

UH contributions to WHOTS-5 cruise report

by

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The primary contributions by the UH group to the WHOTS-5 cruise were preparing, handling, and managing data from most of the subsurface instrumentation on the WHOTS mooring, and conducting CTD profiling and water sampling. UH personnel also participated in the mooring recovery and deployment deck operations.

A. WHOTS mooring subsurface instrumentation

1. WHOTS-5 deployment

UH provided 6 SBE-37 Microcats, 9 SBE-16 Seacats, an RDI 300 kHz Workhorse ADCP, and a 1.2 MHz RDI Workhorse ADCP. WHOI provided 2 Vector Measuring Current Meters (VMCMs). The Microcats and Seacats measure temperature and conductivity; four Microcats also measure pressure. Table 1 provides deployment information for the C-T instrumentation on the WHOTS-5 mooring.

Table 1. WHOTS-5 mooring subsurface instrument deployment information. All times are in GMT.

SN:	Instrument	Depth	Pressure SN	Sample Interval (sec)	Start Logging Data(GMT)	Ice Bath In (GMT)	Ice Bath Out (GMT)	Time in Water (GMT)
1099	Seacat	15	N/A	600	05/19/08 0:00:00	05/19/08 23:59:00	05/20/08 0:34:00	06/04/08 19:02:00
1085	Seacat	25	N/A	600	05/19/08 0:00:00	05/19/08 23:59:00	05/20/08 0:34:00	06/04/08 18:58:00
1087	Seacat	35	N/A	600	05/19/08 0:00:00	05/19/08 23:59:00	05/20/08 0:34:00	06/04/08 18:49:00
3381	Microcat	40	N/A	150	05/19/08 0:00:00	05/20/08 0:39:00	05/20/08 1:19:00	06/04/08 18:45:00
4663	Microcat	45	N/A	150	05/19/08 0:00:00	05/20/08 0:39:00	05/20/08 1:19:00	06/04/08 18:41:00
2530	1200 kHz ADCP	47.5	N/A	600	5/31/2008 0:00:00	N/A	N/A	06/04/08 18:41:00
1088	Seacat	50	N/A	600	05/19/08 0:00:00	05/19/08 23:59:00	05/20/08 0:34:00	06/04/08 18:36:00
1090	Seacat	55	N/A	600	05/19/08 0:00:00	05/19/08 23:59:00	05/20/08 0:34:00	06/04/08 20:04:00
1092	Seacat	65	N/A	600	05/19/08 0:00:00	05/20/08 0:39:00	05/20/08 1:19:00	06/04/08 20:09:00
1095	Seacat	75	N/A	600	05/19/08 0:00:00	05/19/08 23:59:00	05/20/08 0:34:00	06/04/08 20:13:00
4699	Microcat	85	10209	180	05/19/08 0:00:00	05/20/08 0:39:00	05/20/08 1:19:00	06/04/08 20:16:00
1097	Seacat	95	N/A	600	05/19/08 0:00:00	05/19/08 23:59:00	05/20/08 0:34:00	06/04/08 20:19:00
2769	Microcat	105	2949	180	05/19/08 0:00:00	05/20/08 0:39:00	05/20/08 1:19:00	06/04/08 20:24:00
4701	Microcat	120	10211	180	05/19/08 0:00:00	05/20/08 0:39:00	05/20/08 1:19:00	06/04/08 20:27:00
7637	300 kHz ADCP	125	N/A	600	5/31/2008 0:00:00	N/A	N/A	06/04/08 20:31:00
1100	Seacat	135	N/A	600	05/19/08 0:00:00	05/19/08 23:59:00	05/20/08 0:34:00	06/04/08 20:35:00
4700	Microcat	155	2479944	180	05/19/08 0:00:00	05/20/08 0:39:00	05/20/08 1:19:00	06/04/08 20:38:00

see Table 2 for details of sampling programs for these instruments

The WHOTS-5 VMCM configuration and deployment information is provided in Table XXX [Sean]?

The ADCPs were deployed in the upward-looking configuration. The instruments were programmed as described in Table 2.

Table 2. WHOTS-5 mooring ADCP deployment information.

	S/N 7637 300 kHz	S/N 2530 1200 kHz
Number of Depth Cells	30	17
Pings per Ensemble	40	120
Depth Cell Size	4 m	1 m
Time per Ensemble	10 min	10 min
Time per Ping	4 sec	2 sec
Time of First Ping	05/31/08, 00:00	05/31/08, 00:00
Time in water	06/04/08, 20:31	06/04/08, 18:41
Depth	125 m	47.5 m

2. WHOTS-4 recovery

For the fourth WHOTS mooring deployment that took place on 25 June 2007, UH provided 15 SBE-37 Microcats and an RDI 300 kHz Workhorse acoustic Doppler current profiler (ADCP). The Microcats all measured temperature and conductivity, with 5 also measuring pressure. WHOI provided 2 VMCMs, an RDI 600 kHz Workhorse ADCP, and all required subsurface mooring hardware via a subcontract with UH.

Table 3 provides the deployment information for each C-T instrument on the WHOTS-4 mooring.

Table 3. WHOTS-4 mooring Microcat deployment information. All times are GMT.

Depth (meters)	Seabird Model/Serial #	Variables	Sample Interval (seconds)	Navg	Time Logging Started	Cold Spike Time	Time in the water
15	37SM31486-3382	C, T	150	2	06/19/07 12:00:00	06/19/07 21:30:00	06/25/07 17:10
25	37SM31486-3621	C, T	150	2	06/19/07 12:00:00	06/19/07 21:30:00	06/25/07 17:04
35	37SM31486-3620	C, T	150	2	06/19/07 12:00:00	06/19/07 21:30:00	06/25/07 17:01
40	37SM31486-3632	C, T	150	2	06/19/07 12:00:00	06/19/07 21:30:00	06/25/07 16:59
45	37SM31486-2965	C, T, P	180	1	06/19/07 12:00:00	06/19/07 21:30:00	06/25/07 16:56
50	37SM31486-3633	C, T	150	2	06/19/07 12:00:00	06/19/07 21:30:00	06/25/07 16:54
55	37SM31486-3619	C, T	150	2	06/19/07 12:00:00	06/19/07 21:30:00	06/25/07 18:17
65	37SM31486-3791	C, T	150	2	06/19/07 12:00:00	06/19/07 21:30:00	06/25/07 18:20
75	37SM31486-3618	C, T	150	2	06/19/07 12:00:00	06/19/07 20:40:00	06/25/07 18:22
85	37SM31486-3670	C, T, P	180	1	06/19/07 12:00:00	06/19/07 20:40:00	06/25/07 18:25
95	37SM31486-3617	C, T	150	2	06/19/07 12:00:00	06/19/07 20:40:00	06/25/07 18:27
105	37SM31486-	C, T, P	180	1	06/19/07	06/19/07	06/25/07

	3669				12:00:00	20:40:00	18:30
120	37SM31486-2451	C, T, P	180	1	06/19/07 12:00:00	06/19/07 20:40:00	06/25/07 18:33
135	37SM31486-3634	C, T	150	2	06/19/07 12:00:00	06/19/07 20:40:00	06/25/07 18:38
155	37SM31486-3668	C, T, P	180	1	06/19/07 12:00:00	06/19/07 20:40:00	06/25/07 18:41

The WHOTS-4 VMCM configuration and deployment information is provided in Table YYY [Sean]?

Table 4 provides the ADCP deployment configuration and mooring information.

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

	S/N 4891 300 kHz	S/N 1825 600 kHz
Number of Depth Cells	30	25
Pings per Ensemble	40	120
Depth Cell Size	4 m	2 m
Time per Ensemble	10 min	15 min
Time per Ping	4 sec	1 sec
Time of First Ping	06/25/07, 00:00	06/18/07, 01:00
Time of Last Ensemble	06/08/08, 04:30	06/08/08, 06:15
Number of Ensembles	50284	34198
Time in water	06/25/07, 18:35	6/25/07, 16:54
Time out of the water	06/06/08, 23:50	6/7/08, 00:22
Depth	125 m	48.5 m

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. Microcat SN 2451 pressure sensor drifted about 10 m during most of the deployment, and it failed a couple of months before recovery. Microcat SN 3668 conductivity sensor had an offset early in the record, and returned to apparently normal values near the middle of the record.

With the exceptions noted above, 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-4 mooring Microcat recovery information. All times are GMT.

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	6/7/2008 01:13	06/7/2008 05:46:30	06/7/2008 21:30:00	204,131	good	whots4_m_3382.asc
25	37SM31486-	6/7/2008	06/7/2008	06/7/2008	204,130	good	whots4_m_3621.asc

	3621	01:18	05:11:30	21:26:00			
35	37SM31486-3620	6/7/2008 01:24	06/7/2008 05:11:30	06/7/2008 06:30:30	203,770	good	whots4_m_3620.asc
40	37SM31486-3632	6/7/2008 01:26	06/7/2008 05:46:30	06/8/2008 00:34:00	204,205	good	whots4_m_3632.asc
45	37SM31486-2965	6/7/2008 01:28	06/7/2008 05:11:30	06/7/2008 07:39:00	169,833	good	whots4_p_2965.asc
50	37SM31486-3633	6/7/2008 00:22	06/7/2008 05:46:30	06/8/2008 00:38:00	204,207	good	whots4_m_3633.asc
55	37SM31486-3619	6/7/2008 00:18	06/7/2008 05:11:30	06/7/2008 21:21:00	204,128	good	whots4_m_3619.asc
65	37SM31486-3791	6/7/2008 00:15	06/7/2008 05:11:30	06/7/2008 06:57:00	203,782	good	whots4_m_3791.asc
75	37SM31486-3618	6/7/2008 00:10	06/7/2008 05:11:30	06/7/2008 07:45:00	203,802	good	whots4_m_3618.asc
85	37SM31486-3670	6/7/2008 00:06	06/7/2008 05:46:30	06/7/2008 21:42:00	170,114	good	whots4_p_3670.asc
95	37SM31486-3617	6/7/2008 00:03	06/7/2008 05:11:30	06/7/2008 06:50:10	203,779	good	whots4_m_3617.asc
105	37SM31486-3669	6/6/2008 23:59	06/7/2008 05:11:30	06/7/2008 07:35:00	169,831	good	whots4_p_3669.asc
120	37SM31486-2451	6/6/2008 23:55	06/7/2008 05:46:30	06/8/2008 00:41:00	170,174	P sensor drifted	whots4_p_2451.asc
135.5	37SM31486-3634	6/6/2008 23:46	06/7/2008 05:46:30	06/7/2008 21:39:00	204,135	good	whots4_m_3634.asc
155.6	37SM31486-3668	6/6/2008 23:40	06/7/2008 05:46:30	06/7/2008 21:35:00	170,112	C offset half of record	whots4_p_3668.asc

The WHOTS-4 VMCM recovery information is provided in Table ZZZ [Sean]?

The fouling on the ADCP transducer head (Fig. 1) was much less than during the previous WHOTS ADCP deployment at 125 m. The transducer faces for the 48.5 m ADCP were treated with an appropriate antifouling compound and consequently did not show any significant fouling (Fig. 2).



Figure 1. WHOTS-4 ADCP deployed at 125 m after recovery.



Figure 2. WHOTS-4 ADCP deployed at 48.5 m after recovery.

The data from the upward-looking 300 kHz ADCP at 125 m appears to be of high quality, however the instrument's clock on retrieval was offset by 9 minutes 5 seconds ahead of GMT. The heading, pitch and roll information from the ADCP (Fig. 3) provide useful information about the overall behavior of the mooring during its deployment. An example is that the buoy apparently was twisted one turn between May and June 2008. Pitch and roll are generally less than 5 degrees from the vertical, but there are some periods with deviations from the vertical of as much as 10 degrees.

Figure 4 shows the variations of the horizontal and vertical components of velocity in depth and time. The acoustic returns from the upper 40 m of the water column are intermittent, due to very low levels of scattering material near the surface. Diurnal migration of plankton often allowed good data returns to near the surface at night, however. The high spurious speeds due to sideband reflections near the surface are apparent.

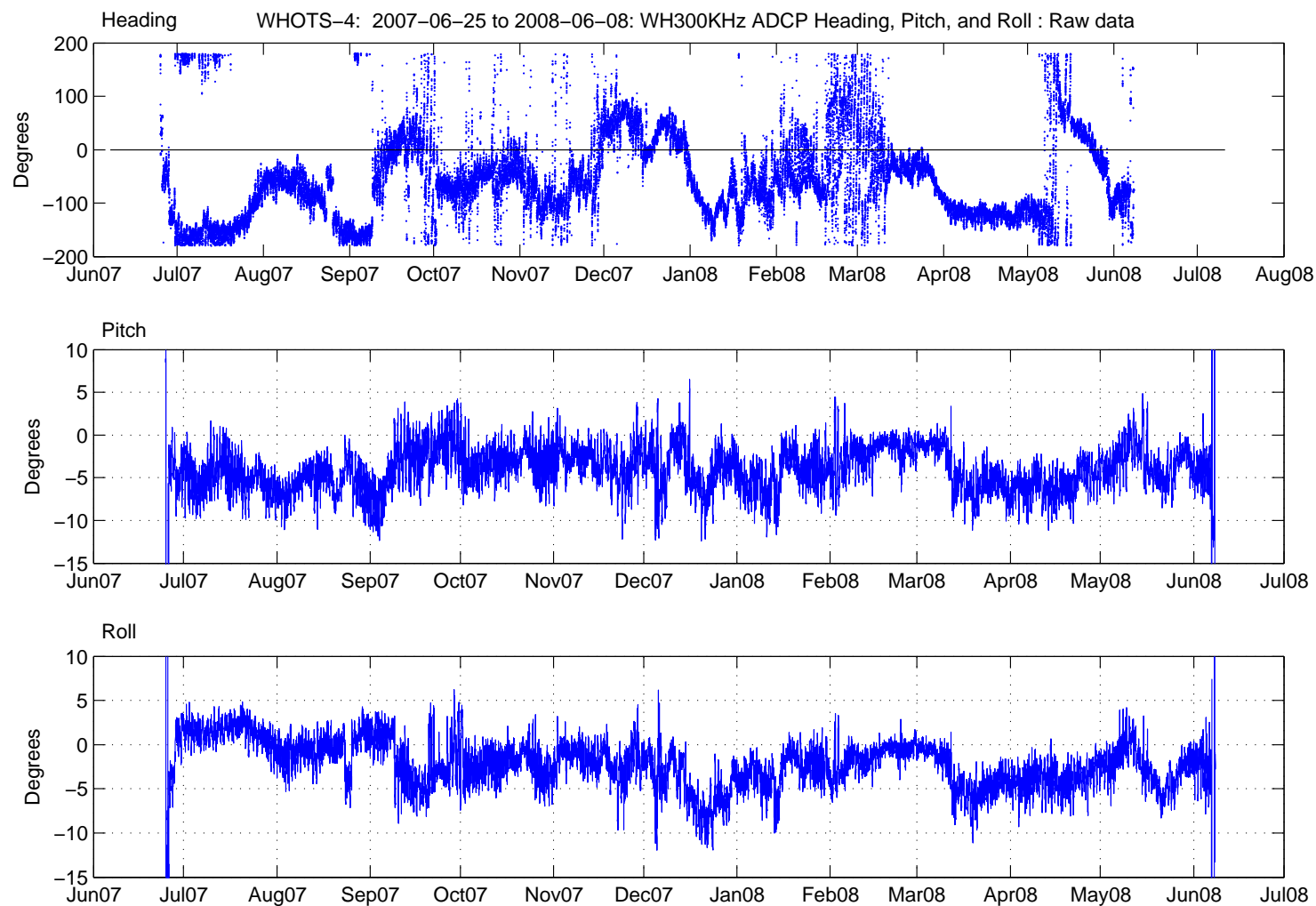


Figure 3. Heading, pitch and roll variations measured by the ADCP at 125 m depth on the WHOTS-4 mooring.

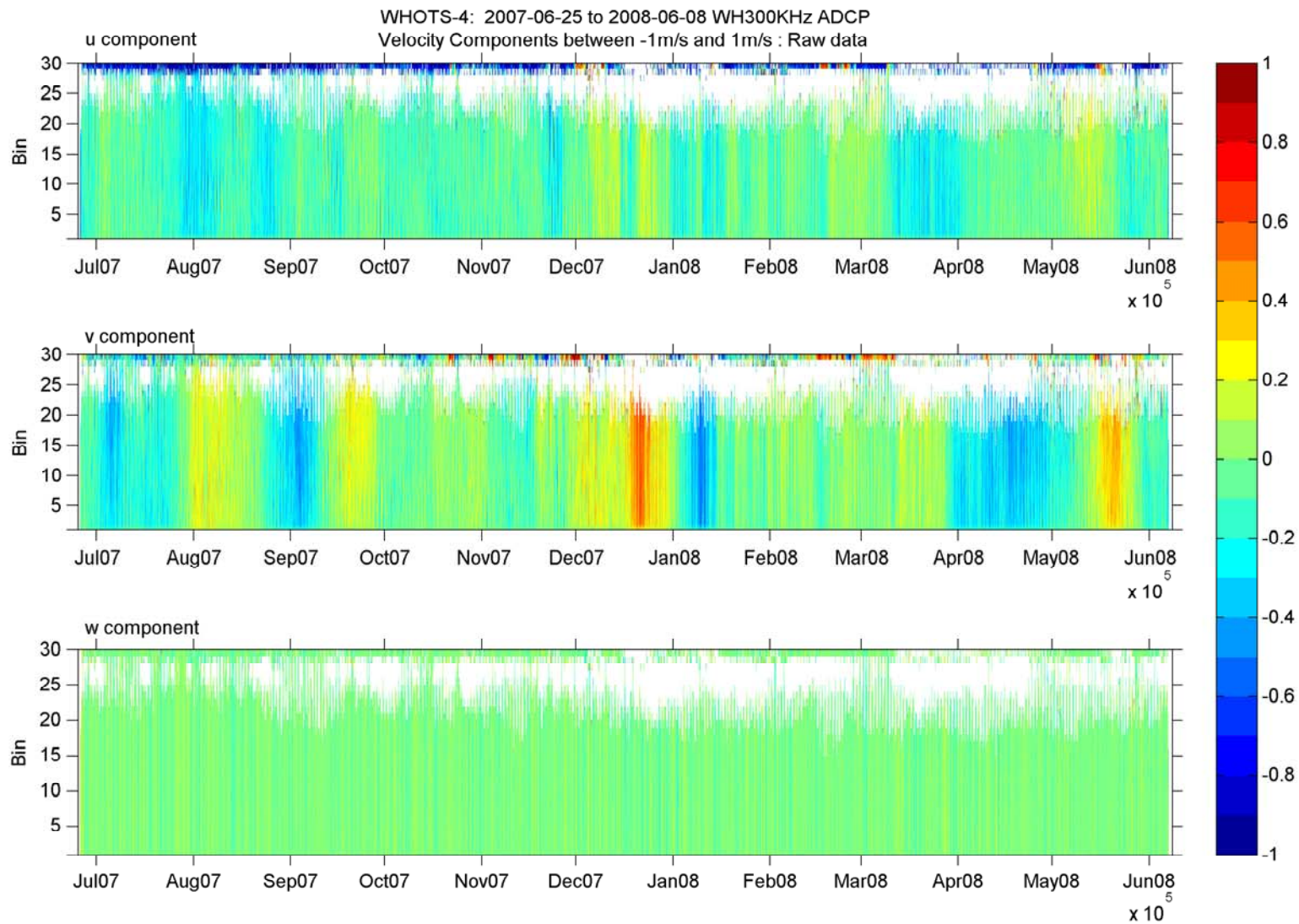


Figure 4. Time-series of eastward, northward and upward velocity components versus bin number measured by the ADCP at 125 m depth on the WHOTS-4 mooring. Height in meters above the transducer is approximately 4 times the bin number.

The data from the upward-looking 600 kHz ADCP at 48.5 m appears to be of high quality, however the instrument's clock on retrieval was offset by 3 minutes 3 seconds ahead of GMT. Figure 5 shows the heading, pitch and roll information from the ADCP. The apparent twisting of the buoy during May-June 2008 observed in the 125 ADCP data (Fig. 3) is not obvious in this ADCP heading record. Pitch and roll are generally less than 5 degrees from the vertical, but there are some periods with deviations from the vertical of as much as 10 degrees.

Figure 6 shows the variations of the horizontal and vertical components of velocity in depth and time. Evidence of reflection from the surface can be seen in the upper three to four bins. The three bins closest to the transducer exhibit contamination possibly from ringing from the transducer or reflection from the nearby instruments, this will be examined closely during data processing.

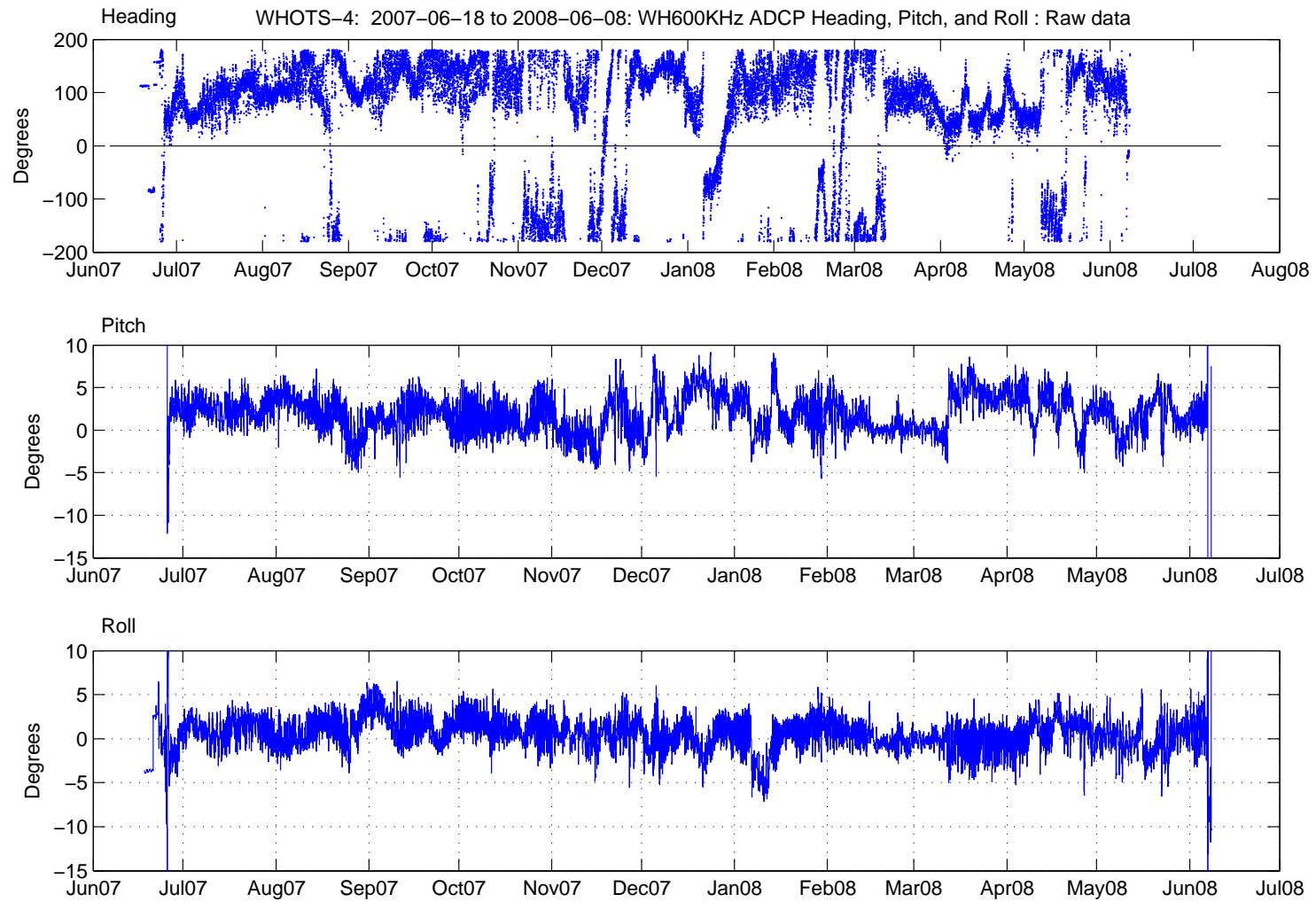


Figure 5. Heading, pitch and roll variations measured by the ADCP at 48.5 m depth on the WHOTS-4 mooring.

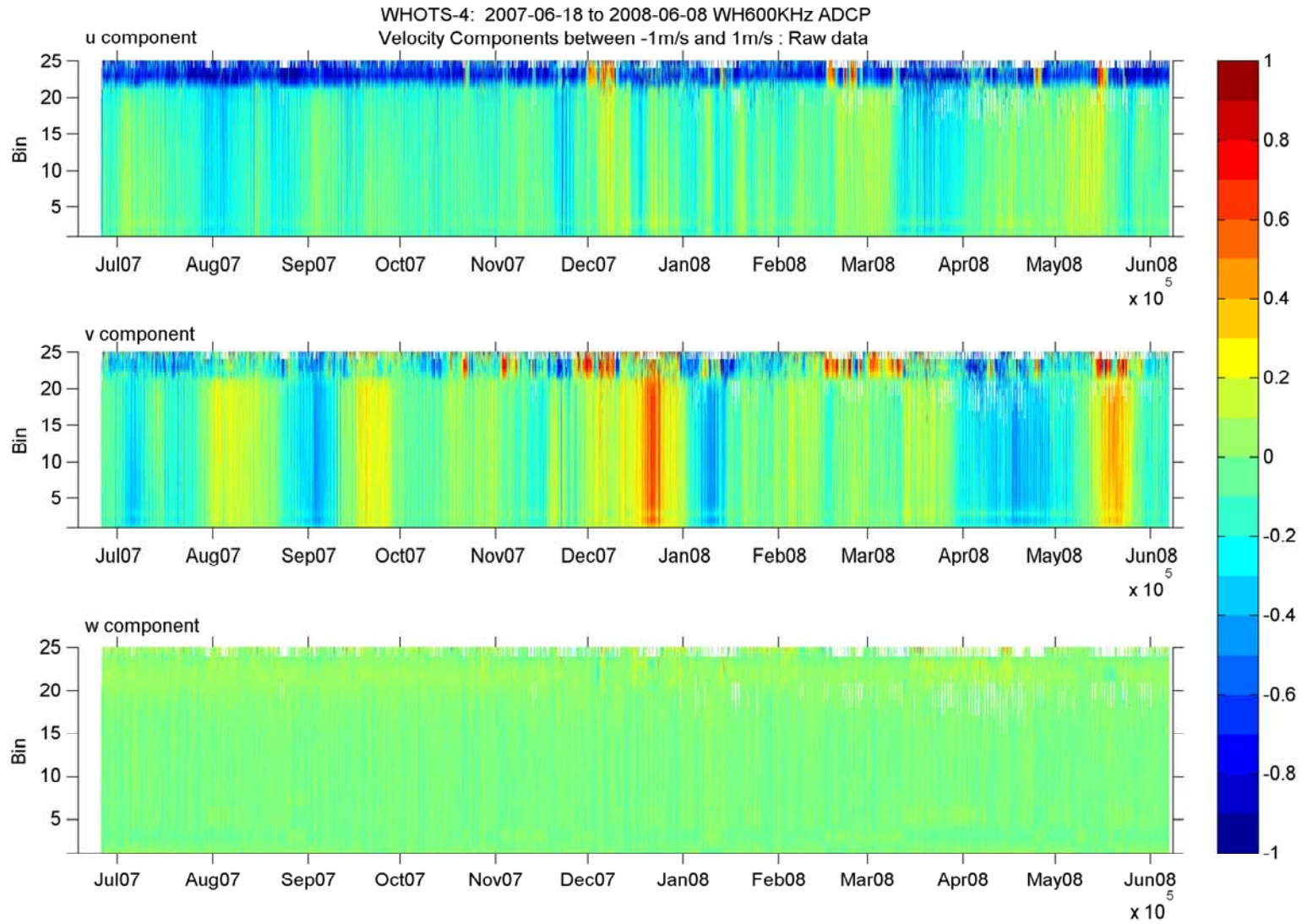


Figure 6. Time-series of eastward, northward and upward velocity components versus bin number measured by the ADCP at 48.5 m depth on the WHOTS-4 mooring. Height in meters above the transducer is approximately 2 times the bin number.

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-5 cruise.

Station/cast	Date	Time (GMT)	Location	Maximum pressure (dbar)
52 / 1	6/5/08	09:56	22° 40.25' N, 157° 59.14' W	1020
52 / 2	6/5/08	13:52	22° 39.70' N, 157° 59.10' W	200
52 / 3	6/5/08	17:52	22° 39.67' N, 157° 58.84' W	200
52 / 4	6/5/08	21:56	22° 39.61' N, 157° 58.92' W	200
52 / 5	6/6/08	01:51	22° 39.57' N, 157° 58.88' W	200
52 / 6	6/6/08	05:54	22° 39.92' N, 157° 58.84' W	200
52 / 7	6/6/08	09:55	22° 39.79' N, 157° 58.87' W	200
50 / 1	6/7/08	21:52	22° 45.94' N, 157° 56.05' W	500
50 / 2	6/8/08	01:56	22° 45.94' N, 157° 56.07' W	500
50 / 3	6/8/08	05:59	22° 45.95' N, 157° 56.07' W	500
50 / 4	6/8/08	09:52	22° 46.06' N, 157° 55.94' W	500
50 / 5	6/8/08	13:52	22° 45.69' N, 157° 56.13' W	500
50 / 6	6/8/08	17:56	22° 45.66' N, 157° 56.13' W	500
50 / 7	6/8/08	21:52	22° 45.85' N, 157° 56.19' W	500
50 / 8	6/9/08	1:53	22° 46.11' N, 157° 56.61' W	1020

A total of 15 CTD casts were conducted at stations 52 (near the WHOTS-4 buoy), and station 50 (near the WHOTS-5 buoy). The first and last casts were to a depth of 1000 m for the purpose of calibrating the CTD conductivity cells. Six CTD casts were conducted to obtain profiles for comparison with subsurface instruments on the WHOTS-4 mooring before recovery, and 7 more casts were conducted for comparison with the WHOTS-5 mooring after deployment. These were sited approximately 200 to 500 m from the buoys. The comparison casts each consisted of 6 yo-yo cycles between 5 dbar and 200 and 500 dbar. Station numbers were assigned following the convention used during HOT cruises. Table 6 provides summary information for all CTD casts, and figures B1-B27 show the water column profile information that was obtained.

Water samples were taken from all casts; 6 samples for 1000 dbar casts and 2 samples each for the 200 and 500 dbar casts. These samples will be analyzed for salinity and used to calibrate the CTD conductivity sensors.

C. Thermosalinograph

The Kilo Moana has an Uncontaminated Scientific Sea Water (USSW) system that includes an internal Seabird Seacat thermosalinograph (TSG) model SBE-21, with an SBE-38 external temperature sensor installed in the bow thruster chamber close to the seawater intake. The intake is located on the starboard hull, 20' 8" from the bow, at a mean depth of 8 m. Sensor information for the TSG system during WHOTS-5 is as follows:

Temperature: SBE-38 Sensor SN0169 was used to measure temperature near the seawater intake, and was last calibrated on May 10, 2007, and installed on May 23, 2008. The SBE-21 thermosalinograph used temperature sensor SN3292, which was last calibrated on November 11, 2007, and installed on January 25, 2008.

Conductivity: The SBE-21 thermosalinograph used conductivity sensor SN3392, which was most recently calibrated on November 11, 2007, and installed on January 25, 2008.

Water samples were drawn from the shipboard Seabird thermosalinograph system every 8 hours during the cruise for post-calibration of that dataset. The TSG data are shown in Figures C1-C7.

D. Shipboard ADCPs

The R/V Kilo Moana is equipped with an RDI 300 kHz Workhorse Mariner ADCP and an RDI OS38 ADCP. The University of Hawaii ADCP processing system is installed, producing real-time profiles and other products. In addition to providing an intercomparison with the upward-looking ADCP on the WHOTS moorings, the shipboard ADCP systems revealed interesting regional current features.

During the WHOTS-5 cruise, the northwestward flow of the North Hawaiian Ridge Current was not observed during our transit from Oahu to Station ALOHA (Fig. 7). Instead, a southeastward flow was seen. Approaching ALOHA, the upper ocean flow intensified and veered from southward to southwestward. The 4 June 2008 NRL 1/12° HyCOM sea surface height analysis showed a cyclonic eddy centered just to the east of ALOHA (Fig. 8), which was consistent with our shipboard ADCP measurements. Inspection of the NRL NCOM analysis for the same time revealed that it was inconsistent with our observations, which was unusual in our experience.

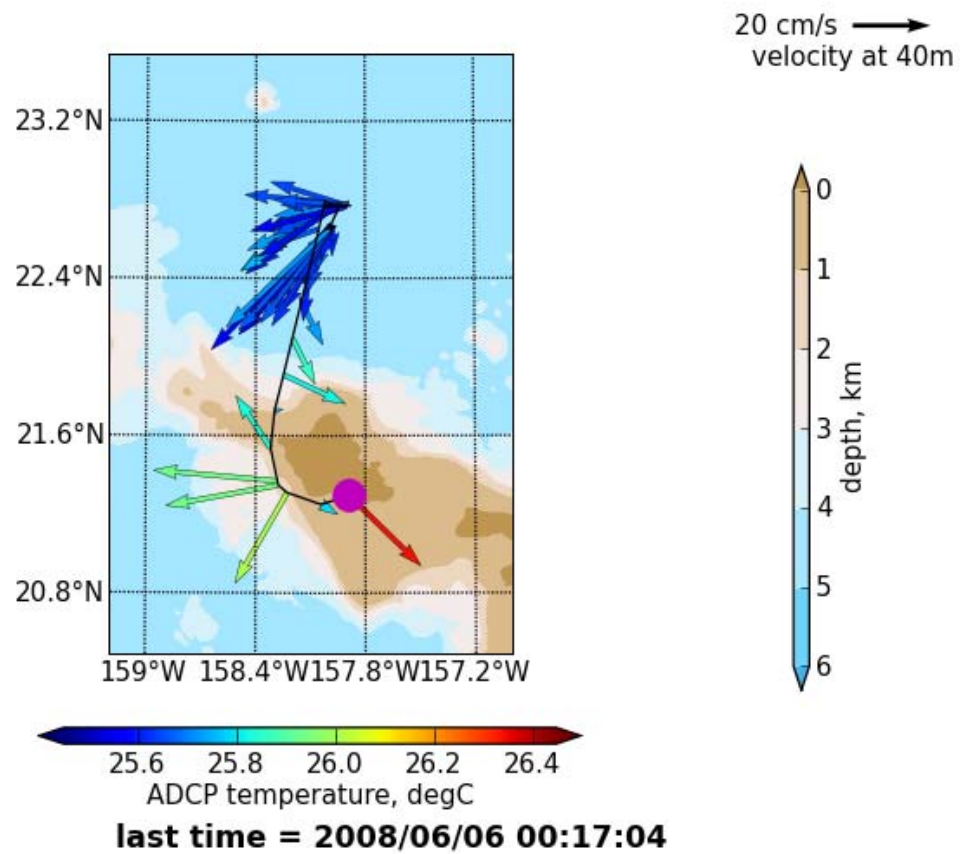


Figure 7. Current vectors for at 40 m measured by the R/V Kilo Moana's 300 kHz Workhorse ADCP from Honolulu to the WHOTS-4 site from 4 June through 6 June 2008.

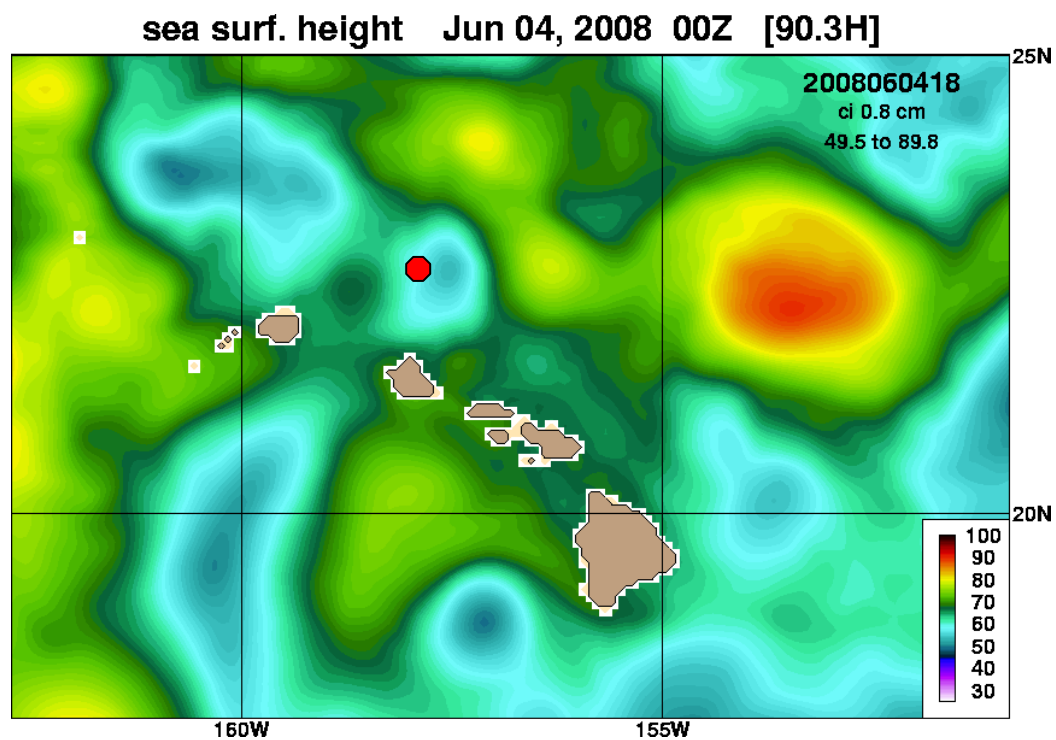


Figure 8. Hawaii region sea level analysis from the Navy Research Laboratory HyCOM analysis system for 6/4/08. The position of Station ALOHA is indicated by the red dot.

Appendix A. Moored C-T Time Series Figures

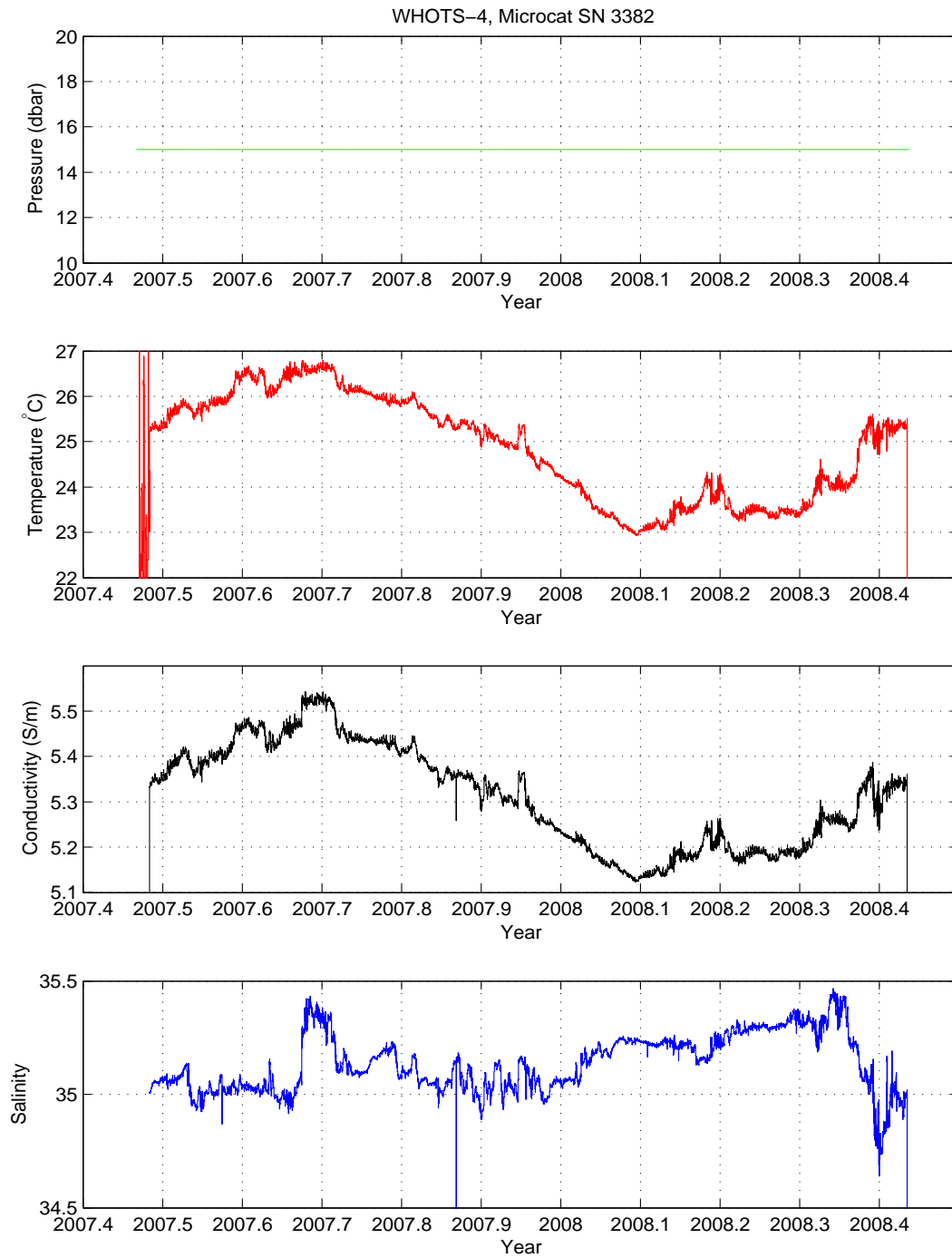


Figure A1. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3382 deployed at 15 m on the WHOTS-4 mooring. Nominal pressure is also included to calculate salinity where pressure data was not available.

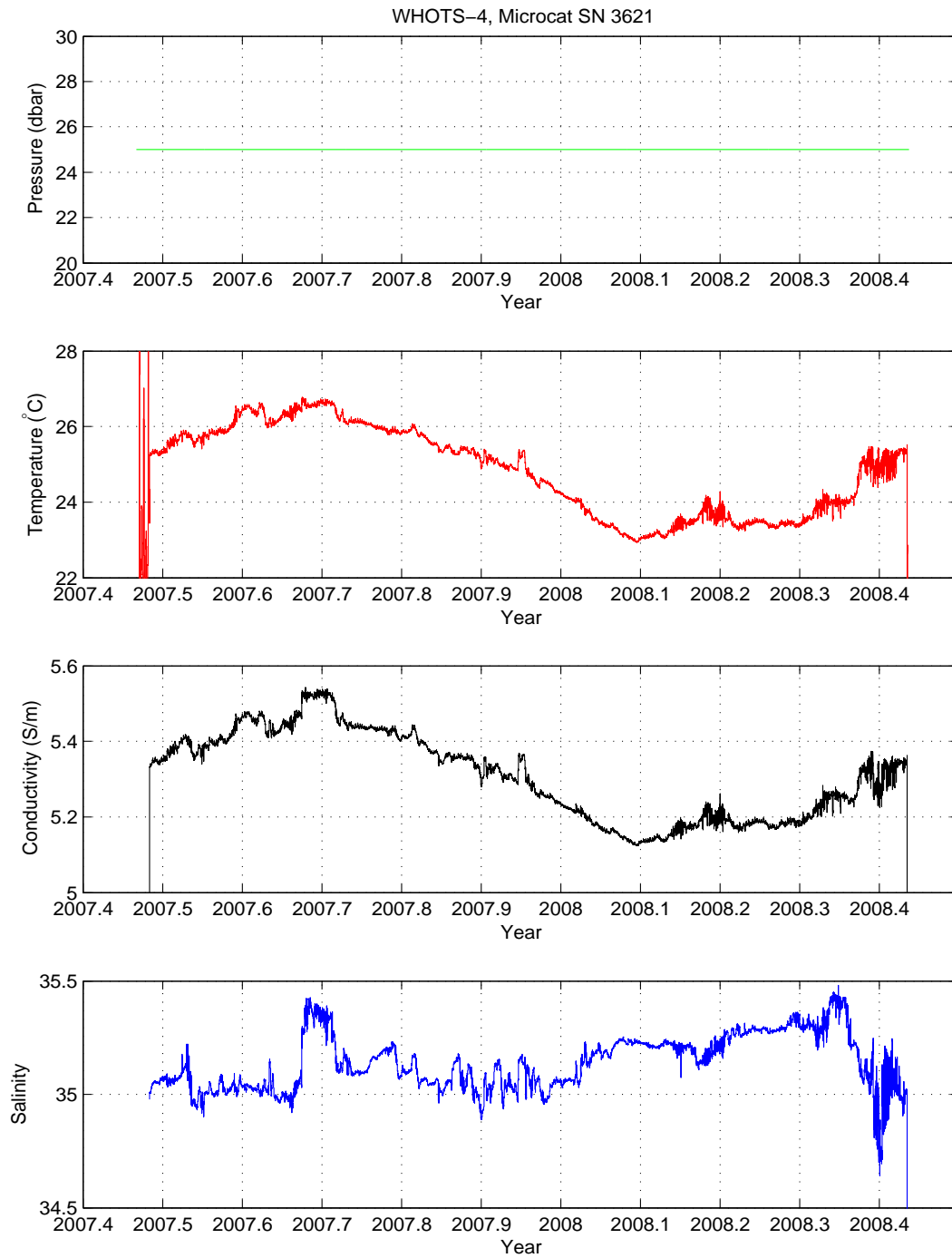


Figure A2. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3621 deployed at 25 m on the WHOTS-4 mooring. Nominal pressure is also included to calculate salinity where pressure data was not available.

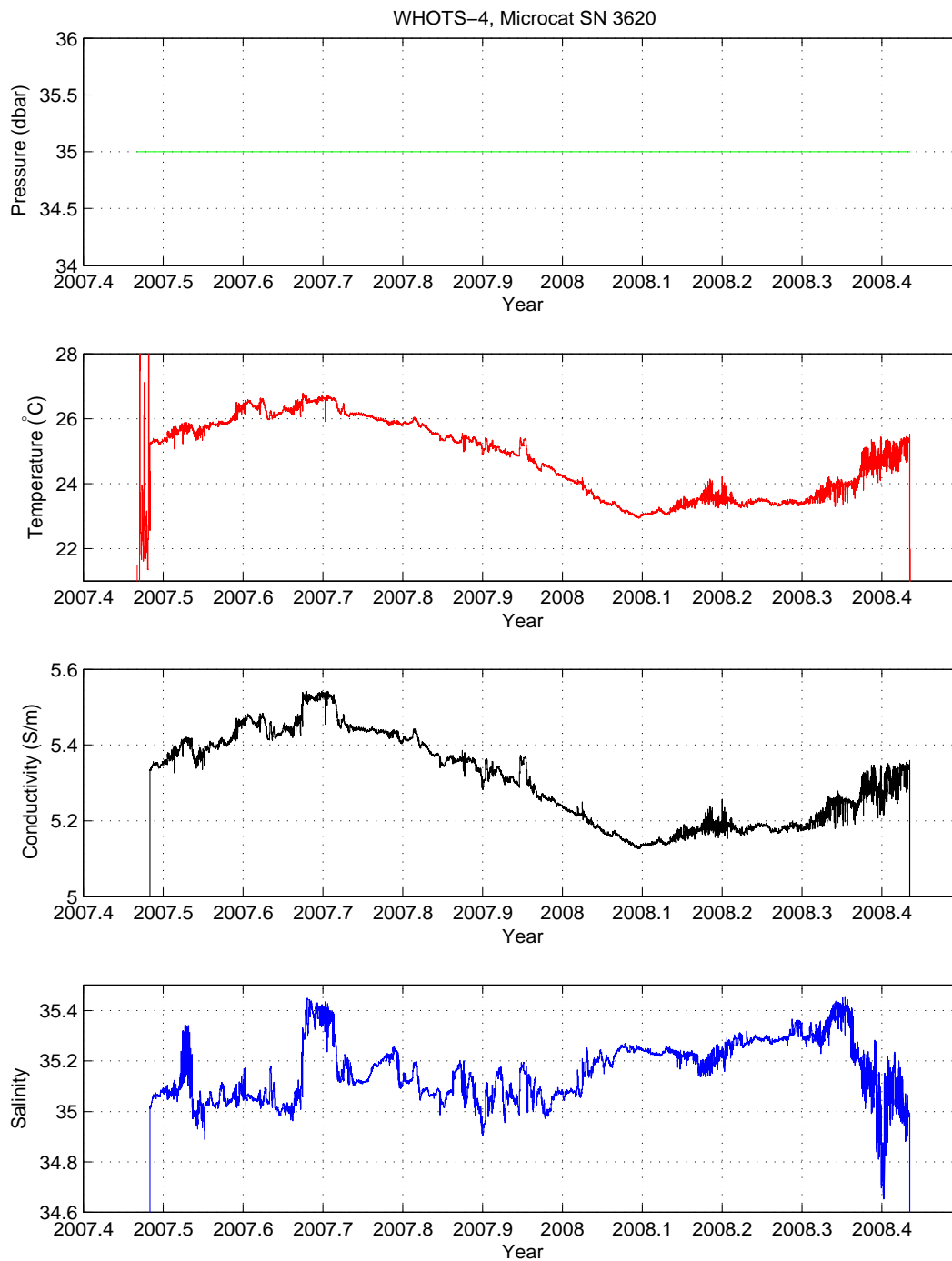


Figure A3. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3620 deployed at 35 m on the WHOTS-4 mooring. Nominal pressure is also included to calculate salinity where pressure data was not available.

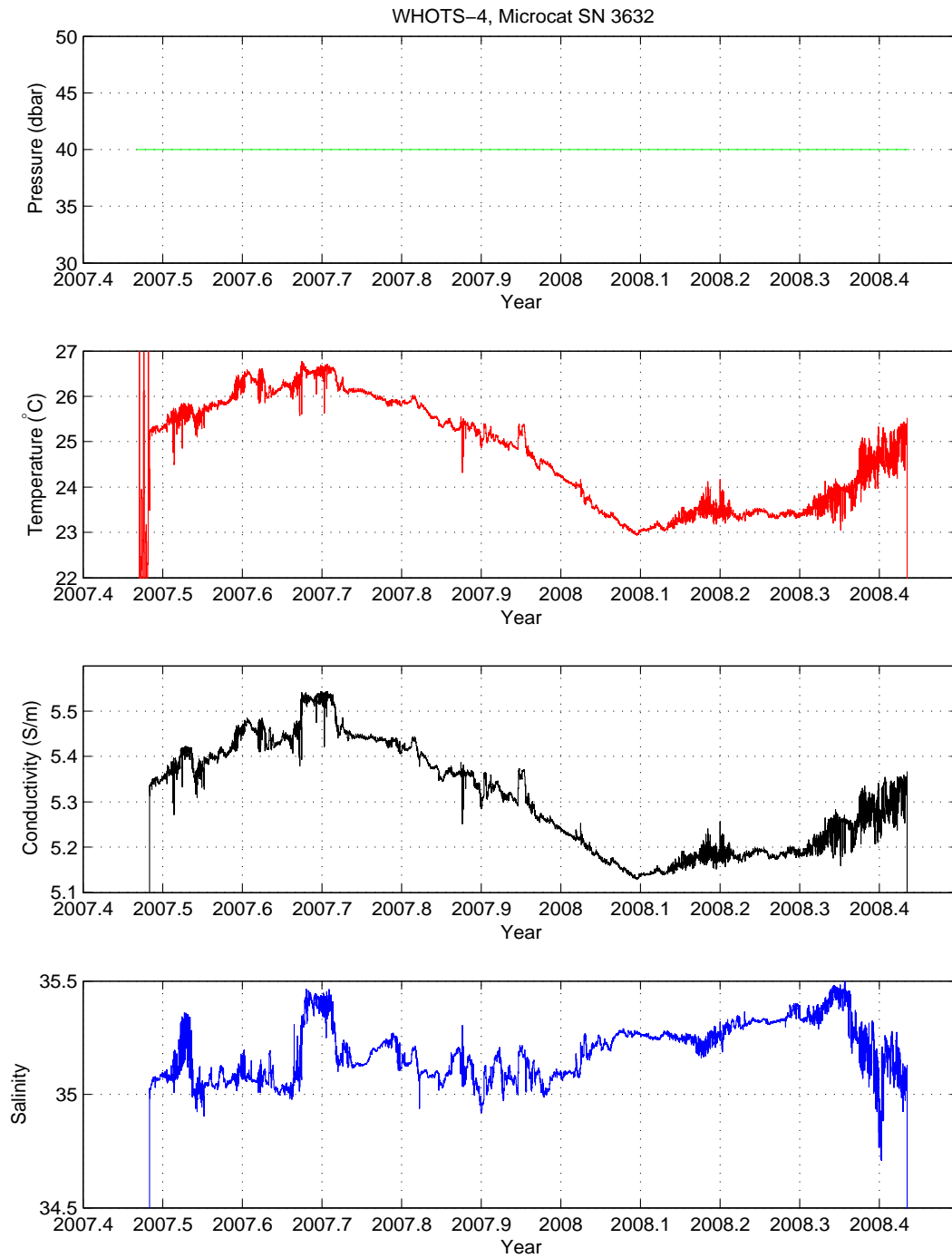


Figure A4. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3632 deployed at 40 m on the WHOTS-4 mooring. Nominal pressure is also included to calculate salinity where pressure data was not available.

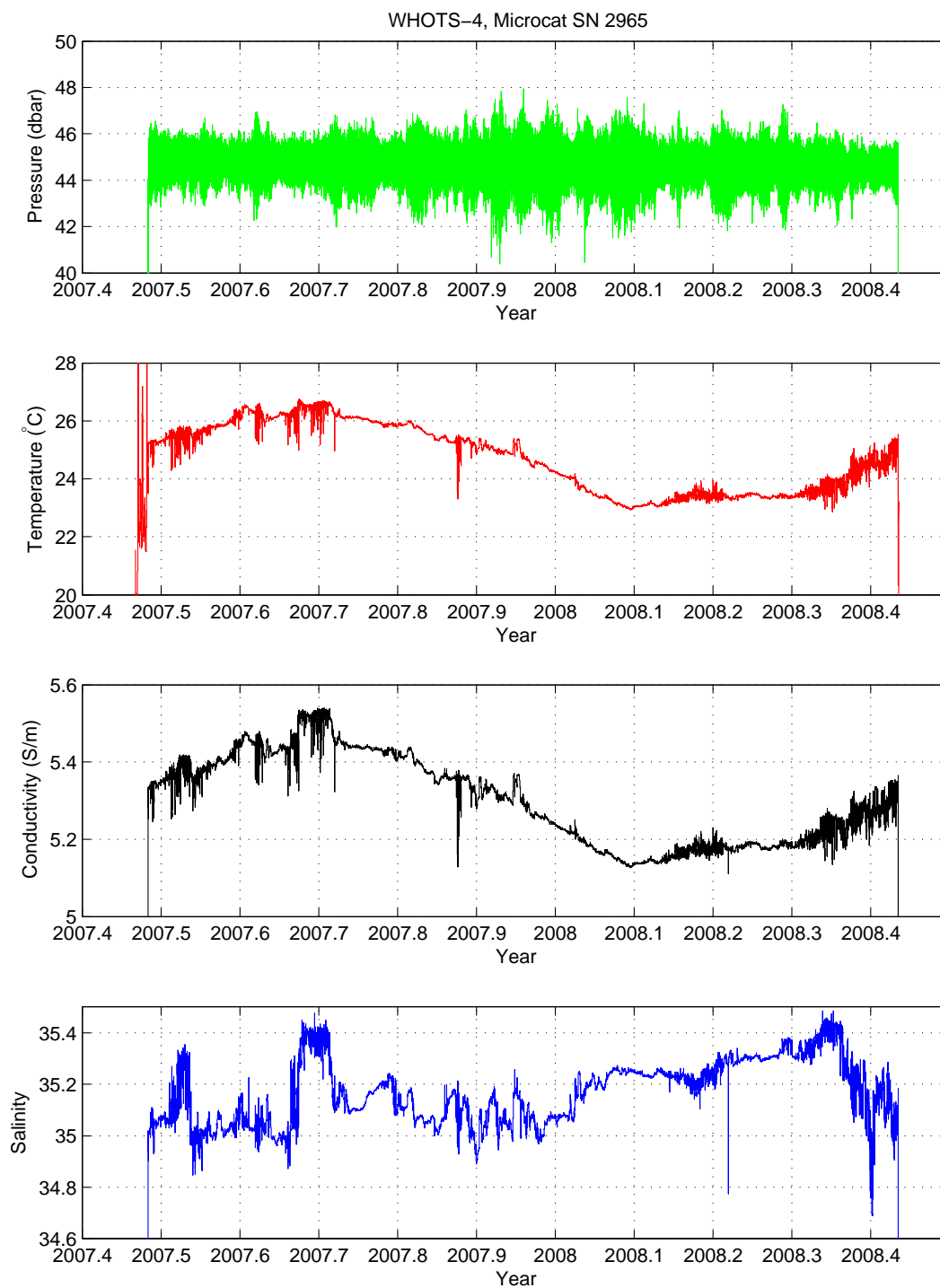


Figure A5. Preliminary pressure, temperature, conductivity and salinity from Microcat SBE-37 SN 2965 deployed at 45 m on the WHOTS-4 mooring.

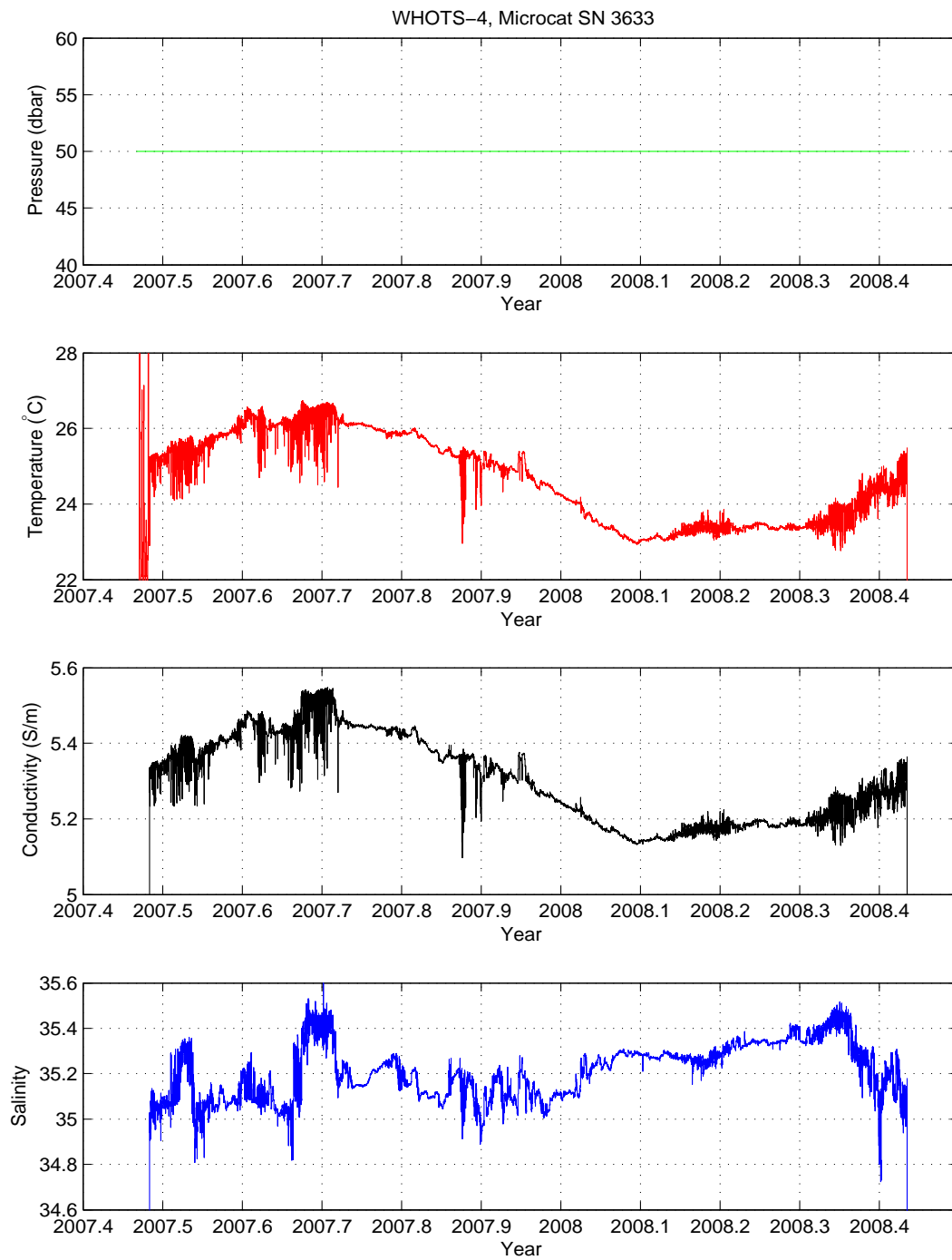


Figure A6. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3633 deployed at 50 m on the WHOTS-4 mooring. Nominal pressure is also included to calculate salinity where pressure data was not available.

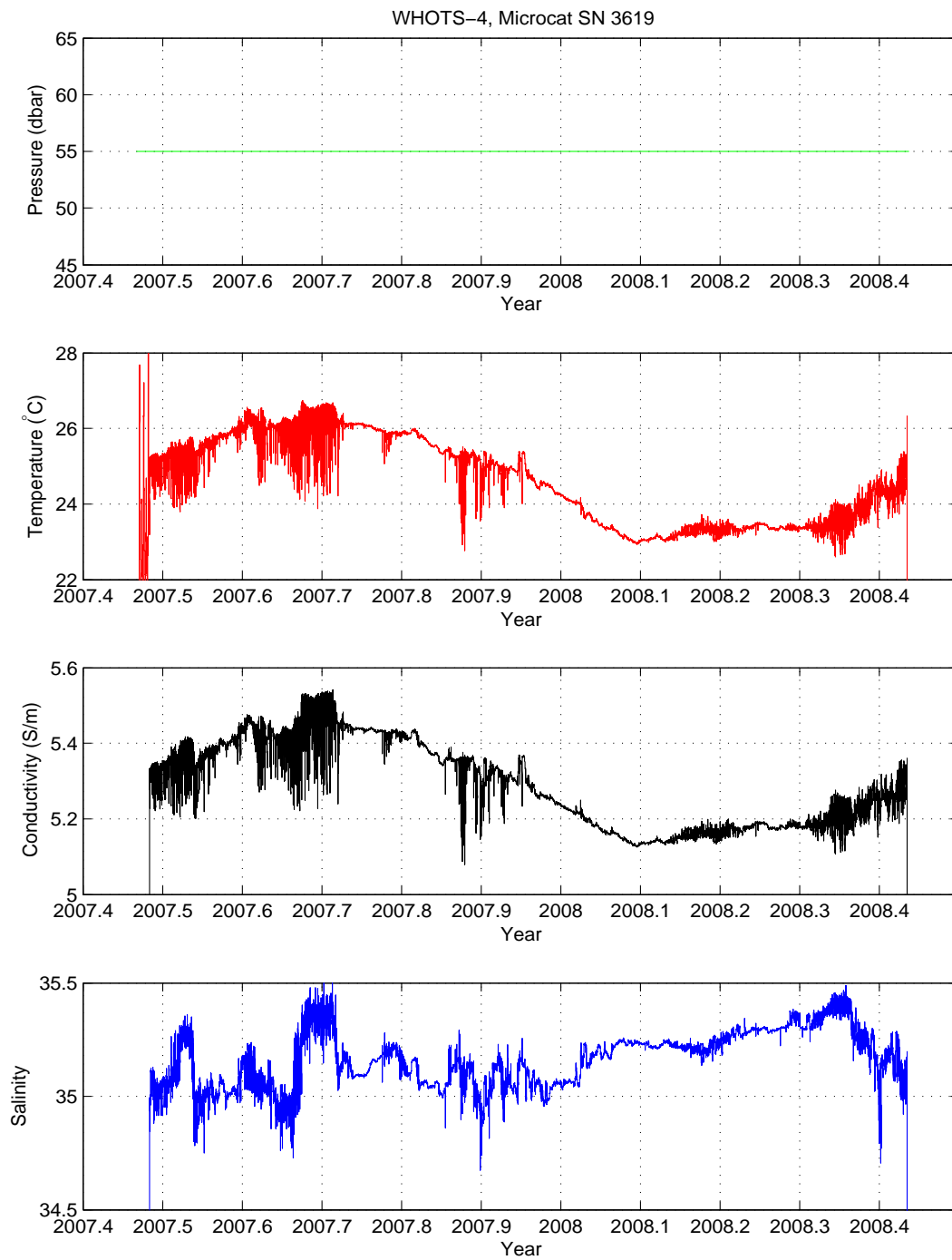


Figure A7. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3619 deployed at 55 m on the WHOTS-4 mooring. Nominal pressure is also included to calculate salinity where pressure data was not available.

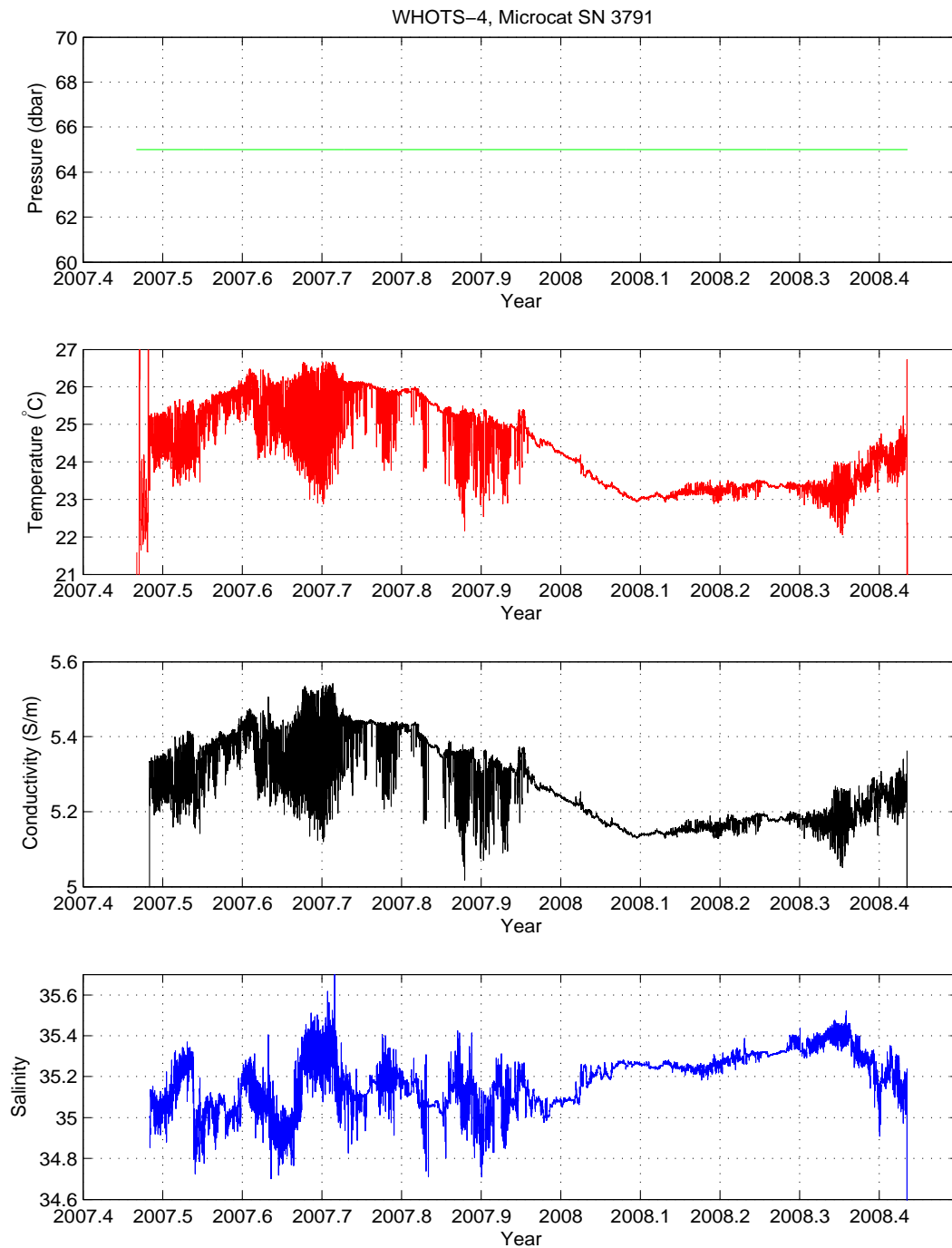


Figure A8. Preliminary temperature, conductivity and salinity from Seacat SBE-37 SN 3791 deployed at 65 m on the WHOTS-4 mooring. Nominal pressure is also included to calculate salinity where pressure data was not available.

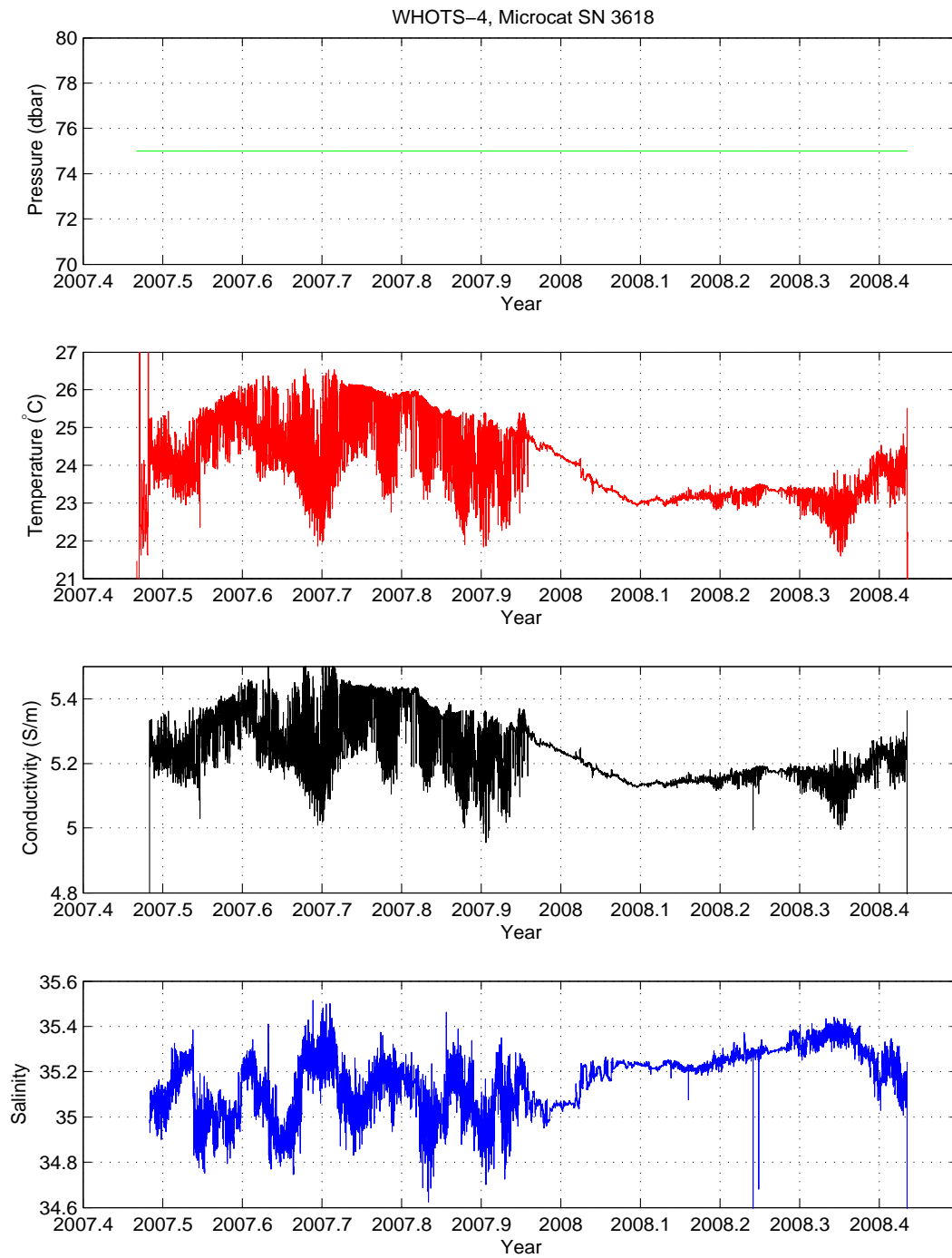


Figure A9. Preliminary temperature, conductivity and salinity from Seacat SBE-37 SN 3618 deployed at 75 m on the WHOTS-4 mooring. Nominal pressure is also included to calculate salinity where pressure data was not available.

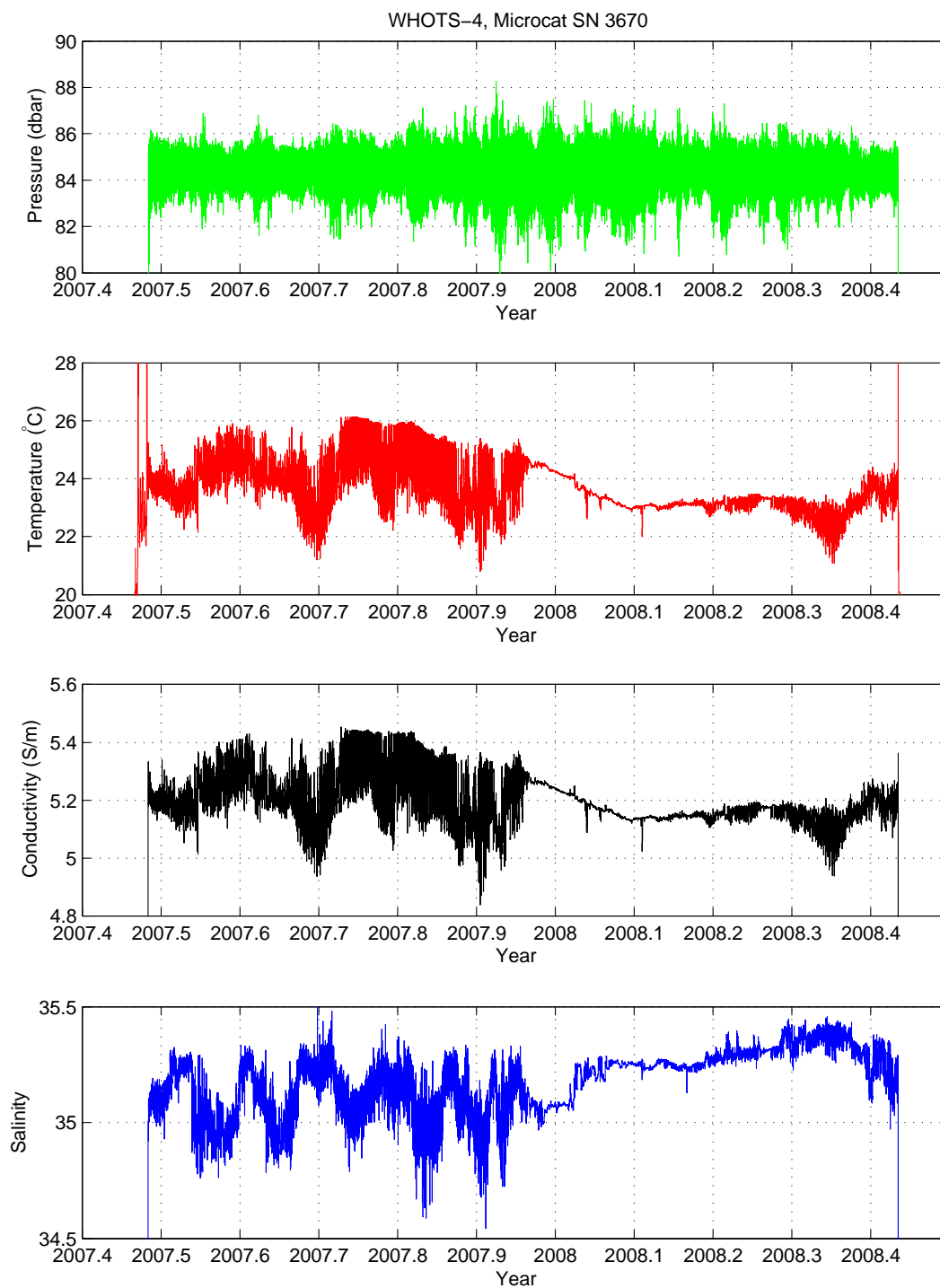


Figure A10. Preliminary pressure, temperature, conductivity and salinity from Microcat SBE-37 SN 3670 deployed at 85 m on the WHOTS-4 mooring.

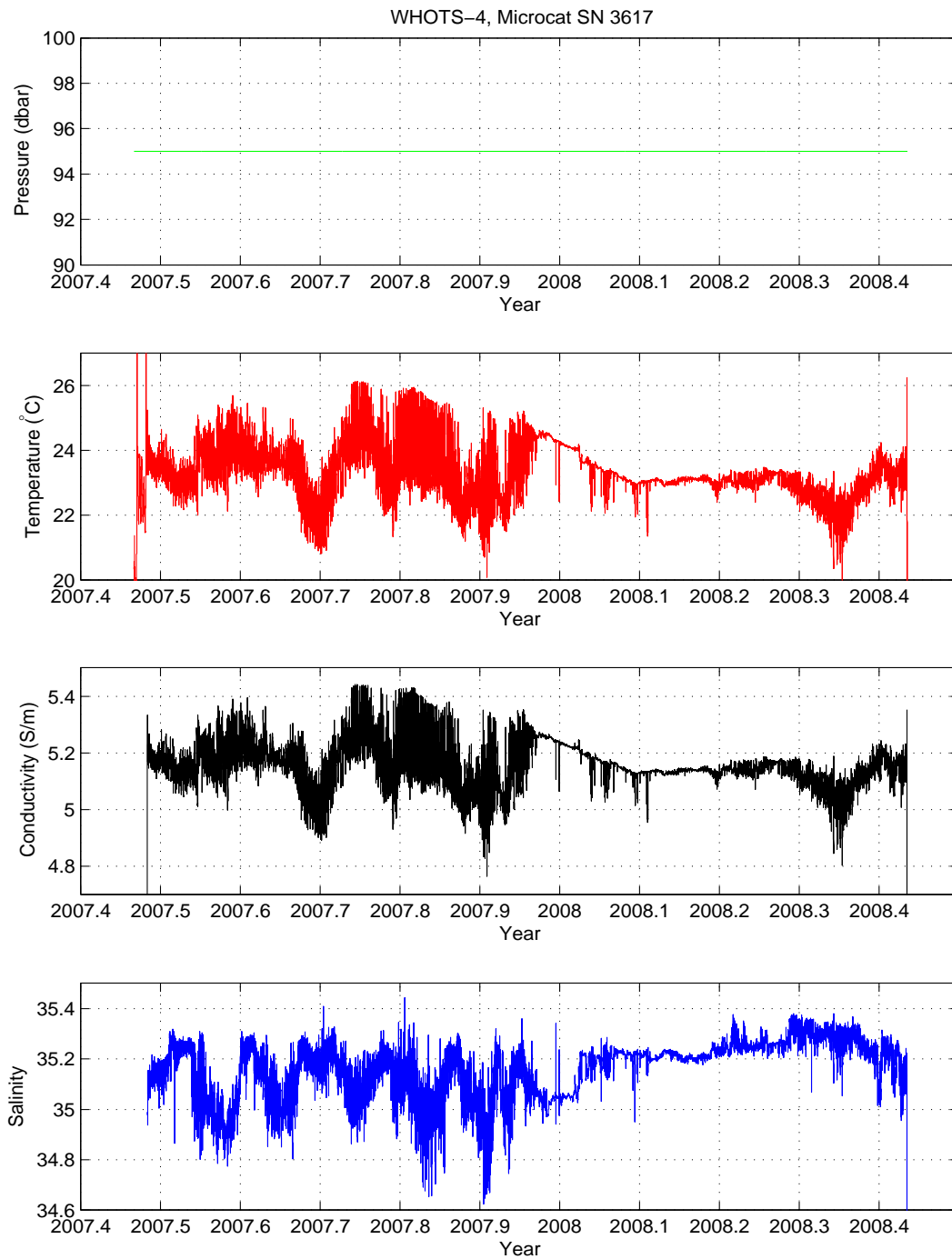


Figure A11. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3617 deployed at 95 m on the WHOTS-4 mooring. Nominal pressure is also included to calculate salinity where pressure data was not available.

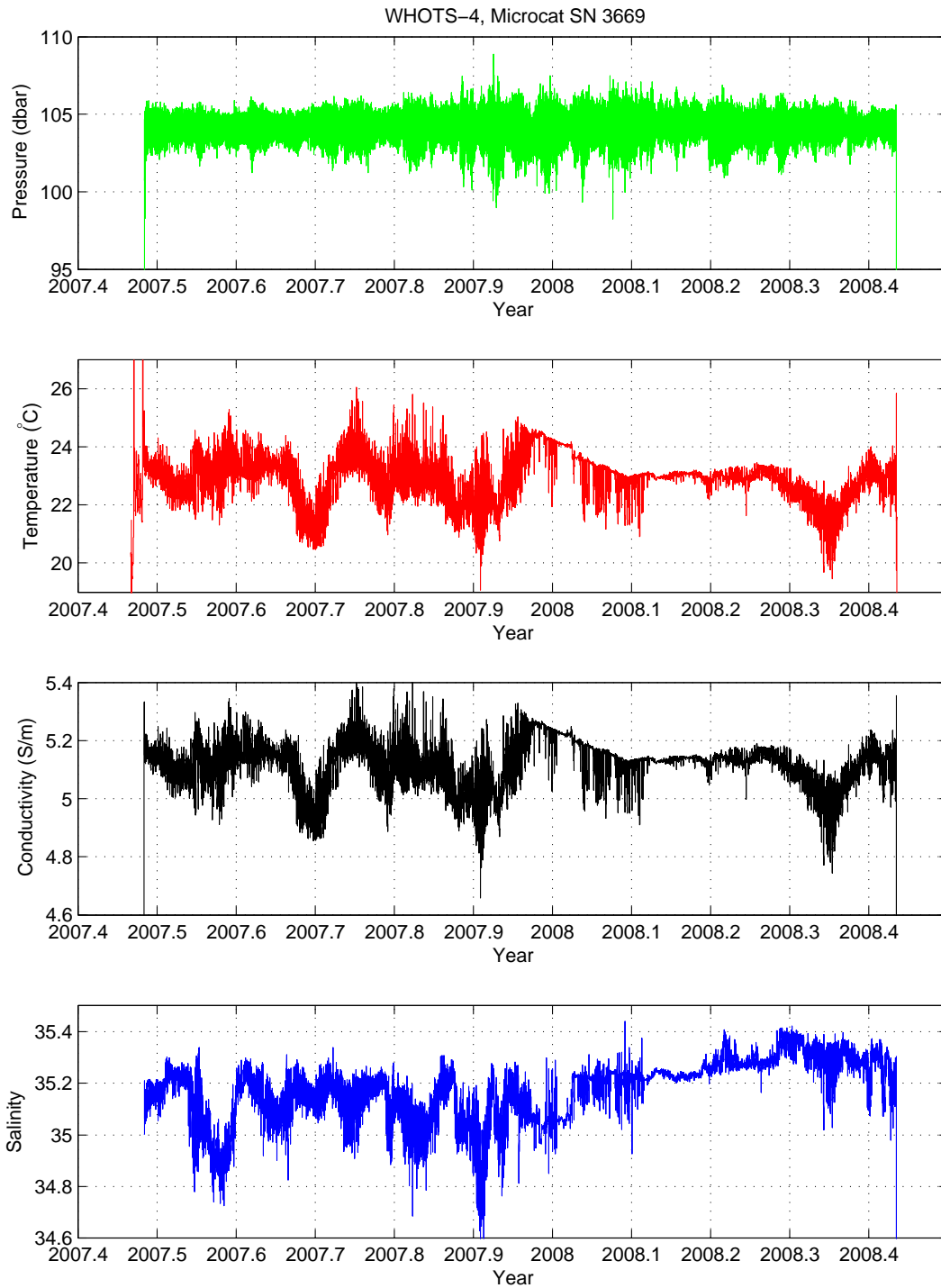


Figure A12. Preliminary pressure, temperature, conductivity and salinity from Microcat SBE-37 SN 3669 deployed at 105 m on the WHOTS-4 mooring.

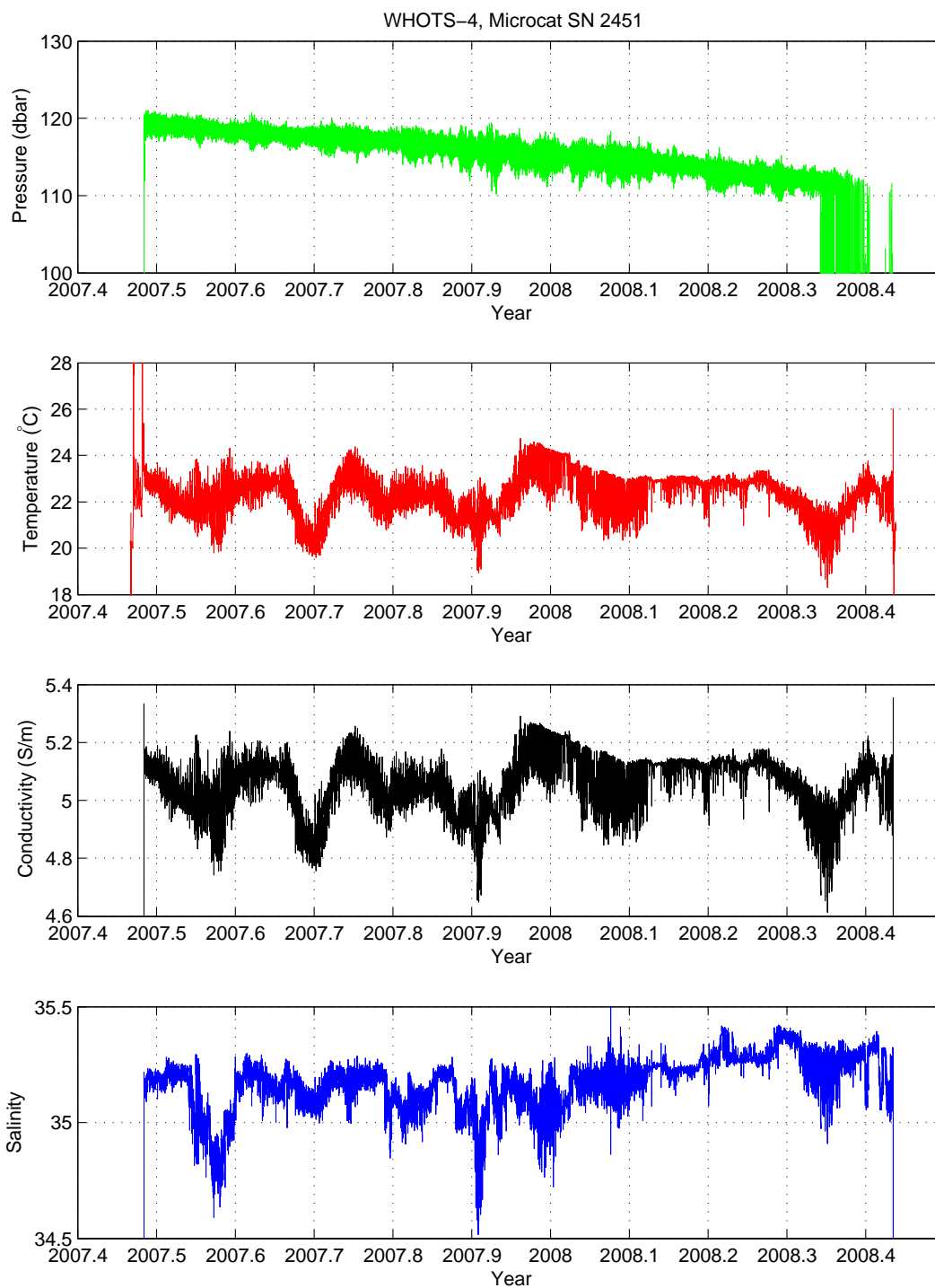


Figure A13. Preliminary pressure, temperature, conductivity and salinity from Microcat SBE-37 SN 2451 deployed at 120 m on the WHOTS-4 mooring.

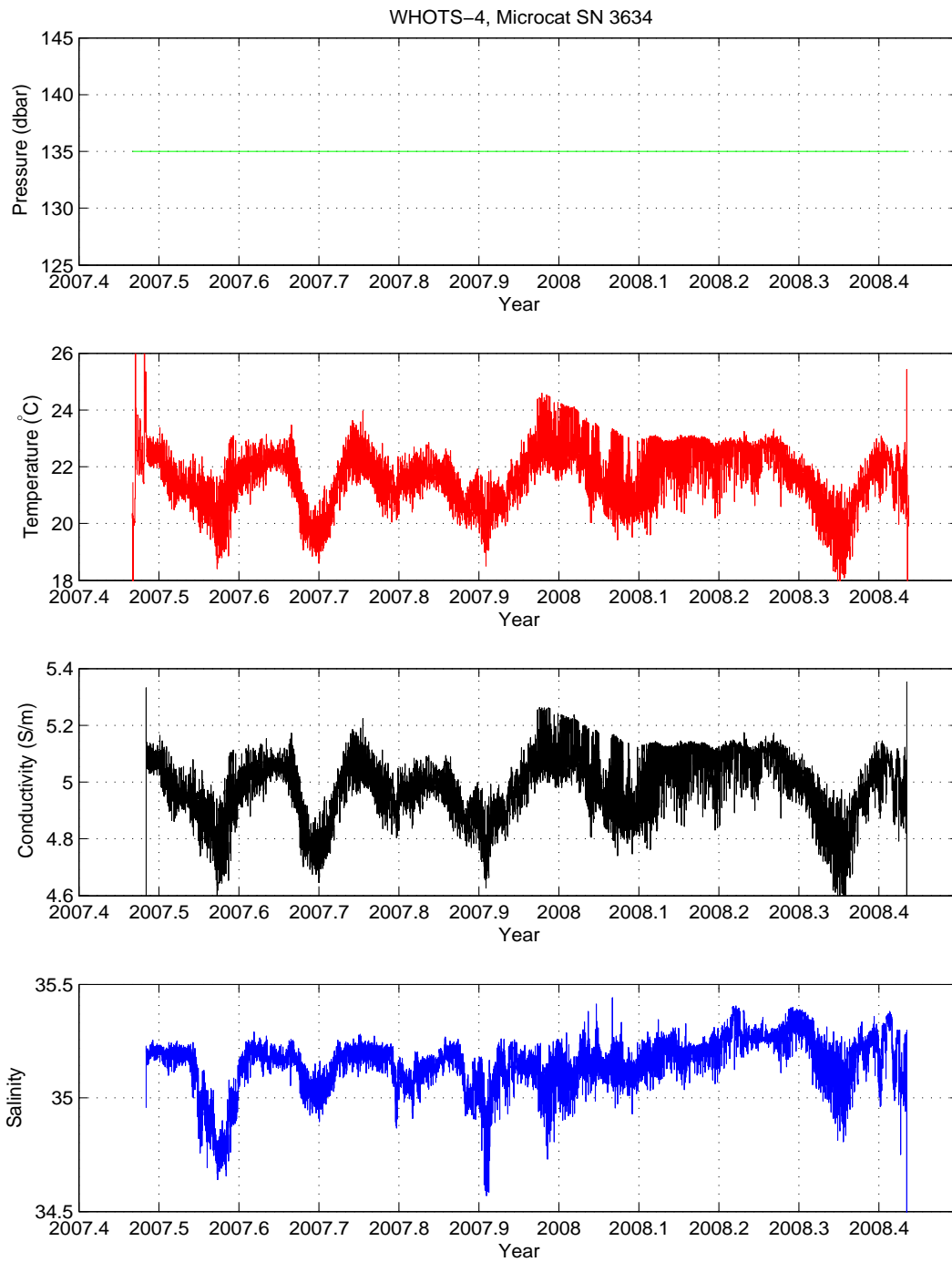


Figure A14. Preliminary temperature, conductivity and salinity from Microcat SBE-37 SN 3634 deployed at 135 m on the WHOTS-4 mooring. Nominal pressure is also included to calculate salinity where pressure data was not available.

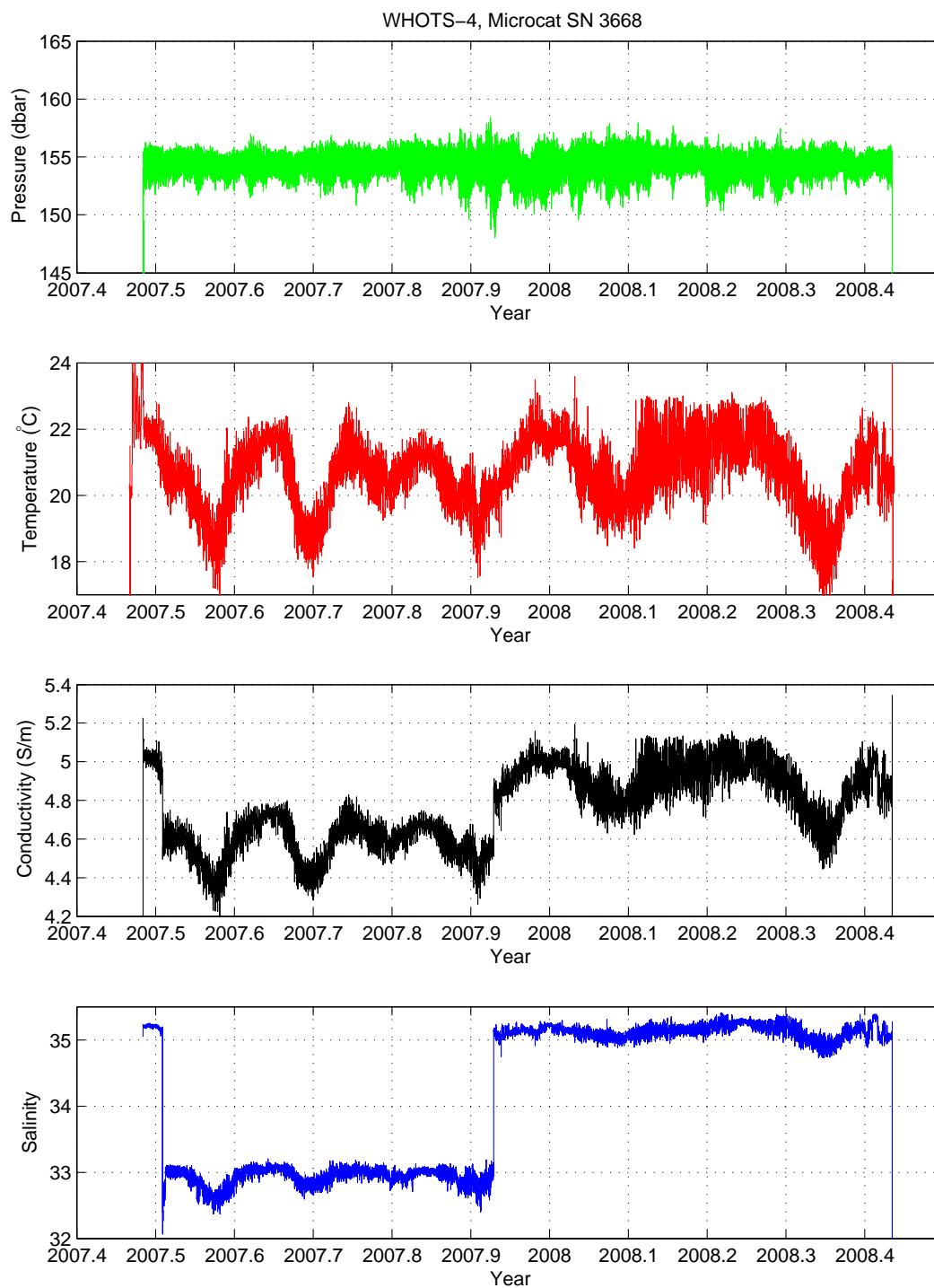


Figure A15. Preliminary pressure, temperature, conductivity and salinity from Microcat SBE-37 SN 3668 deployed at 155 m on the WHOTS-4 mooring.

Appendix B. CTD Casts Figures

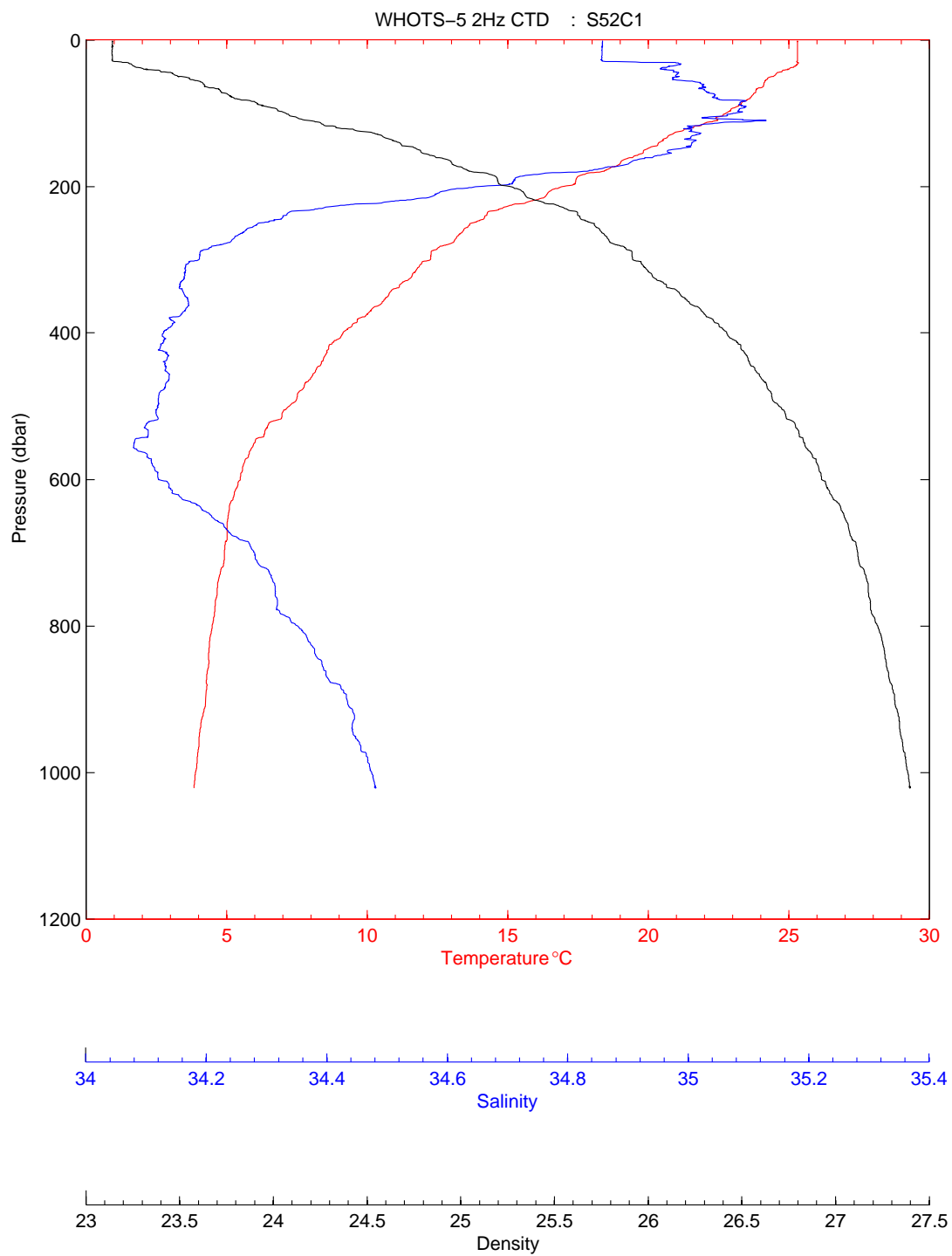


Figure B1. Profiles of 2 Hz temperature, salinity and potential density data during CTD S52C1.

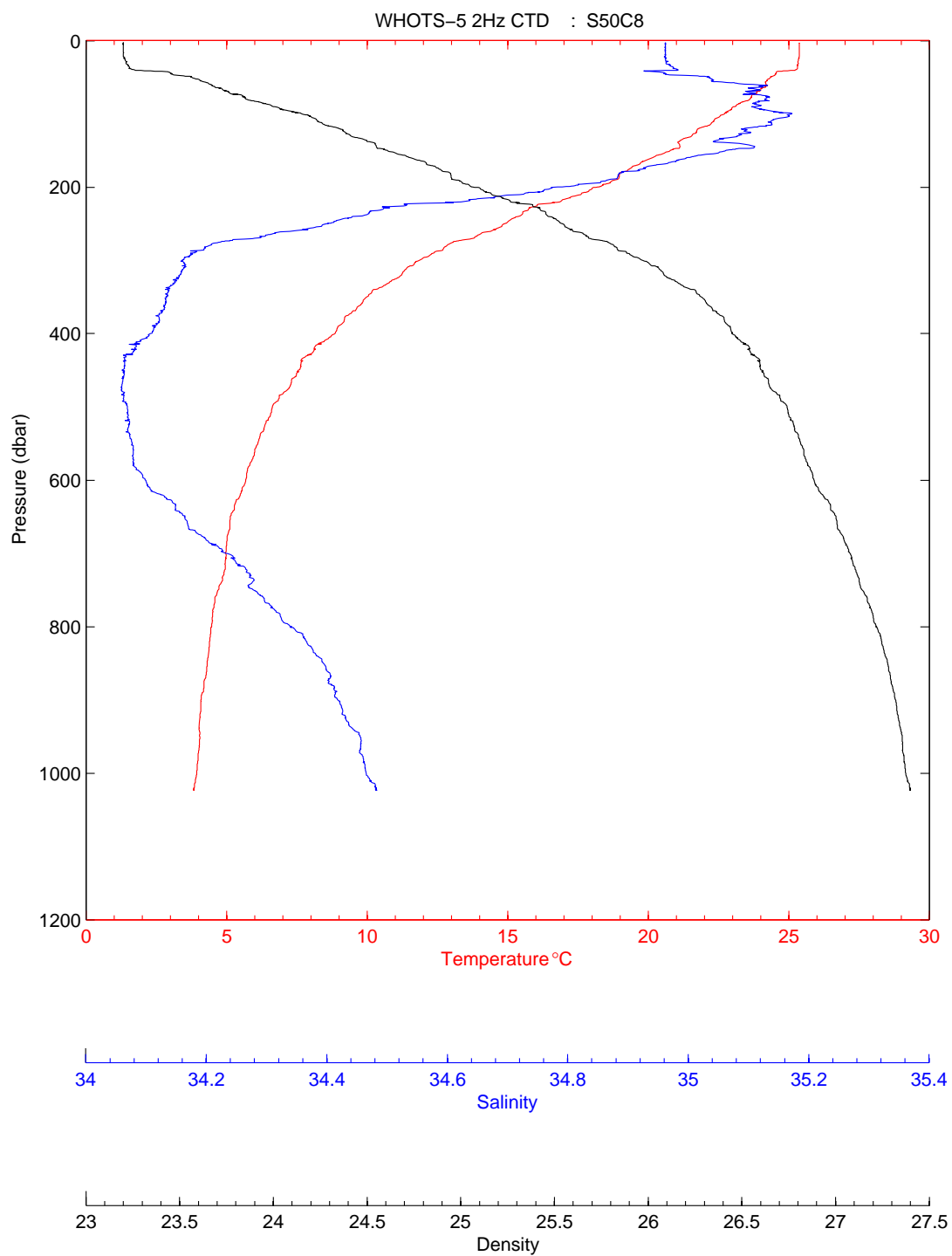


Figure B2. Profiles of 2 Hz temperature, salinity and potential density data during CTD S50C8.

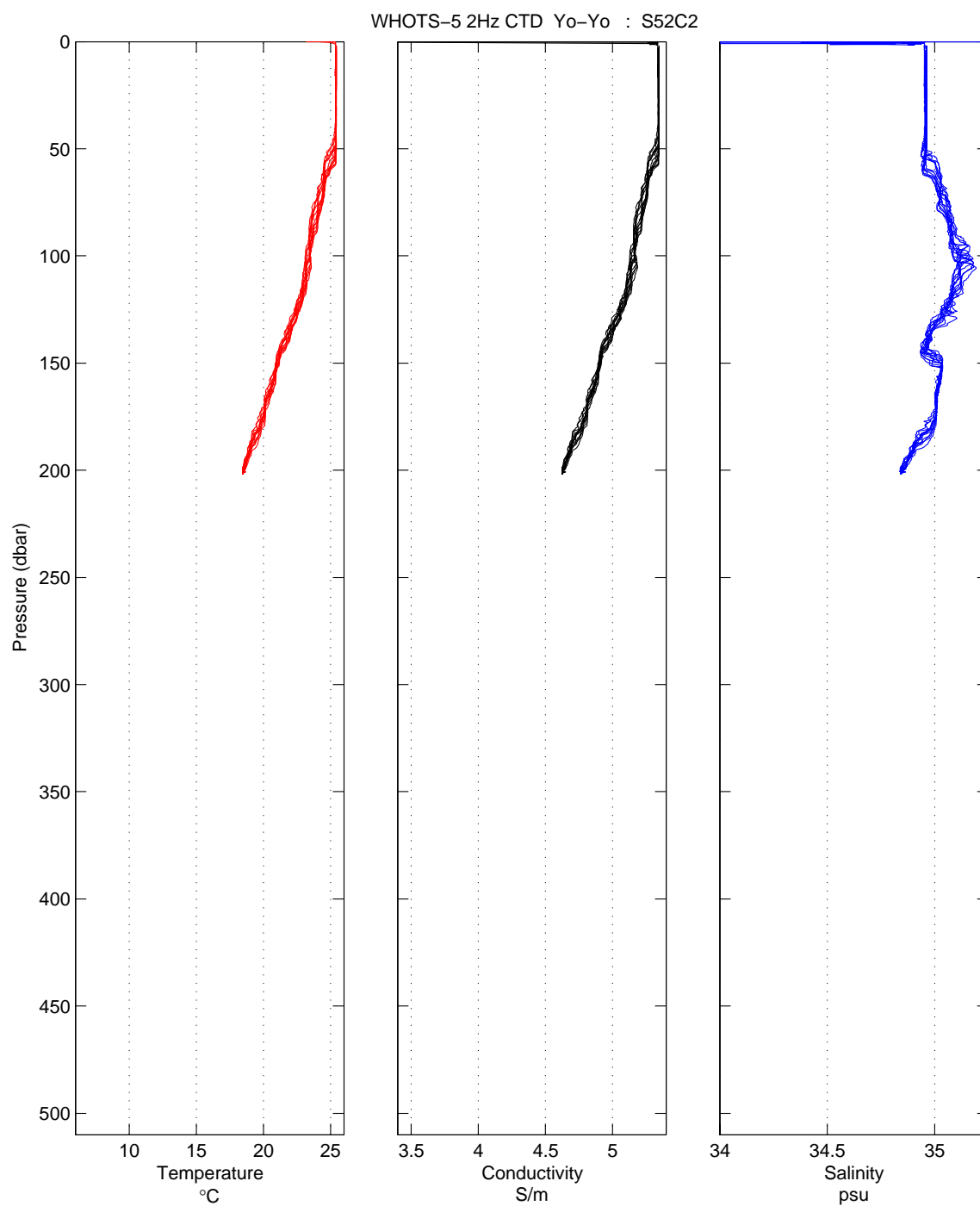


Figure B3. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S52C2.

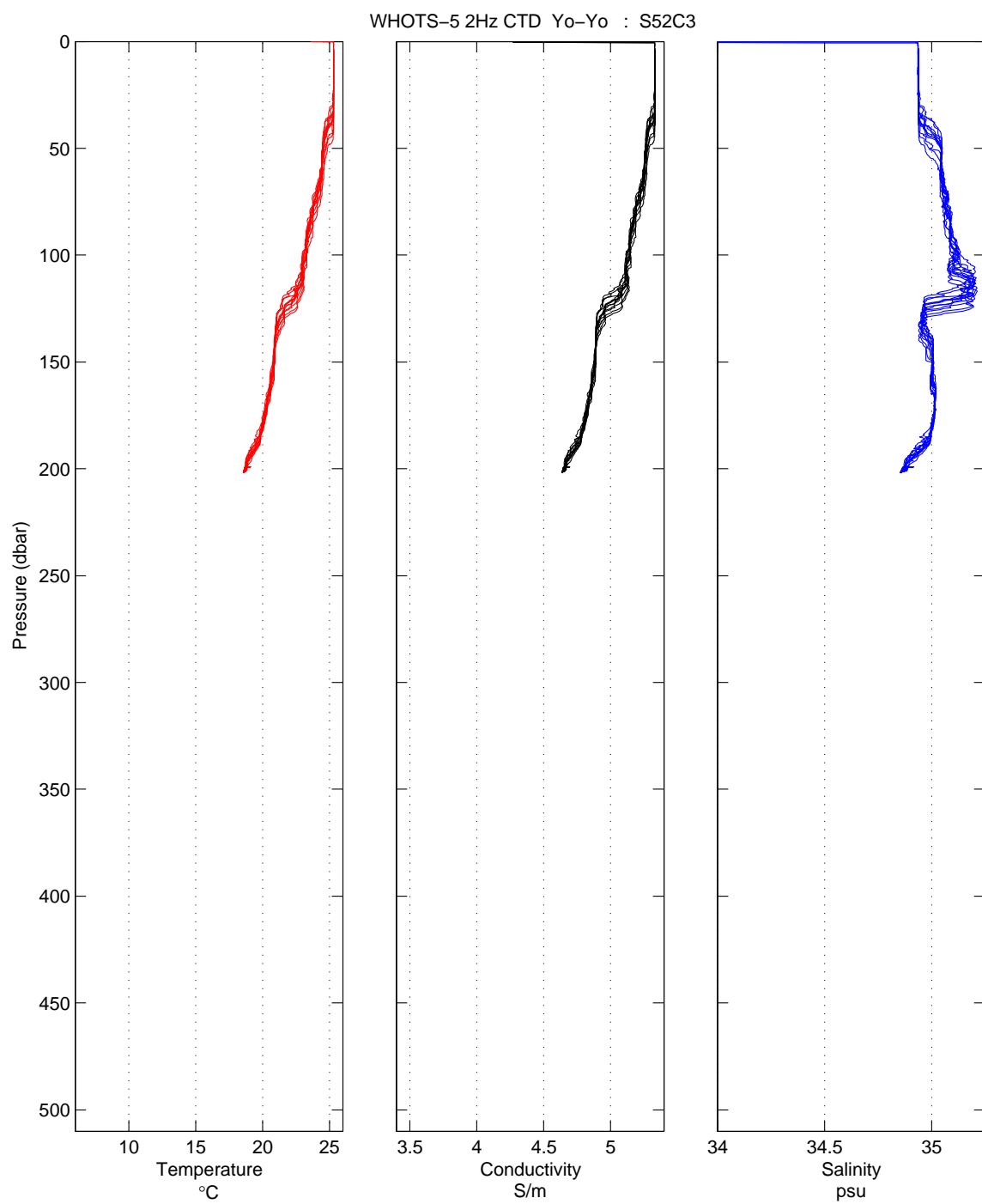


Figure B4. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S52C3.

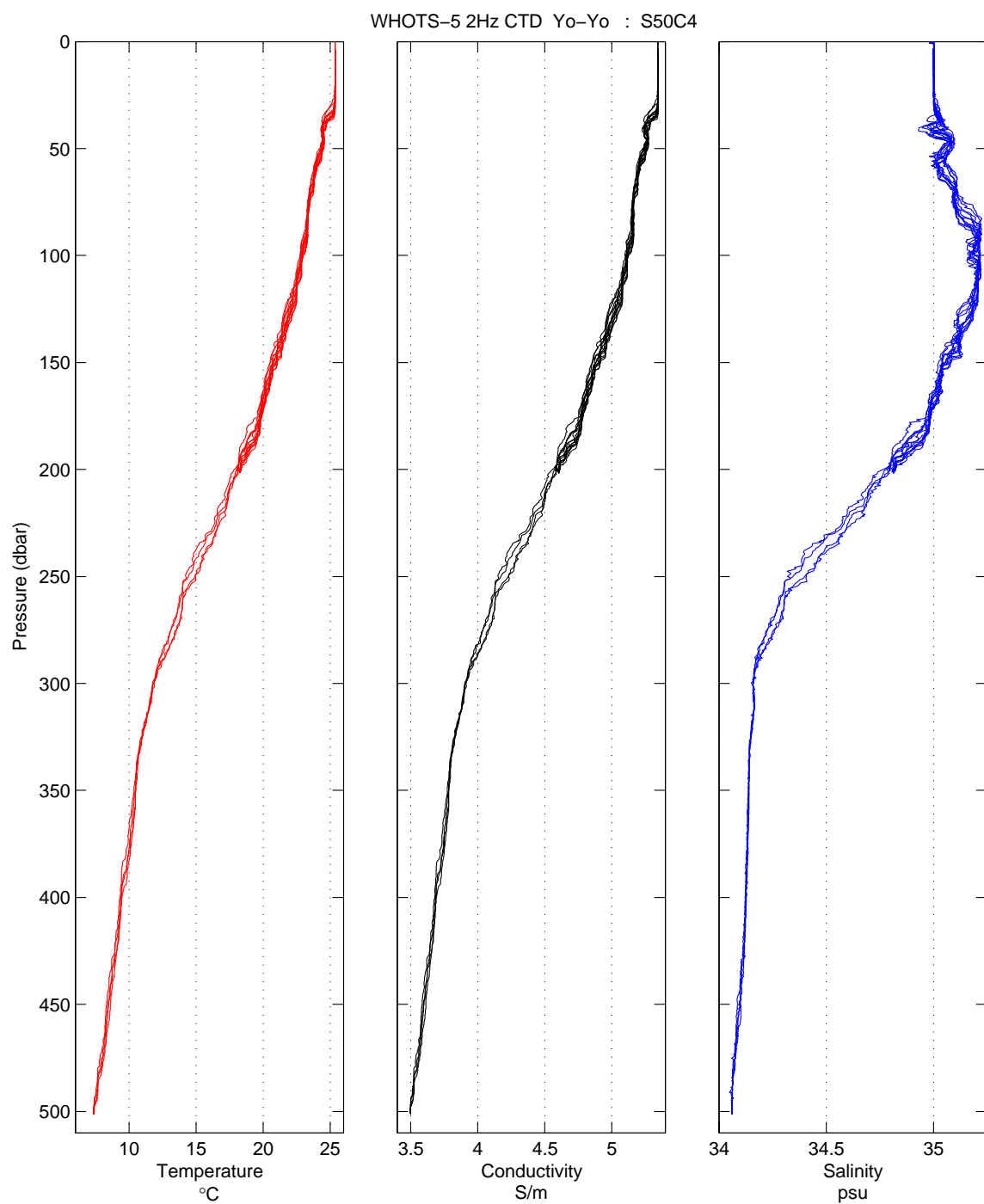


Figure B2. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S52C4.

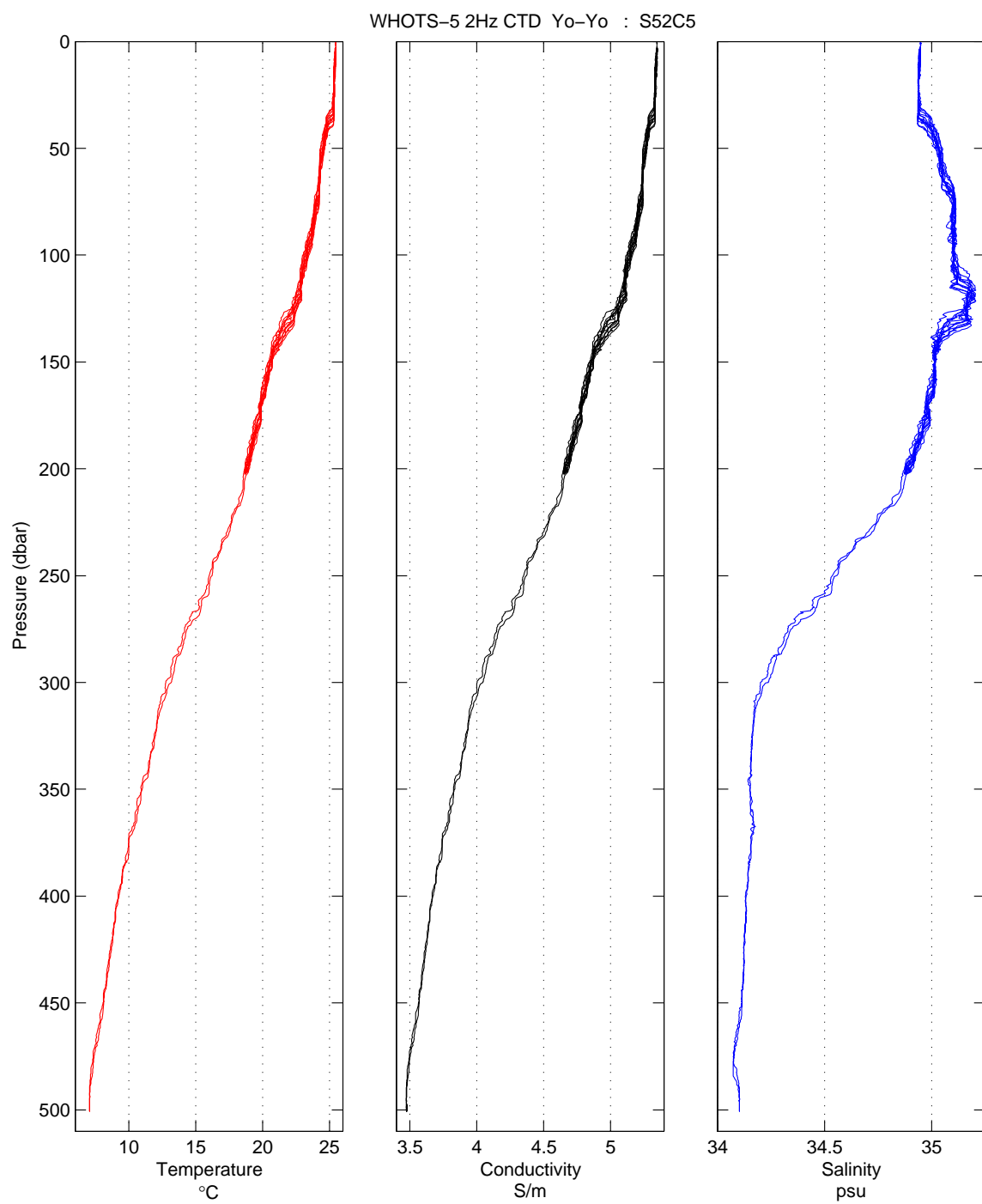


Figure B6. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S52C5.

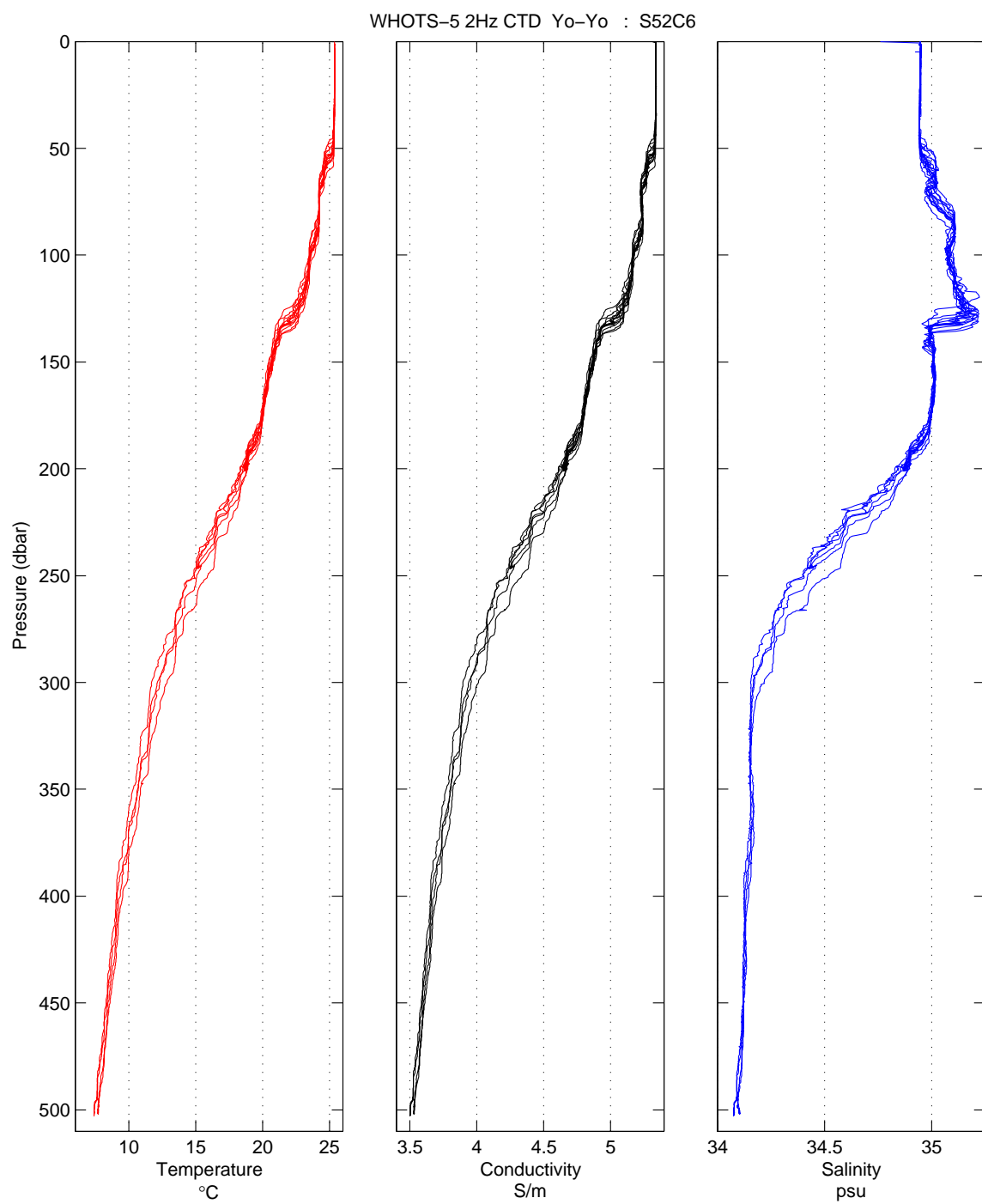


Figure B7. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S52C6.

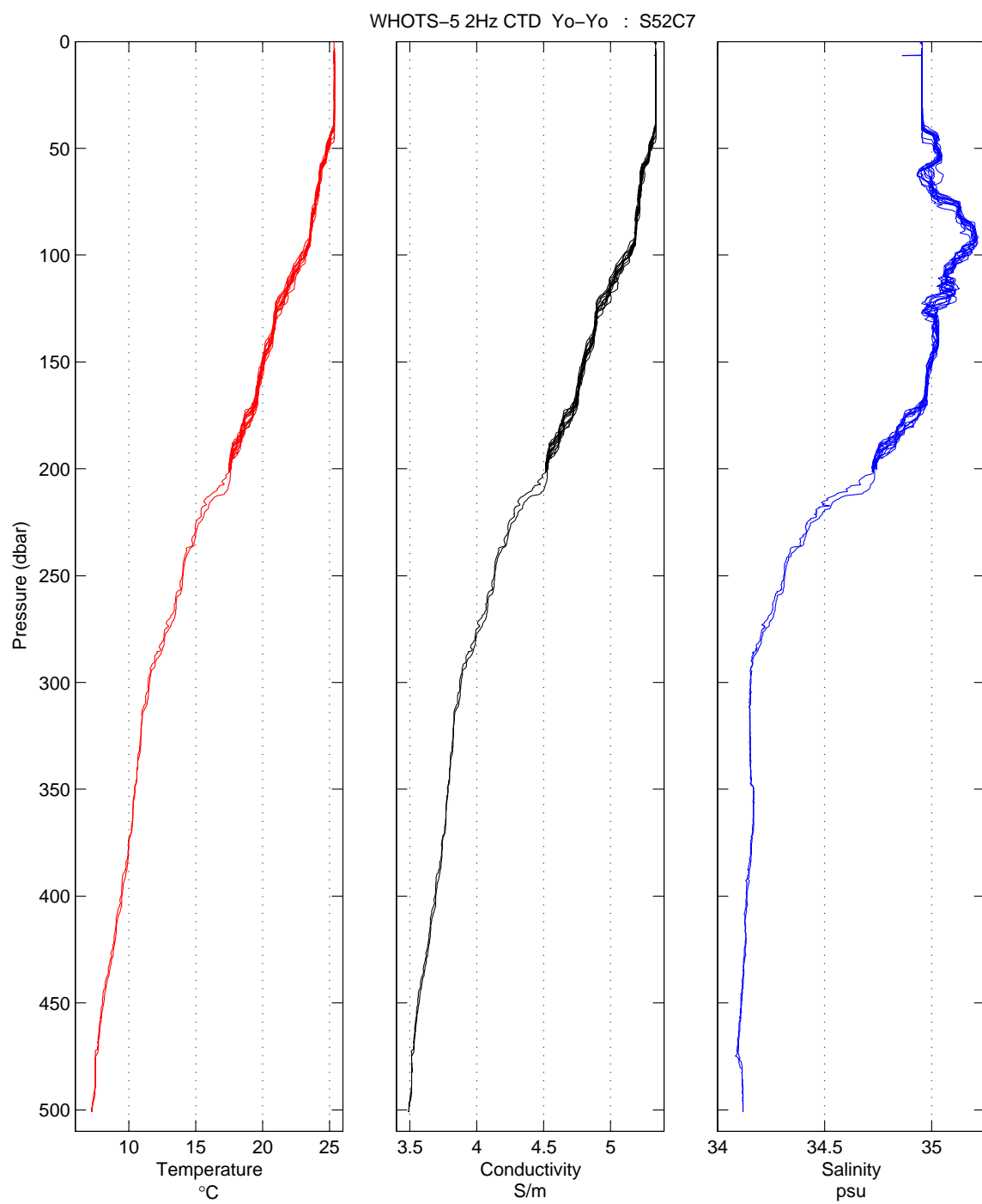


Figure B8. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S52C7.

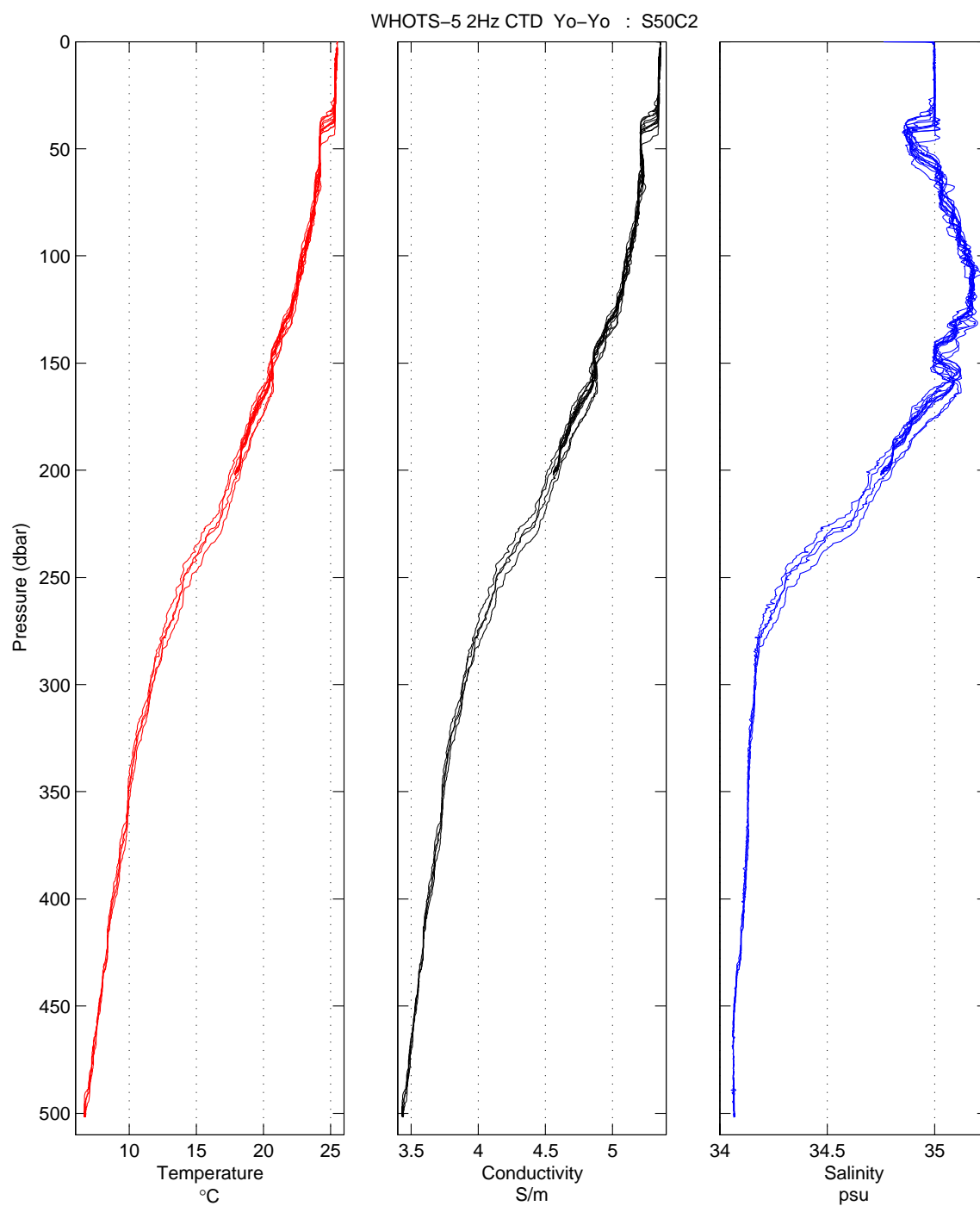


Figure B9. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S50C2.

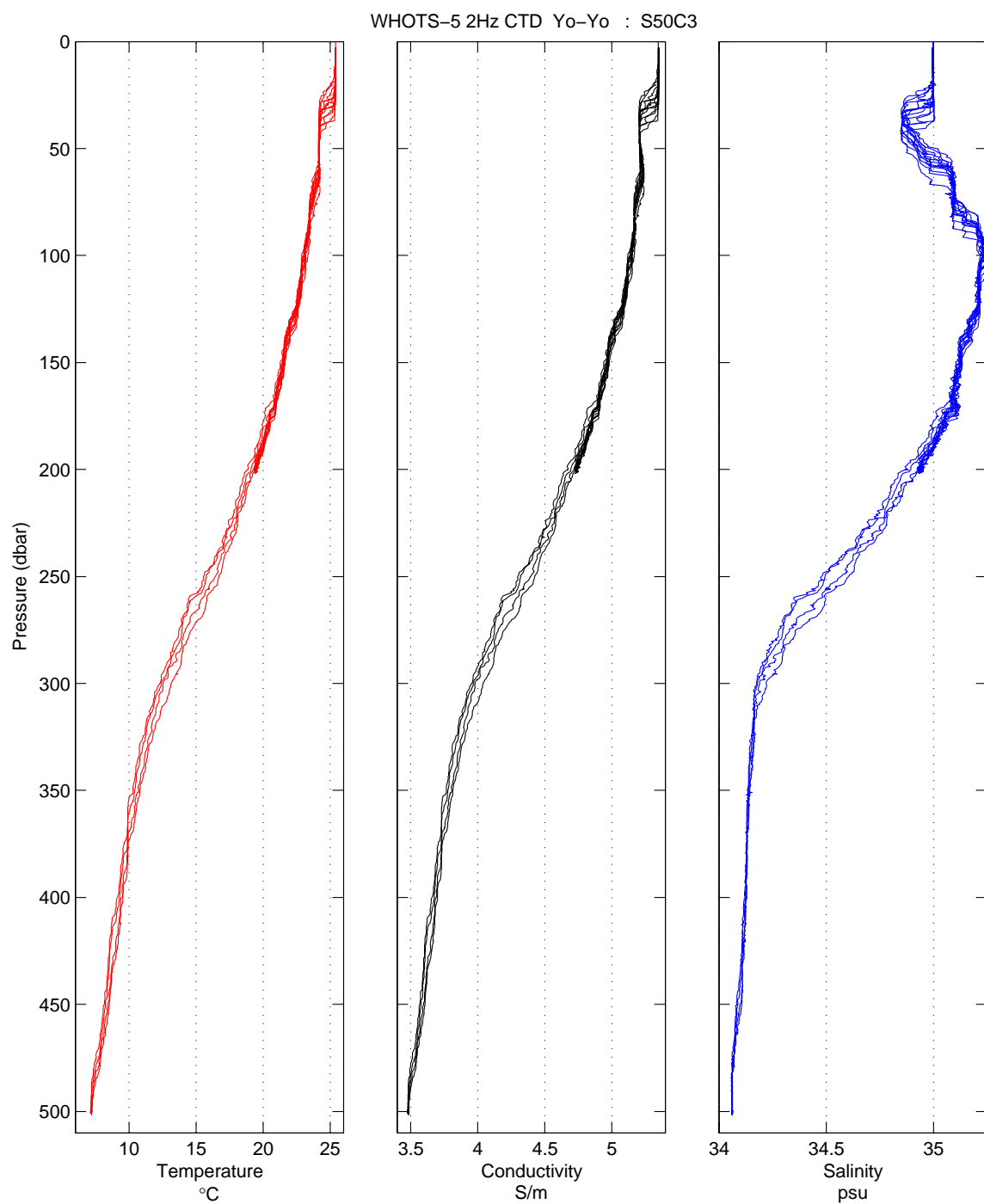


Figure B10. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S50C3.

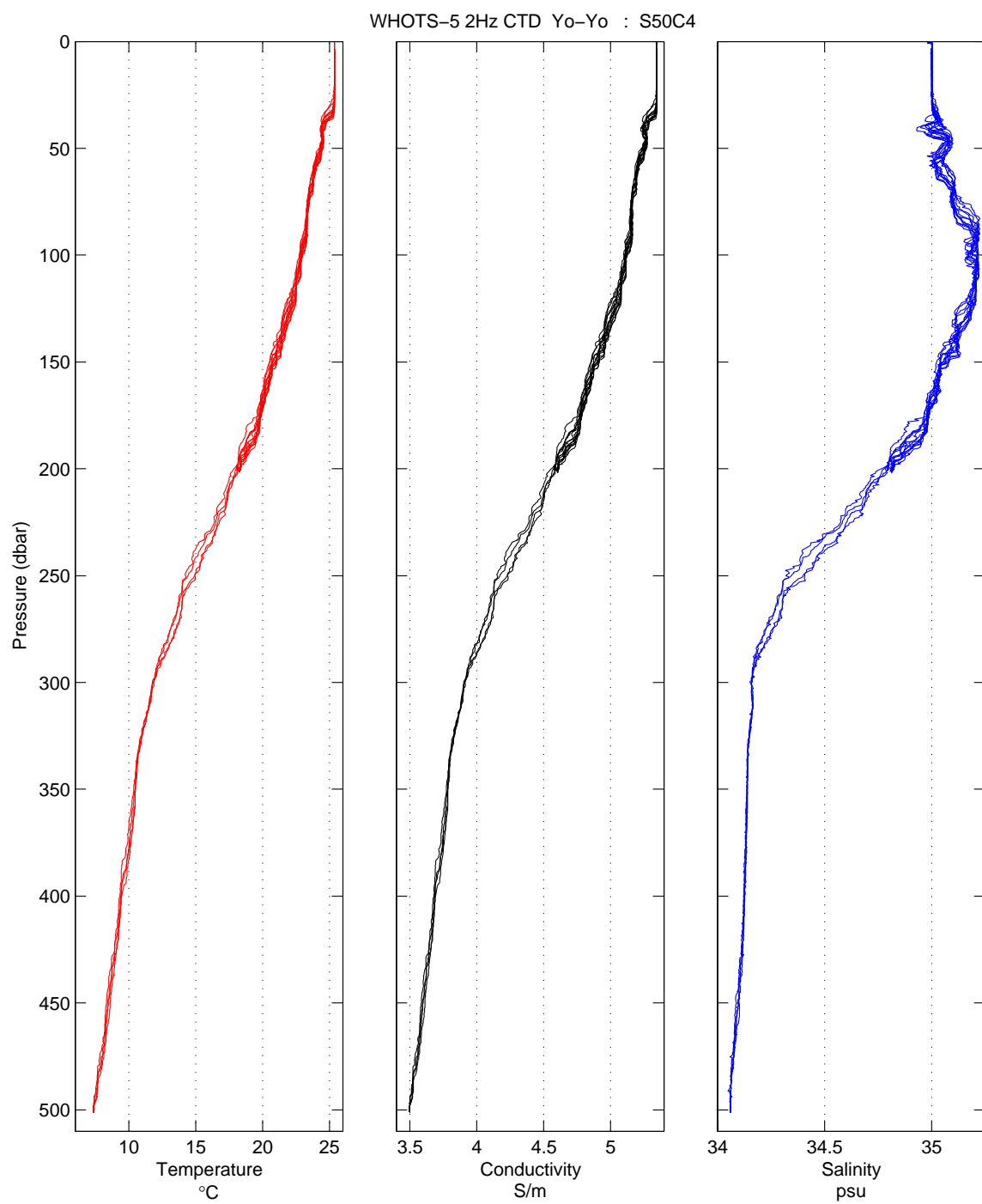


Figure B11. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S50C4.

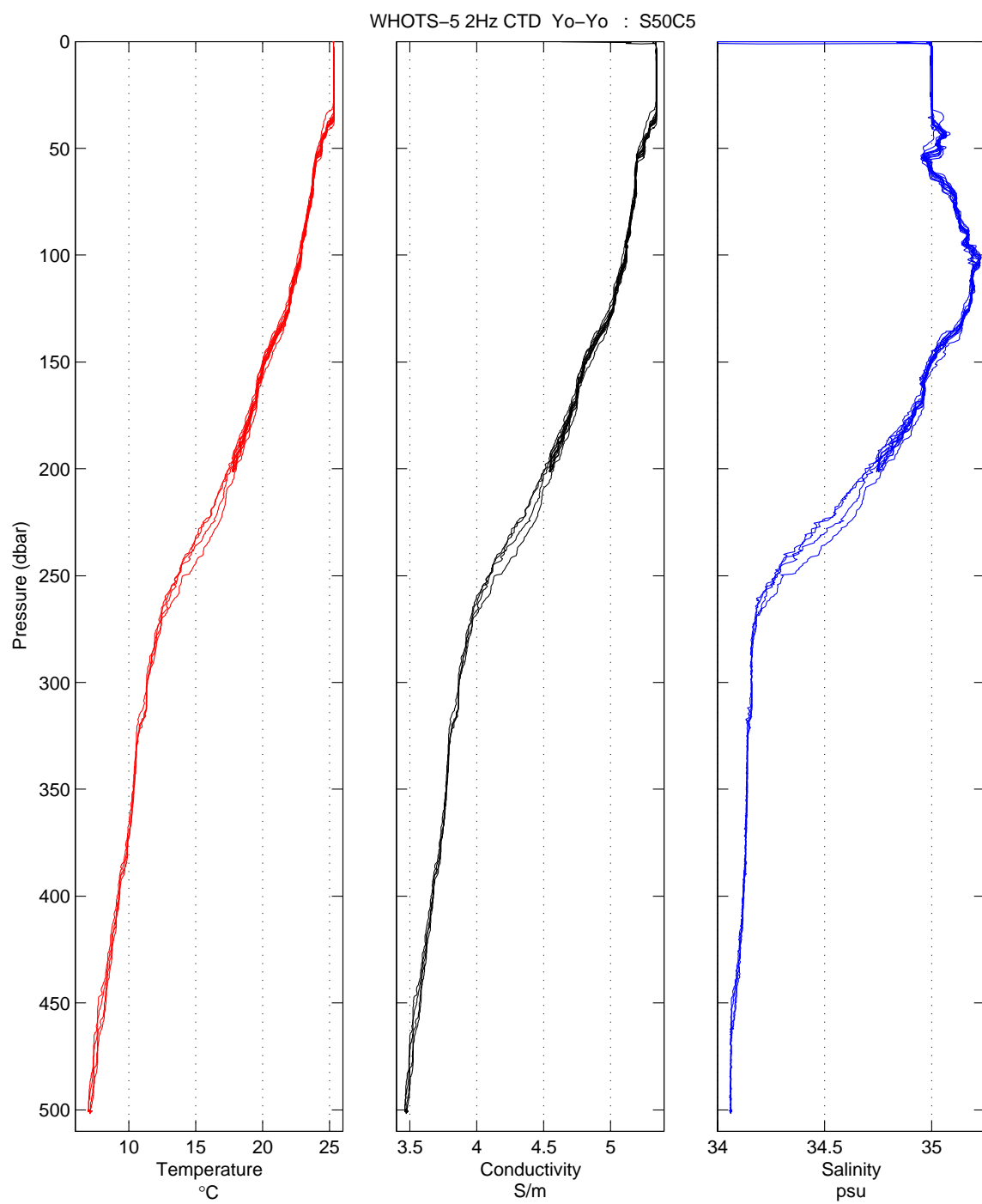


Figure B12. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S50C5.

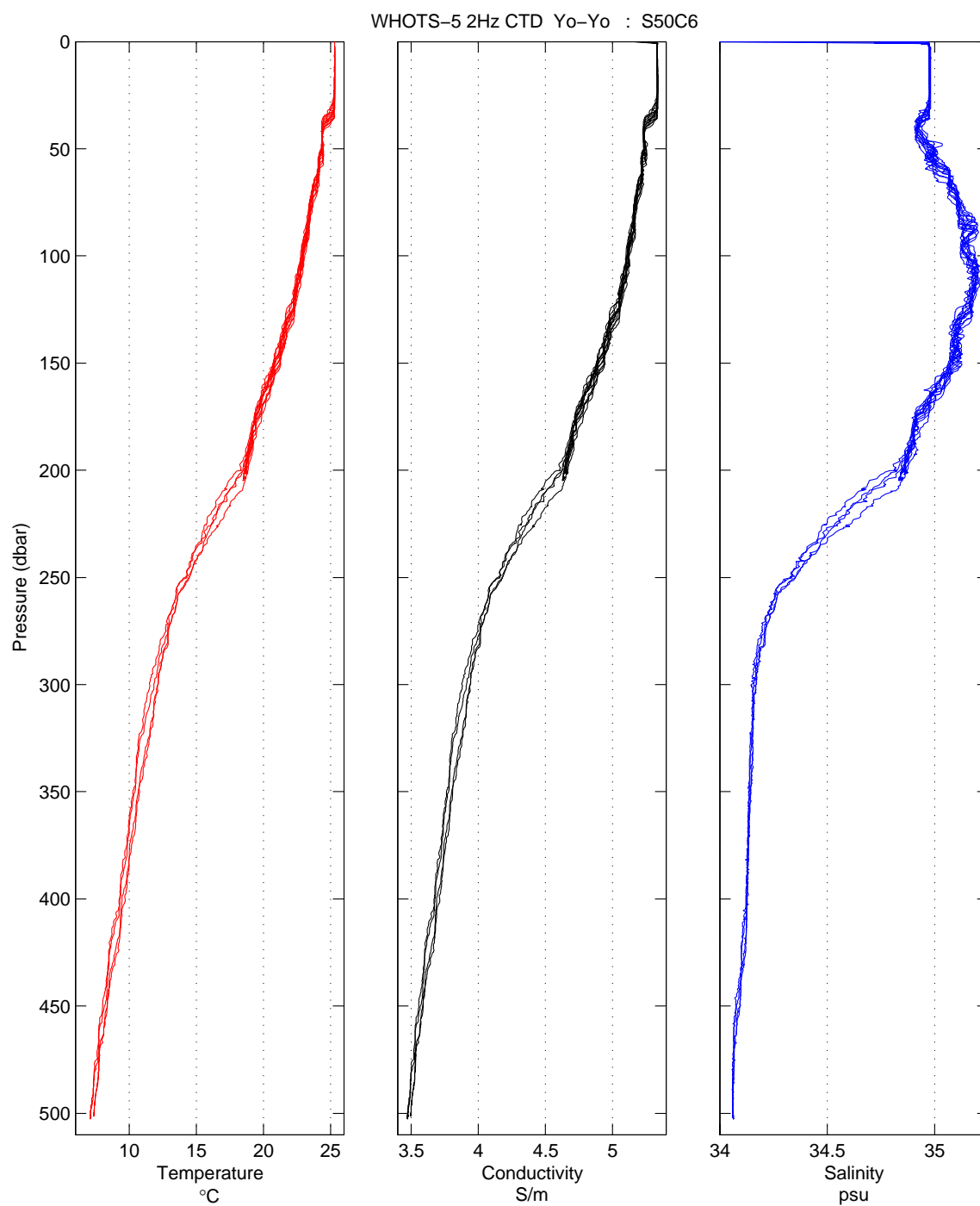


Figure B13. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S50C6.

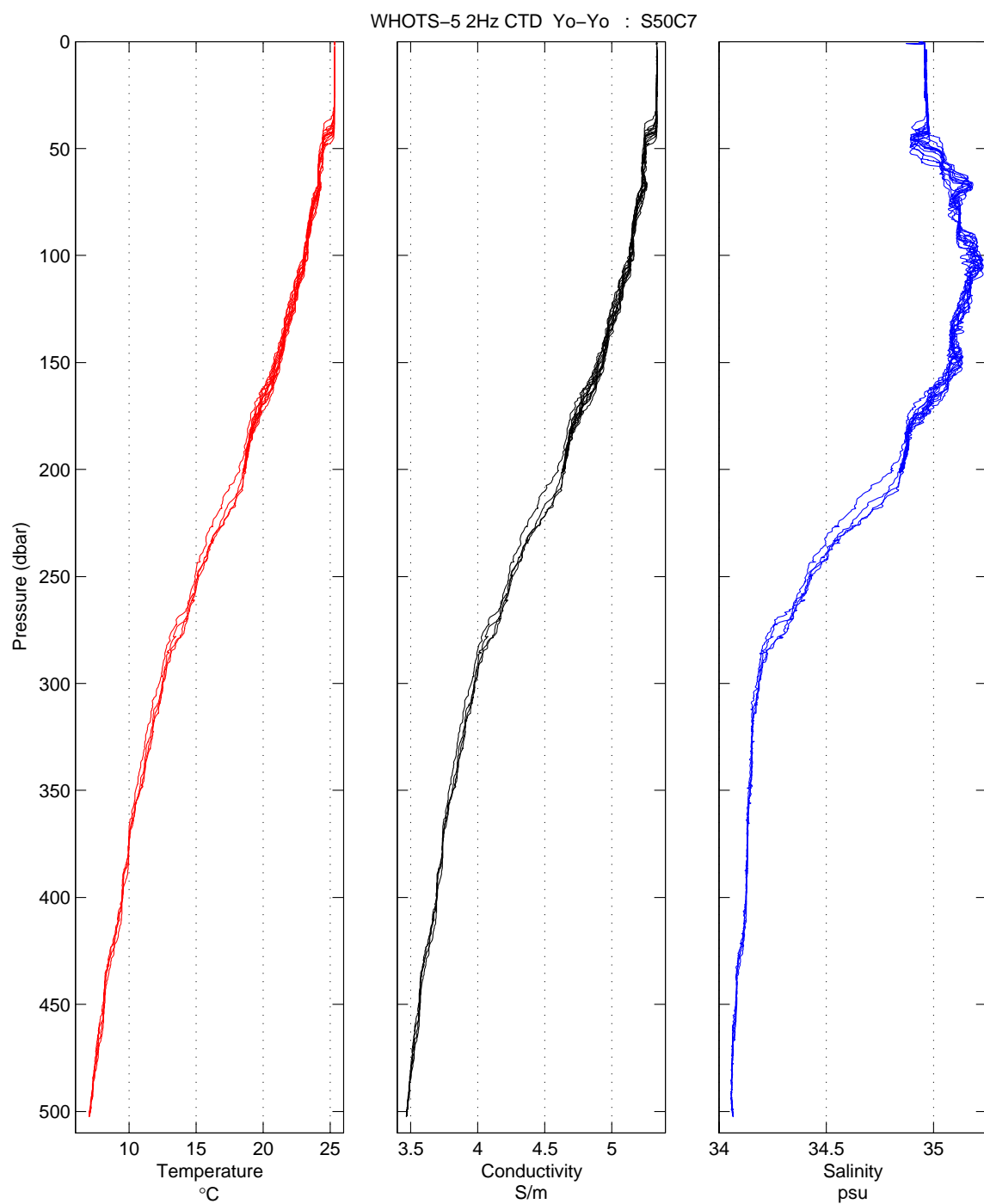


Figure B14. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S50C7.

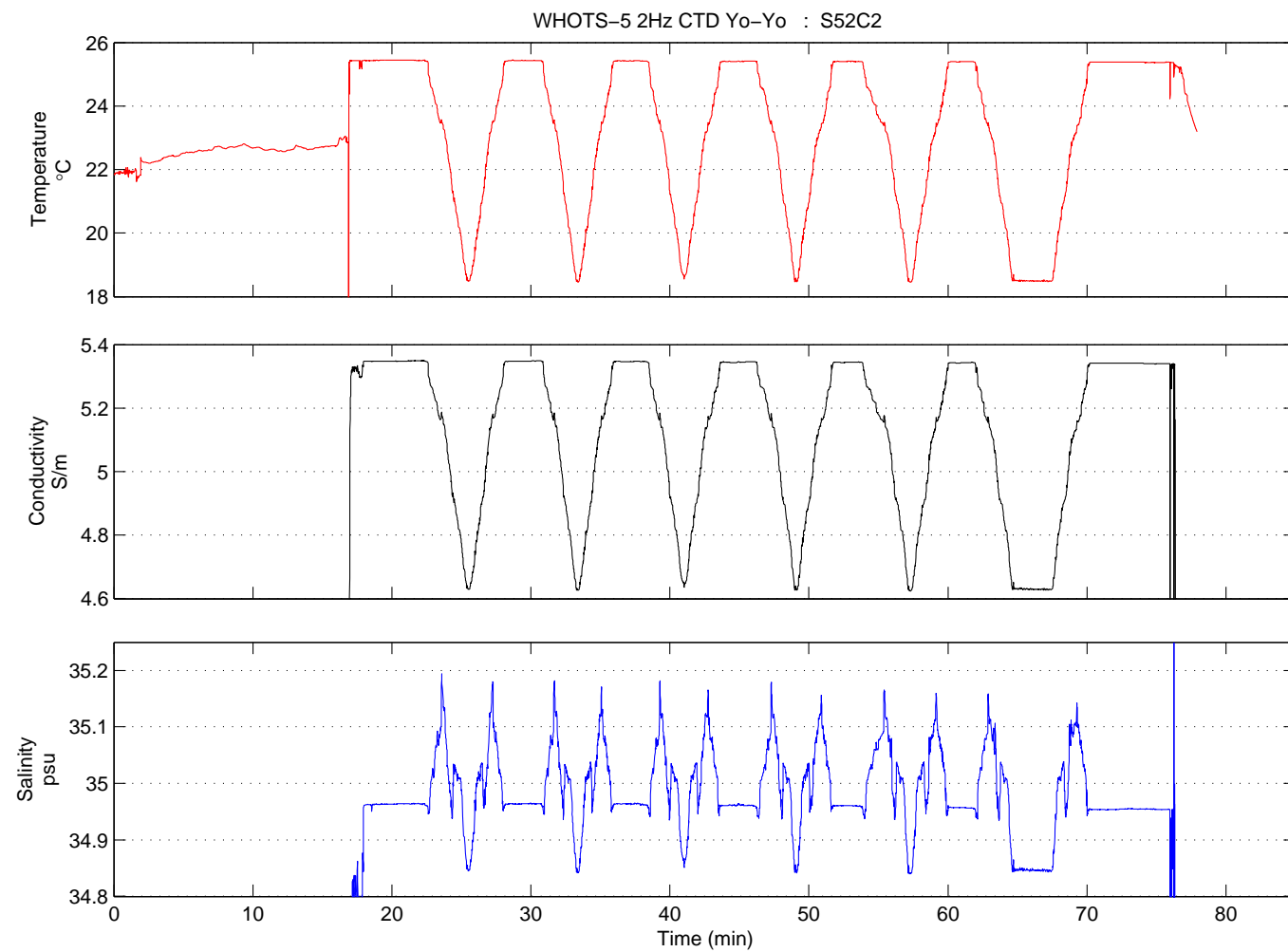


Figure B15. Profiles of 2 Hz temperature, conductivity and salinity data during CTD S52C2.

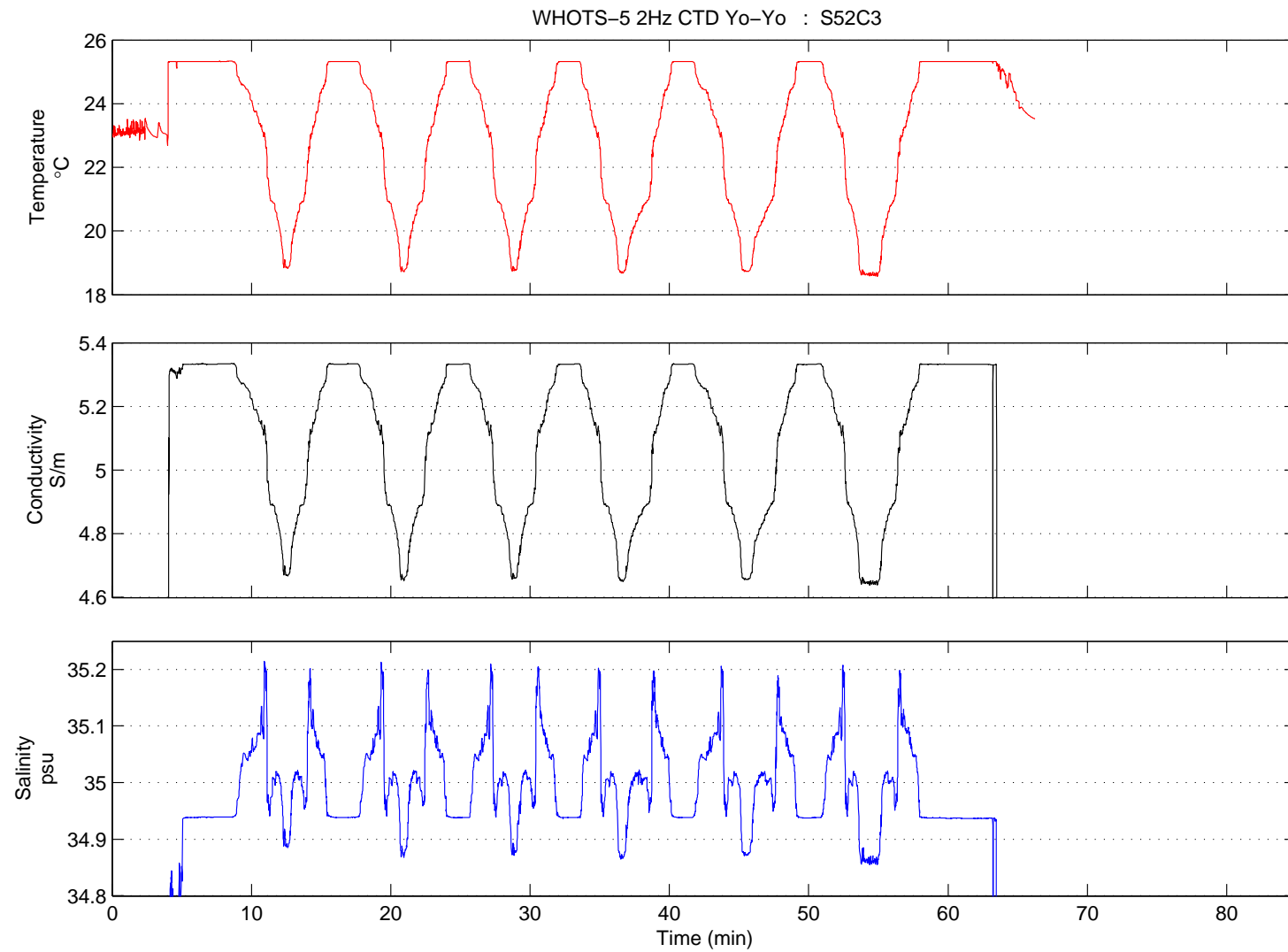


Figure B16. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S52C3.

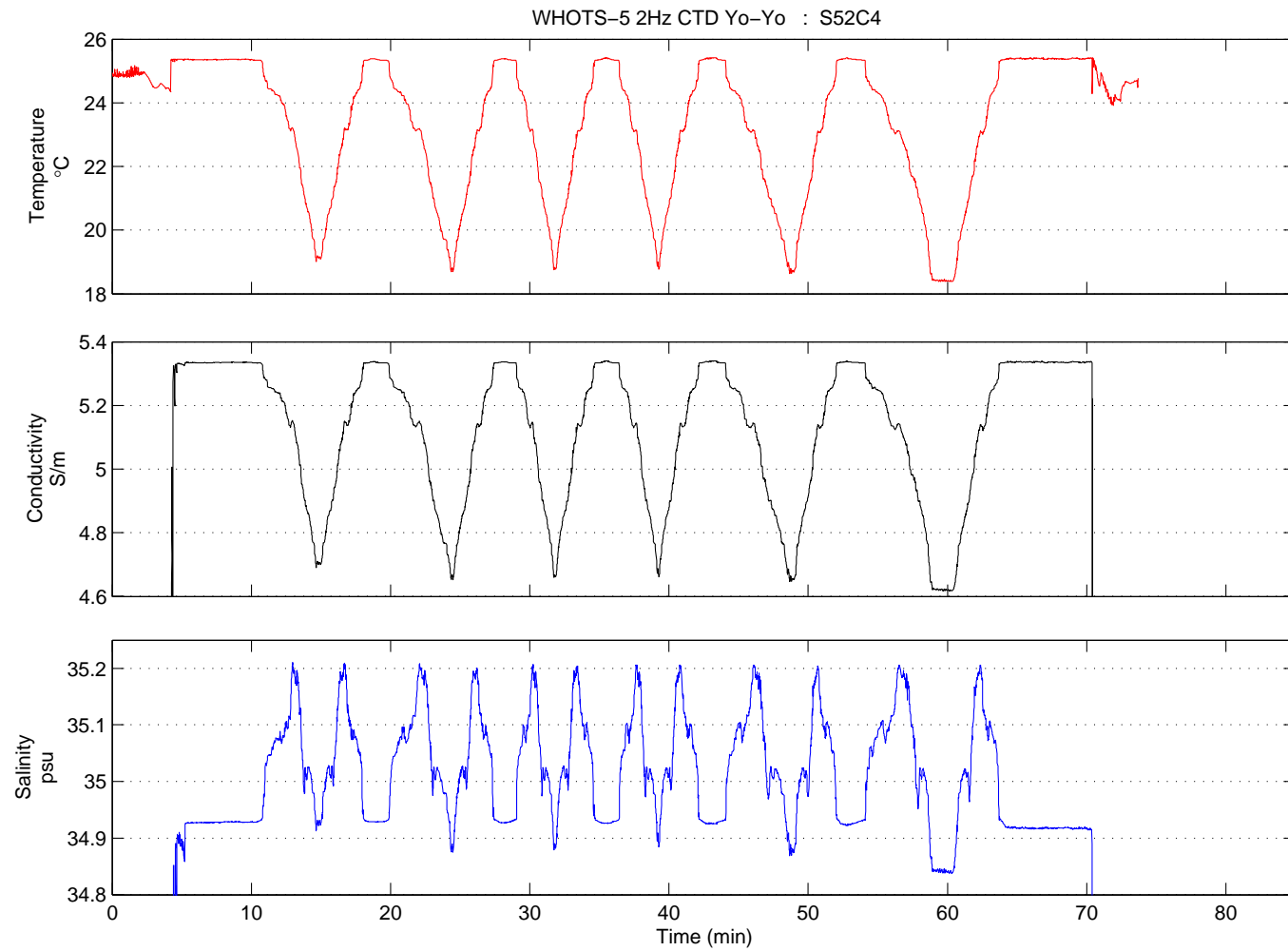


Figure B17. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S52C4.

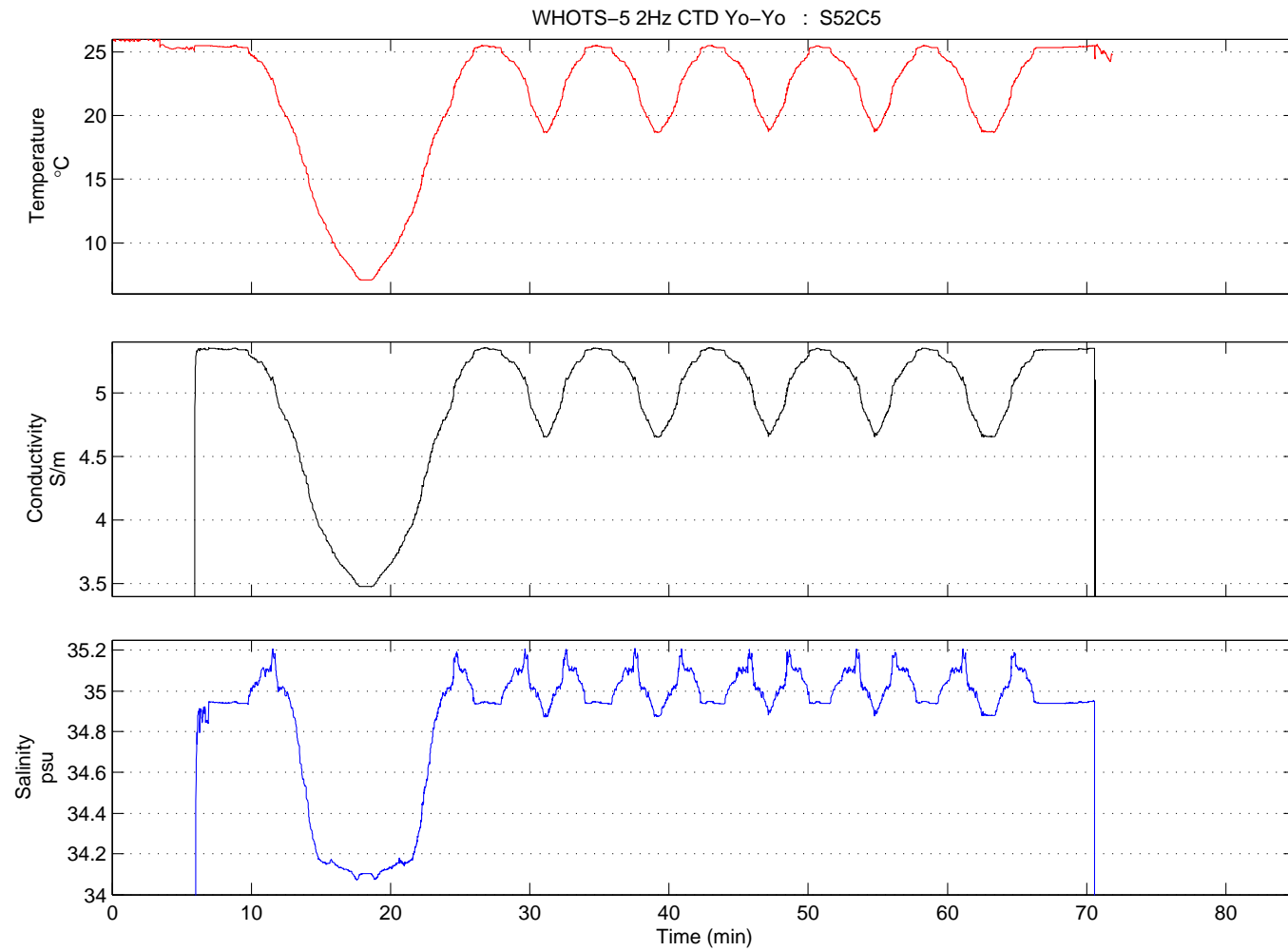


Figure B18. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S52C5.

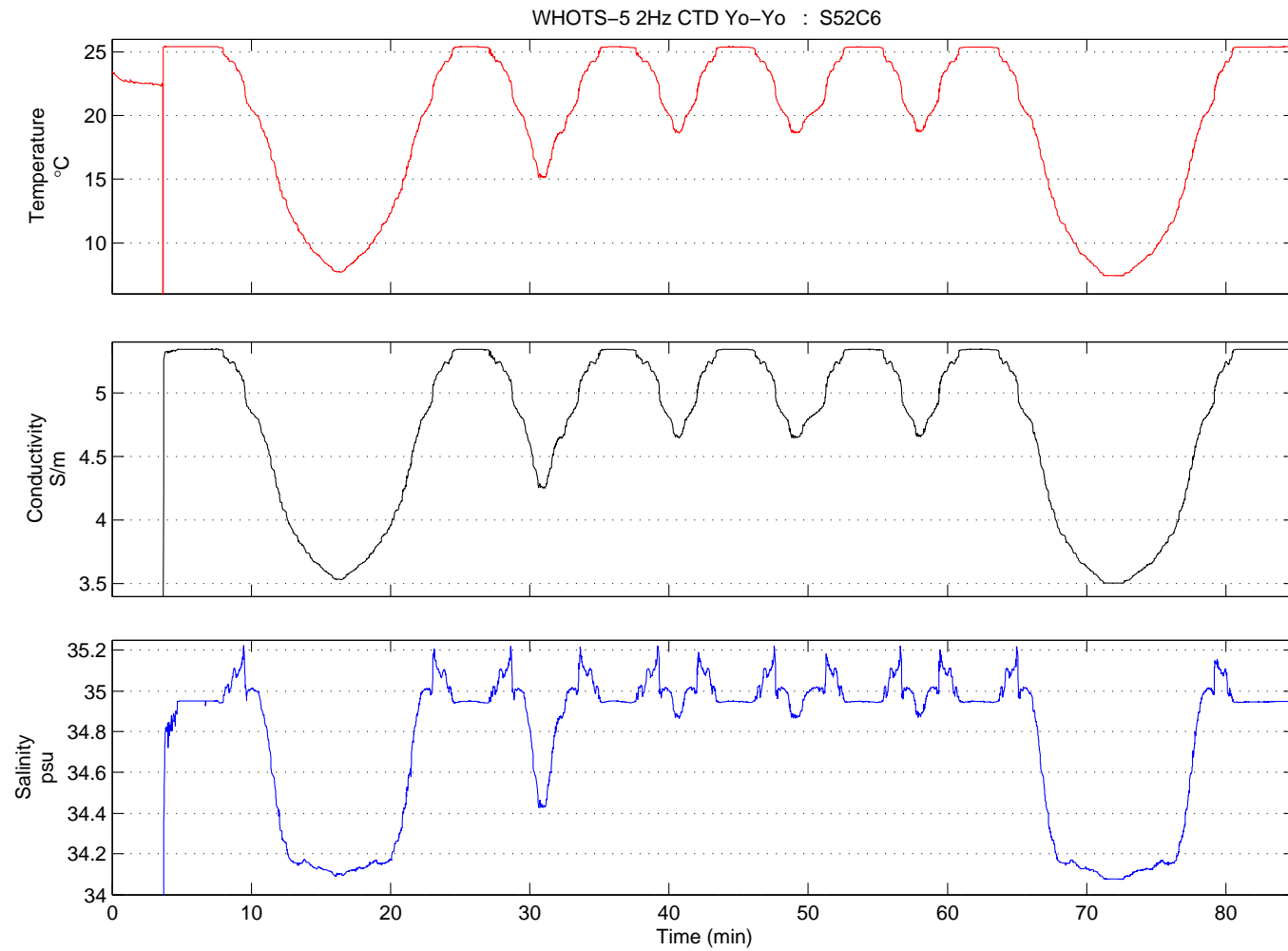


Figure B19. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S52C6.

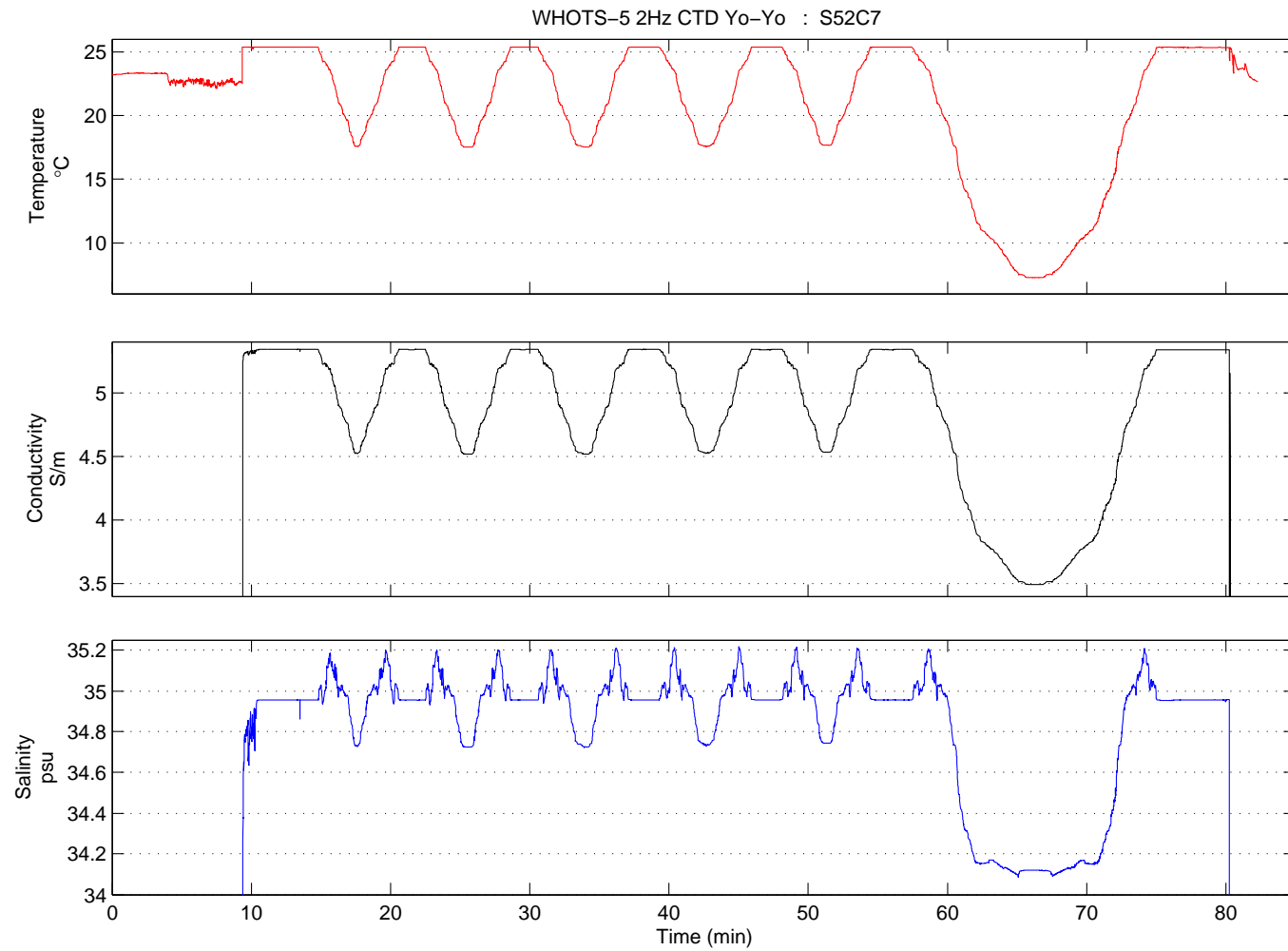


Figure B20. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S52C7.

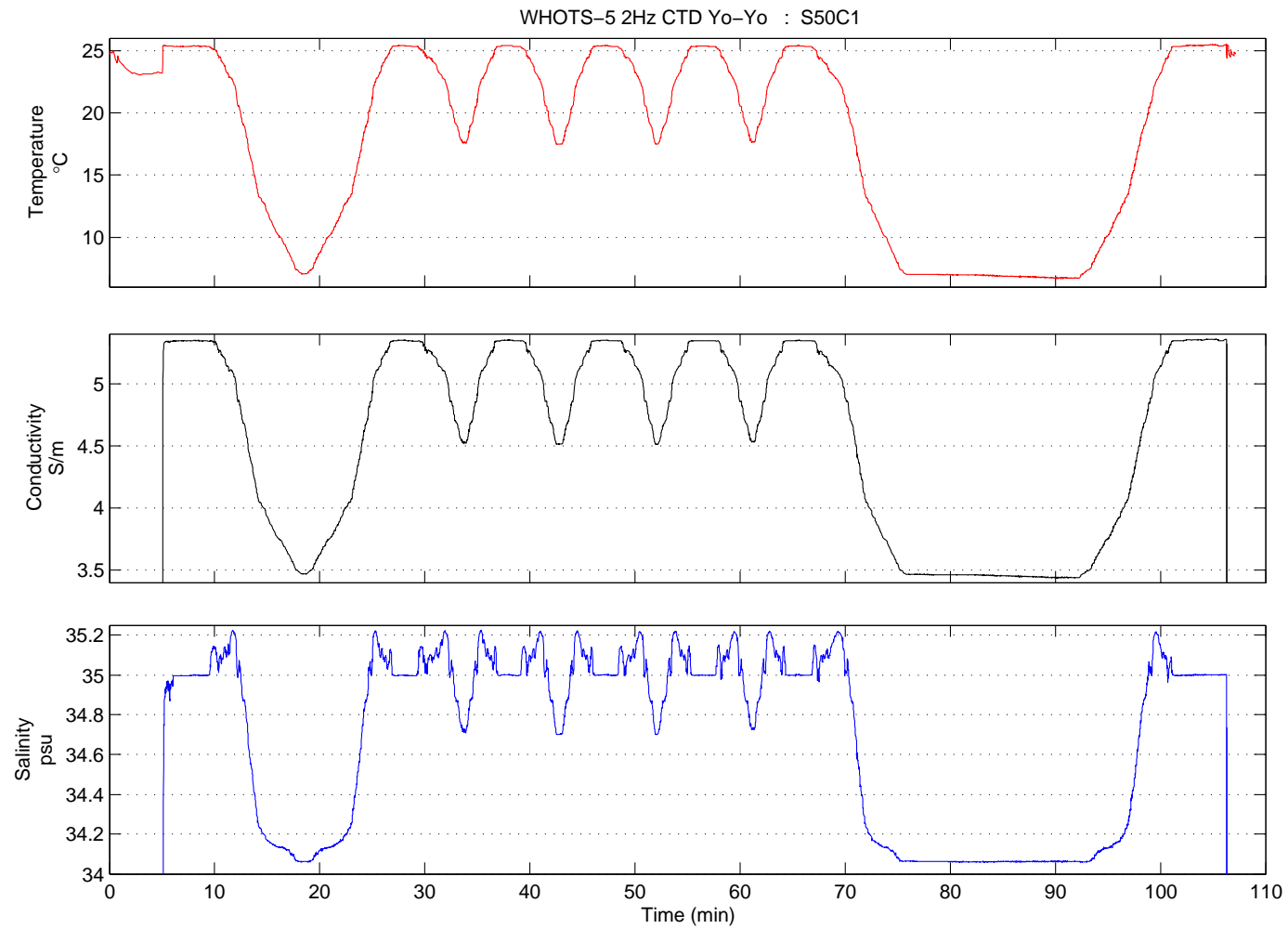


Figure B21. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S50C1.

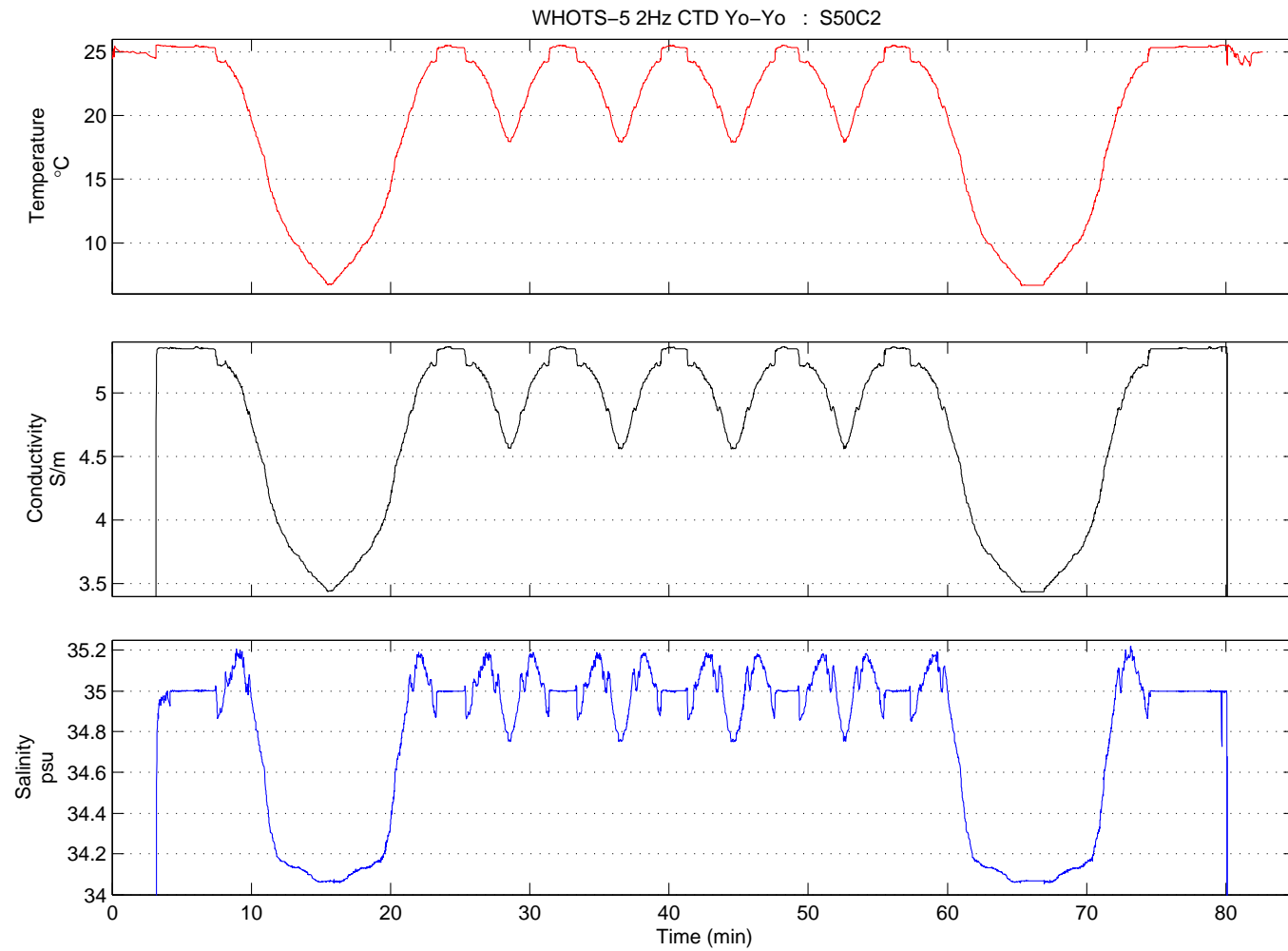


Figure B22. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S50C2.

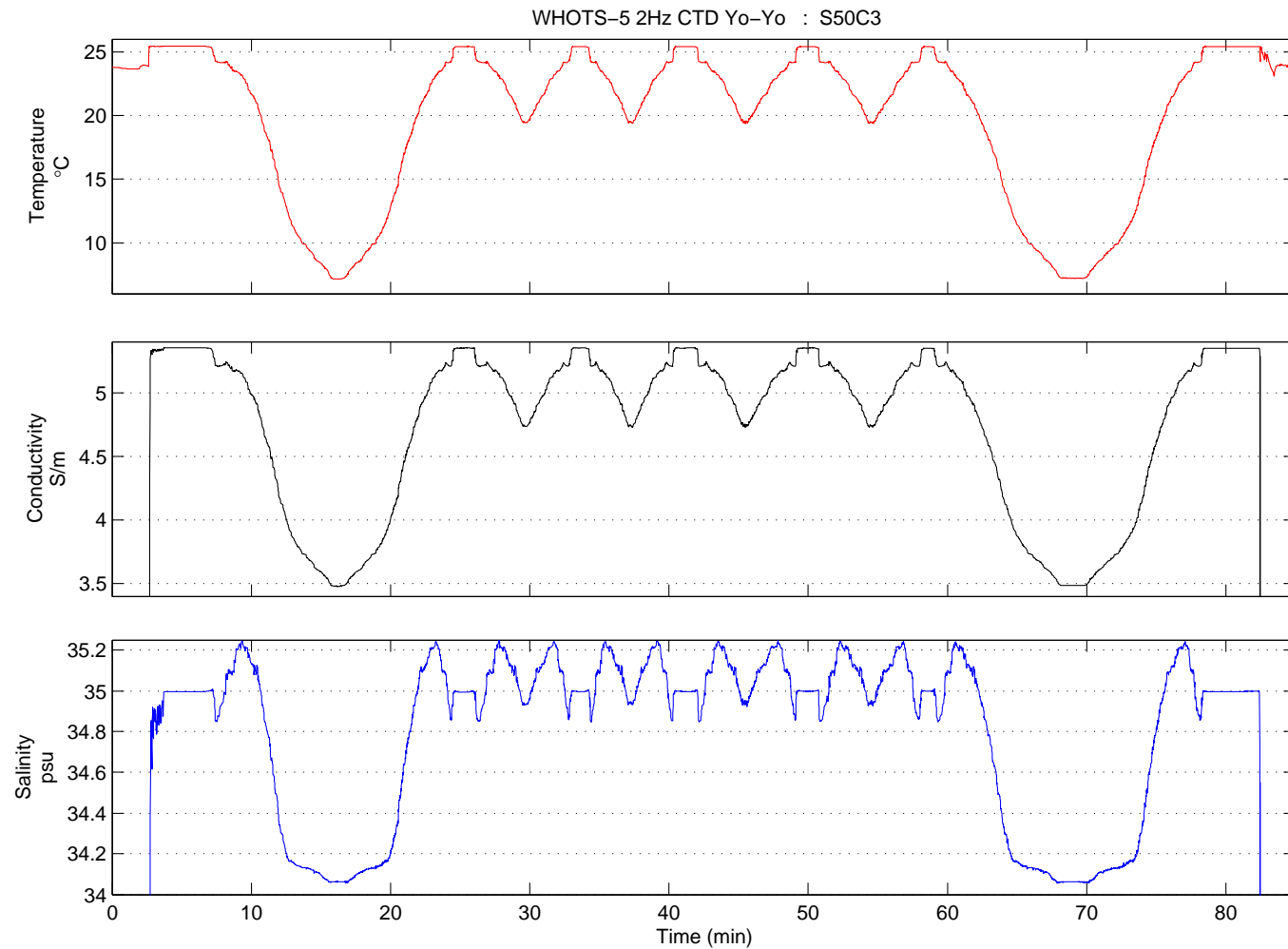


Figure B23. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S50C3.

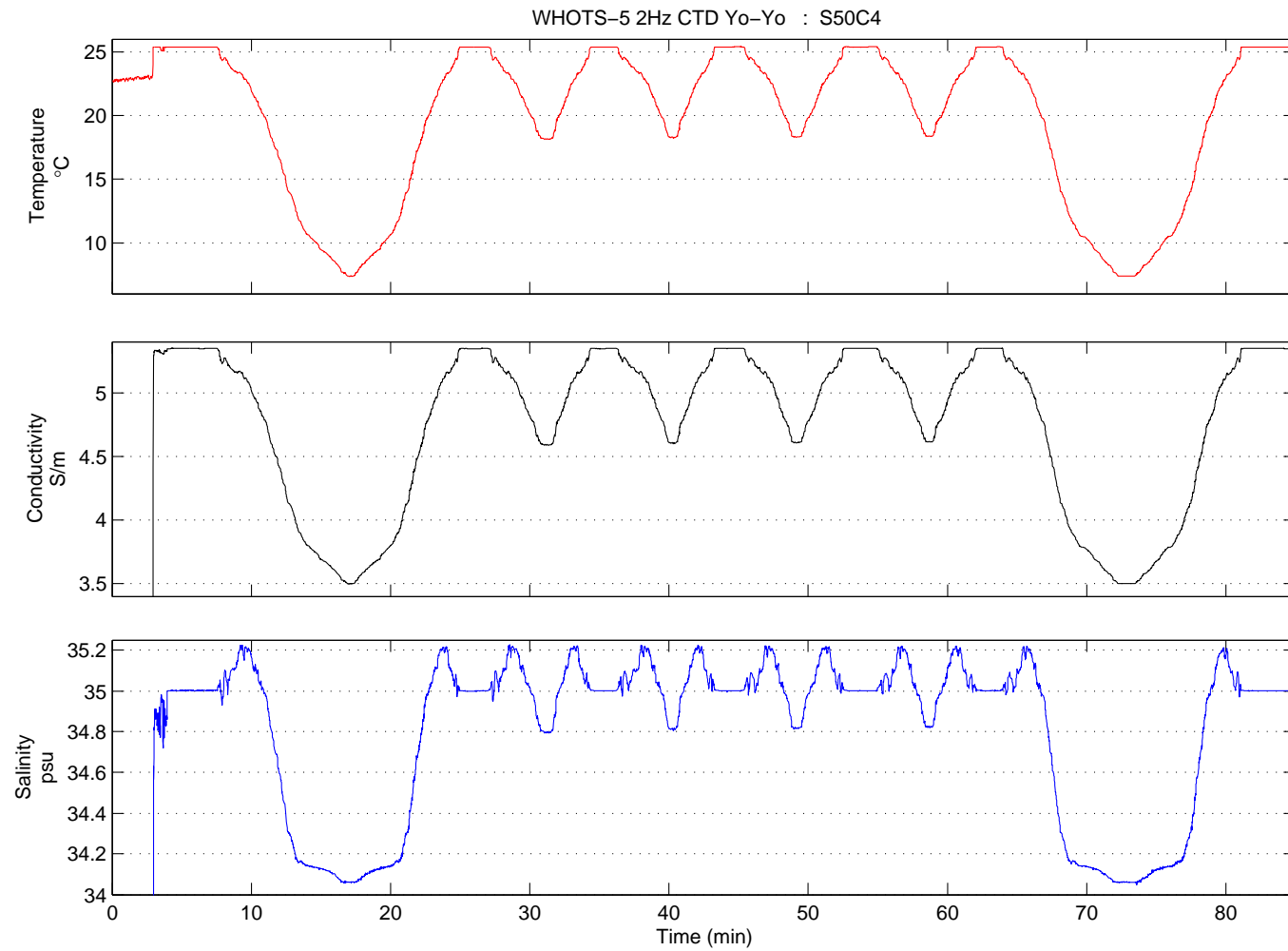


Figure B24. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S50C4.

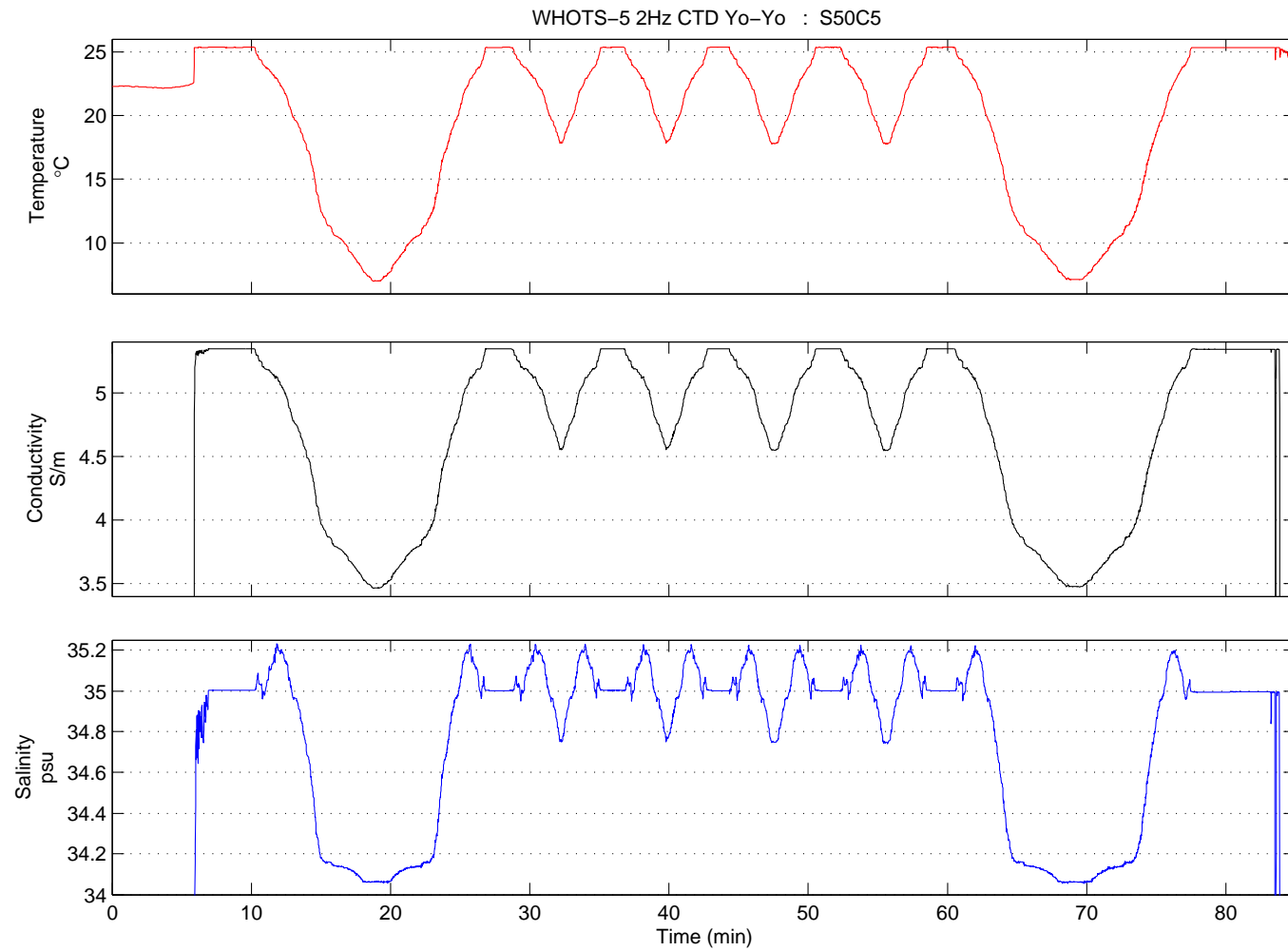


Figure B25. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S50C5.

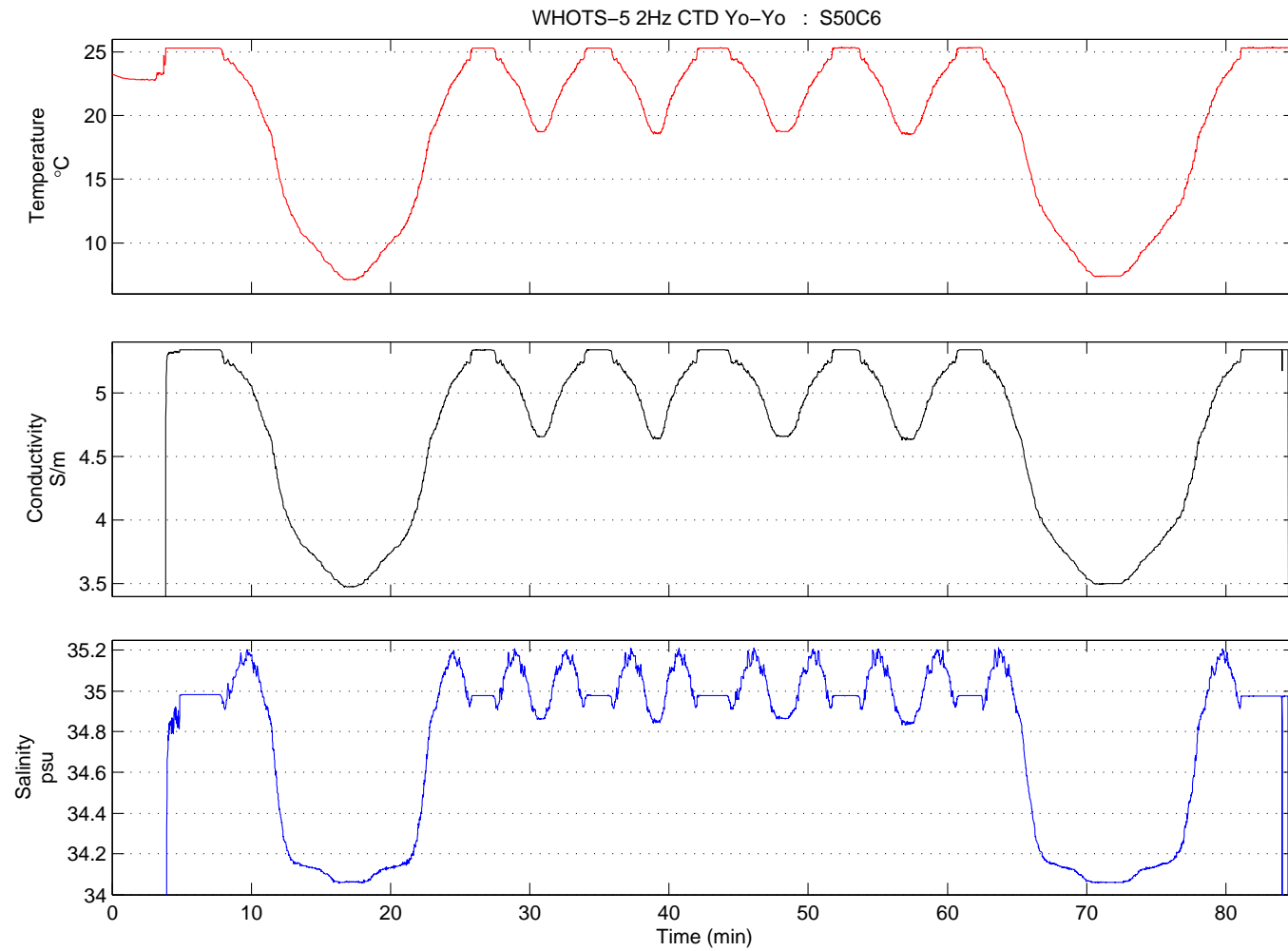


Figure B26. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S50C6.

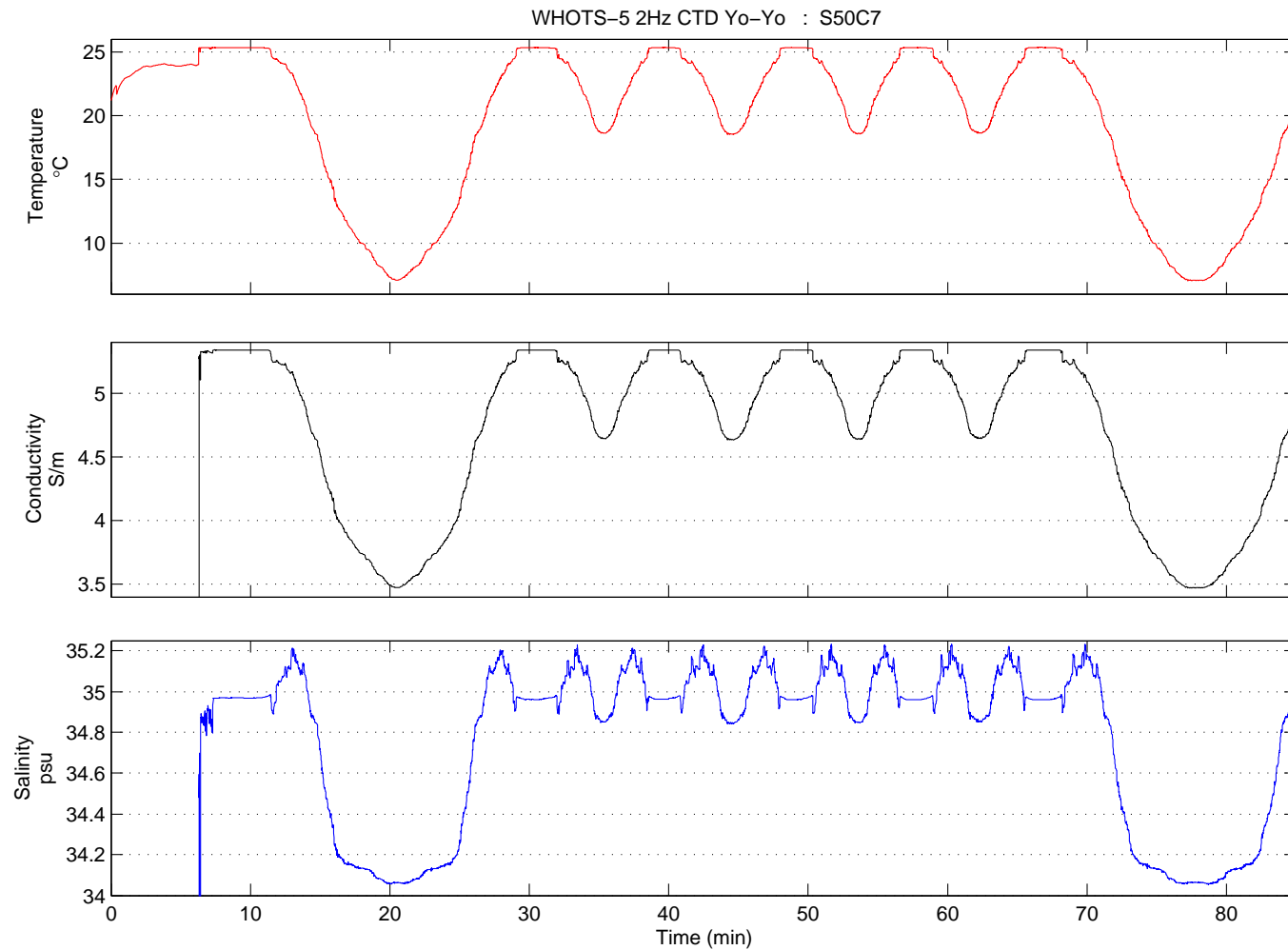


Figure B27. Time-series of 2 Hz temperature, conductivity and salinity data during CTD S50C7.

Appendix C. Thermosalinograph Figures

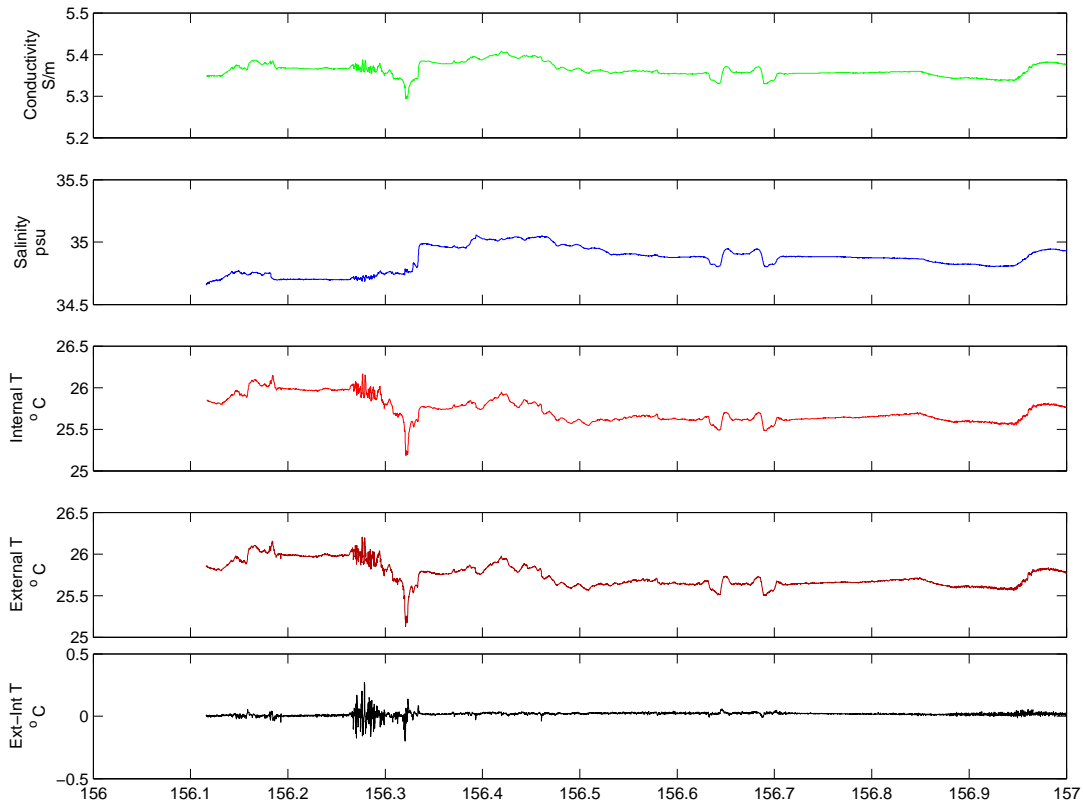


Figure C1. Time-series plots of thermosalinograph conductivity, salinity, internal sensor temperature, remote sensor temperature, and remote - internal temperature difference data during 4 June 2008. The time axis is in Julian days.

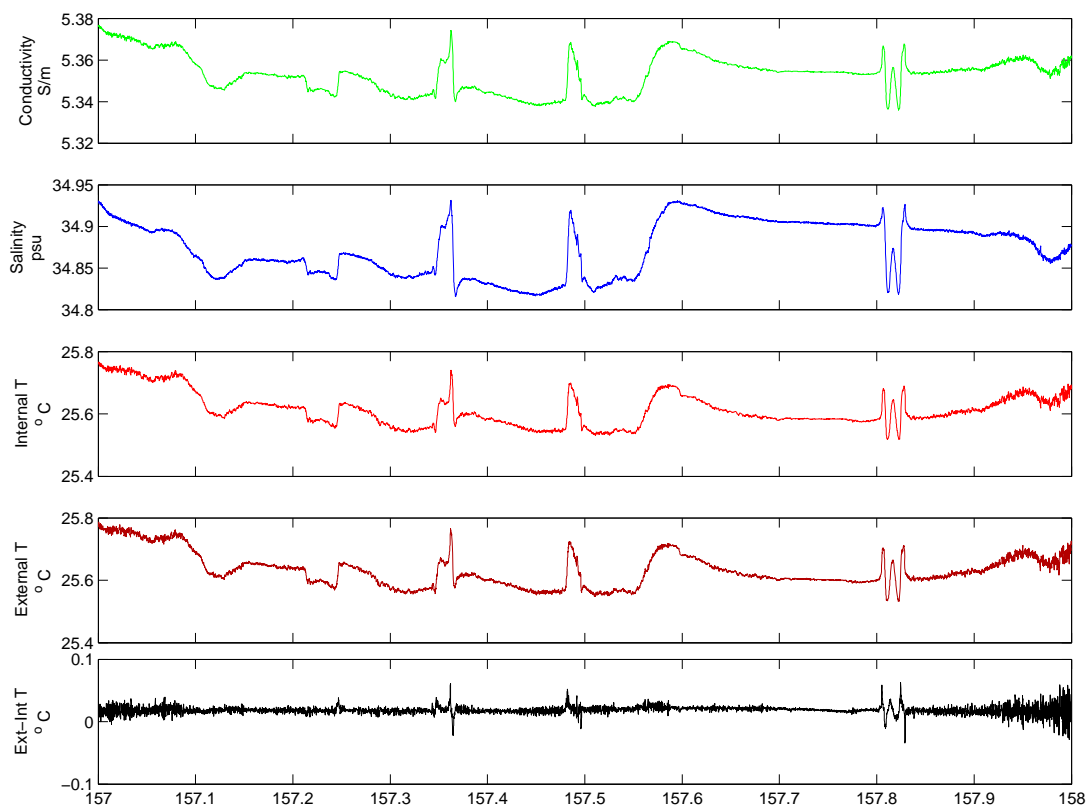


Figure C2. Time-series plots of thermosalinograph conductivity, salinity, internal sensor temperature, remote sensor temperature, and remote - internal temperature difference data during 5 June 2008. The time axis is in Julian days.

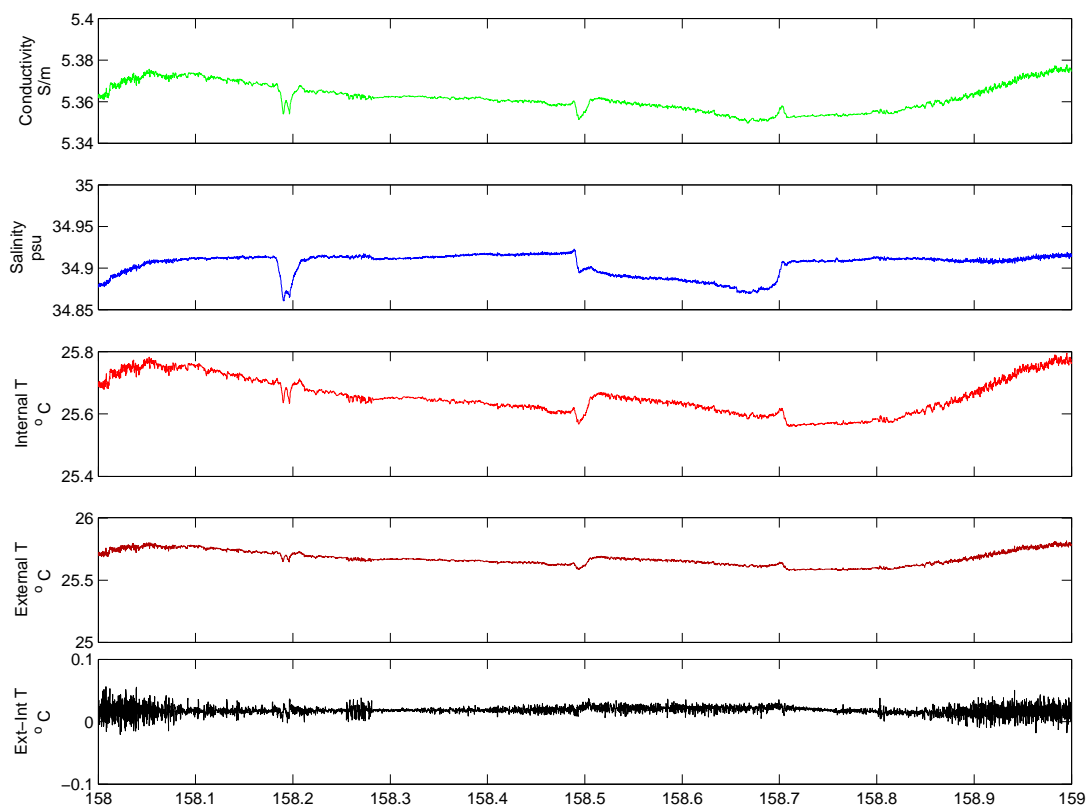


Figure C3. Time-series plots of thermosalinograph conductivity, salinity, internal sensor temperature, remote sensor temperature, and remote - internal temperature difference data during 6 June 2008. The time axis is in Julian days.

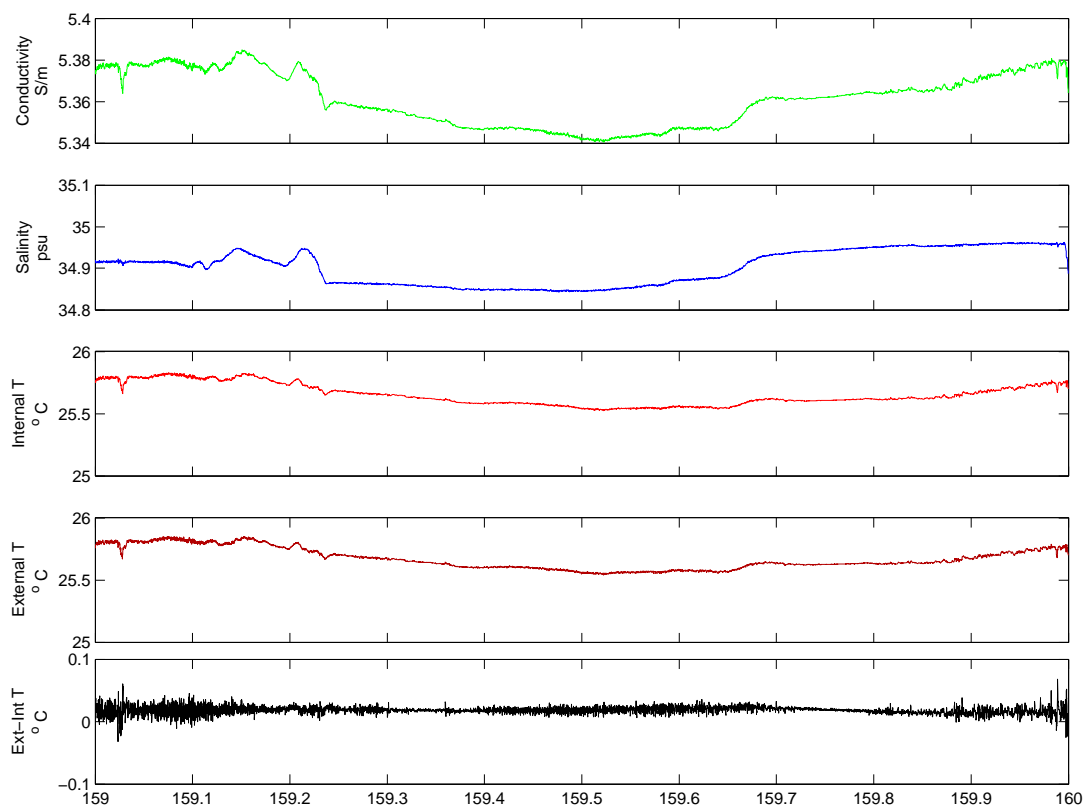


Figure C4. Time-series plots of thermosalinograph conductivity, salinity, internal sensor temperature, remote sensor temperature, and remote - internal temperature difference data during 7 June 2008. The time axis is in Julian days.

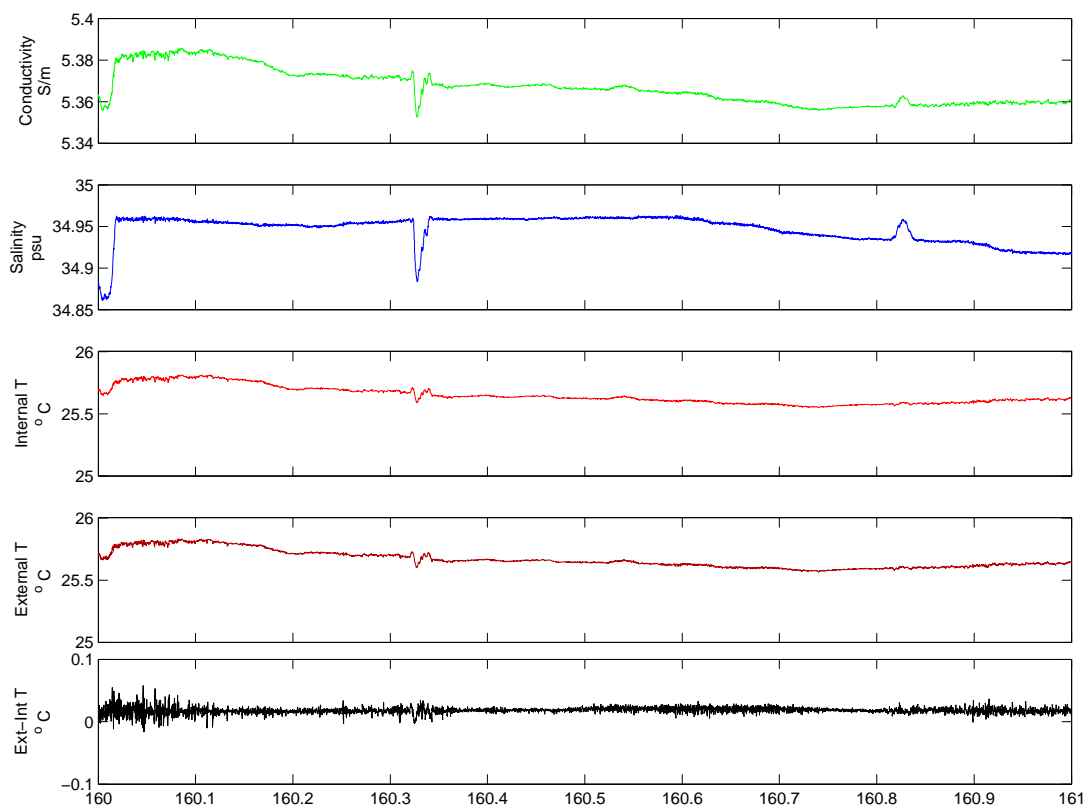


Figure C5. Time-series plots of thermosalinograph conductivity, salinity, internal sensor temperature, remote sensor temperature, and remote - internal temperature difference data during 8 June 2008. The time axis is in Julian days.

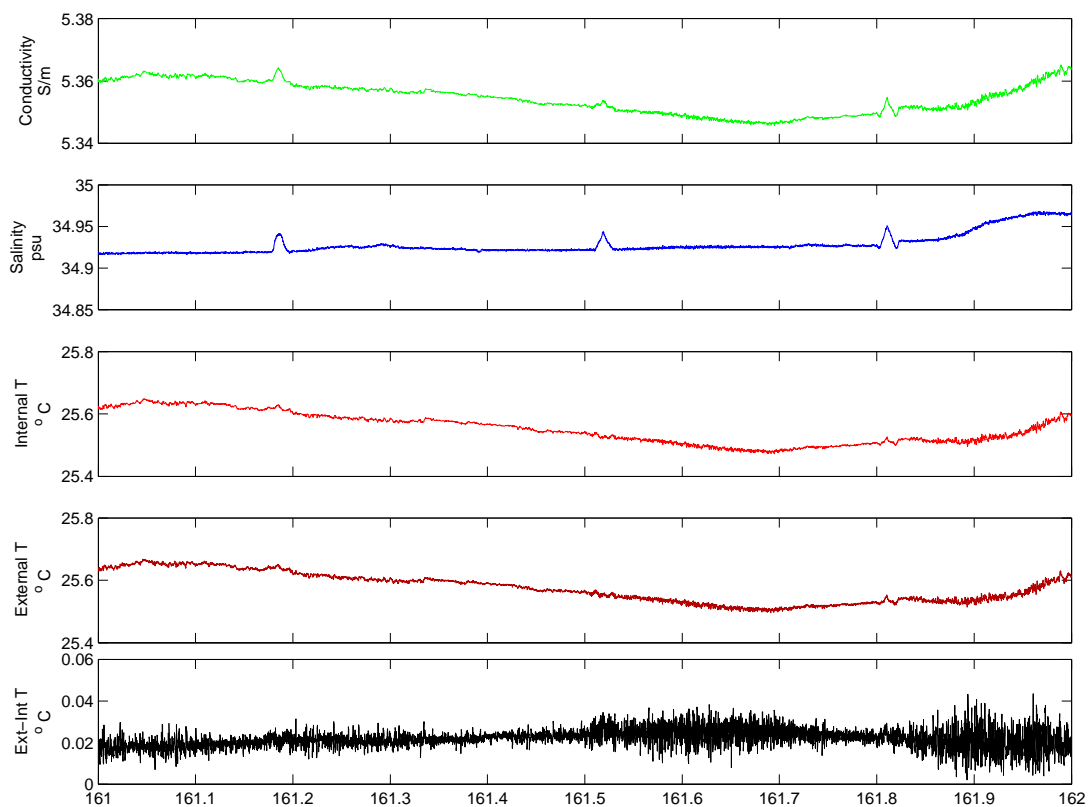


Figure C6. Time-series plots of thermosalinograph conductivity, salinity, internal sensor temperature, remote sensor temperature, and remote - internal temperature difference data during 9 June 2008. The time axis is in Julian days.

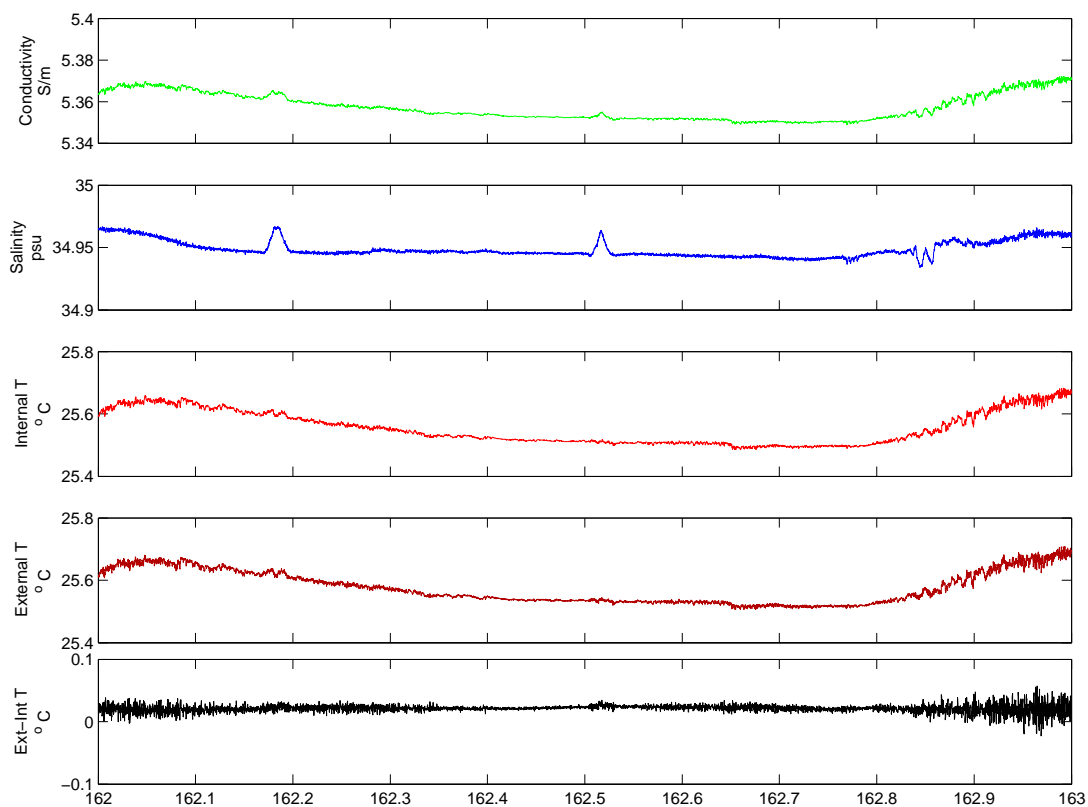


Figure C7. Time-series plots of thermosalinograph conductivity, salinity, internal sensor temperature, remote sensor temperature, and remote - internal temperature difference data during 10 June 2008. The time axis is in Julian days.