
SENTRY OPERATIONS REPORT FOR THE
TN383 CHADWICK CRUISE
DRAFT

WHOI Sentry Operations Group

Zac Berkowitz Justin Fujii Stefano Summan Amanda Sutherland Joe Garcia

Sentry Expedition Leader: Zac Berkowitz

R/V Thomas G. Thompson — September 1 through September 20

Publication Date: September 19, 2020



1 Summary

This document summarizes operations with the *Sentry* autonomous underwater vehicle (AUV) during the TN383 Chadwick cruise. Included in this report is the vehicle configuration; basic vehicle and sensor performance; and post-dive reports (with summary statistics and narratives). This report does not attempt to describe the scientific results or conclusions. A detailed description of the data files resulting from this cruise is provided in a separate document. Individual dive summaries for Sentry dives 562-568 follow each of these is a free-standing document summarizing the dive.

2 Cruise Log

This section provides a brief chronological summary of *Sentry* activities during the cruise. Additional information on specific dives is available in the dive reports.

29 AUG 2020 Sentry team arrived in Newport, OR

30 AUG 2020 First day of Sentry MOB. Sentry system successfully passed a decktest by the end of the day.

1 SEPT 2020 Ship departs Newport, OR at 13:30 local. No decktest due to sea conditions during transit. Power glitch in server van dropped power to Sentry. Vehicle restarted without apparent issues.

2 SEPT 2020 Sentry passed a decktest. Successful tests with MBARI TRN node infrastructure with shore team. Ship arrived at Axial at 14:30.

3 SEPT 2020 Launched Sentry engineering dive 562 in the morning. Rough recovery in the evening sheared off two of Sentry's wings. Minor fixes completed in the evening.

4 SEPT 2020 Replaced two of four thruster cables after damage caused by previous dive's recovery. EM2040 failed a number of Built-In Self-Tests (BISTs) during pre-dive which forced an initial delay which ended up scrubbing the dive.

5 SEPT 2020 Launched and Recovered Sentry 563

6 SEPT 2020 No dive due to inclement weather

7 SEPT 2020 No dive due to strong winds and waves

8 SEPT 2020 No dive due to strong winds and waves

9 SEPT 2020 Plan to launch Sentry for dive 564 was delayed and eventually scrubbed due to the same BIST issues that delayed dive 563. Troubleshooting with Kongsberg has not provided a root cause as of yet. System came back up healthy around 21:30 local and was kept powered up overnight for observation

10 SEPT 2020 EM2040 still passing BISTs after remaining powered up overnight and after a few sessions pinging in air. Launched Sentry dive 564

11 SEPT 2020 Recovered Sentry dive 564

Deployed Sentry dive 565

12 SEPT 2020 Recovered Sentry dive 565

13 SEPT 2020 Launched Sentry dive 566. Another EM2040 failure delayed launch 2.5 hours. Swapped to spare Tx head.
Recovered Sentry dive 566

14 SEPT 2020 No dive due to strong winds and waves

15 SEPT 2020 No dive due to strong winds and waves

16 SEPT 2020 Launched Sentry dive 567

17 SEPT 2020 Recovered Sentry dive 567
Launched Sentry dive 568

18 SEPT 2020 Recovered Sentry dive 568. End of Sentry cruise operations.

19 SEPT 2020 Begin transit back to Newport, OR. Start demob. ops.

20 SEPT 2020 Demob ops.

21 SEPT 2020 Sentry system shipped back to WHOI.

3 Vehicle Configuration

4 Navigation

All dives were navigated using real time Doppler Velocity Log (DVL) velocity inertial measurement unit (IMU) attitude measurements. External aiding during descent was performed with Ultra-Short Baseline (USBL) throughout the cruise. Dive specific notes on navigation are included in the dive reports. All final navigation consists of a track where the DVL/IMU track was fused with the USBL fixes in post-processing.

4.1 Coordinate origins

The vehicle's control system uses simple equidistant coordinates. This system uses an origin, defined in terms of latitude and longitude with the World Geodetic System 1984 (WGS84) datum, and a fixed scaling between meters displacement from the origin. We use the identical routines that have been used by the National Deep Submergence Facility (NDSF) assets Alvin and Jason for decades. Likewise we always used the same origin for Sentry and Alvin at each site. These simple coordinates have several advantages for realtime control of a vehicle. Unlike Universal Transverse Mercator (UTM) grid coordinates, the x and y axes intersect at right angles and align with true east and north respectively at the origin. These coordinates distort quickly as one moves away from the origin, but we solve that problem by putting the origin close to the operating area. We almost always report our results in latitude/longitude, so most users need not be aware of these details.

4.2 USBL Calibration and Performance Notes

A CASIUS calibration of the USBL system was not conducted during this cruise.

5 Items of Note

This section summarized details which are worthy of note or mention for future reference but which do not constitute problems:

N.1: ROV Jason onboard.

N.2: Waveglider onboard for joint ops with Jason.

N.3: Sentry located on starboard side of vessel

N.4: Sentry watch station in the Main Lab

N.5: Externa MAPR installed on aft tail skin

N.6: Subbottom sonar disabled for cruise

6 Ship Specific Information

This section summarizes ship specific information factual, good, and bad and is meant primarily to facilitate more effective use of the same vessel in the future.

- S.1:** Starboard crane used for Sentry operations
- S.2:** Used the ships USBL system, tied into Jason Network
- S.3:** Used hull transducer for WhiffleNav with patch cable in Main Lab
- S.4:** No way to patch Sentry network to Bridge. Used a laptop spanning Jason and Ship networks in Main Lab to push VNC of ranger display up to bridge over ship's wifi.

7 Technical Issues

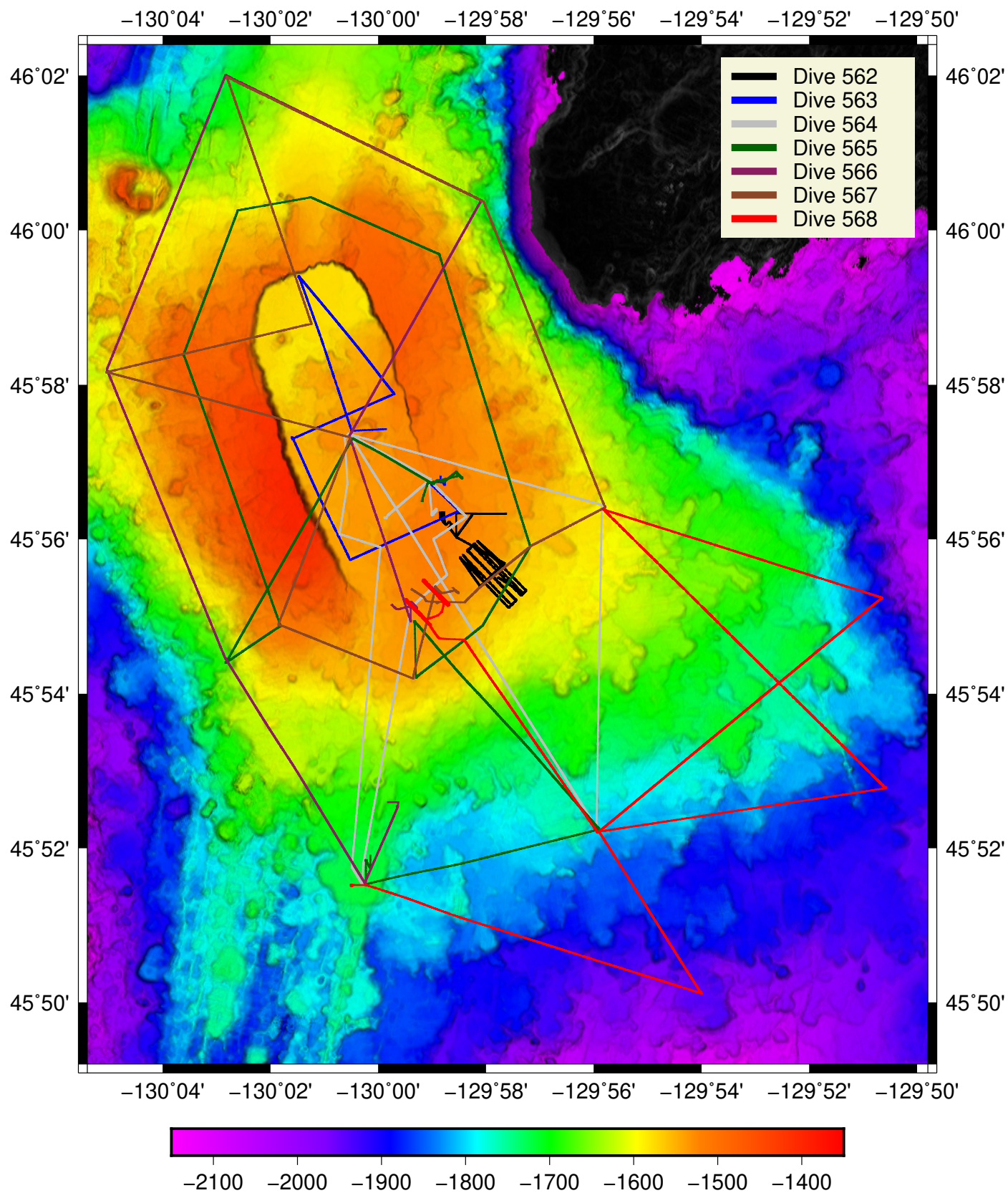
This section summarizes technical issues encountered by the *Sentry* operations group on the cruise. Issues which affected primarily individual dives are listed in the individual dive reports.

- T.1:** Sentry battery B5 experienced an internal problem that prevented it's use for the cruise, requiring operations with only the remaining 4 batteries and reducing the maximum mission time to approx 18 hours deck-to-deck.
- T.2:** Initial deck operations on the Thompson continue to be more difficult than they should be, increasing the chance of damaging equipment.
- T.3:** EM2040 BIST failures scrubbed the launch of two dives. The root cause is still to be determined but seems to be related to the Tx transducer that failed.

8 Acknowledgments

1. Thank you to NSF for funding this expedition.
2. Thank you to the Captain and crew of the R/V Atlantis for safe operations and support.

TN383 Sentry Tracklines



Sentry 562 Dive Report
DRAFT



Zac Berkowitz Justin Fujii Stefano Summan Amanda Sutherland Joe Garcia

Sentry Expedition Leader: Zac Berkowitz

Summary

Weather: Deployment: winds 10-15knts, seas 3-4ft. Recovery: winds 12-18knts, seas 3-6ft.

Reason for end of dive: End of mission time.

Important Positions

Dive Origin: 45 45.0000 -130 -12.0000

Launch Position:

Vehicle Configuration

The science sensing suite for this dive was:

This dive was navigated using the DVL/INS system in real time. USBL provided post-dive corrections.

Narrative

Sentry562 is the first of TN383.

This was an engineering dive for Sentry testing the new MX mission controller under development. Sentry completed a number of different survey blocks, including a multibeam patch test, without incident. The new bottom approach logic worked well. Issues, if any, are limited to minor bugs.

Recovery was difficult despite the moderate weather conditions. Two of Sentry's fins were sheared off at the sacrificial bolts due to impacts with the ship while hooked to the crane. Confusion amongst the deck crew despite voicing no questions during the procedure discussion beforehand played a major contributing role. Once taglines were finally attached the vehicle was recovered without further incident.

This is disappointing and seems to be a continuing trend operating from the Thompson. At no point during the difficulties was there anything specific to Sentry - it is simply a large, heavy object over the rail we don't want impacting the ship.

Vehicle damage delayed the following dive.

Sensor Information

This is a recently added section with selected sensor metadata. This section will be expanded in coming months. Additional data is available in the sentry562/nav-sci/proc directory within the sentry562_config matlab structure as well as in ascii text logs in sentry562/metadata. At present metadata is not yet automatically collected on all sensors.

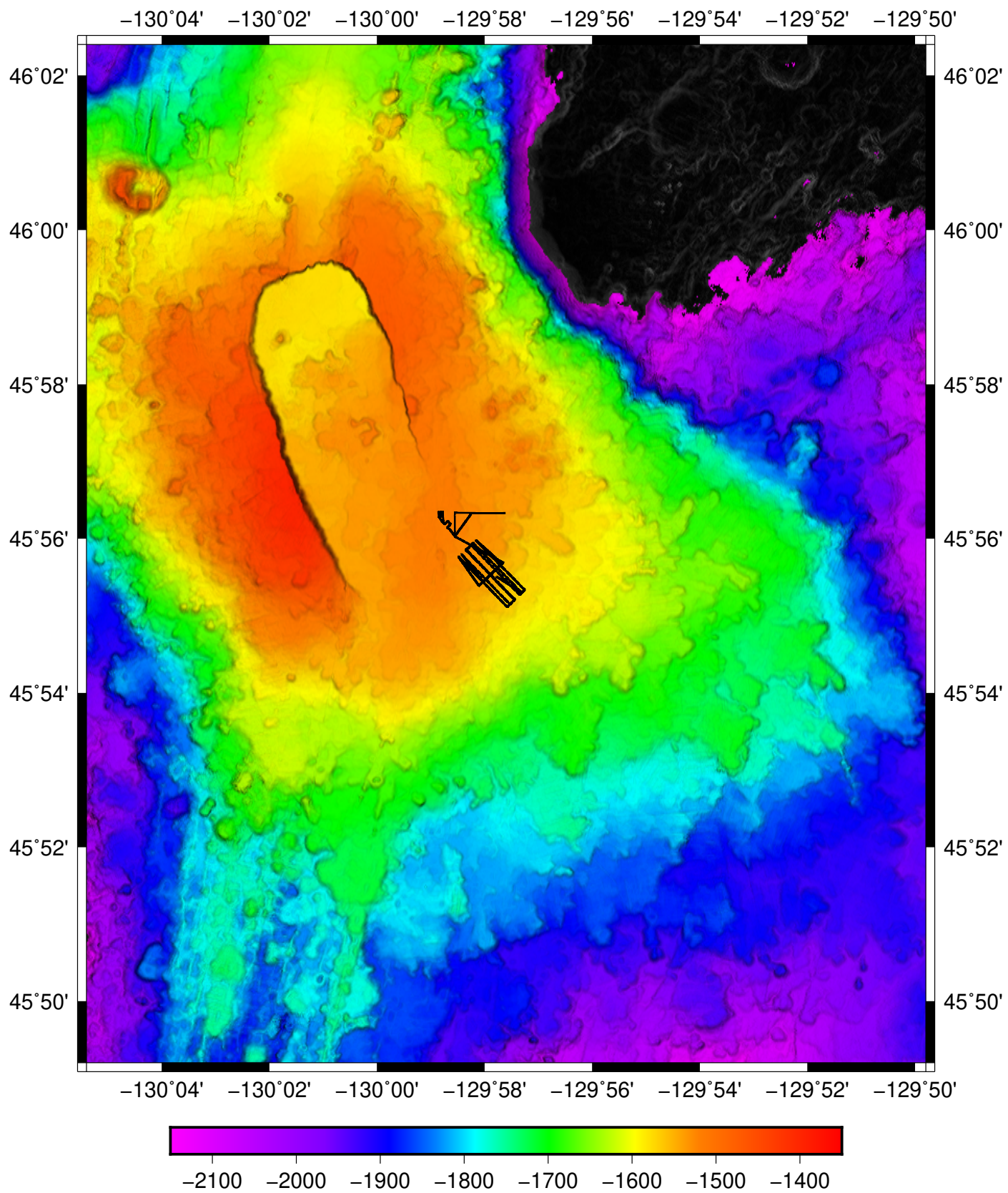
Special Data Processing Notes

None.

Plots and Images

This section contains selected images of data products and plots of vehicle navigation and selected sensors.

Sentry dive 562



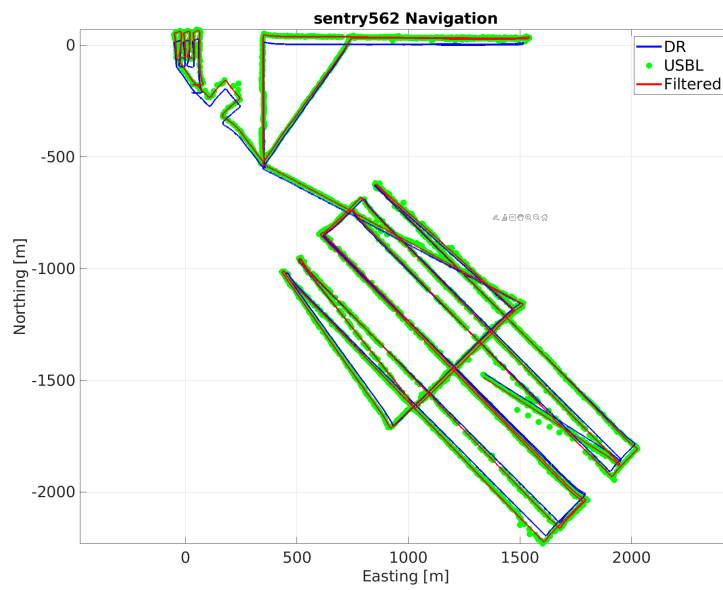


Figure 1: Latitude/Longitude plot of Sentry dive 562 based on post-processed navigation

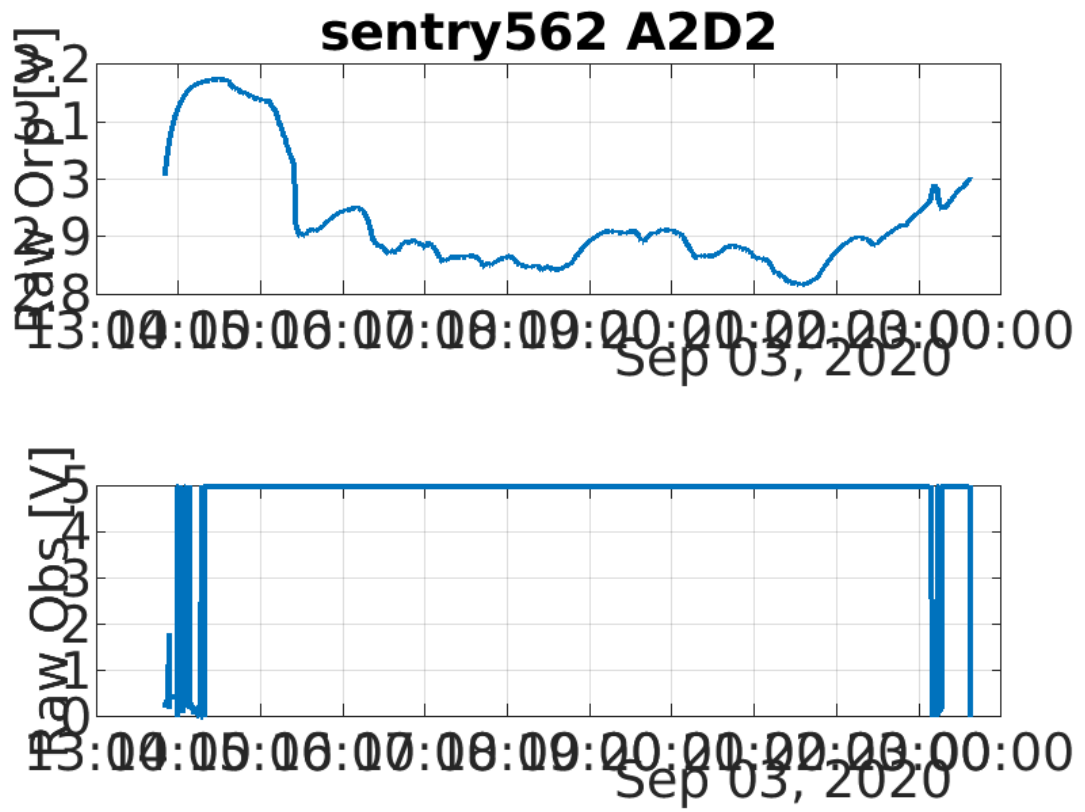


Figure 2: Raw analog Sensor Data

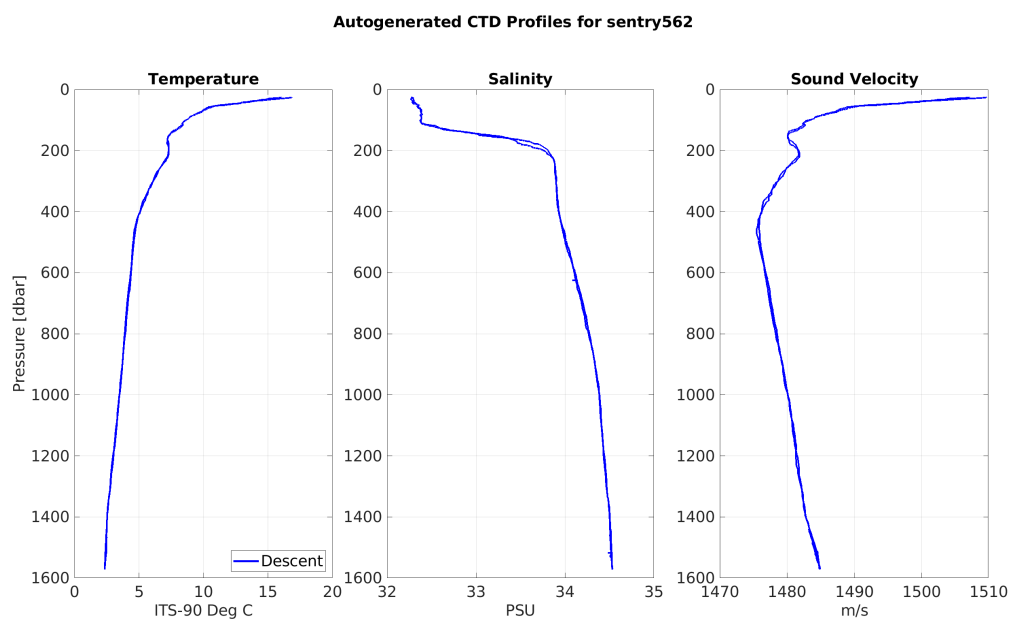


Figure 3: CTD profile sensor data

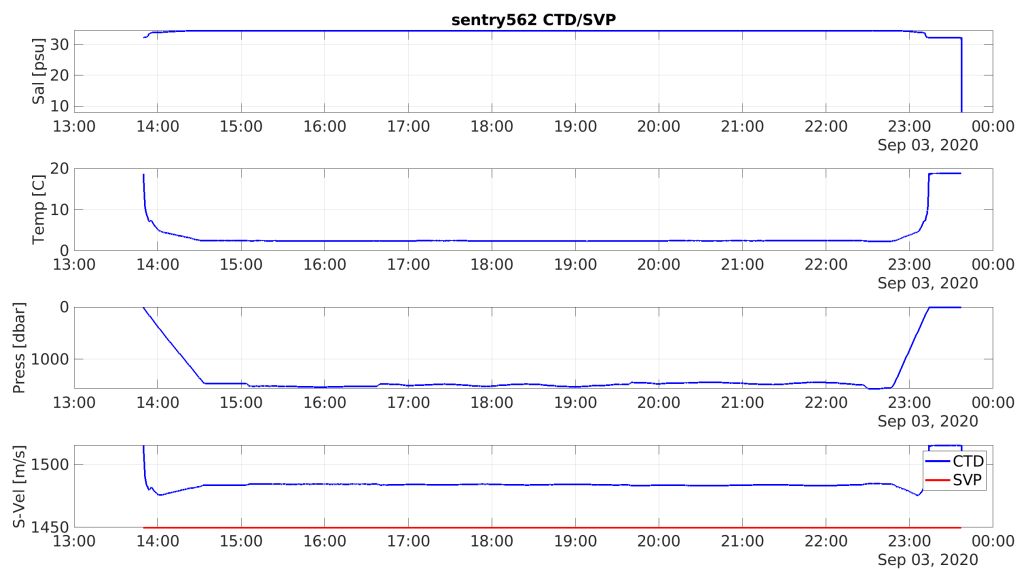


Figure 4: CTD and SVP sensor data

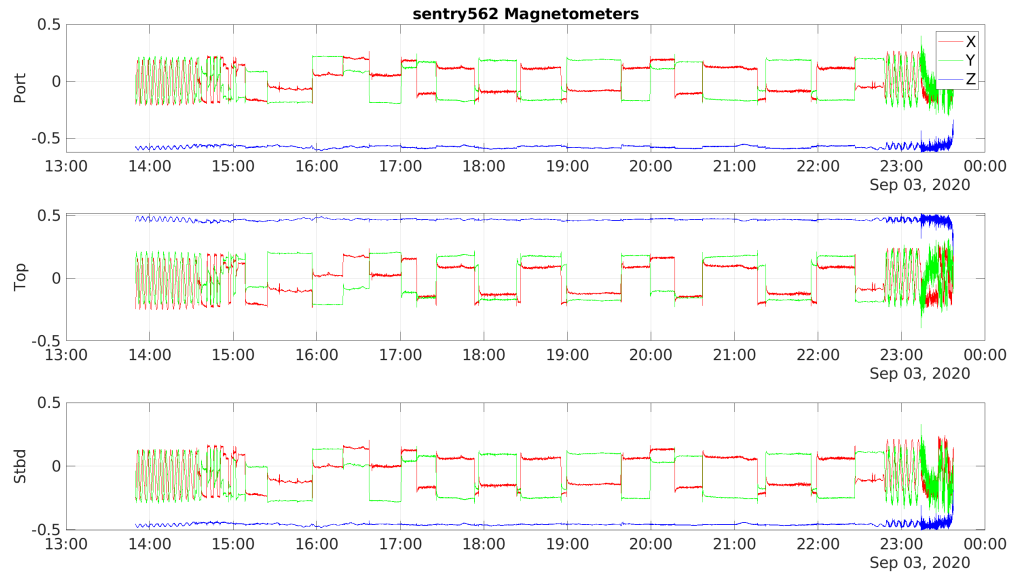


Figure 5: Magnetometer data from each of the three magnetometers on Sentry

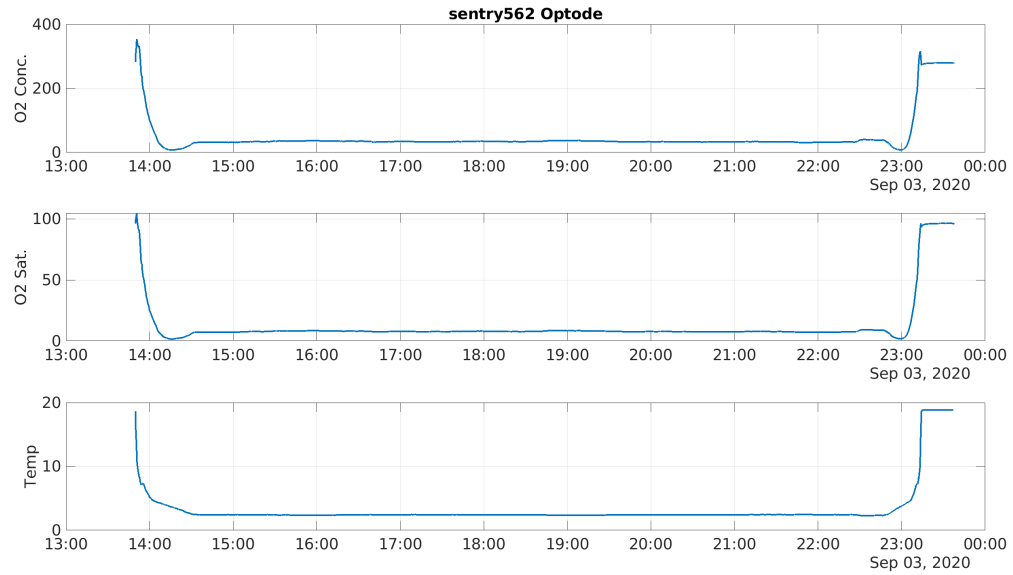


Figure 6: Optode temperature, O2 saturation, and concentration

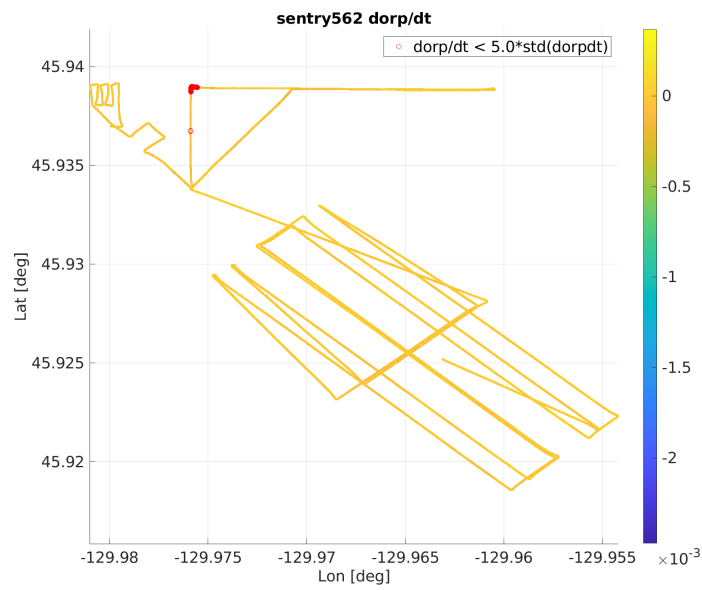


Figure 7: Navigated ORP sensor data.

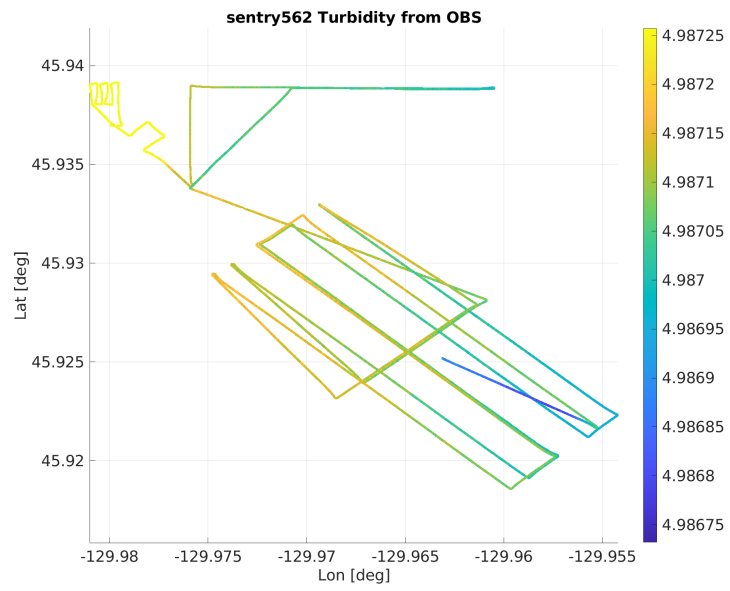


Figure 8: Navigated OBS sensor data.

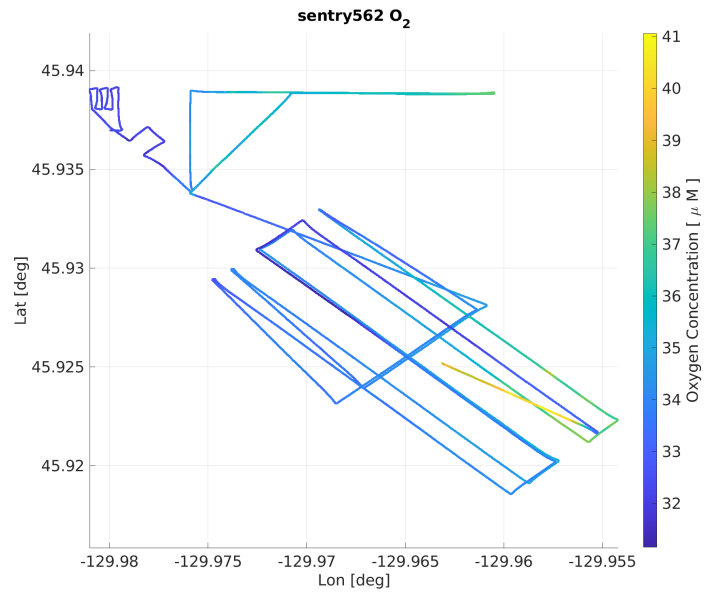


Figure 9: Navigated optode sensor data.

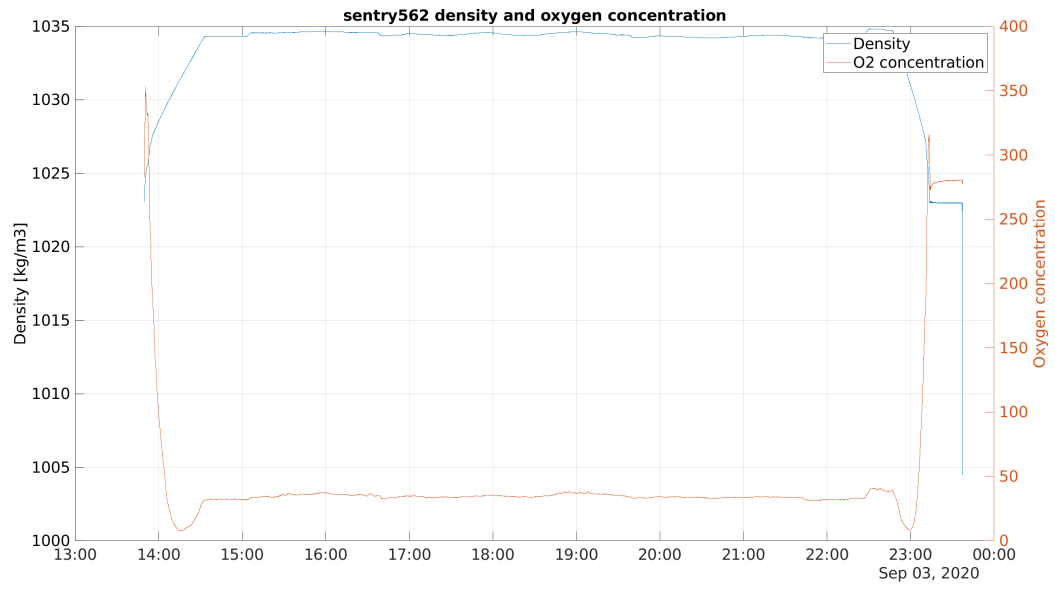


Figure 10: Density and O2 sensor data.

Sentry 563 Dive Report
DRAFT



Zac Berkowitz Justin Fujii Stefano Summan Amanda Sutherland Joe Garcia

Sentry Expedition Leader: Zac Berkowitz

Summary

Weather: Deployment: winds 5-7knts, seas 1-3ft Recovery: winds 5-7knts, seas 1-3ft

Reason for end of dive: End of mission time.

Important Positions

Dive Origin: 45 45.0000 -130 -12.0000

Launch Position: sentry563 launch position: 45 56.785'N 129 59.027'W

Vehicle Configuration

The science sensing suite for this dive was:

This dive was navigated using the DVL/INS system in real time. USBL provided post-dive corrections.

Narrative

Sentry563 is the second dive of TN383.

This short dive covered the inner Axial crossing lines of the multibeam survey. It's duration was limited in order to recover Sentry during daylight hours. Lots of effort prior to the recovery between the Ship's personnel involved and the Sentry group was rewarded with a much smoother recovery than 562.

The TRN datapod was running over the whole dive recording data and providing estimated offsets to the client running on Sentry's main stack. Initial impressions of the results after recovery are positive.

Dive Statistics

0.1 sentry563 Summary

sentry563 Summary

Origin: 45.750000 -130.200000

Origin: 45 45.000'N 130 12.000'W

Launch: 2020/09/05 17:51:35

Survey start: 2020/09/05 18:35:10

Survey start: Lat:45.946969 Lon:-129.980723

Survey start: Lat:45 56.818'N Lon:129 58.843'W

Survey end: 2020/09/05 23:57:09

Survey end: Lat:45.957114 Lon:-129.997328

Survey end: Lat:45 57.427'N Lon:129 59.840'W

Ascent begins: 2020/09/05 23:57:09

On the surface: 2020/09/06 00:24:29

On deck: 2020/09/06 00:43:20

descent rate: 32.7 m/min

ascent rate: 53.6 m/min

survey time: 5.4 hours

deck-to-deck time 6.9 hours

Min survey depth: 1427m

Max survey depth: 1512m

Mean survey depth: 1474m

Mean survey height: 66m

distance travelled: 19.54km

average speed: 1.00m/s

average speed during photo runs: NaN m/s over 0.00 km

average speed during multibeam runs: 1.00 m/s over 19.54 km

total vertical during survey: 861m

Battery energy at launch: 16.3 kwhr

Battery energy at survey start: 15.9 kwhr

Battery energy at survey end: 11.0 kwhr

Battery energy on surface: 11.0 kwhr

Battery energy on deck: 10.9 kwhr

UTC Time	Mission Time	Event	Notes
2020/09/05 17:51:34	+00:00:00.00	launch	launch
2020/09/05 18:34:18	+00:42:44.03	descent	end
2020/09/05 18:35:06	+00:43:32.43	onbottom	START
2020/09/05 18:51:29	+00:59:54.64	start	loop_1
2020/09/05 23:42:49	+05:51:14.49	end	loop_1
2020/09/05 23:59:52	+06:08:17.87	abort	
2020/09/06 00:24:28	+06:32:54.00	surface	surface
2020/09/06 00:43:19	+06:51:45.36	recovery	autogenerated

Table 1: Summary of events during dive sentry563

Sensor Information

This is a recently added section with selected sensor metadata. This section will be expanded in coming months. Additional data is available in the sentry563/nav-sci/proc directory within the sentry563_config matlab structure as well as in ascii text logs in sentry563/metadata. At present metadata is not yet automatically collected on all sensors.

0.2 sentry563 Devices

Instrument	Model	Serial Num.	Comments	Config File
USBL	Sonardyne AvTrak2	U00570D		avtrak_20200905_1620.cfg
DVL	RDI Navigator (300kHz)	727-2000-00J	CX: 1, WP: 0	dv1300_20200905_1621.cfg
CTD	SBE 49	222		sbe49_20200905_1621.cfg
SAIL	obs A/D	13	A: 5, G: 1.00, O: 0	a2d2-pods_20200905_1621.cfg
	orp A/D	14	A: 3, G: 1.00, O: 0.0024	

M

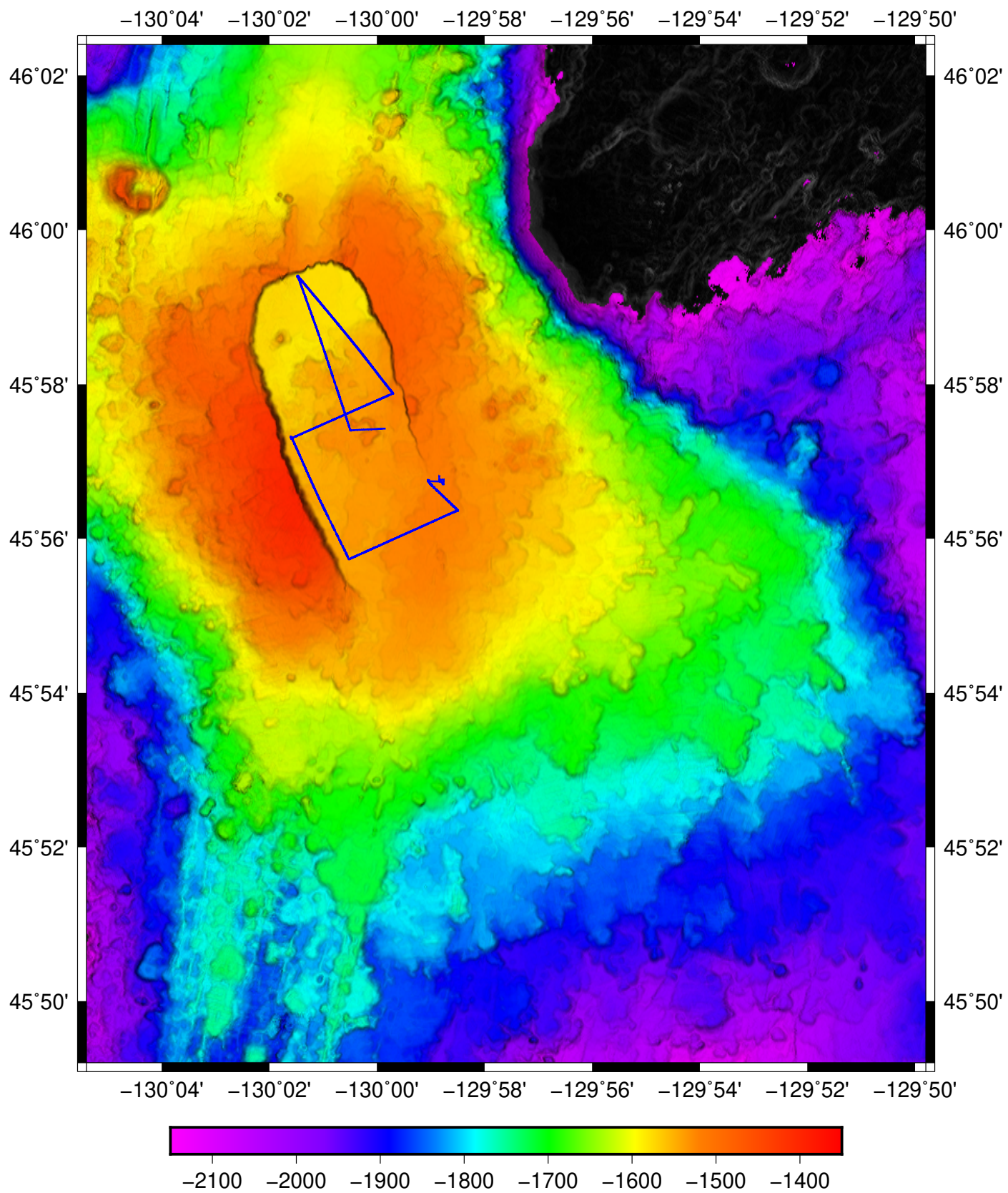
Special Data Processing Notes

None.

Plots and Images

This section contains selected images of data products and plots of vehicle navigation and selected sensors.

Sentry dive 563



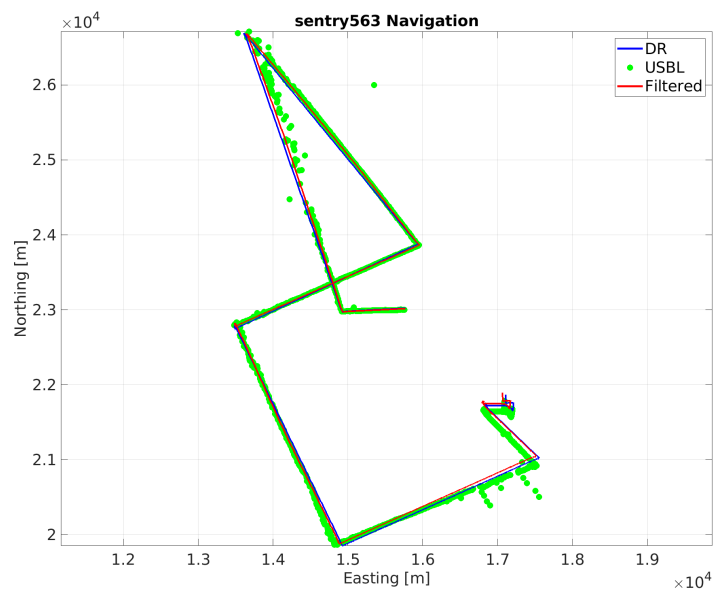


Figure 11: Latitude/Longitude plot of Sentry dive 563 based on post-processed navigation

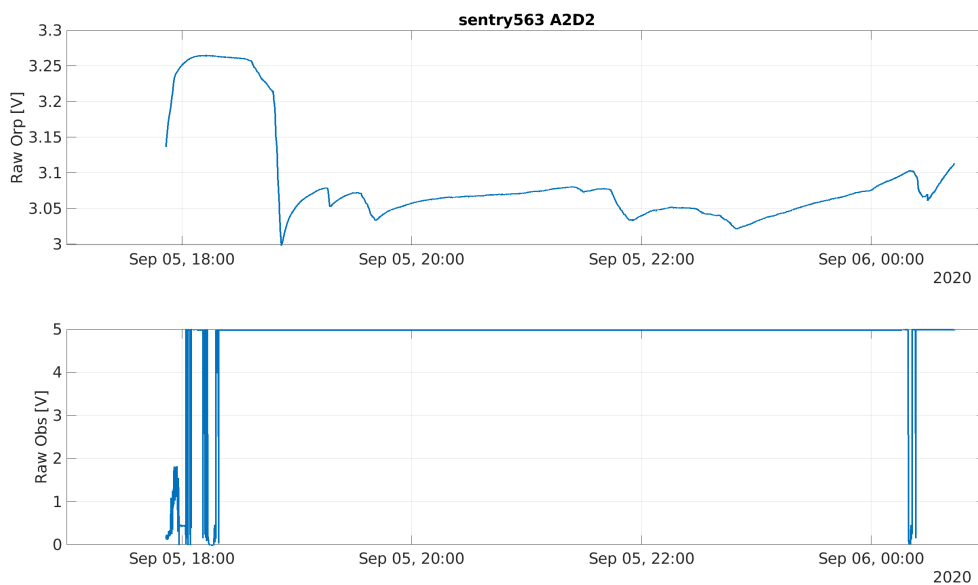


Figure 12: Raw analog Sensor Data

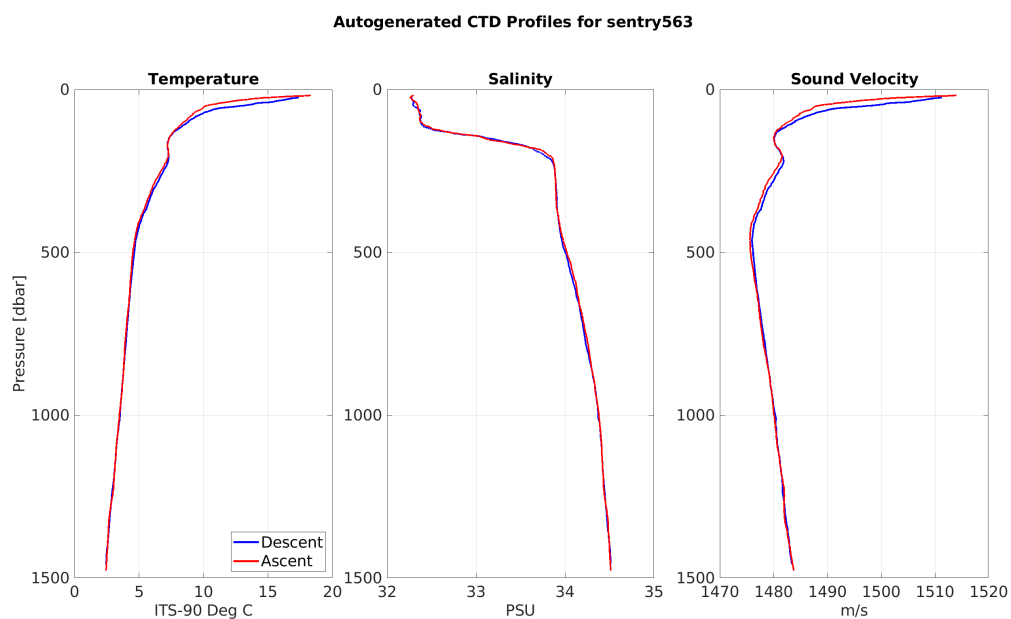


Figure 13: CTD profile sensor data

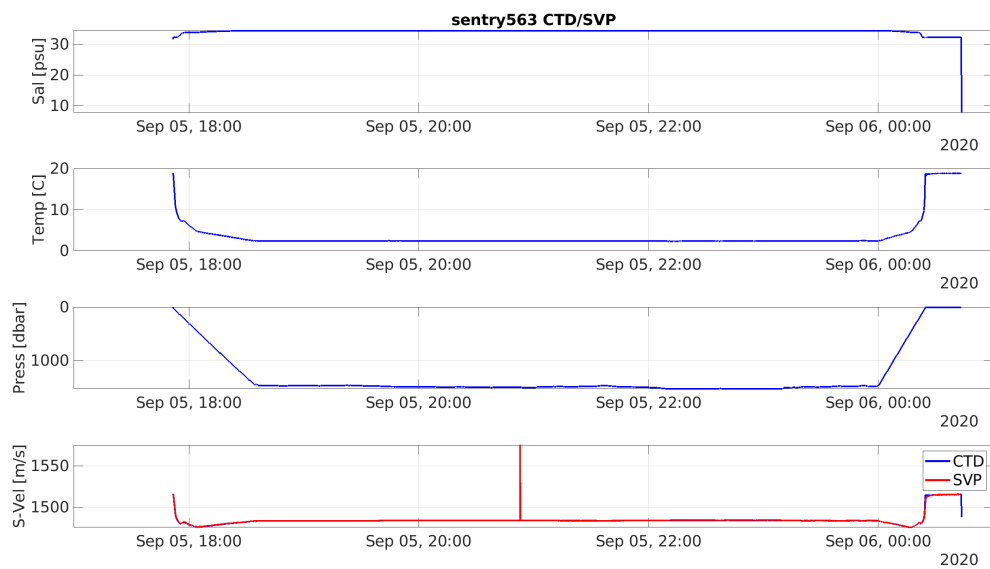


Figure 14: CTD and SVP sensor data

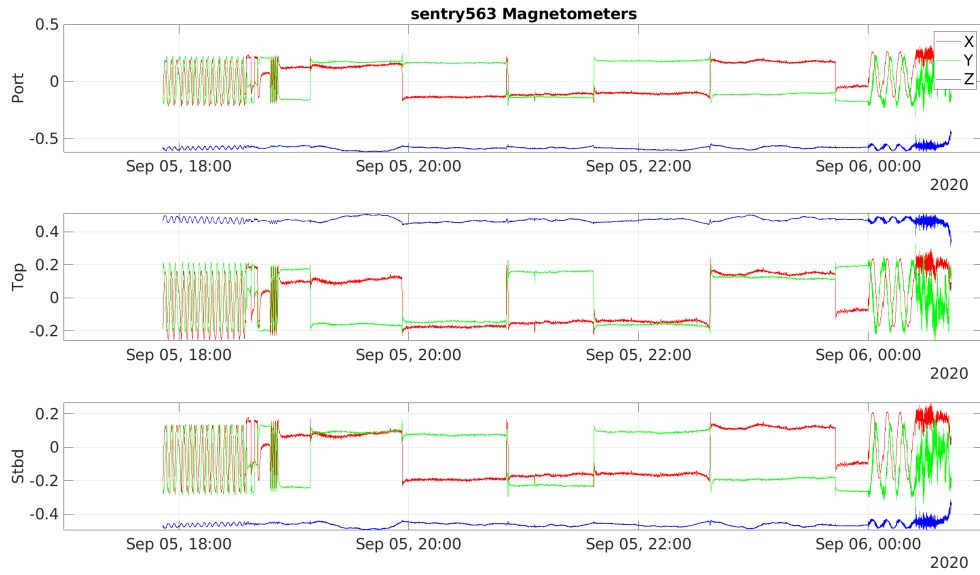


Figure 15: Magnetometer data from each of the three magnetometers on Sentry

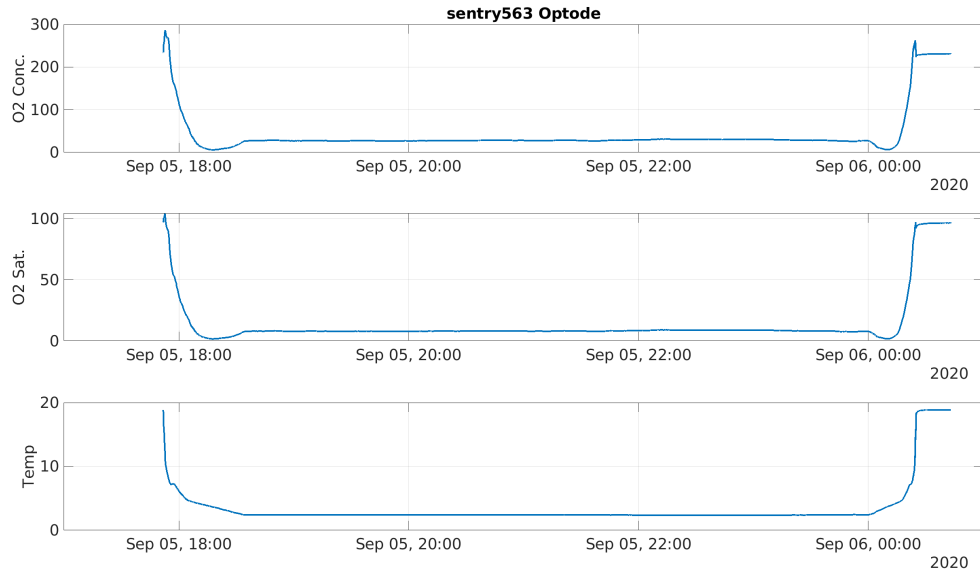


Figure 16: Optode temperature, O2 saturation, and concentration

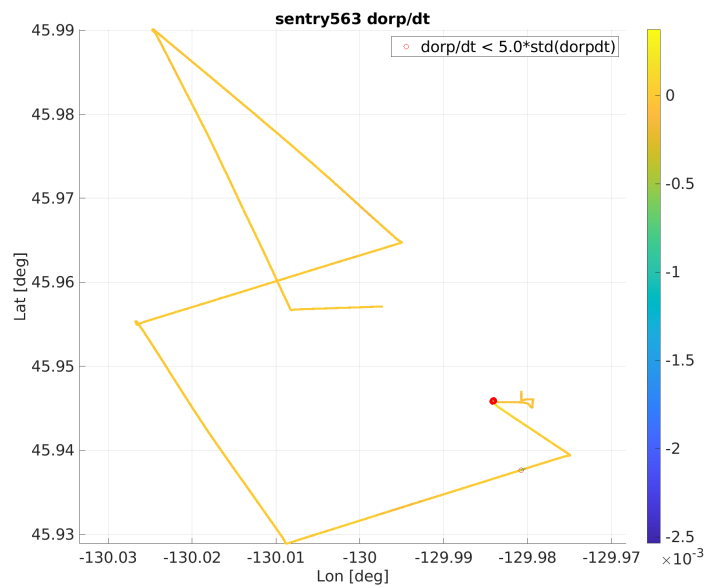


Figure 17: Navigated ORP sensor data.

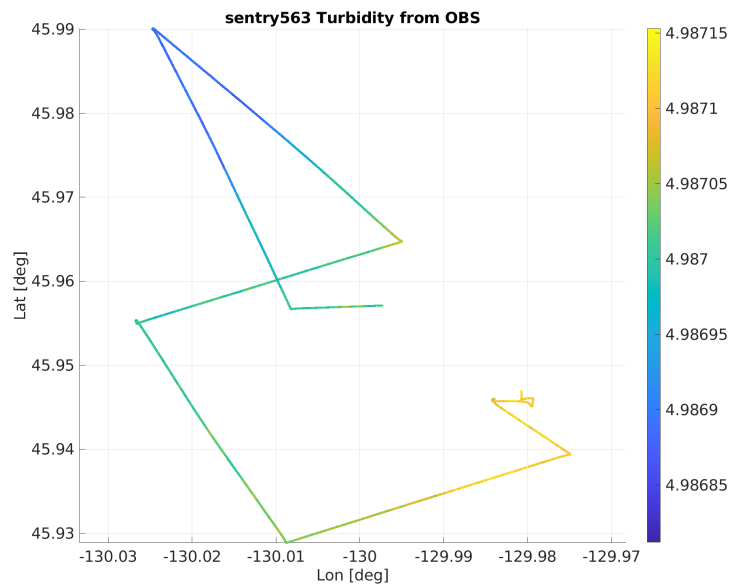


Figure 18: Navigated OBS sensor data.

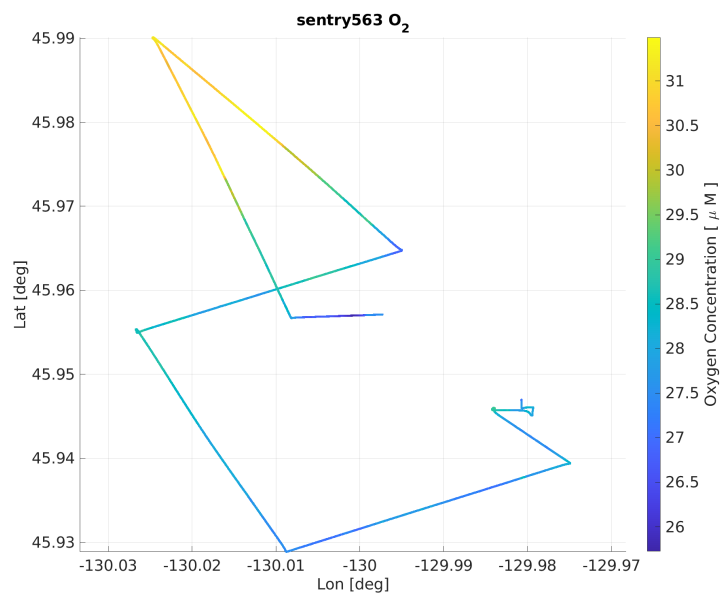


Figure 19: Navigated optode sensor data.

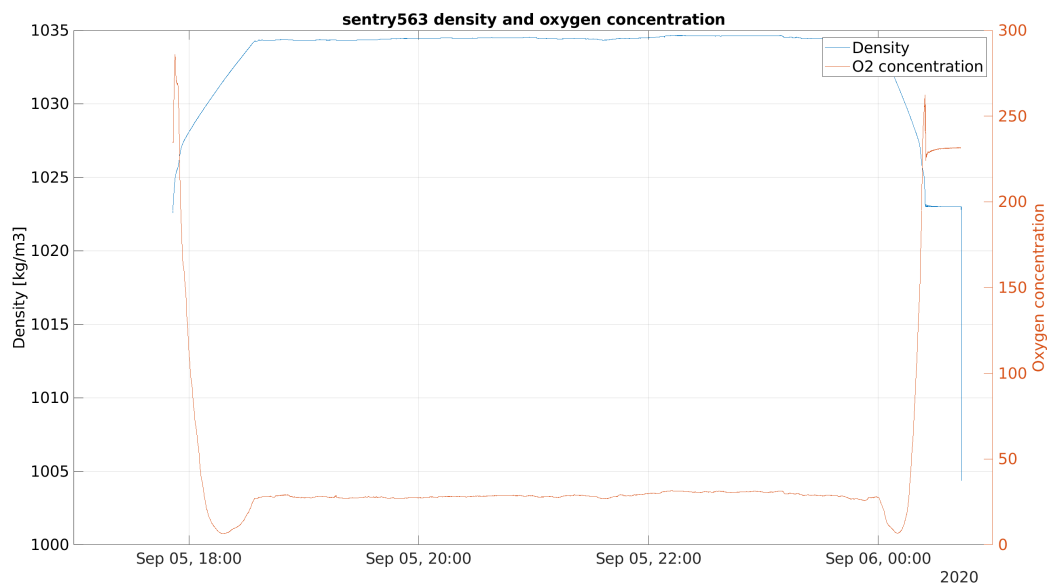
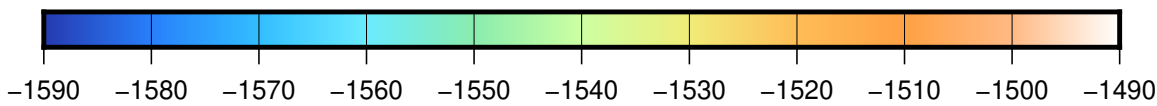
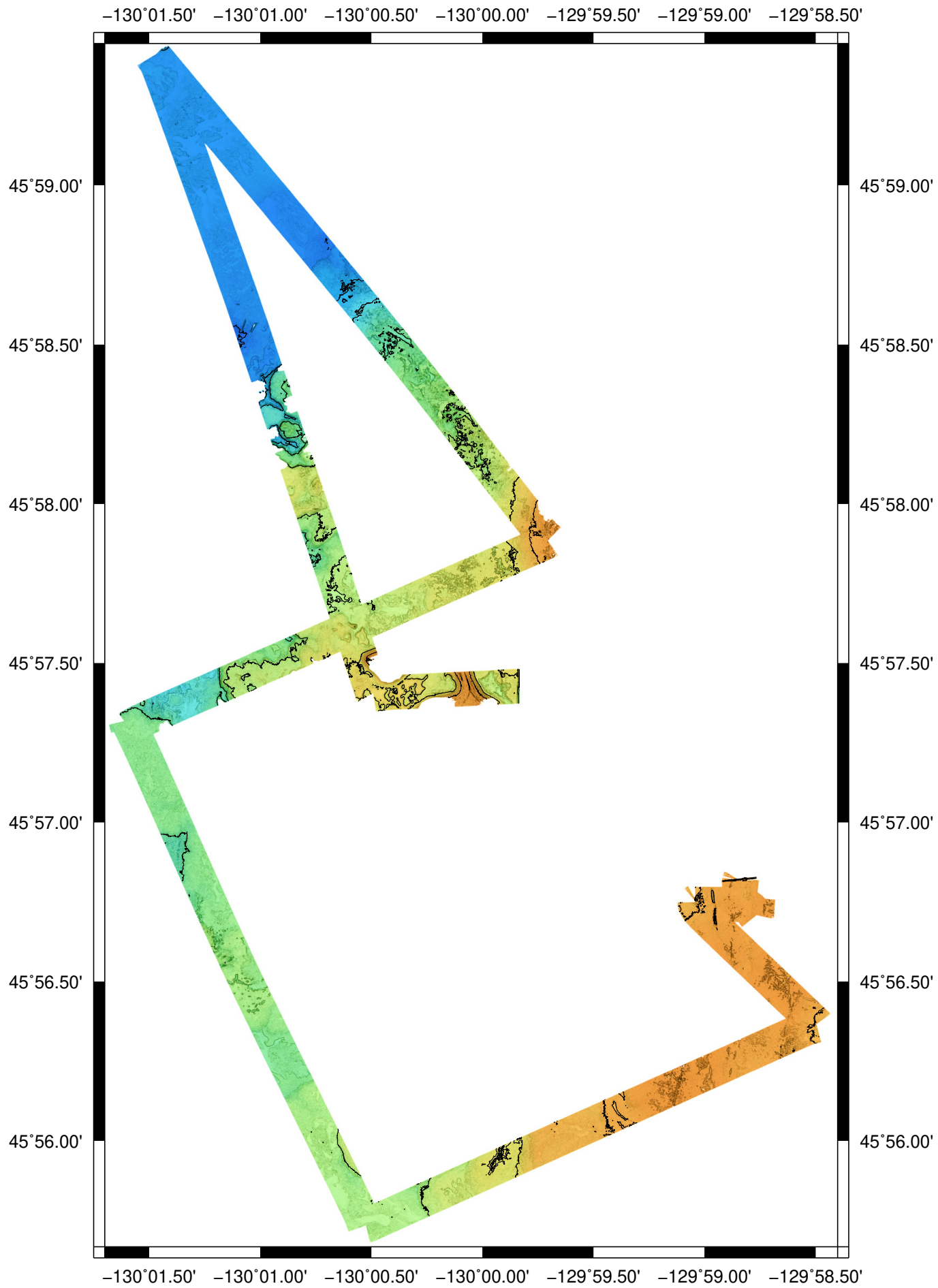


Figure 20: Density and O2 sensor data.



Sentry 564 Dive Report
DRAFT



Zac Berkowitz Justin Fujii Stefano Summan Amanda Sutherland Joe Garcia

Sentry Expedition Leader: Zac Berkowitz

Summary

Weather: Deployment: winds 2-5knts, seas 1-2ft Recovery: winds calm, seas less than 1ft

Reason for end of dive: End of mission time.

Important Positions

Dive Origin: 45 45.0000 -130 -12.0000

Launch Position: sentry564 launch position: 45 56.180'N 129 59.877'W

Vehicle Configuration

The science sensing suite for this dive was:

This dive was navigated using the DVL/INS system in real time. USBL provided post-dive corrections.

Narrative

Sentry564 is the third dive of TN383.

Sentry completed most of the remaining segments of the "inner" caldera multibeam survey over pressure benchmarks. Two longer radial excursions extended to the east and south. The dive proceeded without incident thanks to good coordination between the Jason and Sentry teams during close approaches.

The TRN data pod was active logging data for the dive.

Dive Statistics

0.3 sentry564 Summary

sentry564 Summary

Origin: 45.750000 -130.200000

Origin: 45 45.000'N 130 12.000'W

Launch: 2020/09/10 20:46:13

Survey start: 2020/09/10 21:32:38

Survey start: Lat:45.938069 Lon:-129.998450

Survey start: Lat:45 56.284'N Lon:129 59.907'W

Survey end: 2020/09/11 14:27:22

Survey end: Lat:45.938466 Lon:-129.982829

Survey end: Lat:45 56.308'N Lon:129 58.970'W

Ascent begins: 2020/09/11 14:27:22

On the surface: 2020/09/11 14:59:00

On deck: 2020/09/11 15:21:18

descent rate: 31.0 m/min

ascent rate: 45.7 m/min

survey time: 16.9 hours

deck-to-deck time 18.6 hours

Min survey depth: 1432m

Max survey depth: 1732m

Mean survey depth: 1513m

Mean survey height: 67m

distance travelled: 57.31km

average speed: 0.94m/s

average speed during photo runs: NaN m/s over 0.00 km

average speed during multibeam runs: 0.94 m/s over 57.31 km

total vertical during survey: 3371m

Battery energy at launch: 16.1 kwhr

Battery energy at survey start: 15.5 kwhr

Battery energy at survey end: 2.2 kwhr

Battery energy on surface: 2.0 kwhr

Battery energy on deck: 1.8 kwhr

UTC Time	Mission Time	Event	Notes
2020/09/10 20:46:13	+00:00:00.00	launch	launch
2020/09/10 21:24:22	+00:38:09.02	descent	end
2020/09/10 21:25:11	+00:38:57.60	onbottom	START
2020/09/10 21:37:24	+00:51:10.74	start	loop_1
2020/09/11 05:37:39	+08:51:25.64	end	loop_1
2020/09/11 05:37:39	+08:51:25.64	start	loop_2
2020/09/11 12:09:41	+15:23:28.21	end	loop_2
2020/09/11 12:09:41	+15:23:28.21	start	HoldingPattern
2020/09/11 14:34:28	+17:48:15.10	abort	
2020/09/11 14:59:00	+18:12:47.02	surface	surface
2020/09/11 15:21:18	+18:35:04.85	recovery	autogenerated

Table 2: Summary of events during dive sentry564

Sensor Information

This is a recently added section with selected sensor metadata. This section will be expanded in coming months. Additional data is available in the sentry564/nav-sci/proc directory within the sentry564_config matlab structure as well as in ascii text logs in sentry564/metadata. At present metadata is not yet automatically collected on all sensors.

0.4 sentry564 Devices

Instrument	Model	Serial Num.	Comments	Config File
USBL	Sonardyne AvTrak2	U00570D		avtrak_20200910.1825.cfg
DVL	RDI Navigator (300kHz)	727-2000-00J	CX: 1, WP: 0	dv1300_20200910.1825.cfg
CTD	SBE 49	222		sbe49_20200910.1826.cfg
SAIL	obs A/D	13	A: 5, G: 1.00, O: 0	a2d2-pods_20200910.1825.cfg
	orp A/D	14	A: 3, G: 1.00, O: 0.0024	

M

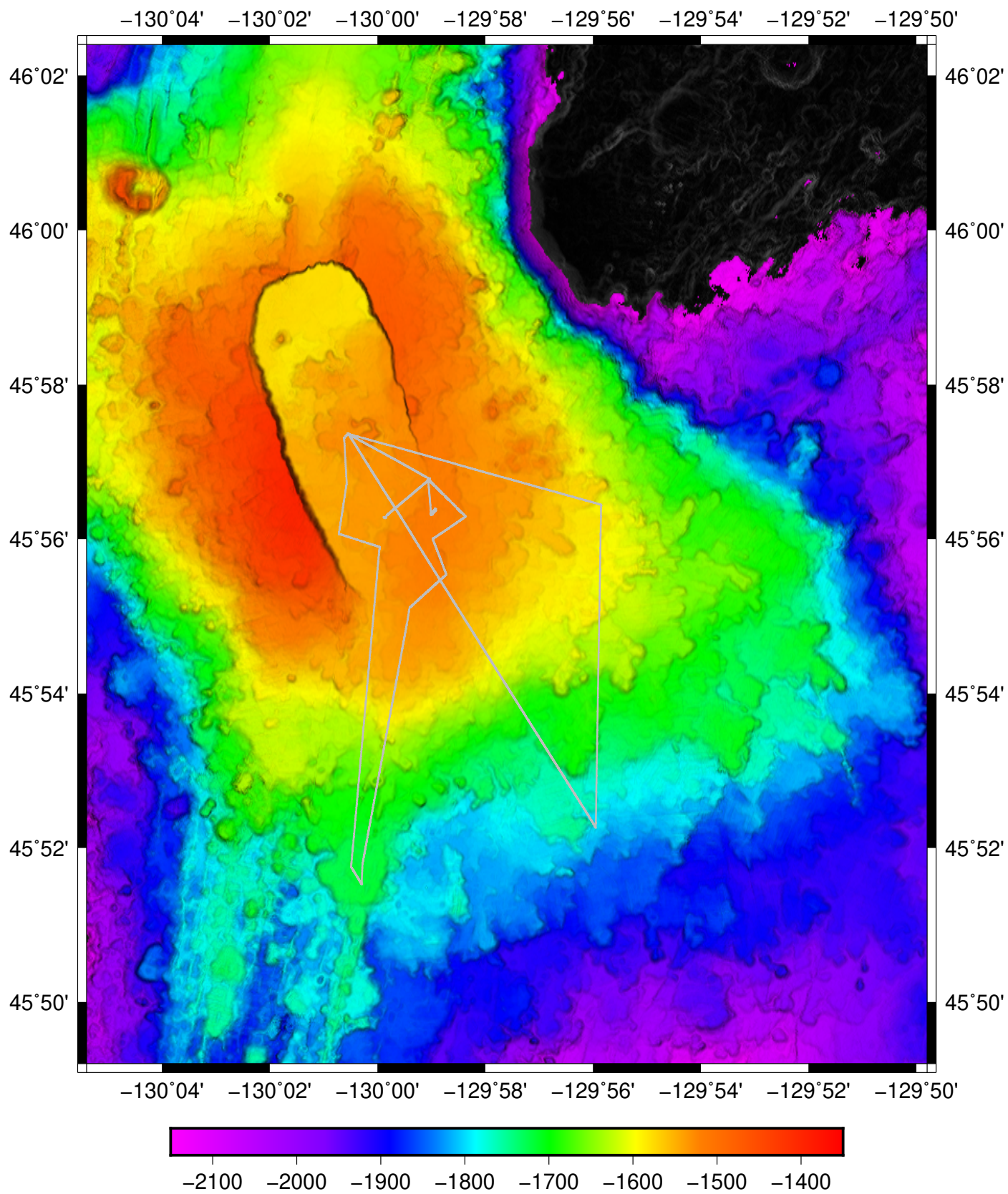
Special Data Processing Notes

None.

Plots and Images

This section contains selected images of data products and plots of vehicle navigation and selected sensors.

Sentry dive 564



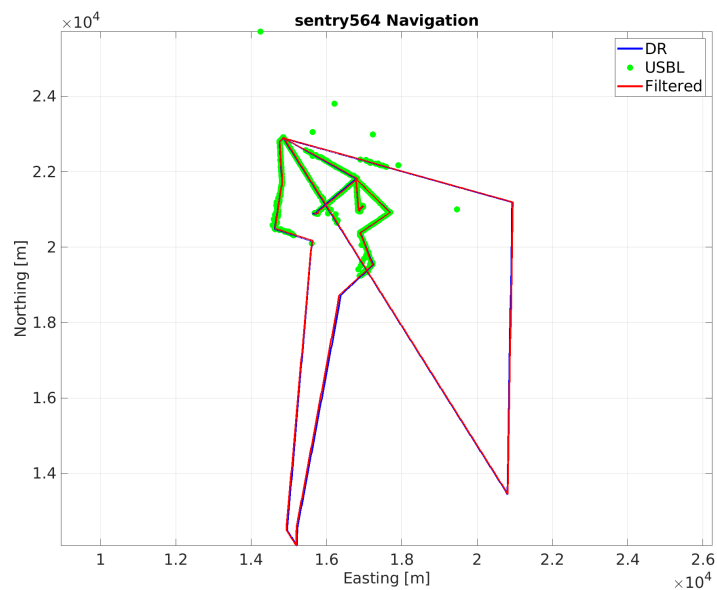


Figure 21: Latitude/Longitude plot of Sentry dive 564 based on post-processed navigation

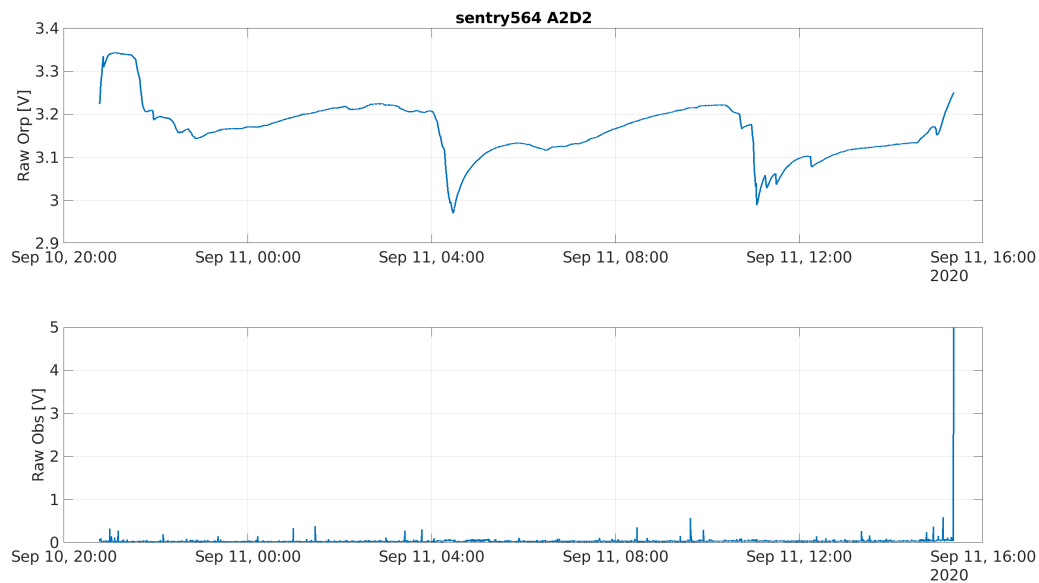


Figure 22: Raw analog Sensor Data

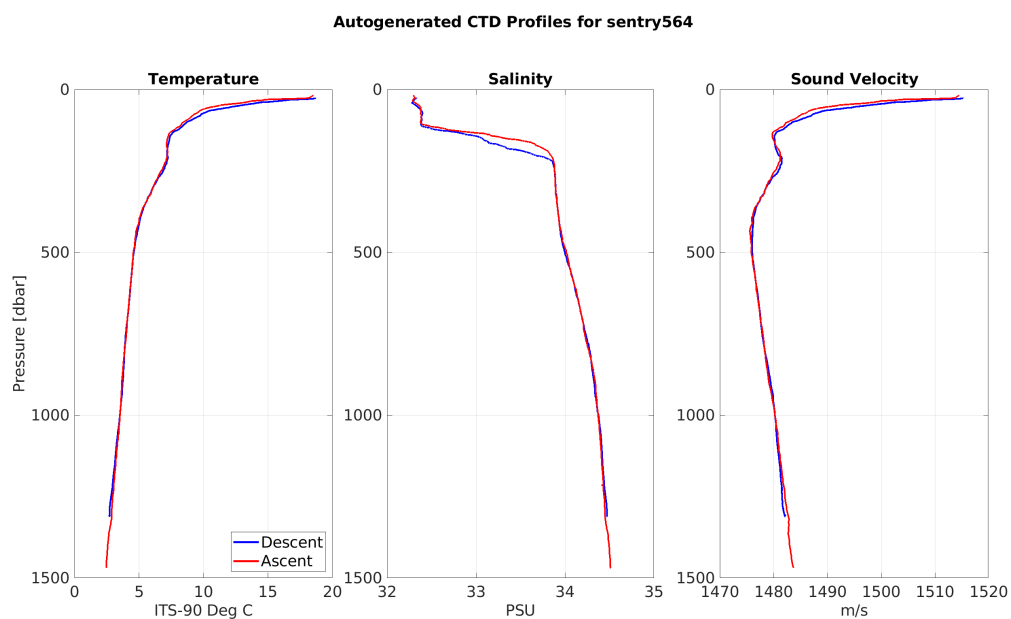


Figure 23: CTD profile sensor data

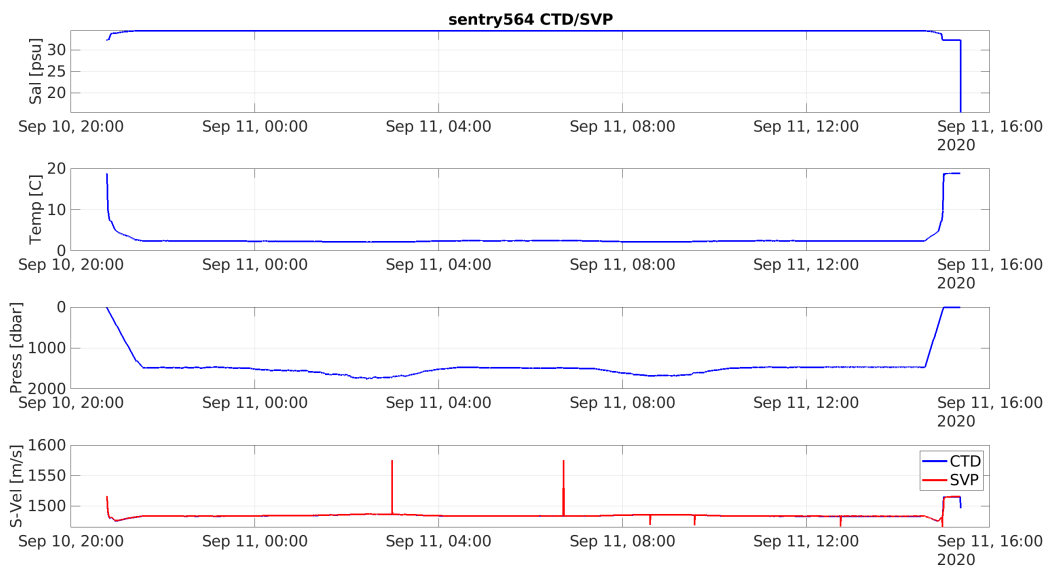


Figure 24: CTD and SVP sensor data

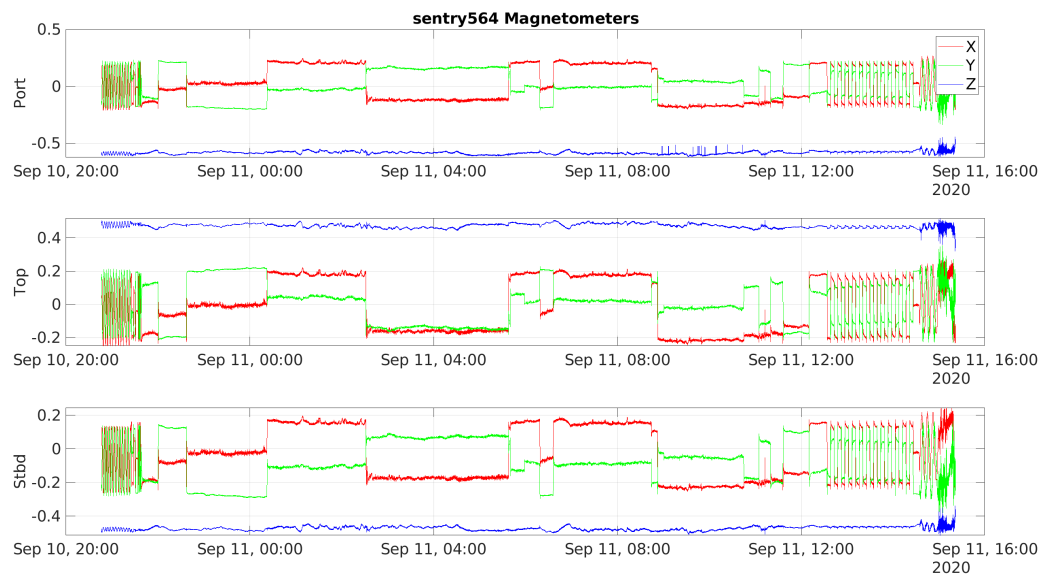


Figure 25: Magnetometer data from each of the three magnetometers on Sentry

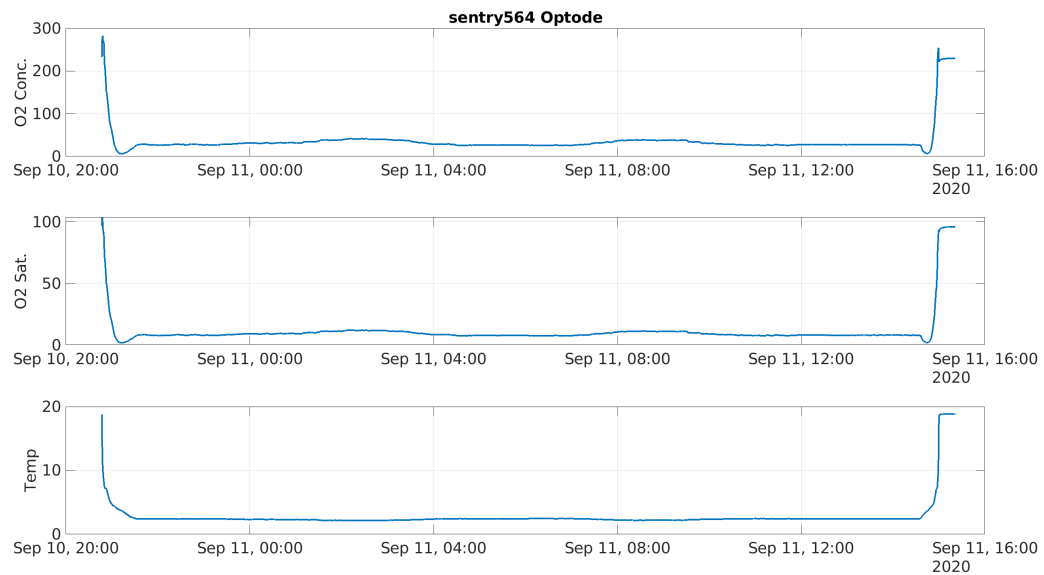


Figure 26: Optode temperature, O2 saturation, and concentration

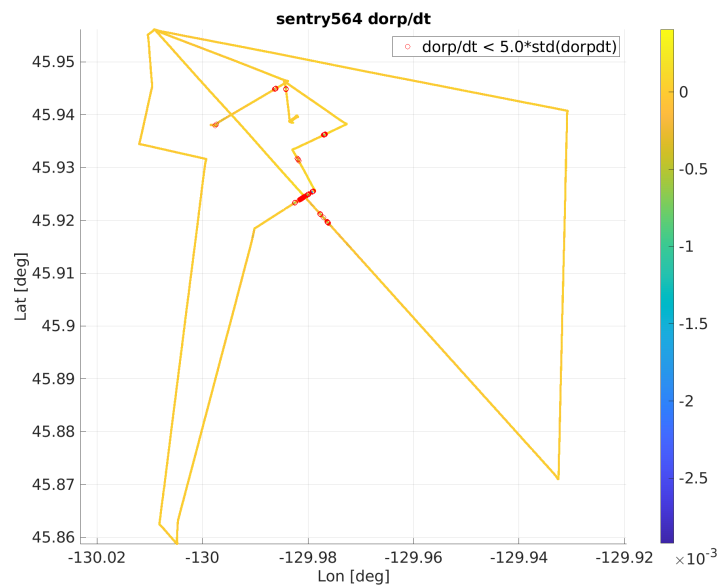


Figure 27: Navigated ORP sensor data.

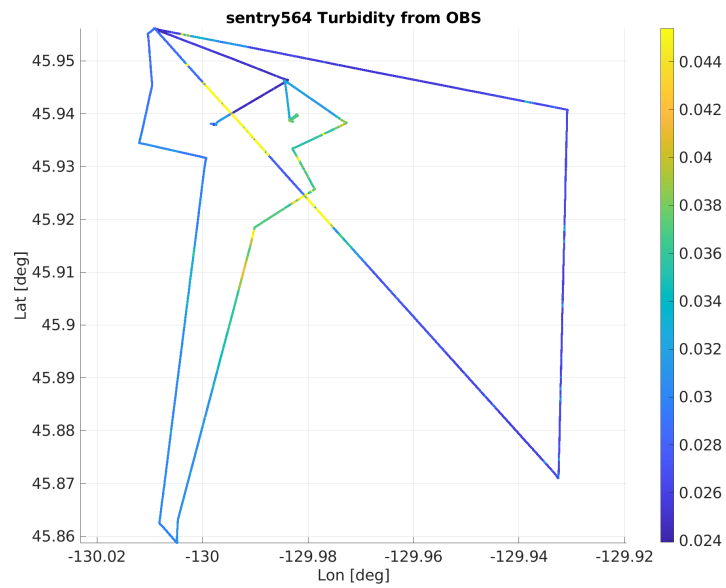


Figure 28: Navigated OBS sensor data.

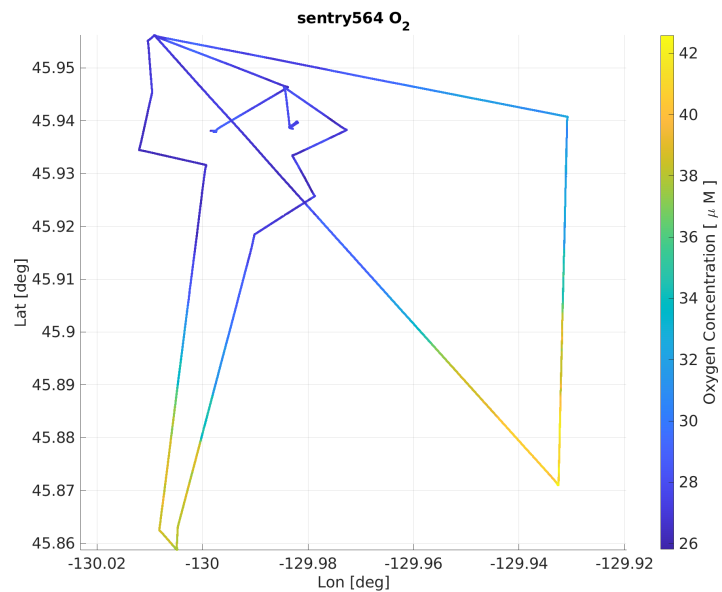


Figure 29: Navigated optode sensor data.

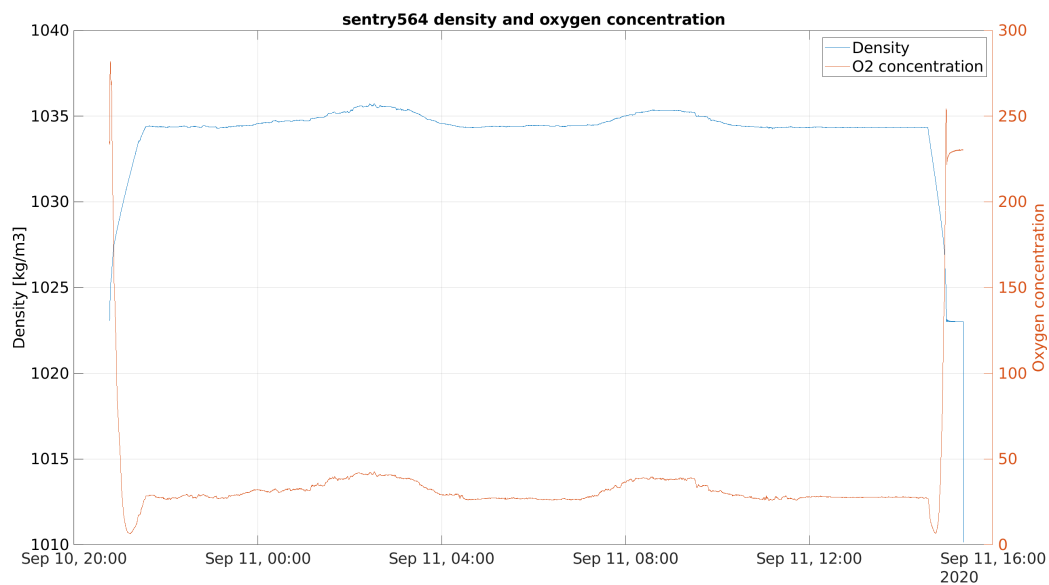
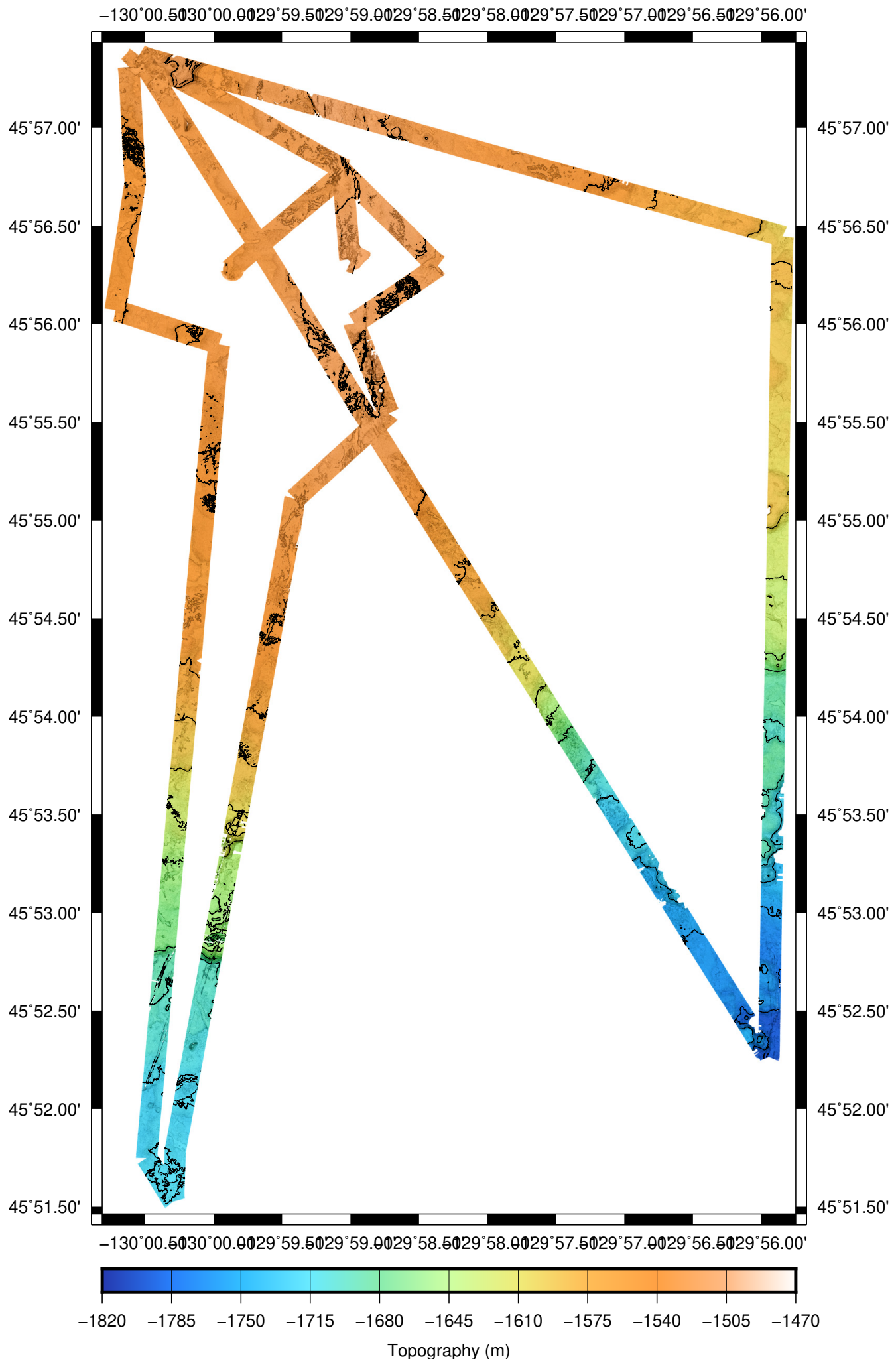


Figure 30: Density and O₂ sensor data.



Sentry 565 Dive Report
DRAFT



Zac Berkowitz Justin Fujii Stefano Summan Amanda Sutherland Joe Garcia

Sentry Expedition Leader: Zac Berkowitz

Summary

Weather: Deployment: winds 2-5knts, seas 1-2ft Recovery: winds calm, seas 1ft

Reason for end of dive: End of mission time.

Important Positions

Dive Origin: 45 45.0000 -130 -12.0000

Launch Position: sentry565 launch position: 45 52.073'N 130 0.243'W

Vehicle Configuration

The science sensing suite for this dive was:

This dive was navigated using the DVL/INS system in real time. USBL provided post-dive corrections.

Narrative

Sentry565 is the fourth dive of TN383.

Sentry completed the remaining segments of the "middle" caldera multibeam survey.

The dive proceeded without incident thanks to good coordination between the Jason and Sentry teams during close approaches.

The TRN data pod was active logging data for the dive with an acoustic communication queue active for in-progress monitoring when within range of the ship.

Dive Statistics

0.5 sentry565 Summary

sentry565 Summary

Origin: 45.750000 -130.200000

Origin: 45 45.000'N 130 12.000'W

Launch: 2020/09/12 04:21:00

Survey start: 2020/09/12 05:14:46

Survey start: Lat:45.865262 Lon:-130.002443

Survey start: Lat:45 51.916'N Lon:130 0.147'W

Survey end: 2020/09/12 21:07:07

Survey end: Lat:45.941748 Lon:-129.986635

Survey end: Lat:45 56.505'N Lon:129 59.198'W

Ascent begins: 2020/09/12 21:07:07

On the surface: 2020/09/12 21:31:47

On deck: 2020/09/12 21:48:15

descent rate: 30.7 m/min

ascent rate: 58.9 m/min

survey time: 15.9 hours

deck-to-deck time 17.5 hours

Min survey depth: 1331m

Max survey depth: 1754m

Mean survey depth: 1501m

Mean survey height: 68m

distance travelled: 56.34km

average speed: 0.98m/s

average speed during photo runs: NaN m/s over 0.00 km

average speed during multibeam runs: 0.98 m/s over 56.34 km

total vertical during survey: 4137m

Battery energy at launch: 16.5 kwhr

Battery energy at survey start: 15.9 kwhr

Battery energy at survey end: 2.7 kwhr

Battery energy on surface: 2.6 kwhr

Battery energy on deck: 2.5 kwhr

UTC Time	Mission Time	Event	Notes
2020/09/12 04:21:00	+00:00:00.00	launch	launch
2020/09/12 05:05:23	+00:44:23.53	descent	end
2020/09/12 05:06:12	+00:45:12.13	onbottom	START
2020/09/12 05:26:18	+01:05:18.19	start	loop_1
2020/09/12 09:25:36	+05:04:36.07	end	loop_1
2020/09/12 09:25:36	+05:04:36.07	start	loop_2
2020/09/12 17:01:10	+12:40:09.64	end	loop_2
2020/09/12 17:01:10	+12:40:09.64	start	loop_3
2020/09/12 19:46:35	+15:25:35.14	end	loop_3
2020/09/12 19:46:35	+15:25:35.14	start	HoldingPattern
2020/09/12 21:07:07	+16:46:06.87	abort	
2020/09/12 21:31:47	+17:10:46.60	surface	surface
2020/09/12 21:48:15	+17:27:14.61	recovery	autogenerated

Table 3: Summary of events during dive sentry565

Sensor Information

This is a recently added section with selected sensor metadata. This section will be expanded in coming months. Additional data is available in the sentry565/nav-sci/proc directory within the sentry565_config matlab structure as well as in ascii text logs in sentry565/metadata. At present metadata is not yet automatically collected on all sensors.

0.6 sentry565 Devices

Instrument	Model	Serial Num.	Comments	Config File
USBL	Sonardyne AvTrak2	U00570D		avtrak_20200912_0256.cfg
DVL	RDI Navigator (300kHz)	727-2000-00J	CX: 1, WP: 0	dv1300_20200912_0257.cfg
CTD	SBE 49	222		sbe49_20200912_0257.cfg
SAIL	obs A/D	13	A: 5, G: 1.00, O: 0	a2d2-pods_20200912_0257.cfg
	orp A/D	14	A: 3, G: 1.00, O: 0.0024	

M

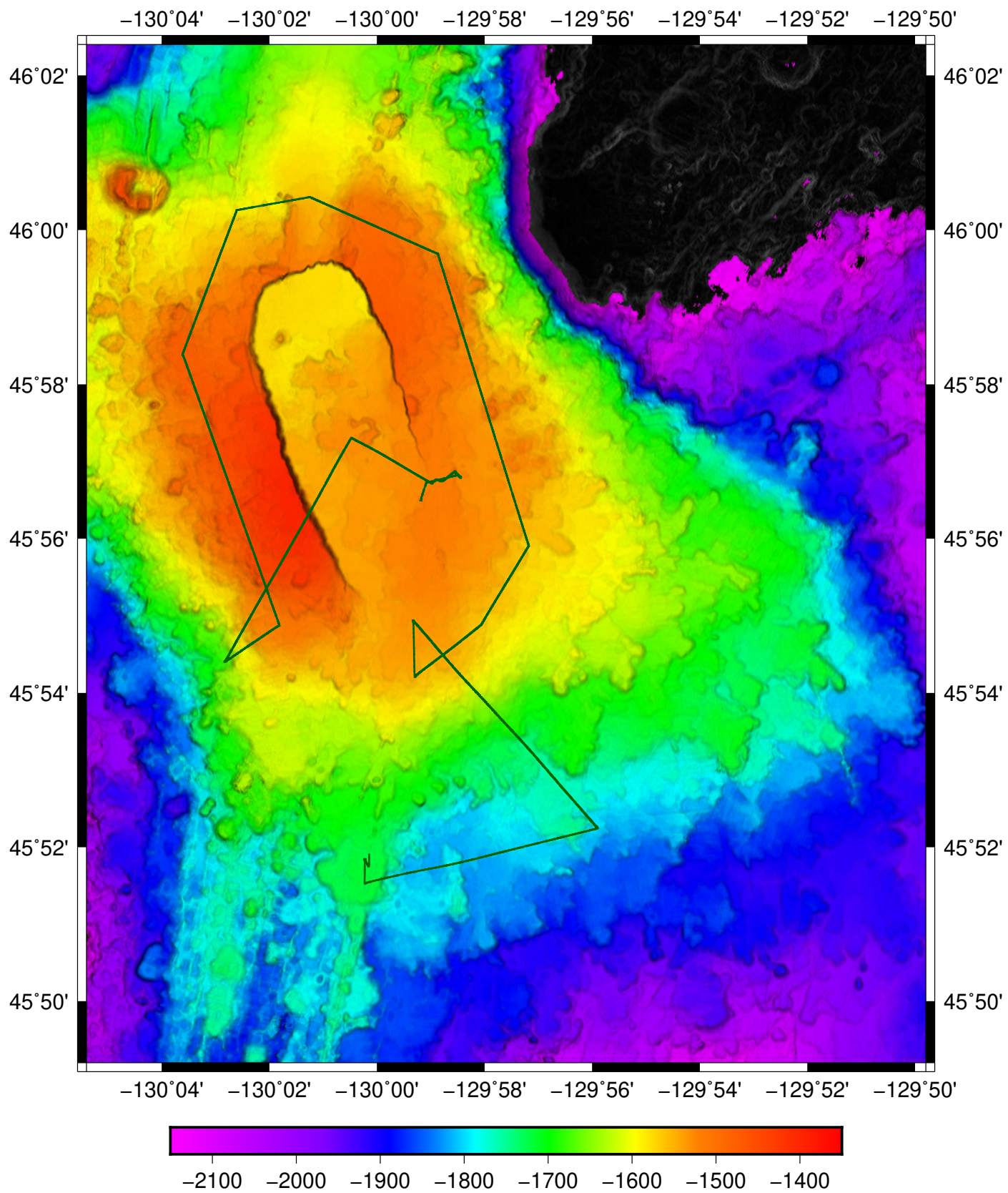
Special Data Processing Notes

None.

Plots and Images

This section contains selected images of data products and plots of vehicle navigation and selected sensors.

Sentry dive 565



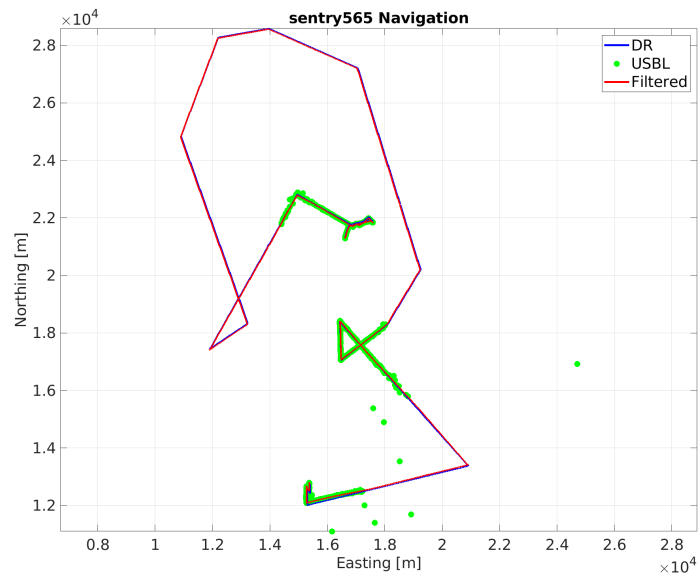


Figure 31: Latitude/Longitude plot of Sentry dive 565 based on post-processed navigation

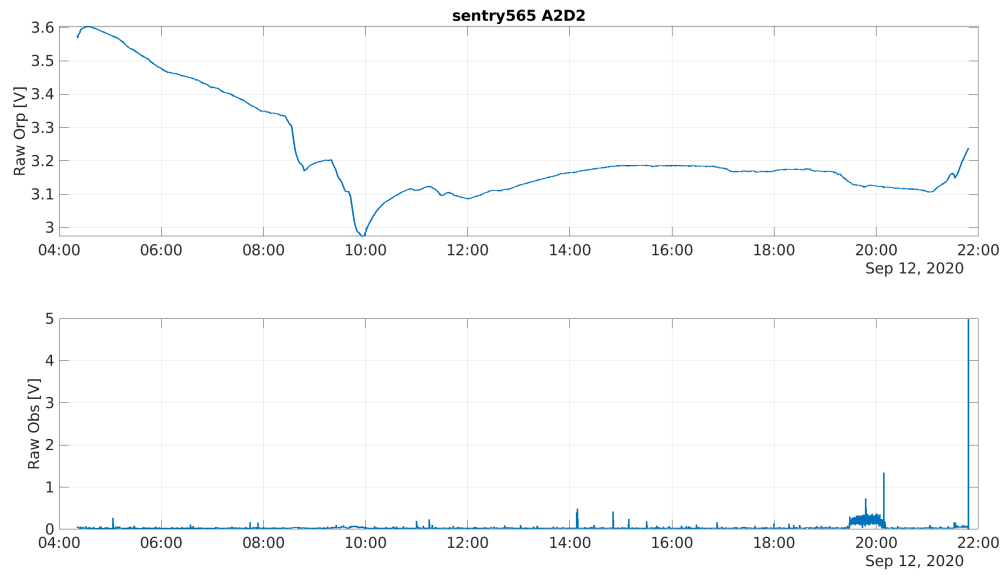


Figure 32: Raw analog Sensor Data

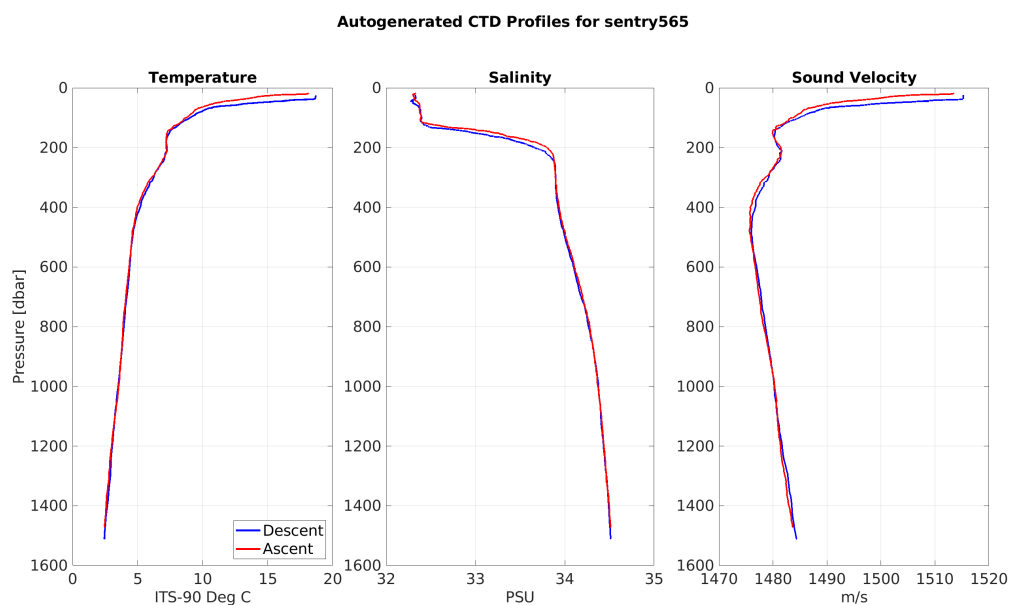


Figure 33: CTD profile sensor data

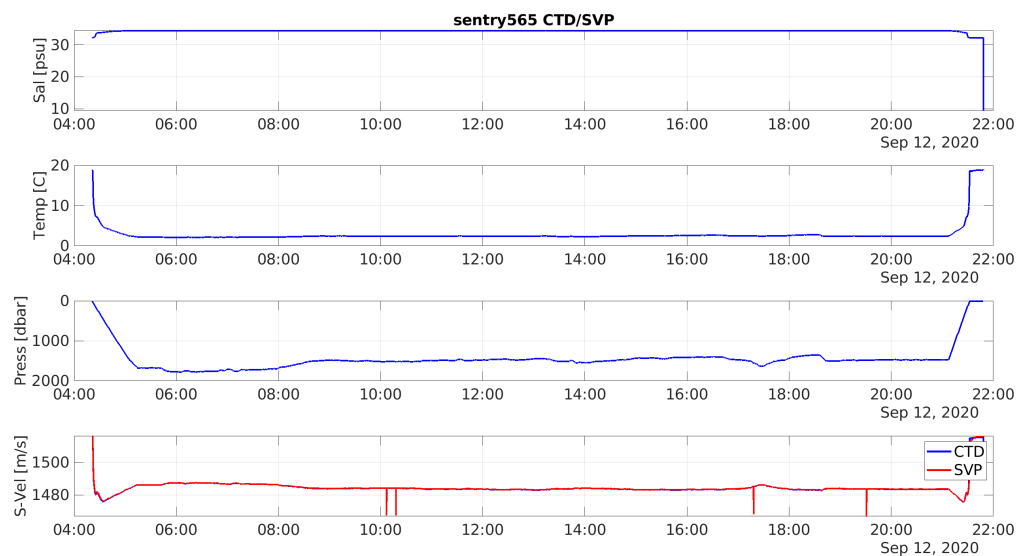


Figure 34: CTD and SVP sensor data

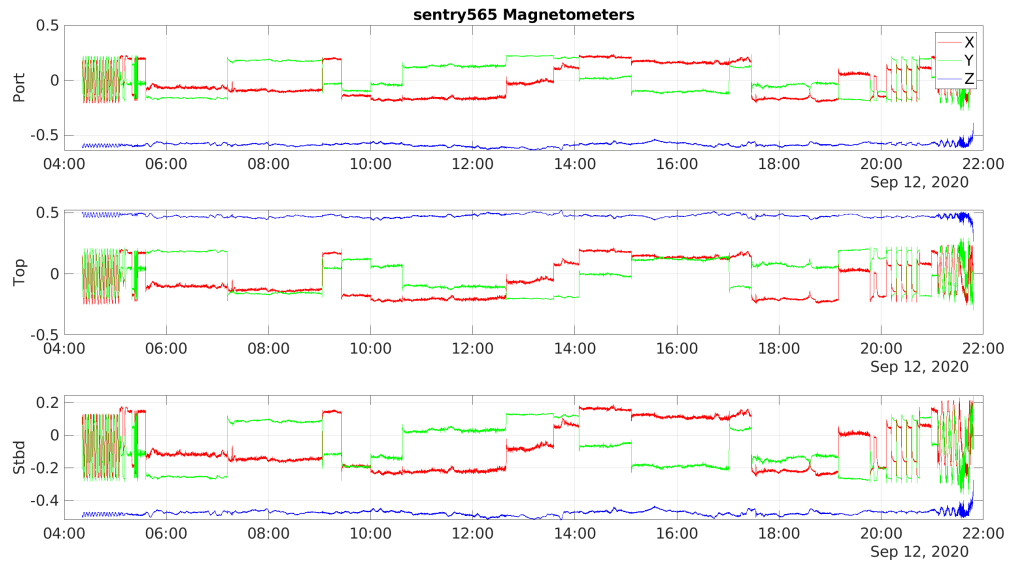


Figure 35: Magnetometer data from each of the three magnetometers on Sentry

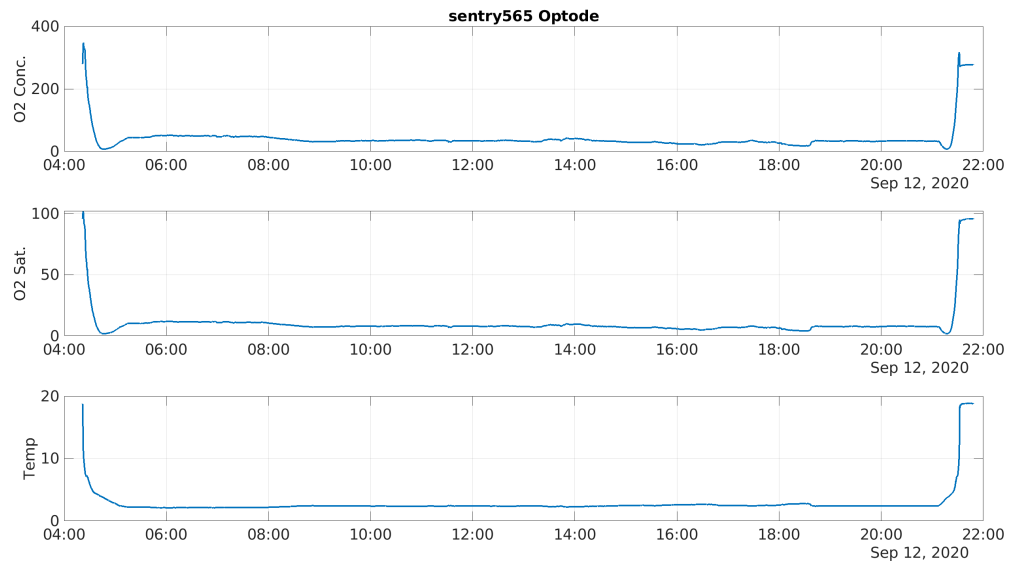


Figure 36: Optode temperature, O2 saturation, and concentration

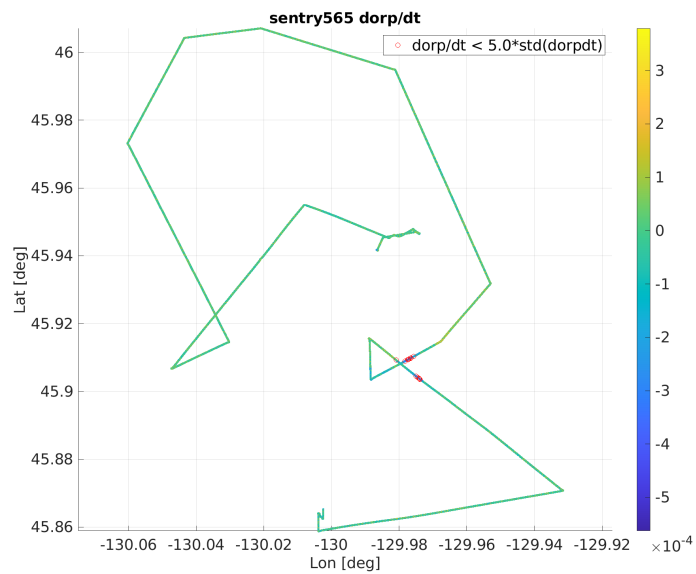


Figure 37: Navigated ORP sensor data.

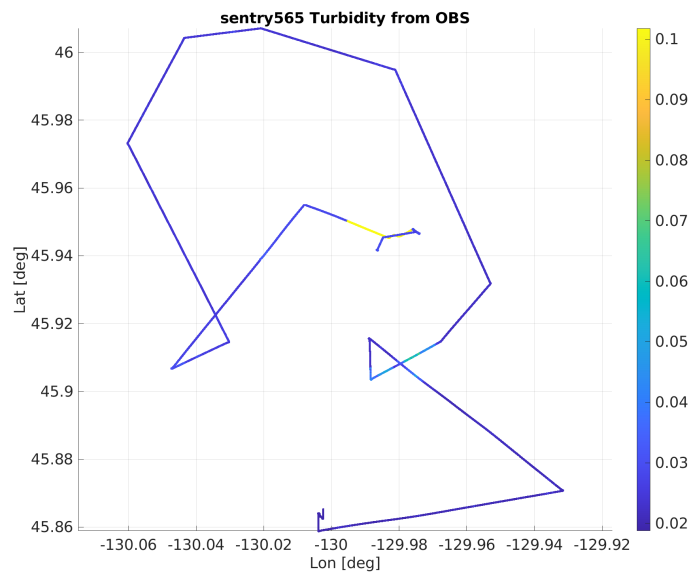


Figure 38: Navigated OBS sensor data.

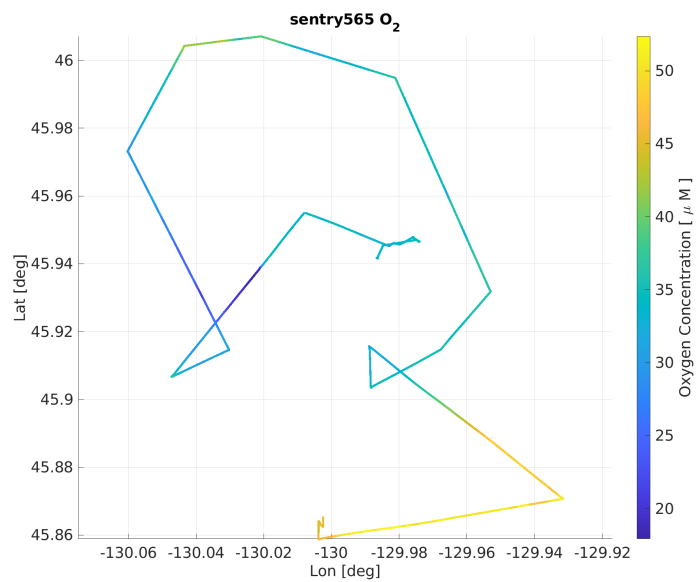


Figure 39: Navigated optode sensor data.

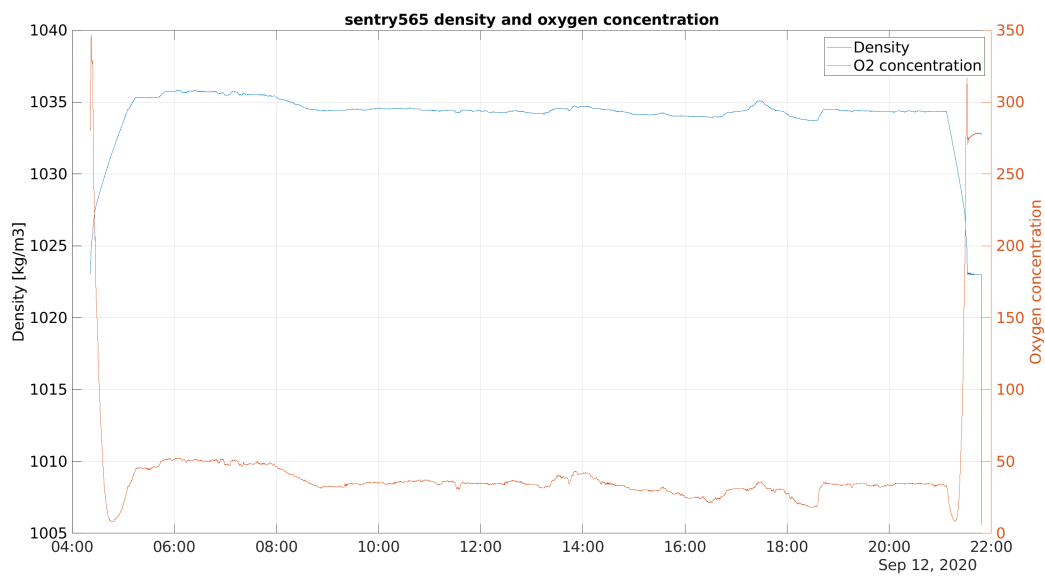
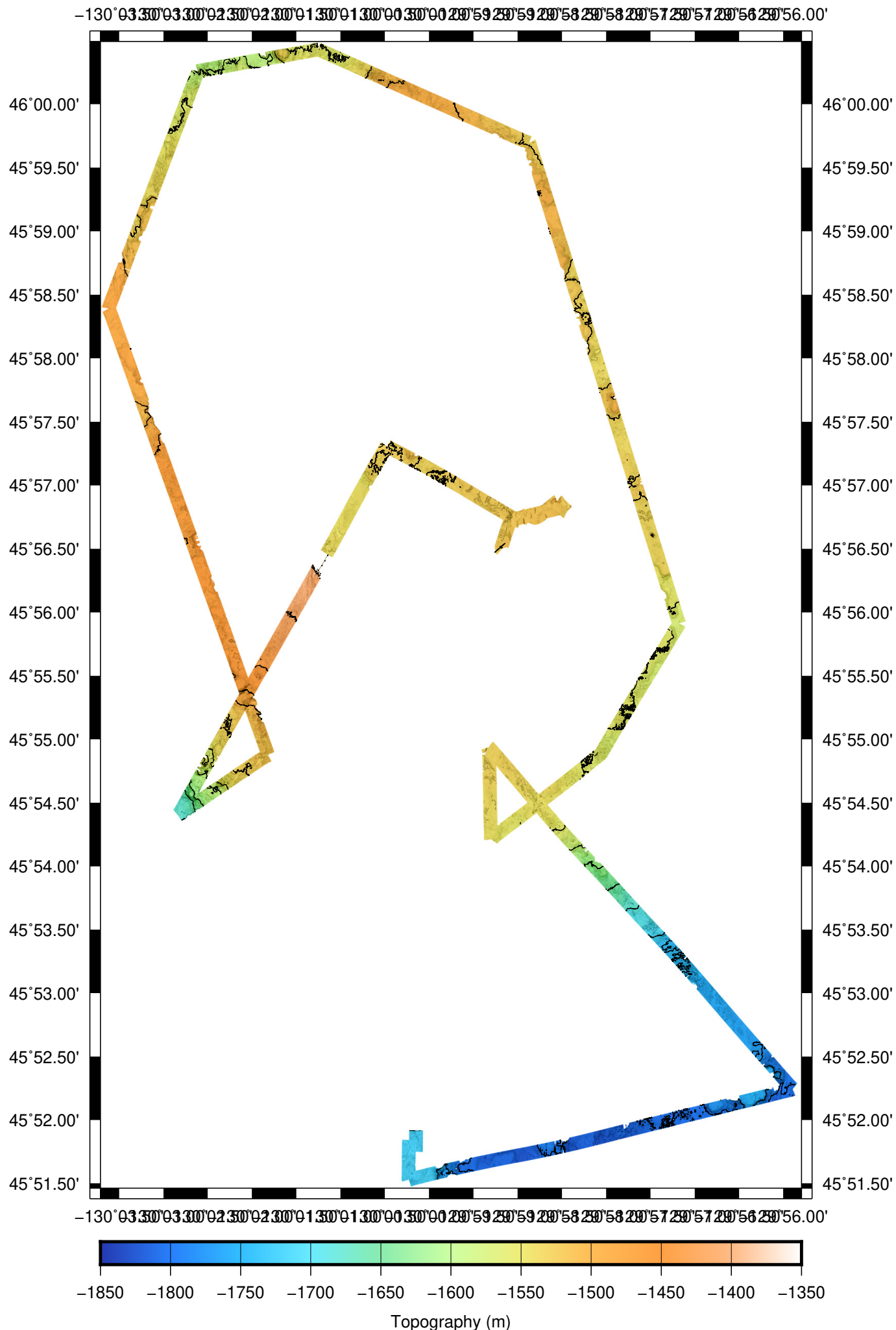


Figure 40: Density and O2 sensor data.



Sentry 566 Dive Report
DRAFT



Zac Berkowitz Justin Fujii Stefano Summan Amanda Sutherland Joe Garcia

Sentry Expedition Leader: Zac Berkowitz

Summary

Weather: Deployment: winds 2-5knts, seas 1-2ft Recovery: winds 1-3knts, seas 1ft

Reason for end of dive: End of mission time.

Important Positions

Dive Origin: 45 45.0000 -130 -12.0000

Launch Position: sentry566 launch position: 45 52.558'N 129 59.817'W

Vehicle Configuration

The science sensing suite for this dive was:

This dive was navigated using the DVL/INS system in real time. USBL provided post-dive corrections.

Narrative

Sentry566 is the fourth dive of TN383.

Sentry completed most of the remaining segments of the "outter loop" for the Axial multibeam survey.

The dive proceeded without incident thanks to good coordination between the Jason and Sentry teams during close approaches. Sentry spent the majority of the dive out of range for USBL tracking and acoustic communication. The waveglider provided limited communication.

The TRN data pod was active logging data for the dive with an acoustic communication queue active for in-progress monitoring when within range of the ship.

Dive Statistics

0.7 sentry566 Summary

sentry566 Summary

Origin: 45.750000 -130.200000

Origin: 45 45.000'N 130 12.000'W

Launch: 2020/09/13 13:41:37

Survey start: 2020/09/13 14:33:44

Survey start: Lat:45.876576 Lon:-129.997326

Survey start: Lat:45 52.595'N Lon:129 59.840'W

Survey end: 2020/09/14 03:07:37

Survey end: Lat:45.919317 Lon:-129.995973

Survey end: Lat:45 55.159'N Lon:129 59.758'W

Ascent begins: 2020/09/14 03:07:37

On the surface: 2020/09/14 03:32:35

On deck: 2020/09/14 03:46:24

descent rate: 30.9 m/min

ascent rate: 58.8 m/min

survey time: 12.6 hours

deck-to-deck time 14.1 hours

Min survey depth: 1396m

Max survey depth: 1659m

Mean survey depth: 1528m

Mean survey height: 67m

distance travelled: 44.47km

average speed: 0.98m/s

average speed during photo runs: NaN m/s over 0.00 km

average speed during multibeam runs: 0.98 m/s over 44.47 km

total vertical during survey: 3214m

Battery energy at launch: 16.4 kwhr

Battery energy at survey start: 15.8 kwhr

Battery energy at survey end: 6.2 kwhr

Battery energy on surface: 6.2 kwhr

Battery energy on deck: 6.0 kwhr

UTC Time	Mission Time	Event	Notes
2020/09/13 13:41:36	+00:00:00.00	launch	launch
2020/09/13 14:25:01	+00:43:24.25	descent	end
2020/09/13 14:25:49	+00:44:12.65	onbottom	START
2020/09/13 14:43:25	+01:01:48.14	start	loop_1
2020/09/13 15:17:13	+01:35:36.55	end	loop_1
2020/09/13 15:17:13	+01:35:36.55	start	loop_2
2020/09/14 02:15:14	+12:33:37.25	end	loop_2
2020/09/14 02:15:14	+12:33:37.25	start	HoldingPattern
2020/09/14 03:07:36	+13:26:00.00	abort	
2020/09/14 03:32:34	+13:50:58.09	surface	surface
2020/09/14 03:46:24	+14:04:47.14	recovery	autogenerated

Table 4: Summary of events during dive sentry566

Sensor Information

This is a recently added section with selected sensor metadata. This section will be expanded in coming months. Additional data is available in the sentry566/nav-sci/proc directory within the sentry566_config matlab structure as well as in ascii text logs in sentry566/metadata. At present metadata is not yet automatically collected on all sensors.

0.8 sentry566 Devices

Instrument	Model	Serial Num.	Comments	Config File
USBL	Sonardyne AvTrak2	U00570D		avtrak_20200913_1159.cfg
DVL	RDI Navigator (300kHz)	727-2000-00J	CX: 1, WP: 0	dv1300_20200913_1159.cfg
CTD	SBE 49	222		sbe49_20200913_1200.cfg
SAIL	obs A/D	13	A: 5, G: 1.00, O: 0	a2d2-pods_20200913_1159.cfg
	orp A/D	14	A: 3, G: 1.00, O: 0.0024	

M

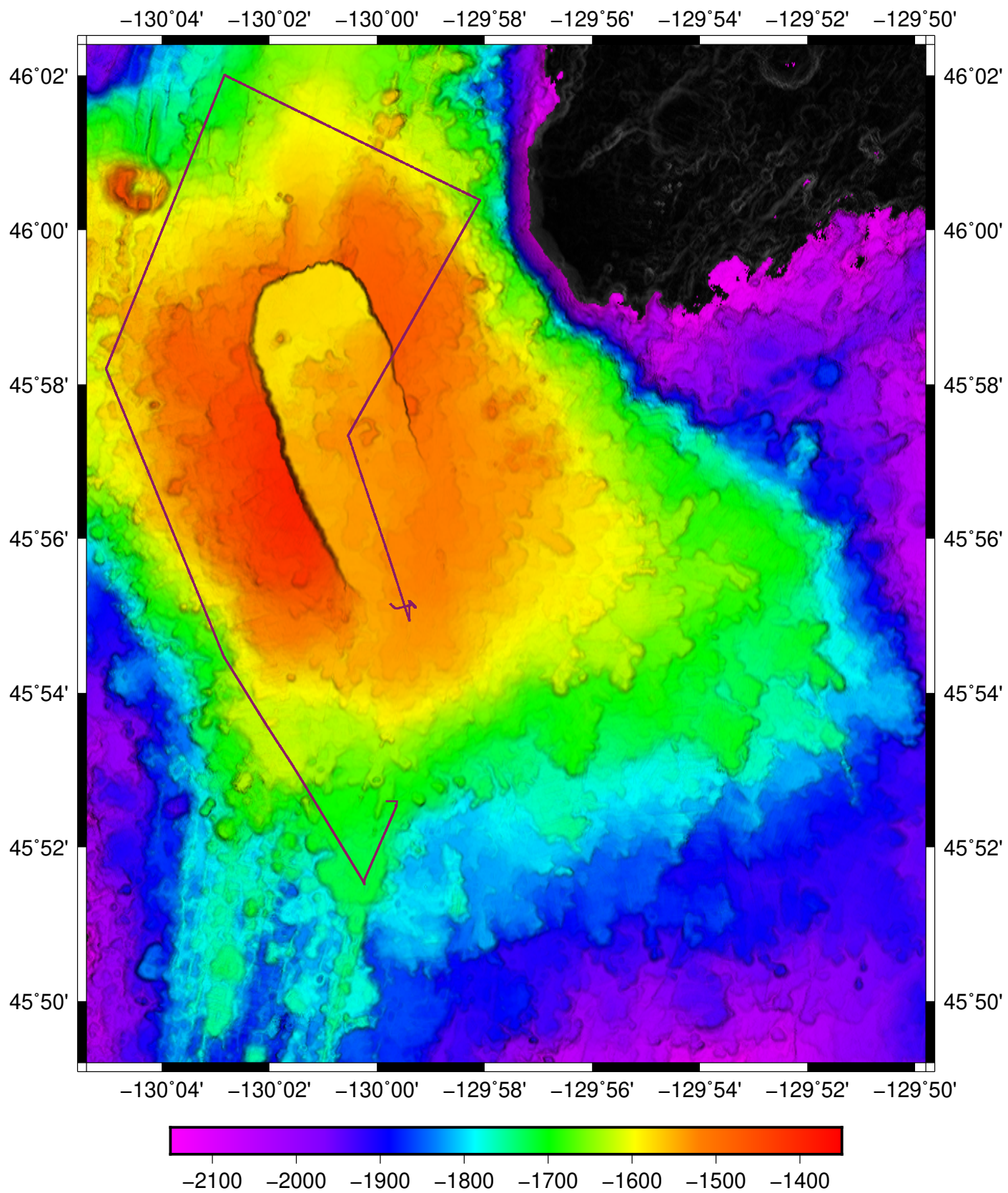
Special Data Processing Notes

None.

Plots and Images

This section contains selected images of data products and plots of vehicle navigation and selected sensors.

Sentry dive 566



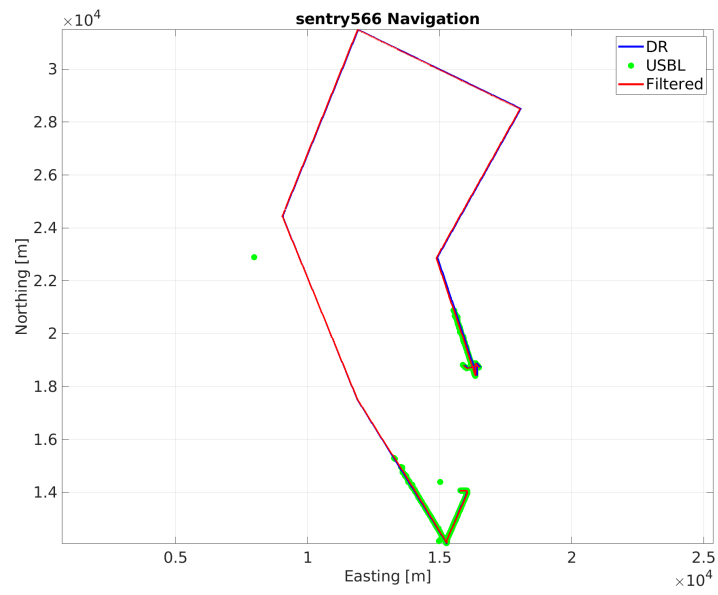


Figure 41: Latitude/Longitude plot of Sentry dive 566 based on post-processed navigation

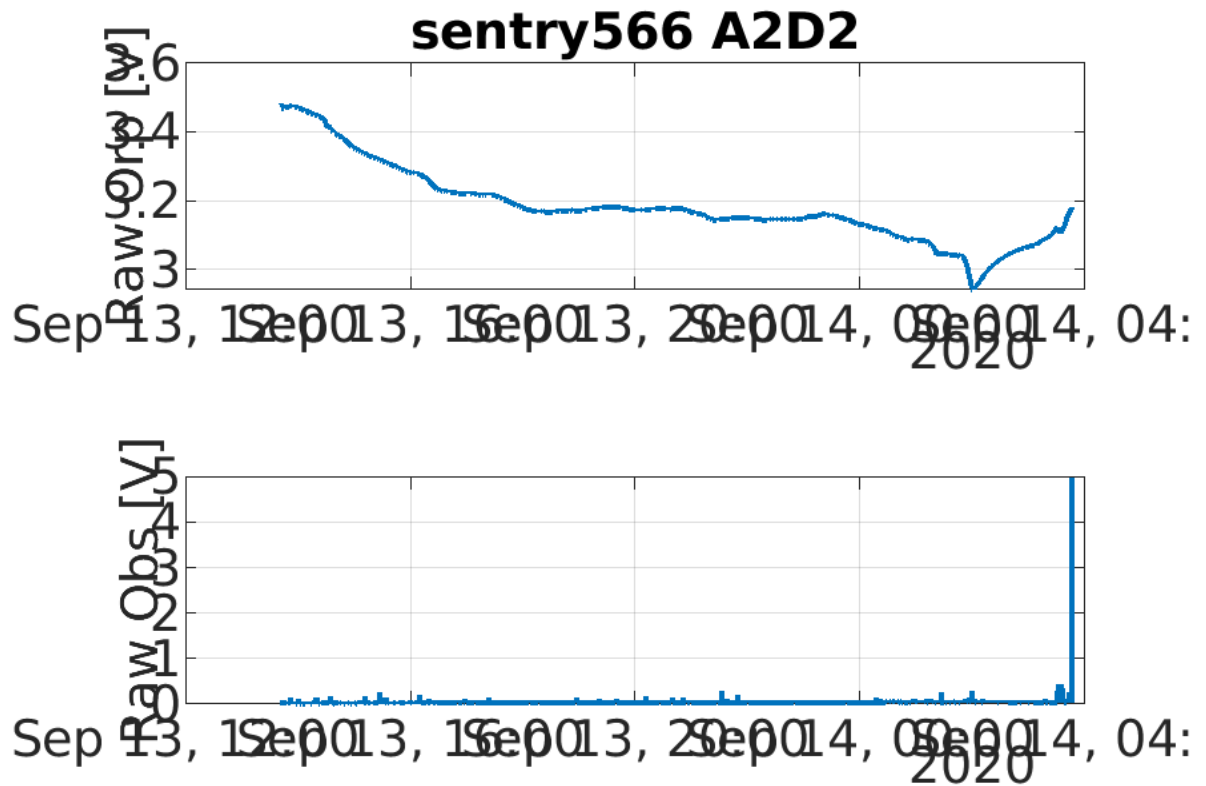


Figure 42: Raw analog Sensor Data

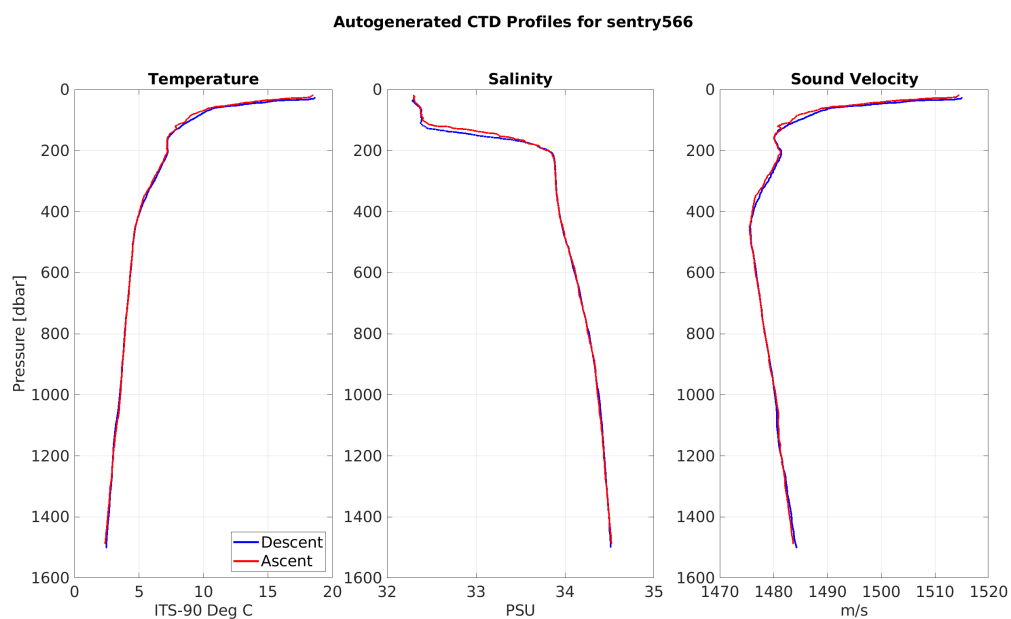


Figure 43: CTD profile sensor data

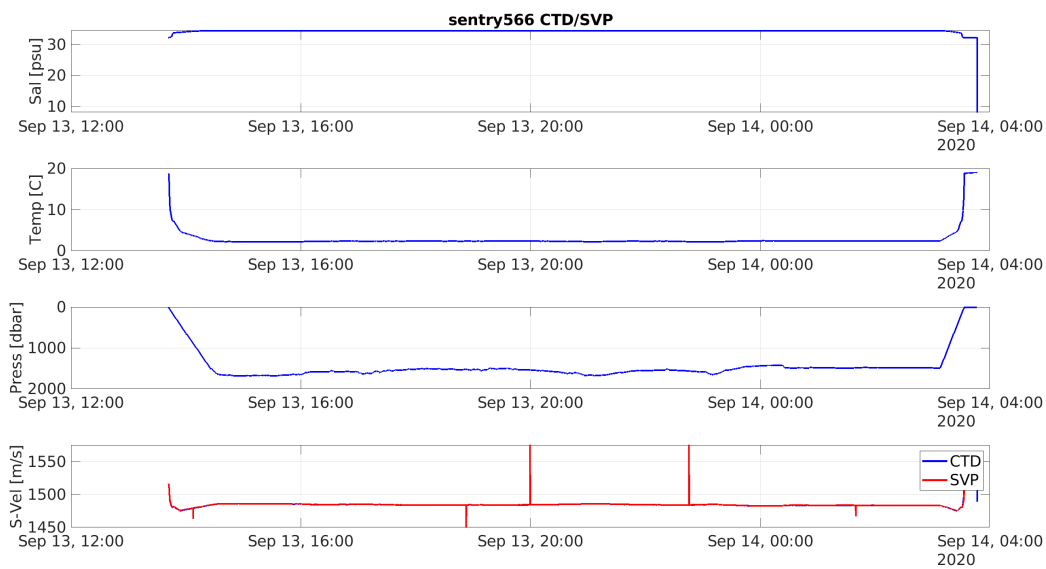


Figure 44: CTD and SVP sensor data

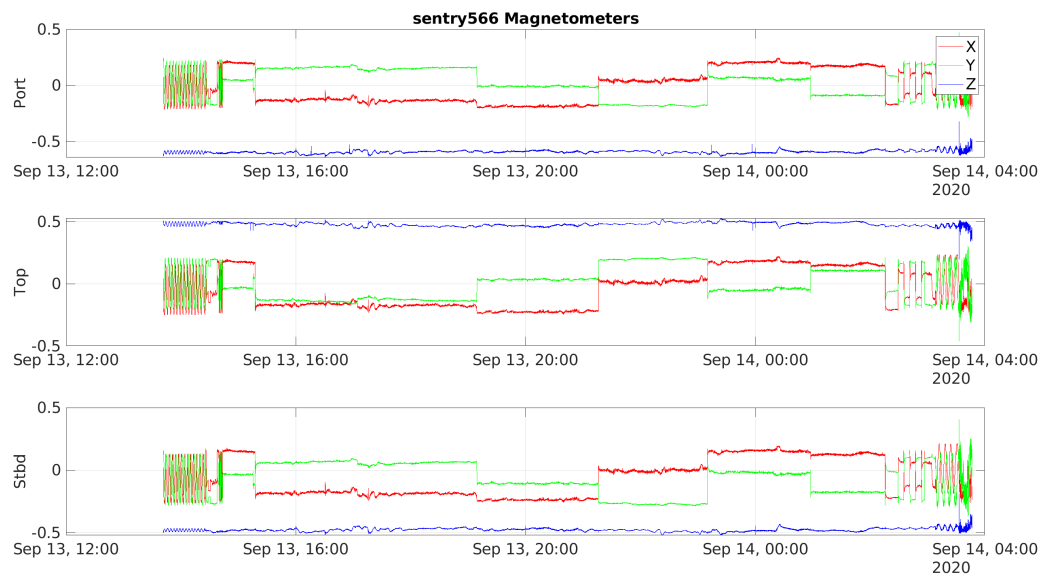


Figure 45: Magnetometer data from each of the three magnetometers on Sentry

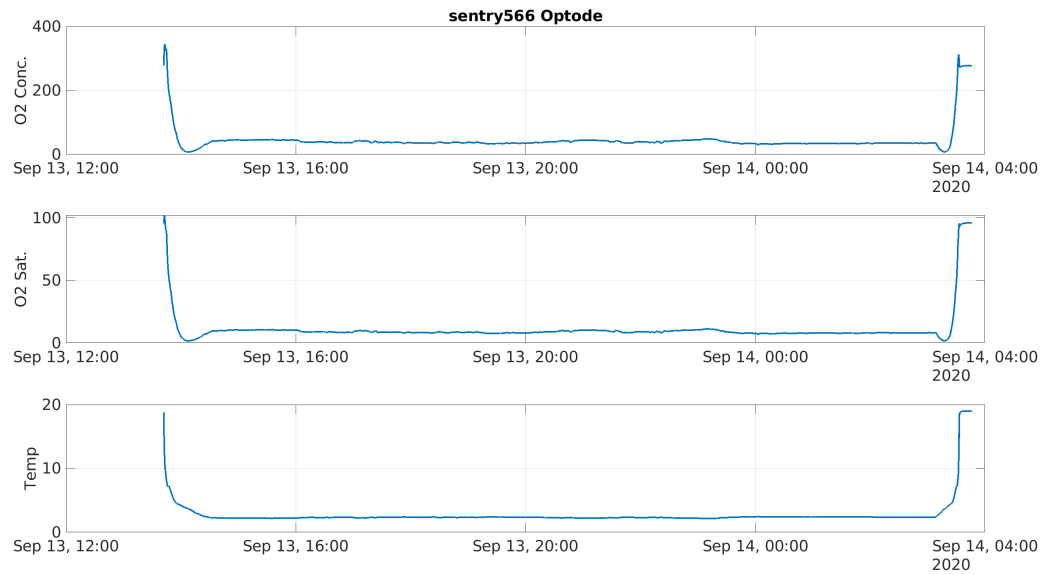


Figure 46: Optode temperature, O2 saturation, and concentration

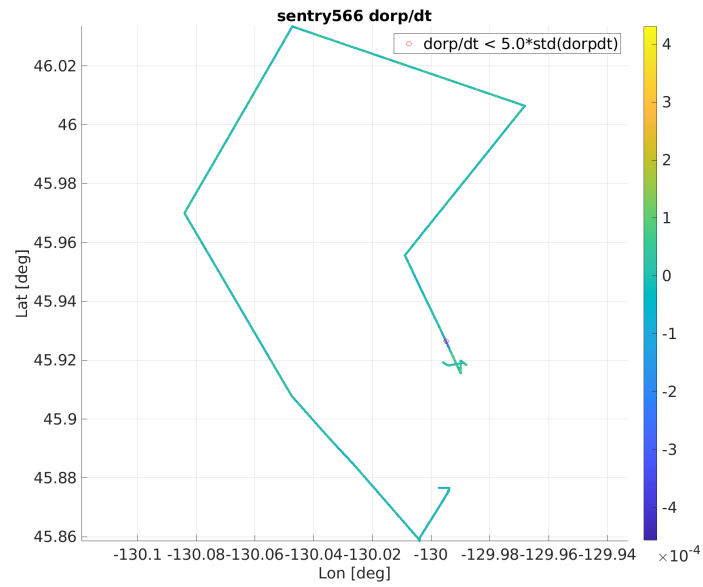


Figure 47: Navigated ORP sensor data.

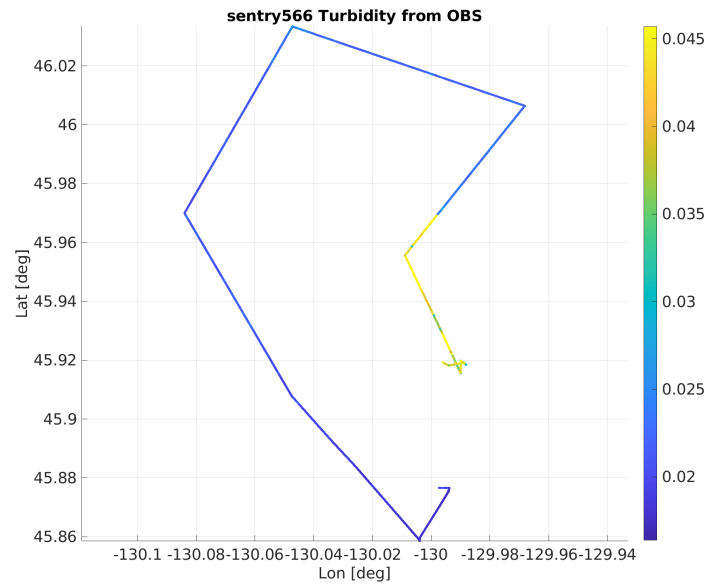


Figure 48: Navigated OBS sensor data.

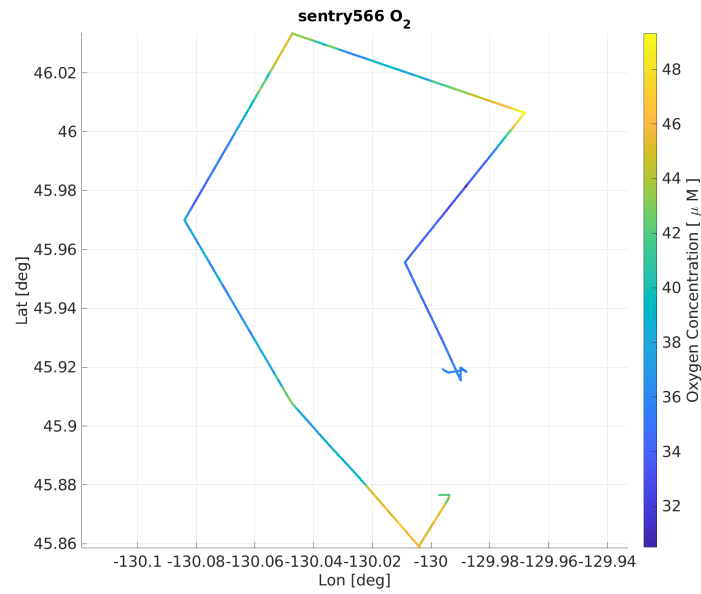


Figure 49: Navigated optode sensor data.

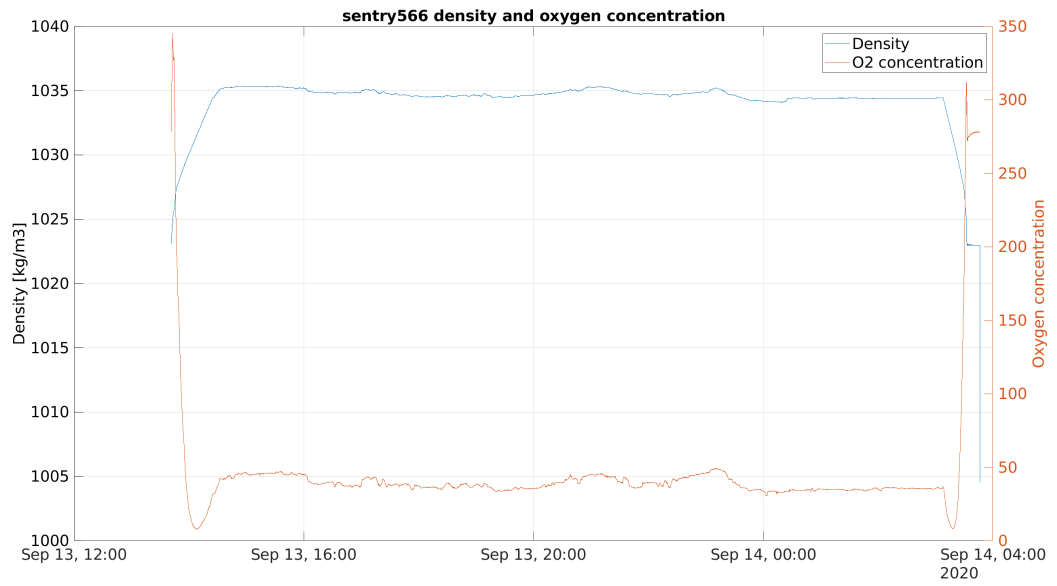
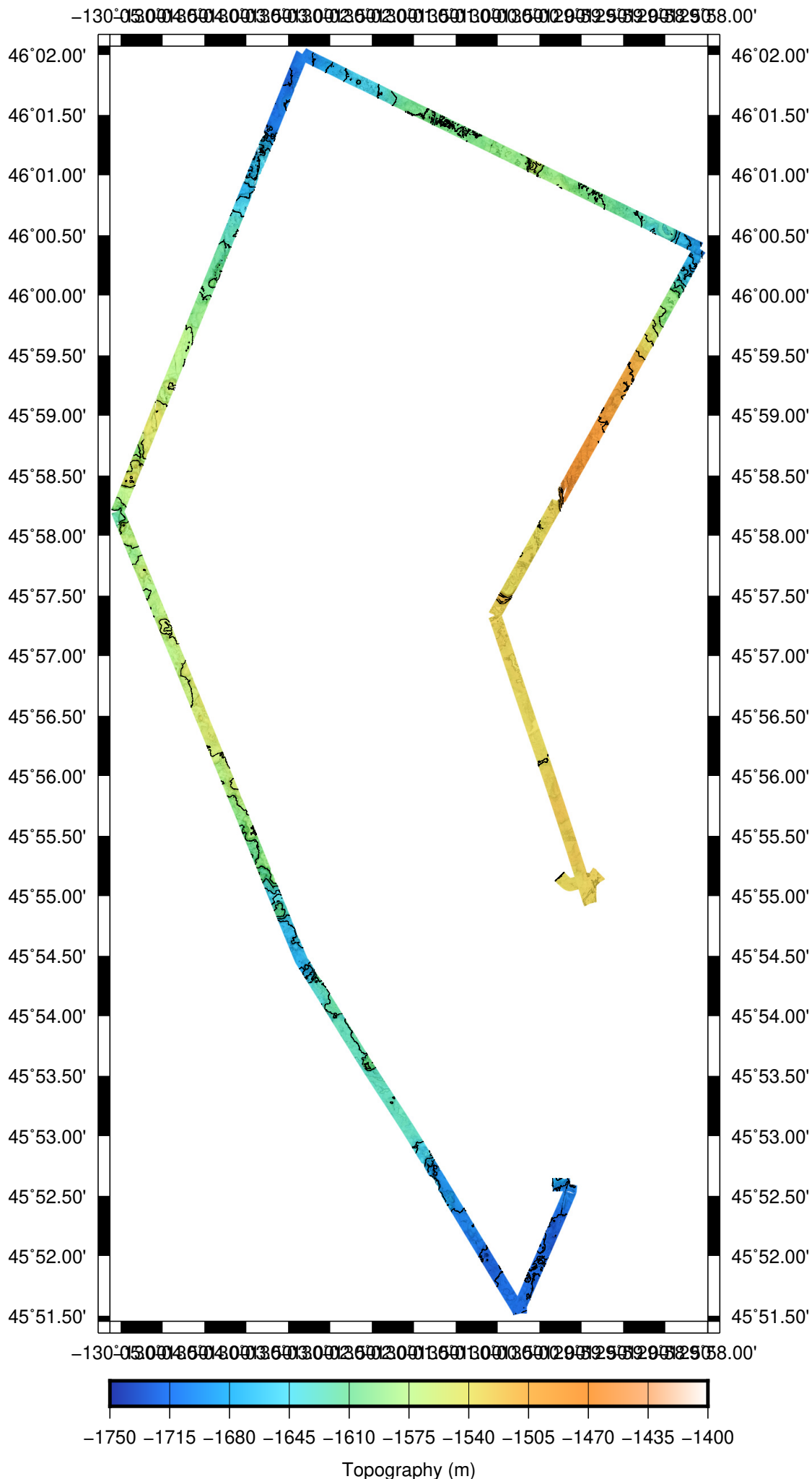


Figure 50: Density and O2 sensor data.



Sentry 567 Dive Report
DRAFT



Zac Berkowitz Justin Fujii Stefano Summan Amanda Sutherland Joe Garcia

Sentry Expedition Leader: Zac Berkowitz

Summary

Weather: Deployment: winds 2-5knts, seas 1-2ft Recovery: winds 1-3knts, seas 1ft

Reason for end of dive: End of mission time.

Important Positions

Dive Origin: 45 45.0000 -130 -12.0000

Launch Position: sentry567 launch position: 45 55.311'N 129 58.930'W

Vehicle Configuration

The science sensing suite for this dive was:

This dive was navigated using the DVL/INS system in real time. USBL provided post-dive corrections.

Narrative

Sentry567 is the fifth dive of TN383.

Sentry completed the last remaining segments of the main multibeam deformation pattern.

The dive proceeded without incident thanks to good coordination between the Jason and Sentry teams during close approaches. Sentry spent the majority of the dive out of range for USBL tracking and acoustic communication. The waveglider provided limited communication.

The TRN data pod was active logging data for the dive with an acoustic communication queue active for in-progress monitoring when within range of the ship. At the end of the dive the TRN bridge was activated and Sentry accepted a small shift to the north the TRN message indicated was the required offset. This represents the first time the TRN code was fully utilized.

Dive Statistics

0.9 sentry567 Summary

sentry567 Summary

Origin: 45.750000 -130.200000

Origin: 45 45.000'N 130 12.000'W

Launch: 2020/09/16 23:29:47

Survey start: 2020/09/17 00:15:37

Survey start: Lat:45.922648 Lon:-129.989874

Survey start: Lat:45 55.359'N Lon:129 59.392'W

Survey end: 2020/09/17 14:53:53

Survey end: Lat:45.923012 Lon:-129.977103

Survey end: Lat:45 55.381'N Lon:129 58.626'W

Ascent begins: 2020/09/17 14:53:53

On the surface: 2020/09/17 15:18:46

On deck: 2020/09/17 15:37:36

descent rate: 31.6 m/min

ascent rate: 58.5 m/min

survey time: 14.6 hours

deck-to-deck time 16.1 hours

Min survey depth: 1341m

Max survey depth: 1662m

Mean survey depth: 1492m

Mean survey height: 68m

distance travelled: 52.58km

average speed: 0.99m/s

average speed during photo runs: NaN m/s over 0.00 km

average speed during multibeam runs: 0.99 m/s over 52.58 km

total vertical during survey: 3928m

Battery energy at launch: 16.6 kwhr

Battery energy at survey start: 15.9 kwhr

Battery energy at survey end: 3.6 kwhr

Battery energy on surface: 3.6 kwhr

Battery energy on deck: 3.4 kwhr

UTC Time	Mission Time	Event	Notes
2020/09/16 23:29:47	+00:00:00.00	launch	launch
2020/09/17 00:07:50	+00:38:03.52	descent	end
2020/09/17 00:08:39	+00:38:52.03	onbottom	START
2020/09/17 00:51:04	+01:21:17.55	start	loop_1
2020/09/17 13:08:46	+13:38:58.71	end	loop_1
2020/09/17 13:08:46	+13:38:58.71	start	HoldingPattern
2020/09/17 14:53:53	+15:24:05.81	abort	
2020/09/17 15:18:45	+15:48:58.58	surface	surface
2020/09/17 15:37:35	+16:07:48.48	recovery	autogenerated

Table 5: Summary of events during dive sentry567

Sensor Information

This is a recently added section with selected sensor metadata. This section will be expanded in coming months. Additional data is available in the sentry567/nav-sci/proc directory within the sentry567_config matlab structure as well as in ascii text logs in sentry567/metadata. At present metadata is not yet automatically collected on all sensors.

0.10 sentry567 Devices

Instrument	Model	Serial Num.	Comments	Config File
USBL	Sonardyne AvTrak2	U00570D		avtrak_20200916_2056.cfg
DVL	RDI Navigator (300kHz)	727-2000-00J	CX: 1, WP: 0	dvl300_20200916_2056.cfg
CTD	SBE 49	222		sbe49_20200916_2057.cfg
SAIL	obs A/D	13	A: 5, G: 1.00, O: 0	a2d2-pods_20200916_2056.cfg
	orp A/D	14	A: 3, G: 1.00, O: 0.0024	

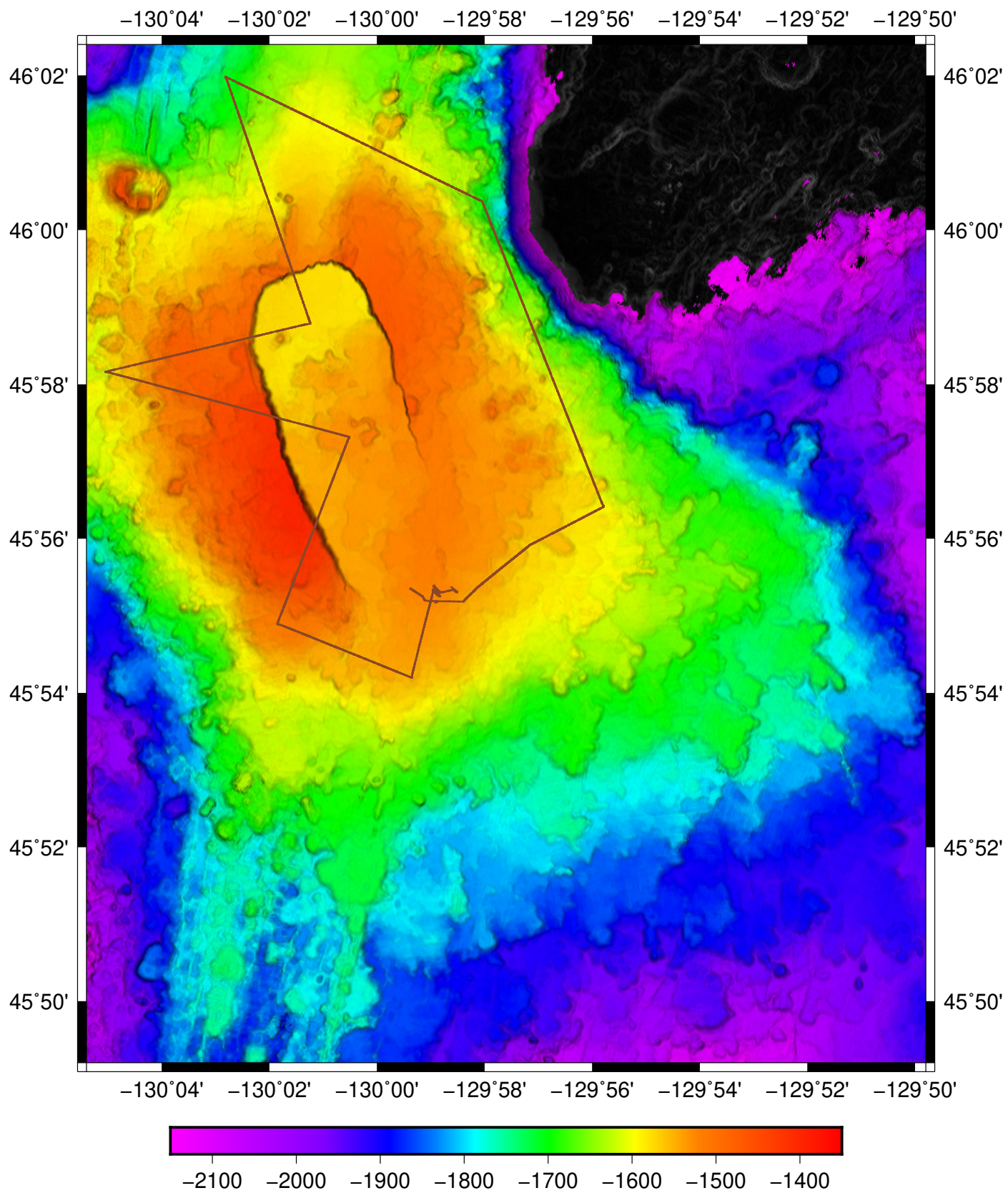
Special Data Processing Notes

None.

Plots and Images

This section contains selected images of data products and plots of vehicle navigation and selected sensors.

Sentry dive 567



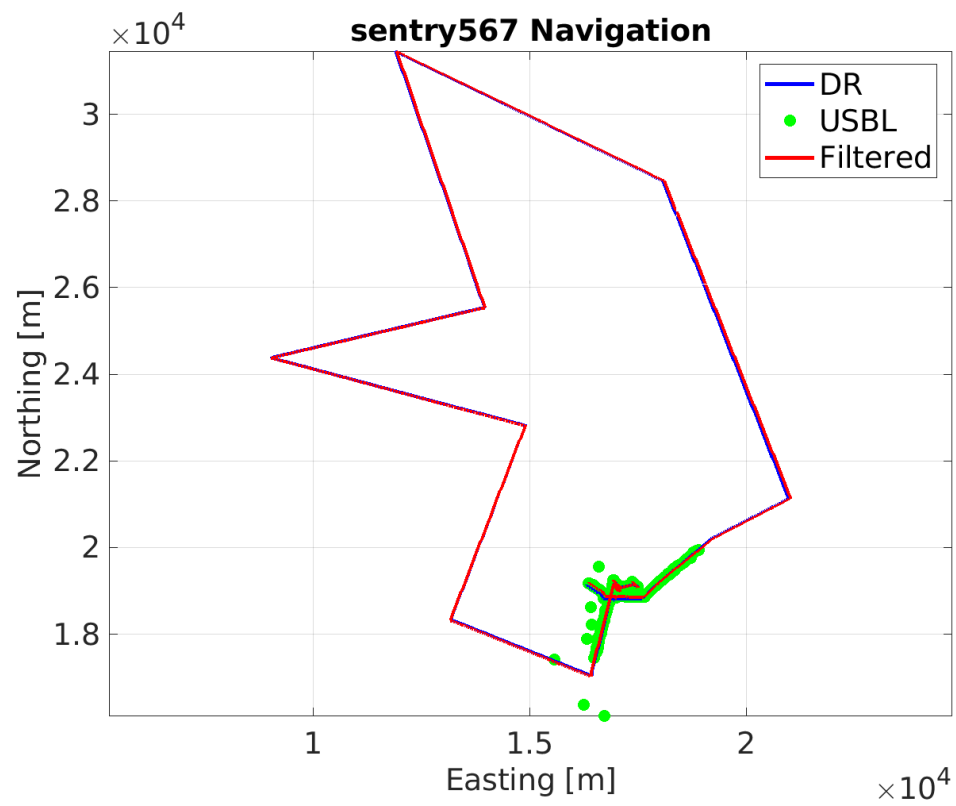


Figure 51: Latitude/Longitude plot of Sentry dive 567 based on post-processed navigation

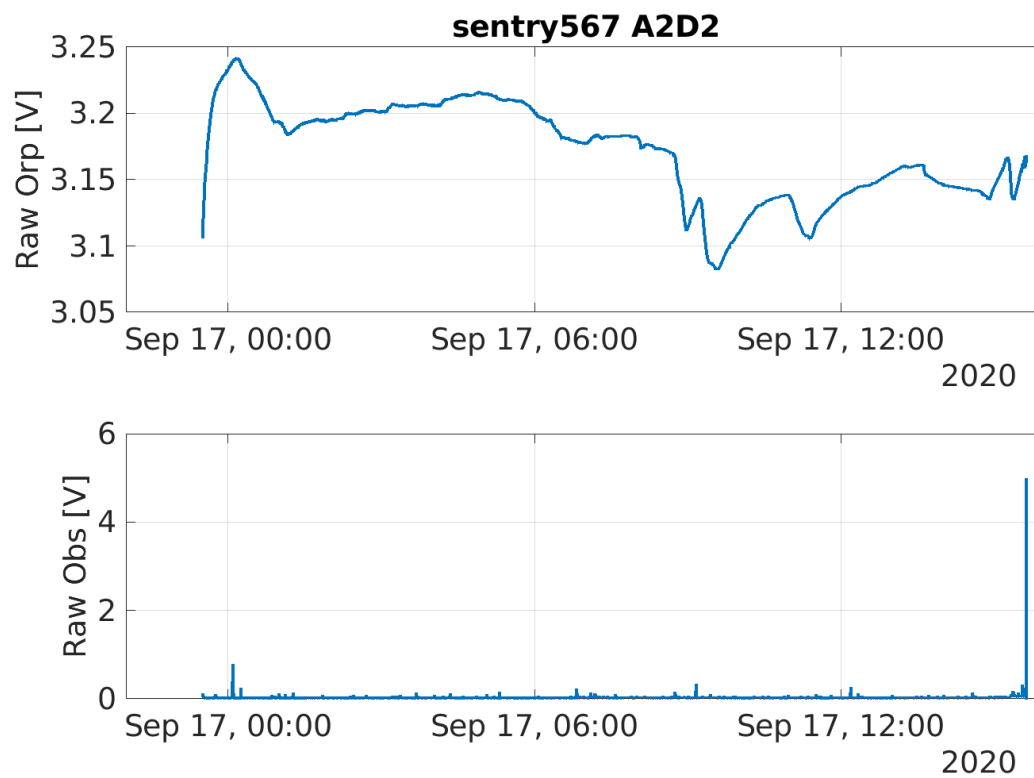


Figure 52: Raw analog Sensor Data

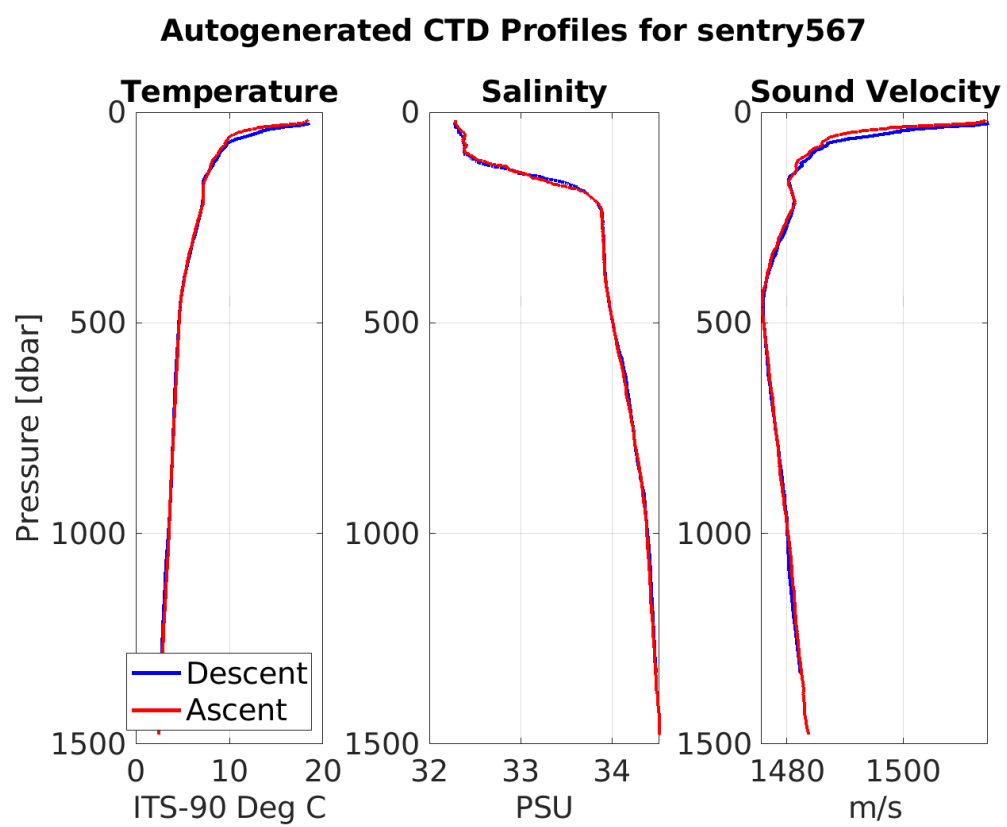


Figure 53: CTD profile sensor data

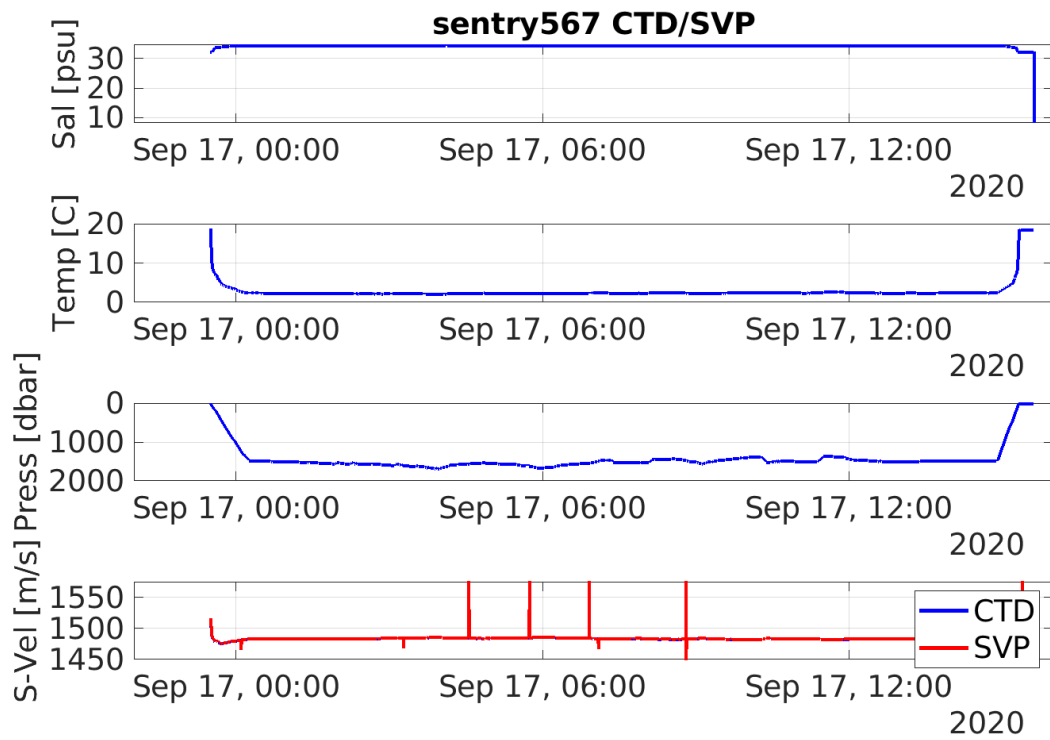


Figure 54: CTD and SVP sensor data

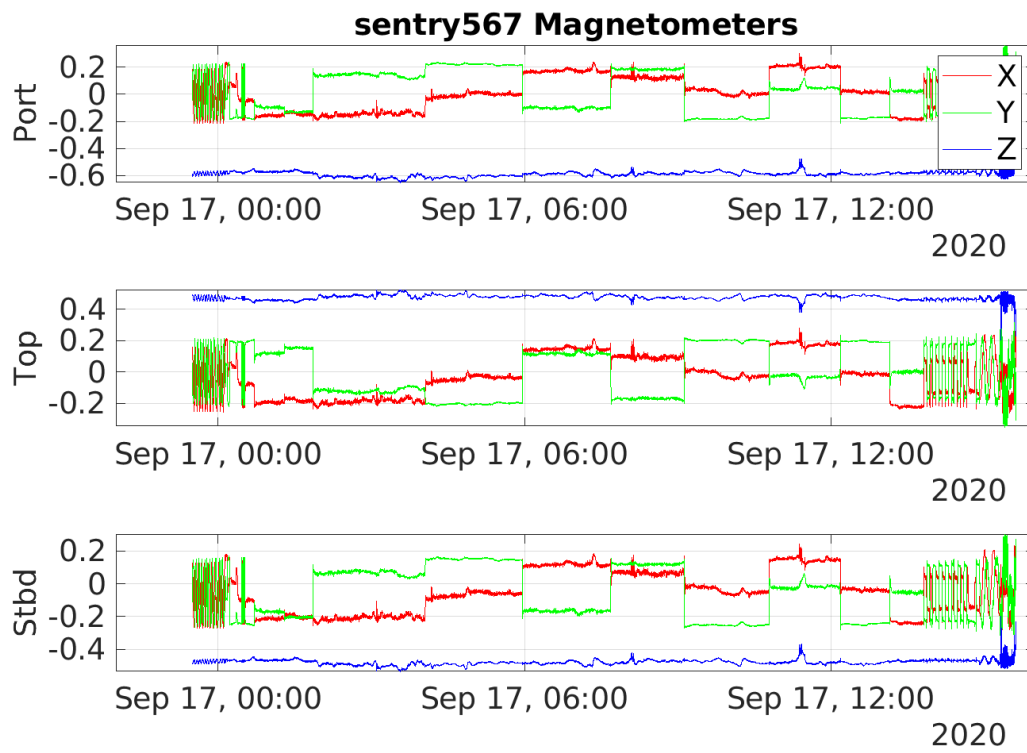


Figure 55: Magnetometer data from each of the three magnetometers on Sentry

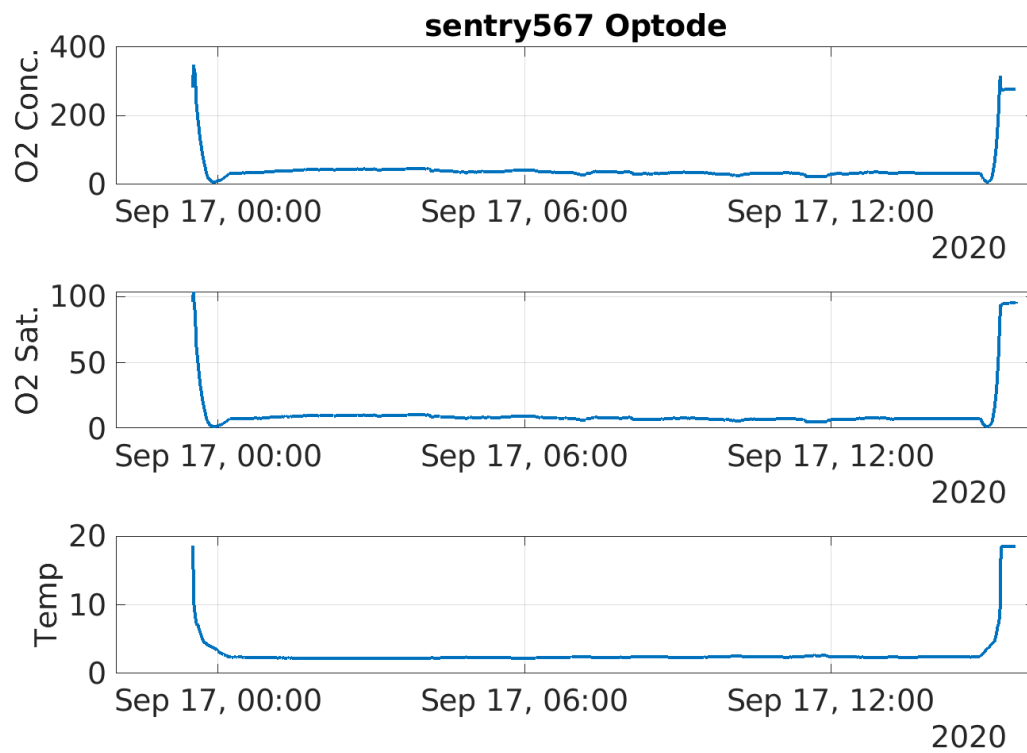


Figure 56: Optode temperature, O2 saturation, and concentration

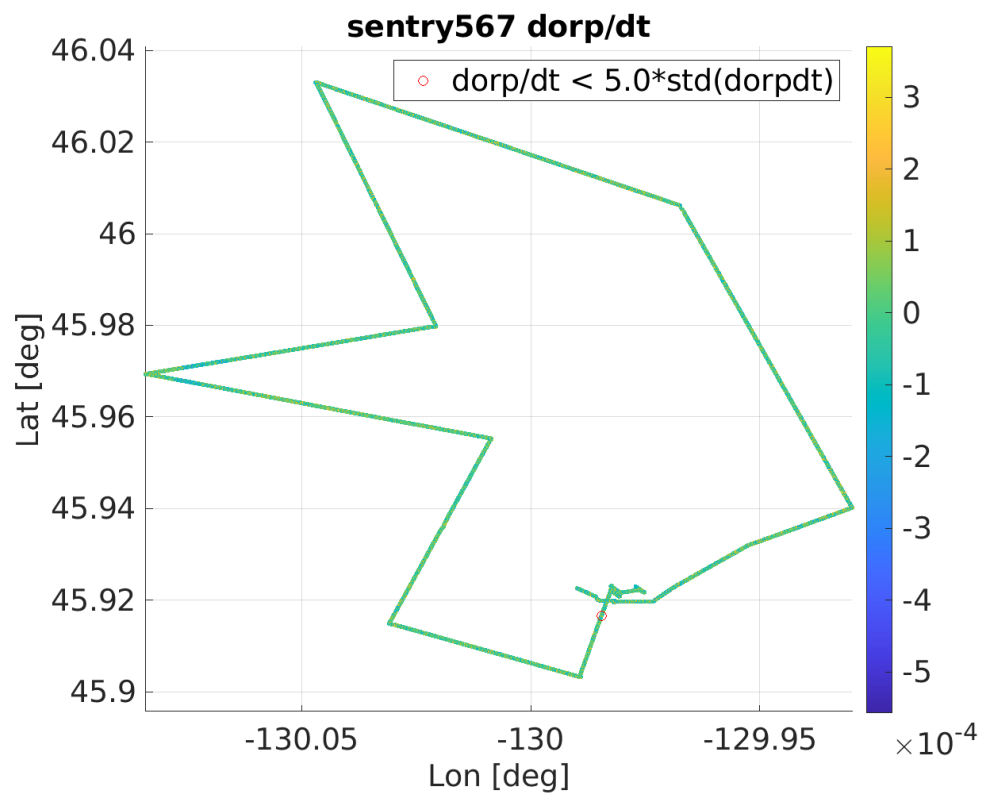


Figure 57: Navigated ORP sensor data.

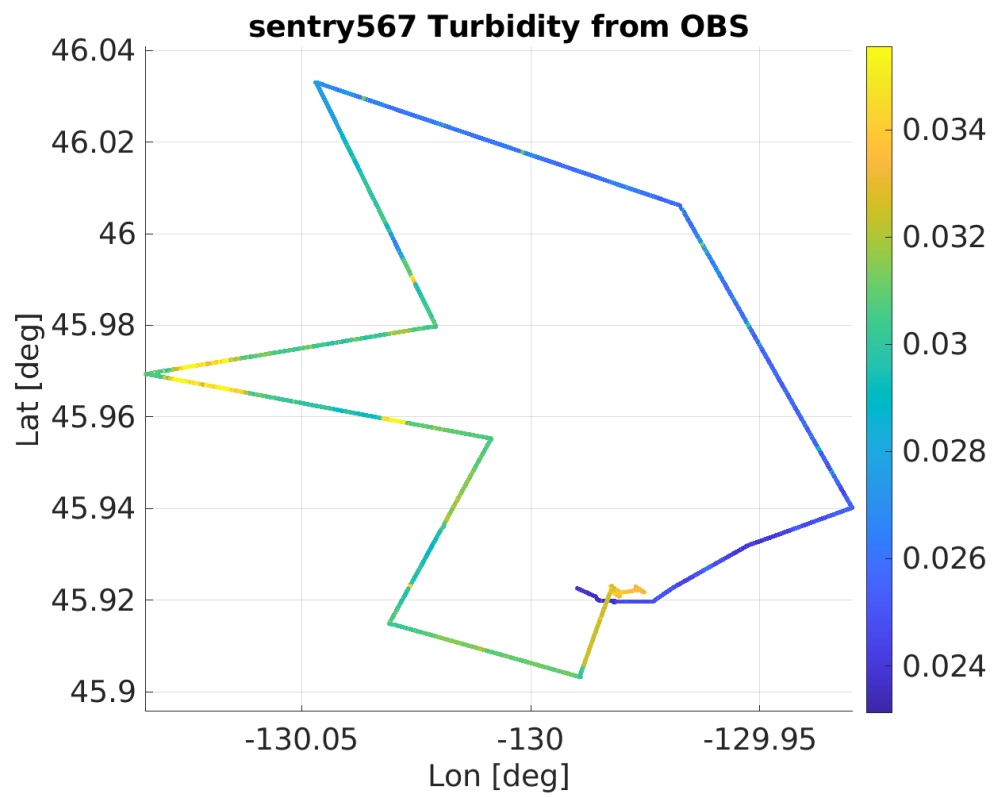


Figure 58: Navigated OBS sensor data.

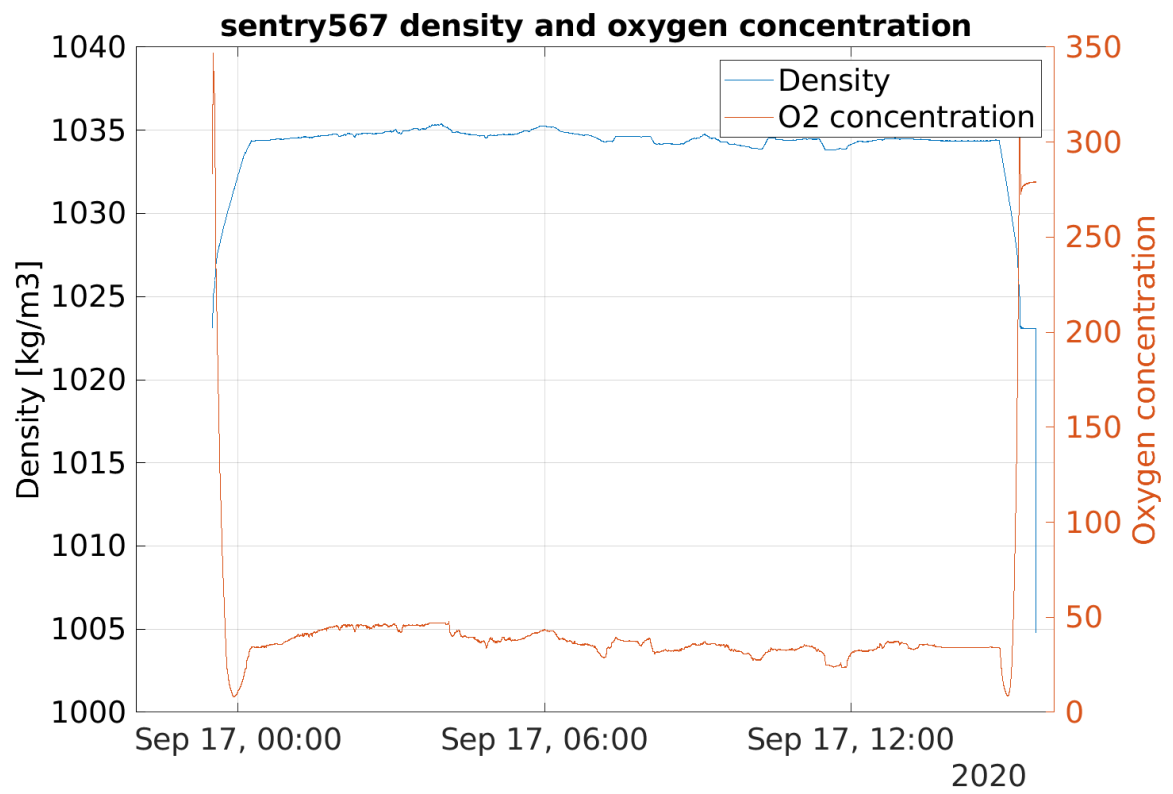
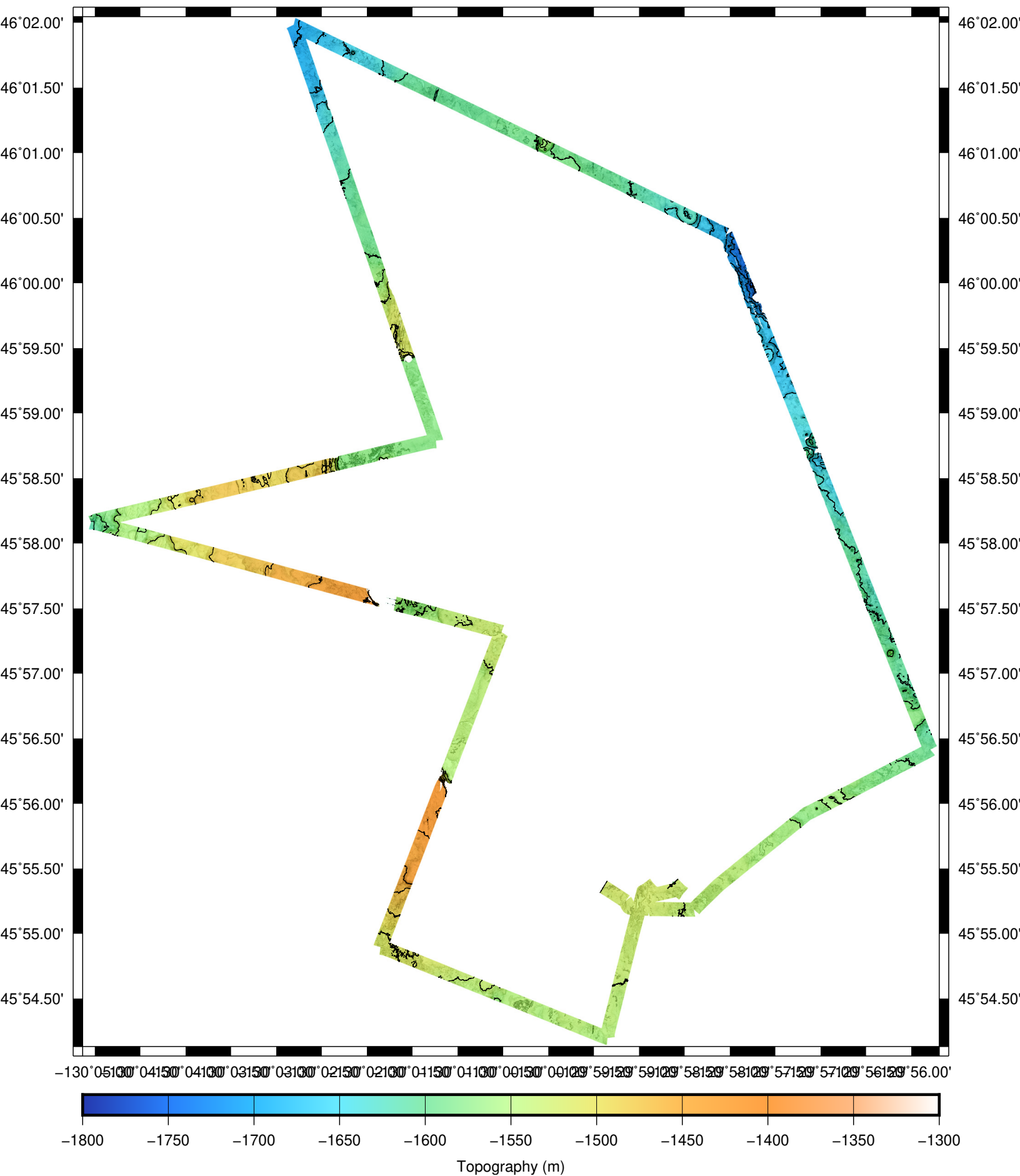


Figure 60: Density and O2 sensor data.

-130°05'10" 04'50" 04'30" 03'50" 03'30" 02'50" 02'30" 04'15" 04'130" 00'150" 00'129" 59'129" 59'129" 58'129" 58'129" 57'129" 57'129" 56'129" 56.00'



Sentry 568 Dive Report
DRAFT



Zac Berkowitz Justin Fujii Stefano Summan Amanda Sutherland Joe Garcia

Sentry Expedition Leader: Zac Berkowitz

Summary

Weather: Deployment: winds 2-5knts, seas 1-2ft Recovery: winds 1-3knts, seas 1ft

Reason for end of dive: End of mission time.

Important Positions

Dive Origin: 45 45.0000 -130 -12.0000

Launch Position: sentry568 launch position: 45 51.532'N 130 0.665'W

Vehicle Configuration

The science sensing suite for this dive was:

This dive was navigated using the DVL/INS system in real time. USBL provided post-dive corrections.

Narrative

Sentry568 is the sixth and final dive of TN383.

Sentry extended multibeam deformation tracklines to the south and south-east of the main Axial site

The dive proceeded without incident thanks to good coordination between the Jason and Sentry teams during close approaches. Sentry spent the majority of the dive out of range for USBL tracking and acoustic communication. The waveglider was not deployed during this dive.

The TRN data pod was active logging data for the dive with an acoustic communication queue active for in-progress monitoring when within range of the ship. At the end of the dive the TRN service indicated it had converged to a stable offset while approaching the holding pattern at the end of the dive. Sentry was diverged manually approx. 500m west of the holding pattern to accommodate Jason operations in the area. While Jason was safely off the bottom the TRN bridge on Sentry was enabled and Sentry accepted the desired shift provided by the TRN server, moving Sentry back on the original tracklines of the holding pattern. The TRN service was left active for approx. 2.5 multibeam lines in the holding pattern before being disabled ahead of Sentry's recovery.

Dive Statistics

0.11 sentry568 Summary

sentry568 Summary

Origin: 45.750000 -130.200000

Origin: 45 45.000'N 130 12.000'W

Launch: 2020/09/18 03:47:56

Survey start: 2020/09/18 04:42:43

Survey start: Lat:45.858604 Lon:-130.007994

Survey start: Lat:45 51.516'N Lon:130 0.480'W

Survey end: 2020/09/18 22:56:22

Survey end: Lat:45.921734 Lon:-129.981574

Survey end: Lat:45 55.304'N Lon:129 58.894'W

Ascent begins: 2020/09/18 22:56:22

On the surface: 2020/09/18 23:20:58

On deck: 2020/09/18 23:40:50

descent rate: 30.1 m/min

ascent rate: 59.1 m/min

survey time: 18.2 hours

deck-to-deck time 19.9 hours

Min survey depth: 1451m

Max survey depth: 1924m

Mean survey depth: 1657m

Mean survey height: 68m

distance travelled: 62.49km

average speed: 0.95m/s

average speed during photo runs: NaN m/s over 0.00 km

average speed during multibeam runs: 0.95 m/s over 62.49 km

total vertical during survey: 4926m

Battery energy at launch: 16.5 kwhr

Battery energy at survey start: 15.9 kwhr

Battery energy at survey end: 2.4 kwhr

Battery energy on surface: 2.3 kwhr

Battery energy on deck: 2.1 kwhr

UTC Time	Mission Time	Event	Notes
2020/09/18 03:47:56	+00:00:00.00	launch	launch
2020/09/18 04:32:52	+00:44:56.43	descent	end
2020/09/18 04:33:41	+00:45:44.83	onbottom	START
2020/09/18 04:46:24	+00:58:28.24	start	loop_1
2020/09/18 19:32:48	+15:44:51.70	end	loop_1
2020/09/18 19:32:48	+15:44:51.70	start	HoldingPattern
2020/09/18 22:56:22	+19:08:25.60	abort	
2020/09/18 23:20:57	+19:33:01.54	surface	surface
2020/09/18 23:40:49	+19:52:53.36	recovery	autogenerated

Table 6: Summary of events during dive sentry568

Sensor Information

This is a recently added section with selected sensor metadata. This section will be expanded in coming months. Additional data is available in the sentry568/nav-sci/proc directory within the sentry568_config matlab structure as well as in ascii text logs in sentry568/metadata. At present metadata is not yet automatically collected on all sensors.

0.12 sentry568 Devices

Instrument	Model	Serial Num.	Comments	Config File
USBL	Sonardyne AvTrak2	U00570D		avtrak_20200918_0202.cfg
DVL	RDI Navigator (300kHz)	727-2000-00J	CX: 1, WP: 0	dvl300_20200918_0202.cfg
CTD	SBE 49	222		sbe49_20200918_0203.cfg
SAIL	obs A/D	13	A: 5, G: 1.00, O: 0	a2d2-pods_20200918_0202.cfg
	orp A/D	14	A: 3, G: 1.00, O: 0.0024	

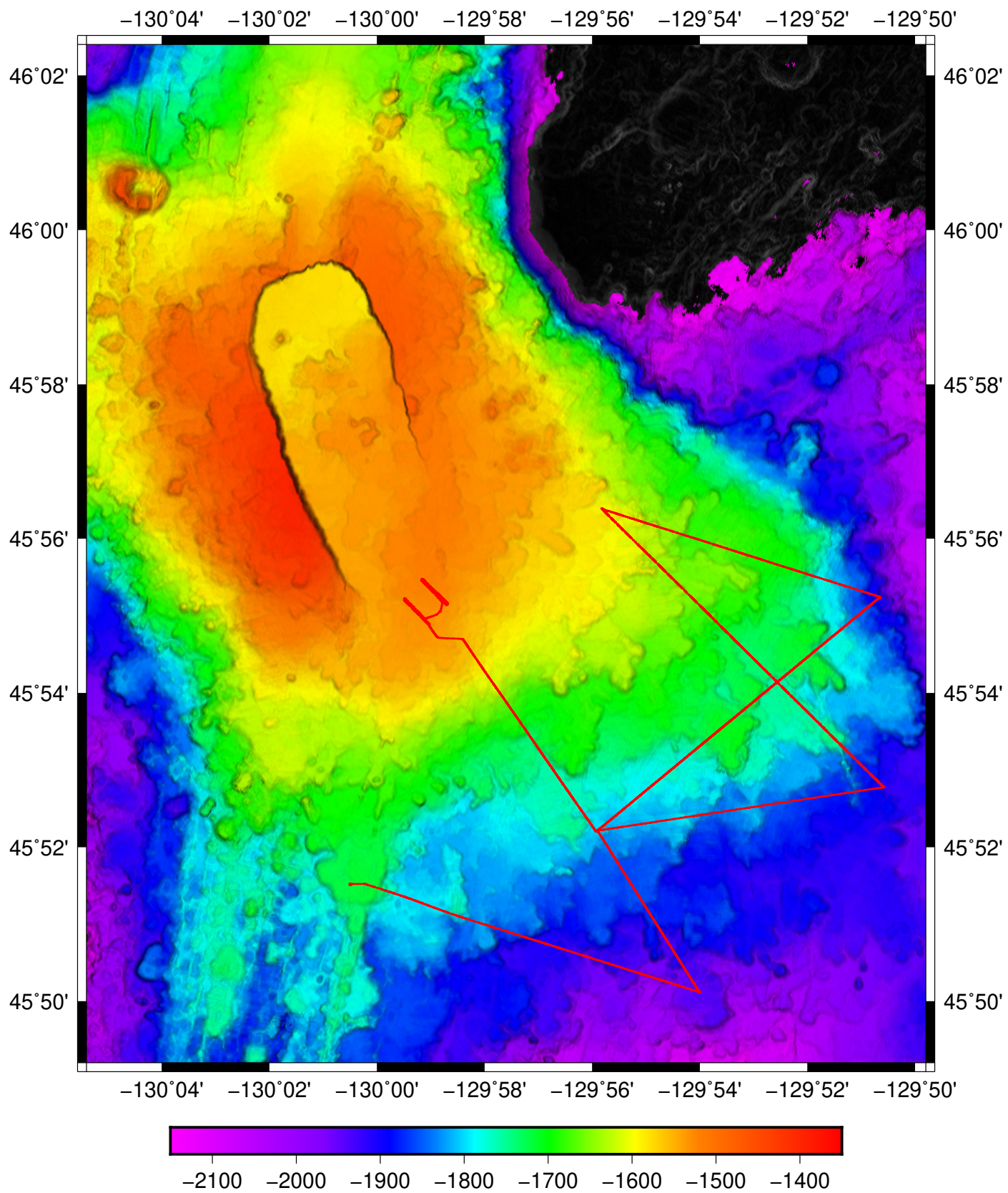
Special Data Processing Notes

None.

Plots and Images

This section contains selected images of data products and plots of vehicle navigation and selected sensors.

Sentry dive 568



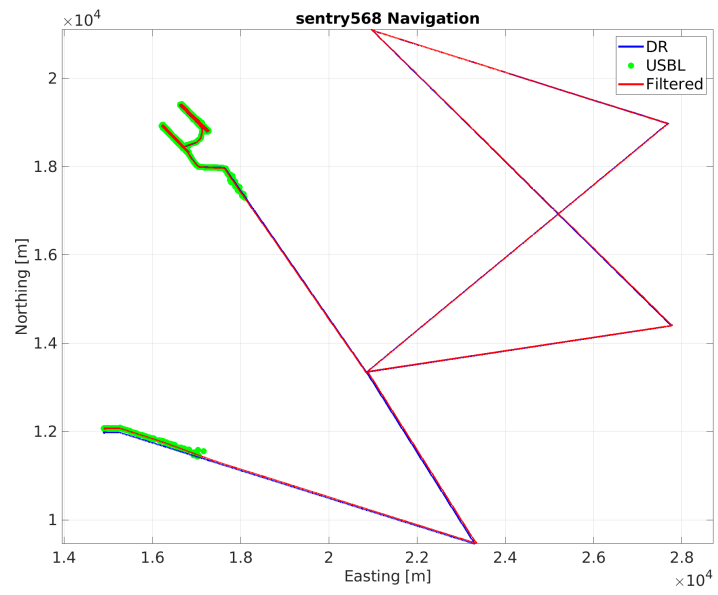


Figure 61: Latitude/Longitude plot of Sentry dive 568 based on post-processed navigation

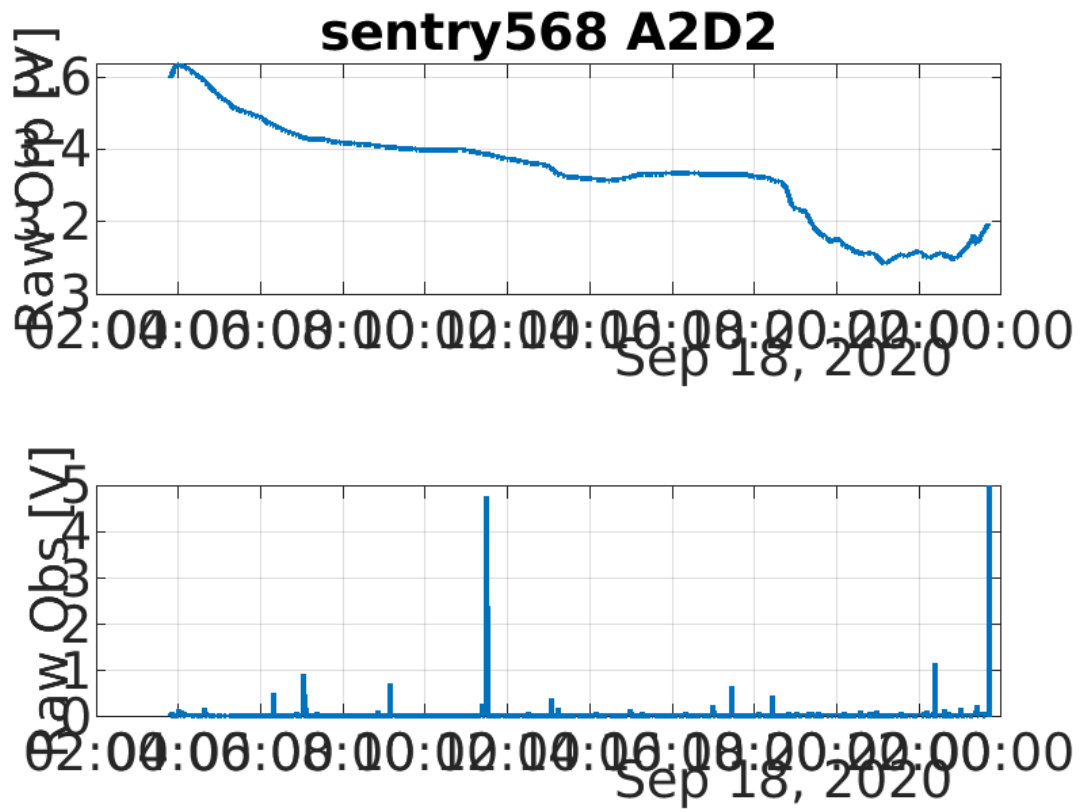


Figure 62: Raw analog Sensor Data

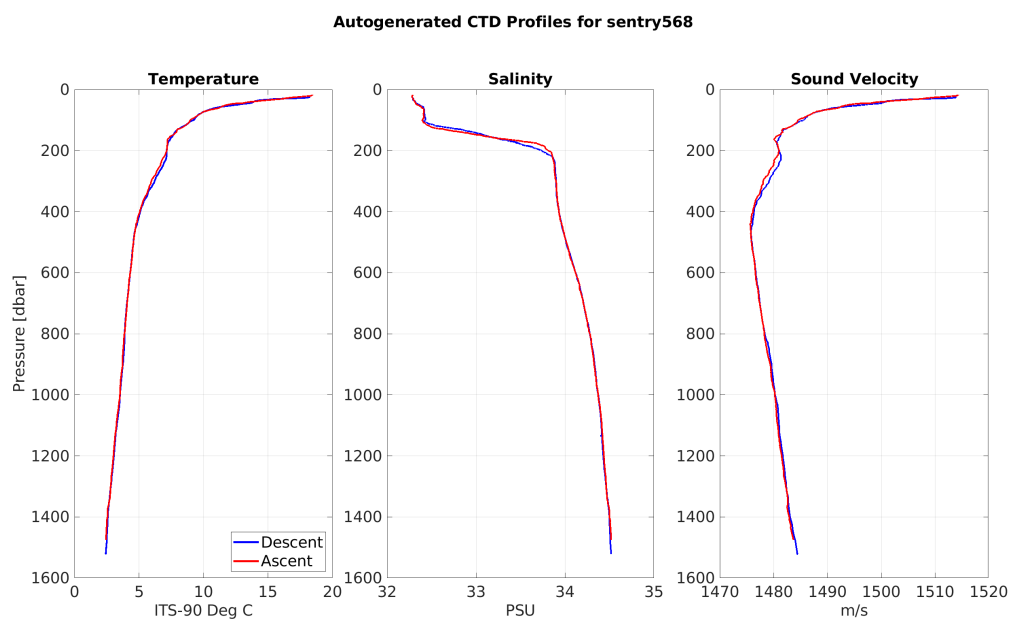


Figure 63: CTD profile sensor data

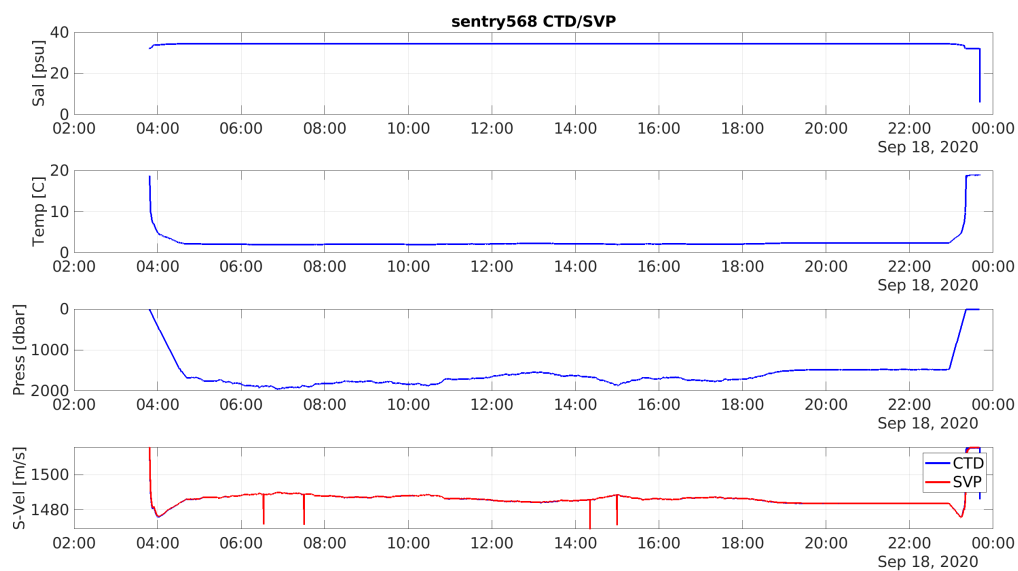


Figure 64: CTD and SVP sensor data

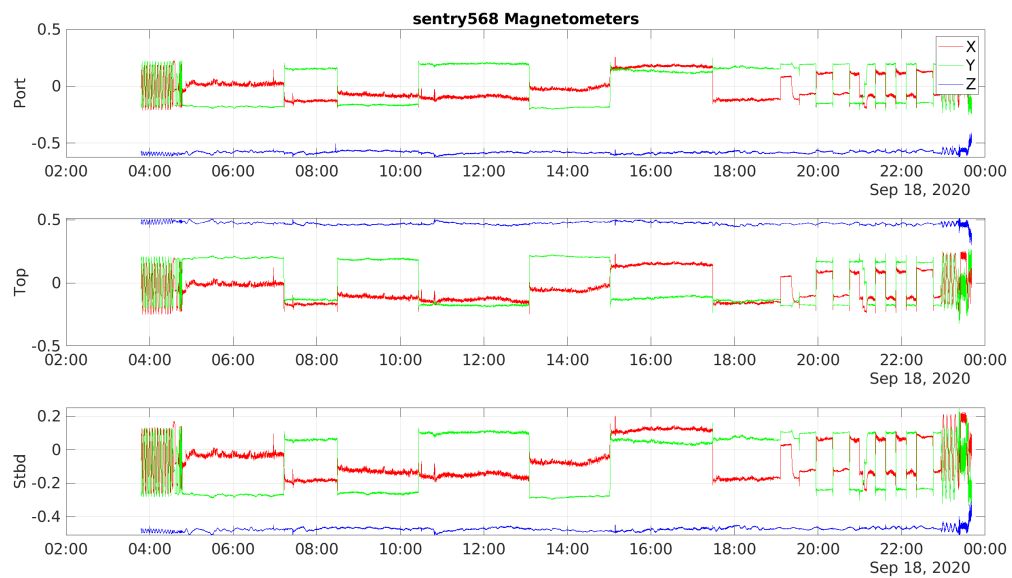


Figure 65: Magnetometer data from each of the three magnetometers on Sentry

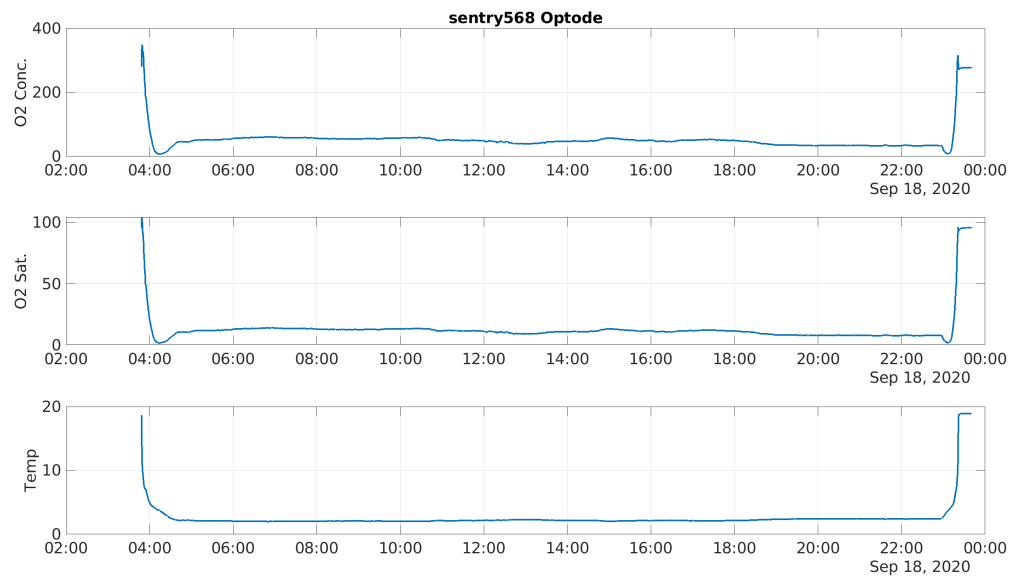


Figure 66: Optode temperature, O2 saturation, and concentration

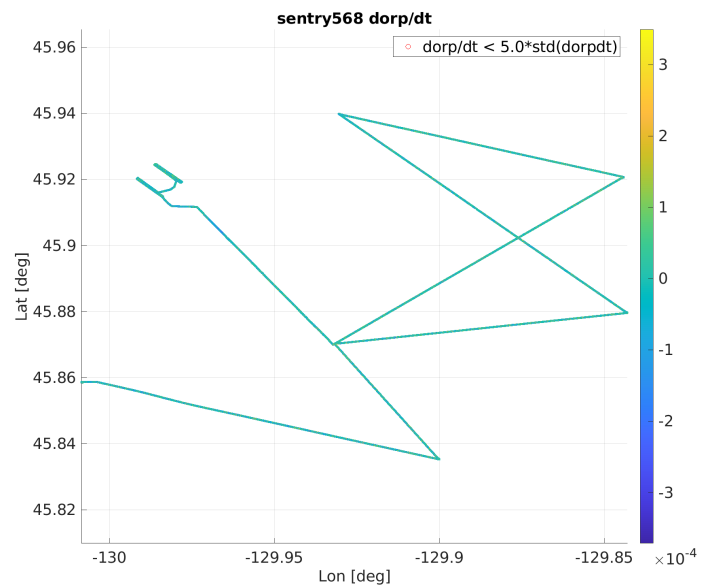


Figure 67: Navigated ORP sensor data.

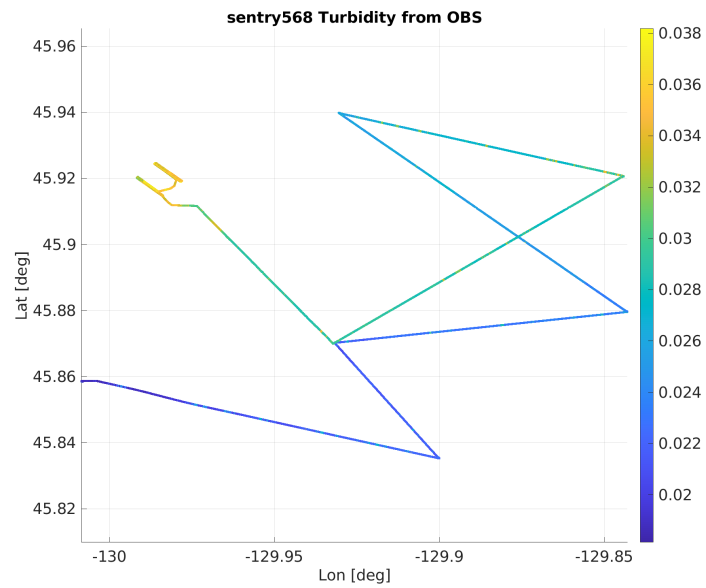


Figure 68: Navigated OBS sensor data.

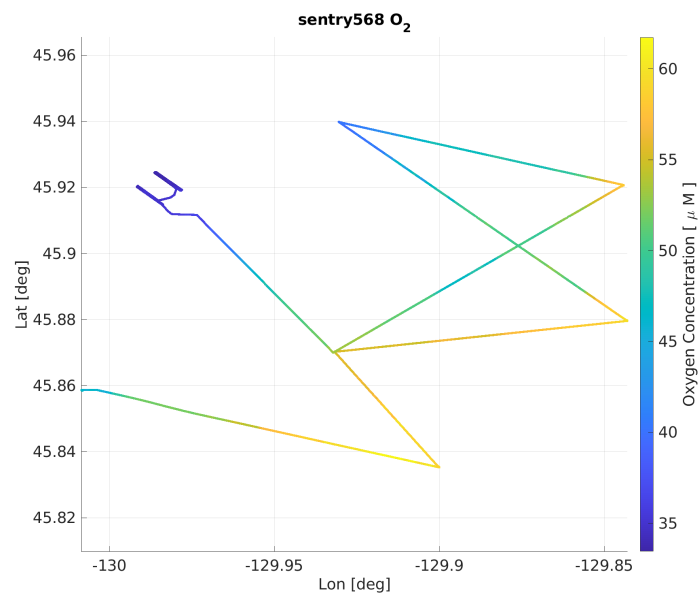


Figure 69: Navigated optode sensor data.

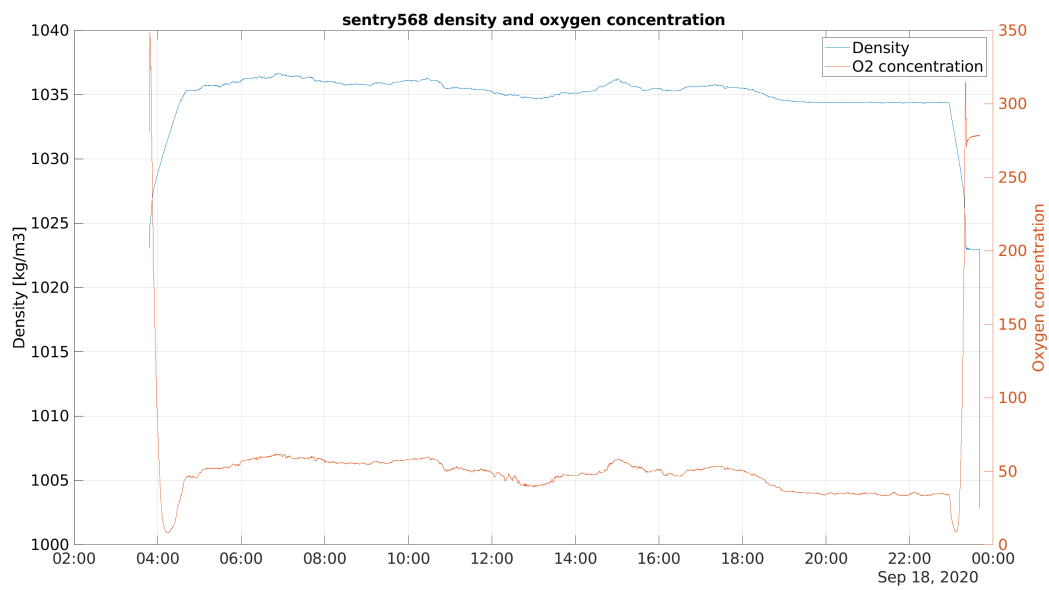


Figure 70: Density and O₂ sensor data.

sentry568_20200918_2135_rnv V01 Bathy Generated at 20200918_2158

