UH contributions to WHOTS-8 cruise report
by
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The primary contributions by the UH group to the WHOTS-8 deployment cruise were preparing and handling subsurface instruments, managing data for most of the subsurface instrumentation on the WHOTS moorings, conducting $CTDO_2$ profiling and rosette water sampling, and salinity sampling for thermosalinograph calibration. UH personnel also participated in the deck operations for mooring recovery and deployment.

During the WHOTS-8 cruise, Station ALOHA was under the influence of the eastern North Pacific high pressure system, and subject to moderate east-northeasterly trade winds (Fig. 1). Winds were light (10-15 kts) during July 5-6th, strengthening July 7th – 9th, with greater vertical development of the boundary layer and shower activity. Winds moderated on the 10th through 11th, picking up again on the 12th.

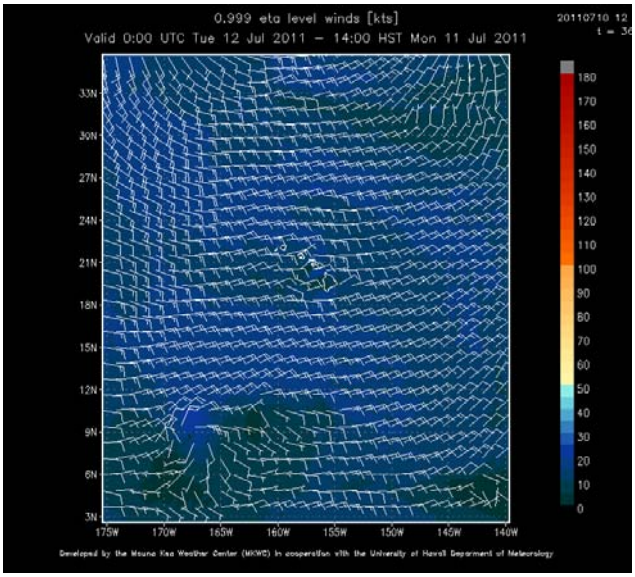


Figure 1. The NOAA/NCEP WRF surface wind and sea level pressure analysis for the central-eastern North Pacific, valid for 0Z on July 12th, 2011.

The real-time shipboard ADCP system was not available at the beginning of the cruise, but was online the 2nd day. The 88 m currents at Station ALOHA were mainly northwestward (Fig. 2) along the southwest flank of a nearly stationary anticyclonic eddy to the east of ALOHA (Fig. 3). The currents were also influenced by M2 internal tides (strongest in the upper 100 m) and by inertial waves (Fig. 4). Surface currents on the transit back from Station ALOHA to Oahu was marked by modest westward flow.

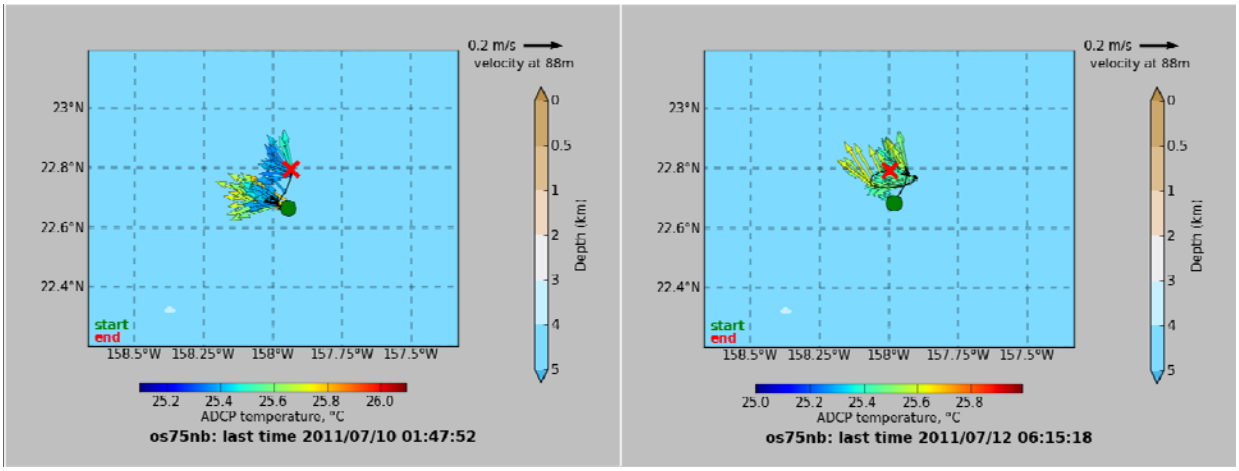


Figure 2. Shipboard 300 kHz ADCP currents from July 10th, 2011 (left) and from July 12th (right) at a depth of 88 m. Water temperature at the transducer depth is indicated by color.

Figure 3. Surface currents (vectors) overlaid on sea surface height anomaly (colors) from the Naval Oceanographic Office NCOM analysis for 0Z on July 9th, 2011.

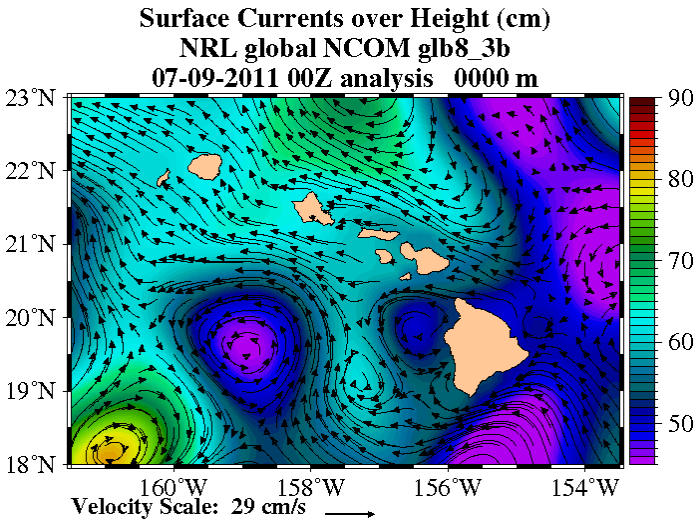
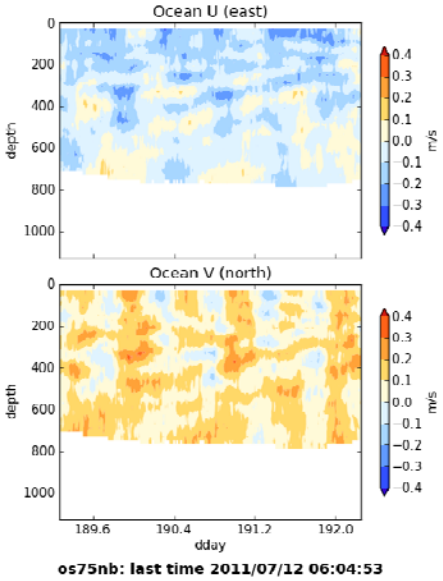


Figure 4. Shipboard ADCP currents from July 10th – 12th as a function of depth and time. Inertial waves can be seen as upward trending, but nearly horizontal, maxima and minima in the velocity components with a period of ~ 32 hours. The M2 internal tides can be seen as the nearly vertically aligned maxima and minima in the velocity components with a period of ~ 12 hours.



A. WHOTS mooring subsurface instrumentation

1. WHOTS-8 deployment

UH provided 15 SBE-37 Microcats, a RDI 300 kHz Workhorse acoustic Doppler current profiler (ADCP), and a Nobska MAVS acoustic velocity sensor. WHOI provided 2 Vector Measuring Current Meters (VMCMs) and a RDI 600 kHz Workhorse ADCP. The Microcats measure temperature and conductivity; five Microcats also measure pressure. Table 1 provides deployment information for the subsurface instrumentation on the WHOTS-8 mooring.

Table 1. WHOTS-8 mooring subsurface instrument deployment information. All times are in UTC.

SN:	Instrument	Depth	Pressure SN	Sample Interval (sec)	Start Logging Data(UTC)		Cold Spike In (UTC)		Cold Spike Out (UTC)		Time in Water (UTC)	
6893	Microcat	15	N/A	150	06/30/11	0:00:00	07/01/11	23:30:00	07/02/11	0:00:00	07/06/11	18:29
10260	MAVS	20	N/A	1800	07/06/11	0:00:00	07/06/11	2:15:00	07/06/11	3:15:00	07/06/11	18:27
6894	Microcat	25	N/A	150	06/30/11	0:00:00	07/01/11	23:30:00	07/02/11	0:00:00	07/06/11	18:24
6895	Microcat	35	N/A	150	06/30/11	0:00:00	07/01/11	23:30:00	07/02/11	0:00:00	07/06/11	18:18
6896	Microcat	40	N/A	150	06/30/11	0:00:00	07/01/11	23:30:00	07/02/11	0:00:00	07/06/11	18:15
6887	Microcat	45	2651319	180	06/30/11	0:00:00	07/01/11	23:30:00	07/02/11	0:00:00	07/06/11	18:12
1825	600 kHz ADCP	47.5	N/A	600	7/6/2011	0:00:00	07/06/11	1:26:00	07/06/11	1:56:00	07/06/11	19:17
6897	Microcat	50	N/A	150	06/30/11	0:00:00	07/01/11	23:30:00	07/02/11	0:00:00	07/06/11	19:22
6898	Microcat	55	N/A	150	06/30/11	0:00:00	07/01/11	23:30:00	07/02/11	0:00:00	07/06/11	19:27
6899	Microcat	65	N/A	150	06/30/11	0:00:00	07/01/11	23:30:00	07/02/11	0:00:00	07/06/11	19:30
3618	Microcat	75	N/A	150	06/30/11	0:00:00	07/02/11	0:05:00	07/02/11	0:35:00	07/06/11	19:36
6888	Microcat	85	2651320	180	06/30/11	0:00:00	07/02/11	0:05:00	07/02/11	0:35:00	07/06/11	19:39
3617	Microcat	95	N/A	150	06/30/11	0:00:00	07/02/11	0:05:00	07/02/11	0:35:00	07/06/11	19:41
6889	Microcat	105	2651321	180	06/30/11	0:00:00	07/02/11	0:05:00	07/02/11	0:35:00	07/06/11	19:44
6890	Microcat	120	2651322	180	06/30/11	0:00:00	07/02/11	0:05:00	07/02/11	0:35:00	07/06/11	19:47
4891	300 kHz ADCP	125	N/A	600	07/06/11	0:00:00	07/06/11	0:55:00	07/06/11	1:25:00	07/06/11	19:50
3634	Microcat	135	N/A	150	06/30/11	0:00:00	07/02/11	0:05:00	07/02/11	0:35:00	07/06/11	19:53
6891	Microcat	155	2651323	180	06/30/11	0:00:00	07/02/11	0:05:00	07/02/11	0:35:00	07/06/11	19:59

see Table 2 for details of sampling programs for these instruments

The WHOTS-8 VMCM configuration and deployment information is provided in Table XXX [Sean]?

The ADCPs were deployed in the upward-looking configuration. The MAVS was deployed in a vertical downward orientation. The instruments were programmed as described in Table 2.

Table 2. WHOTS-8 mooring ADCP and MAVS deployment information.

	ADCP S/N 4891	ADCP S/N 1825	MAVS S/N 10260
Frequency (kHz)	300	600	N/A
Number of Depth Cells	30	25	1
Pings per Ensemble	40	80	80
Depth Cell Size	4 m	2 m	N/A
Time per Ensemble	10 min	10 min	30 min
Time per Ping	4 sec	2 sec	2 sec
Time of First Ping	07/06/11, 00:00	07/06/11, 00:00	07/06/11, 00:00
Cold Spike Time	07/06/11, 00:55	07/06/11, 01:26	07/06/11, 02:15
Time in water	07/06/11, 19:50	07/06/11, 19:17	07/06/11, 18:27
Depth	125 m	47.5 m	20

2. WHOTS-7 recovery

For the seventh WHOTS mooring deployment that took place on 27 July 2010, UH provided 15 SBE-37 Microcats, a RDI 300 kKHz Workhorse ADCP, a RDI 600 kHz Workhorse ADCP and a Nobska MAVS acoustic velocity sensor. The Microcats all measured temperature and conductivity, with 6 also measuring pressure. WHOI provided 2 VMCMs and all required subsurface mooring hardware.

Table 3 provides the deployment information for each C-T instrument on the WHOTS-7 mooring.

Table 3. WHOTS-7 mooring Microcat deployment information. All times are in UTC.

SN:	Depth	Pressure SN	Sample Interval (sec)	Start Logging Data(UTC)		Cold Spike In (UTC)		Cold Spike Out (UTC)		Time in Water (UTC)	
3382	15	N/A	150	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	19:00:20
4663	25	N/A	150	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	18:52:45
3633	35	N/A	150	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	18:48:30
3381	40	N/A	150	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	18:44:20
3668	45	5579	180	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	18:40:45
3619	50	N/A	150	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	18:38:40
3620	55	N/A	150	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	19:40:20
3621	65	N/A	150	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	19:45:40
3632	75	N/A	150	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	19:48:45
4699	85	10209	180	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	19:51:37
3791	95	N/A	150	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	19:54:05
2769	105	2949	180	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	19:56:55
4700	120	2479944	180	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	20:04:55
3669	135	5700	180	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:33:00	07/28/10	20:07:45
4701	155	10211	180	07/22/10	0:00:00	07/22/10	23:21:00	07/23/10	0:21:00	07/28/10	20:11:16

The WHOTS-7 VMCM configuration and deployment information is provided in Table YYY [Sean]?

Table 4 provides the ADCP and MAVS deployment configuration and recovery information.

Table 4. WHOTS-7 mooring ADCP and MAVS deployment and recovery information.

	ADCP S/N 7637	ADCP S/N 3917	MAVS S/N 10261
Frequency (kHz)	300	600	N/A
Number of Depth Cells	30	25	1
Pings per Ensemble	40	80	80
Depth Cell Size	4 m	2 m	N/A
Time per Ensemble	10 min	10 min	30 min
Time per Ping	4 sec	2 sec	2 sec
Time of First Ping	07/28/10, 02:00	07/28/10, 02:00	07/26/10, 00:00
Time of Last Ensemble	N / A	N / A	07/13/11, 01:00
Number of Ensembles	38,015	38,432	16,898
Time in water	07/28/10, 20:05	07/28/10, 18:39	07/28/10, 18:54
Time out of the water	07/11/11, 22:40	07/11/11, 23:21	07/12/11, 01:36
Time of spike	07/12/11, 05:40:00	07/12/11, 04:55:00	07/12/11, 06:35
Depth	125	47.5	20

All instruments on the mooring were successfully recovered. Most of the instruments had some degree of biofouling, with the heaviest fouling near the surface. Fouling extended down to the ADCP at 125 m, although it was minor at that level.

Table 5 gives the post-deployment information for the C-T instruments. All instruments returned full data records.

The data recovered from the Microcats appear to be of high quality, although post-deployment calibrations are required. Figures A1-A15 show the nominally calibrated temperature, conductivity and salinity records from each instrument, and pressure for those instruments that were equipped with pressure sensors.

Table 5. WHOTS-7 mooring Microcat recovery information. All times are in UTC.

Depth (meters)	Seabird Serial #	Time out of water	Time of Spike	Time Logging Stopped	Samples Logged	Data Quality	File Name raw data
15	37SM31486-3382	07/12/2011 01:32	07/12/2011 04:15:00	07/12/2011 05:44:30	204,618	good	mc_3382_data.cap
25	37SM31486-4663	07/12/2011 01:36	07/12/2011 04:15:00	07/12/2011 08:45:00	204,690	good	mc_4663_data.cap
35	37SM31486-3633	07/12/2011 01:41	07/12/2011 04:15:00	07/12/2011 05:18:30	204,607	good	mc_3633_data_b.cap
40	37SM31486-3381	07/12/2011 01:43	07/12/2011 04:15:00	07/12/2011 05:22:00	204,609	good	mc_3381_data_b.cap
45	37SM31486-3668	07/11/2011 23:24	07/12/2011 04:15:00	07/12/2011 05:54:30	170,518	good	mc_3668_data_p.cap
50	37SM31486-3619	07/11/2011 23:19	07/12/2011 04:15:00	07/12/2011 05:58:00	204,623	good	mc_3619_data.cap
55	37SM31486-3620	07/11/2011 23:16	07/12/2011 04:15:00	07/12/2011 05:13:00	204,605	good	mc_3620_data.cap
65	37SM31486-3621	07/11/2011 23:11	07/12/2011 04:35:00	07/12/2011 08:43:00	204,689	good	mc_3621_data.cap
75	37SM31486-3632	07/11/2011 23:07	07/12/2011 04:35:00	07/12/2011 08:47:00	204,691	good	mc_3632_data.cap
85	37SM31486-4699	07/11/2011 23:03	07/12/2011 04:35:00	07/12/2011 08:56:00	170,579	good	mc_4699_data_p.cap
95	37SM31486-3791	07/11/2011 22:59	07/12/2011 04:35:00	07/12/2011 17:52:00	204,908	good	mc_3791_data.cap
105	37SM31486-2769	07/11/2011 22:54	07/12/2011 04:35:00	07/12/2011 08:54:00	170,578	good	mc_2769_data_p.cap
120	37SM31486-4700	07/11/2011 22:50	07/12/2011 04:35:00	07/12/2011 08:50:00	170,577	good	mc_4700_data_p.cap
135	37SM31486-3669	07/11/2011 22:36	07/12/2011 04:35:00	07/12/2011 08:52:00	170,577	good	mc_3669_data_p.cap
155	37SM31486-4701	07/11/2011 22:31	07/12/2011 04:15:00	07/12/2011 05:48:00	170,516	good	mc_4701_data_p.cap

The WHOTS-7 VMCM recovery information is provided in Table ZZZ [Sean]?

The fouling on the 300 kHz ADCP transducer faces (Figure 5) was minimal most likely due to the depth of deployment (125 m) as well as E-Paint anti-foulant grease used on the faces. The

transducer faces for the 47.5 m ADCP were also treated with anti-foulant grease and despite significant algae growth near the faces, the faces themselves did not show the same level of growth (Figure 6).

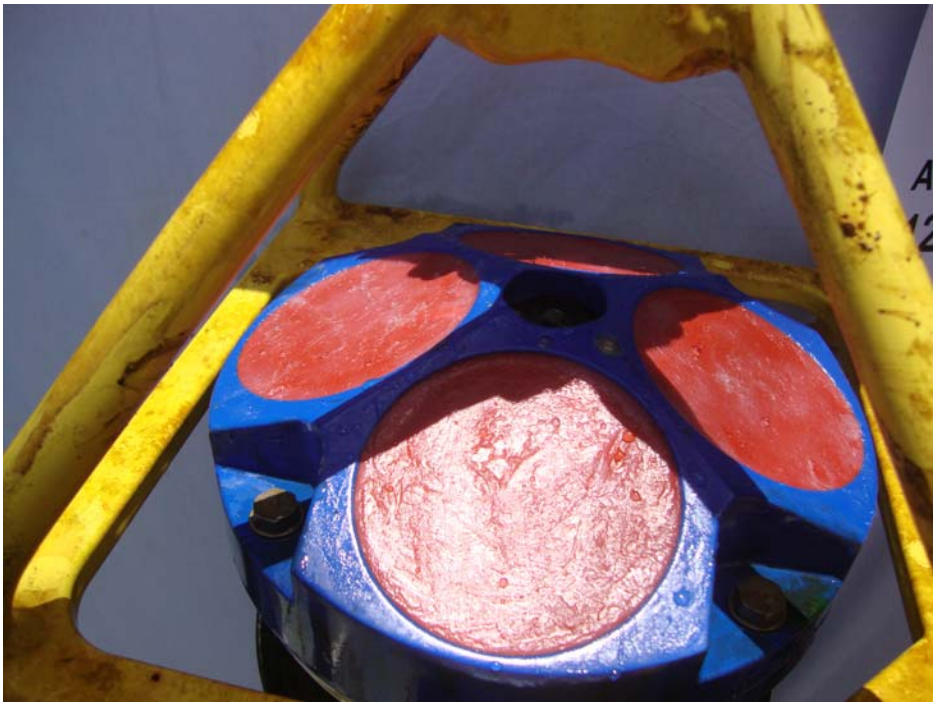


Figure 5. WHOTS-7 ADCP deployed at 125 m after recovery.

Figure 6. WHOTS-7 ADCP deployed at 47.5 m after recovery.

The data from the upward-looking 300 kHz ADCP at 125 m ends in April 2011. The instrument was not pinging upon recovery. The cause of this malfunction is still being investigated. The data file for the 300 kHz ADCP had to be repaired as it was not closed properly when the instrument stopped recording.

The repaired data file for the 300 kHz ADCP still needs further work before standard plots can be made. A sample, however, of u and v velocities are shown in Figures 7 and 8.

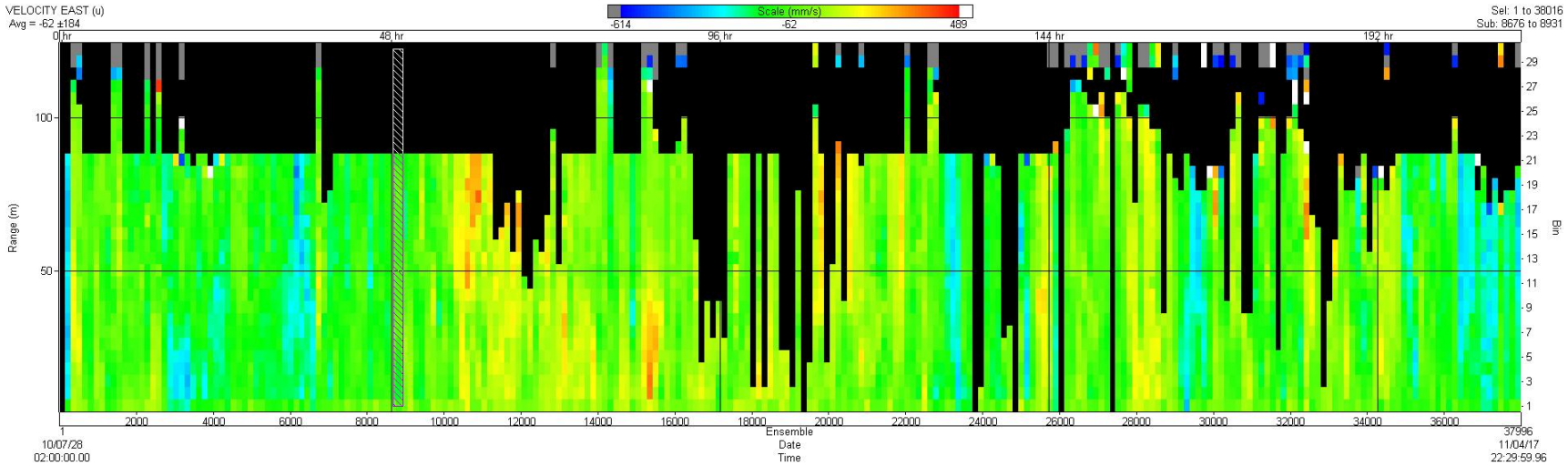


Figure 7. Sample of u velocity from the ADCP at 125 m depth on the WHOTS-7 mooring.

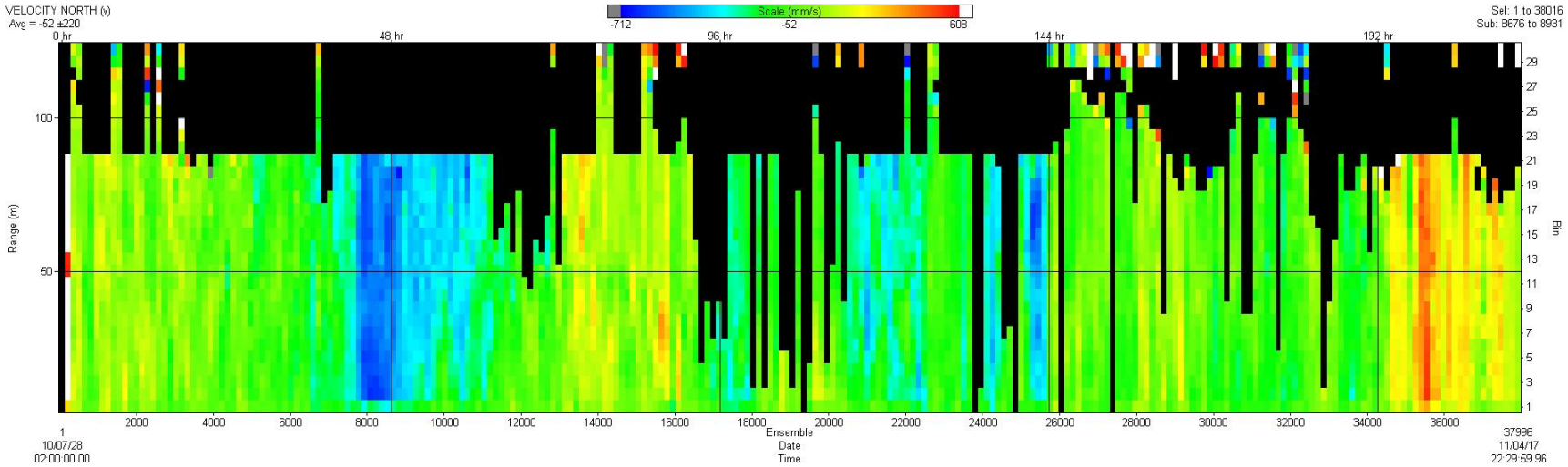


Figure 8. Sample of v velocity from the ADCP at 125 m depth on the WHOTS-7 mooring.

The data from the upward-looking 600 kHz ADCP at 47.5 m ends in April 2011. The instrument was not pinging upon recovery. Examination of the connectors on both the transducer and battery units showed corrosion (Figure 9). It appears that water may have leaked through those connectors and possibly caused the ADCP to stop recording data.

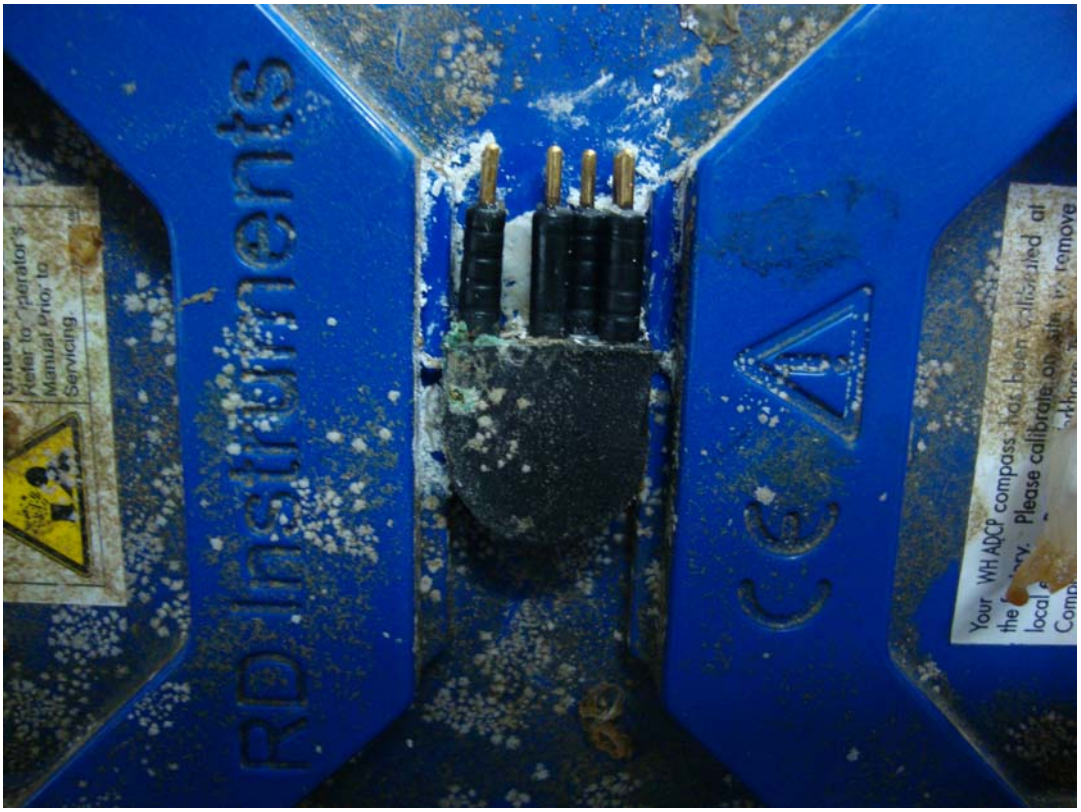


Figure 9: Connector corrosion on the 600 kHz ADCP.

Figure 10 shows the heading, pitch and roll information from the ADCP before the instrument failed.

Figure 11 shows the variations of the horizontal and vertical components of velocity in depth and time before the instrument failed.

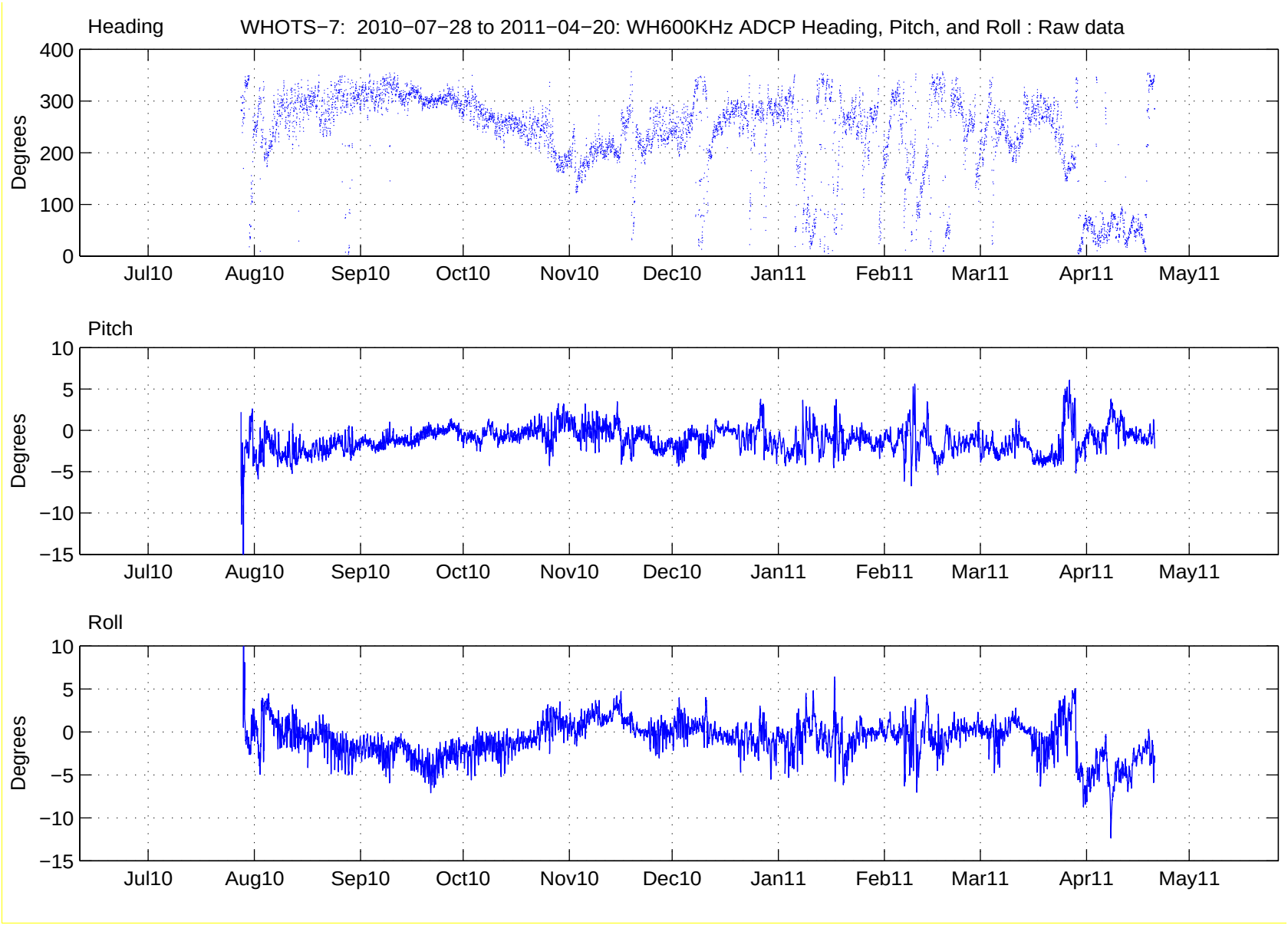


Figure 10. Heading, pitch and roll variations measured by the ADCP at 47.5 m depth on the WHOTS-7 mooring.

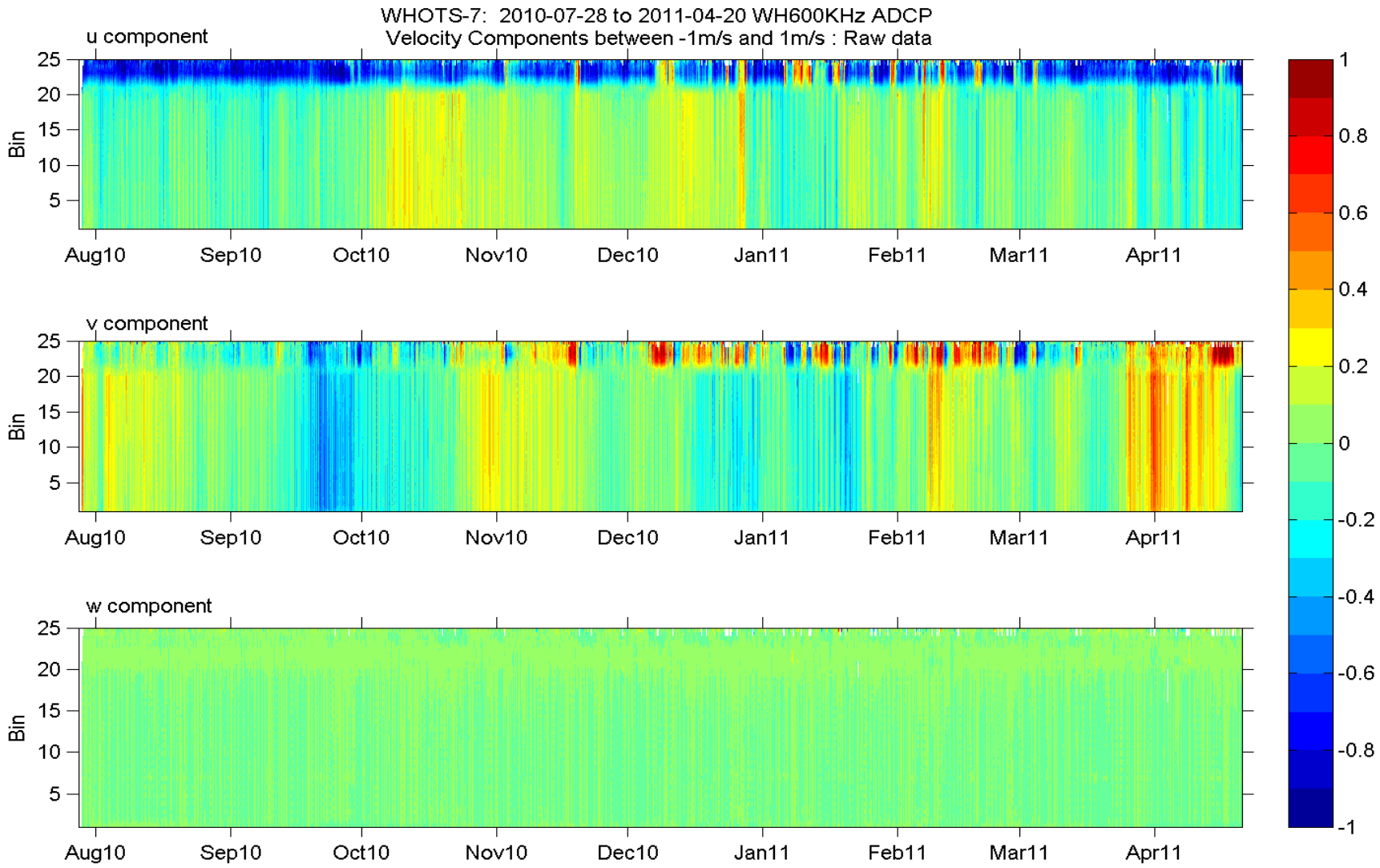


Figure 11. Time-series of eastward, northward and upward velocity components versus bin number measured by the ADCP at 47.5 m depth on the WHOTS-7 mooring. Height in meters above the transducer is approximately 2 times the bin number.

The MAVS at 20 m was downloaded via Flash memory. Figure 12 shows the pitch, roll, and temperature information from the MAVS. Computed u, v and w velocities appeared suspect after download. Figure 13 shows the raw velocities from each of the four acoustic transducers and it appears that two of the transducers (B and D) failed at the beginning of the record. This issue will have to be further investigated.

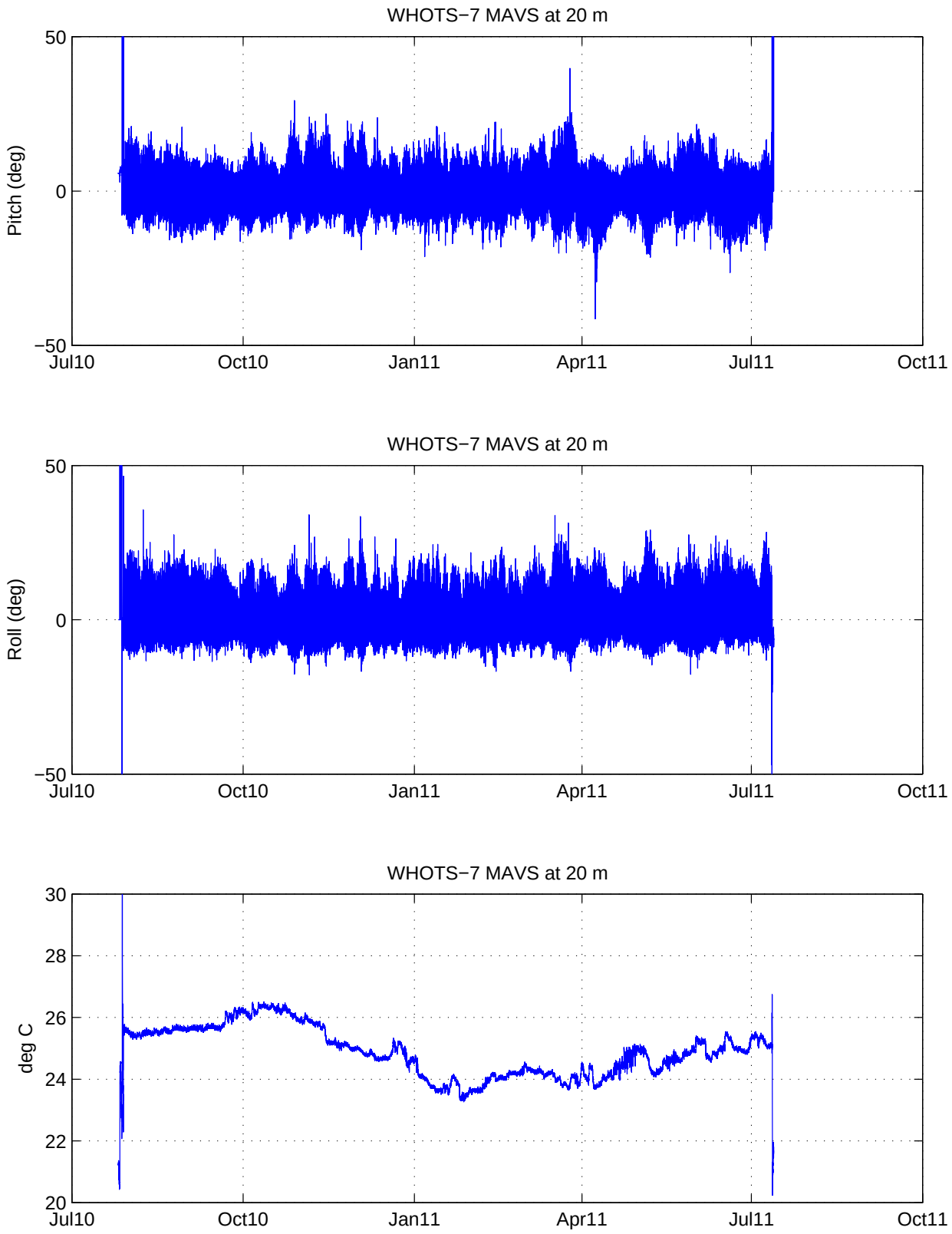


Figure 12. Pitch, roll and temperature variations measured by the MAVS at 20 m depth on the WHOTS-7 mooring.

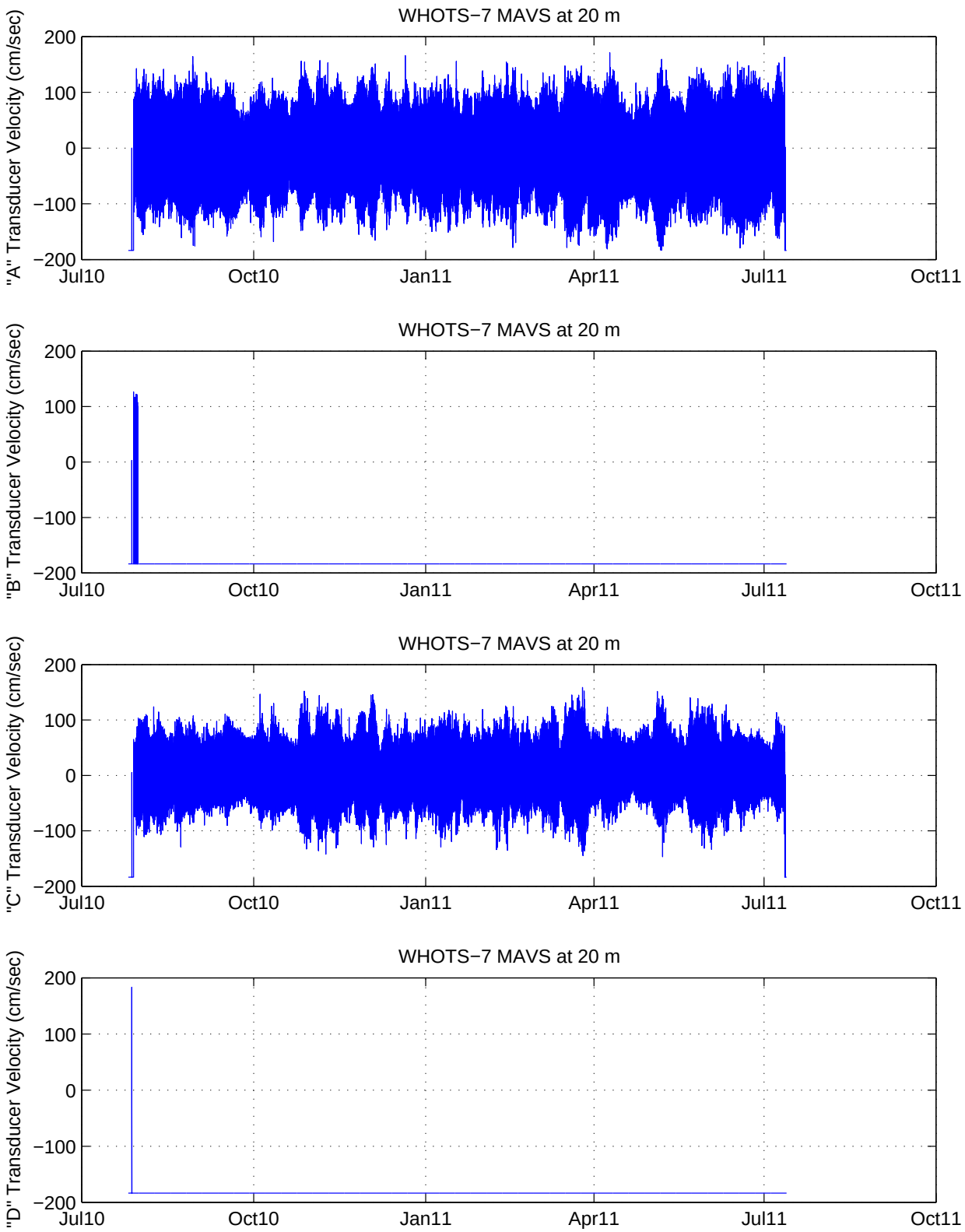


Figure 13. Time-series of the raw acoustic velocity measured by each transducer from the MAVS at 20 m depth on the WHOTS-7 mooring.

B. CTD Stations

UH provided CTD and water sampling equipment, including a Seabird 9/11+ CTD sampling pressure, dual temperature, dual conductivity and dual oxygen sensors at 24 Hz. Seabird sensors used by UH routinely as part of the Hawaii Ocean Time-series were used to more easily tie the WHOTS cruise data into the HOT CTD dataset. The CTD was installed inside a twelve-place General Oceanics rosette with six 5-liter Niskin sampling bottles controlled by a Seabird carousel.

Table 6. CTD stations occupied during the WHOTS-8 cruise.

Station/cast	Date	Time (UTC)	Location	Maximum pressure (dbar)
Test	7/6/11	06:05	21° 27.98´ N, 158° 20.70´ W	1020
52 / 1	7/7/11	16:07	22° 40.57´ N, 157° 58.97´ W	500
52 / 2	7/7/11	19:36	22° 40.65´ N, 157° 59.03´ W	500
52 / 3	7/7/11	23:45	22° 40.88´ N, 157° 59.14´ W	500
52 / 4	7/8/11	03:50	22° 40.93´ N, 157° 59.14´ W	500
52 / 5	7/8/11	07:31	22° 40.49´ N, 157° 59.66´ W	500
50 / 1	7/9/11	15:43	22° 46.56´ N, 157° 55.95´ W	500
50 / 2	7/9/11	19:37	22° 46.57´ N, 157° 56.01´ W	500
50 / 3	7/9/11	23:36	22° 47.00´ N, 157° 55.87´ W	500
50 / 4	7/10/11	03:42	22° 47.00´ N, 157° 55.66´ W	500
50 / 5	7/10/11	07:32	22° 46.84´ N, 157° 55.90´ W	1020
51 / 1	7/12/11	16:15	22° 47.85´ N, 157° 49.96´ W	1020
50 / 6	7/12/11	18:06	22° 46.90´ N, 157° 56.09´ W	1020
2 / 1	7/12/11	19:47	22° 44.95´ N, 158° 00.00´ W	1020
52 / 6	7/12/11	21:46	22° 40.97´ N, 157° 59.02´ W	1020
53 / 1	7/12/11	23:53	22° 40.02´ N, 158° 05.04´ W	1020

Eleven CTD casts were conducted from July 6 – 10 at station 50 (near the WHOTS-7 buoy), station 52 (near the WHOTS-8 buoy) and at a test station. Five CTD casts were conducted to obtain profiles for comparison with subsurface instruments on the WHOTS-7 mooring before recovery, and five casts were conducted for comparison with the WHOTS-8 mooring after deployment. These were sited approximately 200 to 500 m from the buoys. The comparison casts consisted of 4 yo-yo cycles between 10 dbar and 200 dbar and then to 500 dbar (5th yo-yo cycle of each cast) except for the last cast at station 50 which went to 1000 dbar. Station numbers were assigned following the convention used during HOT cruises.

Additionally, five more CTD casts were conducted on July 12th as part of a survey through an anti-cyclonic eddy that had been monitored during the cruise while on station. The survey utilized five stations (Figure 14). Station 51 was located northeast of the WHOTS mooring sites in an attempt to assess the center of the eddy. Station 53 was located southwest of the WHOTS

mooring sites to assess the area outside of the eddy. Station 2 is the center of Station ALOHA; the primary site for HOT cruise work and will be reoccupied by a HOT cruise on July 19th. Stations 50 and 52 were the same sites used for the comparison work conducted July 7-10 and provided an opportunity for a temporal comparison of both the eddy and subsurface instruments on the WHOTS-8 mooring. All CTD casts conducted as part of the eddy survey were to 1000 meters.

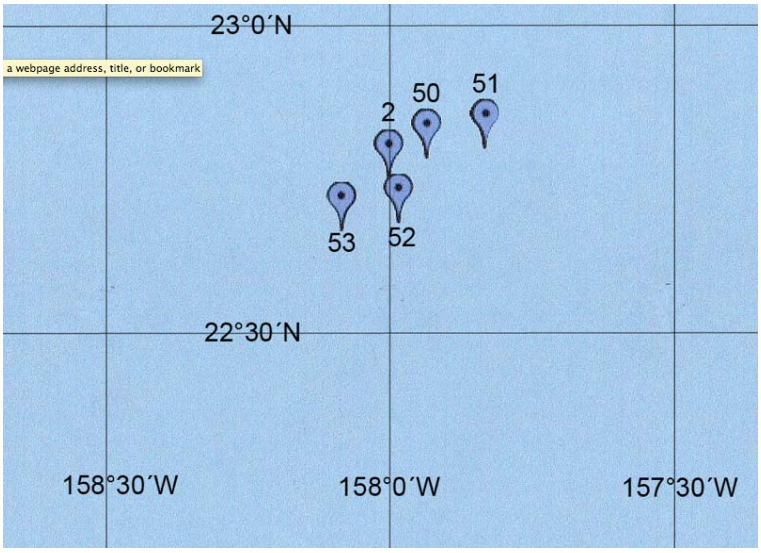


Figure 14. General map of hydrographic survey on 12 July 2011.

Table 6 provides summary information for all CTD casts, and figures B1-B9 show the water column profile information that was obtained.

Water samples were taken from all casts; 4-5 samples for both the 500 dbar and 1000 dbar casts. These samples will be analyzed for salinity and used to calibrate the CTD conductivity sensors.

C. Thermosalinograph

R/V *Hi'ialakai* has an underway seawater system that includes an internal Seabird Seacat thermosalinograph (TSG) model SBE-21, with an SBE-38 external temperature sensor. Thermosalinograph data and calibration information will be received from the Survey Technician following the cruise.

D. Shipboard ADCPs

R/V *Hi'ialakai* ADCP data will be received from the Survey Technician following the cruise.

Appendix A. Moored C-T Time Series Figures

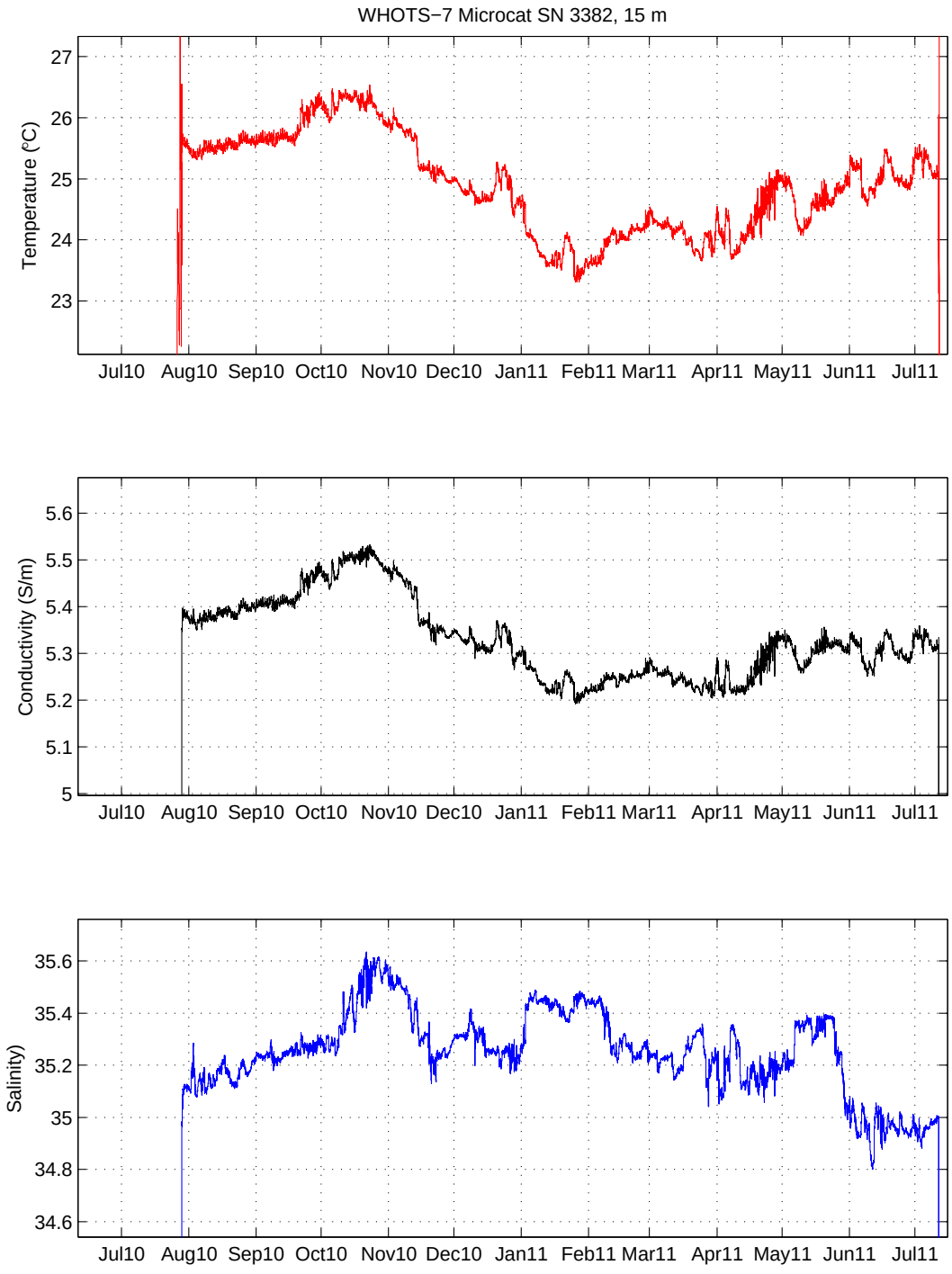


Figure A1. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3382 deployed at 15 m on the WHOTS-7 mooring. Nominal pressure was used to calculate salinity.

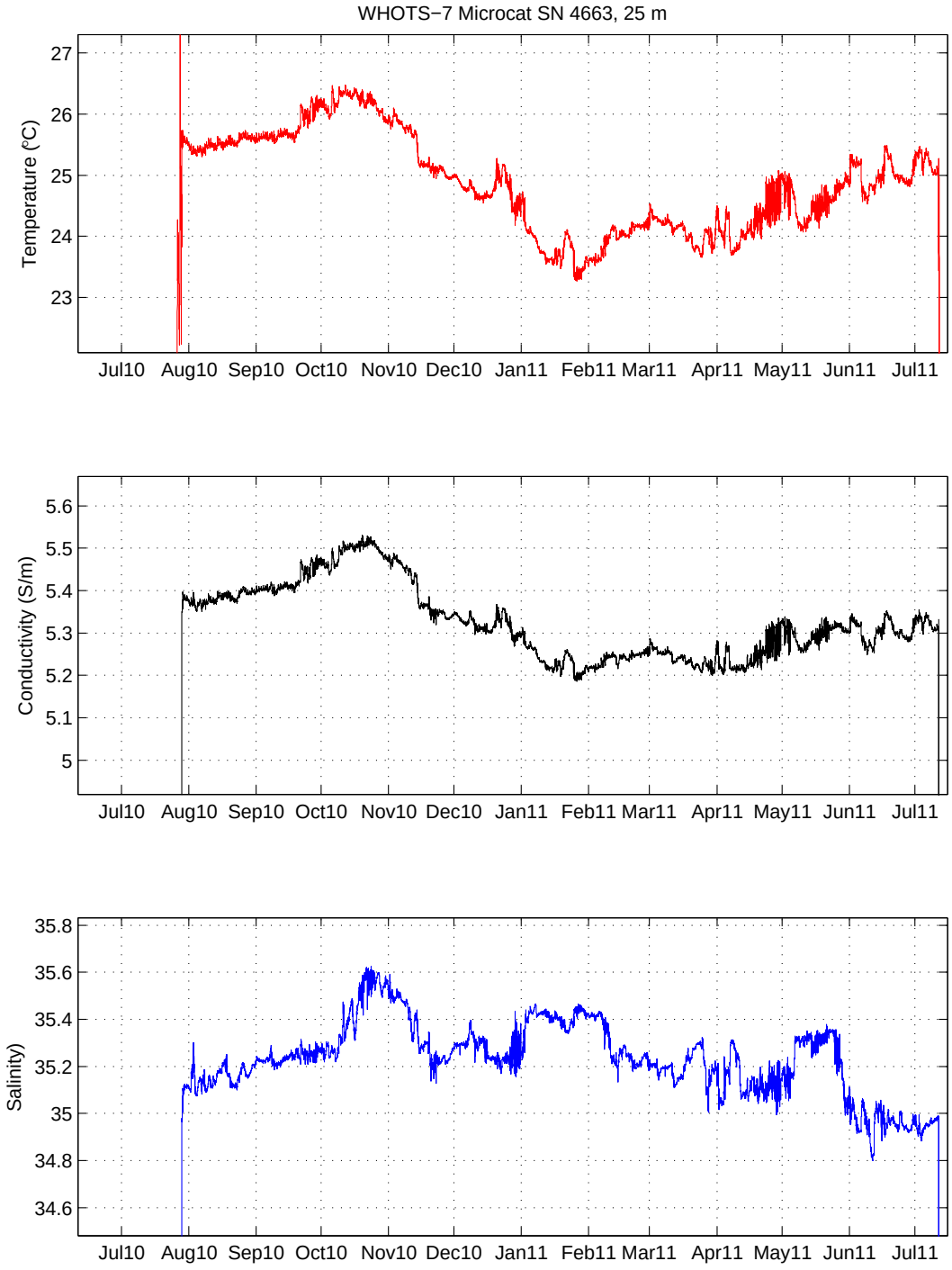


Figure A2. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 4663 deployed at 25 m on the WHOTS-7 mooring. Nominal pressure was used to calculate salinity.

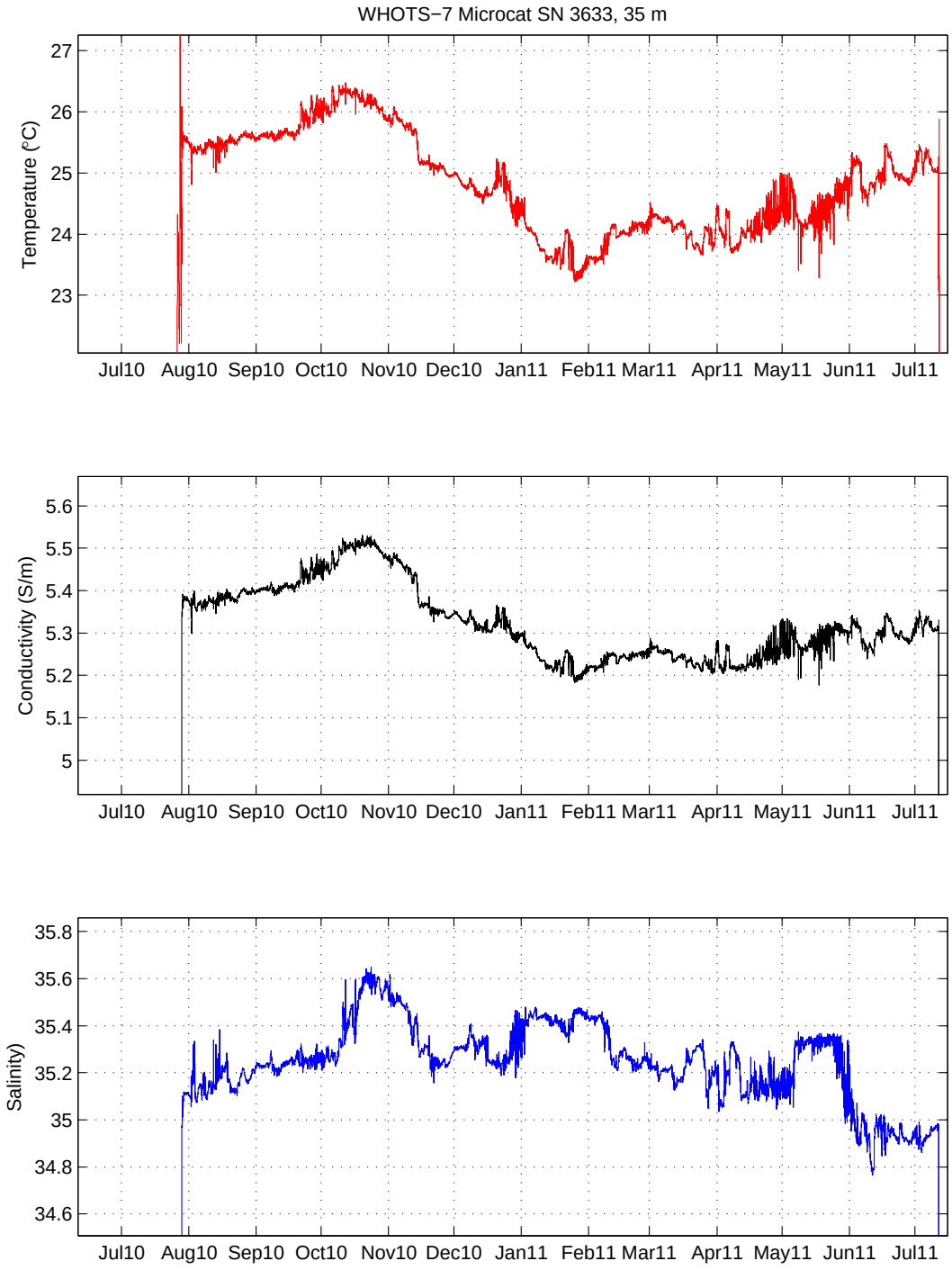


Figure A3. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3633 deployed at 35 m on the WHOTS-7 mooring. Nominal pressure was used to calculate salinity.

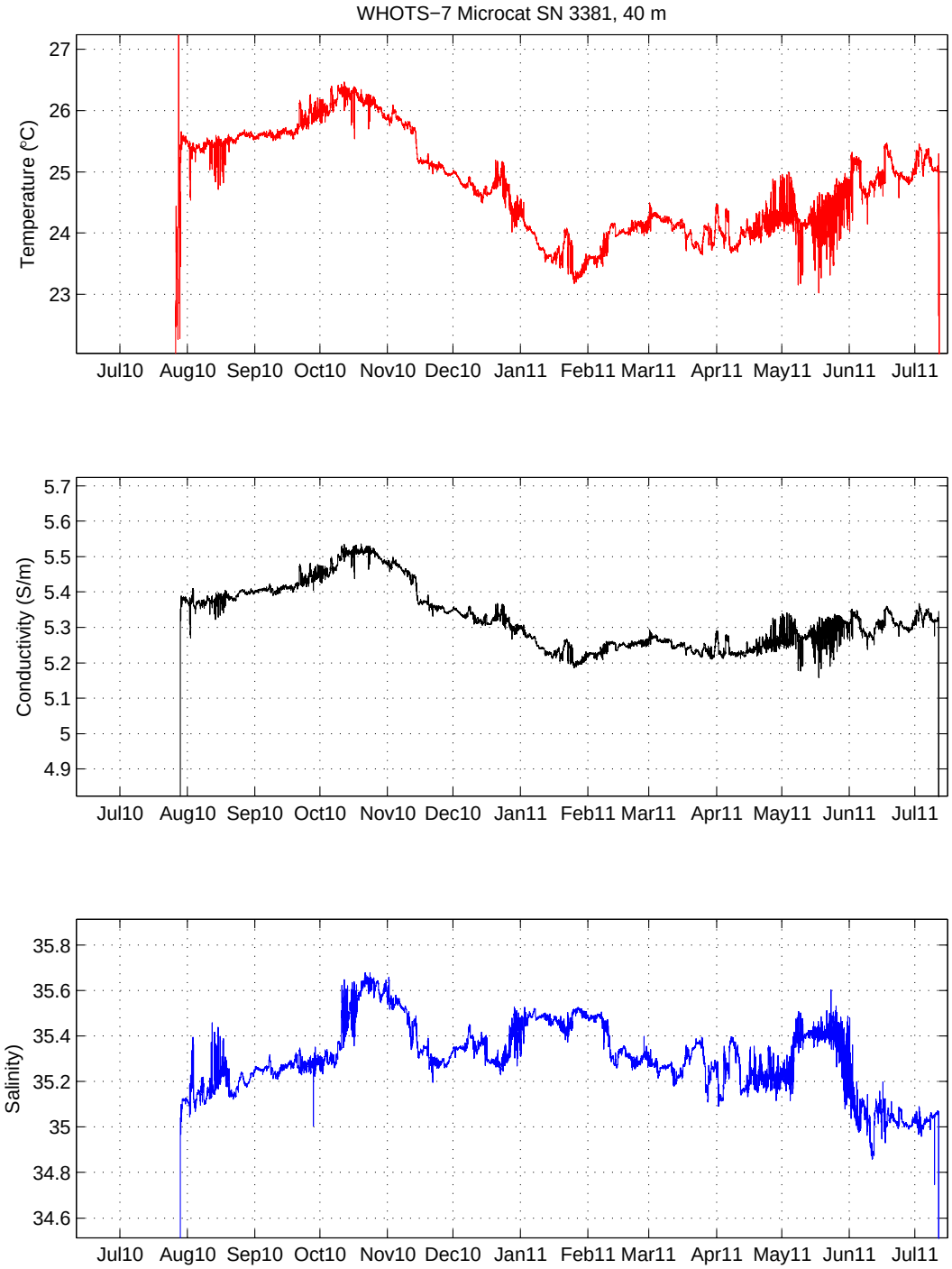


Figure A4. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3381 deployed at 40 m on the WHOTS-7 mooring. Nominal pressure was used to calculate salinity.

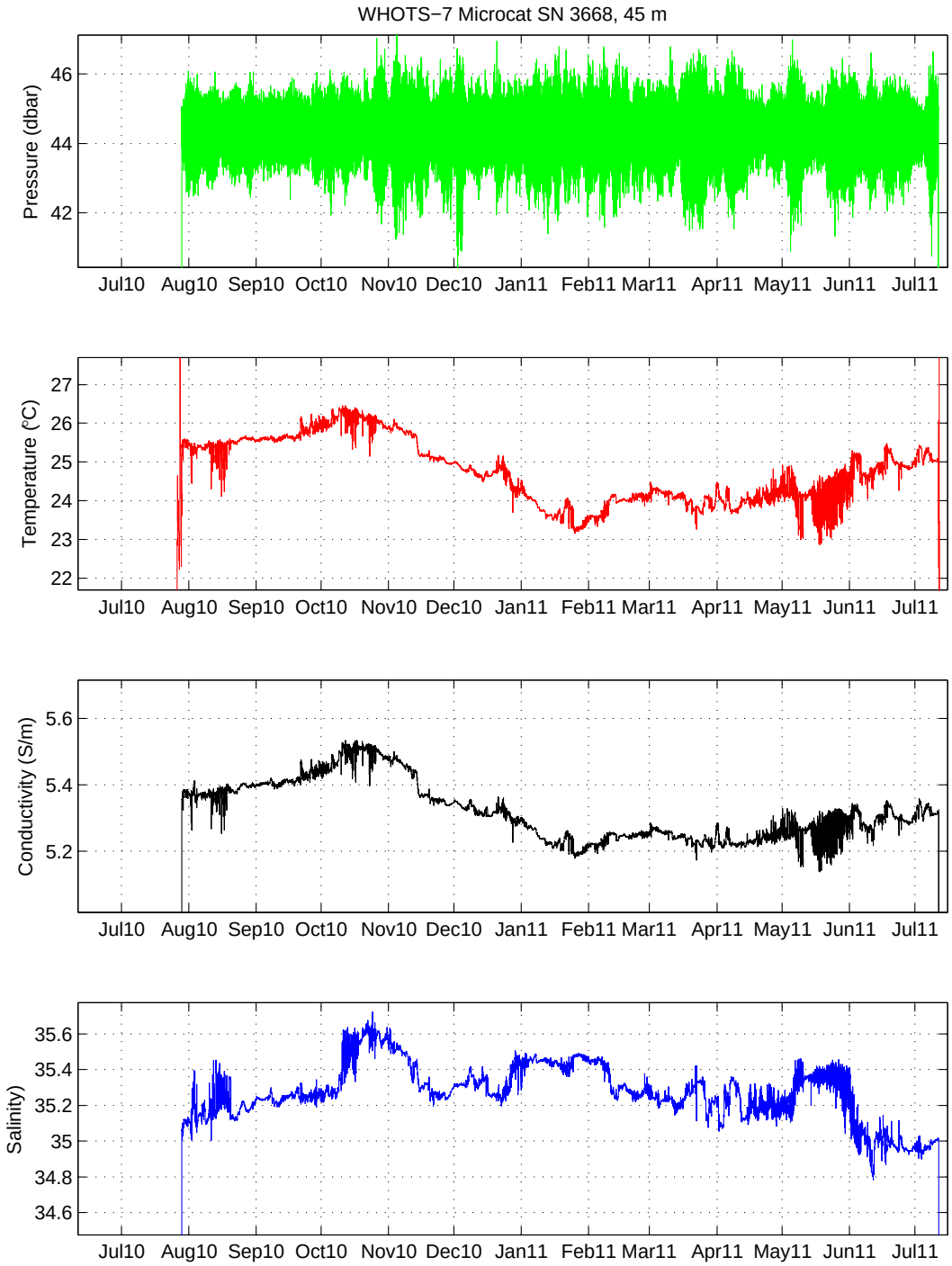


Figure A5. Preliminary pressure, temperature, conductivity and salinity from Microcat SBE-37 SN 3668 deployed at 45 m on the WHOTS-7 mooring.

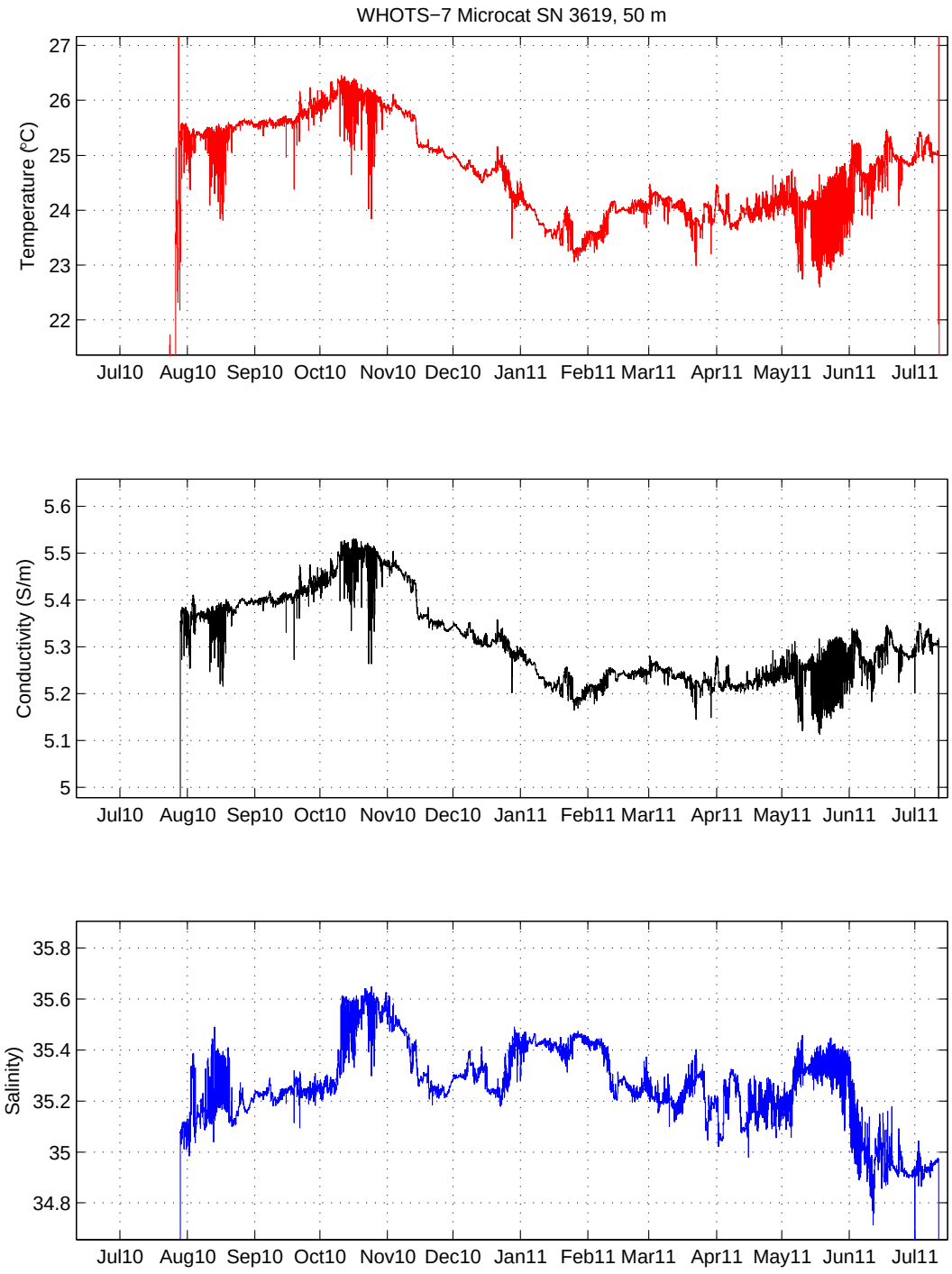


Figure A6. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3619 deployed at 50 m on the WHOTS-7 mooring. Nominal pressure was used to calculate salinity.

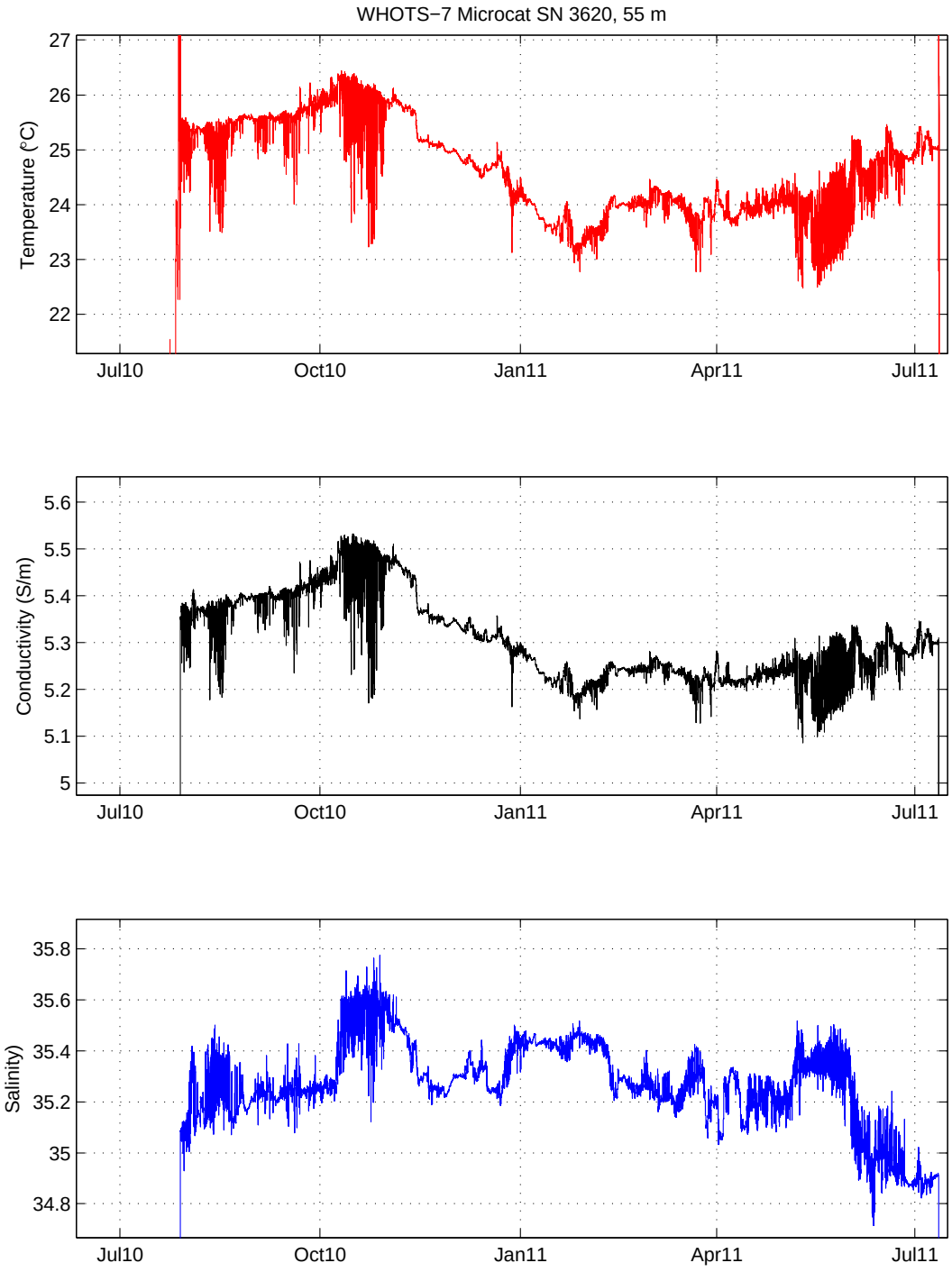


Figure A7. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3620 deployed at 55 m on the WHOTS-7 mooring. Nominal pressure was used to calculate salinity.

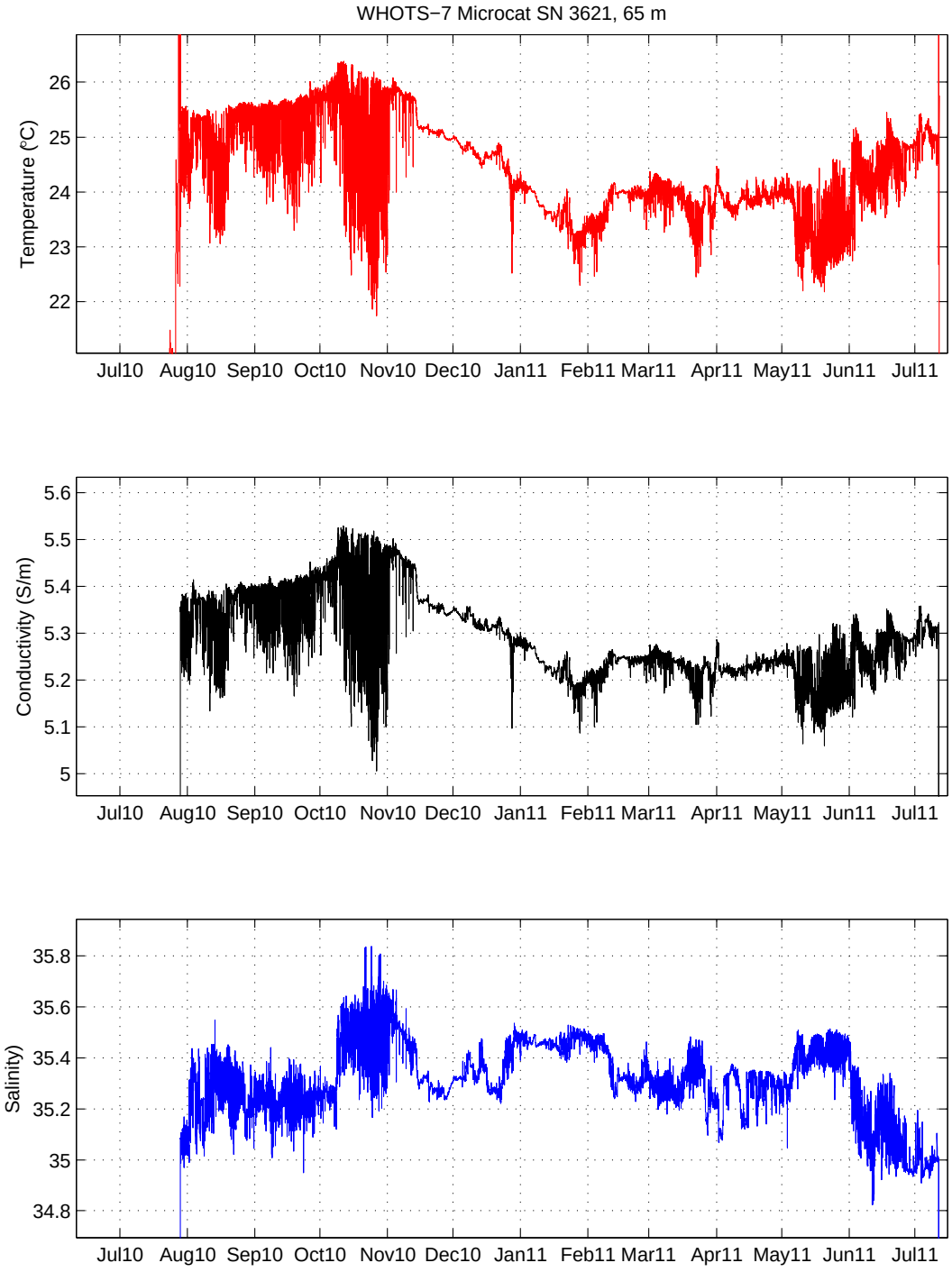


Figure A8. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3621 deployed at 65 m on the WHOTS-7 mooring. Nominal pressure was used to calculate salinity.

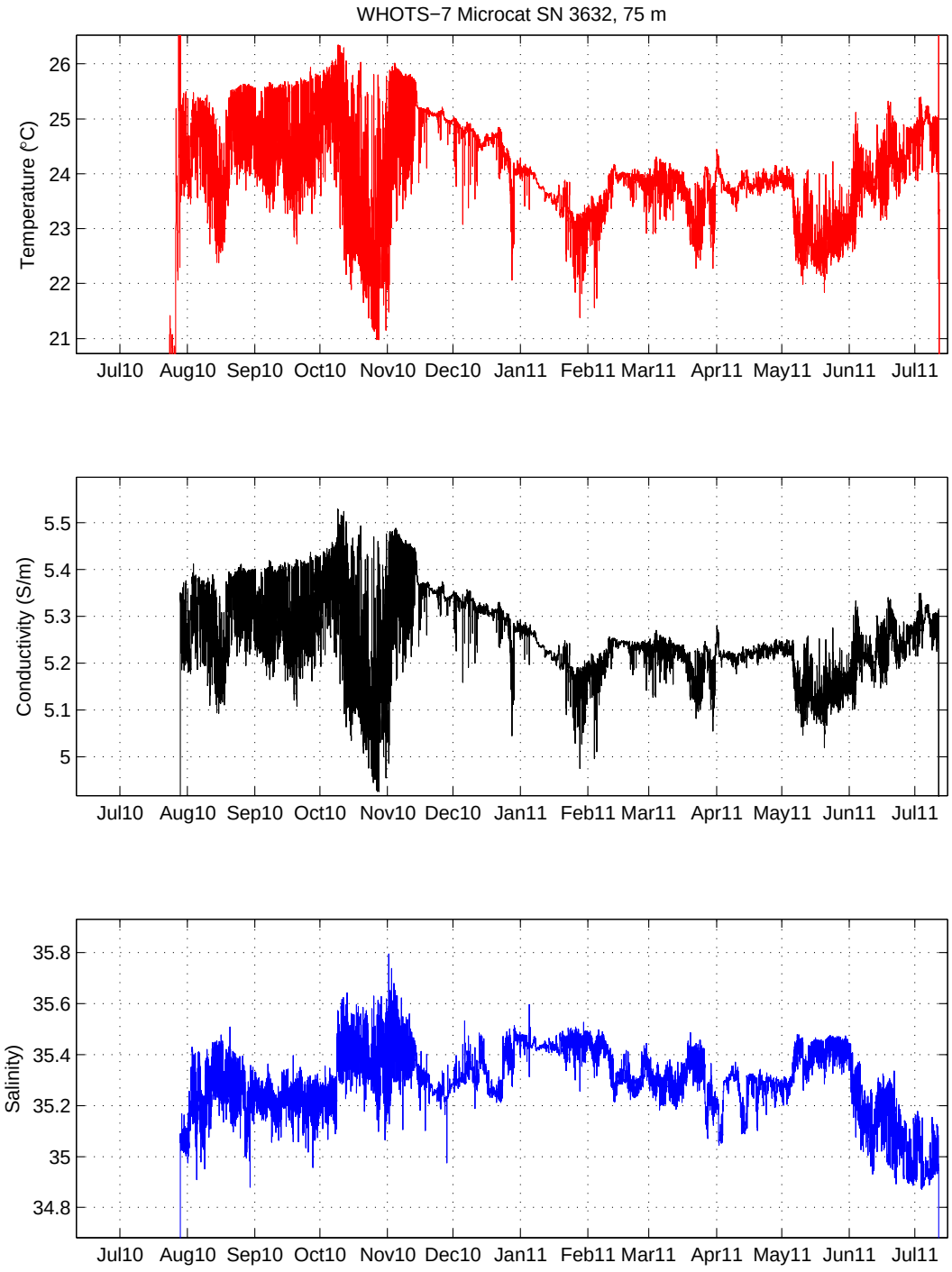


Figure A9. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3632 deployed at 75 m on the WHOTS-7 mooring. Nominal pressure was used to calculate salinity.

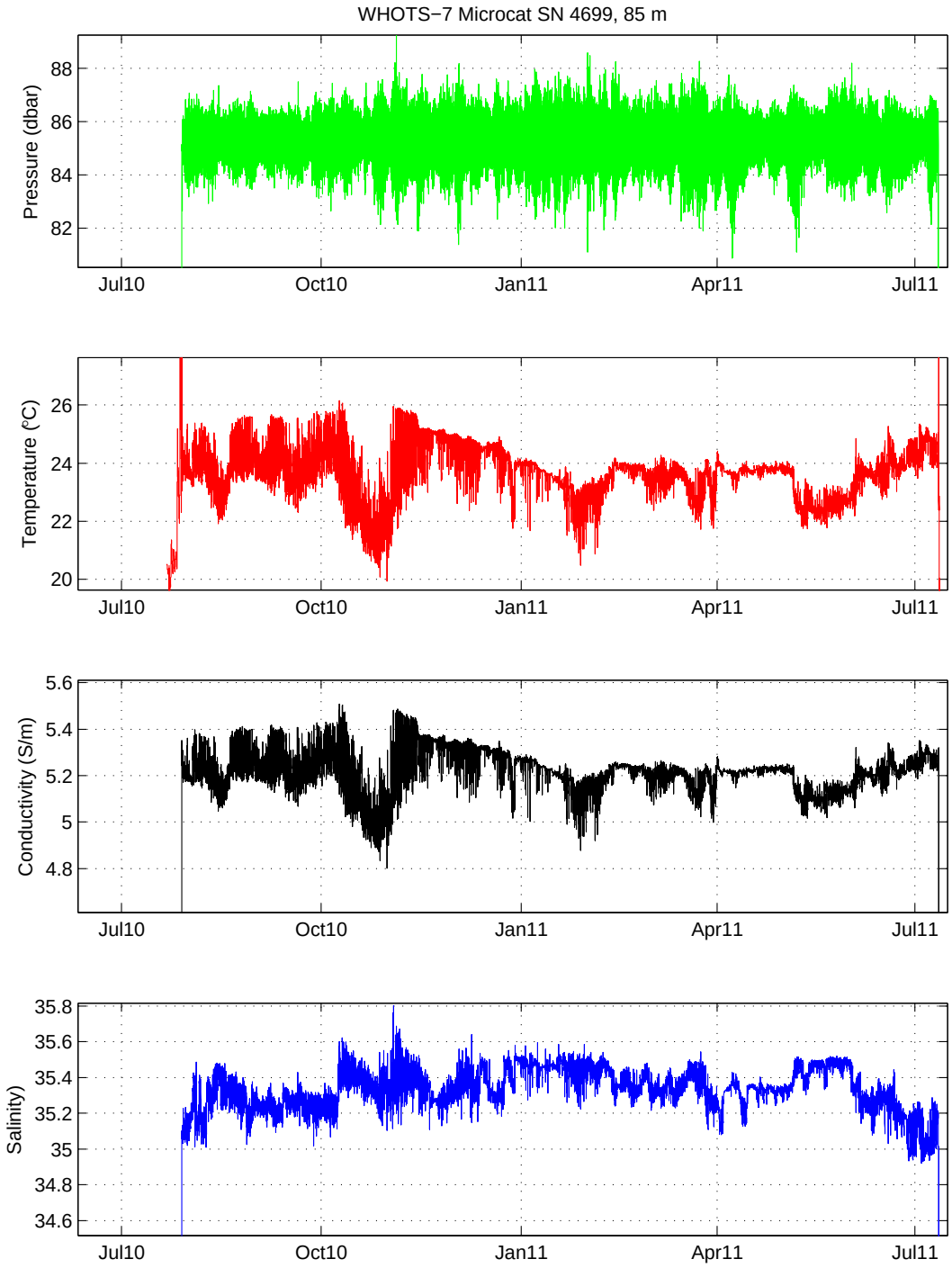


Figure A10. Preliminary pressure, temperature, conductivity and salinity from Microcat SBE-37 SN 4699 deployed at 85 m on the WHOTS-7 mooring.

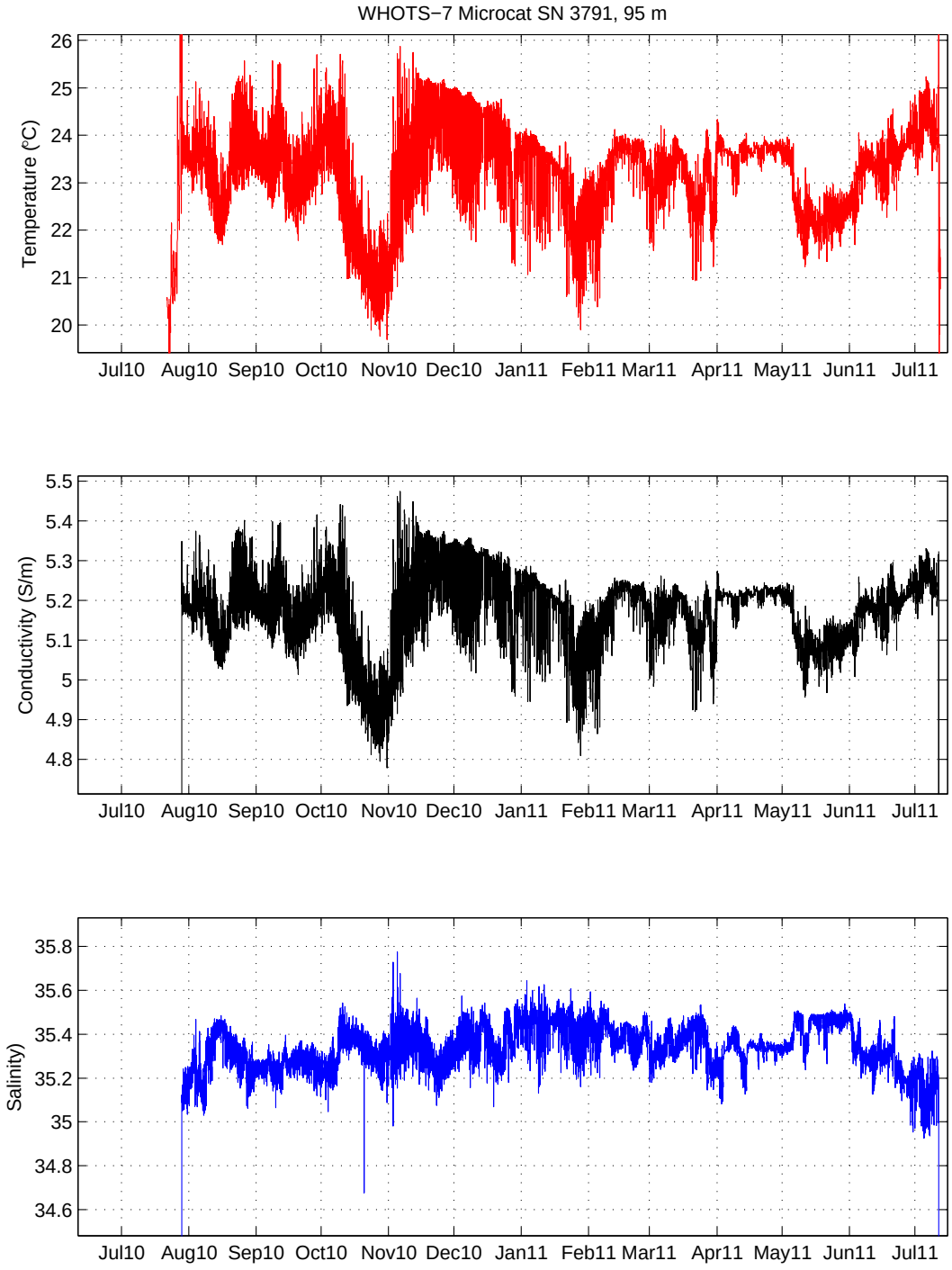


Figure A11. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3791 deployed at 95 m on the WHOTS-7 mooring. Nominal pressure was used to calculate salinity.

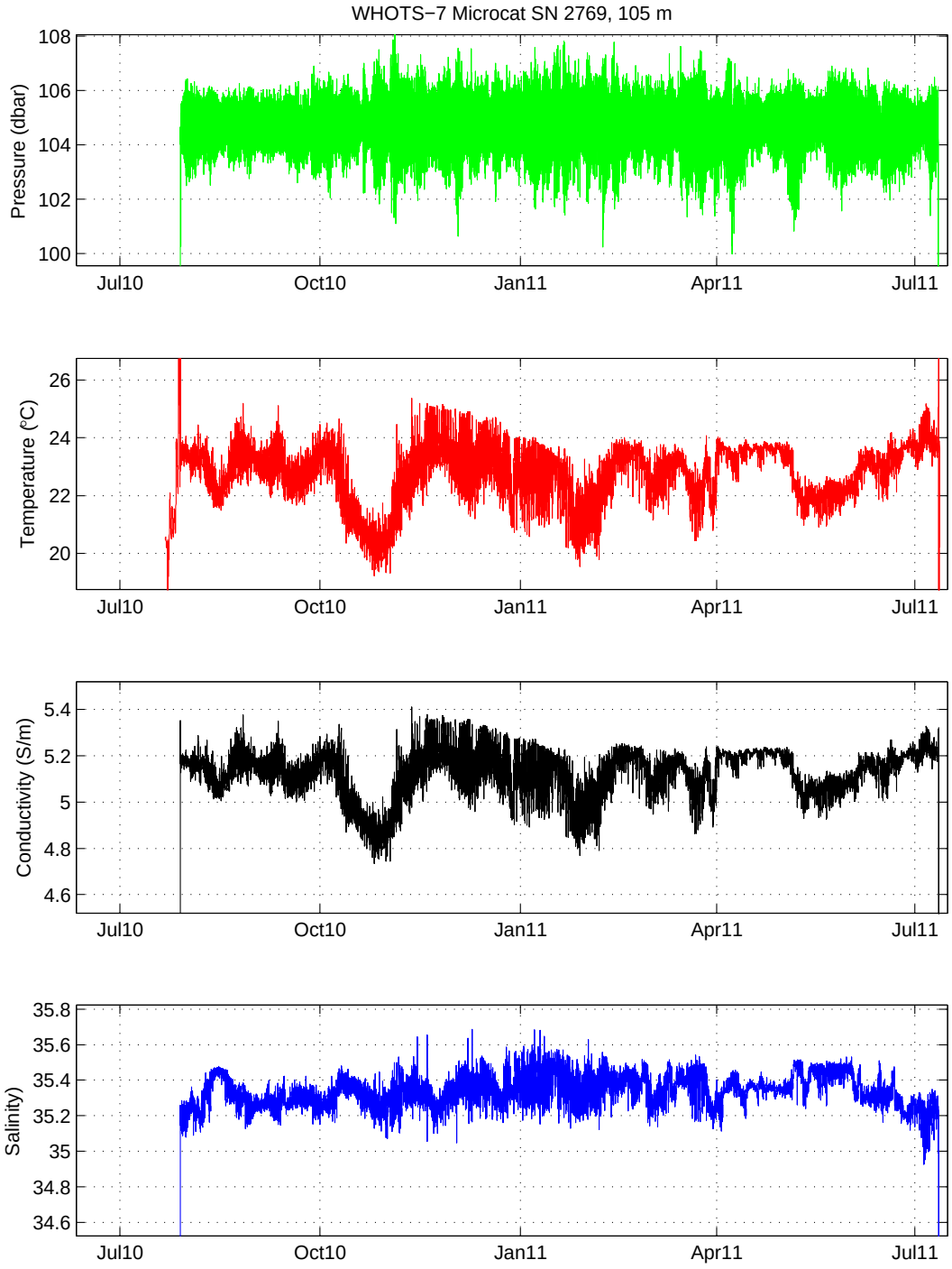


Figure A12. Preliminary pressure, temperature, conductivity and salinity from Microcat SBE-37 SN 2769 deployed at 105 m on the WHOTS-7 mooring.

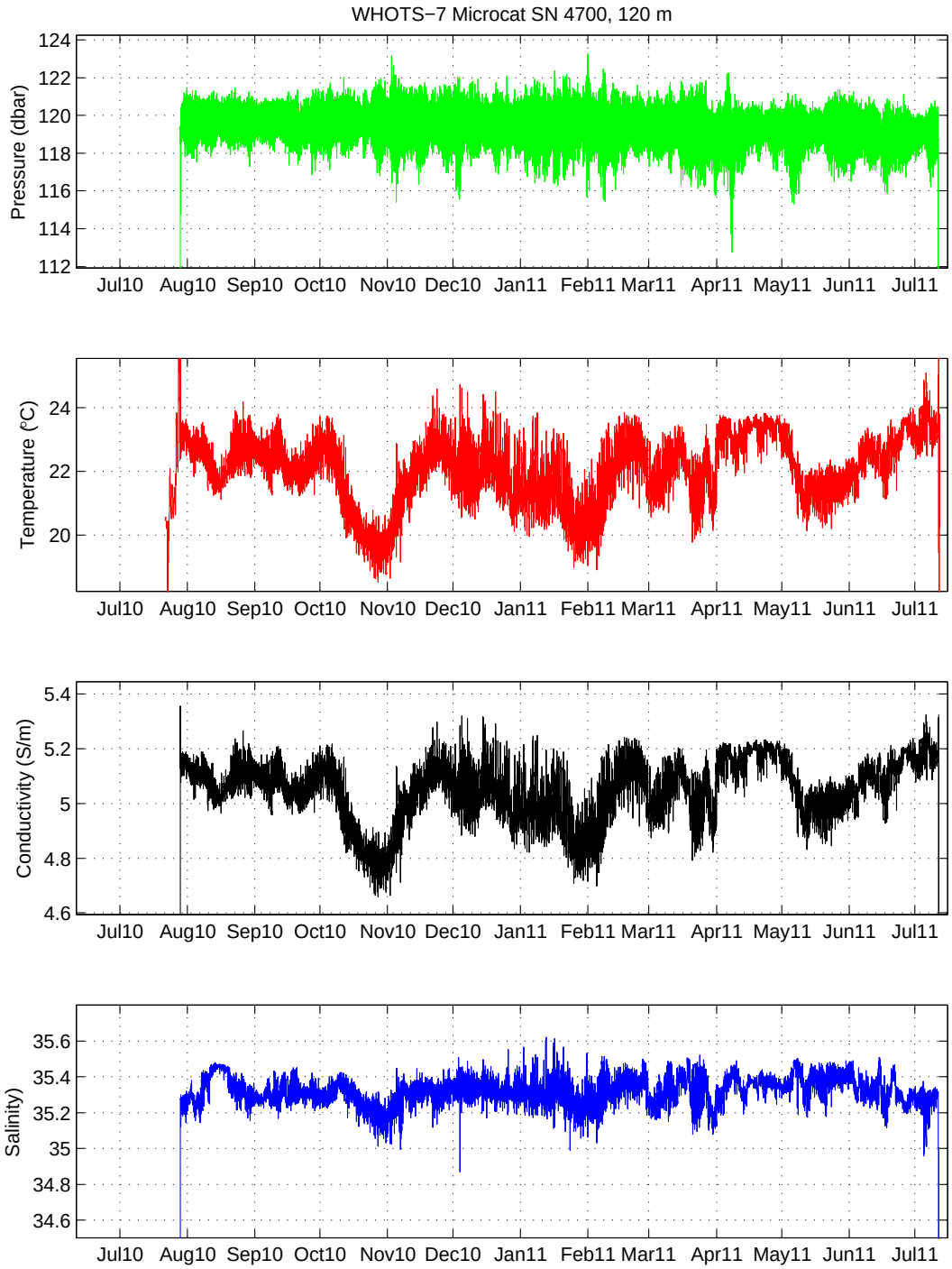


Figure A13. Preliminary pressure, temperature, conductivity and salinity from Microcat SBE-37 SN 4700 deployed at 120 m on the WHOTS-7 mooring.

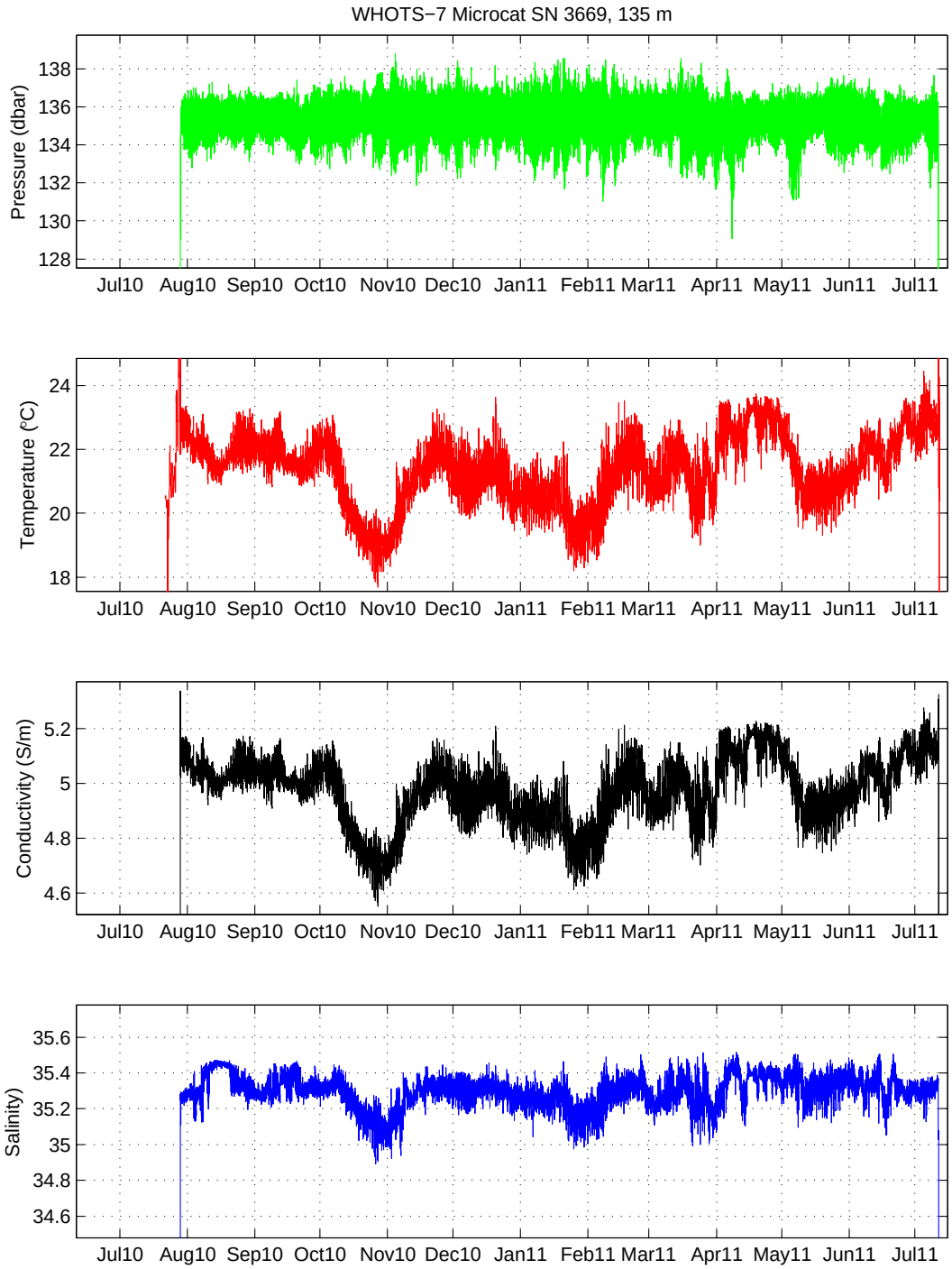


Figure A14. Preliminary pressure, temperature, conductivity and salinity from Microcat SBE-37 SN 3669 deployed at 135 m on the WHOTS-7 mooring.

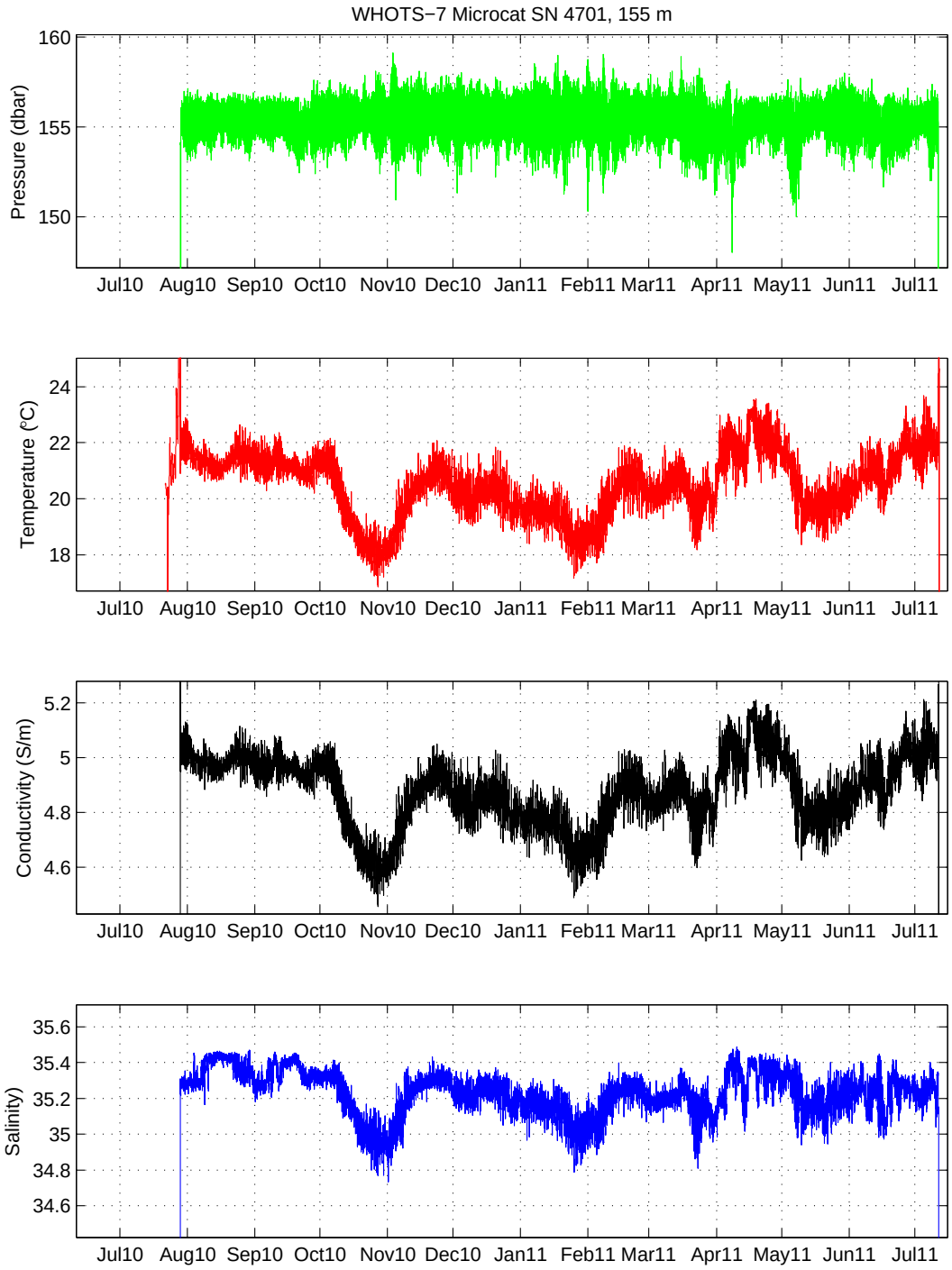


Figure A15. Preliminary pressure, temperature, conductivity and salinity from Microcat SBE-37 SN 4701 deployed at 155 m on the WHOTS-7 mooring.

Appendix B. CTD Casts Figures

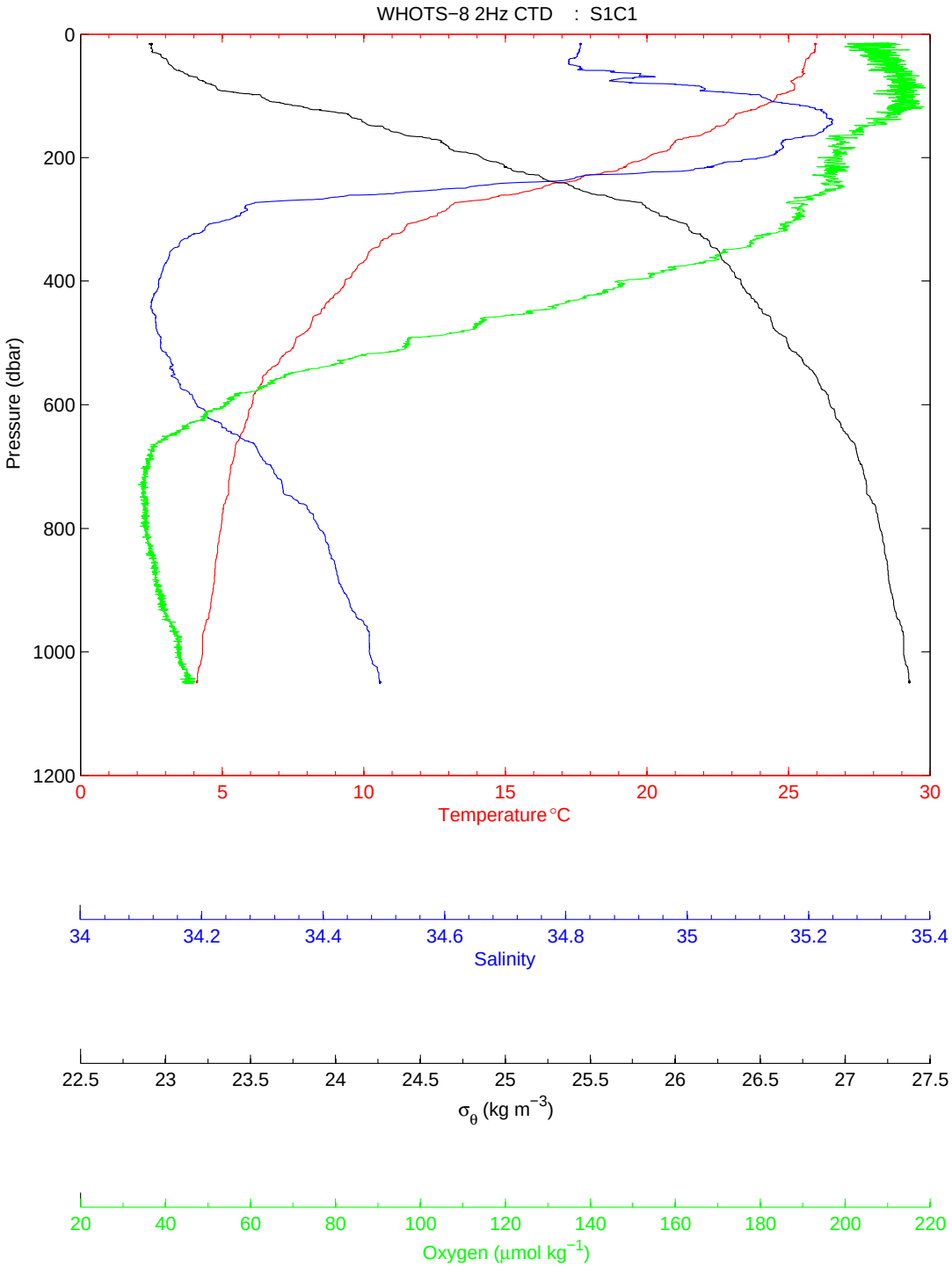


Figure B1. Profiles of 2 Hz temperature, salinity, potential density and oxygen data during test CTD station.

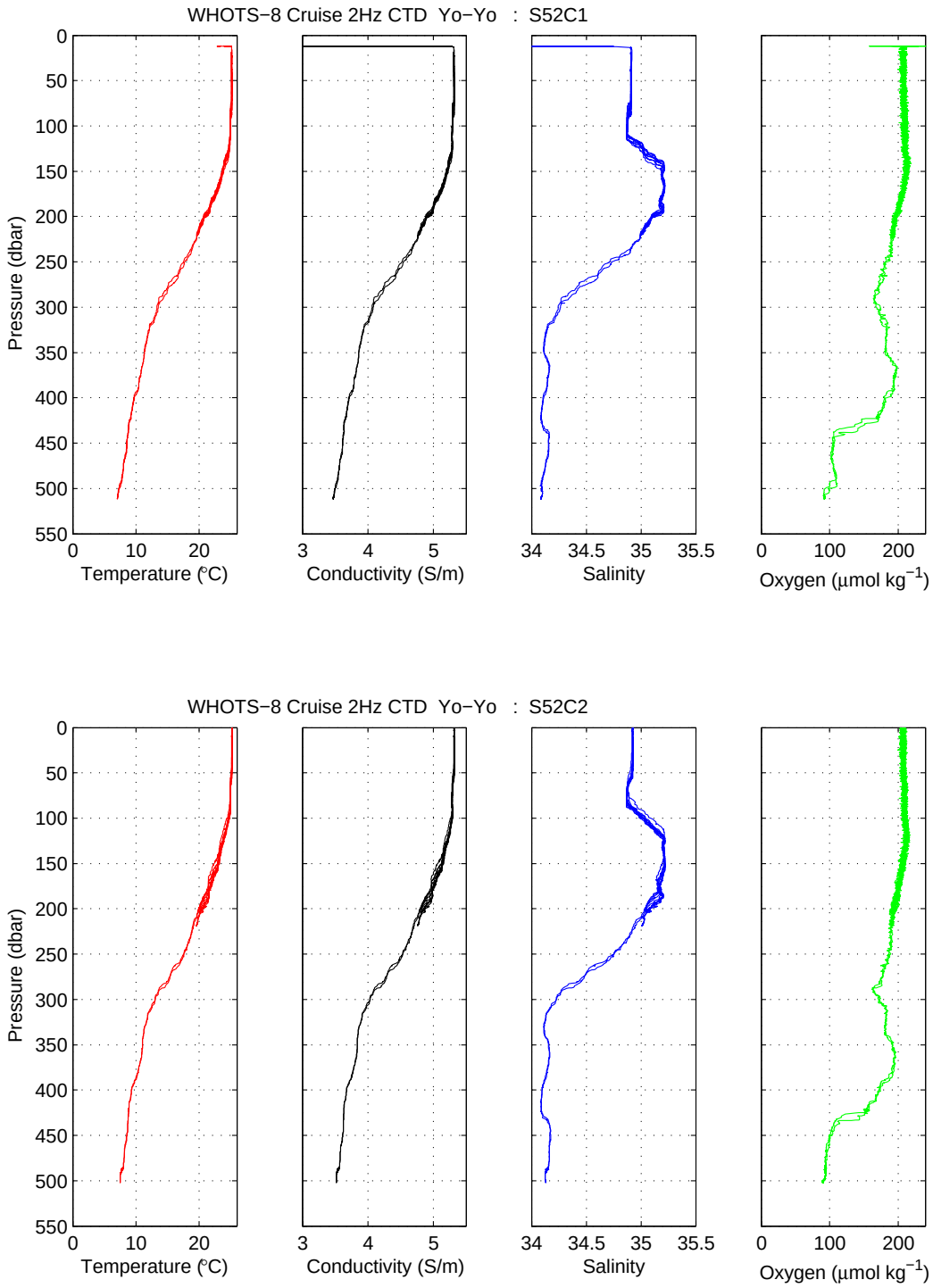


Figure B2. Profiles of 2 Hz temperature, conductivity, salinity, and oxygen data during S52C1 and S52C2.

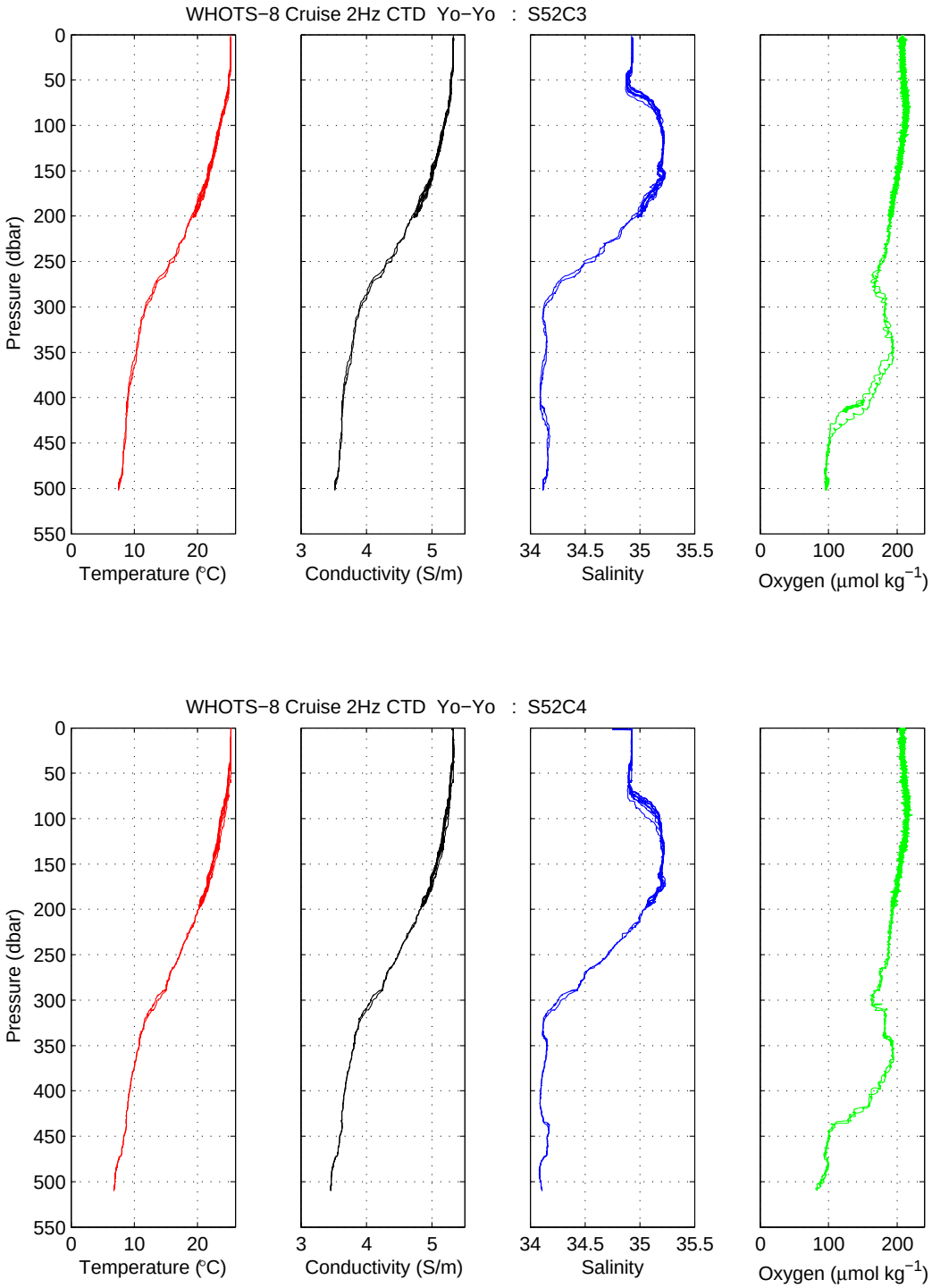


Figure B3. Profiles of 2 Hz temperature, conductivity, salinity and oxygen data during S52C3 and S52C4.

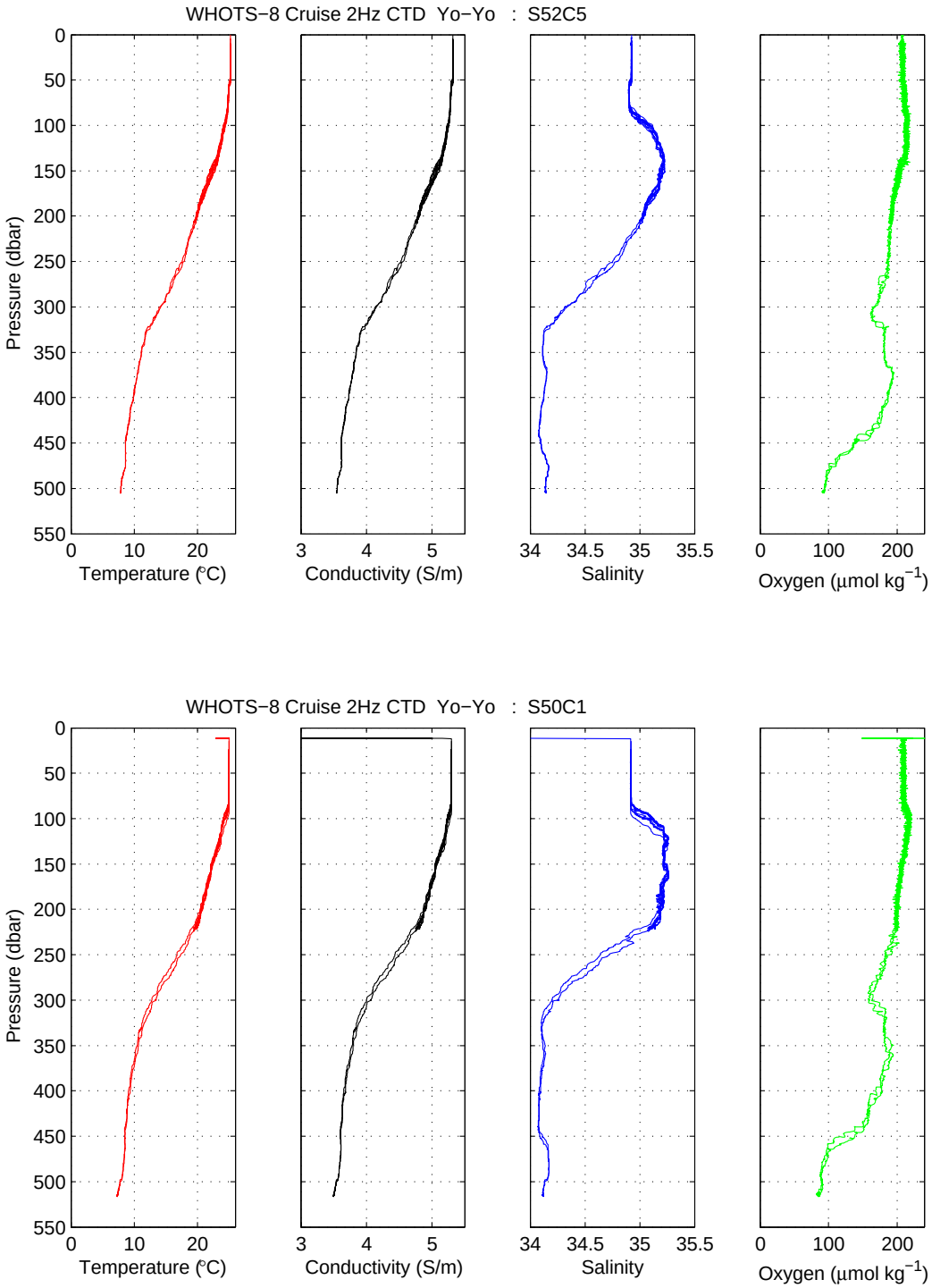


Figure B4. Profiles of 2 Hz temperature, conductivity, salinity and oxygen data during S52C5 and S50C1.

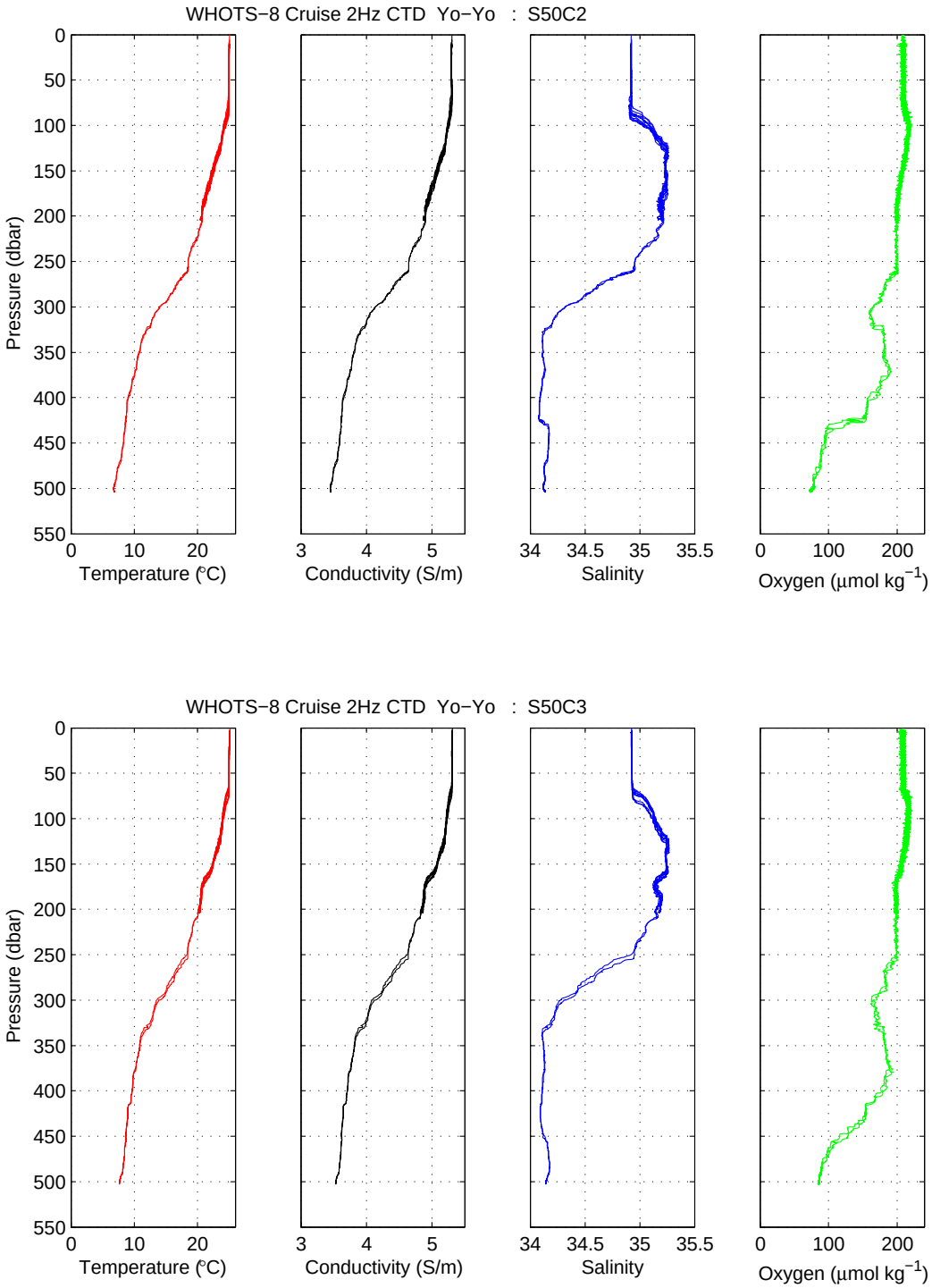


Figure B5. Profiles of 2 Hz temperature, conductivity, salinity and oxygen data during S50C2 and S50C3.

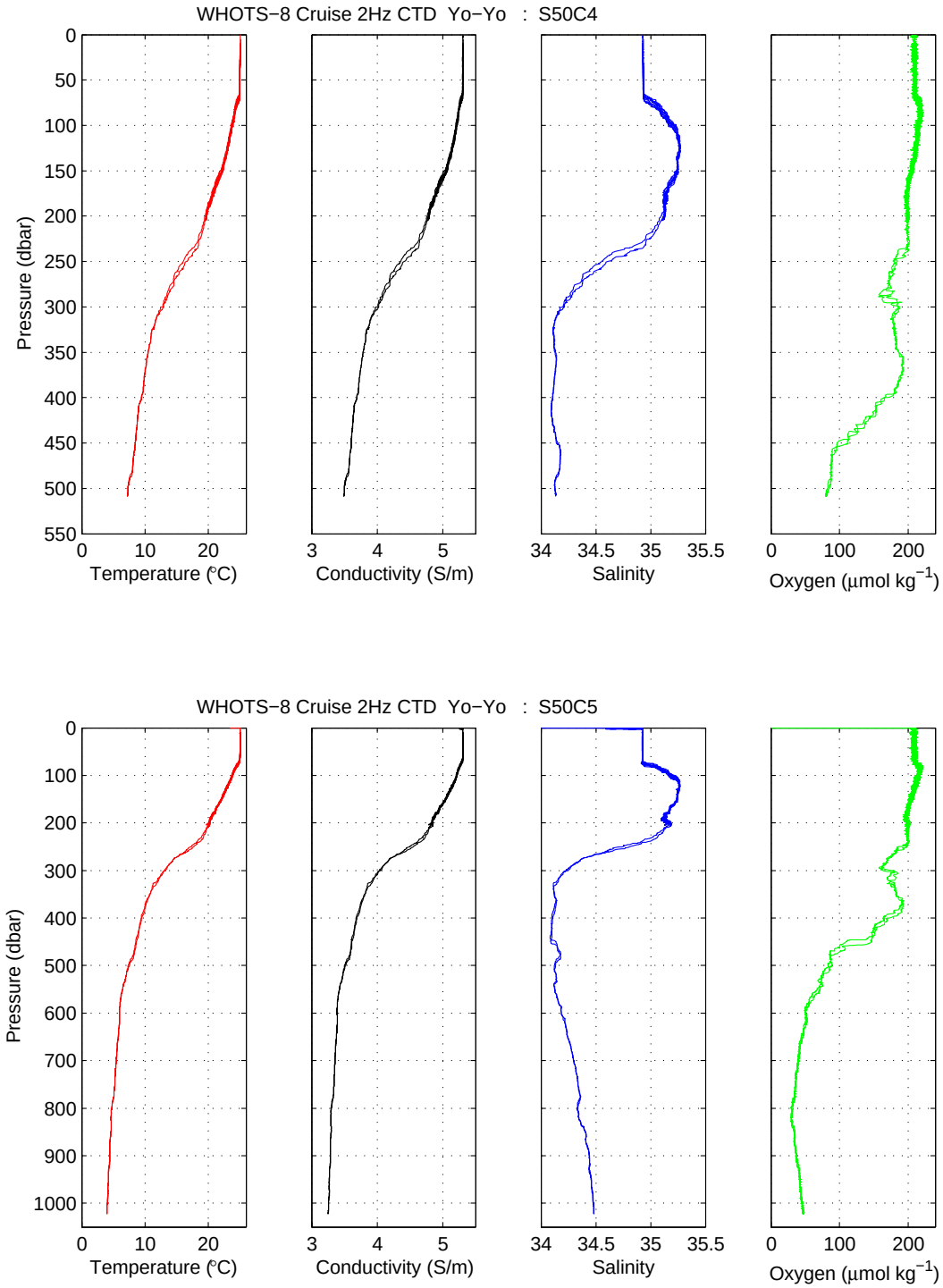


Figure B6. Profiles of 2 Hz temperature, conductivity, salinity and oxygen data during S50C4 and S50C5.

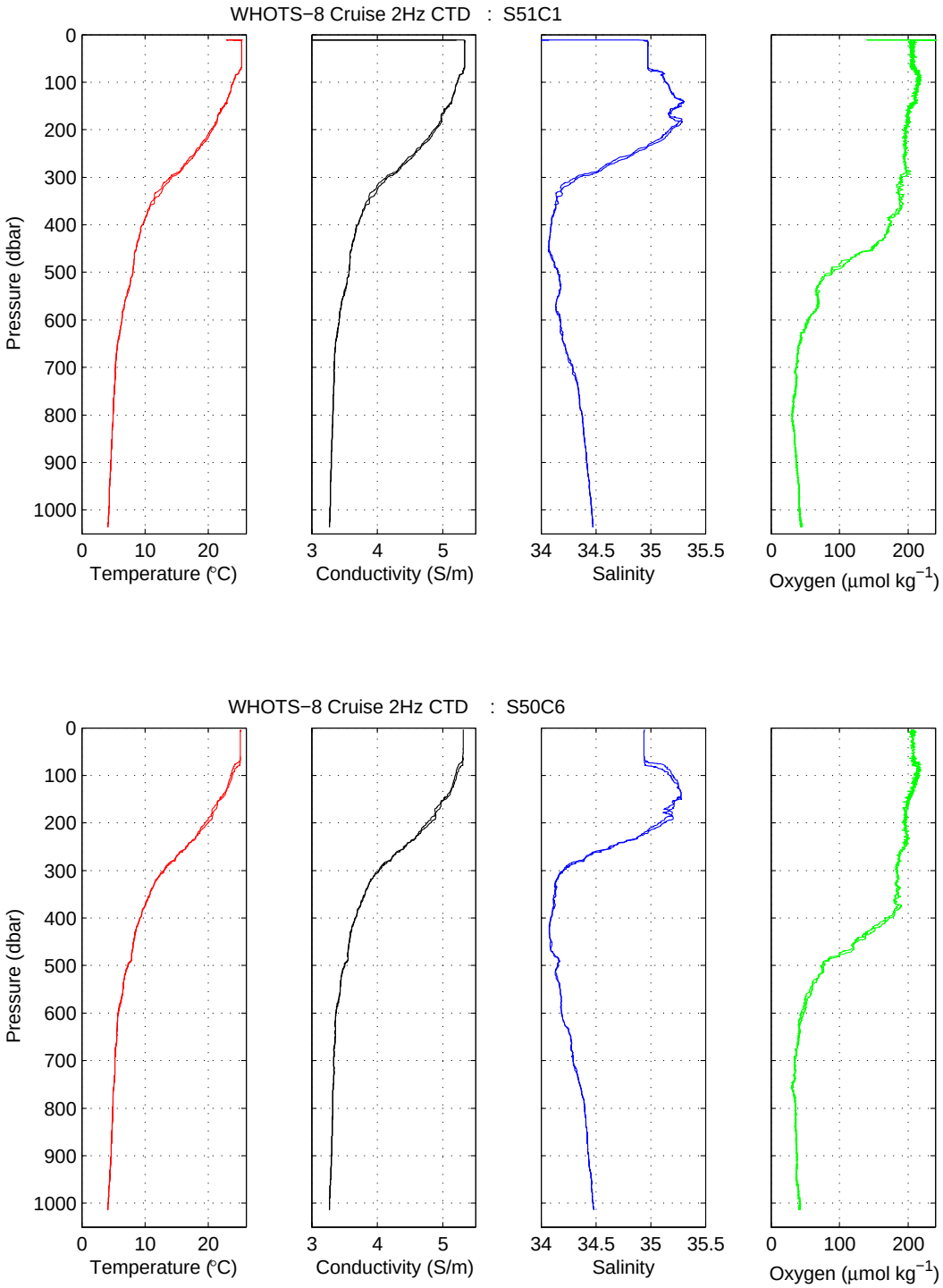


Figure B7. Profiles of 2 Hz temperature, conductivity, salinity and oxygen data during S51C1 and S50C6.

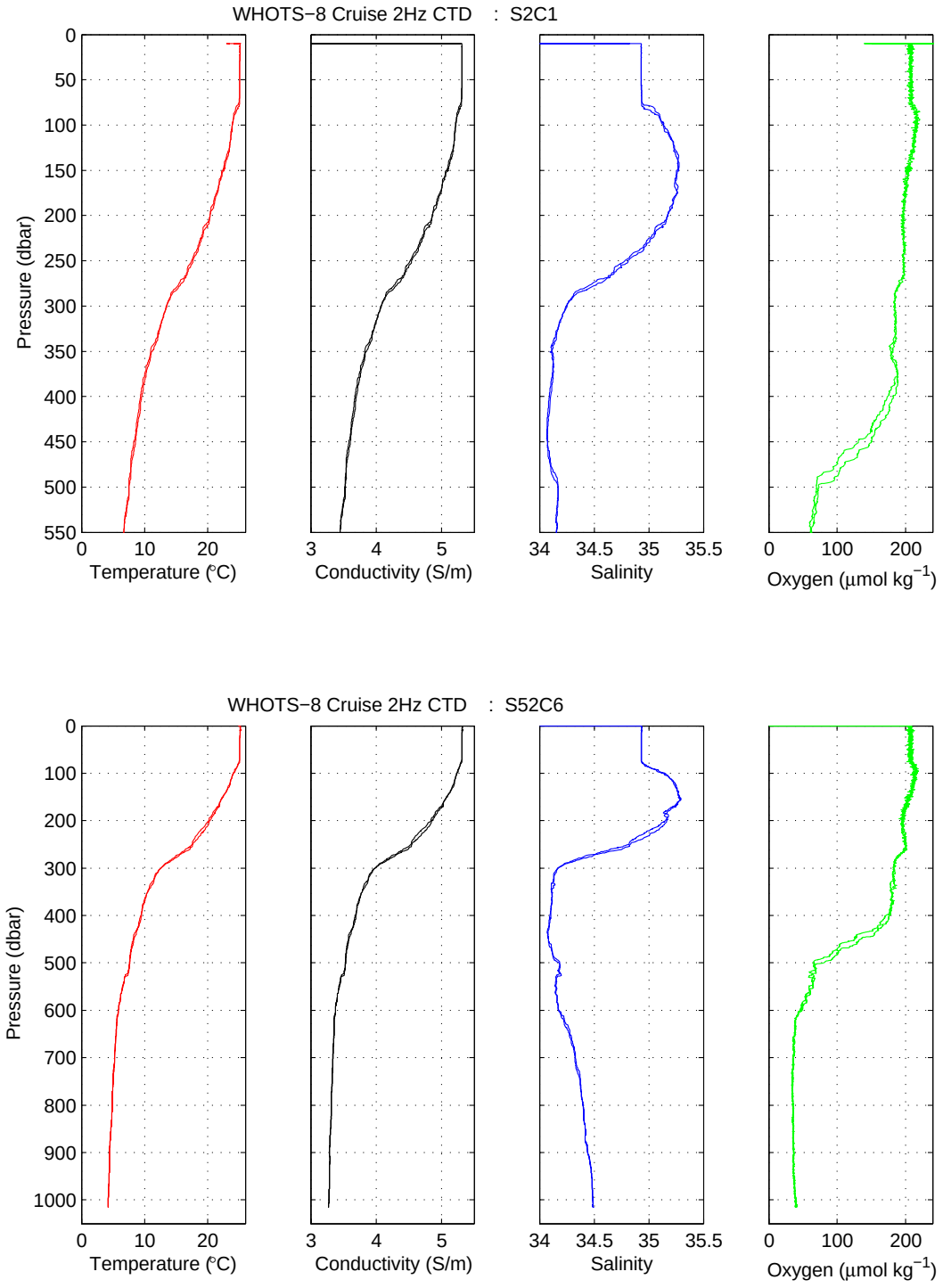


Figure B8. Profiles of 2 Hz temperature, conductivity, salinity and oxygen data during S2C1 and S52C6.

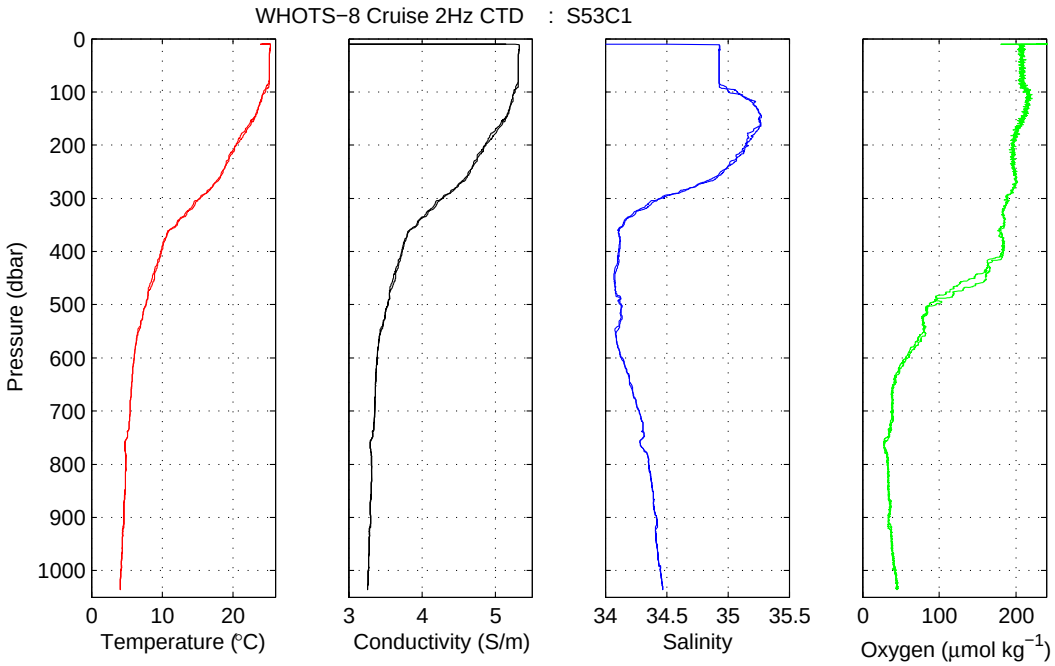


Figure B9. Profiles of 2 Hz temperature, conductivity, salinity and oxygen data during CTD S53C1.