

SOCIB Glider Mission Summary Report

SOCIB-PARTHENOPE_ABACUS_20211201_sdeep04_GFMR0124

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Document generated on August 25, 2023



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-PARTHENOPE_ABACUS_20211201_sdeep04_GFMR0124
Platform model	G2 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	22.0 days
Mission start	2021-12-01 08:16:50
Mission end	2021-12-23 08:59:23
Total distance	472.0[km] 254.86[nm]
Deployment point [dd°mm.mmmm']	N 39°28.6575' E 02°35.7384'
Recovery point [dd°mm.mmmm']	N 39°08.8169' E 02°44.1347'
Battery Consumption (Ah)	99.8(from 45.0 to 144.8)
Battery specification	20211021 SN0055/ Saft lithium (329Ah)
Survey area	Algerian Channel
Objetive	<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 (failed) 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>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: Reused glider, from previous mission GFMR0121 ▪ Event 2: Aviable hydrophone data ▪ Event 3: During the mission, the IP of the primary dockserver was changed
SCI events	<ul style="list-style-type: none"> ▪ Event 1: Several zero values in salinity, temperature and oxygen were observed during the glider mission. ▪ Event 2: Several spikes in CHL and Turbidity are present. ▪ Event 3: In the open waters, surface blobs of warm and relatively low salinity water have been observed in the upper 50m of the water column. Evidence of relative high salinity water (LIW) has been present during the glider mission between 350 to 450m. ▪ Event 4: Several negative values are observed in the CHL and Turbidity

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▪ PARTHENOPÉ
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/dep0023_sdeep04_scb-sdeep004_L0_2021-12-01_data_dt.nc
- L1: https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb_sdeep004/L1/2021/dep0023_sdeep04_scb-sdeep004_L1_2021-12-01_data_dt.nc
- L2: https://thredds.socib.es/thredds/fileServer/auv/glider/sdeep04-scb_sdeep004/L2/2021/dep0023_sdeep04_scb-sdeep004_L2_2021-12-01_data_dt.nc

2 Engineering Review

2.1 Preparation

- Premission: ok. Reused glider, all the previous steps belong to GFMR0121.
- Hardware: ok
- Batteries: ok
- Comms: ok
- Science: ok
- Ballasting: ok
- Sealing: ok
- Fileset: ok
- CEM: na
- Harbor check: ok. Performed a dual deployment (sdeep09 and sdeep04) and a recovery (sdeep08)
- Recovery: ok
- Conclusion: ok

2.2 Mission Survey

- Deployment:
 - Vessel: Socib I
 - Personnel: 2 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	4	0	0
attitude rev	0	1	0
pitch motor	70	0	0
digifin	464	11	0
IRIDIUM	152	0	0

- Communication Systems (see appendix for Iridium states):
 - Total number iridium calls [num]: 113
 - Iridium calls to secondary [num]: 11
 - ON overall iridium period [h]: 2.1
 - Iridium calls state from MODE NO CARRIER to MODE UNKNOWN [num]: 26
 - Iridium calls state from MODE UNKNOWN to MODE CONNECT [num]: 1
 - Iridium calls state from MODE CONNECT to MODE UNKNOWN [num]: 94
 - Iridium calls state from MODE UNKNOWN to MODE AWAITING OK [num]: 127
 - Iridium calls state from MODE AWAITING CONNECTION to MODE UNKNOWN [num]: 8

- Drop calls (Iridium state from 2 to 99 with c iridium on = 1) [num]: 10
- Missed call detected on: 2021-12-05 19:19:50
- Unstable comms detected on: 2021-12-05 19:19:50
- Missed call detected on: 2021-12-07 19:14:23
- Unstable comms detected on: 2021-12-07 19:14:23
- Missed call detected on: 2021-12-17 18:58:55
- Missed call detected on: 2021-12-17 23:16:17
- Missed call detected on: 2021-12-18 02:42:55
- Missed call detected on: 2021-12-18 23:30:46
- Missed call detected on: 2021-12-19 02:45:55
- Missed call detected on: 2021-12-19 10:52:25
- Missed call detected on: 2021-12-22 03:01:43
- Unstable comms detected on: 2021-12-22 03:01:43
- Total time at surface [h]: 7.46
- Total time at surface [%]: 1.41
- 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

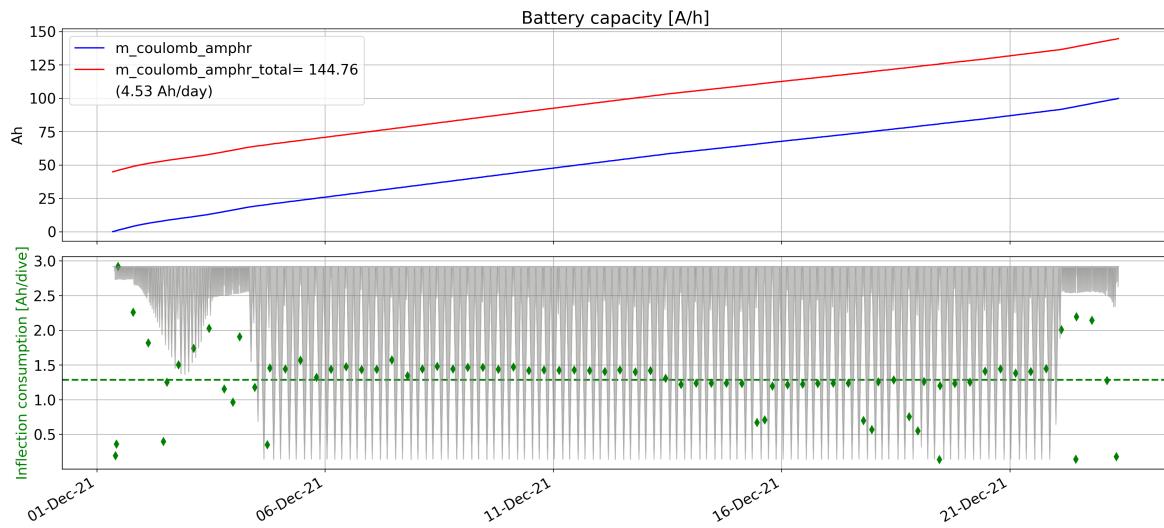


Figure 2.1: Battery capacity

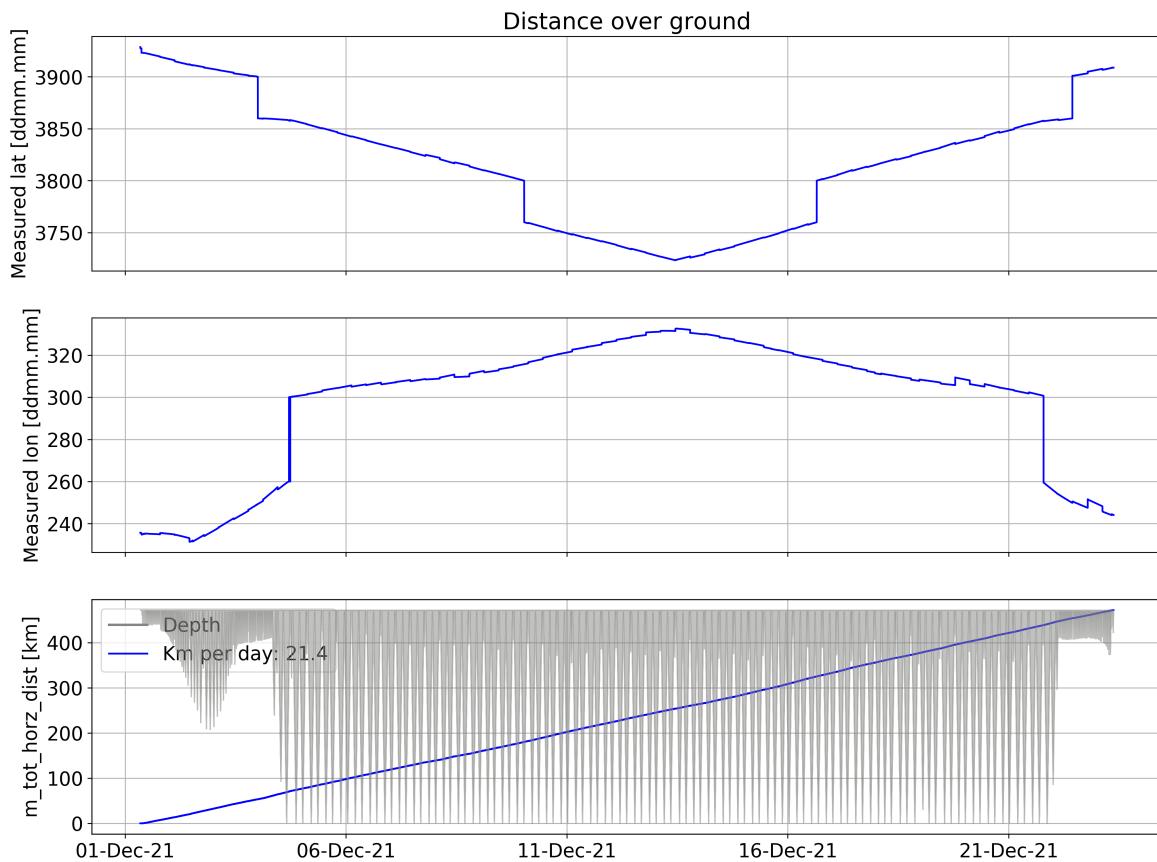


Figure 2.2: Distance over ground

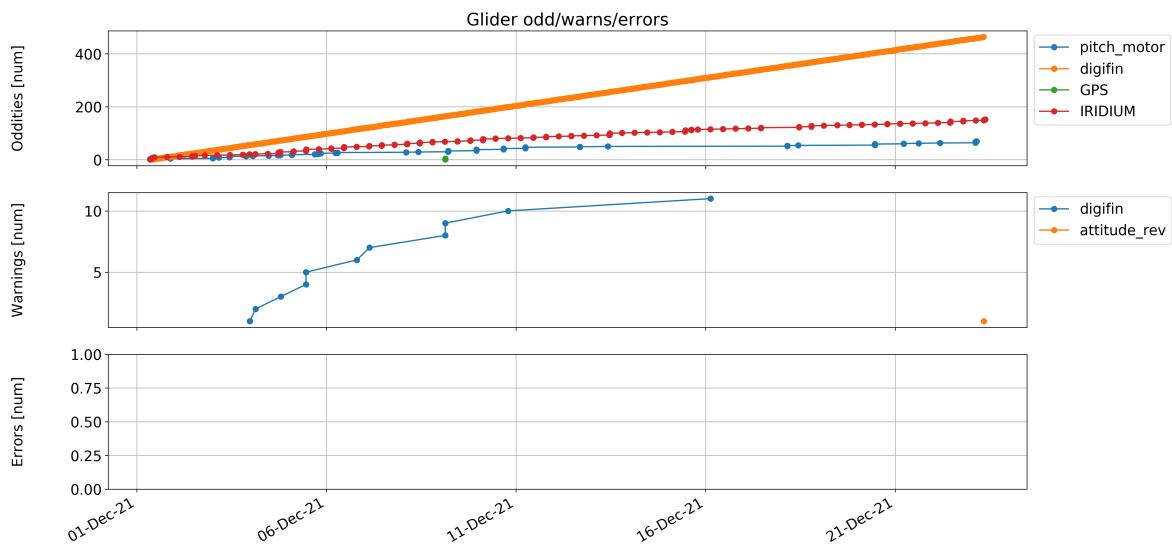


Figure 2.3: Glider Odd Warn and Err

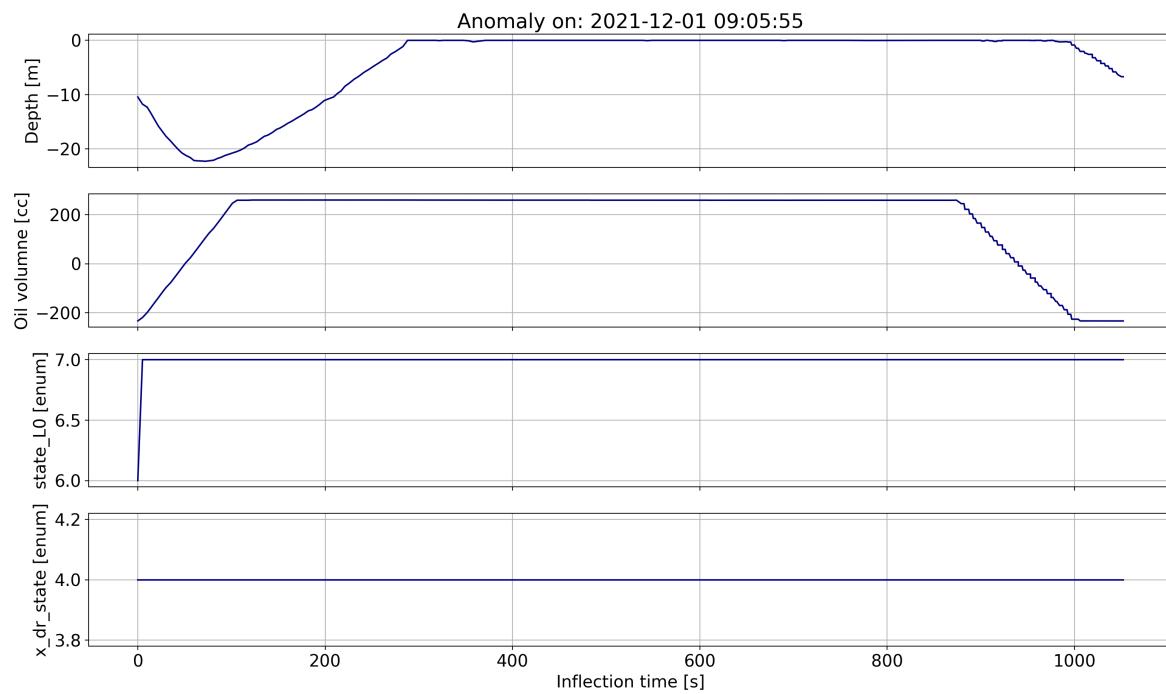


Figure 2.4: 20211201T090555 Anomaly 1

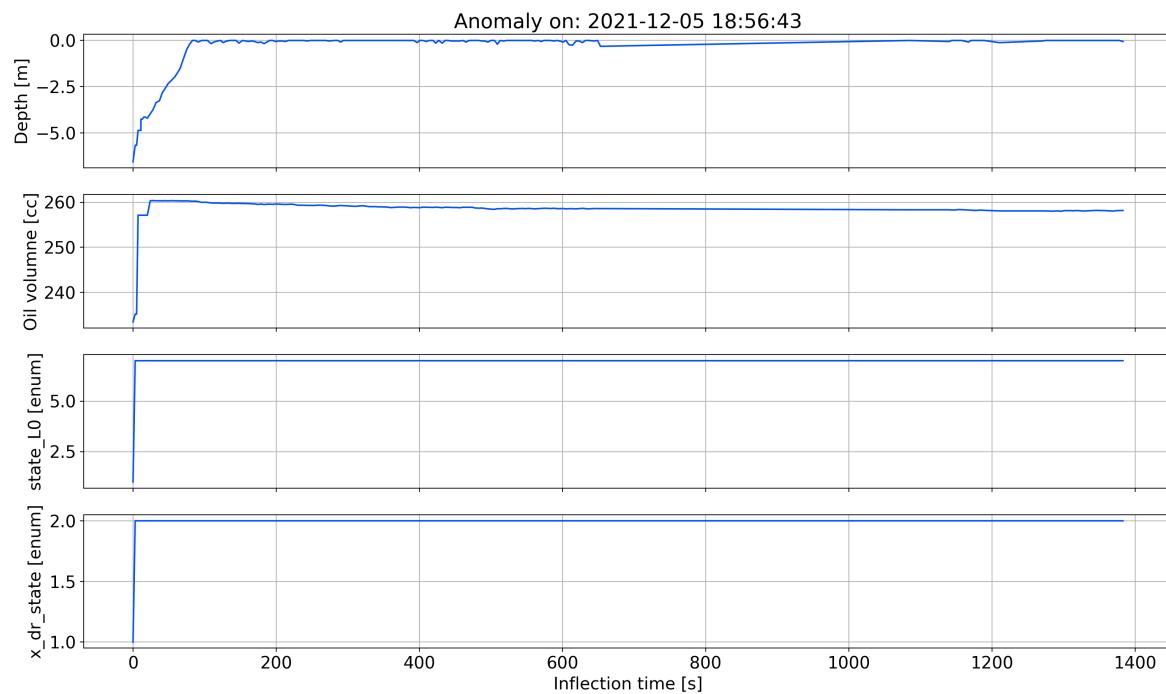


Figure 2.5: 20211205T185643 Anomaly 2

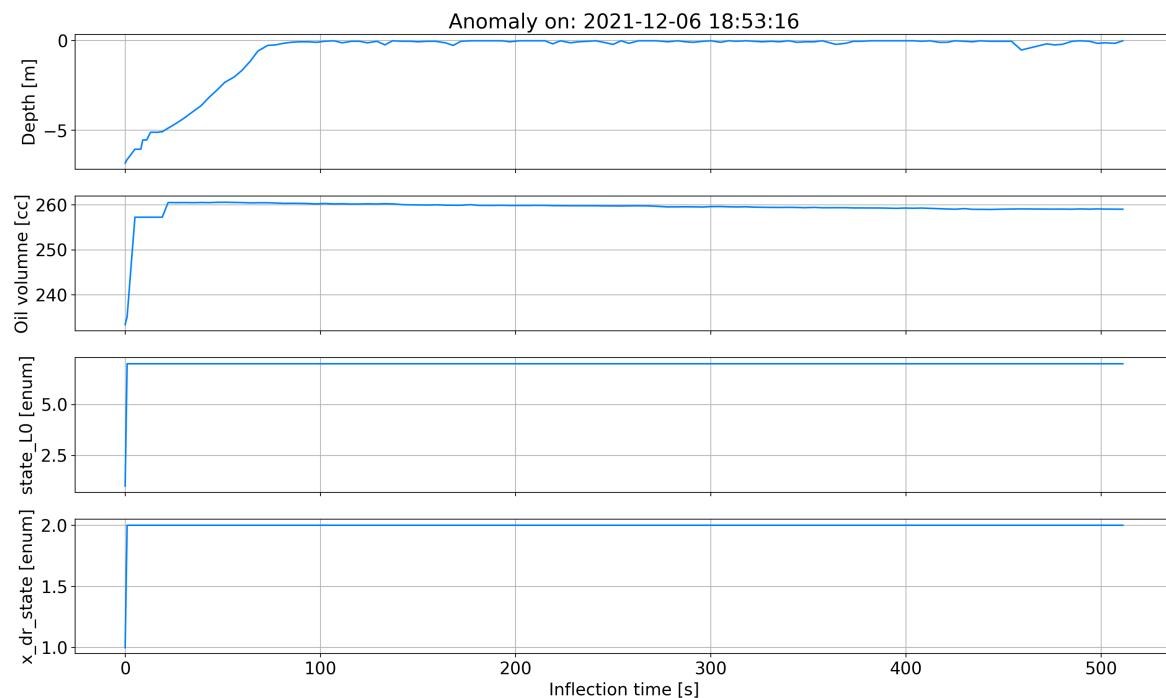


Figure 2.6: 20211206T185316 Anomaly 3

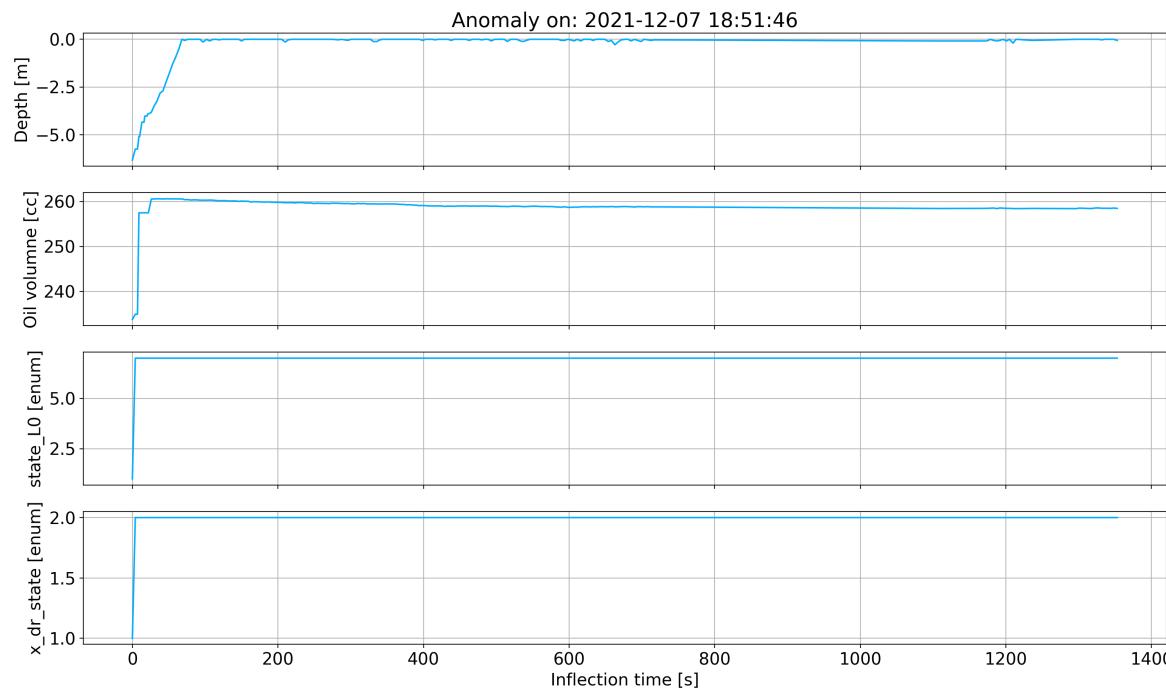


Figure 2.7: 20211207T185146 Anomaly 4

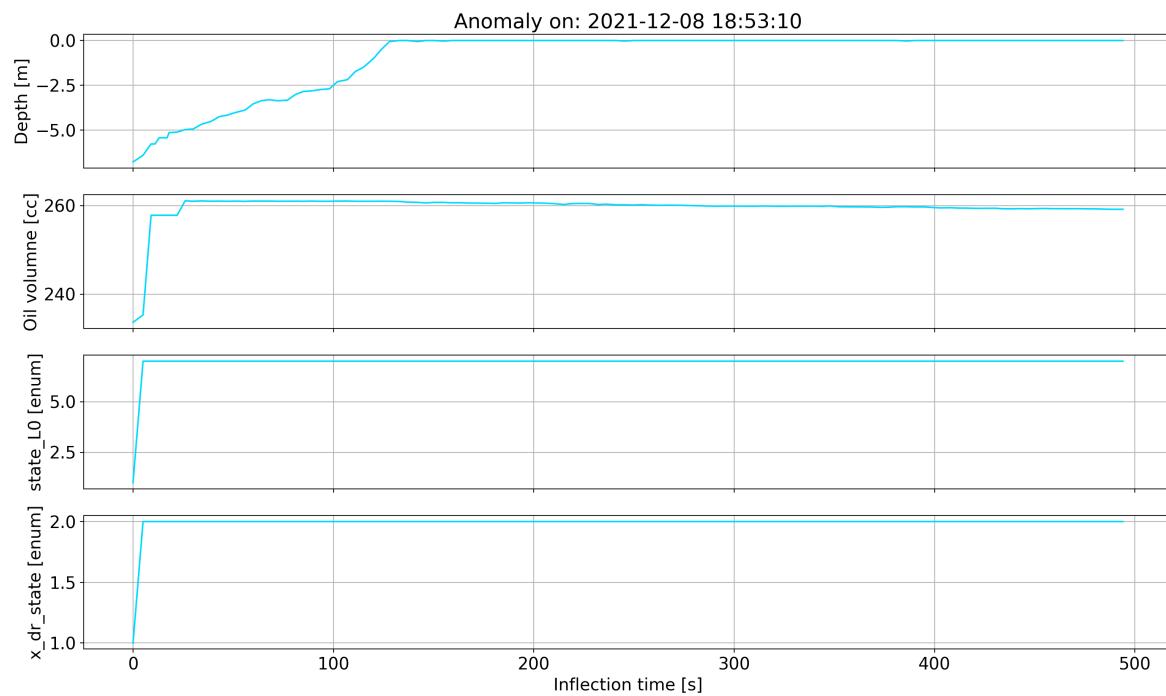


Figure 2.8: 20211208T185310 Anomaly 5

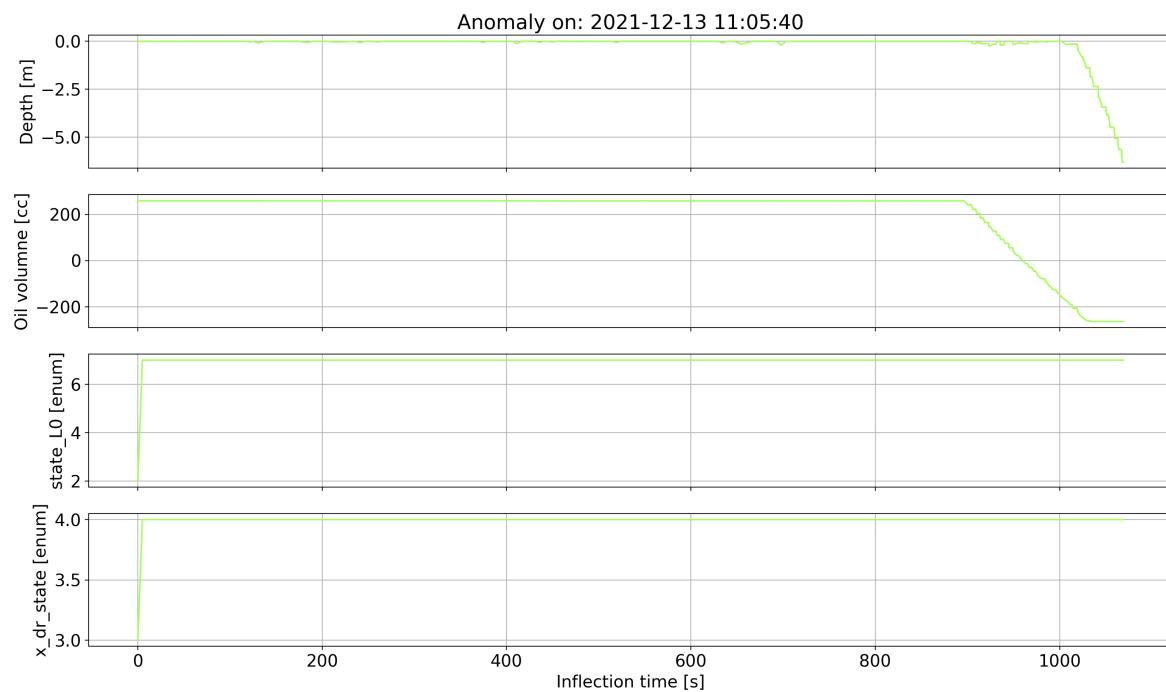


Figure 2.9: 20211213T110540 Anomaly 6

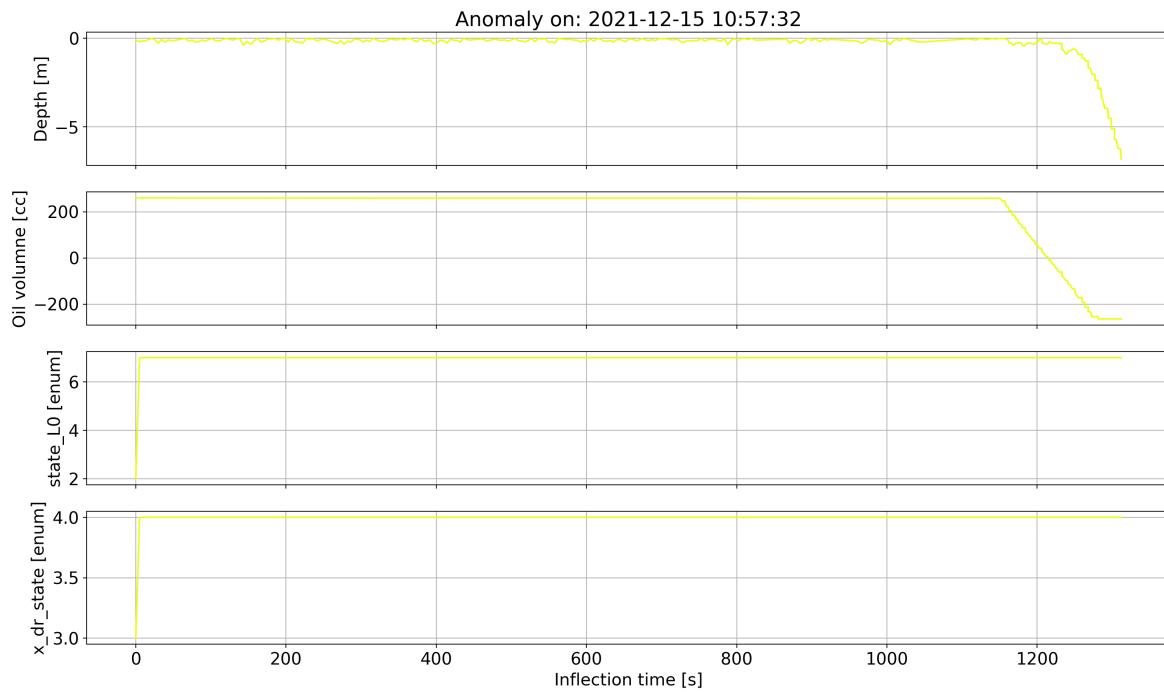


Figure 2.10: 20211215T105732 Anomaly 7

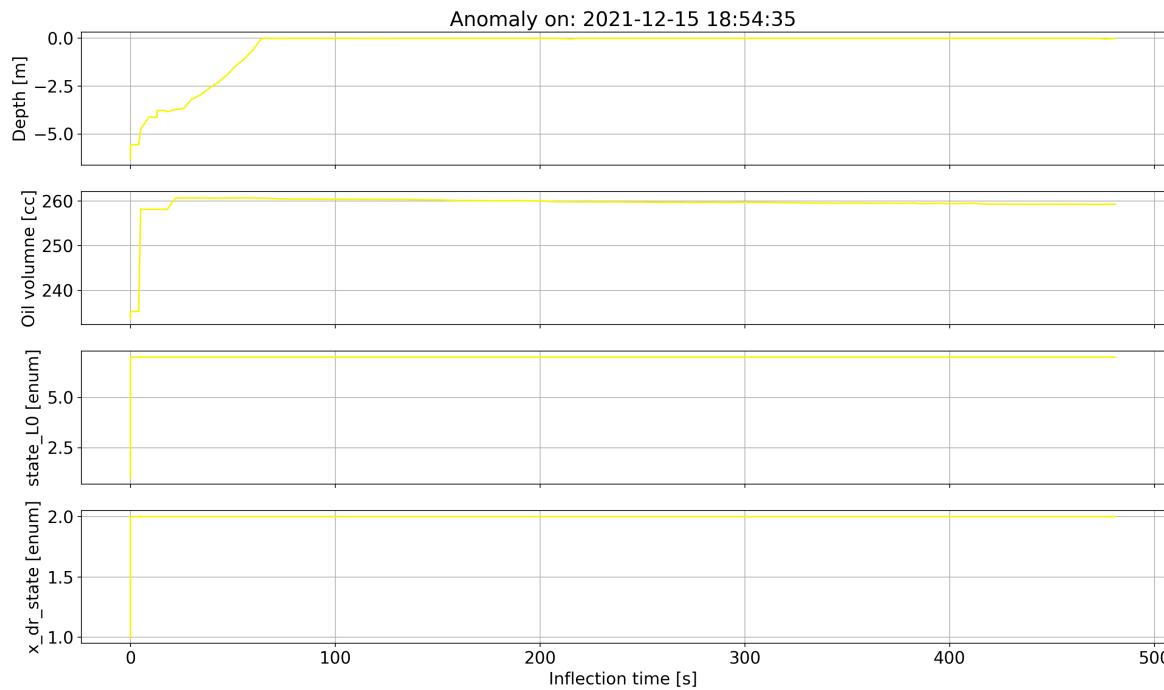


Figure 2.11: 20211215T185435 Anomaly 8

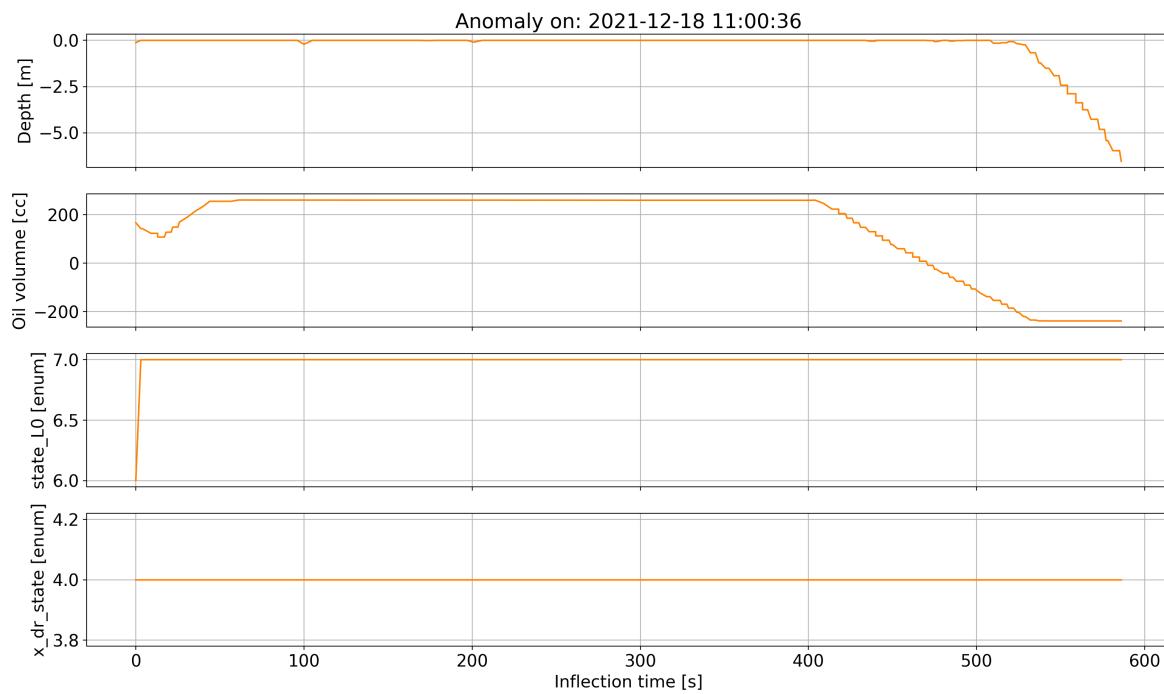


Figure 2.12: 20211218T110036 Anomaly 9

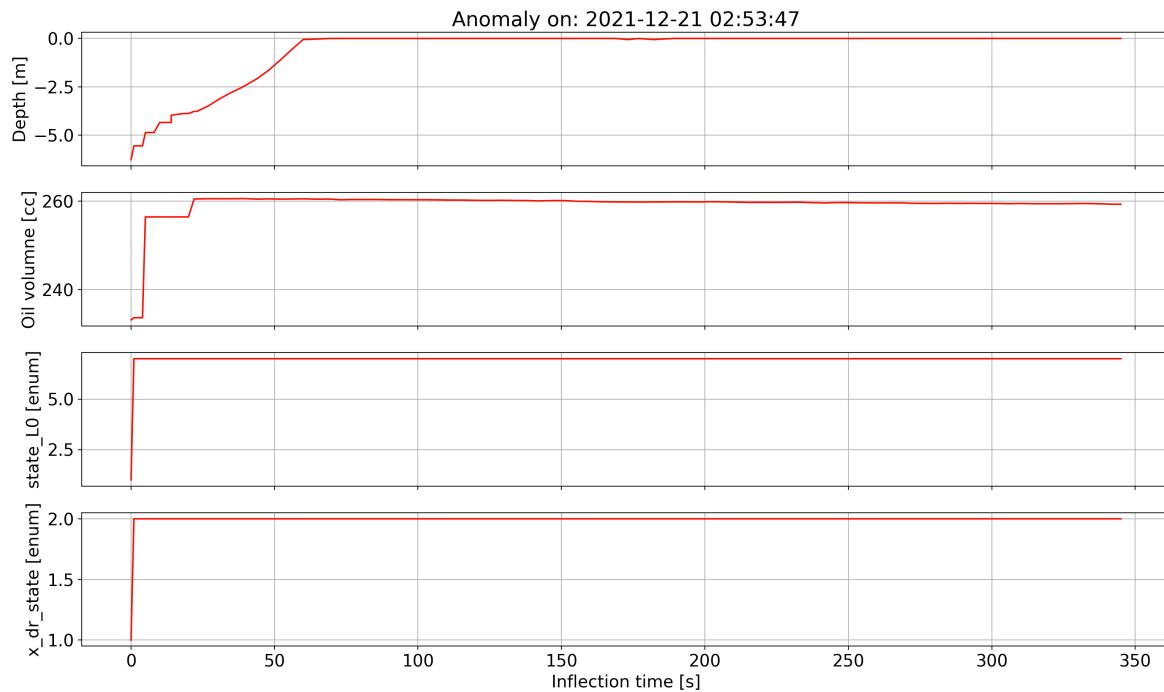


Figure 2.13: 20211221T025347 Anomaly 10

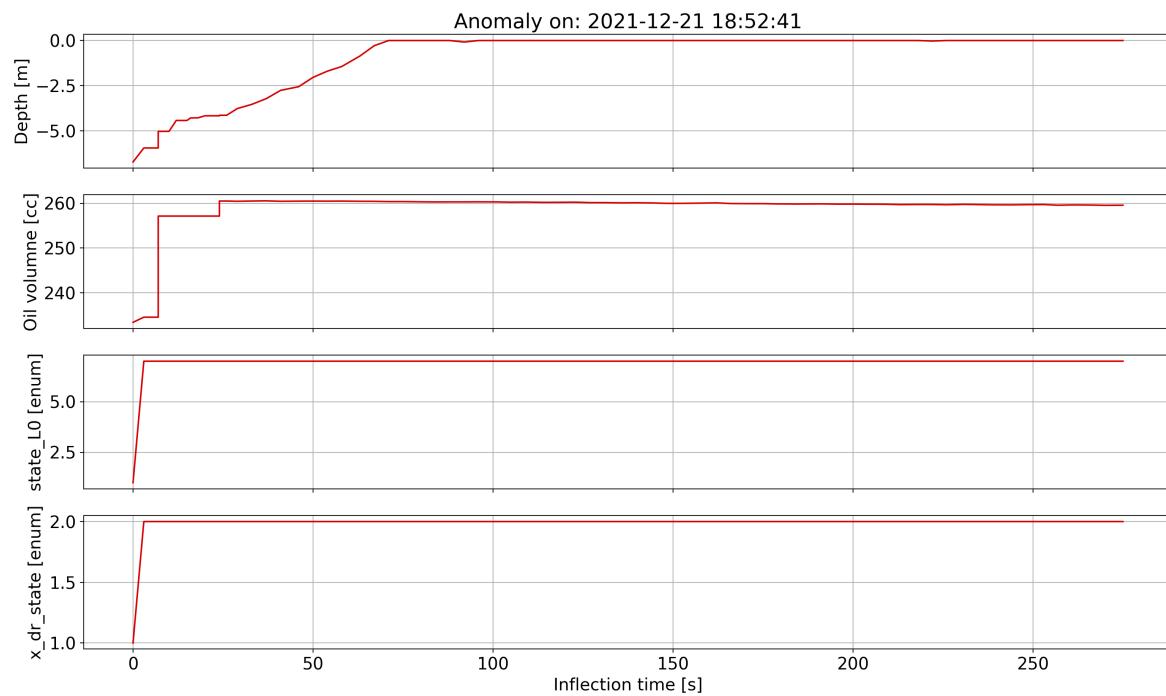


Figure 2.14: 20211221T185241 Anomaly 11

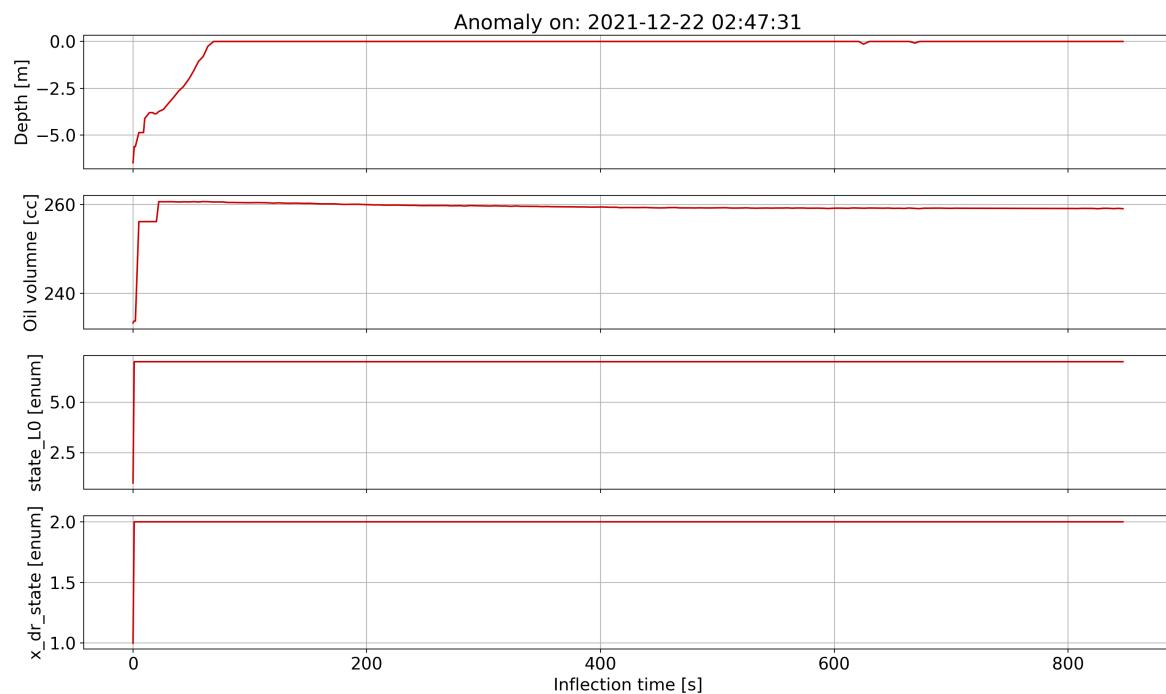


Figure 2.15: 20211222T024731 Anomaly 12

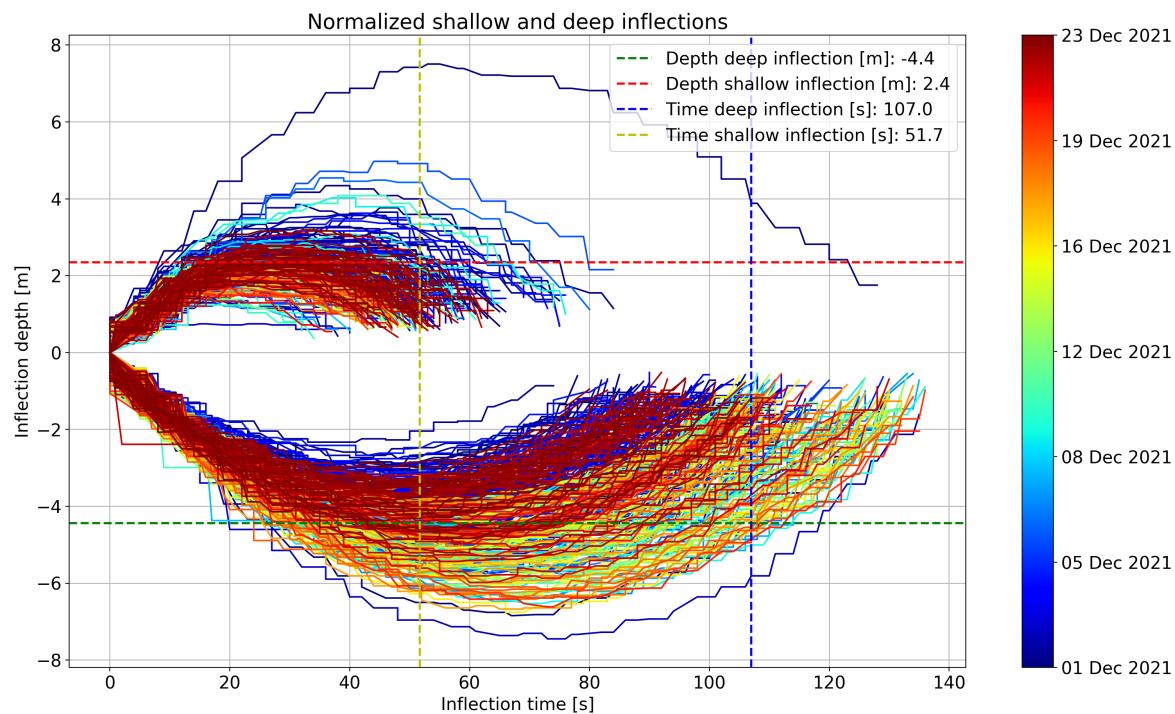


Figure 2.16: Depth inflections

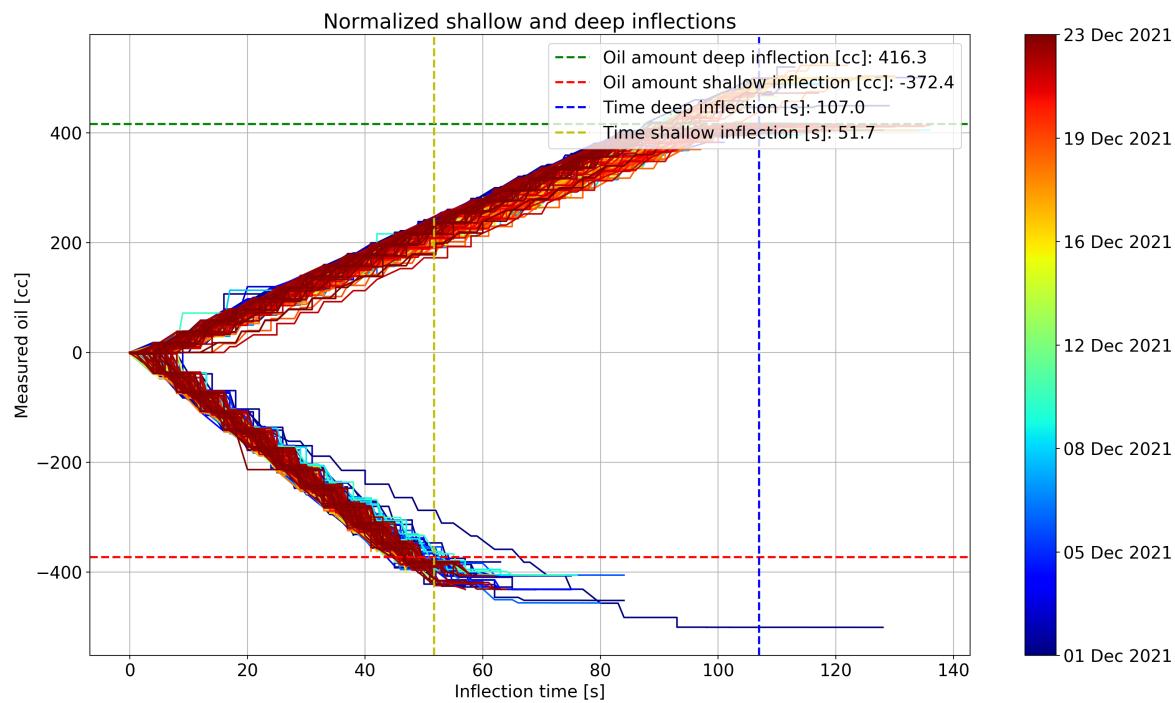


Figure 2.17: Oil inflections

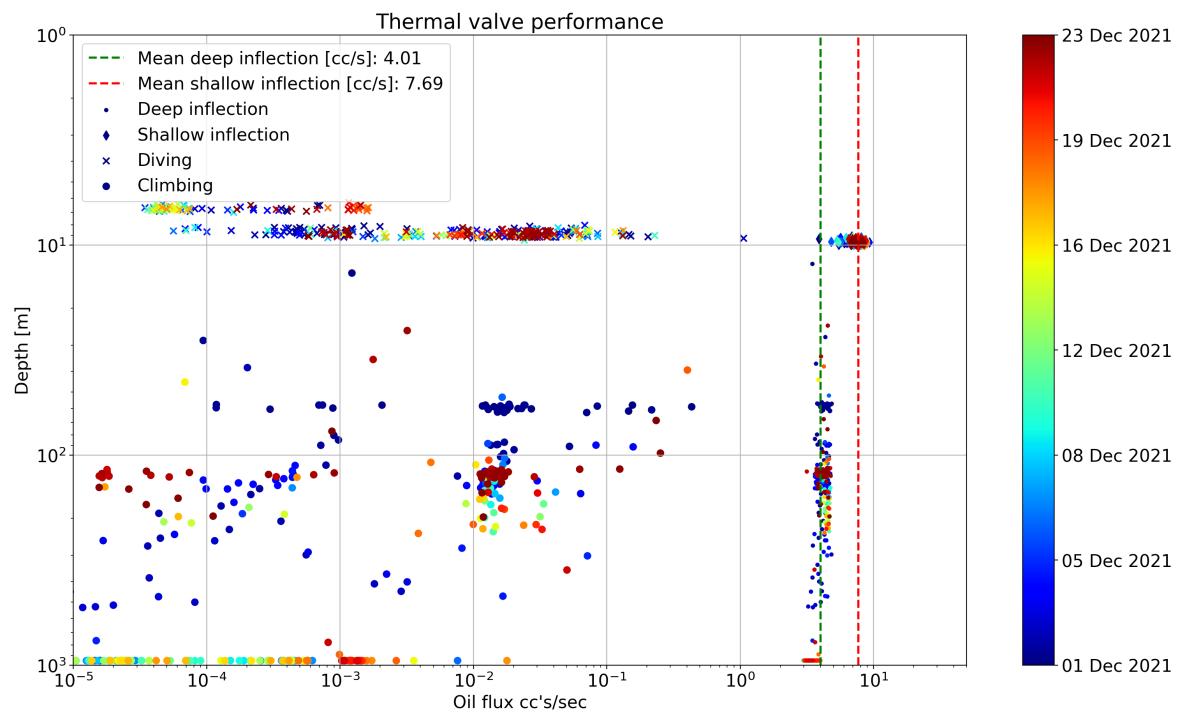


Figure 2.18: Oil flux

Normalized shallow and deep inflections

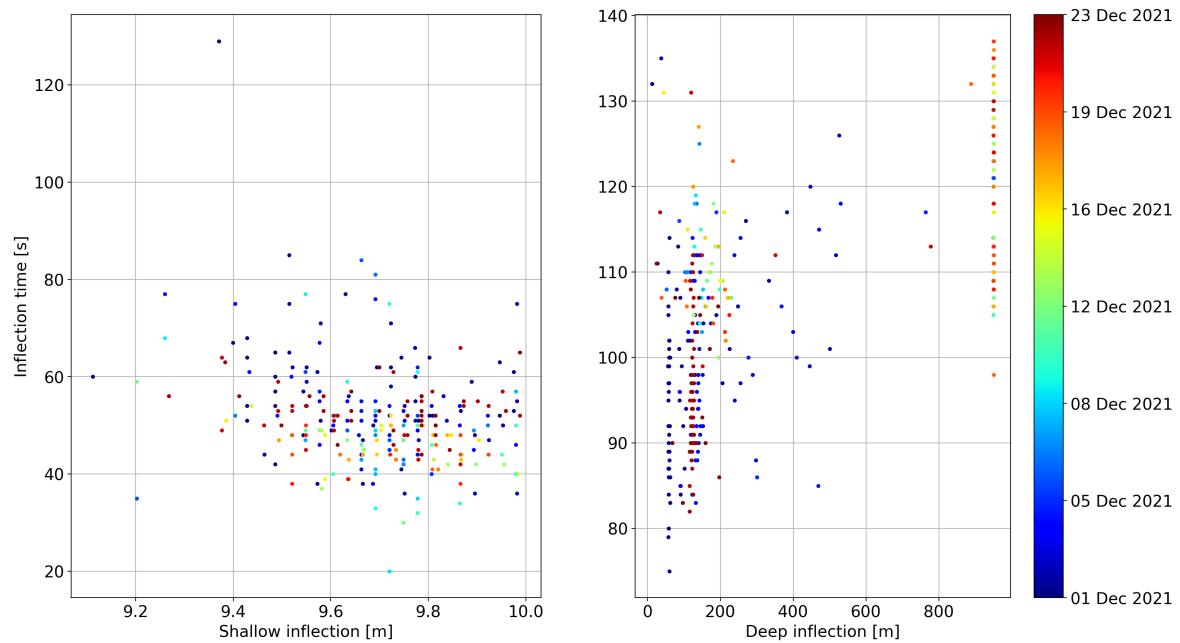


Figure 2.19: Duration inflections

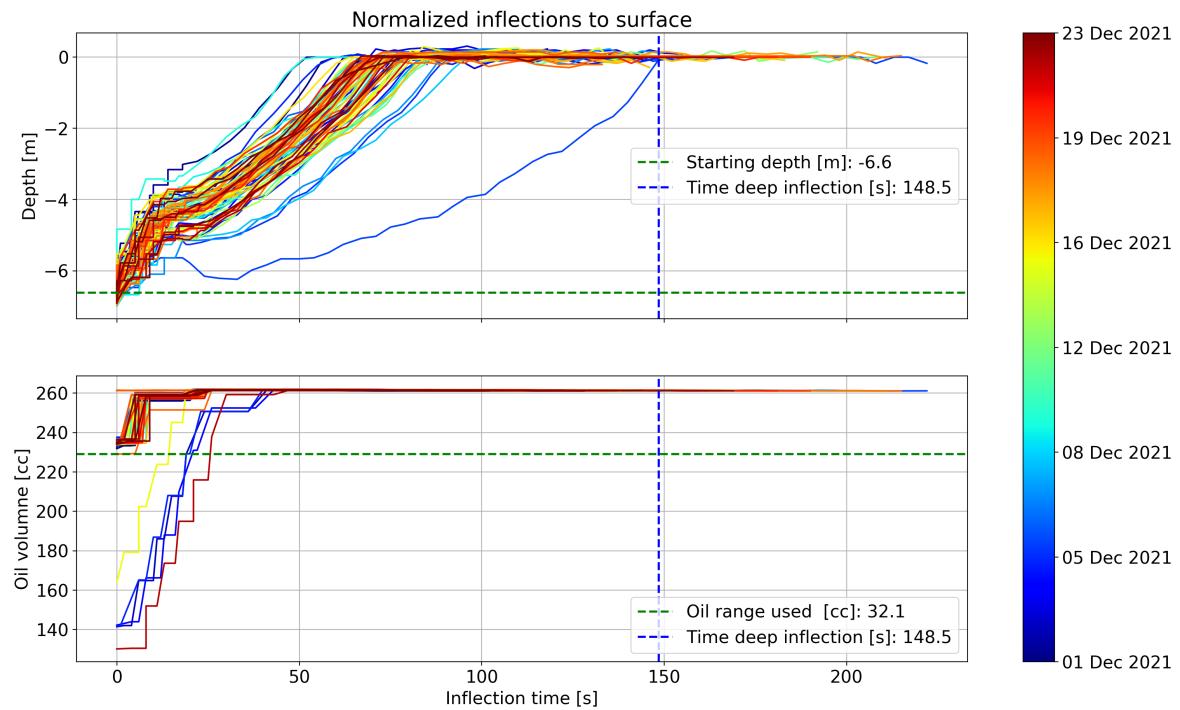


Figure 2.20: Surface Oil inflections

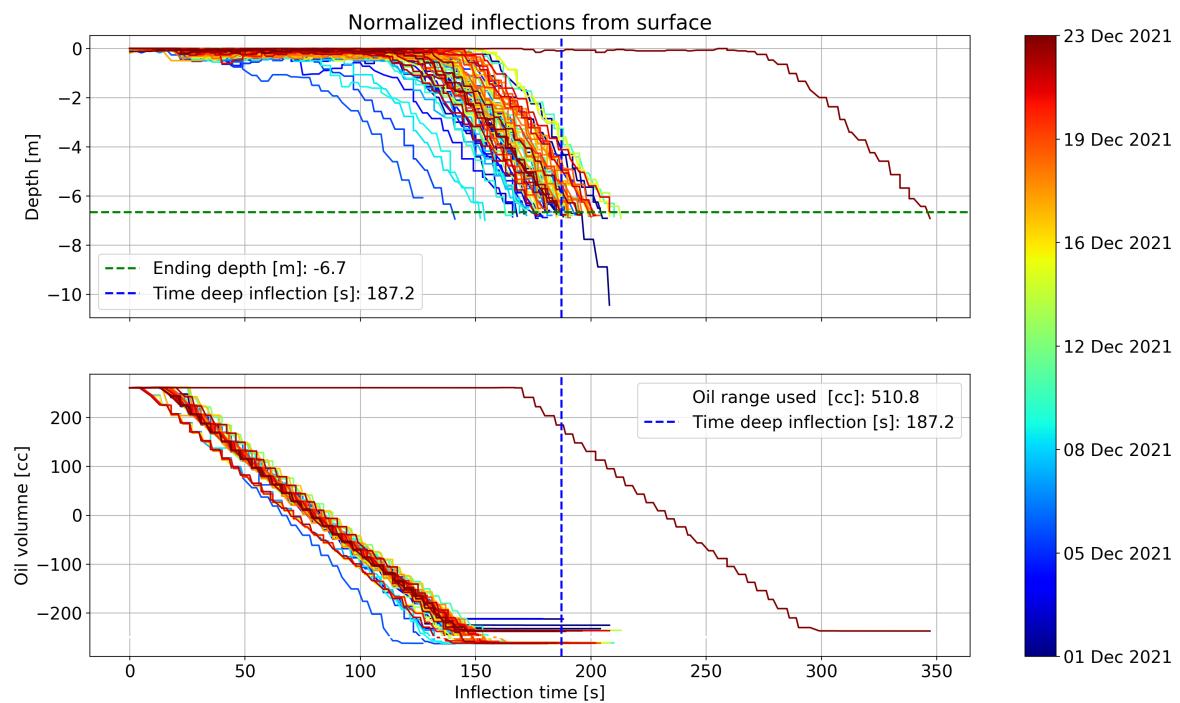


Figure 2.21: Surface Duration inflections

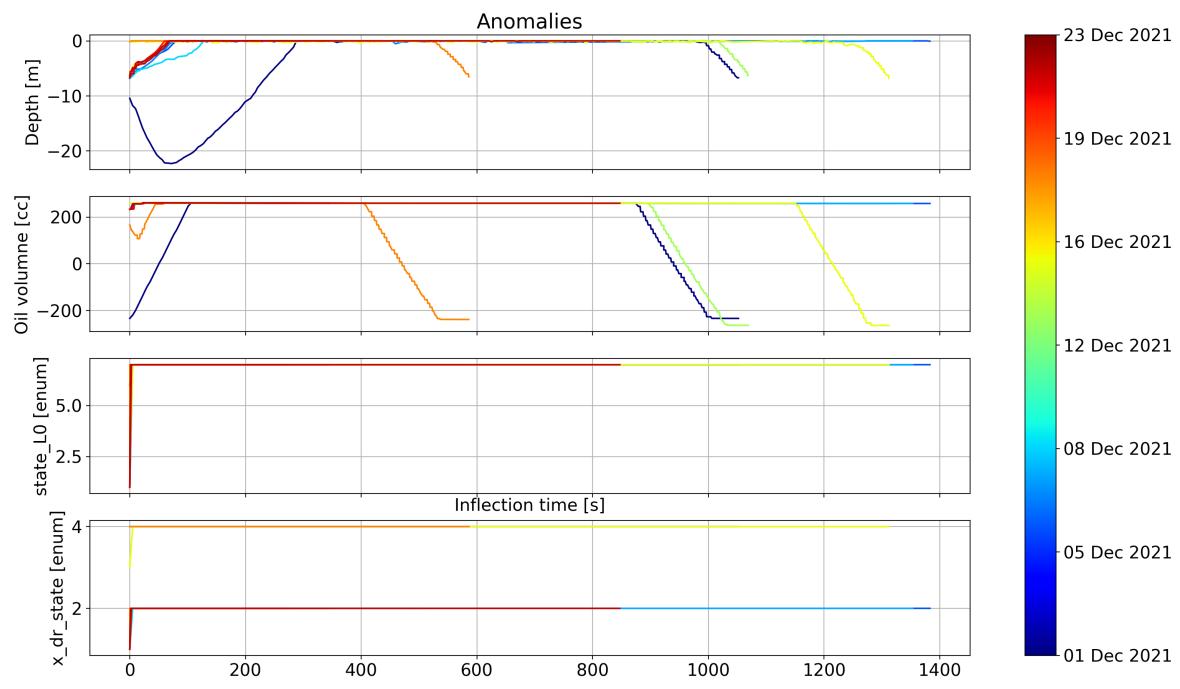


Figure 2.22: Anomalies (time)

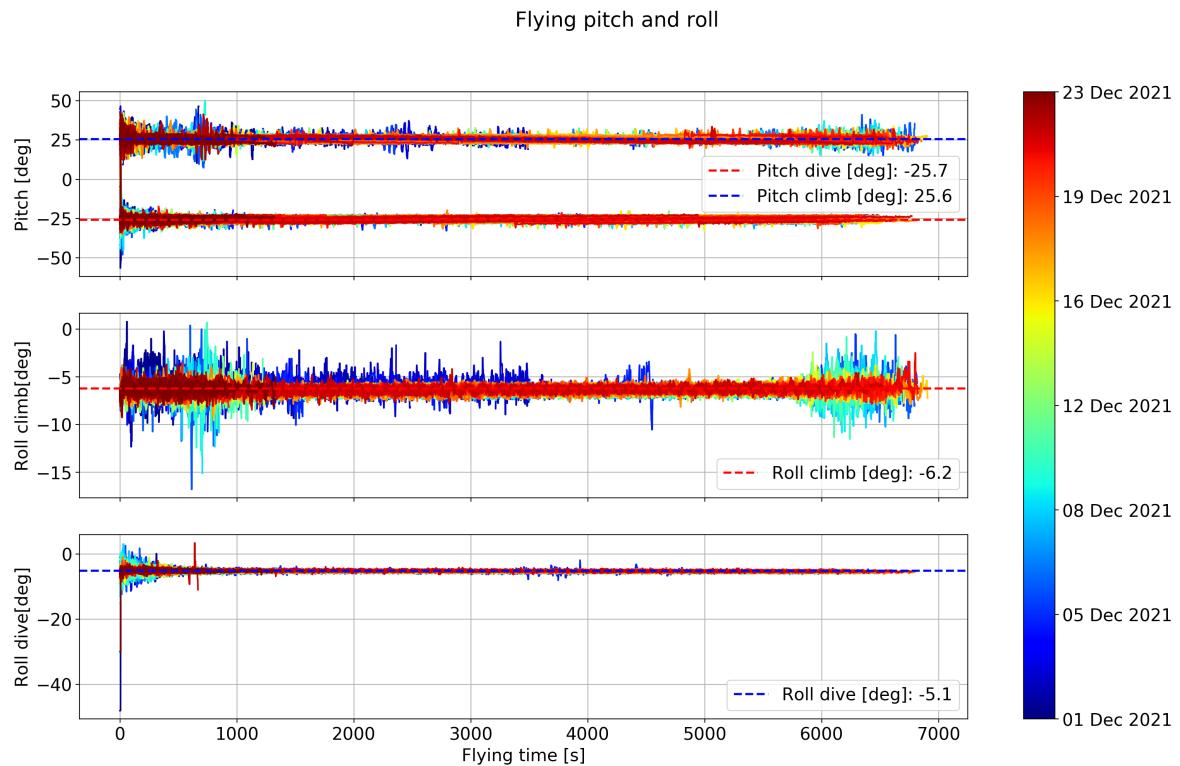


Figure 2.23: Pitch and roll, when climbing and diving

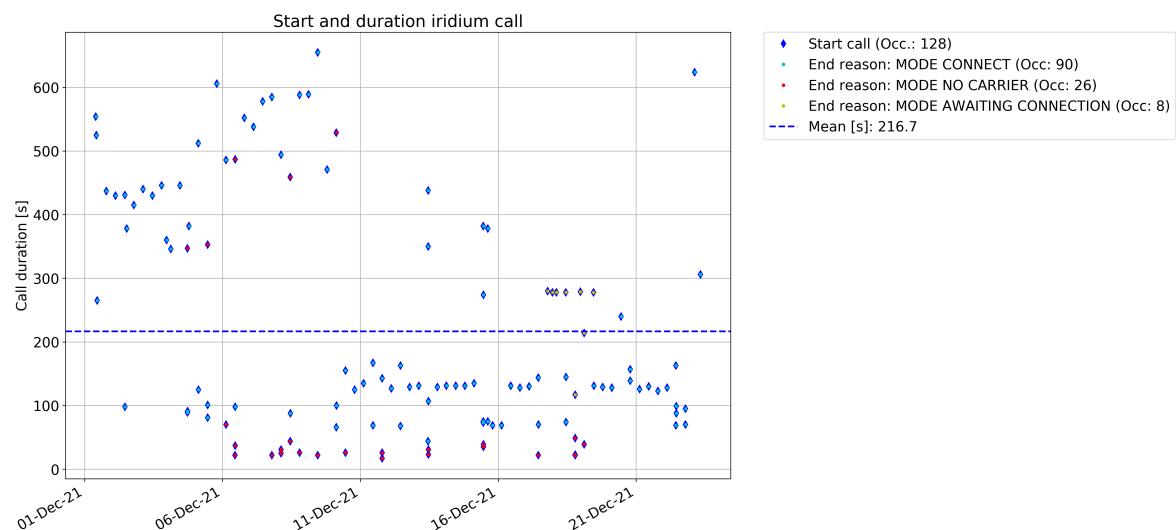


Figure 2.24: Iridium Status

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	692	694	340360	5.4	268.9
FLNTU-FLBBCDSLC	4124	20201118	693	694	na	na	126.8
OXY 3-4	1410	20201012	693	694	314715	5.843	268.9
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

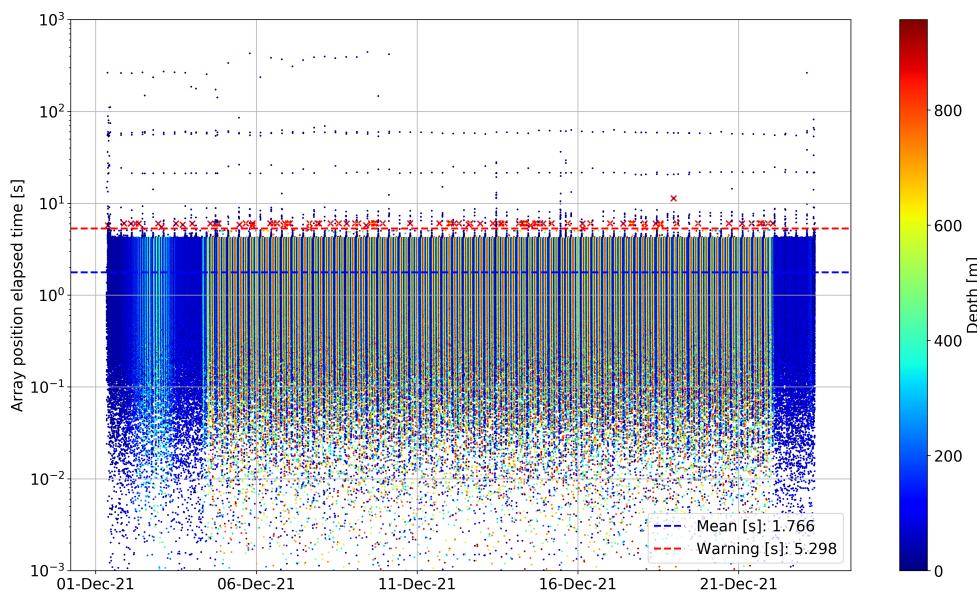


Figure 3.1: Array time

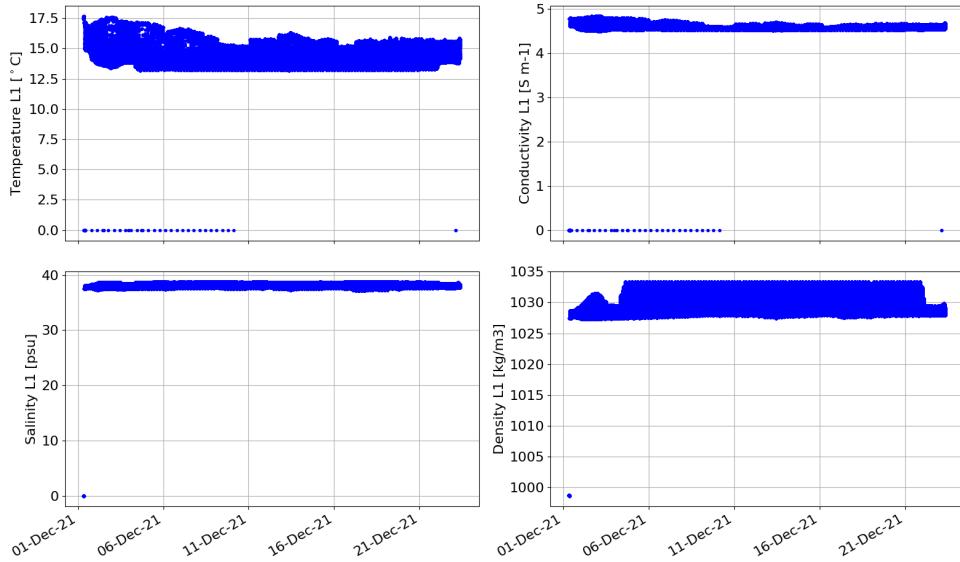


Figure 3.2: Raw CTD L1

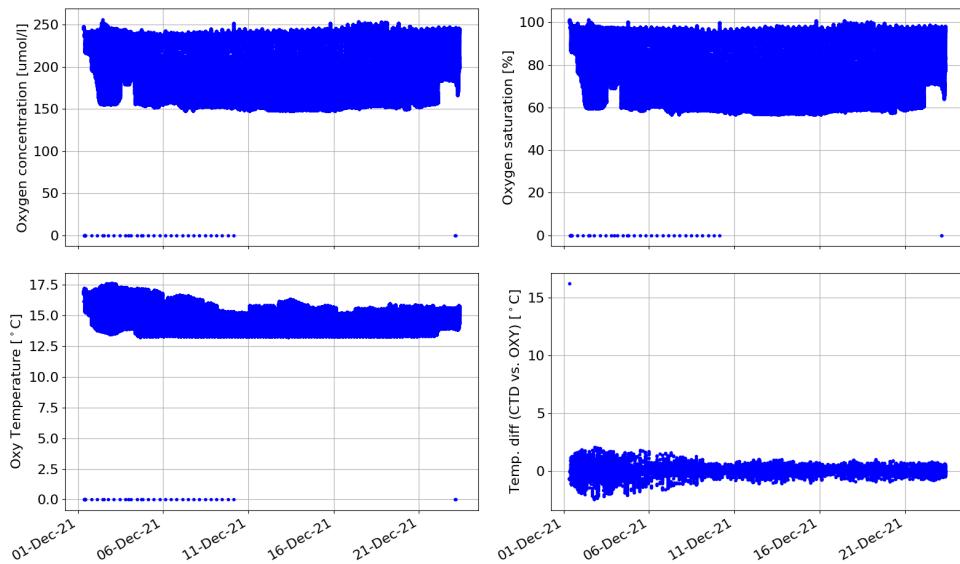


Figure 3.3: Raw OXY L1

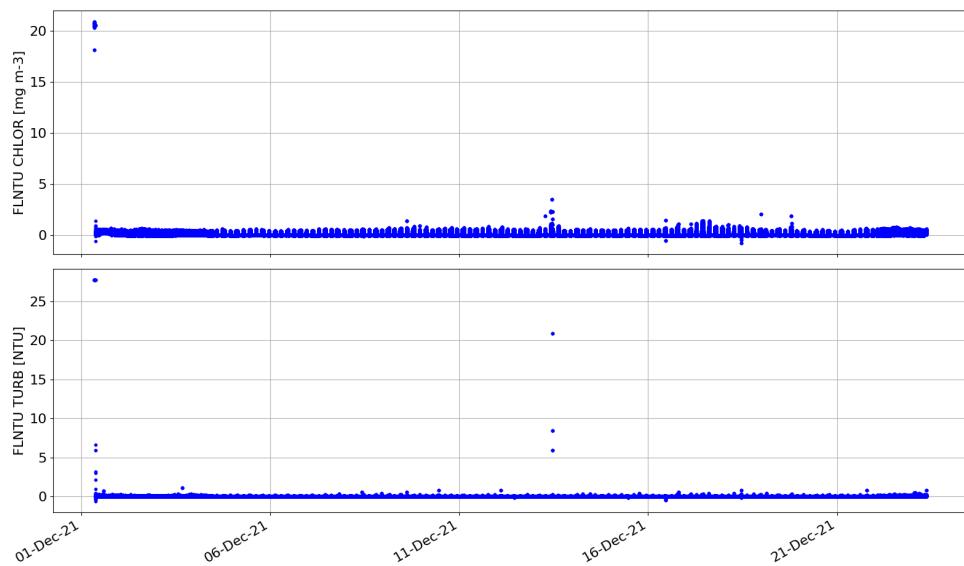


Figure 3.4: Raw FLNTU L1

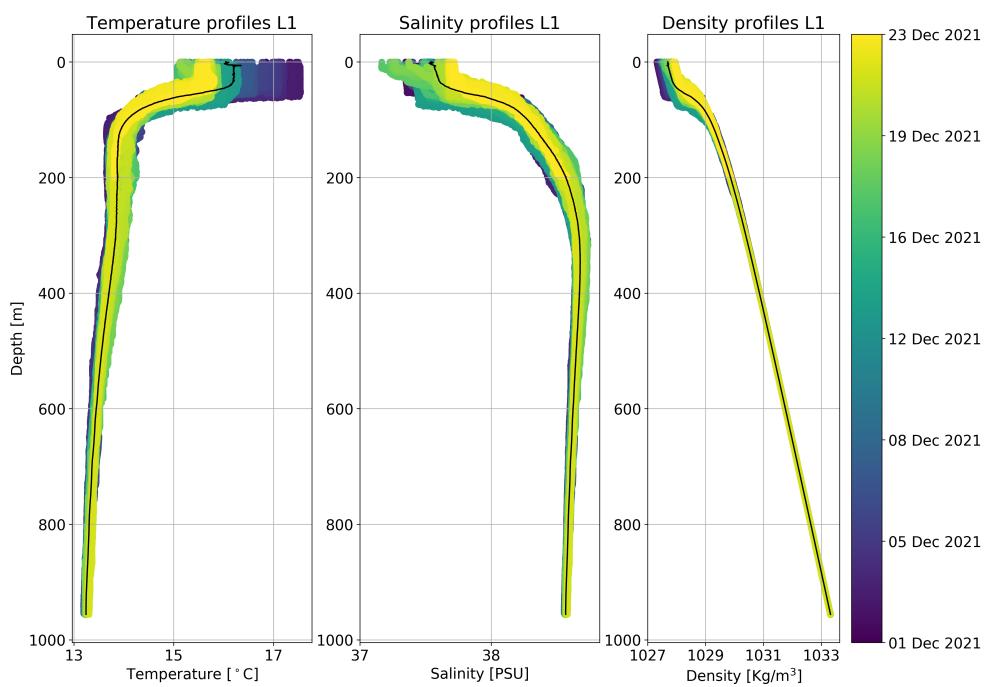


Figure 3.5: CTD profiles

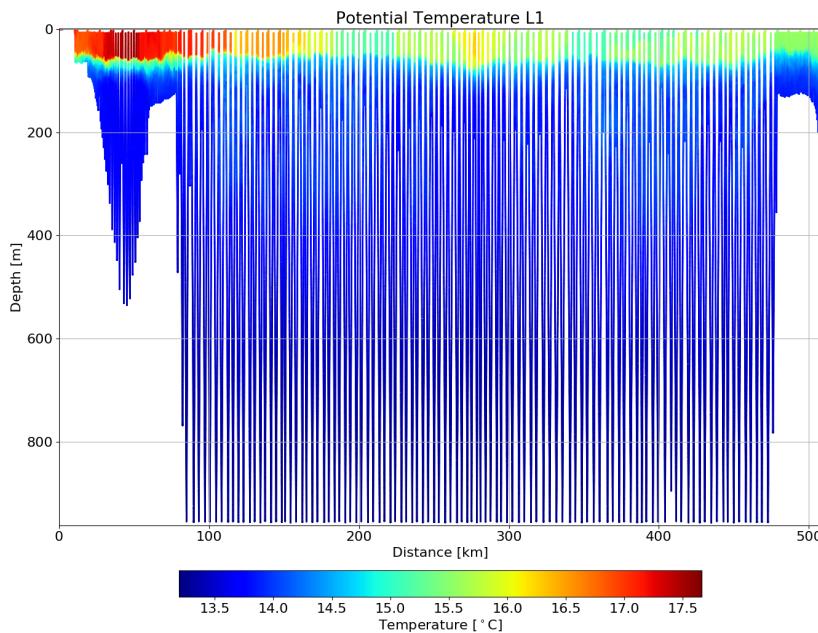


Figure 3.6: CTD temperature

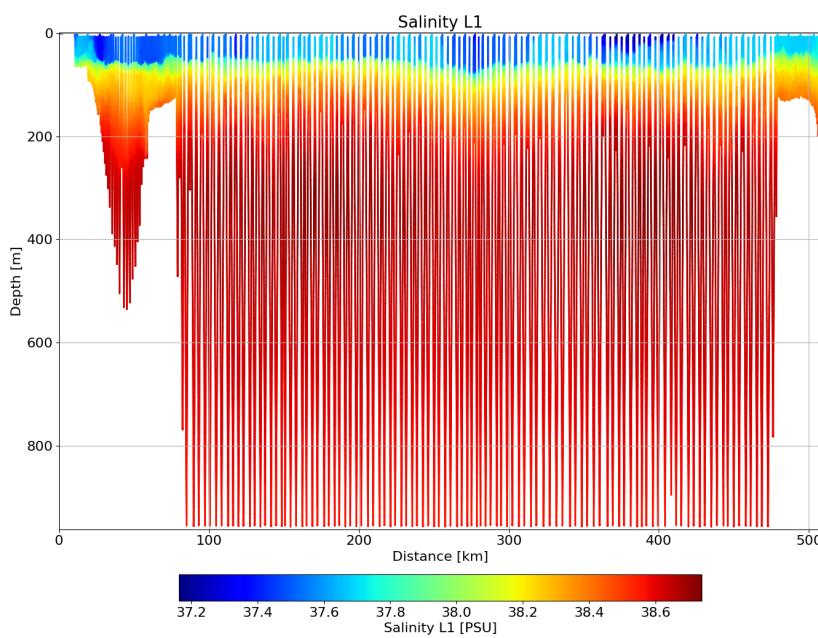


Figure 3.7: CTD Salinity

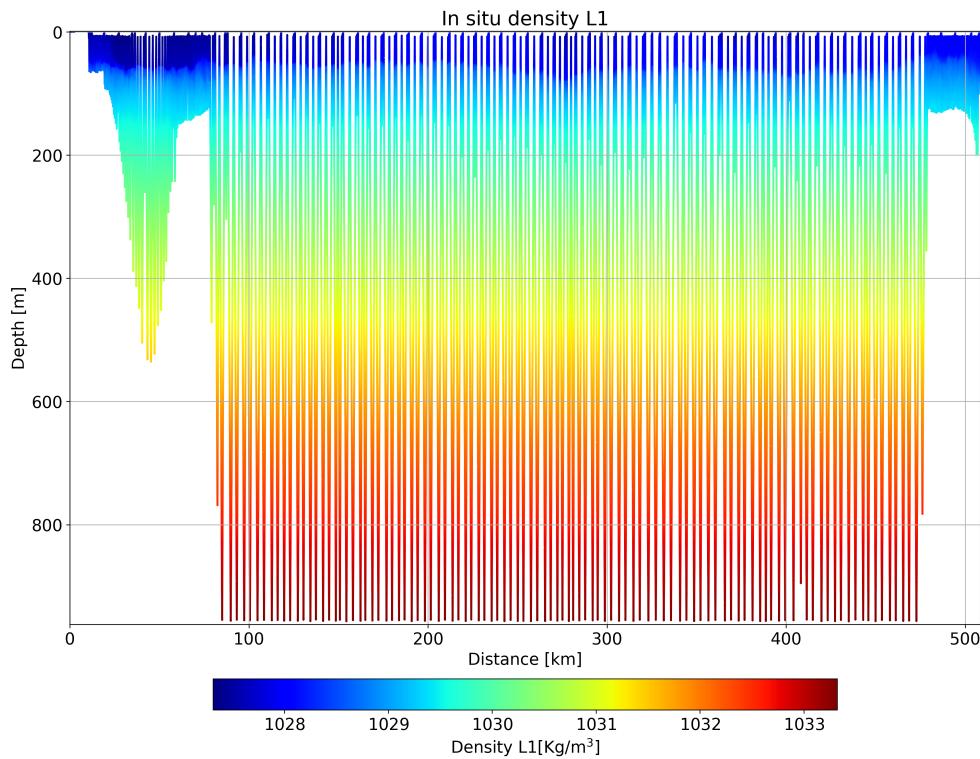


Figure 3.8: CTD Density

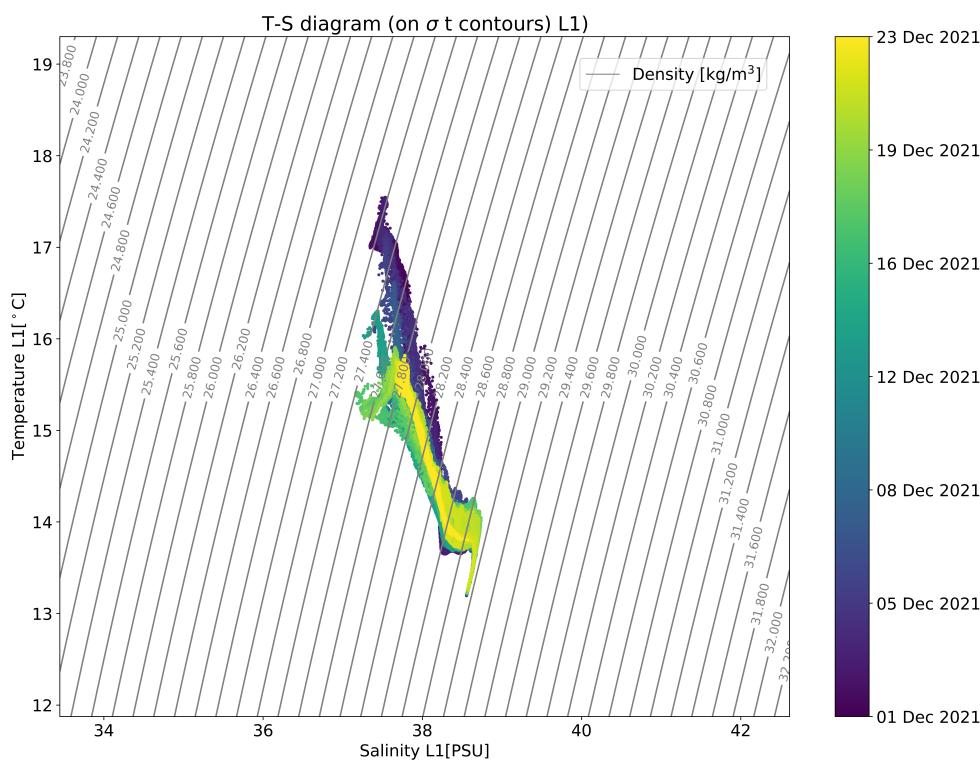


Figure 3.9: TS diagram (CTD)

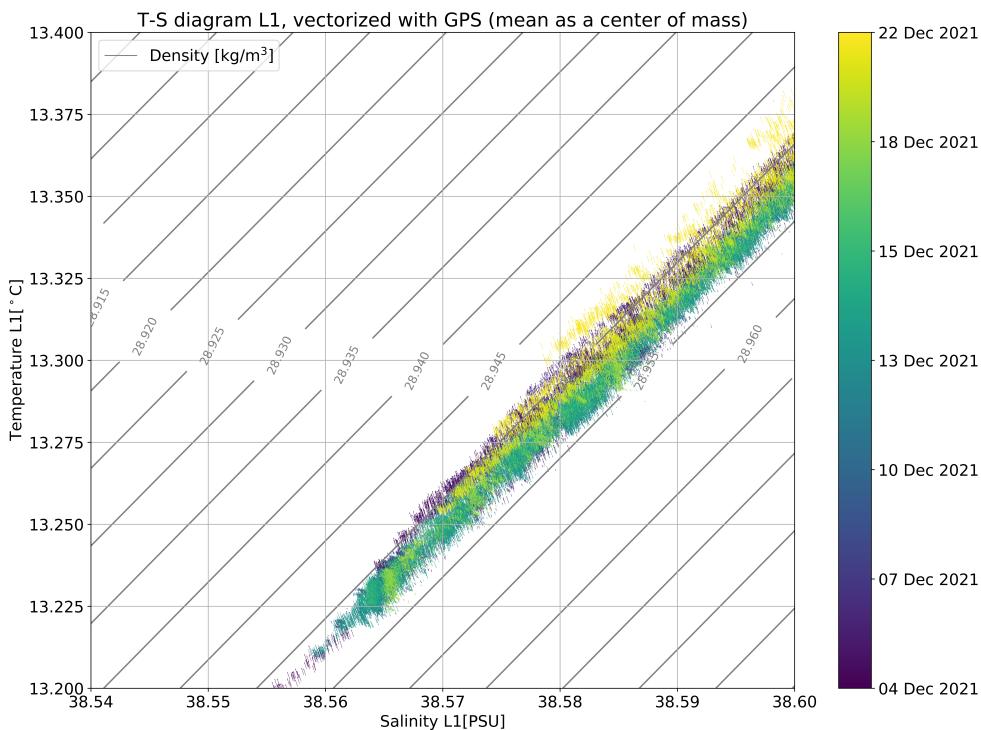


Figure 3.10: TS diagram (CTD)calib

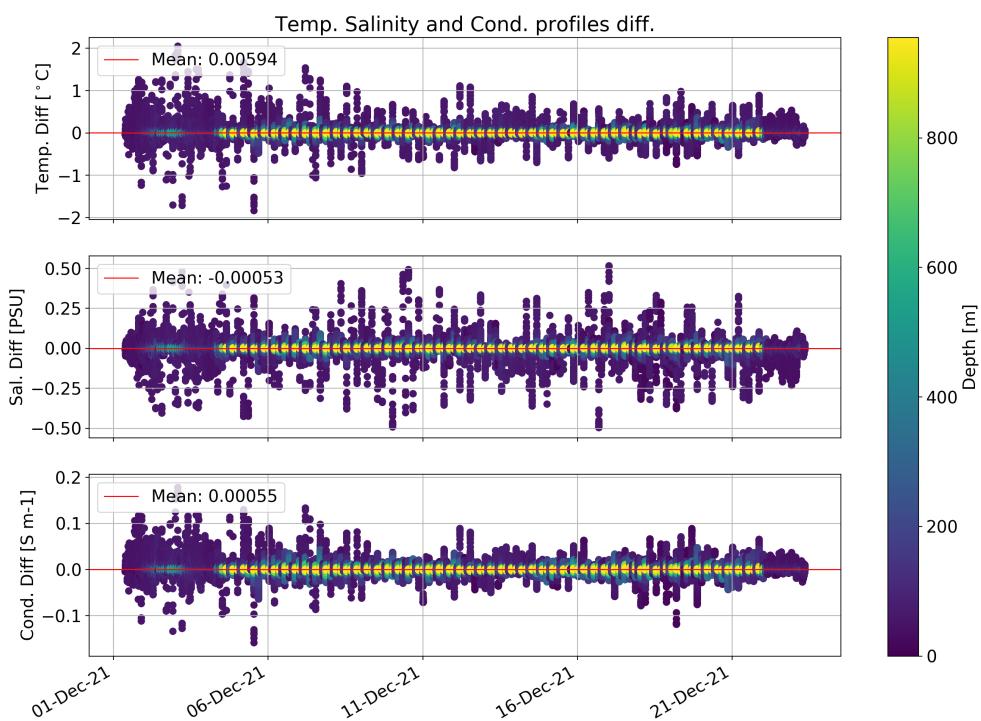


Figure 3.11: Profile consistency (CTD)

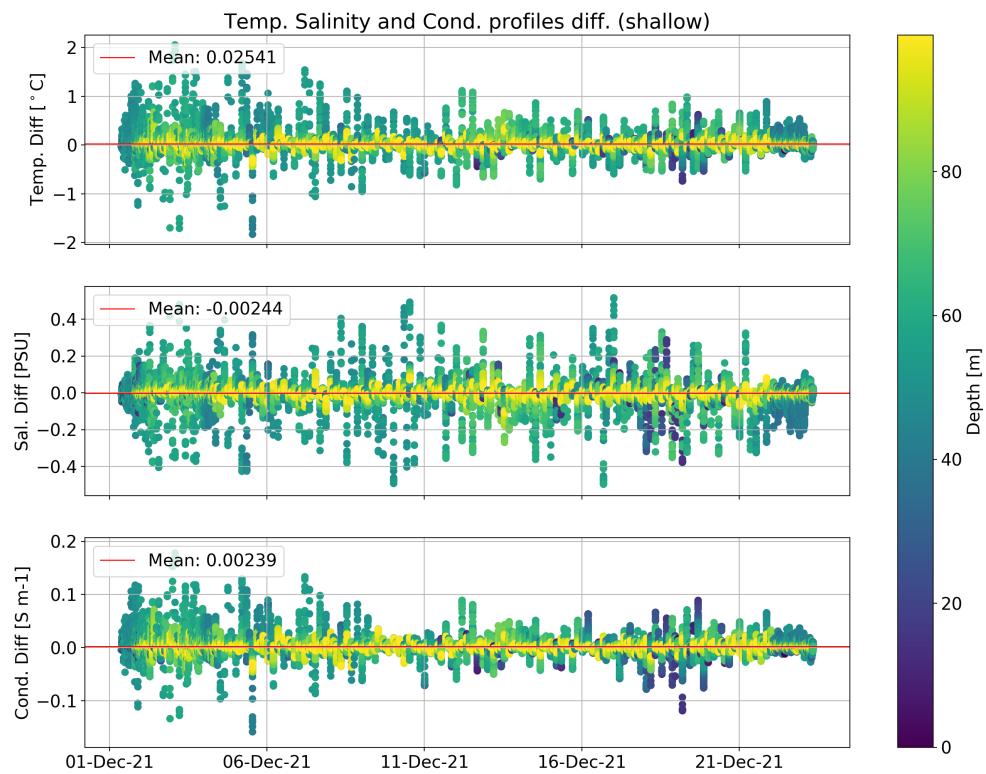


Figure 3.12: Profile consistency (CTD) zoom

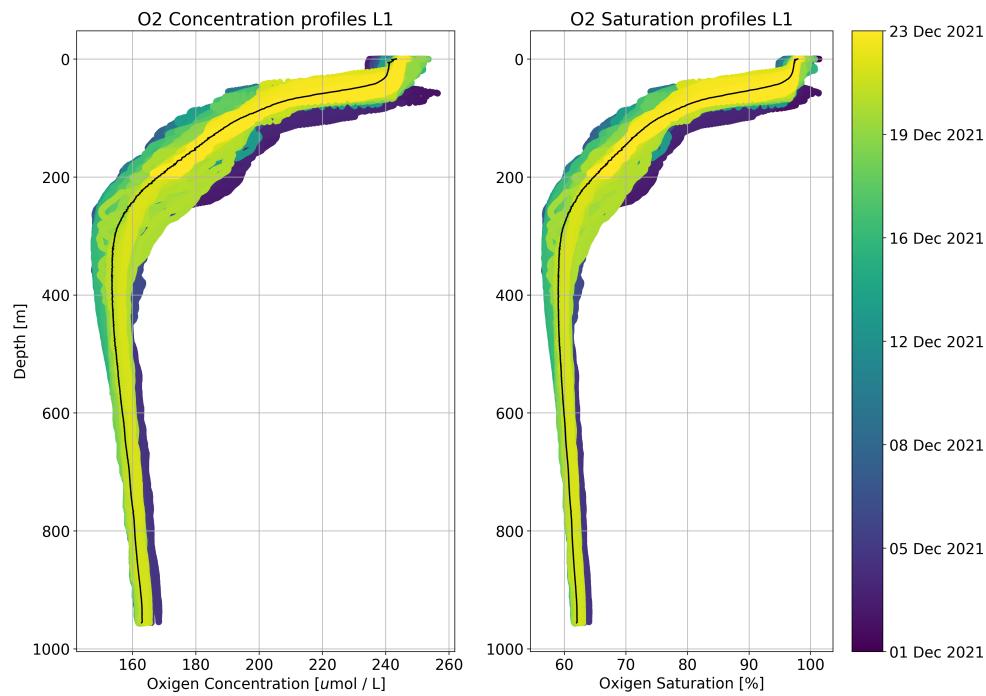


Figure 3.13: Oxygen profiles

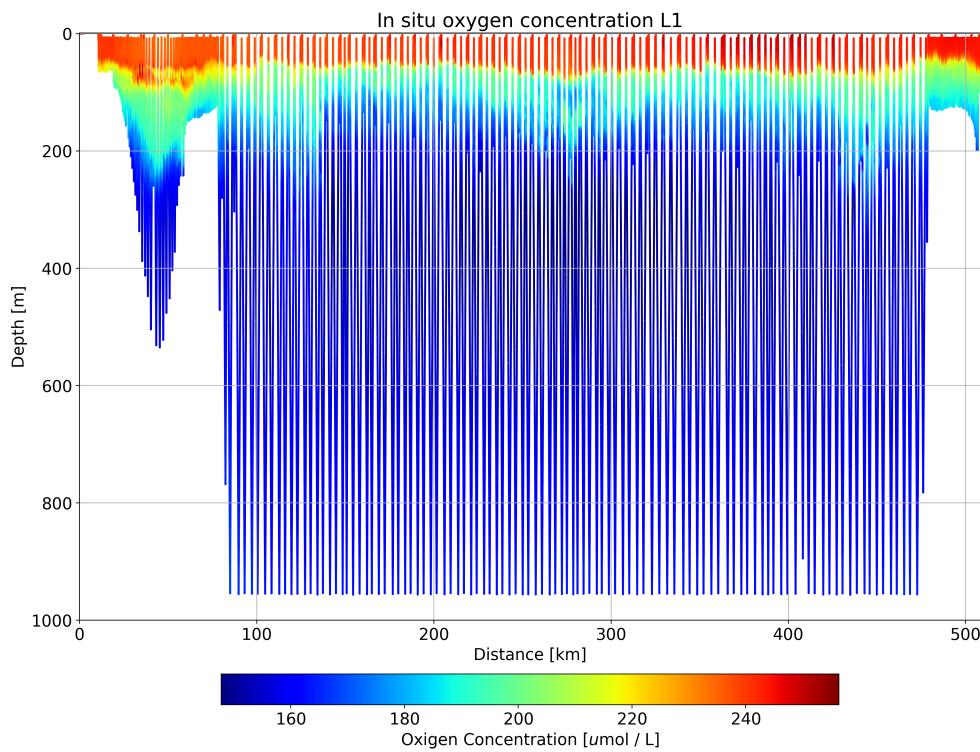


Figure 3.14: Oxygen Concentration

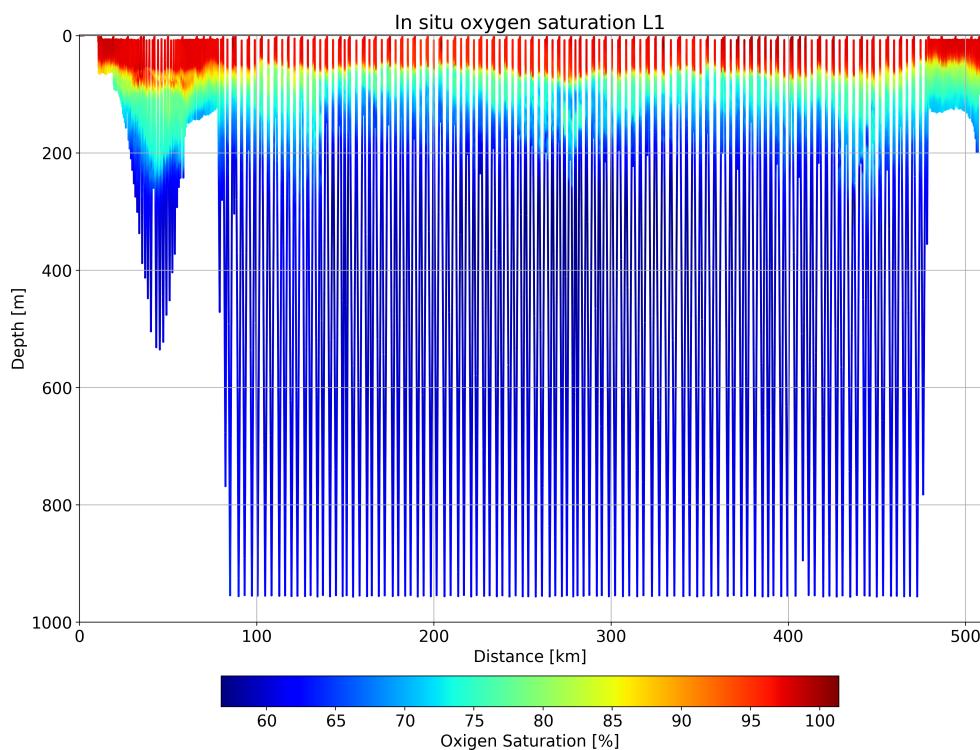


Figure 3.15: Oxygen Saturation

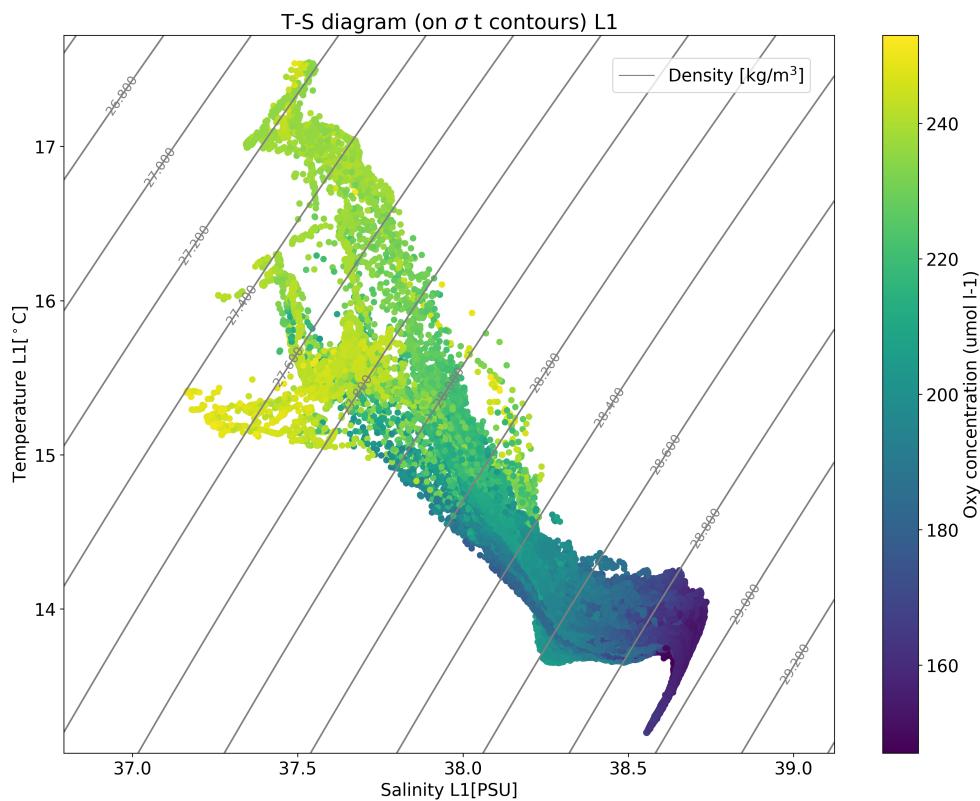


Figure 3.16: TS diagram (OXY)

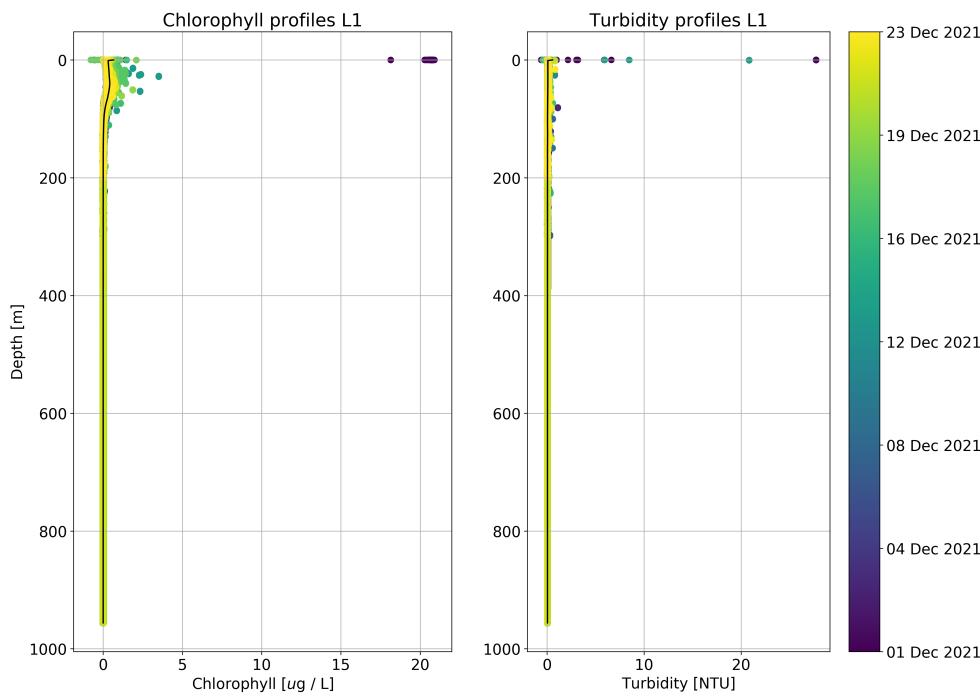


Figure 3.17: Chlorophyll-a and Turbidity profiles

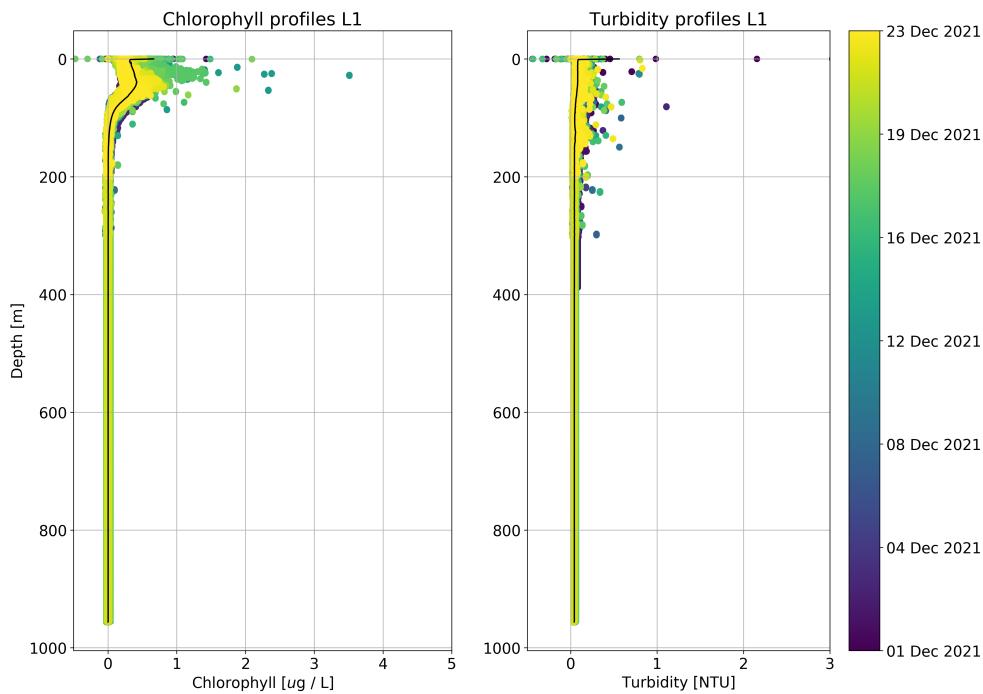


Figure 3.18: Chlorophyll-a and Turbidity profiles zoom

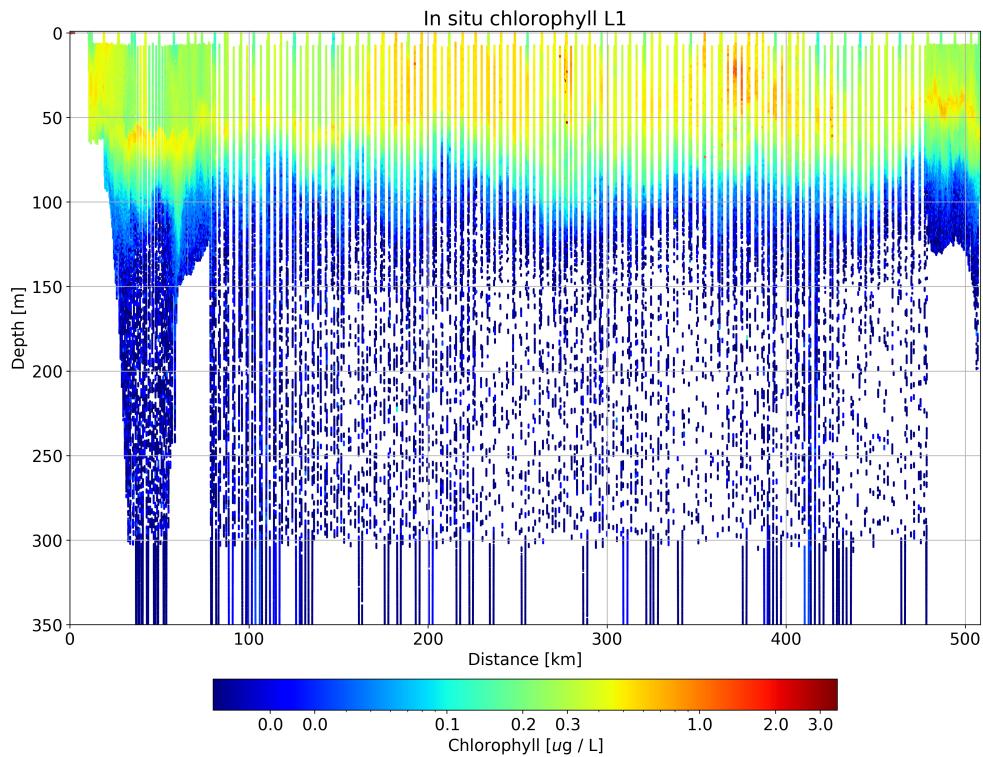


Figure 3.19: Chlorophyll-a

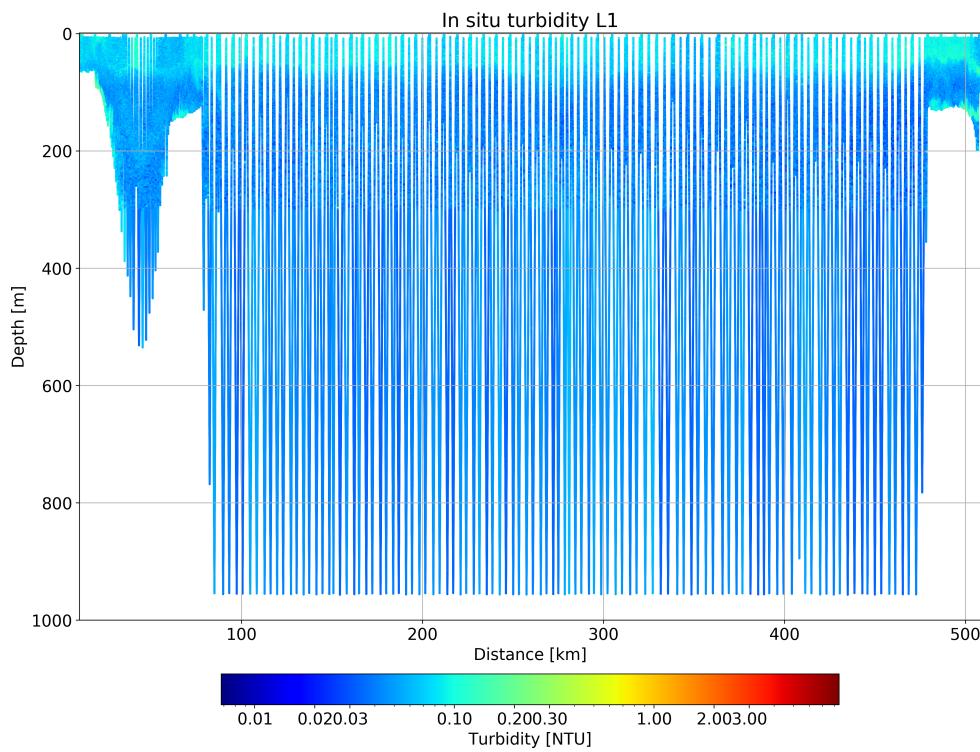


Figure 3.20: Turbidity

4 Appendix

4.1 Glider behaviour

Showing changes on Sampling (behaviour 15):

- 01 Dec 2021 09:01:13 @ Sampling of: SAMPLE13.MA OXY SN 0141
- 01 Dec 2021 09:01:14 @ Sampling state to sample set to: Diving, climbing and hovering
- 01 Dec 2021 09:01:14 @ Sampling argument: intersample time set to: 4.0 s
- 01 Dec 2021 09:01:14 @ Sampling nth yo to sample set to: 1.0 nodim
- 01 Dec 2021 09:01:14 @ Sampling argument: min depth set to: -5.0 m
- 01 Dec 2021 09:01:14 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Sampling (behaviour 14):

- 01 Dec 2021 09:01:14 @ Sampling of: SAMPLE14.MA FLNTU(-150m to -300m) SN 4124
- 01 Dec 2021 09:01:15 @ Sampling state to sample set to: Diving, climbing and hovering
- 01 Dec 2021 09:01:15 @ Sampling argument: intersample time set to: 16.0 s
- 01 Dec 2021 09:01:15 @ Sampling nth yo to sample set to: 1.0 nodim
- 01 Dec 2021 09:01:15 @ Sampling argument: min depth set to: 150.0 m
- 01 Dec 2021 09:01:15 @ Sampling argument: max depth set to: 300.0 m

Showing changes on Sampling (behaviour 13):

- 01 Dec 2021 09:01:15 @ Sampling of: SAMPLE12.MA FLNTU(surface to -150m) SN 4124
- 01 Dec 2021 09:01:16 @ Sampling state to sample set to: Diving, climbing and hovering
- 01 Dec 2021 09:01:16 @ Sampling argument: intersample time set to: 8.0 s
- 01 Dec 2021 09:01:16 @ Sampling nth yo to sample set to: 1.0 nodim
- 01 Dec 2021 09:01:16 @ Sampling argument: min depth set to: -5.0 m
- 01 Dec 2021 09:01:16 @ Sampling argument: max depth set to: 150.0 m

Showing changes on Sampling (behaviour 12):

- 01 Dec 2021 09:01:16 @ Sampling of: SAMPLE11.MA CTD(Profile) sn 0107
- 01 Dec 2021 09:01:17 @ Sampling state to sample set to: Diving, climbing and hovering
- 01 Dec 2021 09:01:17 @ Sampling argument: intersample time set to: 4.0 s
- 01 Dec 2021 09:01:17 @ Sampling nth yo to sample set to: 1.0 nodim
- 01 Dec 2021 09:01:17 @ Sampling argument: min depth set to: -5.0 m
- 01 Dec 2021 09:01:17 @ Sampling argument: max depth set to: 2000.0 m

Showing changes on Yoing (behavior behavior yo 11):

- 01 Dec 2021 09:01:17 @ Yoing num half cycles to do(nodim) set to: 2.0
- 01 Dec 2021 09:01:17 @ Yoing d target depth(m) set to: 5.0
- 01 Dec 2021 09:01:17 @ Yoing d bpump value(X) set to: -230.0
- 01 Dec 2021 09:01:17 @ Yoing d target altitude(m) set to: 20.0
- 01 Dec 2021 09:01:17 @ Yoing d use pitch(enum) set to: 3.0
- 01 Dec 2021 09:01:17 @ Yoing d pitch value(X) set to: -0.453800
- 01 Dec 2021 09:01:18 @ Yoing c use pitch(enum) set to: 3.0
- 01 Dec 2021 09:01:18 @ Yoing c pitch value(X) set to: 0.453800
- 01 Dec 2021 09:16:34 @ Yoing d target depth(m) set to: 950.0
- 01 Dec 2021 10:17:26 @ Yoing num half cycles to do(nodim) set to: -1.0
- 01 Dec 2021 10:17:26 @ Yoing d bpump value(X) set to: 400.0
- 15 Dec 2021 11:13:17 @ Yoing num half cycles to do(nodim) set to: 2.0
- 15 Dec 2021 15:03:02 @ Yoing num half cycles to do(nodim) set to: -1.0

Showing changes on Altimeter set to (behaviour u alt min depth):

- 01 Dec 2021 09:11:48 @ Altimeter set to u alt min depth set to: 2
- 01 Dec 2021 10:11:31 @ Altimeter set to u alt min depth set to: 30
- 13 Dec 2021 10:59:33 @ Altimeter set to u alt min depth set to: 1000
- 20 Dec 2021 10:57:31 @ 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
- Digifin _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

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