure 2.9: Oil inflections

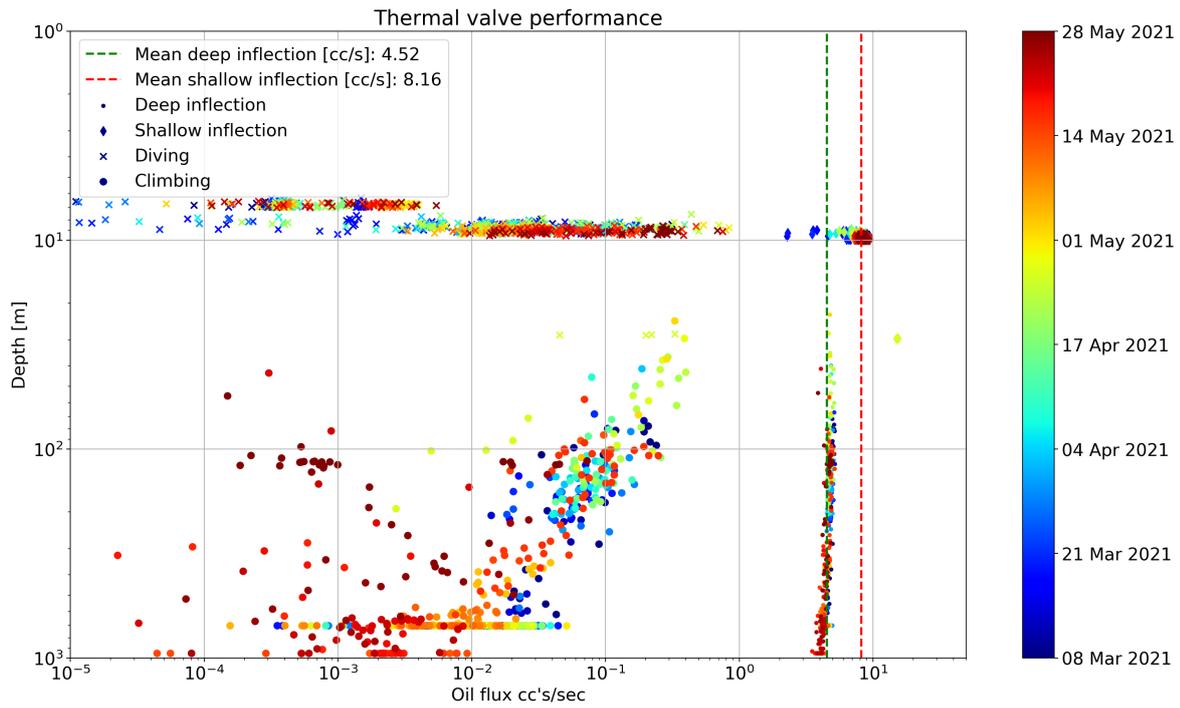


Figure 2.10: Oil flux

Normalized shallow and deep inflections

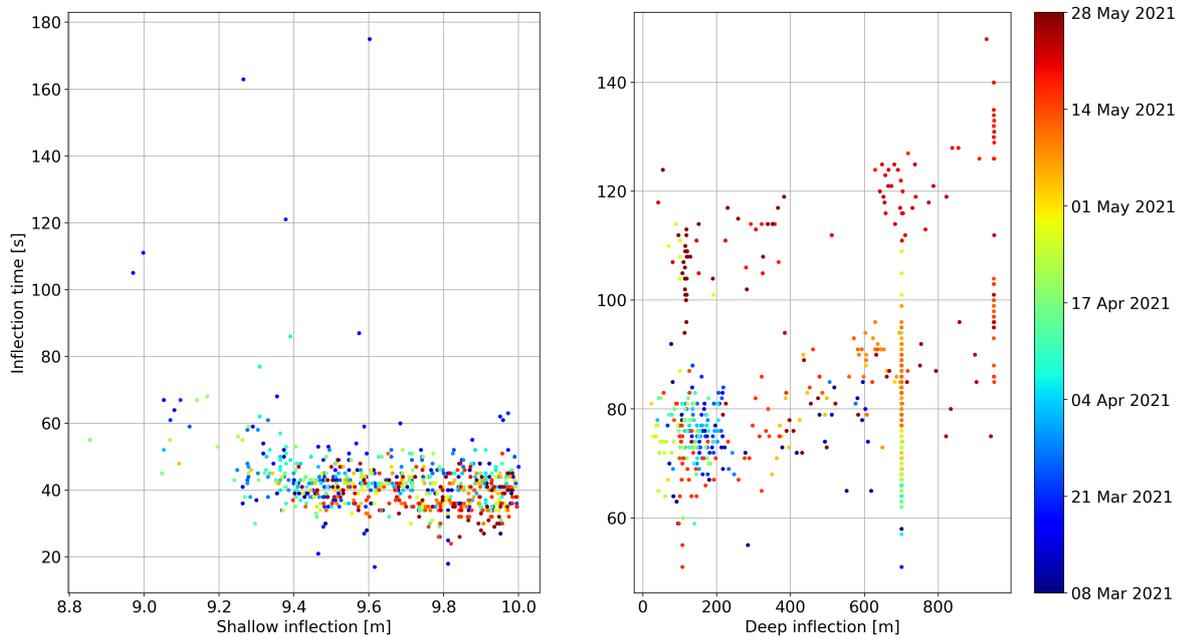


Figure 2.11: Duration inflections

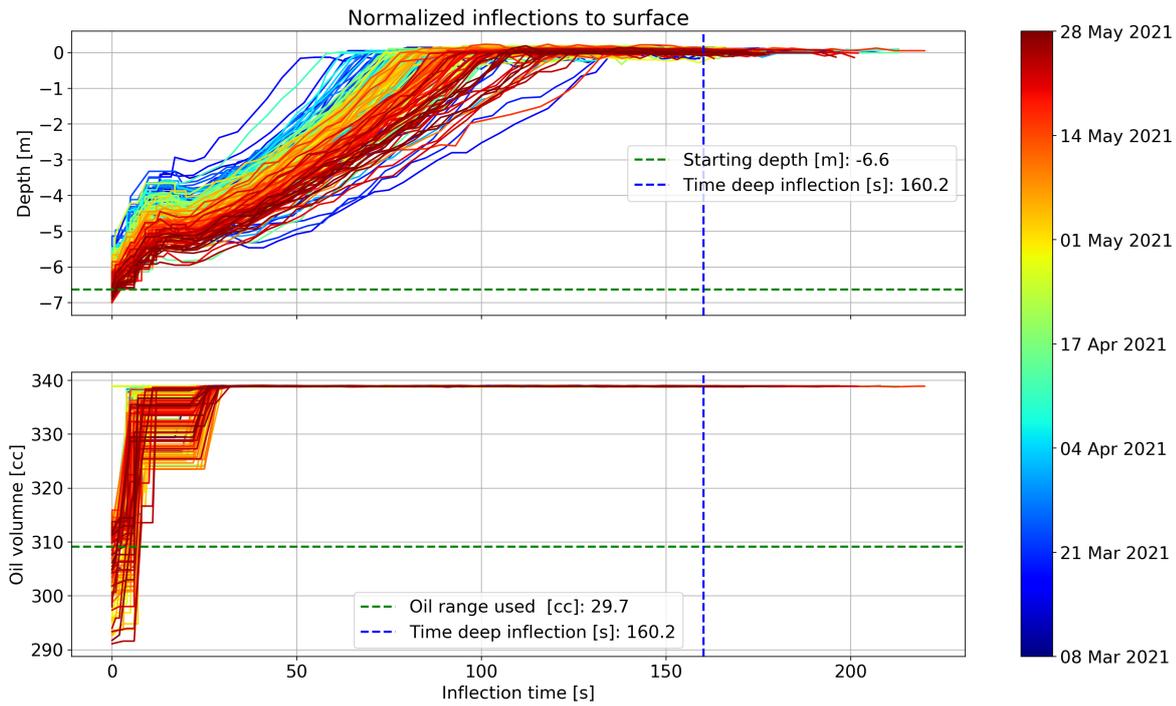


Figure 2.12: Surface Oil inflections

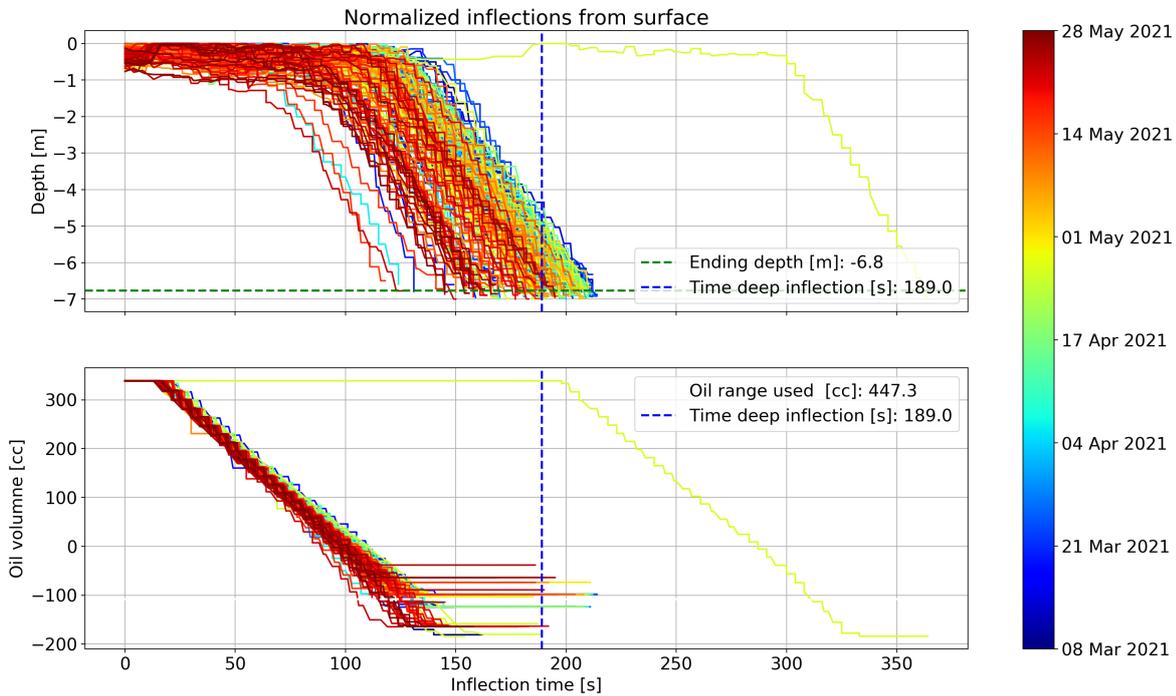


Figure 2.13: Surface Duration inflections

Flying pitch and roll

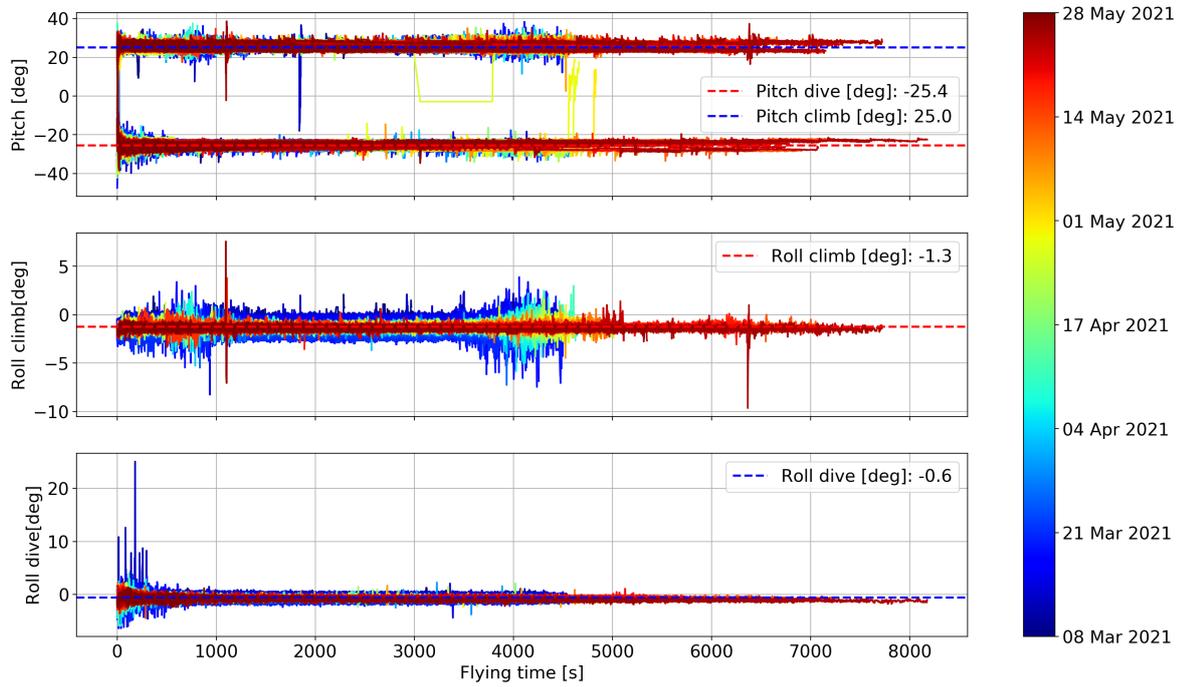


Figure 2.14: Pitch and roll, when climbing and diving

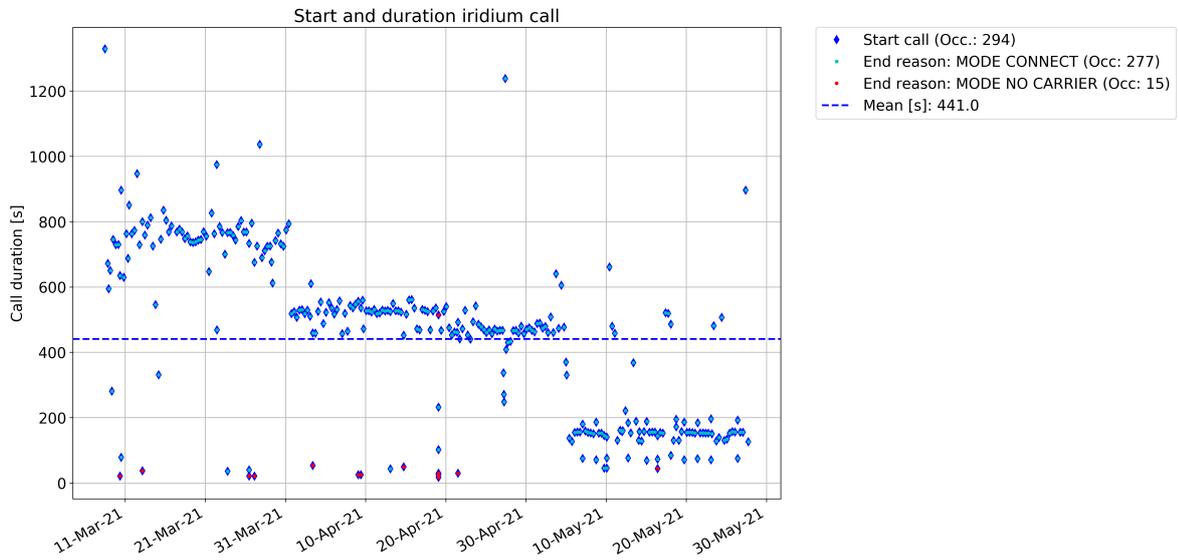


Figure 2.15: Iridium Status

### 3 Scientific Preliminary Review

#### 3.1 SCI Profiles

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

Sensor	Serial number	Calibration date	Casts	Half YOs	Samples	Intersample time [s]*	Sampled distance [km]
CTD	9599	20190524	1875	1896	1272761	5.256	1034.5
FLNTU-FLBBCDSL	6171	20200302	907	1896	na	na	503.8
OXY 3-4	0825	20190815	1813	1896	1108859	5.886	1007.7
PAR	50310	20190823	898	1896	na	na	234.0
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

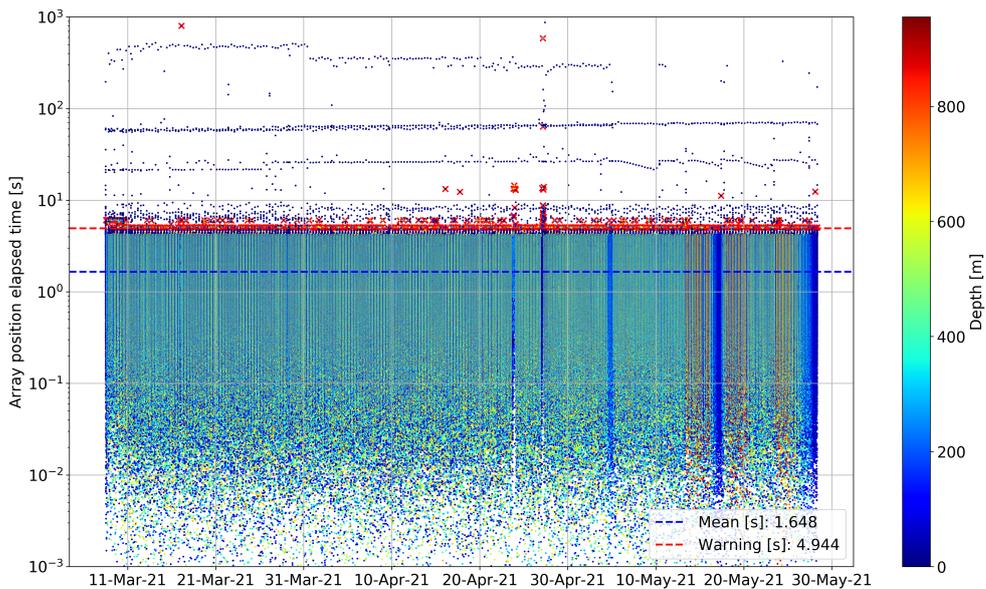


Figure 3.1: Array time

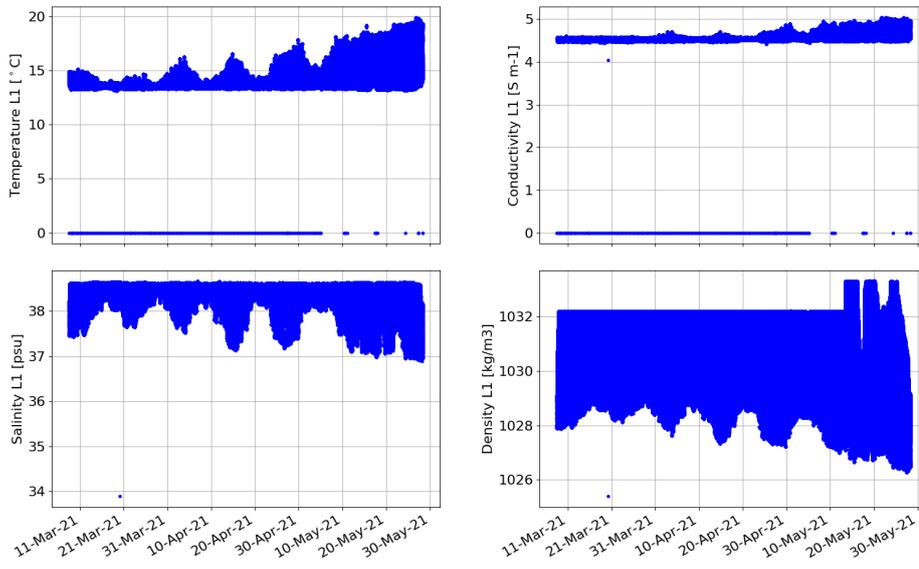


Figure 3.2: Raw CTD L1

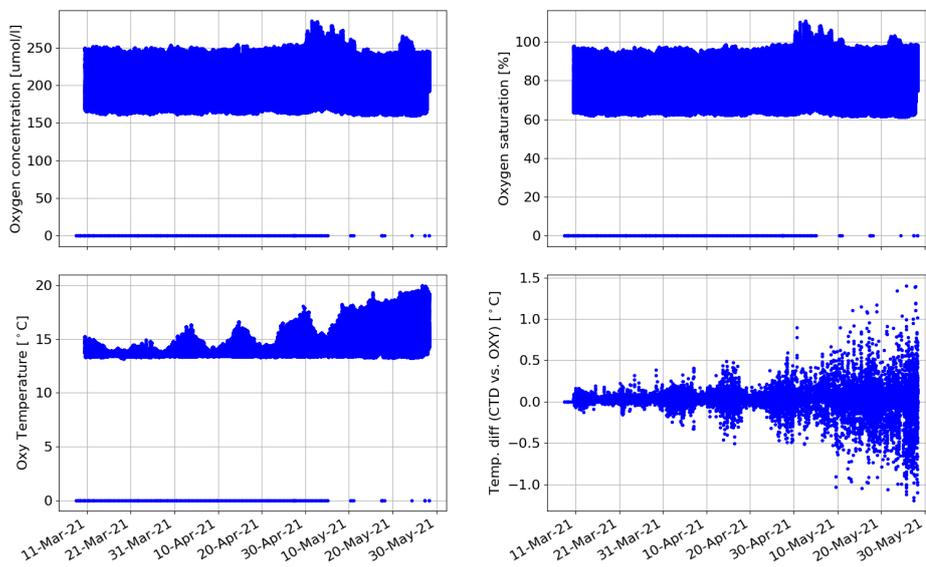


Figure 3.3: Raw OXY L1

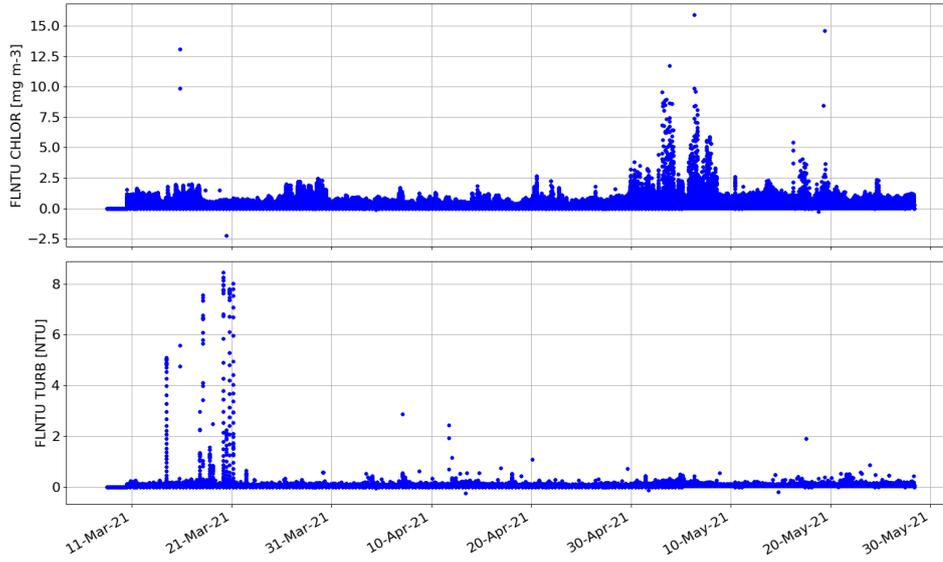


Figure 3.4: Raw FLNTU L1

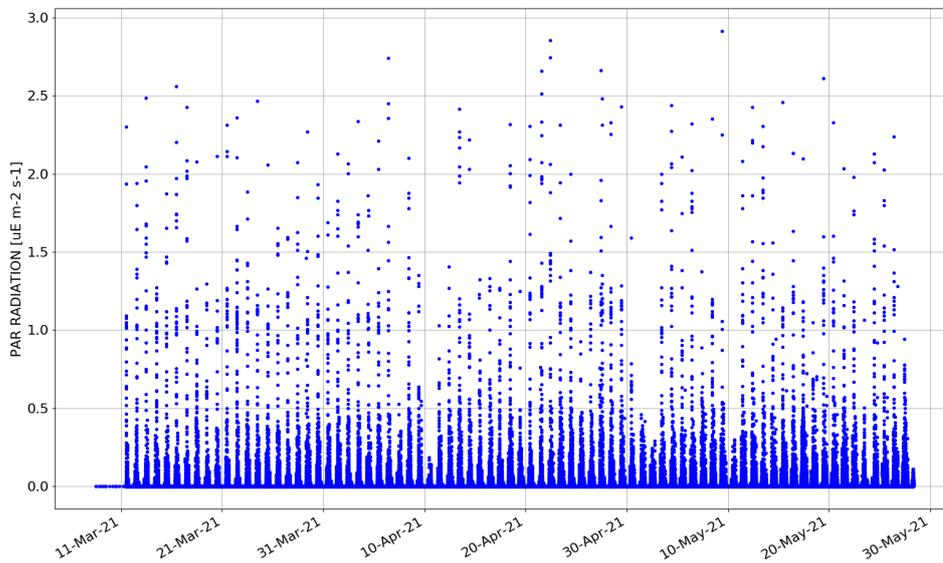


Figure 3.5: Raw PAR L1

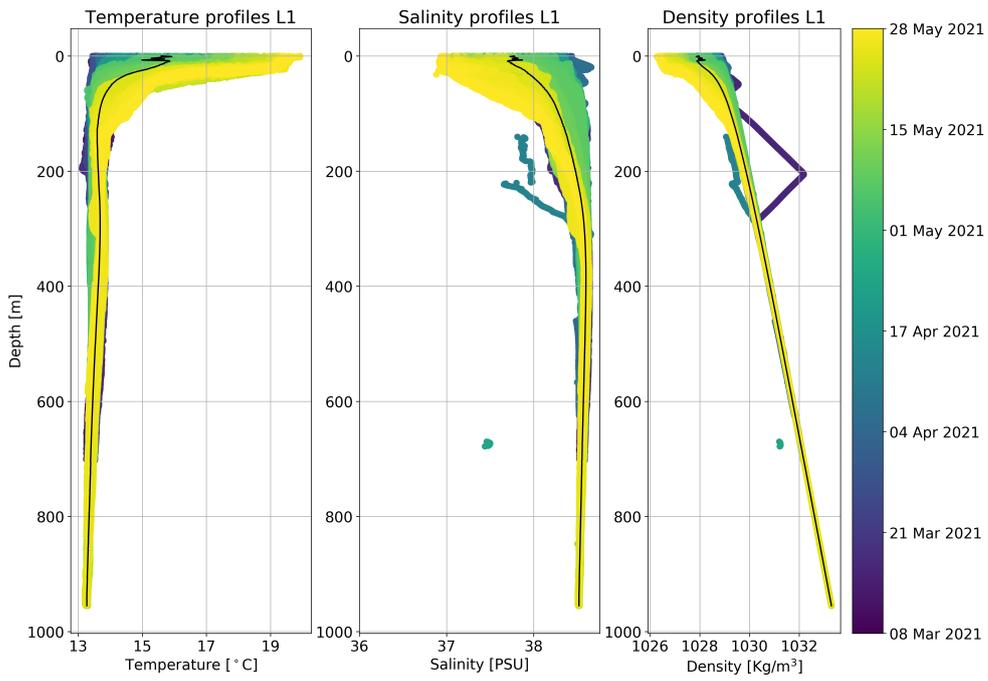


Figure 3.6: CTD profiles

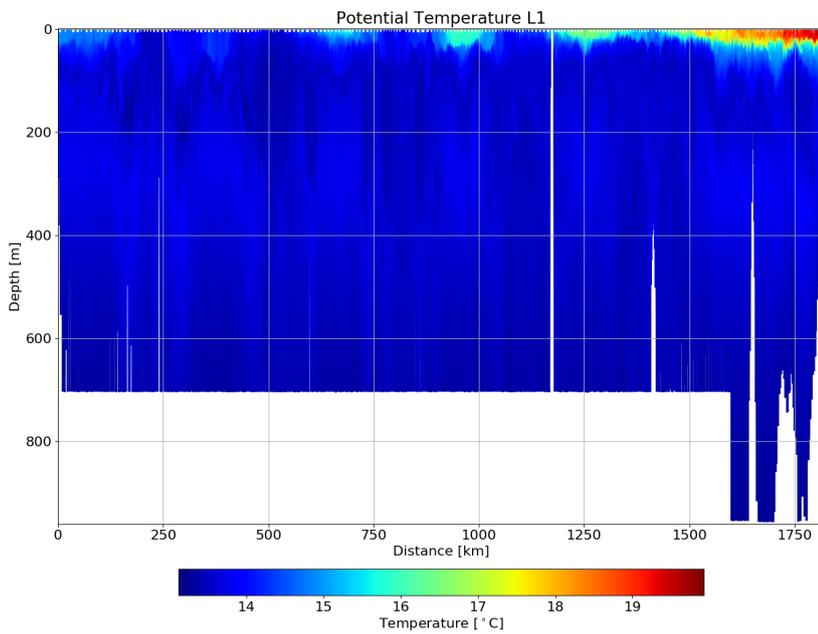


Figure 3.7: CTD temperature

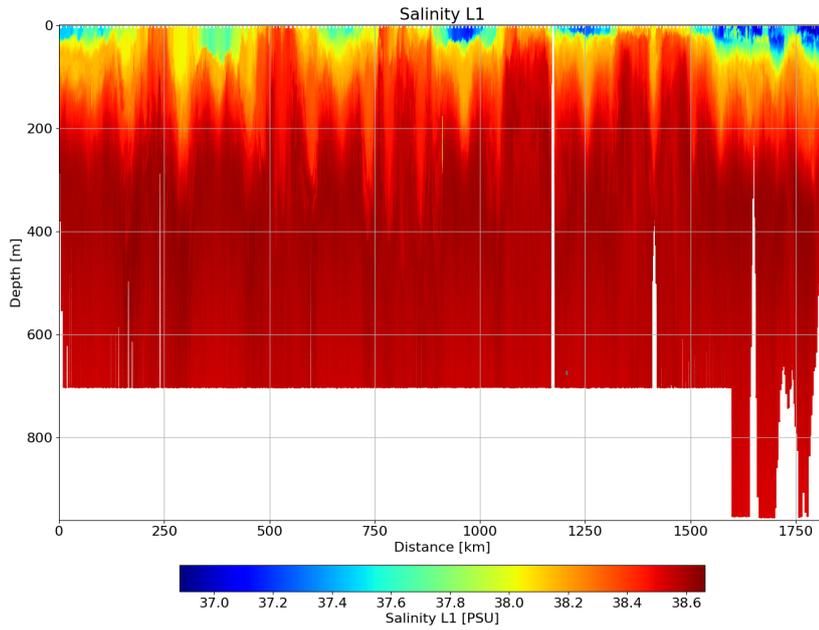


Figure 3.8: CTD Salinity

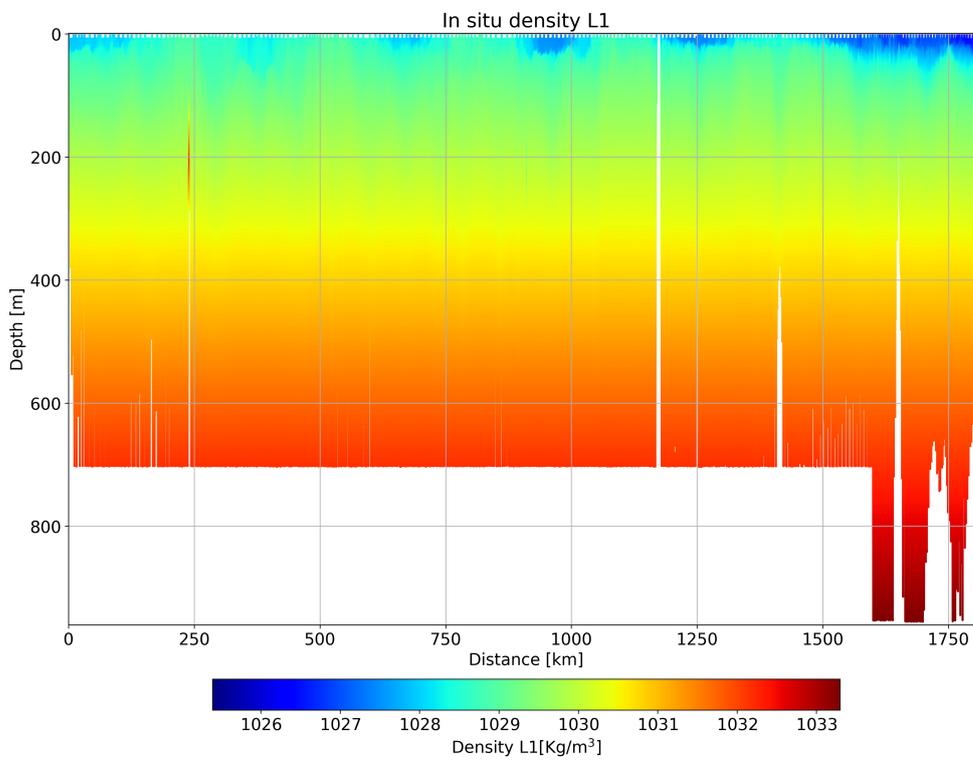


Figure 3.9: CTD Density

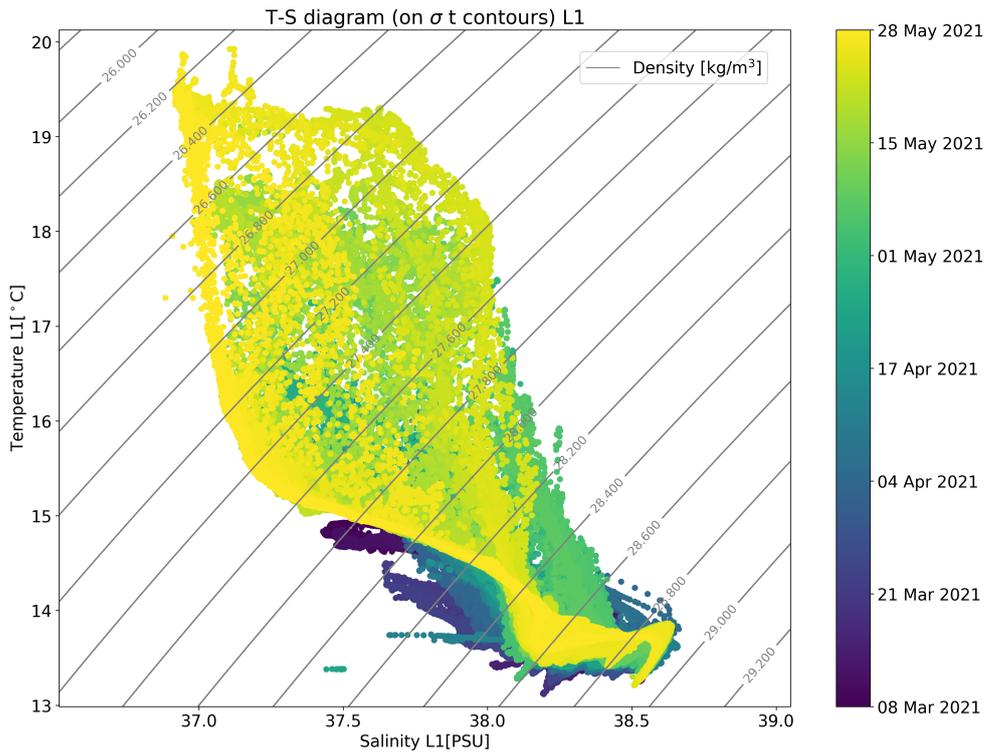


Figure 3.10: TS diagram (CTD)

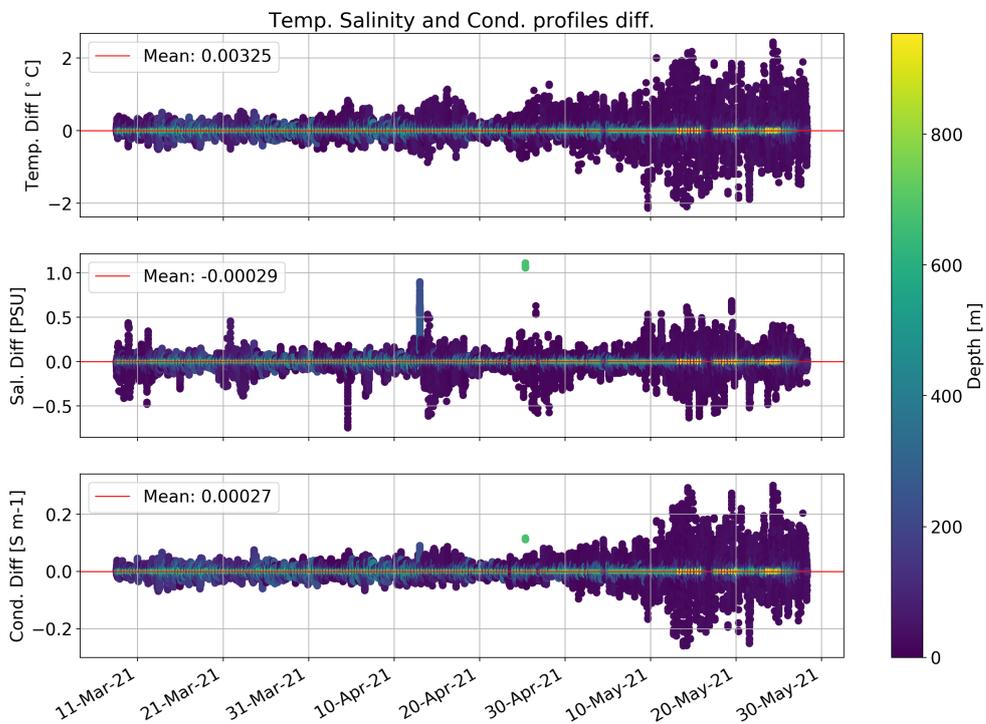


Figure 3.11: Profile consistency (CTD)

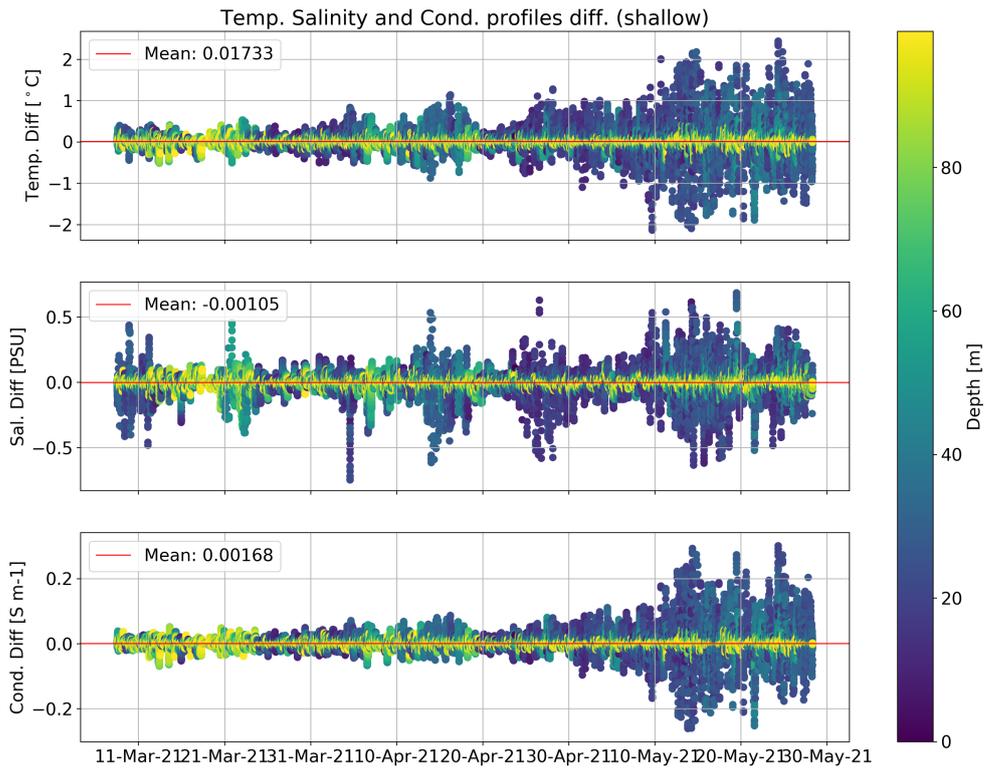


Figure 3.12: Profile consistency (CTD) zoom

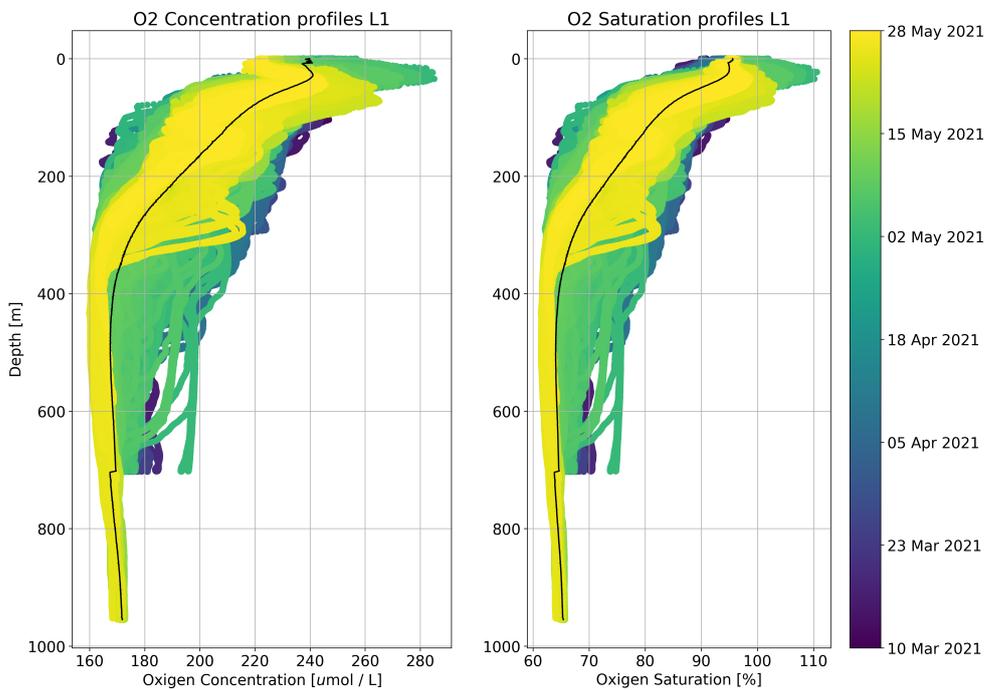


Figure 3.13: Oxygen profiles

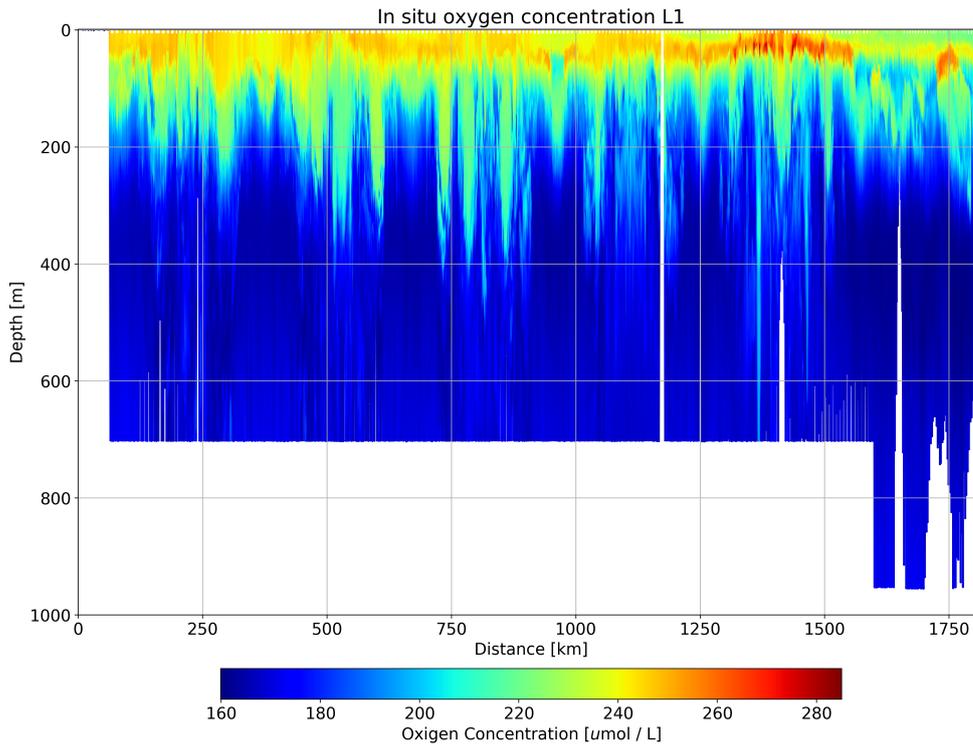


Figure 3.14: Oxygen Concentration

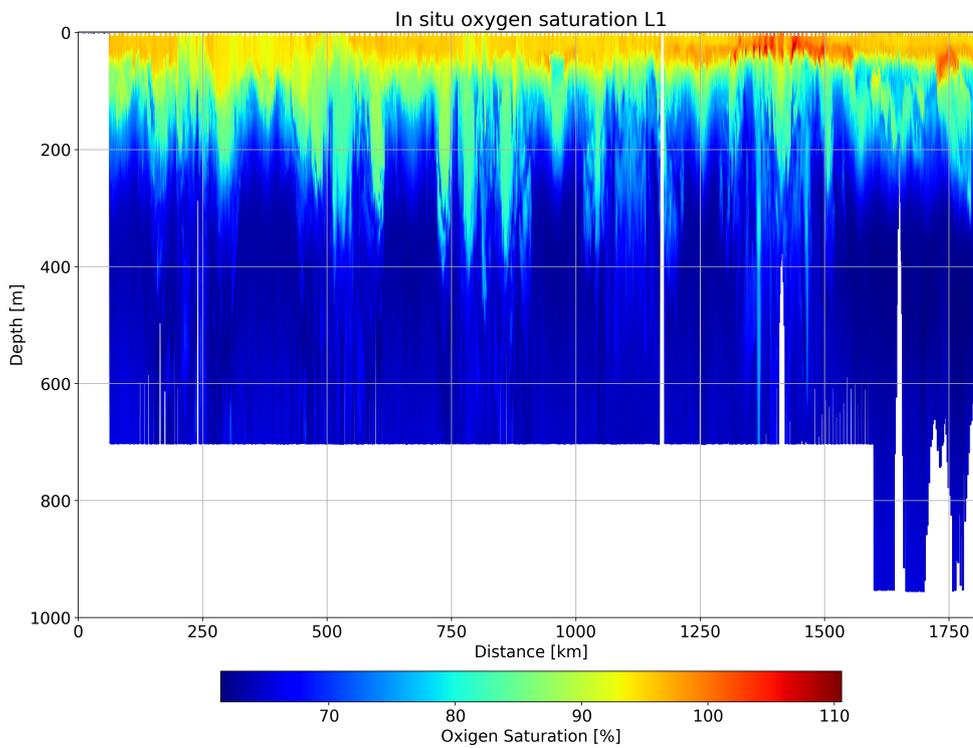


Figure 3.15: Oxygen Saturation

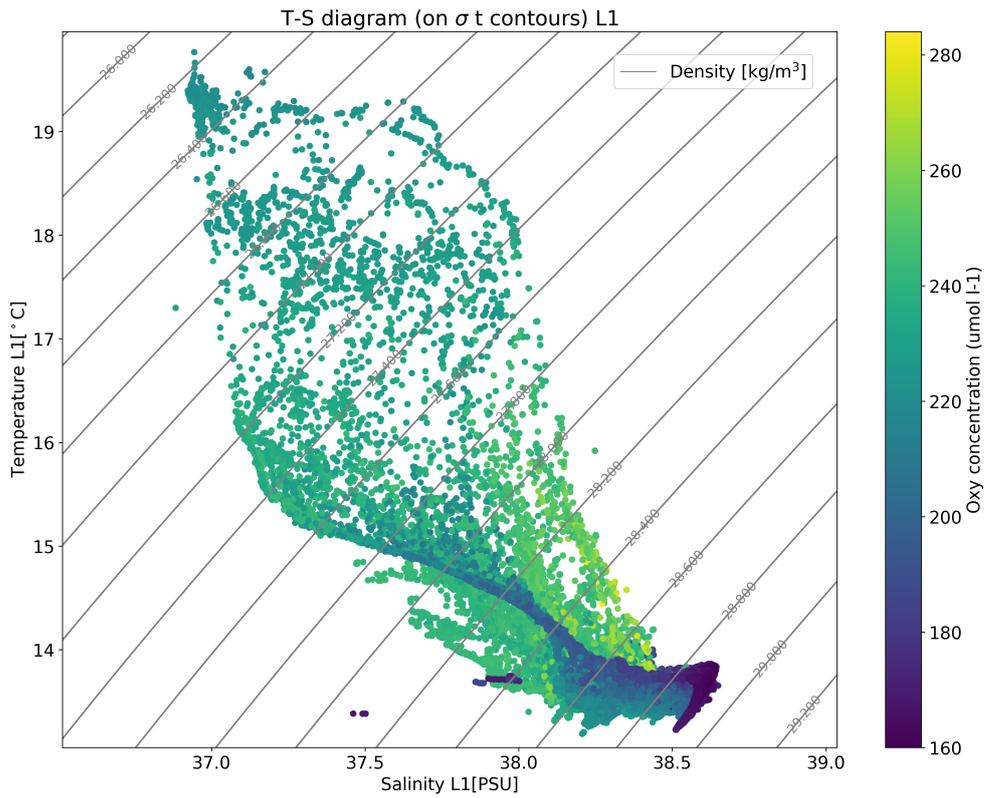


Figure 3.16: TS diagram (OXY)

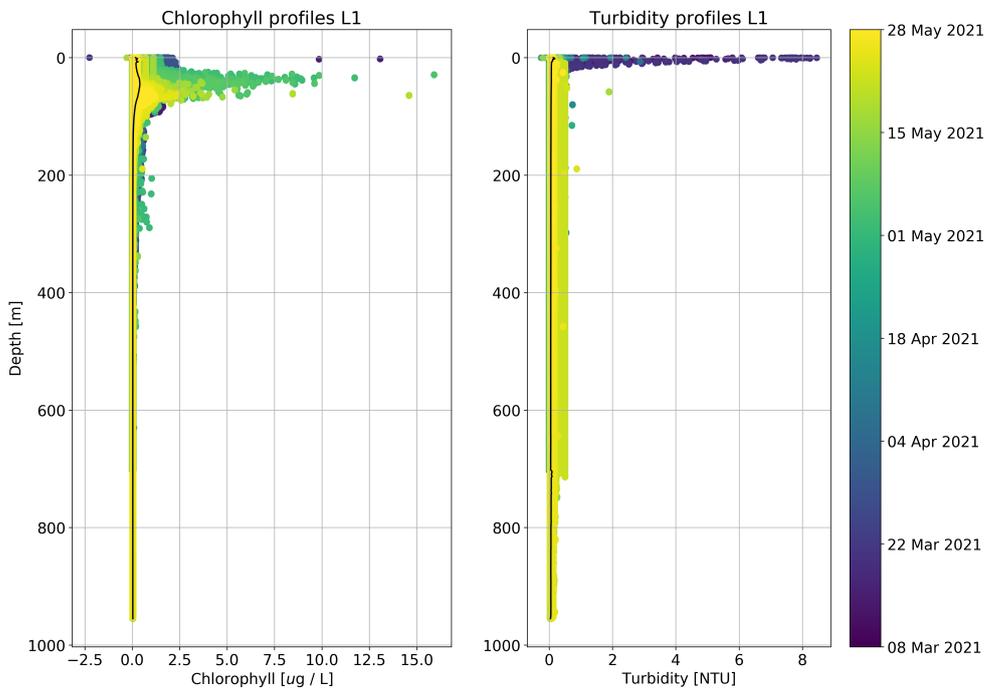


Figure 3.17: Chlorophyll-a and Turbidity profiles

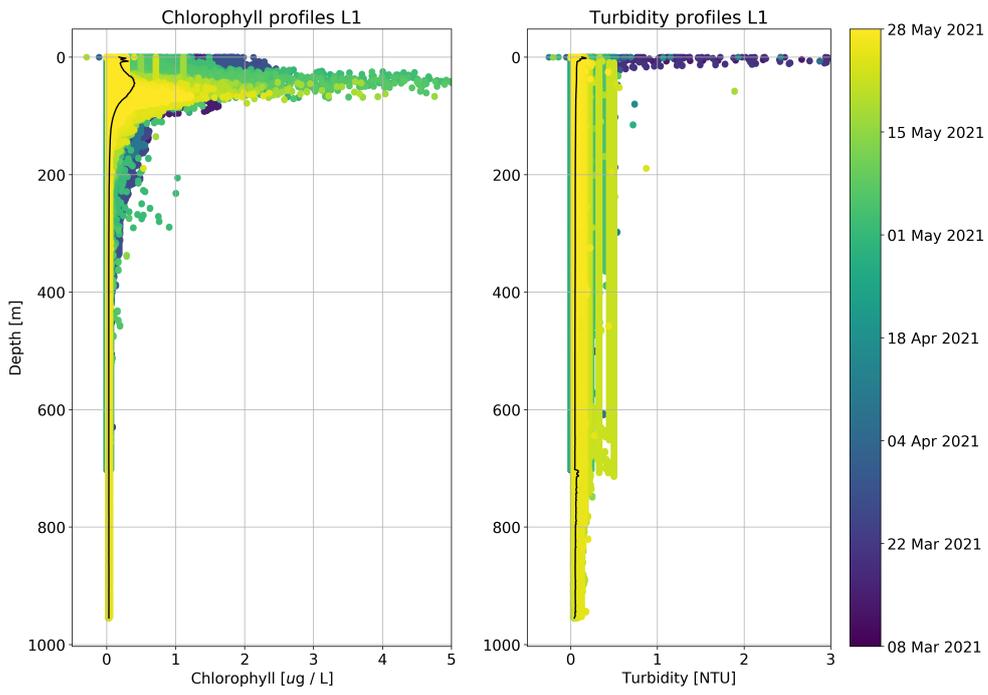


Figure 3.18: Chlorophyll-a and Turbidity profiles zoom

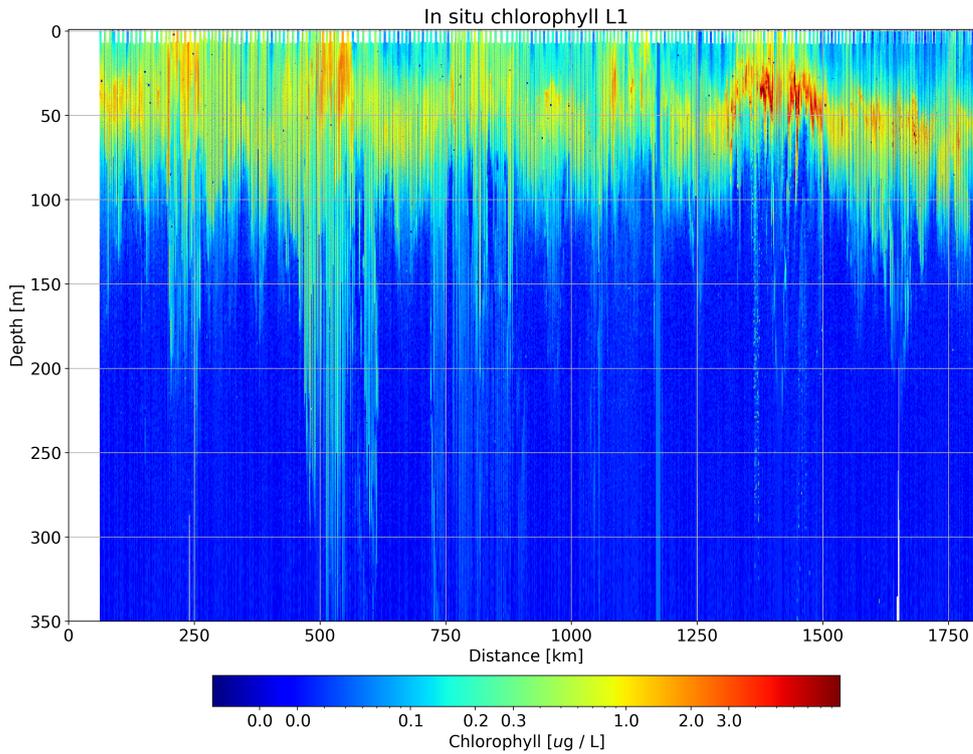


Figure 3.19: Chlorophyll-a

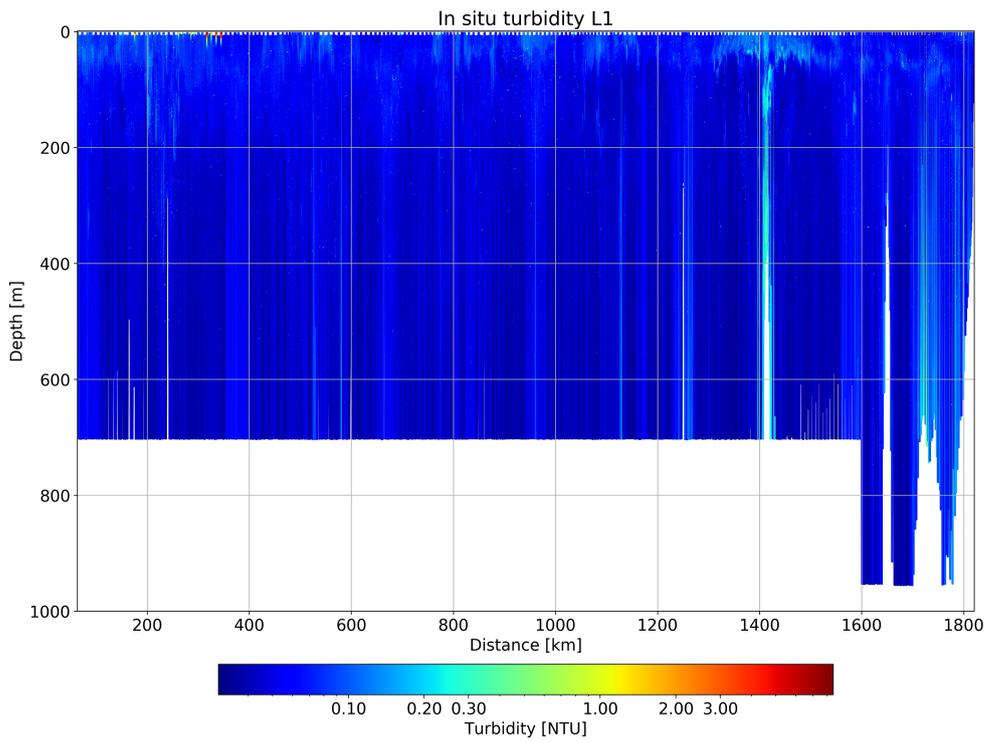


Figure 3.20: Turbidity

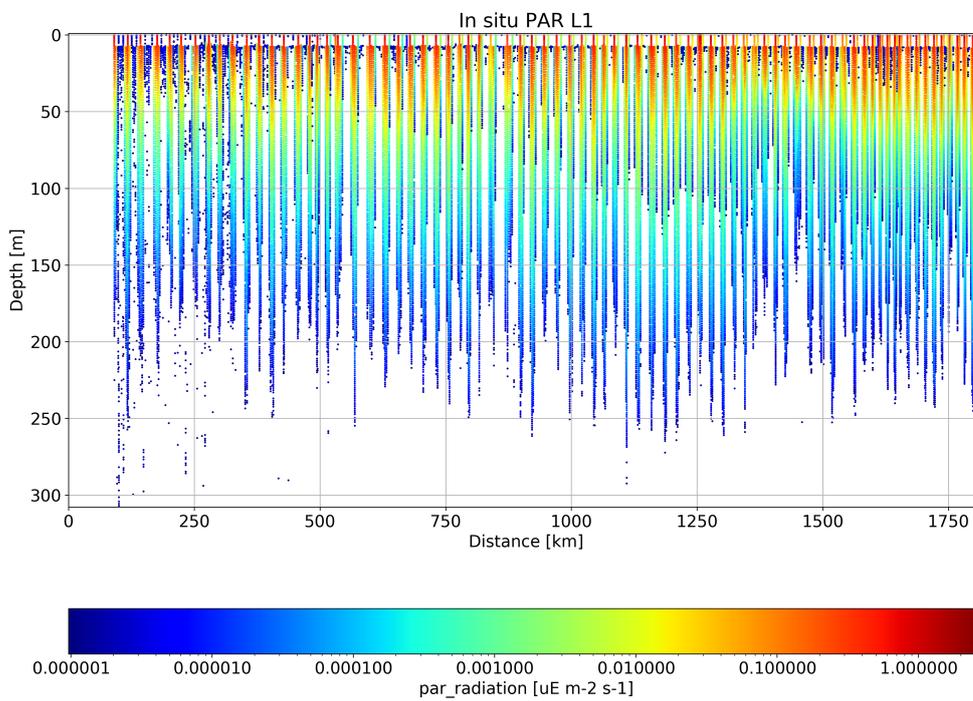


Figure 3.21: PAR radiation

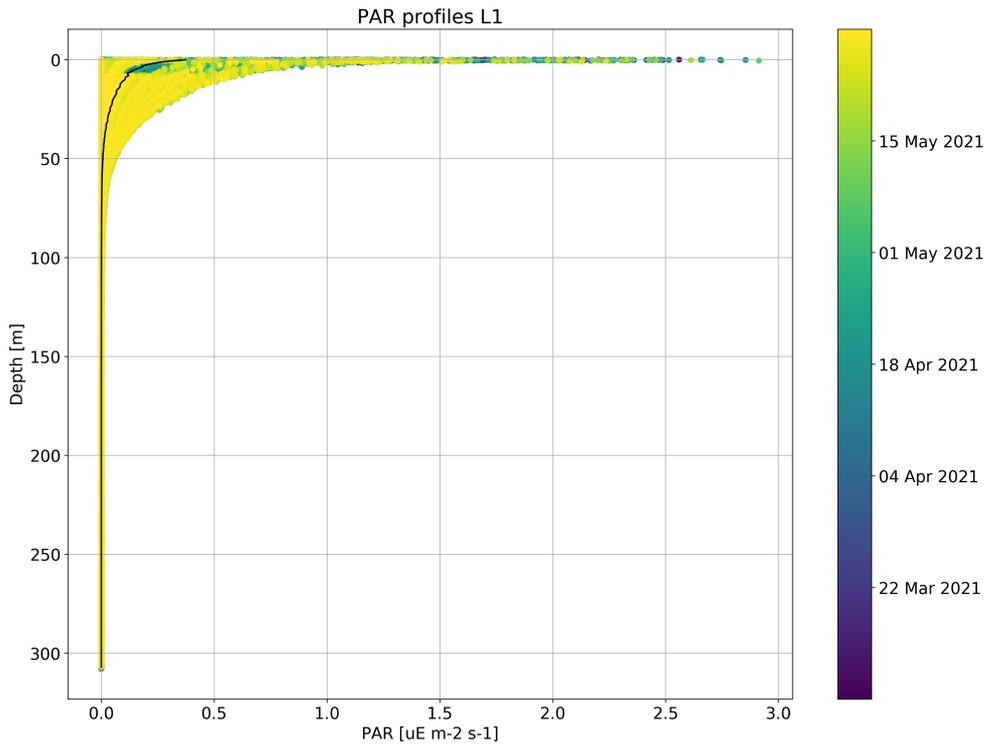


Figure 3.22: PAR profiles

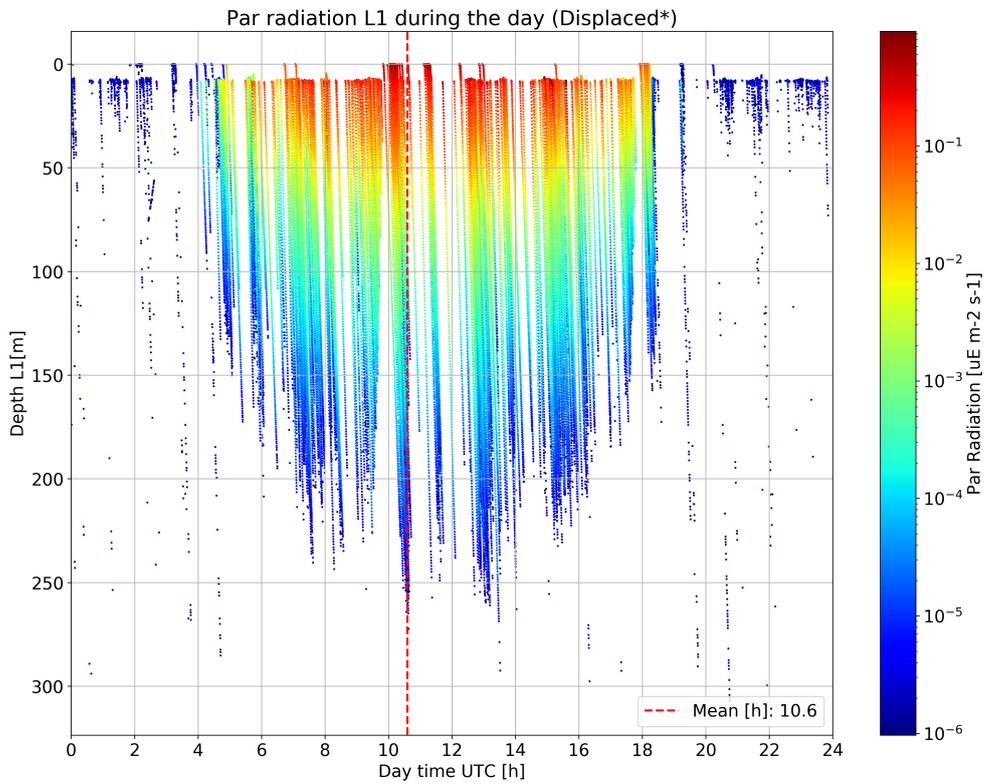


Figure 3.23: Daily par

## 4 Appendix

### 4.1 Glider behaviour

Showing changes on Sampling (behaviour 16):

- 08 Mar 2021 11:07:38 @ Sampling of: PAR(0m to -300m)
- 08 Mar 2021 11:07:39 @ Sampling state to sample set to: Diving
- 08 Mar 2021 11:07:39 @ Sampling argument: intersample time set to: -1.0 s
- 08 Mar 2021 11:07:39 @ Sampling nth yo to sample set to: 1.0 nodim
- 08 Mar 2021 11:07:39 @ Sampling argument: min depth set to: 0.0 m
- 08 Mar 2021 11:07:39 @ Sampling argument: max depth set to: 300.0 m
- 11 Mar 2021 12:14:38 @ Sampling argument: intersample time set to: 8.0 s

Showing changes on Sampling (behaviour 15):

- 08 Mar 2021 11:07:39 @ Sampling of: configuration for CANALES-AUG-2020 (GF-MR-0104)OXY4831-sn0825 SCI-BAY sn1328
- 08 Mar 2021 11:07:40 @ Sampling state to sample set to: Diving and climbing
- 08 Mar 2021 11:07:40 @ Sampling argument: intersample time set to: -1.0 s
- 08 Mar 2021 11:07:40 @ Sampling nth yo to sample set to: 1.0 nodim
- 08 Mar 2021 11:07:40 @ Sampling argument: min depth set to: -5.0 m
- 08 Mar 2021 11:07:40 @ Sampling argument: max depth set to: 2000.0 m
- 10 Mar 2021 12:13:58 @ Sampling argument: intersample time set to: 4.0 s

Showing changes on Sampling (behaviour 14):

- 08 Mar 2021 11:07:40 @ Sampling of: configuration for CANALES-AUG-2020 (GF-MR-0104)FLNTU-SLC sn6171 SCI-BAY sn1328
- 08 Mar 2021 11:07:41 @ Sampling state to sample set to: Diving
- 08 Mar 2021 11:07:41 @ Sampling argument: intersample time set to: -1.0 s
- 08 Mar 2021 11:07:41 @ Sampling nth yo to sample set to: 1.0 nodim
- 08 Mar 2021 11:07:41 @ Sampling argument: min depth set to: 150.0 m
- 08 Mar 2021 11:07:41 @ Sampling argument: max depth set to: 300.0 m
- 10 Mar 2021 12:13:59 @ Sampling argument: intersample time set to: 16.0 s
- 10 Mar 2021 12:13:59 @ Sampling argument: min depth set to: 300.0 m
- 10 Mar 2021 12:13:59 @ Sampling argument: max depth set to: 1000.0 m

Showing changes on Sampling (behaviour 13):

- 08 Mar 2021 11:07:41 @ Sampling of: configuration for CANALES-AUG-2020 (GF-MR-0104)FLNTU-SLC sn6171 SCI-BAY sn1328
- 08 Mar 2021 11:07:42 @ Sampling state to sample set to: Diving
- 08 Mar 2021 11:07:42 @ Sampling argument: intersample time set to: -1.0 s
- 08 Mar 2021 11:07:42 @ Sampling nth yo to sample set to: 1.0 nodim
- 08 Mar 2021 11:07:42 @ Sampling argument: min depth set to: -5.0 m
- 08 Mar 2021 11:07:42 @ Sampling argument: max depth set to: 150.0 m
- 10 Mar 2021 12:14:00 @ Sampling argument: intersample time set to: 8.0 s
- 10 Mar 2021 12:14:00 @ Sampling argument: max depth set to: 300.0 m

Showing changes on Sampling (behaviour 12):

- 08 Mar 2021 11:07:42 @ Sampling of: CTD(Profile)
- 08 Mar 2021 11:07:43 @ Sampling state to sample set to: Diving, climbing and hovering
- 08 Mar 2021 11:07:43 @ Sampling argument: intersample time set to: 4.0 s
- 08 Mar 2021 11:07:43 @ Sampling nth yo to sample set to: 1.0 nodim
- 08 Mar 2021 11:07:43 @ Sampling argument: min depth set to: -5.0 m
- 08 Mar 2021 11:07:43 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Yoing (behaviour behavior yo 11):

- 08 Mar 2021 11:07:43 @ Yoing num half cycles to do(nodim) set to: 2.0
- 08 Mar 2021 11:07:43 @ Yoing d target depth(m) set to: 5.0

- 08 Mar 2021 11:07:43 @ Yoing d bpump value(X) set to: -230.0
  - 08 Mar 2021 11:07:43 @ Yoing d target altitude(m) set to: 20.0
  - 08 Mar 2021 11:07:43 @ Yoing d use pitch(enum) set to: 3.0
  - 08 Mar 2021 11:07:43 @ Yoing d pitch value(X) set to: -0.453800
  - 08 Mar 2021 11:07:44 @ Yoing c use pitch(enum) set to: 3.0
  - 08 Mar 2021 11:07:44 @ Yoing c pitch value(X) set to: 0.453800
  - 08 Mar 2021 11:37:17 @ Yoing d target depth(m) set to: 950.0
  - 08 Mar 2021 12:14:58 @ Yoing num half cycles to do(nodim) set to: -1.0
  - 08 Mar 2021 12:14:58 @ Yoing d target depth(m) set to: 700.0
  - 08 Mar 2021 12:14:58 @ Yoing d bpump value(X) set to: 400.0
  - 13 May 2021 10:10:16 @ Yoing d target depth(m) set to: 950.0
  - 17 May 2021 18:14:51 @ Yoing d bpump value(X) set to: 500.0
  - 23 May 2021 10:27:02 @ Yoing d bpump value(X) set to: 350.0
  - 27 May 2021 10:10:22 @ Yoing d bpump value(X) set to: 500.0
  - 28 May 2021 08:17:09 @ Yoing num half cycles to do(nodim) set to: 2.0
  - 28 May 2021 08:17:09 @ Yoing d target depth(m) set to: 50.0
  - 28 May 2021 08:17:09 @ Yoing d bpump value(X) set to: -230.0
- Showing changes on Altimeter set to (behaviour u alt min depth):
- 08 Mar 2021 11:17:57 @ Altimeter set to u alt min depth set to: 2
  - 31 Mar 2021 10:06:10 @ Altimeter set to u alt min depth set to: 30
  - 12 Apr 2021 10:04:41 @ Altimeter set to u alt min depth set to: 500
  - 27 Apr 2021 10:05:23 @ Altimeter set to u alt min depth set to: 2
  - 13 May 2021 10:07:09 @ Altimeter set to u alt min depth set to: 50

## 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
- Digifin \_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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