

SOCIB Glider Mission Summary Report

SOCIB-CNRismar_FRIPP2.2021_20210330_sdeep06_GFMR0115

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SOCIB

Balearic Islands
Coastal Observing
and Forecasting System



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1 Introduction

The aim of this document is to summarize the most significant technical and scientific events during the glider mission. It will explain engineering events that could affect the science data and also some fact from the science point of view.

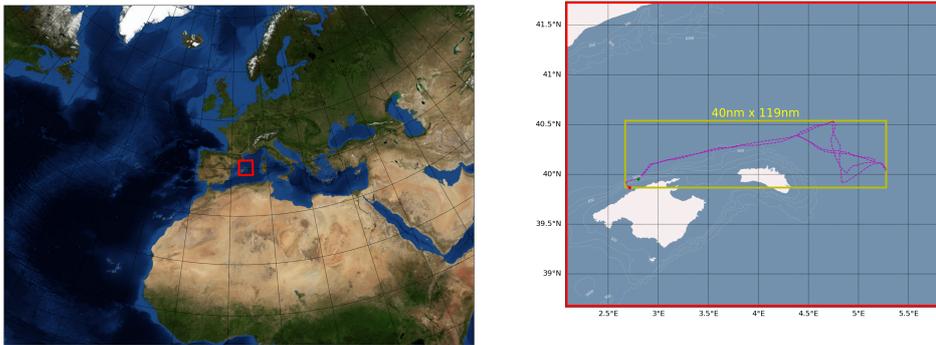


Figure 1.1: Map providing general overview of the Survey Area

1.1 Summary

Mission name	SOCIB-CNRismar_FRIPP2.2021_20210330_sdeep06_GFMR0115
Platform model	G3 Electric
Platform ID / Name / WMO Code	U827/ sdeep06/ 6801637
Software NAV version	Version 10.02 tags/V10.02-0-gfdea92ab (0, 1)
Software SCI version	Version 10.02 tags/V10.02-0-gfdea92ab (0, 1)
FWD bay sn	0518
SCI bay sn	1348
Mission duration	42.9 days
Mission start	2021-03-30 14:40:21
Mission end	2021-05-12 13:06:40
Total distance	827.99[km] 447.08[nm]
Deployment point [dd°mm.mmmm']	N 39°57.2027' E 02°48.0038'
Recovery point [dd°mm.mmmm']	N 39°52.1539' E 02°42.8759'
Battery Consumption (Ah)	254.1(from 7.7 to 261.8)
Battery specification	20210111 SN0048 / TWR 4S lithium (550Ah)
Survey area	North Menorca
Objective	The project aims to study, through a multisensor sea-glider mission supported by modeled and remotely-sensed data, the impact of frontal dynamics on the Phytoplankton production and distribution as inferred from fluorometric measurements.
Abstract	<p>Frontal dynamics influencing Primary Production: investigating the onset of the spring bloom mechanism through gliders.</p> <p>The project aims to study, through a multisensor sea-glider mission supported by modeled and remotely-sensed data, the impact of frontal dynamics on the Phytoplankton production and distribution as inferred from fluorometric measurements. baiming the coverage of the norht Menorca area in APR 2021, sampling physical and biogeochemical parmeters (CTD, BSK, fluorescence and turibity, oxygen, and PAR).</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: Shallow dives leaded to a slow horizontal velocity, the mission was longer because of that. Also frontal currents contributed. ▪ Event 2: Glider suffered a deviation from target track due to it was flying in shallower waters. ▪ Event 3: For following deployments on the area it is proposed Pto. Pol-lença. ▪ Event 4: High difference on shallow and deep inflection time ▪ Event 5: Altimeter turned off on deep waters to save some energy.
SCI events	<ul style="list-style-type: none"> ▪ Event 1: Spikes have been observed in all the sensors. The more have been observed in CDOM and then in backscatter as you can see from the time-series plots. In addition there is a concern about the cdom sensor around 20th of April but it was recover afterwards. ▪ Event 2: There is also a clear hysteresis in the oxygen sensor that you could see with the upcast and downcast but it is manageable with a time lag correction. ▪ Event 3: CTD data over all good with some negative values to observed in temp and salinity ▪ Event 4: The chl data is what we should get, of course some negative spikes but overall it is one of the best time that we observe the chl with the FL3 sensor.

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 ▪ ISAC-CNR
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)	na
Further Details	glider@socib.es

*Available netCDF data product:

- L0: https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep06-scb_s1deep006/L0/2021/dep0003_sdeep06_scb-s1deep006_L0_2021-03-30_data_dt.nc
- L1: https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep06-scb_s1deep006/L1/2021/dep0003_sdeep06_scb-s1deep006_L1_2021-03-30_data_dt.nc
- L2: https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep06-scb_s1deep006/L2/2021/dep0003_sdeep06_scb-s1deep006_L2_2021-03-30_data_dt.nc

2 Engineering Review

2.1 Preparation

- Permission: ok
- Hardware: ok
- Batteries: ok, using 4S TWR
- 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 RV
 - Personnel: 2 ETD + 1 GF (field team)+ 1 GF (piloting)
 - Location: Soller Bay
- Navigation: The glider responded well to the commanded target waypoints.
- Underwater Maneuvering: Performed well
- Engineering sensors:

Sensor	Oddities	Warnings	Errors
GPS	0	6	0
ocean pres- sure	54	0	0
pitch motor	13	0	0
science super	1	0	0
digifin	861	7	0
IRIDIUM	31	0	0
coulomb	7	0	0

- Communication Systems (see appendix for Iridium states):
 - Total number iridium calls [num]: 189
 - Iridium calls to secondary [num]: 8
 - ON overall iridium period [h]: 7.4
 - Iridium calls state from MODE NO CARRIER to MODE UNKNOWN [num]: 29
 - Iridium calls state from MODE OK to MODE UNKNOWN [num]: 1

- Iridium calls state from MODE CONNECT to MODE UNKNOWN [num]: 173
 - Iridium calls state from MODE ERROR to MODE UNKNOWN [num]: 1
 - Iridium calls state from MODE UNKNOWN to MODE AWAITING OK [num]: 205
 - 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]: 22
 - Total time at surface [h]: 12.82
 - Total time at surface [%]: 1.24
- Hull/Hydrodynamics: No signs of problems
 - Recovery:
 - Vessel: Valiant
 - Personnel: 2 ETD + 1 GF (field team)+ 1 GF (piloting)
 - Location: Soller Bay

2.3 NAV plots

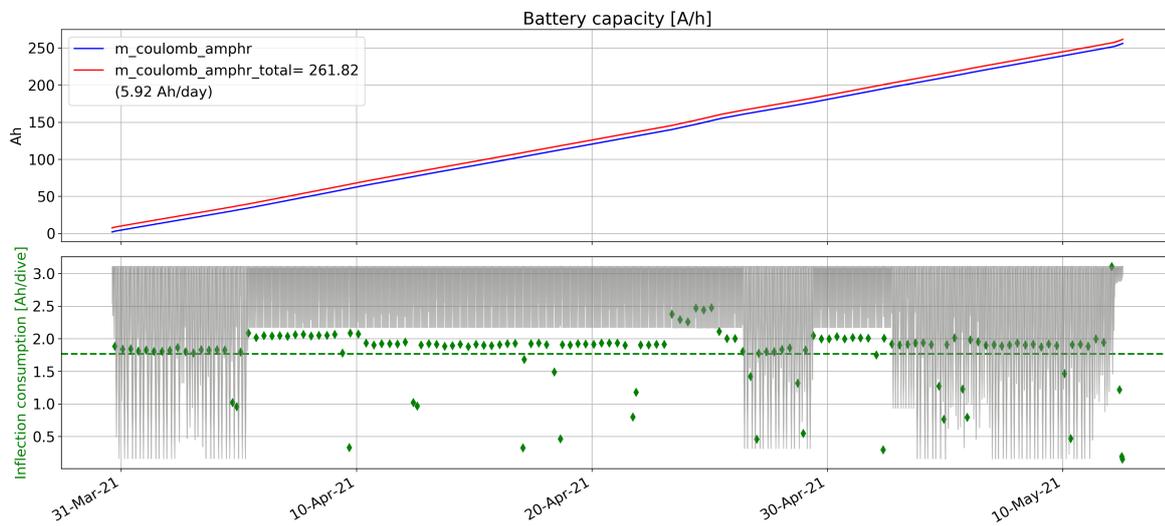


Figure 2.1: Battery capacity

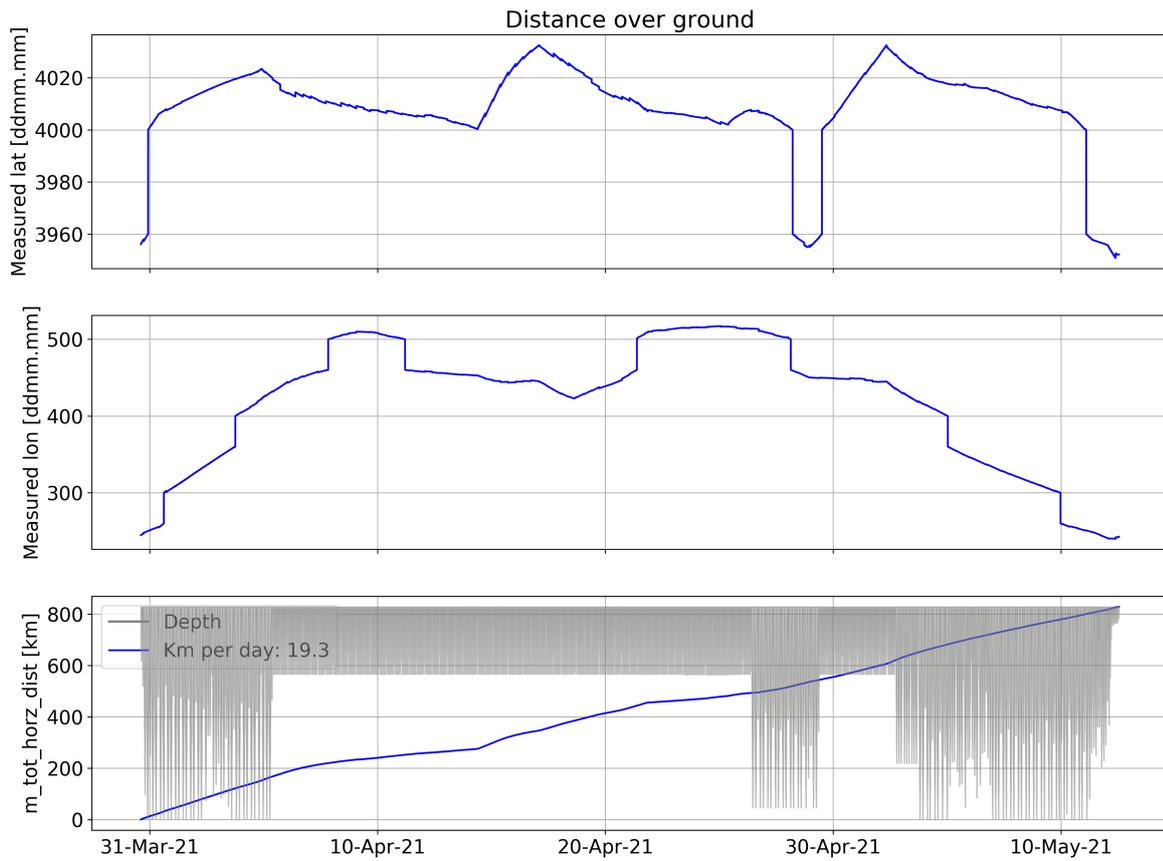


Figure 2.2: Distance over ground

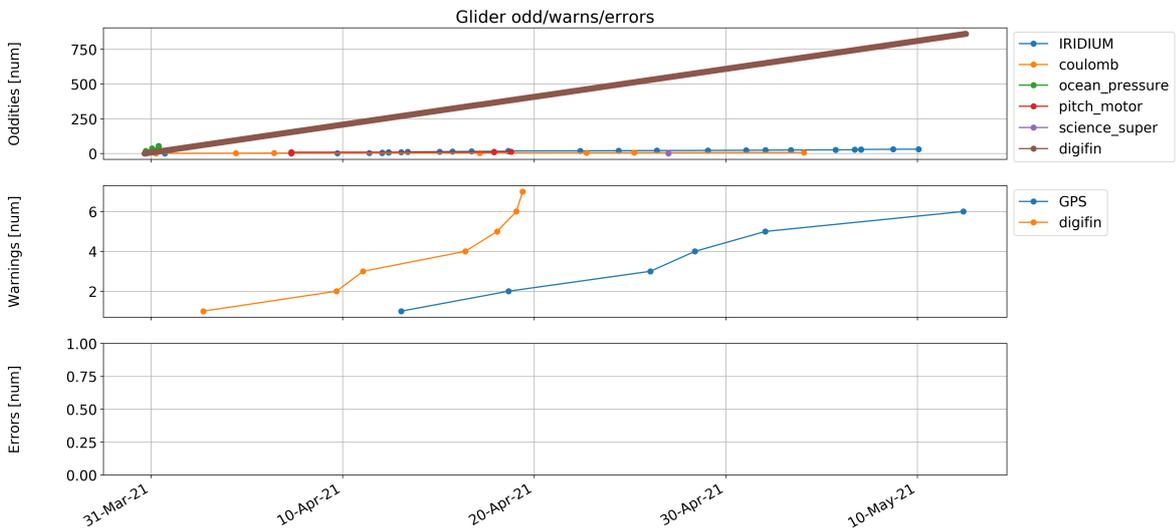


Figure 2.3: Glider Odd Warn and Err

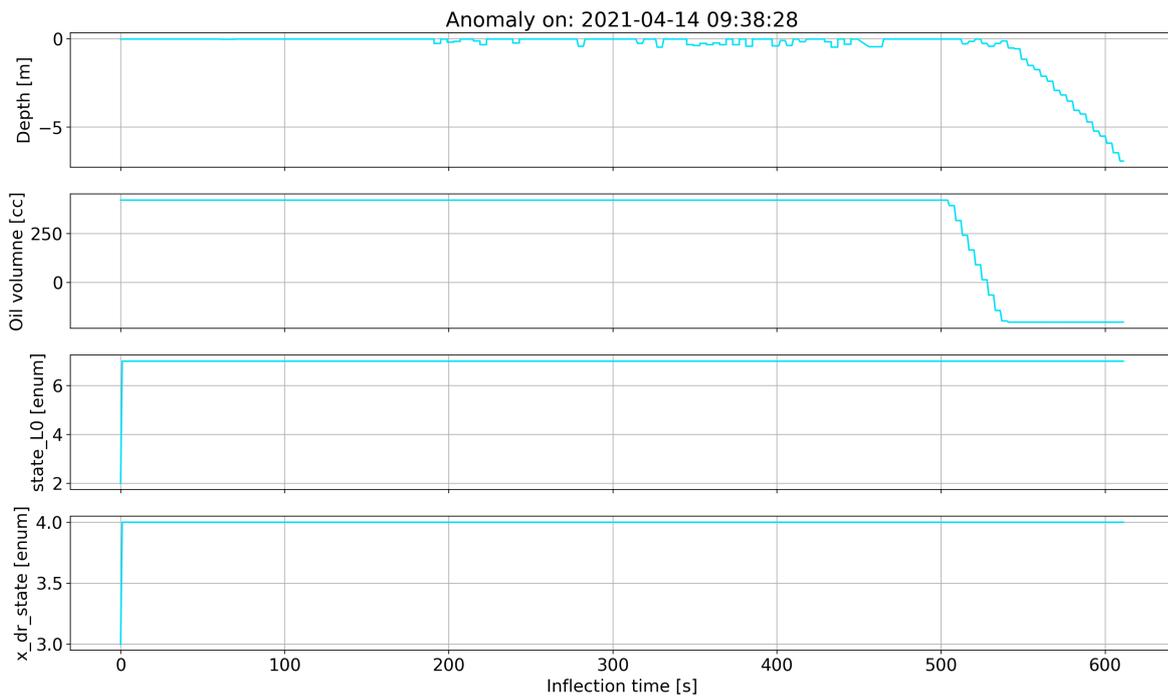


Figure 2.4: 20210414T093828 Anomaly 1

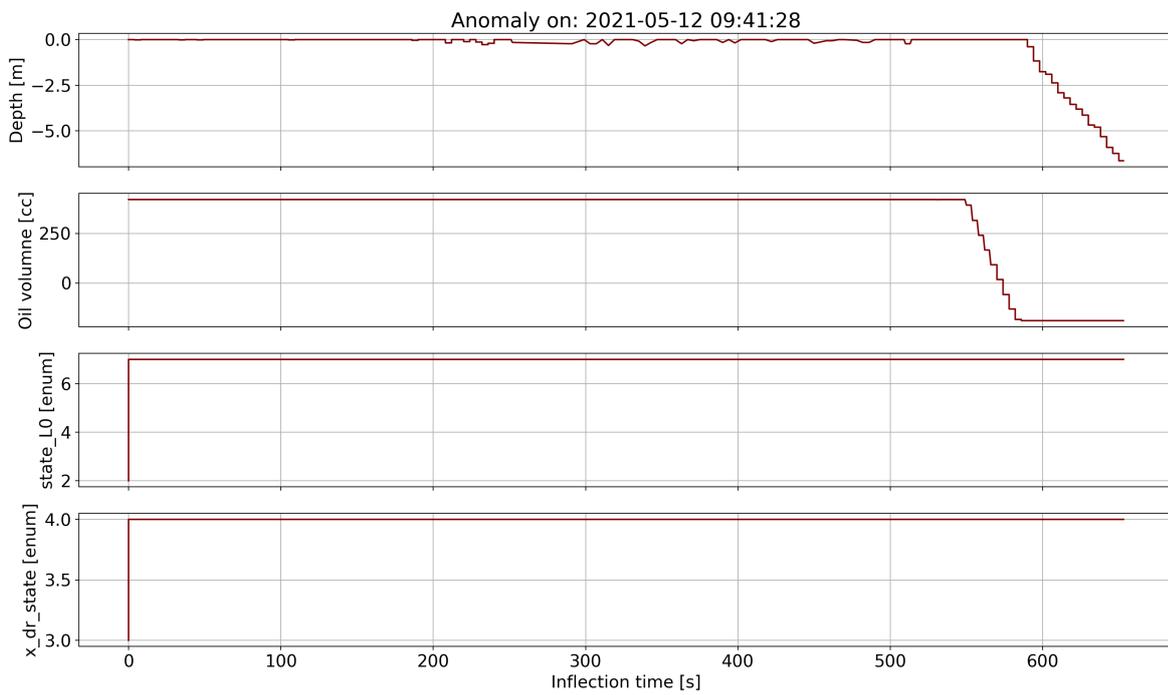


Figure 2.5: 20210512T094128 Anomaly 2

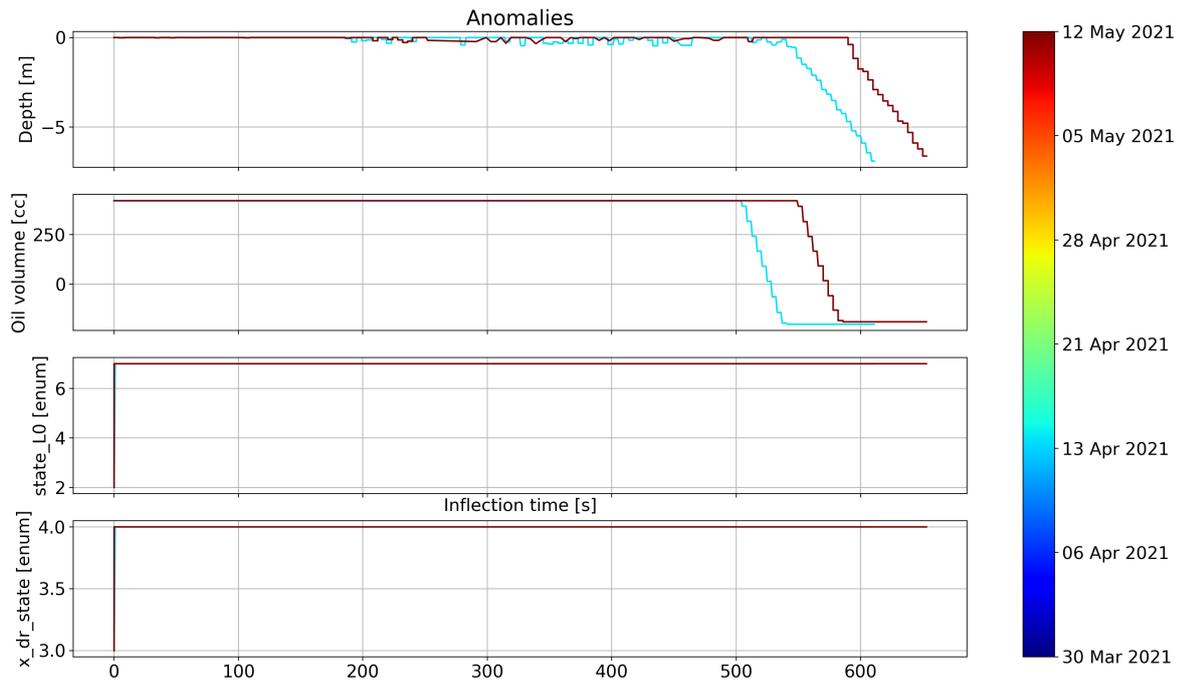


Figure 2.6: Anomalies (time)

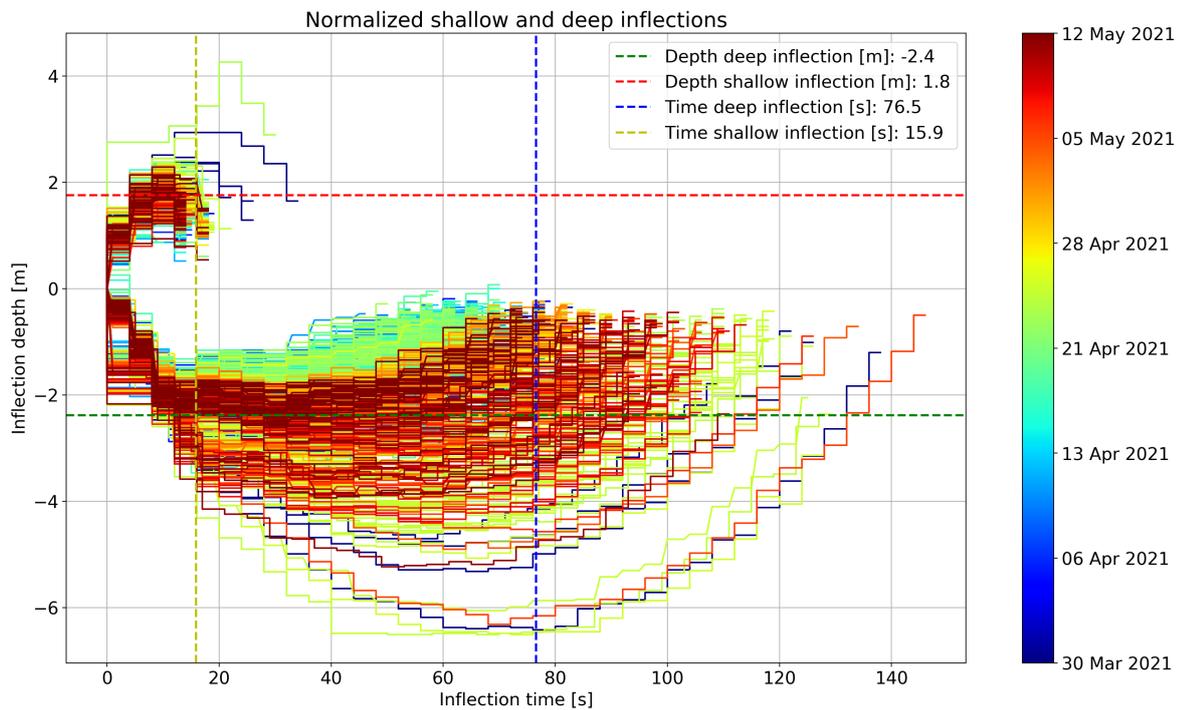


Figure 2.7: Depth inflections

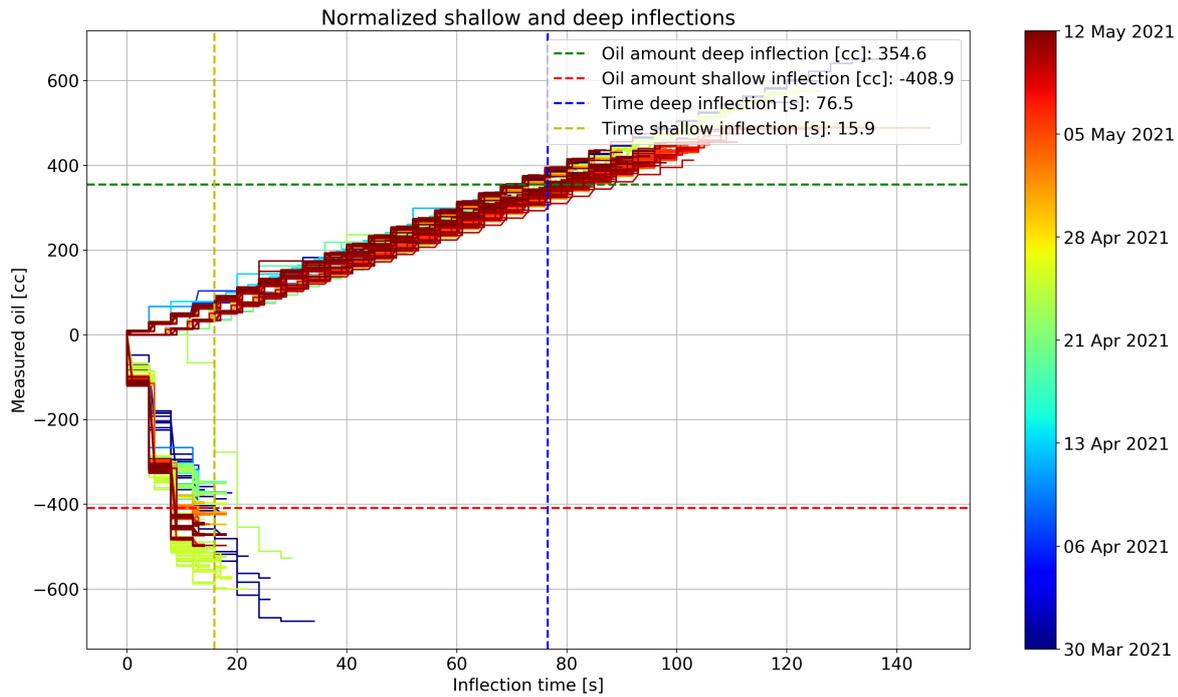


Figure 2.8: Oil inflections

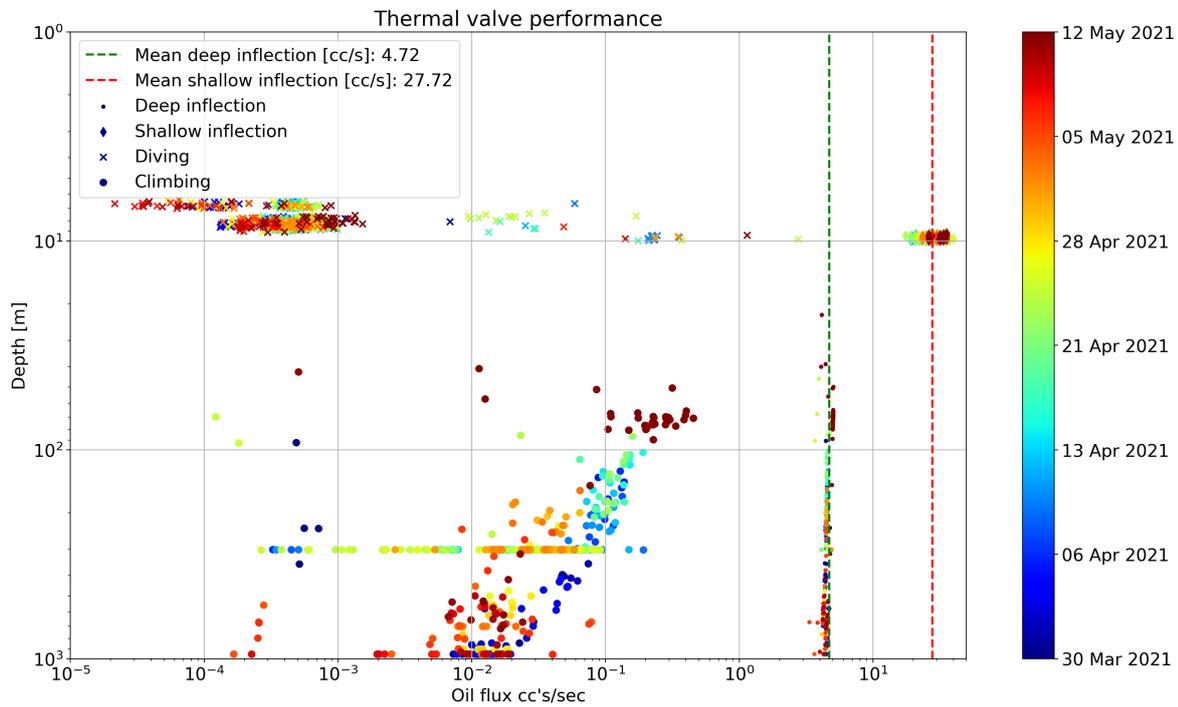


Figure 2.9: Oil flux

Normalized shallow and deep inflections

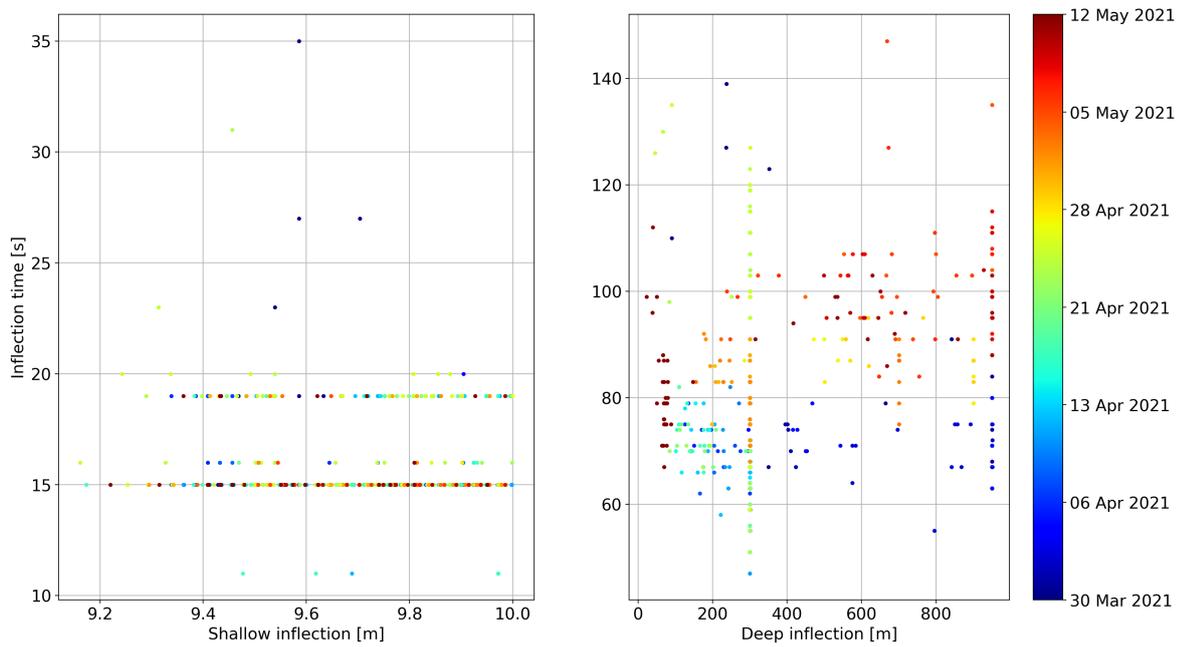


Figure 2.10: Duration inflections

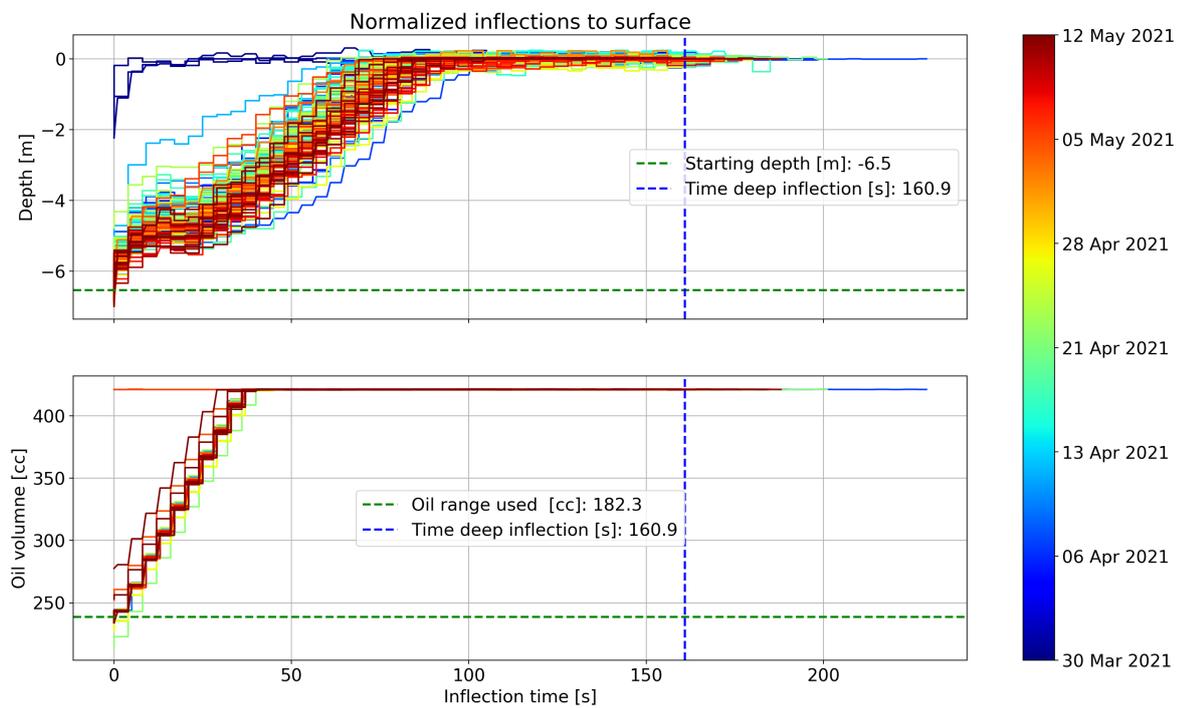


Figure 2.11: Surface Oil inflections

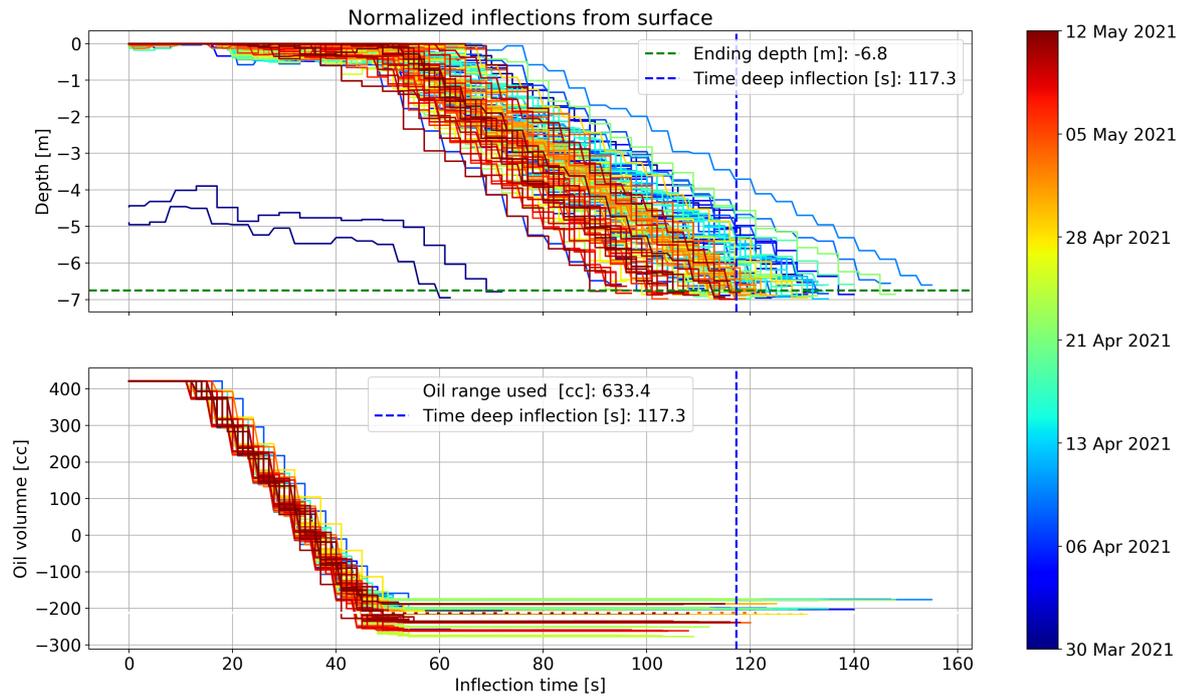


Figure 2.12: Surface Duration inflections

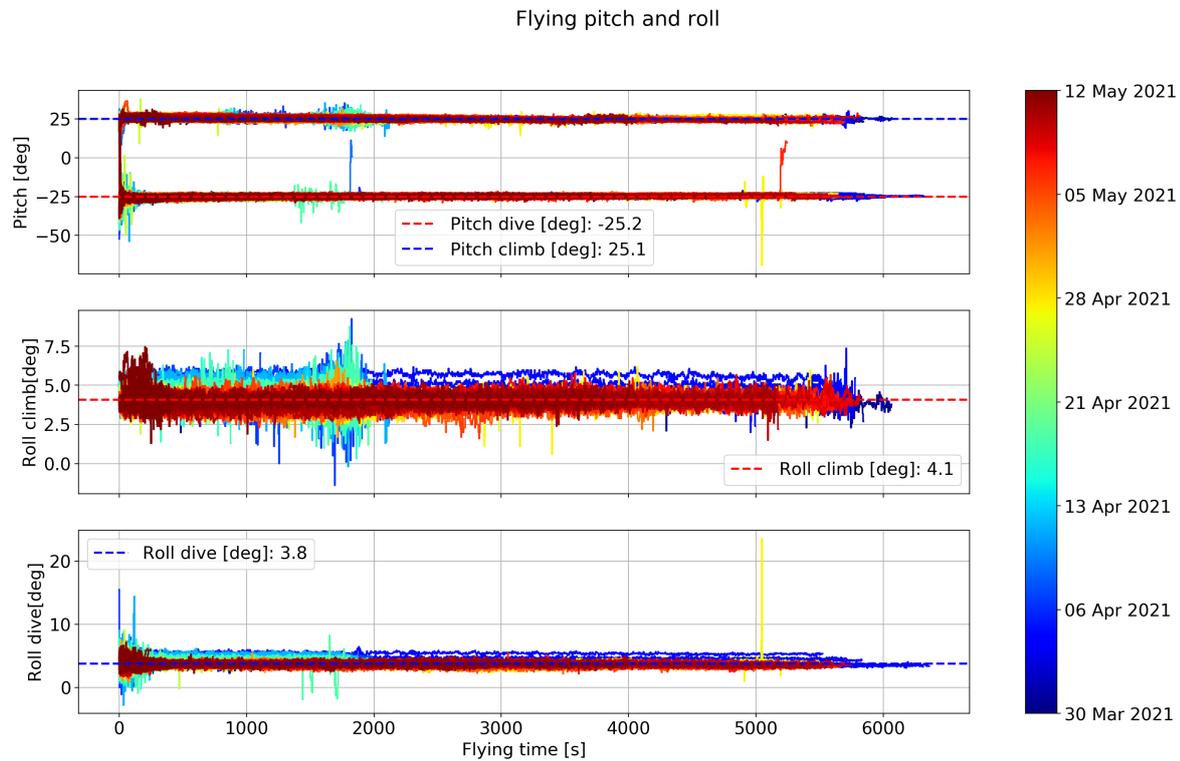


Figure 2.13: Pitch and roll, when climbing and diving

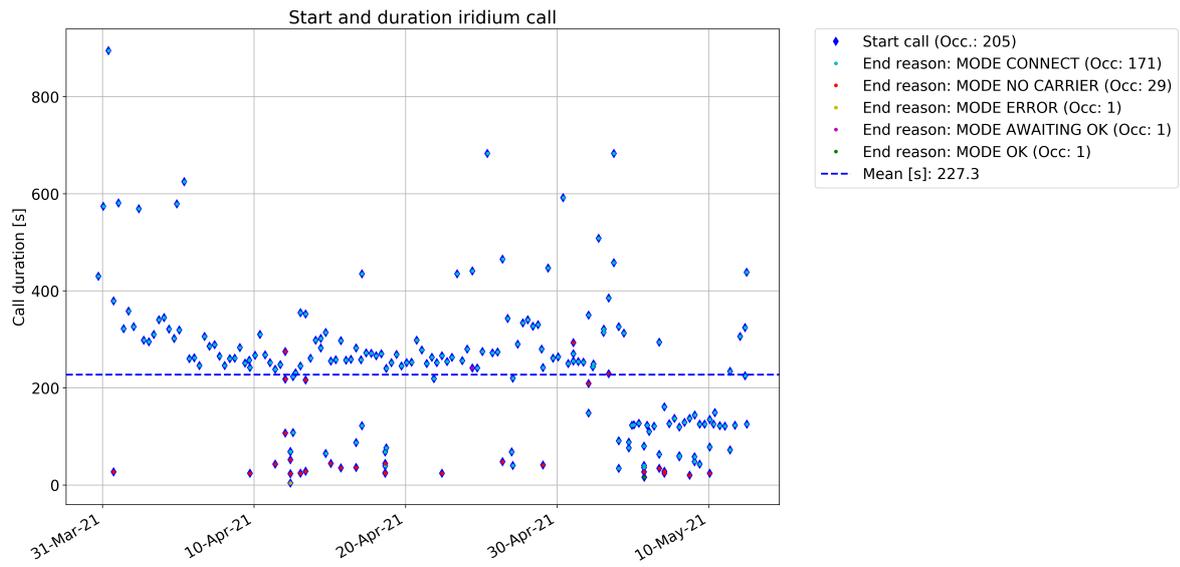


Figure 2.14: Iridium Status

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	9597	20190612	1621	1621	601590	6.0	597.9
FLNTU-FLBBCDSL	6041	20191230	810	1621	na	na	298.2
OXY 3-4	0842	20190919	1621	1621	601571	5.999	597.9
PAR	50318	20200316	810	1621	81037	16.595	219.3
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	45
FLx	Turbidity dark count	na
FLx	CDOM dark count	50
FLx	BB700 dark count	45

3.2 SCI plots

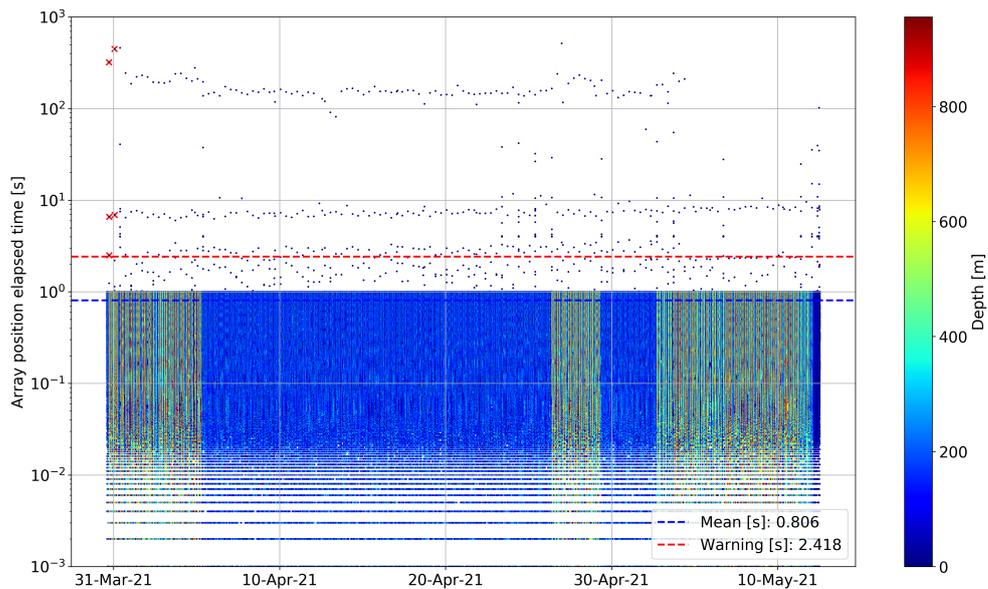


Figure 3.1: Array time

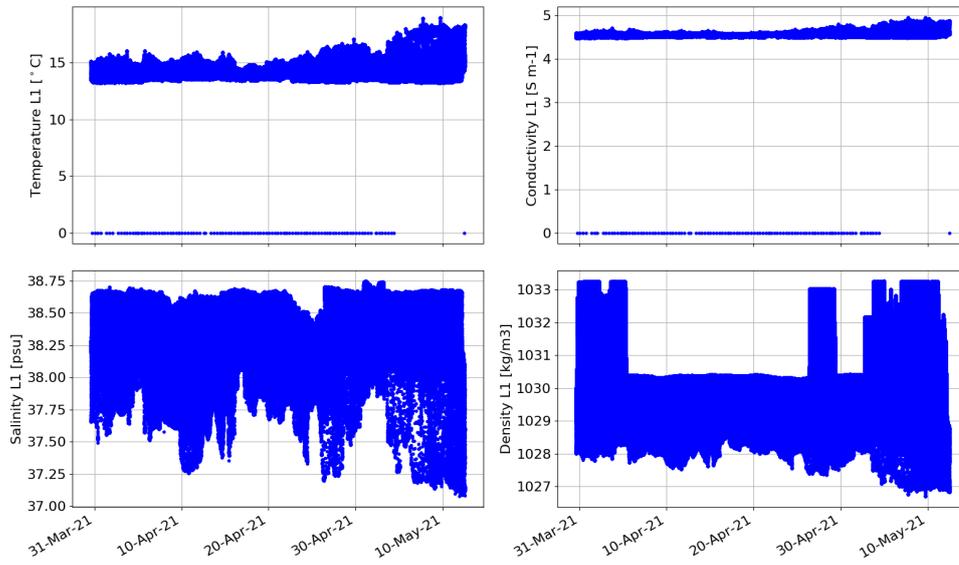


Figure 3.2: Raw CTD L1

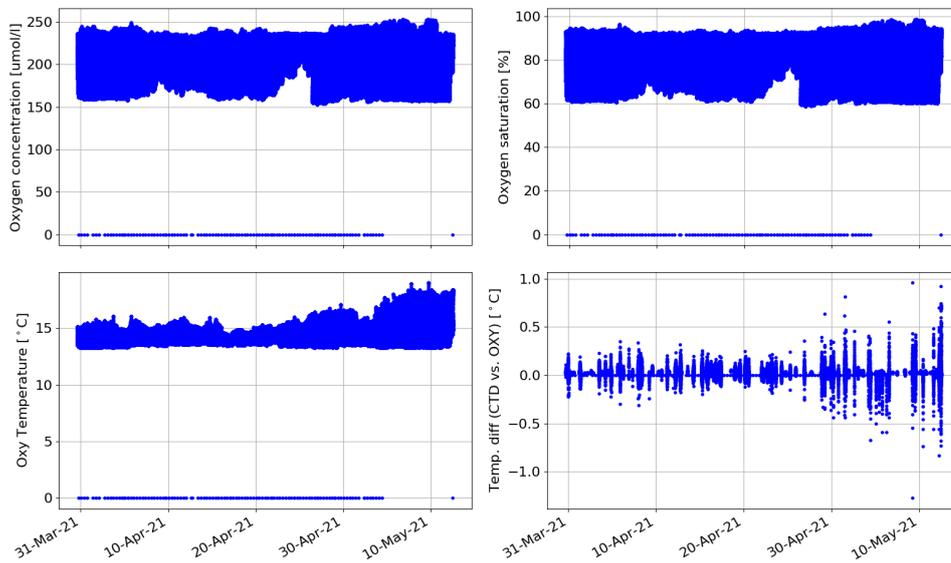


Figure 3.3: Raw OXY L1

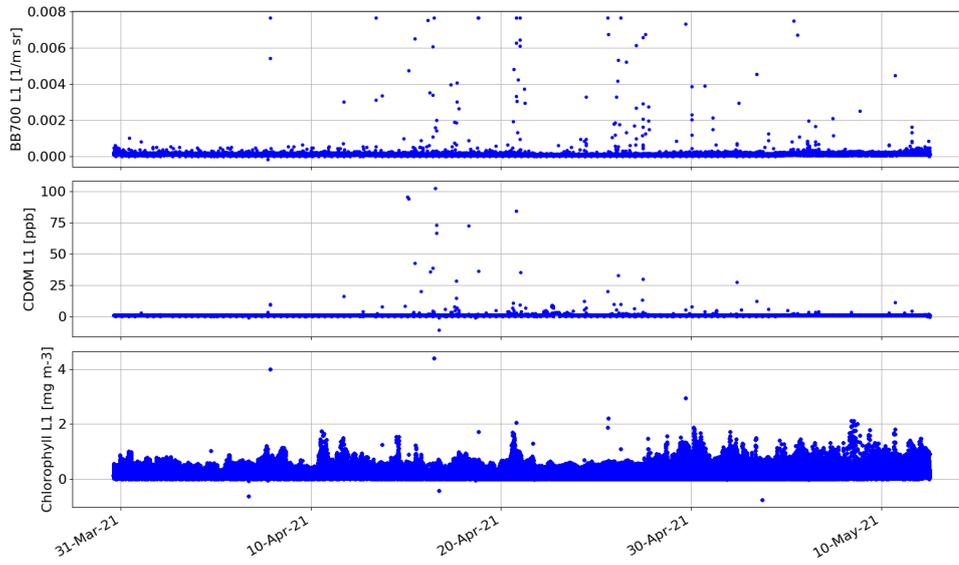


Figure 3.4: Raw FLBBCDSLCL1

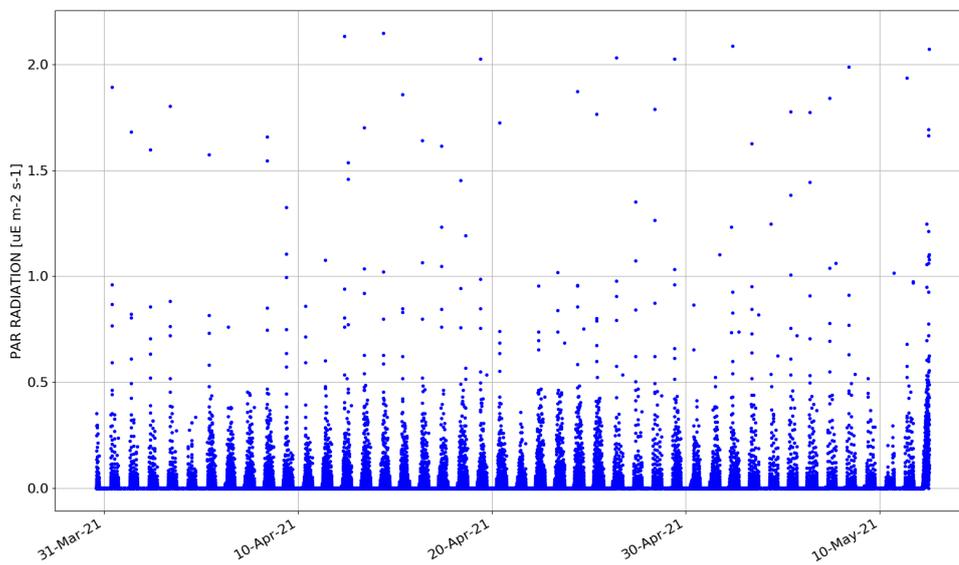


Figure 3.5: Raw PAR L1

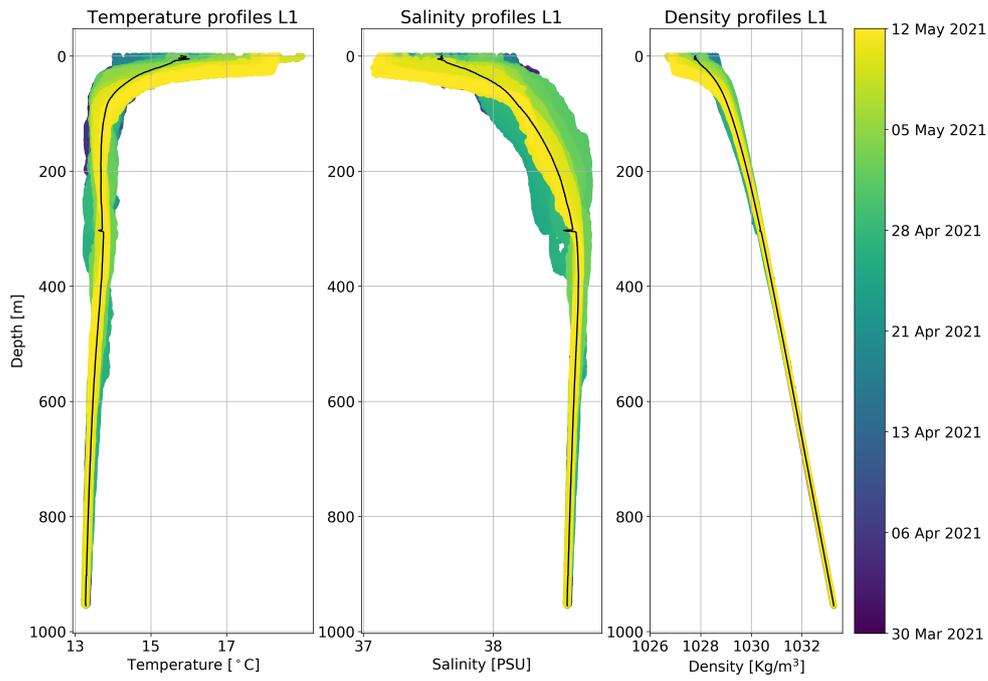


Figure 3.6: CTD profiles

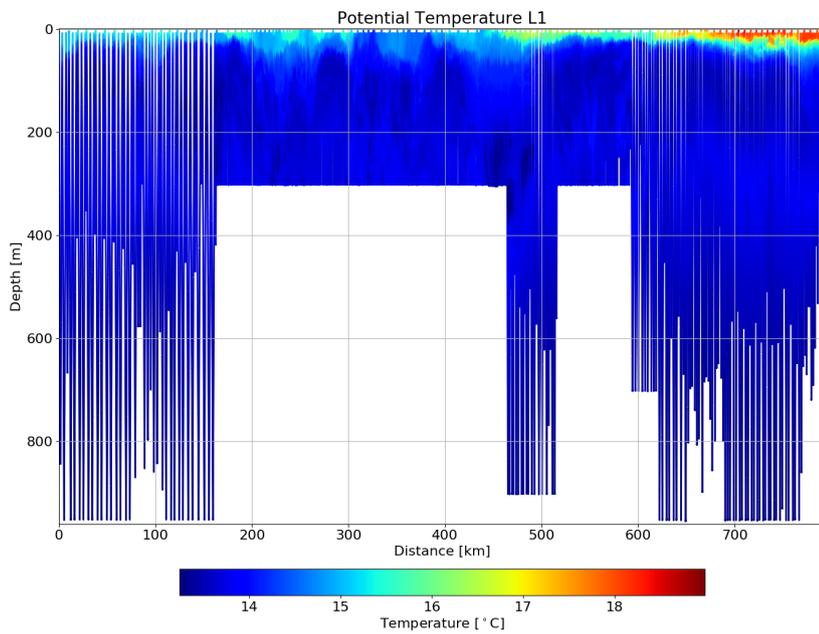


Figure 3.7: CTD temperature

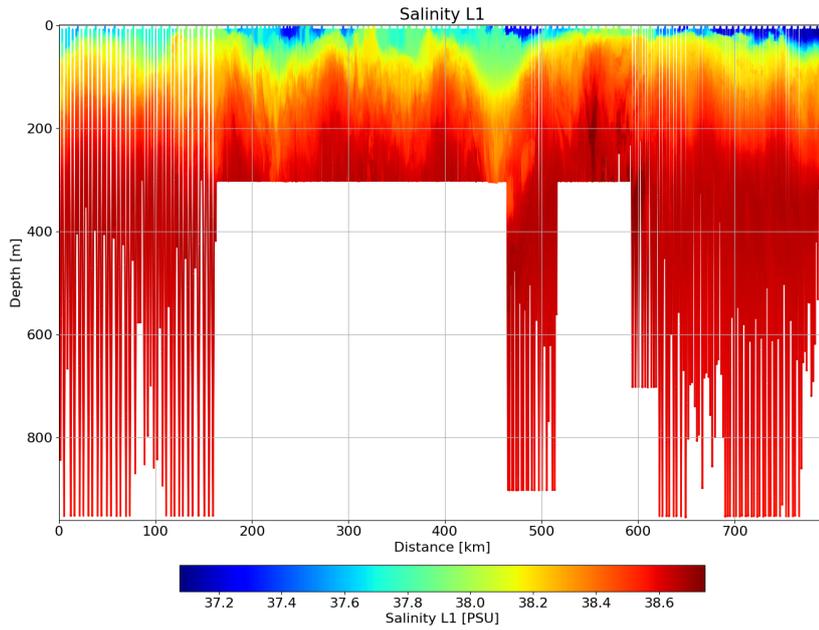


Figure 3.8: CTD Salinity

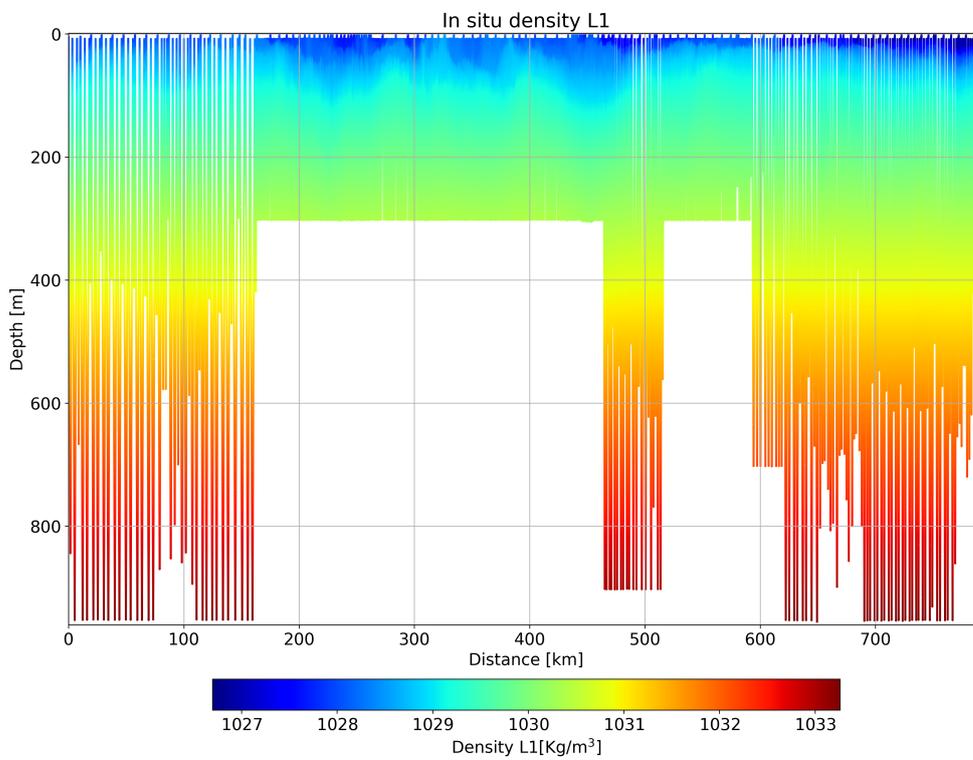


Figure 3.9: CTD Density

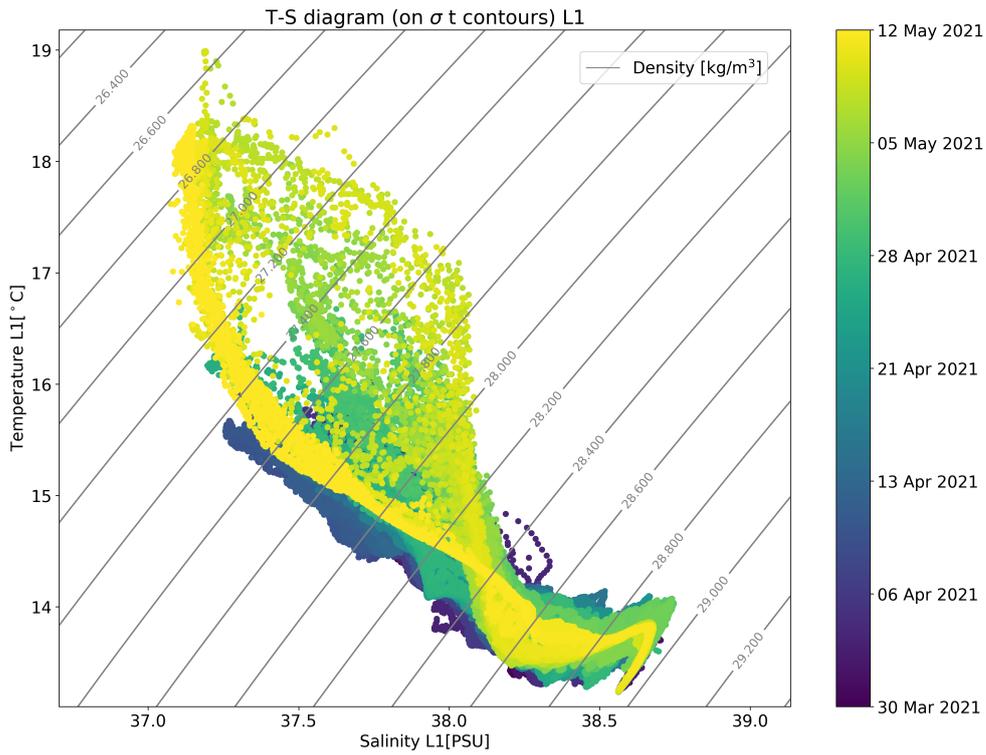


Figure 3.10: TS diagram (CTD)

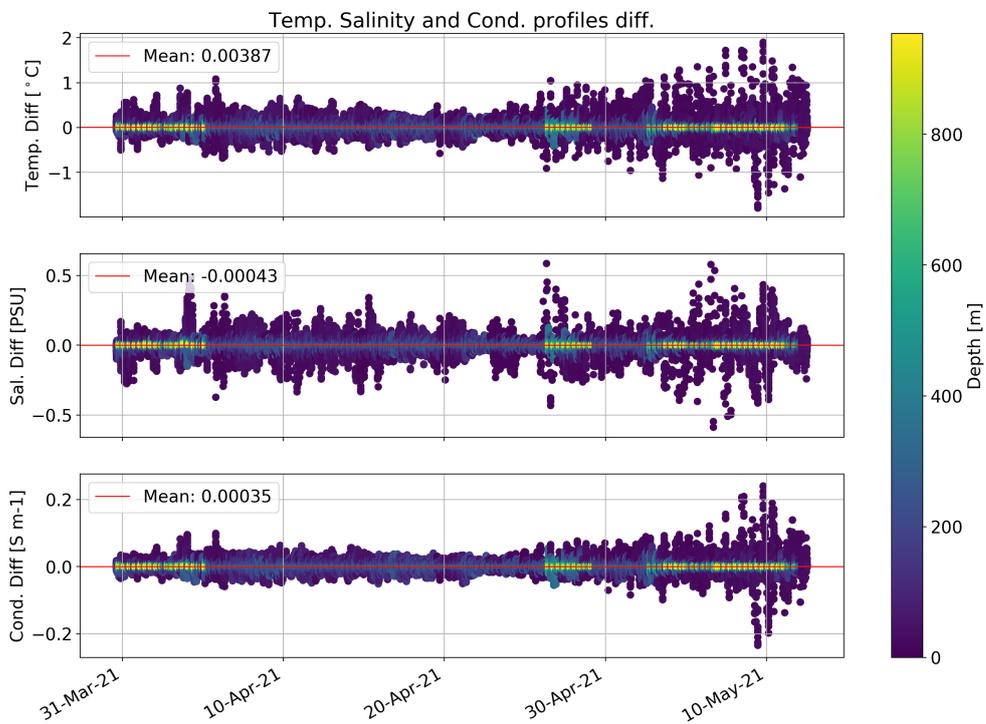


Figure 3.11: Profile consistency (CTD)

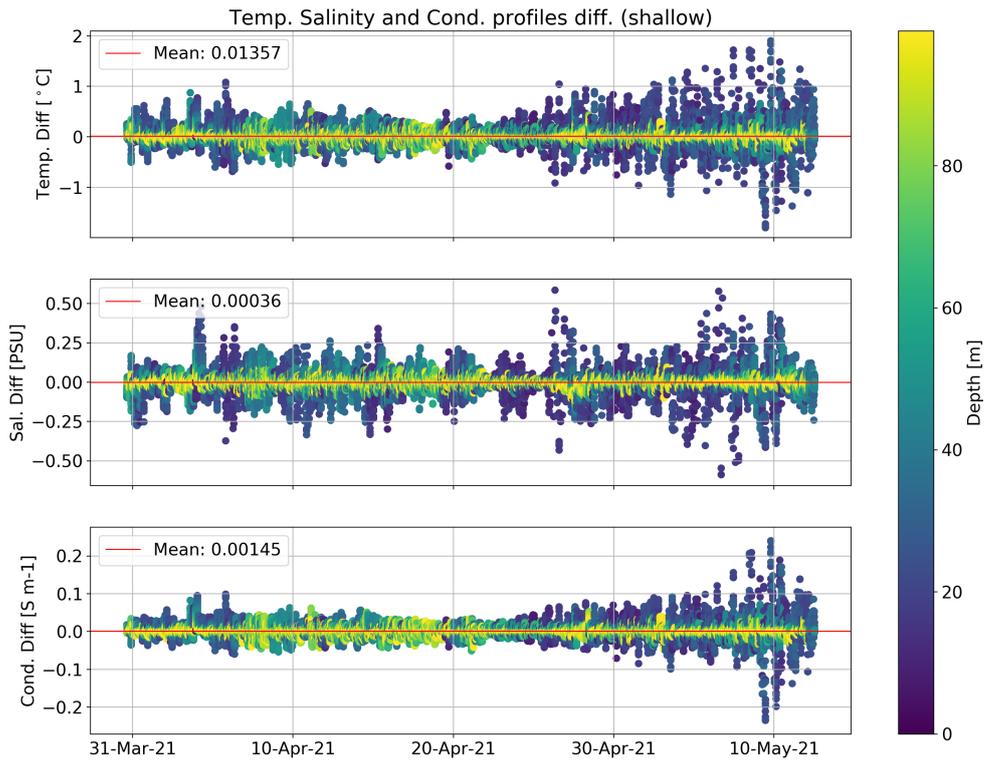


Figure 3.12: Profile consistency (CTD) zoom

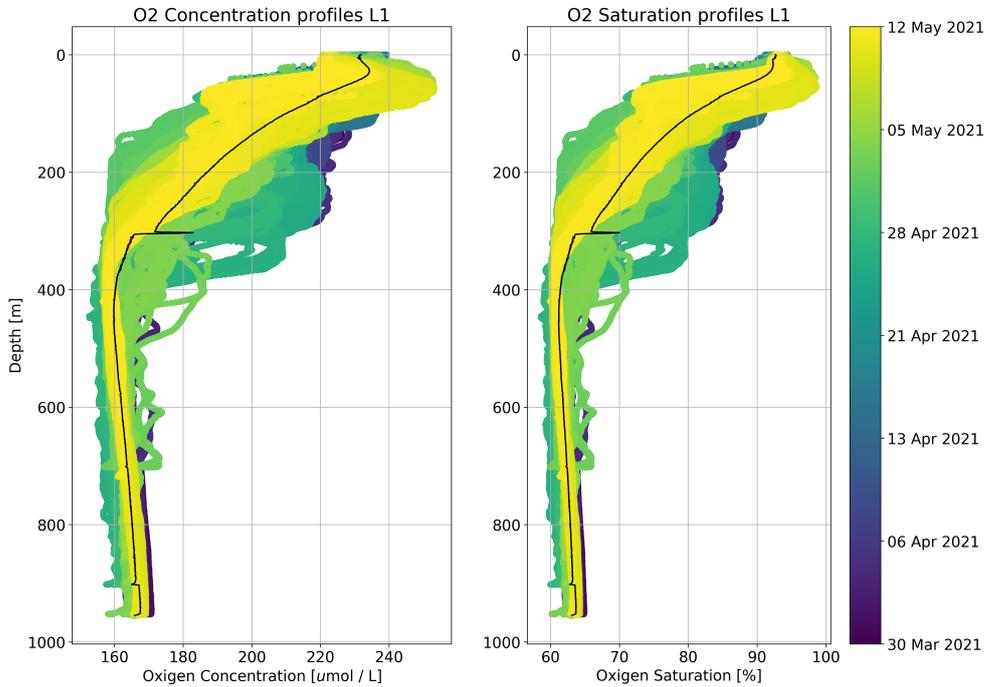


Figure 3.13: Oxygen profiles

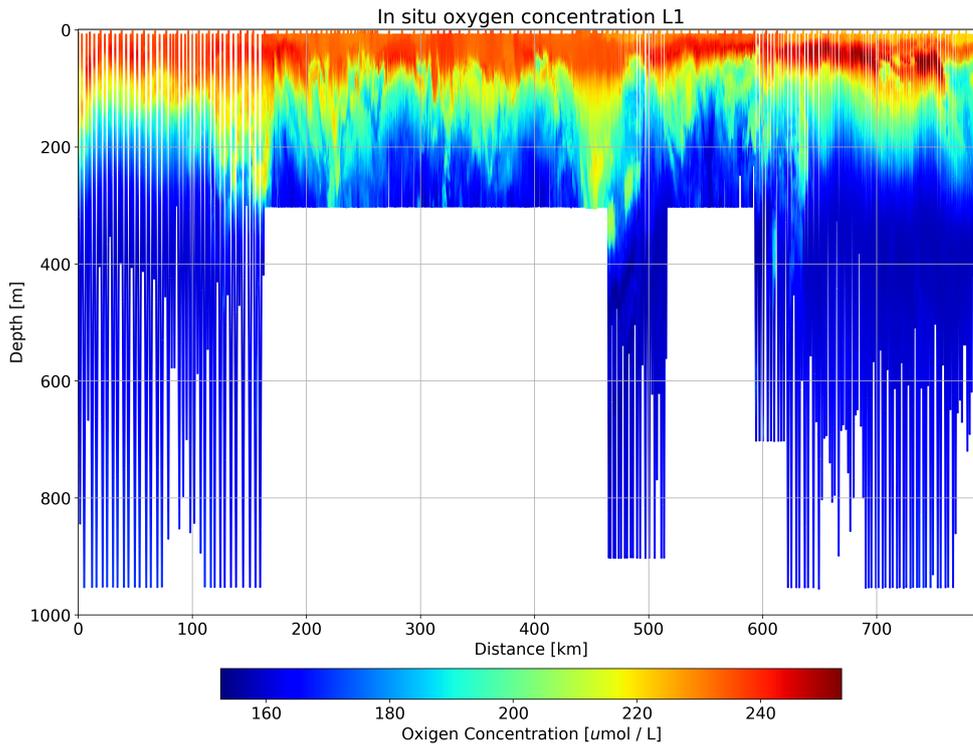


Figure 3.14: Oxygen Concentration

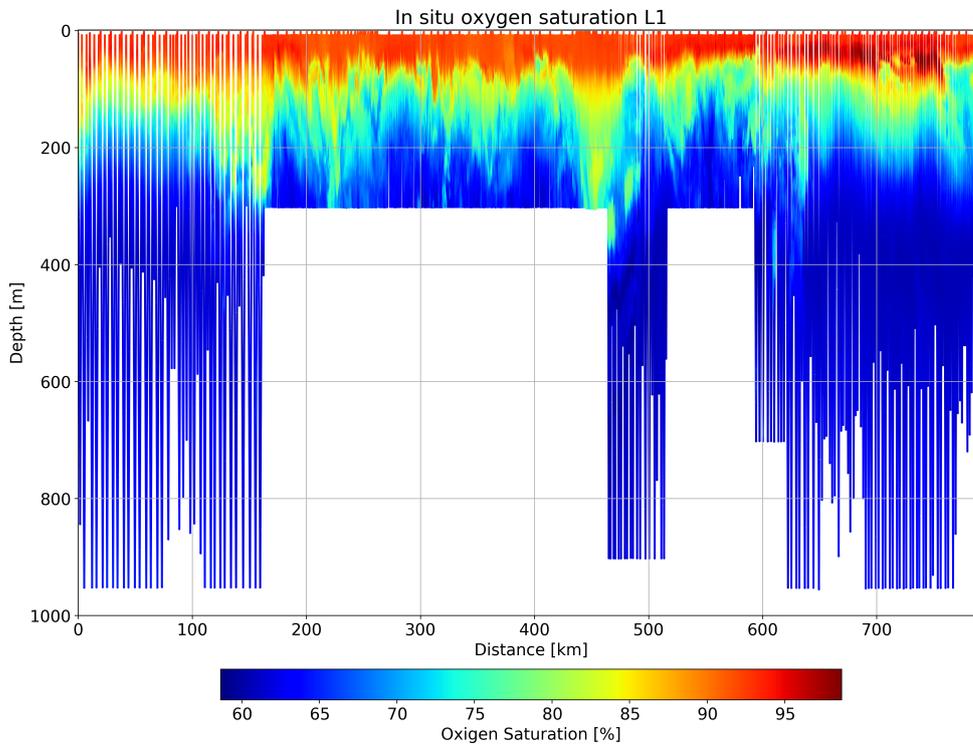


Figure 3.15: Oxygen Saturation

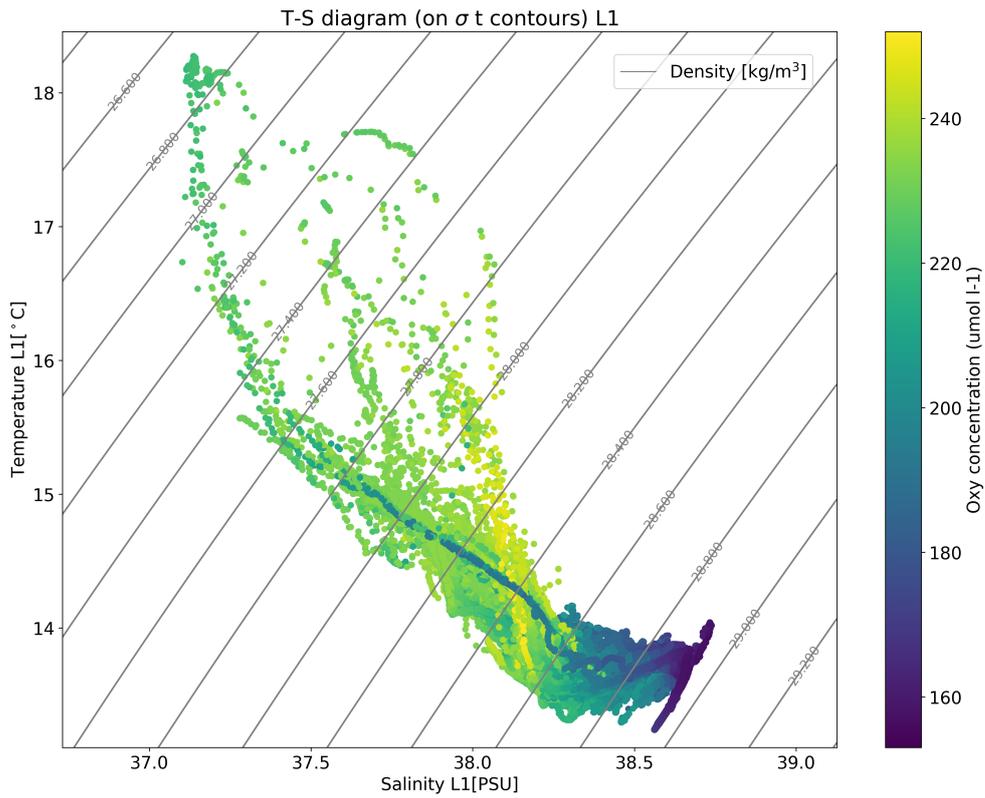


Figure 3.16: TS diagram (OXY)

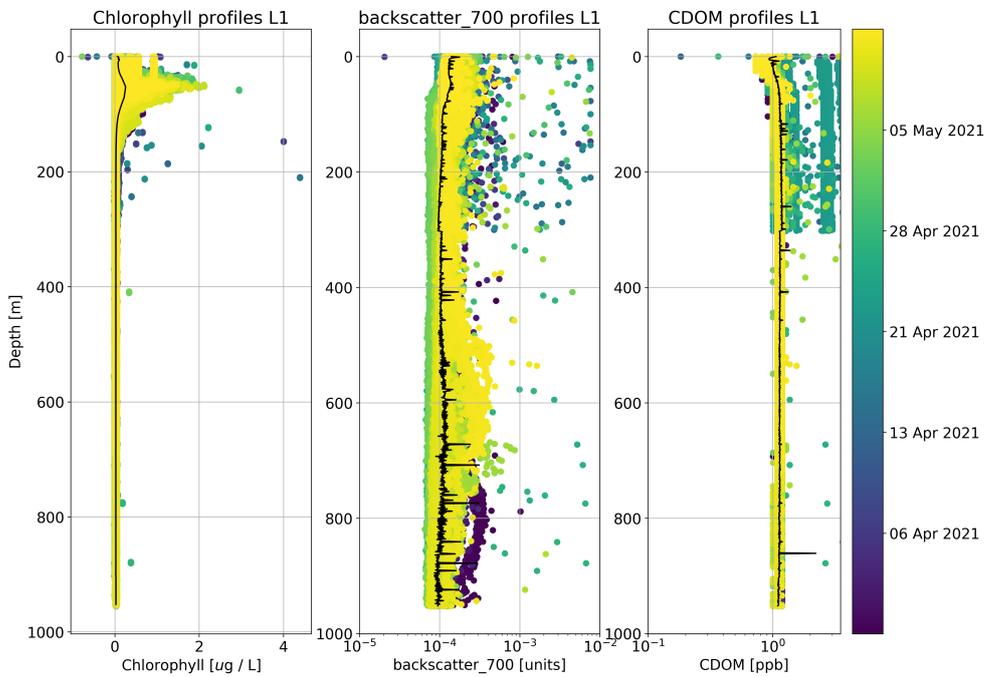


Figure 3.17: Chlorophyll-a, CDOM and BB700 profiles

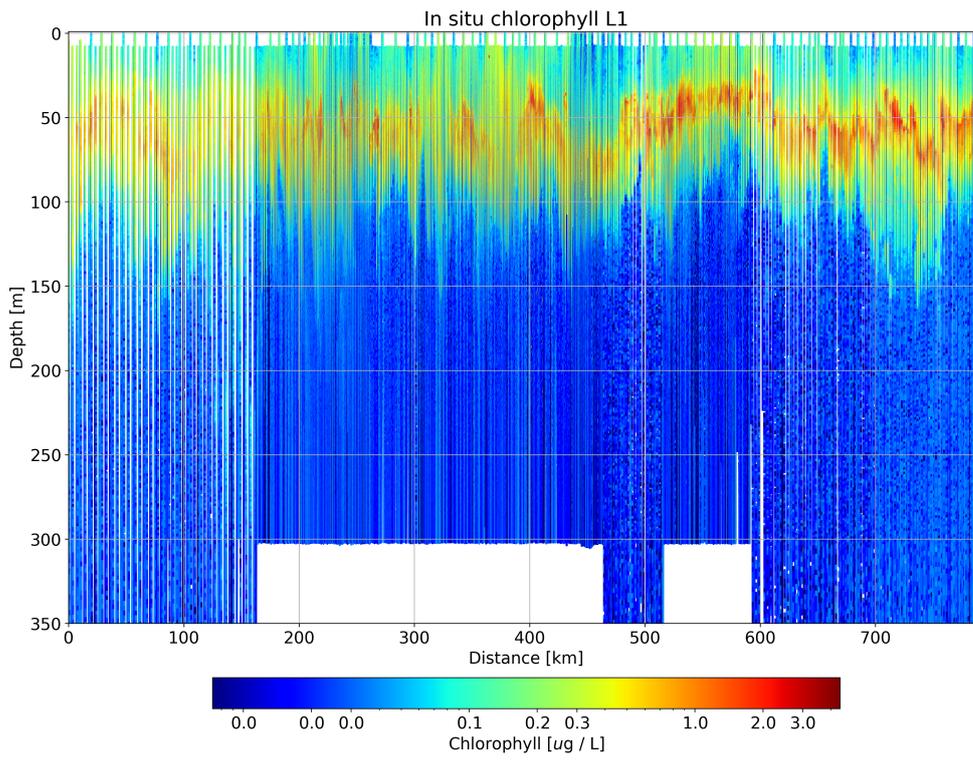


Figure 3.18: Chlorophyll-a

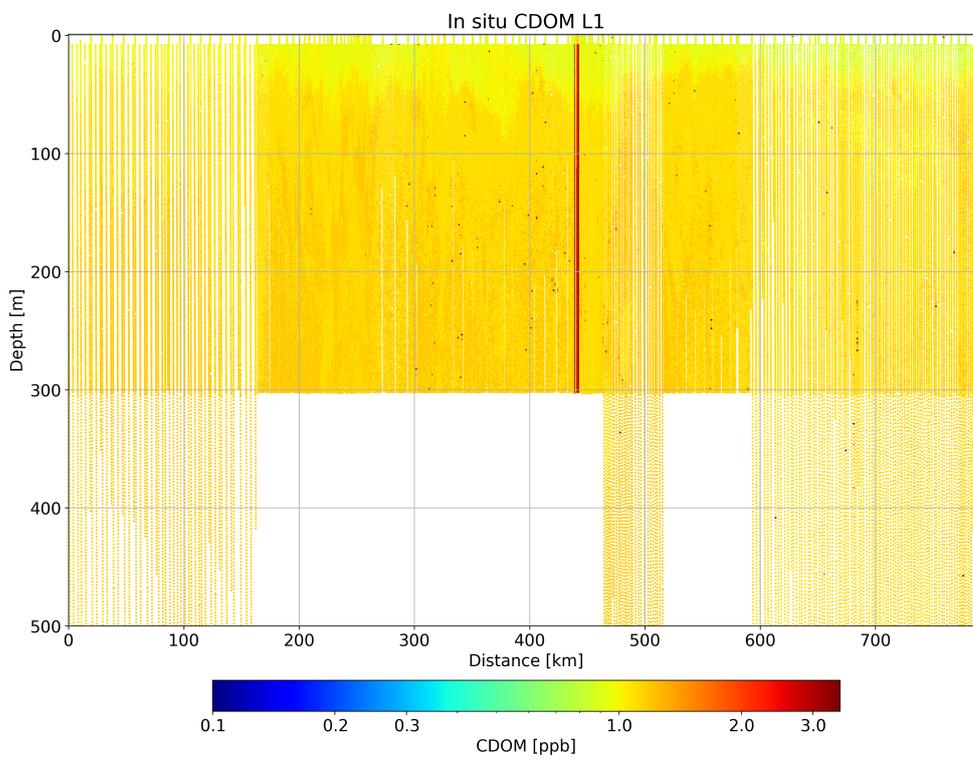


Figure 3.19: CDOM

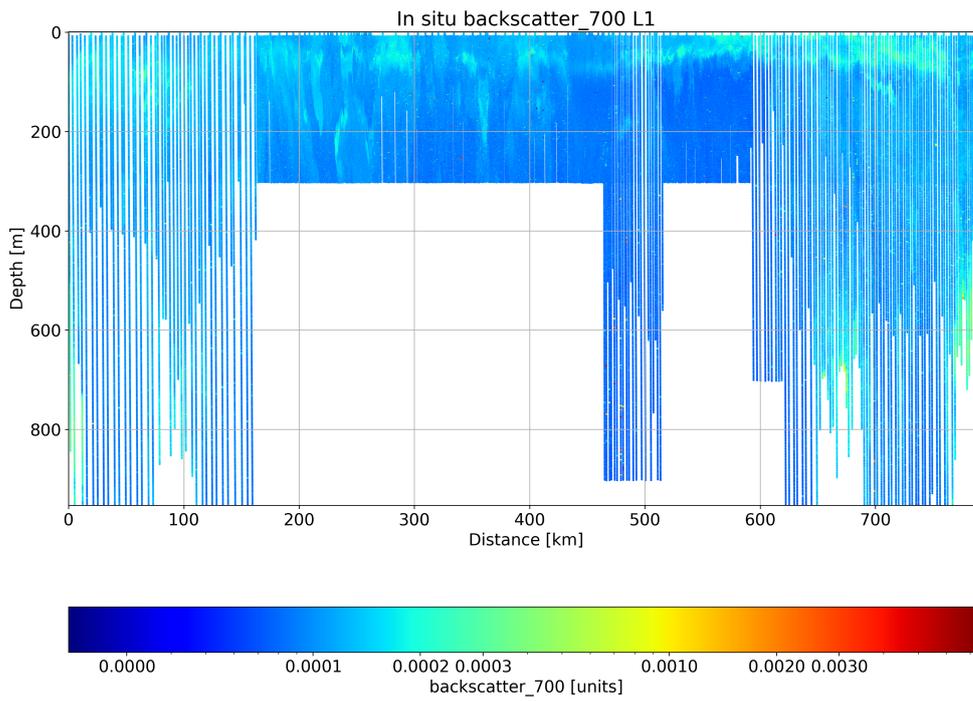


Figure 3.20: Backscatter 700

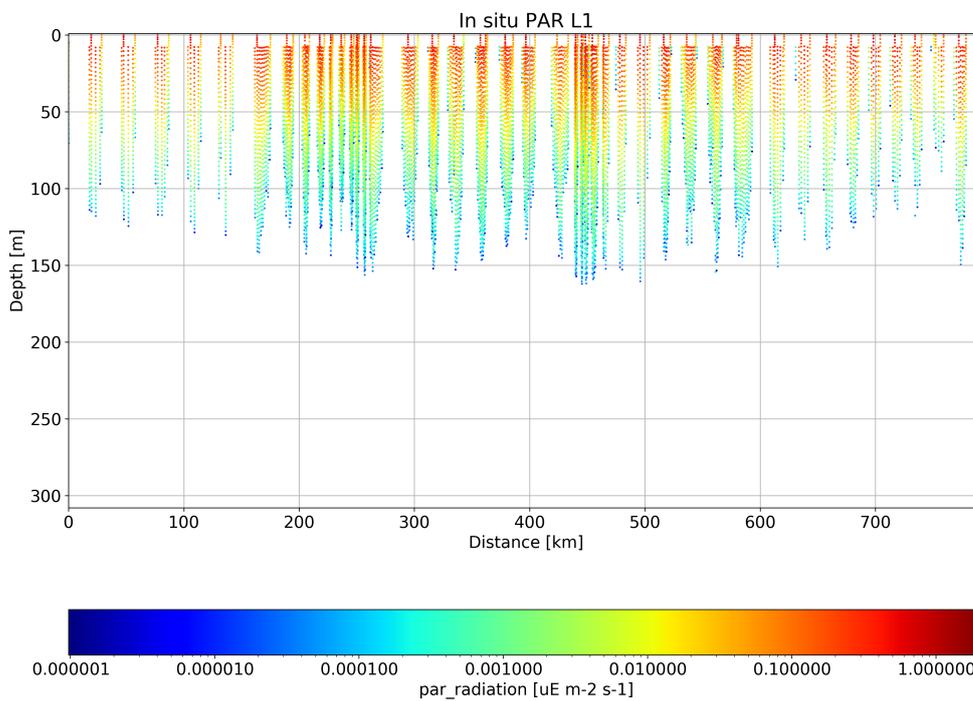


Figure 3.21: PAR radiation

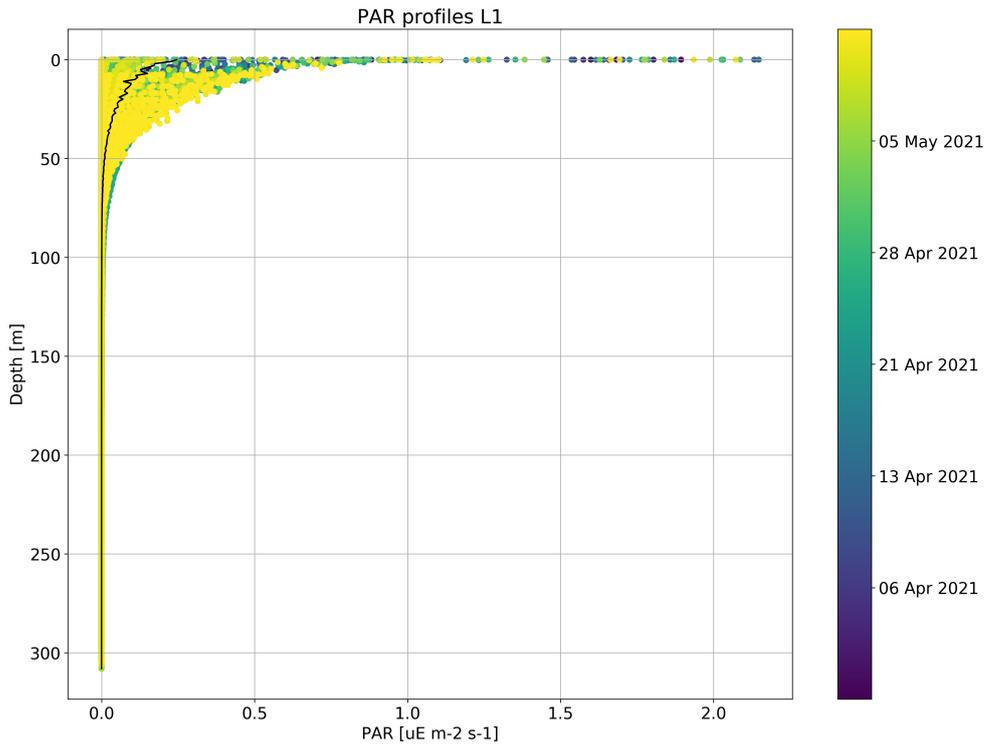


Figure 3.22: PAR profiles

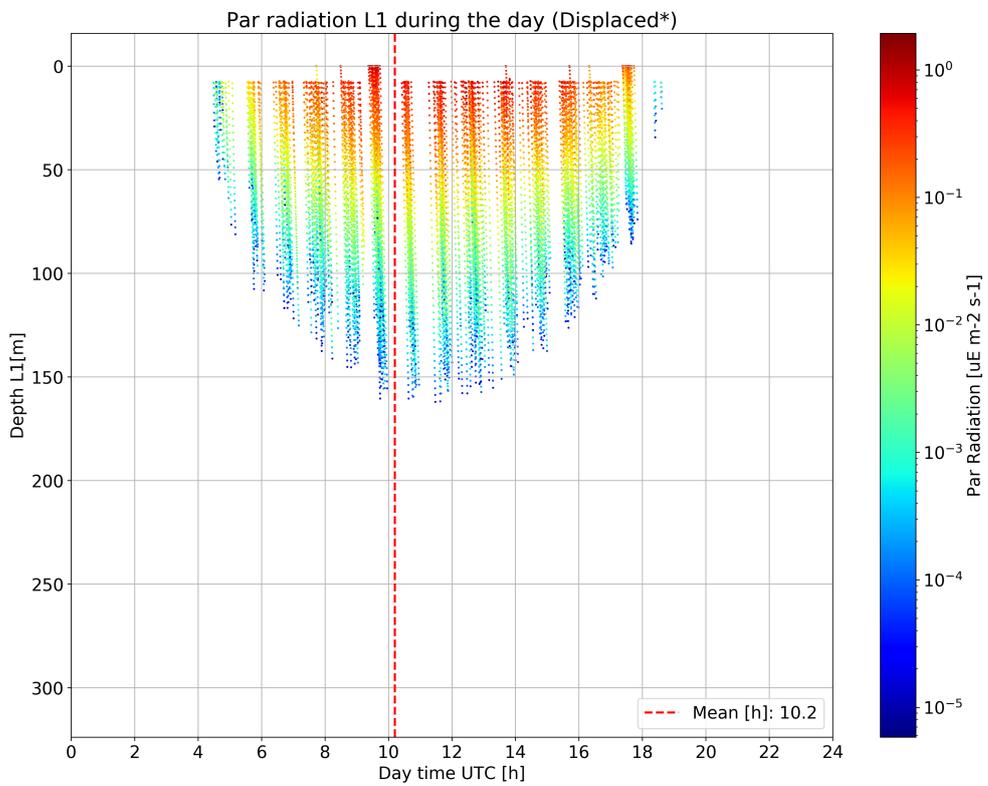


Figure 3.23: Daily par

4 Appendix

4.1 Glider behaviour

Showing changes on Sampling (behaviour 16):

- 31 Mar 2021 09:31:59 @ Sampling of: SAMPLE15.MA PAR(0m to -300m) 20200316 PAR sn50318
- 31 Mar 2021 09:31:59 @ Sampling state to sample set to: Diving
- 31 Mar 2021 09:31:59 @ Sampling argument: intersample time set to: 16.0 s
- 31 Mar 2021 09:31:59 @ Sampling nth yo to sample set to: 1.0 nodim
- 31 Mar 2021 09:31:59 @ Sampling argument: min depth set to: 0.0 m
- 31 Mar 2021 09:31:59 @ Sampling argument: max depth set to: 300.0 m

Showing changes on Sampling (behaviour 15):

- 31 Mar 2021 09:31:59 @ Sampling of: SAMPLE13.MA OXY4831 20190919 OXY sn0842
- 31 Mar 2021 09:31:59 @ Sampling state to sample set to: Diving, climbing and hovering
- 31 Mar 2021 09:31:59 @ Sampling argument: intersample time set to: 4.0 s
- 31 Mar 2021 09:31:59 @ Sampling nth yo to sample set to: 1.0 nodim
- 31 Mar 2021 09:31:59 @ Sampling argument: min depth set to: -5.0 m
- 31 Mar 2021 09:31:59 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Sampling (behaviour 14):

- 31 Mar 2021 09:31:59 @ Sampling of: SAMPLE14.MA FLNTU(-150m to -300m) 20191230 FLNTU sn6041
- 31 Mar 2021 09:31:59 @ Sampling state to sample set to: Diving
- 31 Mar 2021 09:31:59 @ Sampling argument: intersample time set to: 16.0 s
- 31 Mar 2021 09:31:59 @ Sampling nth yo to sample set to: 1.0 nodim
- 31 Mar 2021 09:31:59 @ Sampling argument: min depth set to: 300.0 m
- 31 Mar 2021 09:31:59 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Sampling (behaviour 13):

- 31 Mar 2021 09:31:59 @ Sampling of: SAMPLE12.MA FLNTU(surface to -150m) (20191121 FLNTU sn5987)
- 31 Mar 2021 09:31:59 @ Sampling state to sample set to: Diving
- 31 Mar 2021 09:31:59 @ Sampling argument: intersample time set to: 8.0 s
- 31 Mar 2021 09:31:59 @ Sampling nth yo to sample set to: 1.0 nodim
- 31 Mar 2021 09:31:59 @ Sampling argument: min depth set to: -5.0 m
- 31 Mar 2021 09:31:59 @ Sampling argument: max depth set to: 300.0 m

Showing changes on Sampling (behaviour 12):

- 31 Mar 2021 09:31:59 @ Sampling of: SAMPLE11.MA CTD(Profile) 20190612 CTD sn9597
- 31 Mar 2021 09:31:59 @ Sampling state to sample set to: Diving, climbing and hovering
- 31 Mar 2021 09:31:59 @ Sampling argument: intersample time set to: 4.0 s
- 31 Mar 2021 09:31:59 @ Sampling nth yo to sample set to: 1.0 nodim
- 31 Mar 2021 09:31:59 @ Sampling argument: min depth set to: -5.0 m
- 31 Mar 2021 09:31:59 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Yoing (behaviour behavior yo 11):

- 31 Mar 2021 09:31:59 @ Yoing num half cycles to do(nodim) set to: -1.0
- 31 Mar 2021 09:31:59 @ Yoing d target depth(m) set to: 950.0
- 31 Mar 2021 09:31:59 @ Yoing d target altitude(m) set to: 20.0
- 31 Mar 2021 09:31:59 @ Yoing d bpump value(X) set to: 400.0
- 31 Mar 2021 09:31:59 @ Yoing d use pitch(enum) set to: 3.0
- 31 Mar 2021 09:31:59 @ Yoing d pitch value(X) set to: -0.453800
- 31 Mar 2021 09:31:59 @ Yoing c use pitch(enum) set to: 3.0
- 31 Mar 2021 09:31:59 @ Yoing c pitch value(X) set to: 0.453800
- 05 Apr 2021 09:28:11 @ Yoing d target depth(m) set to: 300.0
- 23 Apr 2021 09:17:36 @ Yoing d bpump value(X) set to: 550.0
- 24 Apr 2021 09:25:36 @ Yoing d bpump value(X) set to: 600.0
- 25 Apr 2021 09:22:50 @ Yoing d bpump value(X) set to: 450.0

- 26 Apr 2021 09:22:24 @ Yoing d target depth(m) set to: 900.0
 - 29 Apr 2021 09:15:20 @ Yoing d target depth(m) set to: 300.0
 - 02 May 2021 17:12:54 @ Yoing d target depth(m) set to: 700.0
 - 03 May 2021 17:19:27 @ Yoing d target depth(m) set to: 950.0
 - 03 May 2021 17:19:27 @ Yoing d bpump value(X) set to: 500.0
 - 12 May 2021 11:33:27 @ Yoing num half cycles to do(nodim) set to: 2.0
 - 12 May 2021 11:33:27 @ Yoing d target depth(m) set to: 50.0
- Showing changes on Altimeter set to (behaviour u alt min depth):
- 30 Mar 2021 17:33:33 @ Altimeter set to u alt min depth set to: 10
 - 10 Apr 2021 09:22:50 @ Altimeter set to u alt min depth set to: 350
 - 02 May 2021 17:07:19 @ Altimeter set to u alt min depth set to: 150
 - 12 May 2021 01:02:47 @ Altimeter set to u alt min depth set to: 10

4.2 Installed devices (from autoexec.mi)

- Forward section assy _SN: 518
- Payload bay assy _SN: 1348
- Aft section assy _SN: 1001
- Aft electronic assy _SN: 0002
- Aft end cap assy _SN: 153
- Radomefin _SN: 1237
- Pressure transducer _SN: 123648
- Aft hull _SN: 2430
- Fwd hull _SN: 2420
- Freewave master _SN: 970-3925
- Iridium sim card _SN: 8988169234003166048
- Argos ID _SN: Dec 198867/Hex 0C16335
- Altimeter _SN: 60201896
- Pitch motor _SN: 250
- 1000- Motor _SN: controller117
- 1000- Pump assy _SN: 03L20
- 1000- Valve assy _SN: 636
- Science persistor _SN: 00029
- science motherboard _SN: 00014
- seabird CTD _SN: 9597
- Main board _SN: 159
- Communication board _SN: 2
- Iridium phone _SN: 200
- Main persistor _SN: 22
- Attitude sensor _SN: 42805
- Air pump _SN: 1288
- Communications Assy _SN: 0002
- Freewave Slave _SN: 968-0550
- GPS _SN: 1470
- Argos X-cat _SN: 1202
- Air bladder _SN: 39630664.21

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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