Palau Oceanographic Array
Data Report

August 2003 – January 2004

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Australian Institute of Marine Science
National Oceanographic and Atmospheric Administration
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Acknowledgements

Steven Victor from the Palau International Coral Reef Center ensured a successful campaign and provided an excellent working base. Thanks to Pat Colin from the Coral Reef Research Foundation for guiding us, providing instrumentation and essential backup in the field. Andrew Bauman from the Office of Environmental Response and Coordination greatly supported the project and assisted with the field work. Andrew Smith and the team at The Nature Conservancy also provided excellent support and the use of their vessel. Bob Richmond from the University of Guam provided additional instrumentation. This research was funded by the Australian Institute of Marine Science, National Oceanic and Atmospheric Administration and The Nature Conservancy. Support from the Koror State Government and the Office of the President is gratefully acknowledged.

Partners

AIMS	Australian Institute of Marine Science
CRRF	Coral Reef Research Foundation
	Koror State Conservation and Law Enforcement
NOAA	National Oceanic and Atmospheric Administration
OERC	Office of the Environmental Response and Coordination & the Office of the President
PICRC	Palau International Coral Reef Center
TNC	The Nature Conservancy
UoG	University of Guam

The Proposed Work

Coral bleaching in Palau: Prediction and mapping with the use of hydrodynamic models and satellite data

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The Palau International Coral Reef Center (PICRC), the Koror State Department of Conservation and Law Enforcement and the Coral Reef Research Foundation have teamed with the US National Oceanic and Atmospheric Administration (NOAA), the Australian Institute of Marine Science (AIMS), The Nature Conservancy (TNC) and the University of Guam (UoG) to conduct the most intensive study of oceanography in Palau's history.

The project will be conducted over the next two years and will aim at developing a good understanding of the effects of water currents on coral bleaching. The aim is to model the water currents in and around Palau so that these models can be used to predict which regions are more likely and less likely to experience coral bleaching in the future.

The project has been split into five distinct sections:

a) A study will be conducted with the use of historic environmental data (i.e. water temperatures, weather records and satellite data) to try to develop an understanding of the origin of the hot water that caused the severe bleaching during 1998.
b) Instruments will be deployed between September 2003 and January 2004. Oceanic variables, including tidal heights, currents, water temperature and salinity; and weather variables, such as wind, air temperature and incoming solar radiation; will be recorded.
c) IKONOS satellite imagery, in conjunction with specific hydrographic transects, will be used to derive a complete bathymetric chart of the Palau region at 4 meter resolution.
d) A series of 1, 2 and 3 dimensional hydrodynamic models (computer simulations) will be built with the help of the bathymetric map and the field data.
e) All of the above information will be combined to derive a map, which will describe the patterns of hot and cool water in and around Palau during a future coral bleaching event. This will be used by TNC to derive an understanding of the spatial variability of coral bleaching during a future bleaching event.

PICRC, NOAA and AIMS, with input from Koror State Dept of Conservation and Law Enforcement and TNC, have designed a plan for the deployment of instruments to measure tides, currents, water temperature and salinity. These instruments are being deployed now and will be used to calibrate and validate the computer models of water motion in and around Palau.

The modelling effort will take place at NOAA and AIMS with input from PICRC scientists. It is expected that there will be a number of spin-off projects that will build on this project and will involve PICRC, NOAA and AIMS.

This project has a number of direct benefits for Palau. For example, the bleaching information will be used to help the Federal and State Governments of Palau to design and manage their Marine Protected Areas so as to enable the sustainable use of the valuable coral reef resources in Palauan waters. The output from the models can also be used for other studies such as those concerned with sediment from rivers, fish spawning, coral spawning and gaining a general understanding of the links between one part of the reef and another.

Introduction

Palau is an archipelago of hundreds of islands, the majority of which are surrounded by an extensive barrier reef. The major island group is located near 7^{o} 20' N, 134^{o} 30' E, in the Western Pacific Ocean, and is part of the Caroline Islands of Micronesia.

Coral bleaching is a global problem for coral reefs and affected large areas during 1997/1998. Most of Micronesia escaped damage; however, there was an unprecedented loss of coral around Palau itself (Wilkinson, 2002). Bruno *et al.* (2001) documents the 1998 bleaching event in Palau from field surveys and found, on average, nearly half of 946 scleratinian taxa were totally bleached and another 15% were partially bleached. The bleaching event was relatively severe and widespread across depths, sites, habitats and coral taxa.

There was no major *in situ* monitoring of water temperature around Palau during the bleaching event. A long-term temperature monitoring programme has since been instigated by Pat Colin from the Coral Reef Research Foundation (Colin, 2000). The short-term study reported here complements the CRRF array by expanding the number of observing locations to over 60.

This study will attempt to explain how the corals will fair during a bleaching event by understanding the key physical processes that determine the thermal environment in which the corals live. As Palau is located near 7°N, it experiences the sun passing meridionally overhead twice a year and therefore has two peaks of solar insolation, offset from the maximum solar zenith, in March and October/November (Penland *et al.*, 2004). We were able to deploy instruments in August 2003 and recover them in January 2004 so that at least one of the hottest periods of the year was observed.

This report describes data collected from a physical oceanographic array deployed in Palau from August 2003 to January 2004. The aim was to observe bleaching-like conditions; this four-month period allowed a reasonable amount of time to experience a variety of weather events. This report presents a comprehensive overview of the data collected and allows a first look at the time series collected. Further analysis and data quality assessments will be done as the study progresses.

The data will also be useful for longer-term studies as the time series are long enough for a good tidal current analysis for hindcasting or prediction.

The Temperature Transect and Mooring Summary section displays what instruments were deployed at each site and their position in the water column or reef slope. The filenames of the raw data downloaded directly from the loggers is given together with their processed filename. The naming conventions are summarized in Appendix M.

Deployment details of each instrument can be found in Appendices B, C, D, E and F. Plots of the observed data can be found in Appendices G, H, I, J , K and L. The plots in these appendices are presented specifically to illustrate what data were collected; they are not intended for analysis or scientific investigation. A companion DVD-ROM to this data report is available for these purposes, the data format and layout of which are described in Appendices M & N.

Figure 1 Location map of Palau.

Deployment Methodology

As coral bleaching has a high spatial variability, the best scenario would have been to position instruments to maximise the geographic coverage of Palau. However, due to time constraints and a limited number of instruments this was not possible. A region that is influenced by a wide range of oceanic conditions was selected for instrumentation, to be representative of the situation in Palau. As discussed, a planned endeavour is to use numerical models to infer oceanic information in the Palau region. Instruments were positioned so as to provide boundary conditions for such models. To this end, most major entrances or channels were assigned a current meter or tide gauge to measure flows or sealevels in order to determine the fluxes into, or out of the system. Other instrumentation was then deployed within these regions to allow model validation and observe the thermal stratification at reasonably high temporal and spatial resolution.

A small vessel from The Nature Conservancy was used and a team of SCUBA divers secured the instruments to the reef slopes or sea floor. This meant that it was more practical to instrument the region adjacent to our base at PICRC in Koror. The nearby region also had the desired large range of topographic features; for example, a reef flat, lagoons, channels, rock islands, lakes and the open ocean.

Instruments were sourced principally from AIMS and were supplemented by others from UoG and CRRF. The instruments were deployed to, in effect, bound specific regions of interest. These boxes were named Lagoon (Figure 8), Malakal Harbour (Figure 9) and the Rock Islands near Koror (Figure 10). The lagoon box extended from the Philippine Sea in the West to a deep-water mooring off Uchelbeluu in the East. Ulong Island defined the southern boundary and the Paleo channel near the western entrance, mid-way up Babeldaob, was the northernmost limit. The Malakal box is contained within the Lagoon box and adjacent to the Rock Islands box. The next section describes the locations and instrumentation deployed at each location.

A deep-water mooring was deployed seaward of the outer reef at Uchelbeluu to gain an understanding of the oceanic conditions. The mooring was designed for a water depth of 120m, however due to the rapid descent of the seafloor, the mooring was positioned at 250m, 130m deeper than anticipated. This meant that the data were collected below the main thermocline.

Figure 2 Temperature Mooring ready for deployment.

Weather:
Meteorological observations for the period from January 1994 to April 2004 were acquired from the NOAA National Weather Service station in Palau. Due to nearby obstacles, the location of the NOAA weather station led to a lack of confidence in the wind measurements. A portable weather station was installed as a part of this study to compare with the existing long-term dataset. The weather station monitored standard meteorological parameters and also included solar radiation and Photosynthetically Active Radiation (PAR) sensors to monitor the solar insolation. This station was positioned high on a promontory in the northeast of Koror to ensure the best fetch in all directions.

Figure 3 Portable Weather station being set up by Cary McLean.

Temperature measurements:
Temperature loggers were positioned either individually or as vertical profiles. Profiles were realised by placing instruments on moorings or down reef slopes. The locations of the loggers were selected to monitor regions where vertical stratification of water may occur, or conversely where turbulent mixing may occur, and also to examine possible areas of upwelling.

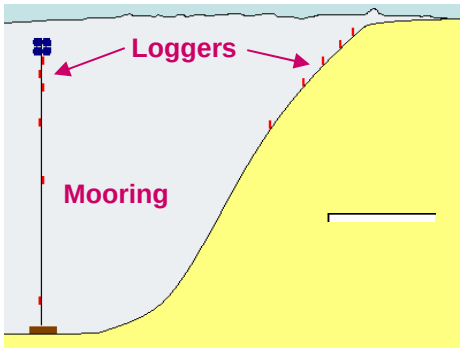


Figure 4 Schematic showing an in-line mooring and transect of temperature loggers.

Figure 5 Cary McLean secures an SBE39 temperature logger to a coral outcrop using stainless steel wire.

Current measurements:
An array of bottom mounted Acoustic Doppler Current Profilers (ADCP), as well as a number of point instruments, were deployed in reef channels, lagoons and flats to ensure a wide variety of current regimes. Current profilers monitor water movement through the entire depth of the water column using acoustic techniques and, thus, were deployed in deep channels at region boundaries. Point meters were located in shallow waters, at region boundaries and within the specified boxes.

Figure 6 Felipe Arzayus Recovering an ADCP.

Tide gauges:
While several of the temperature and current meters also contained pressure sensors, additional tide gauges were deployed to ascertain the sealevel response to weather, tides and larger scale circulation features in greater detail. Tide gauges were deployed on reef flats at region boundaries to monitor over-reef water fluxes. Tide gauges were located across the specified regions to determine the relative phase of tidal inundation across Palau. One tide gauge was positioned adjacent to the existing Malakal Harbour Tide Gauge, for a short period, to compare with the long-term dataset.

Salinity measurements:
Salinity can be determined by measuring the conductivity and temperature of water. An east-west transect of conductivity and temperature loggers was constructed to measure salinity and monitor the development of salinity fronts and hyper-saline conditions. The transect was positioned from the Philippine Sea, across the Palau lagoon, through Malakal Harbour and out to the eastern reef extreme.

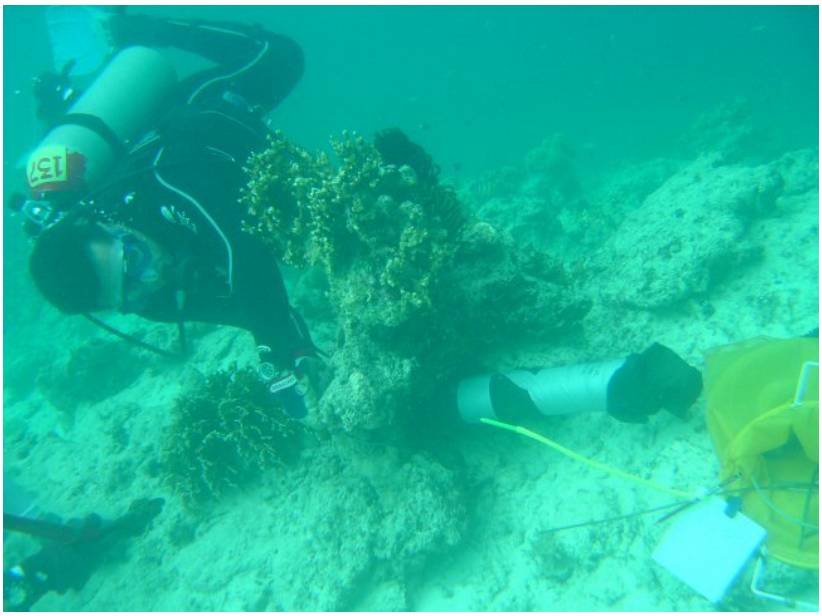


Figure 7 Cary McLean securing an SBE16 Conductivity and Temperature logger.

Vertical profiles of Conductivity and Temperature with Depth (CTD):
A number of CTD profiles were measured to determine the vertical variation of water properties across the Palau region. These were performed using an instrument which measures conductivity, temperature, and pressure with a frequency of 4 Hz. The instrument was attached to a rope and lowered by hand through the water column. The speed of descent was controlled at approximately 1 m/s; the ascent of the CTD was performed at the same rate. This permitted a near-repeat measurement of the water properties.

Bathymetry measurements:
An essential input for numerical modelling is accurate bathymetry. Production of a satellite-derived bathymetry of Palau is underway at the NOAA National Ocean Service. The techniques being applied require calibration by *in situ* data. An echo-sounder was used to collect *in situ* depth measurements in a variety of regions across Palau. These data are not presented here but will be in the final bathymetry report.

Instrument Array Summary

A total of thirteen current meters, six tide gauges, five conductivity loggers, one weather station and thirty-seven individual temperature loggers were deployed in this experiment. Some instruments were positioned in two or more locations during the study; e.g., the thirteen current meters were deployed in fourteen locations.

Table 1, Table 2, Table 3 and Table 4 list the instruments, their deployment codes and geographic locations. Figure 8, Figure 9 and Figure 10 show the array locations overlaid on satellite imagery. Station coding was used to help distinguish the type of parameters measured, as shown in Table 1. Many instruments have sensing capabilities beyond their primary function listed below and thus measure additional properties (e.g., temperature is measured by the current profilers, tide gauges and conductivity probes).

Table 1 Station Codes and number of instruments

Code	Instrument	Number of Instruments
A	Current meter	13 total (9 Profiling - 2 Point S4s, 2 Point Nobskas)
B	Tide gauge	4 Brancker XR420 TD, 2 SBE39PT
C	Conductivity logger	5 SBE16CT
T	Temperature	37 SBE39, 4 SBE16CT, 1 Brancker XR420 TD, 1 RDI ADCP, 1 Nobska
WX	Weather station	1 Campbell Scientific

Table 2 lists the deployment summary ordered by the three specified regions or boxes: Lagoon, Malakal Harbour and the Rock Islands. The Malakal Harbour box completes the western boundary of the Lagoon box. Co-located instruments are grouped together in Table 2. Table 3 lists the instrument sites by the primary parameter measured; i.e., currents, sealevel, temperature and salinity.

Table 2 Instrument codes for each of the three specified regions. Co-located instruments are grouped together.

(a) Lagoon box

Code	Instrument	Serial no.	Depth	Location Description
A6	S4	564	33m	Paleo Channel - Toachel Mlengui
T6 B5 C1	SBE39T SBE39PT SBE16CT	*5 loggers* 0760 2123	20m	Philippine Sea - West reef flat
A7 T1 C2	Nobska SBE39T SBE16CT	10046 *5 loggers* 2127	14.5m to 20m	Falcon Reef - lagoon central
A3	Nobska	10045	20m	Ulong West
A4 T8 B4	ADCP 300kHz SBE39T Brancker XR420	584 BT *5 loggers* 10091	>30m to 40m 1m	Ulong East
T7 B3	SBE39T Brancker XR420	*5 loggers* 10093	to 18m 6m	Central Rock Islands, Urukthapel
A13	Nortek Aquapro	0866 CRRF	>30m	Toachel mid

A2	S4	615	4m	Ngetalau passage (channel) outside Rock Is.
A5 T5 C5	ADCP 300kHz SBE39T SBE16CT	412 BTP *5 loggers* 2125	215m to	Uchelbeluu

(b) Malakal Harbour box

Code	Instrument	Serial no.	Depth	Location Description
A10	ADCP 1200kHz	1292 UoG	22m	Toachel Ra Ngel
B2	SBE39PT	0759	1.9m	Ngedarrak Reef flat
A8 T2 C4	ADCP 600kHz	3228 BTPW	30m	Lighthouse Toachel Ra Kesebekuu
A9 C3	Nortek Aquapro	0794	27.7m	Malakal Harbor Pincers
B6	Brancker XR420	10093	2m	Malakal Harbour Tide Gauge (moved from B3)

(c) Rock Islands box

Code	Instrument	Serial no.	Depth	Location Description
B1	Brancker XR420	10079	2.5m	RI Toirius
A11	ADCP 600kHz	1673	22m	RI northern channel entrance
A11b	ADCP 1200kHz	1292 UoG	22.6m	RI northern channel entrance
A11c	Nortek Aquapro	0866 CRRF	>30m	RI northern channel entrance
A14	ADCP 1200kHz	1292 UoG	4m	Japanese channel
A12	Nortek Aquadopp	0970 CRRF	11.4m	RI southern reef opening
A1	ADCP 1200kHz	0974	24.2m	RI mid channel
T3	SBE39T	*5 loggers*	20m	RI inside channel
T4	SBE39T	*5 loggers*	20m	RI Nikko lake

Table 3 Instrument codes listed by primary instrument type

(a) Current Profilers and Point Meters

Code	Instrument	Serial no.	Depth	Location Description
A1	ADCP 1200kHz	974	25m	RI mid channel
A2	S4	615	4m	Ngetalau passage outside rock is.
A3	Nobska	10045	16m	Ulong West
A4	RDI ADCP 300kHz	584 BT	30+m	Ulong East
A5	RDI ADCP 300kHz	412 BTP	126m	Uchelbeluu
A6	S4	564	30m	Paleo Channel - Toachel Mlengui
A7	Nobska	10046	25m	Falcon Reef - lagoon central
A8	RDI ADCP 600kHz	3228 BTPW	30m	Lighthouse Toachel Ra Kesebekuu
A9	Nortek Aquapro	1015	30m	Malakal Harbor Pincers
A10	ADCP 1200kHz	1292	17m	Toachel Ra Ngel
A11	RDI ADCP 600kHz	1673	25m	RI northern channel entrance
A11b	ADCP 1200kHz	1292	22.6m	RI northern channel entrance

A11c	Nortek Aquapro	0866	>30m	RI northern channel entrance
A12	Nortek Aquadopp	0970	12m	RI southern reef opening
A13	Nortek Aquapro	0866	30m	Toachel mid
A14	ADCP 1200kHz	1292	4m	Japanese channel

(b) Temperature Profiles

Code	Instruments	Other	Depth	Location Description
T1	4 SBE39s	C2	20m	Falcon Reef - lagoon central
T2	4 SBE39s	C4	20m	Lighthouse Toachel Ra Kesebekuu
T3	5 SBE39s		20m	RI inside channel
T4	5 SBE39s		18m	RI Nikko Bay
T5	5 SBE39s	C5	250m	Deep water mooring Uchelbeluu
T6	4 SBE39s	C1 B5	30m	Philippine Sea – West reef flat
T7	5 SBE39s	B3	18m	Central Rock Islands, Urukthapel
T8	4 SBE39s	B7	45m	Ulong East Channel

(c) Tide Gauges

Code	Instrument	Serial no.	Depth	Location Description
B1	Brancker XR420	10079	4m	RI Toirius
B2	SBE39PT	759	4m	Reef flat Ngedarrak Reef
B3	Brancker XR420	10093	18m	Central Rock Islands, Urukthapel
B3B	Brancker XR420	10093	4.5m	East of Blue Corner
B3C	Brancker XR420	10093	2.5m	North Babeldaup
B4	Brancker XR420	10091	30m	Ulong East
B5	SBE39PT	760	20m	Philippine Sea – lagoon side reef flat
B6	Brancker XR420	10093	2m	Malakal Harbour Tide Gauge

(d) Conductivity loggers

Code	Instrument	Serial no.	Depth	Location Description
C1	SBE16CT	2123	5.5m	Philippine Sea
C2	SBE16CT	2127	5.0m	Falcon Reef
C3	SBE16CT	2126	2.6m	Malakal Harbour Pincers
C4	SBE16CT	2124	1.5m	Lighthouse Toachel Ra Kesebekuu
C5	SBE16CT	2125	160m	Uchelbeluu

Table 4 Locations of instruments and other points of interest

(a) Instrument locations

Code	Latitude, Longitude	Location Description
A1	7,19.786,134,29.637	RI mid channel
A2	7,19.315,134,29.400	Ngetalau passage
A3	7,18.293,134,16.726	Ulong West
A4B4	7,16.617,134,18.716	Ulong East
A4	7,16.621,134,18.681	Subsurface buoy
A5T5C5	7,15.918,134,33.398	Uchelbeluu
A6	7,28.927,134,27.776	Paleo Channel – Toachel Mlengui
A7T1C2	7,22.424,134,23.231	Falcon Reef
A8T2C4	7,16.991,134,27.928	Lighthouse Toachel Ra Kesebekuu
A9C3	7,20.163,134,25.483	Malakal Harbour Pincers
A10	7,17.786,134,28.958	Toachel Ra Ngel

A11	7,19.400,134,28.949	RI northern channel entrance
A12	7,19.223,134,29.795	RI southern reef opening
A13	7,19.023,134,31.490	Toachel mid
A14	7,17.786,134,28.958	Japanese Channel
T3	7,19.570,134,29.417	RI Inside channel
T4	7,19.772,134,30.034	RI Nikko Bay
T6C1	7,24.713,134,20.258	Philippine Sea
T7B3	7,16.376,134,24.667	Urukthapel
T8	7,16.621,134,18.802	Ulong East Channel
B1	7,19.821,134,28.878	RI
B2	7,17.472,134,28.282	Ngedarrak Reef flat
B3	7, 16.376 134, 24.667	Central Rock Islands, Urukthapel
B3B	7,8.4912,134, 17.8275	East of Blue Corner
B3C	7,46.60848, 134, 35.1582	North Babeldaup
B4	07,16.621, 134,18.680	Ulong East
B5	7,24.380,134,21.065	Philippine Sea – Lagoon reef
B6	7,20.011,134,27.430	Malakal Harbour Tide Gauge
C1	7,24.713,134,20.258	Philippine Sea
C2	7,22.424,134,23.231	Falcon Reef
C3	7,20.163,134,25.483	Malakal Harbour Pincers
C4	7,16.991,134,27.928	Lighthouse Toachel Ra Kesebekuu
C5	7,15.918,134,33.398	Uchelbeluu
WXSTA	7,20.969,134,30.018	Weather Station

(b) Additional locations

Code	Latitude, Longitude	Location Description
L10CRRF	7,19.786,134,29.637	Lighthouse 10m CRRF
L2 CRRF	7 16.613,134,27.067	Lighthouse 2m CRRF
Falcon Reef	7 22.400,134,23.240	Falcon Reef CRRF
Malakal Hbr	7 19.008,134,27.627	Malakal Hbr CRRF
Ngaregabel Rf	7 24.725,134,27.006	Ngaregabel Reef CRRF
Ngerkul Gap	7 19.170,134,29.779	Ngerkul Gap CRRF
Nikko Bay	7 20.049,134,30.301	Nikko Bay CRRF
Ongael Basin	7 15.053,134,22.479	Ongael Basin CRRF
Ongael out	7 14.964,134,22.471	Ongael Outside CRRF
ShortDropOff	7 16.418,134,31.440	Short Drop Off CRRF
Ulong 10	7 17.425,134,14.463	Ulong Rock 10m CRRF N
Ulong 55	7 17.453,134,14.442	Ulong Rock 55m CRRF N
West Channel	7 32.560,134,28.059	West Channel CRRF
LIGHTH	7 16.927,134,27.881	Lighthouse

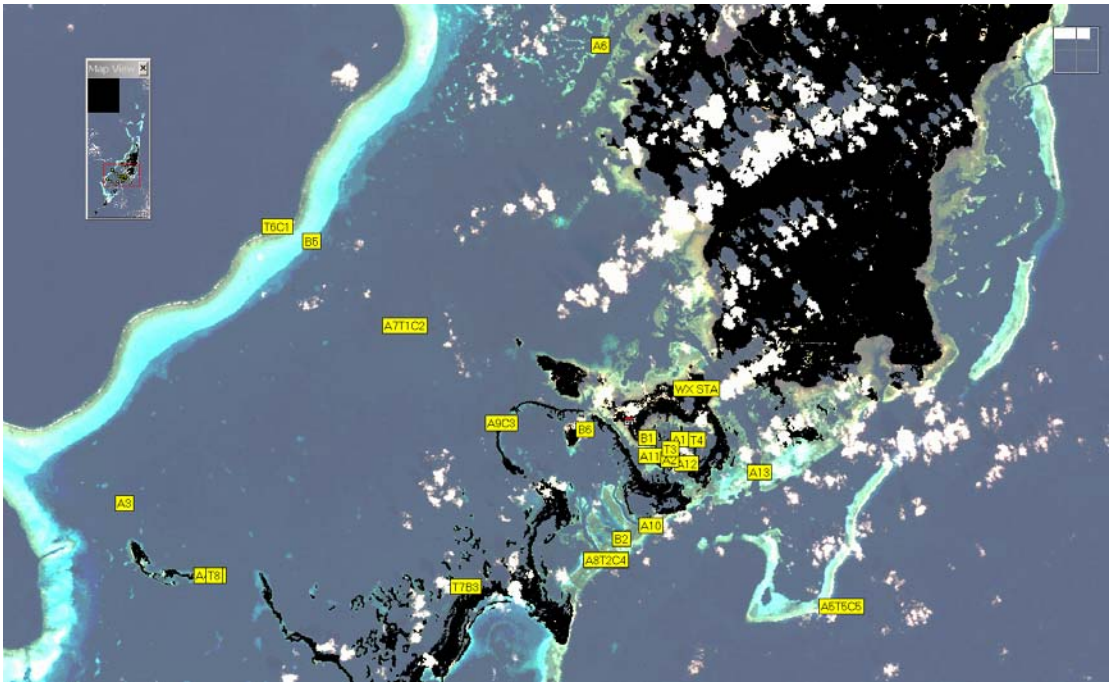


Figure 8 IKONOS satellite image of Palau. The Lagoon box covers the area shown. Deployed instruments are indicated by their codes. Orientation of zoomed areas in Figure 9 and Figure 10 may be performed using these codes.

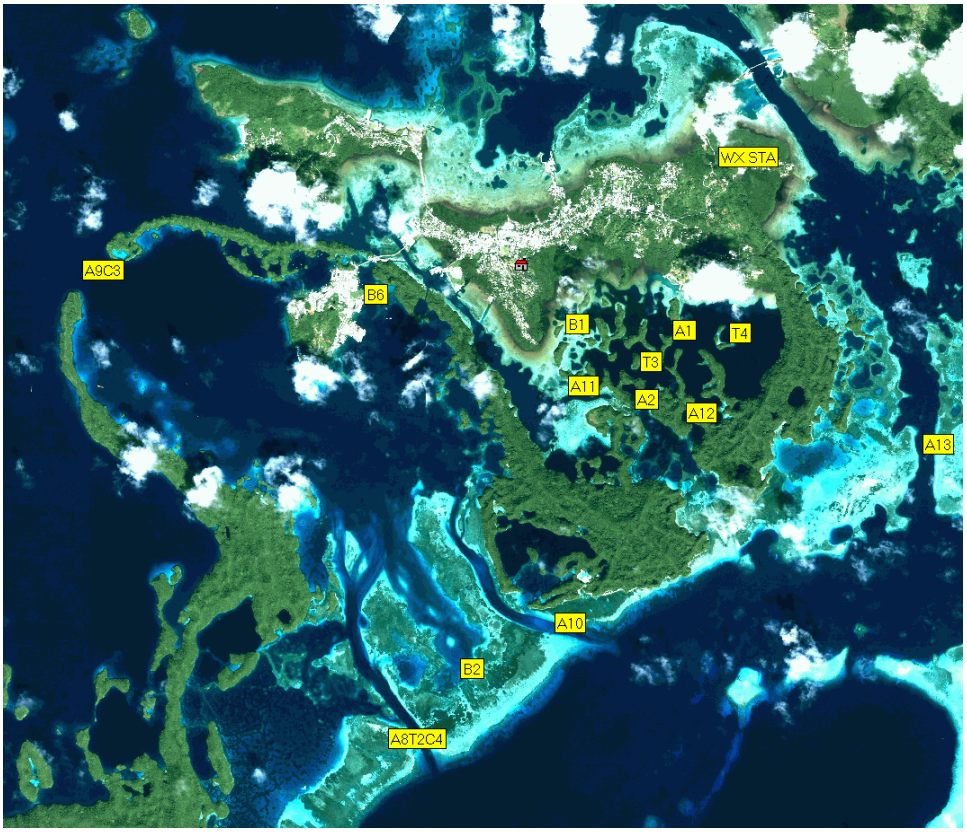


Figure 9 Zoomed image of the Malakal Harbour box from Figure 8.

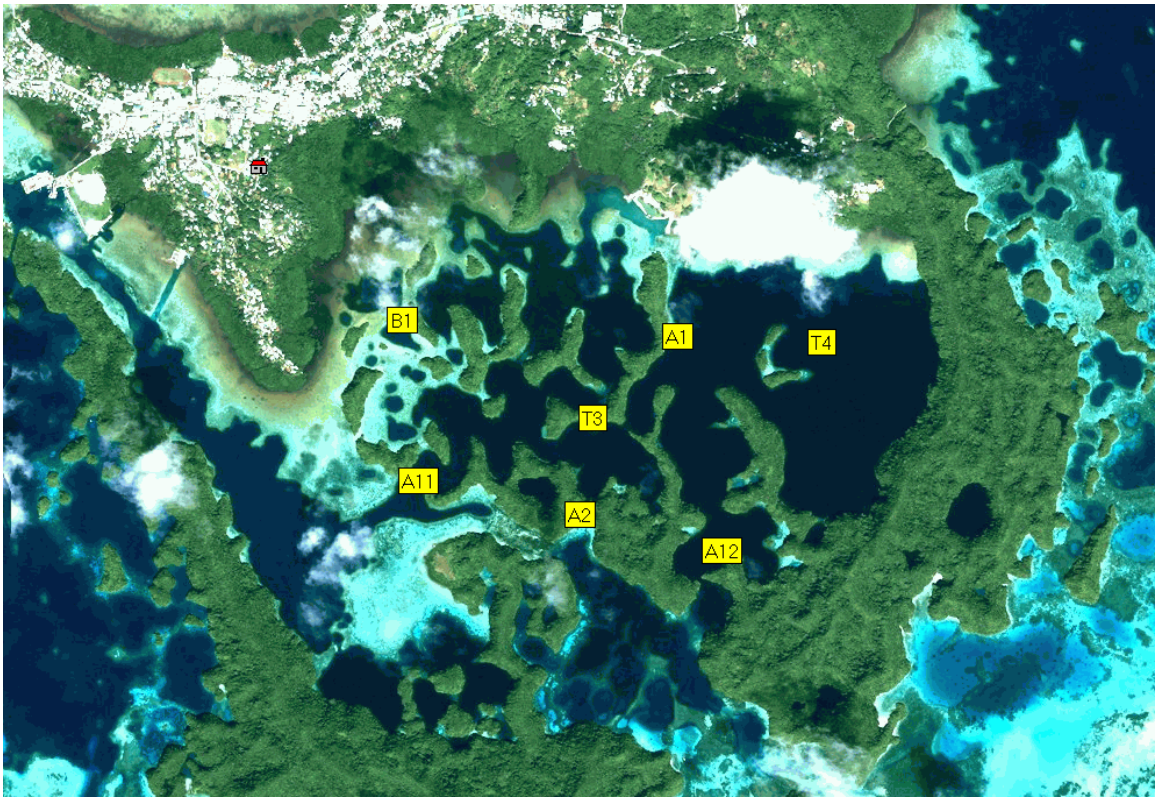


Figure 10 Zoomed image of the Rock Islands box from Figure 9.

Temperature Transect and Mooring Summary

The following tables summarise all of the instrumentation on each of the transects or in-line moorings. Further, instrument-specific information can be found in Appendices B, C, D and E. Instruments are numbered from the bottom up - T1i1 indicates transect one, instrument 1 (the deepest instrument). T1i6 is the shallowest instrument in the same transect. Figure 11 depicts a typical reef transect; Figure 12 and Figure 13 illustrate the moorings deployed at locations T5 and T8, respectively.

After the tables are calculations to estimate each instrument depth relative to Lowest Astronomical Tide (LAT). The Malakal Harbour sealevel was used to estimate the tide height when observations of water depth were taken by diver pressure gauges. There were usually 2 estimates taken: one upon deployment and one at recovery. There may be missing data; however, the best estimate was included in the table proper. Deployment times are all UTC+9 hours; i.e., the local Palau time.

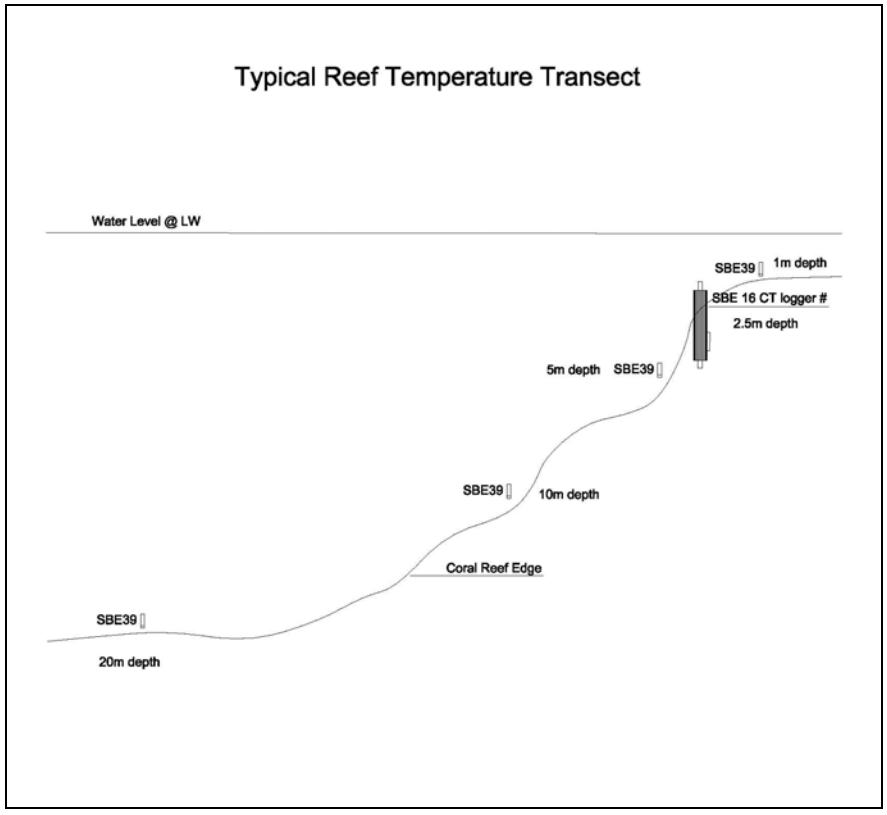


Figure 11 Typical configuration of a reef temperature transect.

T1 + A7 + C2 Falcon Reef

7° 22.424' N 134° 23.232' E 45m Total Depth

First Good: 8 Sep 2003, 14:00:00
Last Good: 3 Jan 2004, 14:30:00

	Depth (LAT)	Instrument	Serial	Filename
T1i6	1.9m	SBE39T	0935	09350401.asc
T1i5	2.9m	SBE39T	0929	09290401.asc
T1i4 C2	5.1m	SBE16CT	2127	21270401.hex
T1i3	8.2m	SBE39T	0920	09200401.asc
T1i2 A7	11.3m	Nobska	10046	10046.bin
T1i1	19.4m	SBE39T	0934	09340401.asc

		T16	T15	T14	T13	T12	T11
Deployment	depth(m)	2.5	3.5	6	9	14.5	20
Malakal slv		1.13	1.06	1.00	0.74	1.82	0.72
Recovery	depth(m)	3.7	4.7	6.9	10	13.1	21.4
Malakal slv		1.82	1.83	1.83	1.83	1.85	1.85
LAT = depth-slv		1.9	2.9	5.1	8.2	11.3	19.4

T2 + A8 + C4 Lighthouse Toachel Ra Kesebekuu

07°16.955'N, 134°27.932'E **30m Total Depth**

First Good: 31 Aug 2003, 16:00:00
Last Good: 31 Dec 2003, 08:00:00

	Depth (LAT)	Instrument	Serial	Filename
T2i6	1.3m	SBE39T	925	09250801.asc
T2i5 C4	1.5m	SBE16CT	2124	21240301.asc
T2i4	5.1m	SBE39T	933	09330801.asc
T2i3	9.2m	SBE39T	1054	10540801.asc
T2i2	21.6m	SBE39T	1052	10520801.asc
T2i1 A8	27.7m	RDI	3228	pal02000.000

		T26	T25	T24	T23	T22	T21
Deployment	depth(m)	1	2.5	5	10	20	30
Malakal slv		1	0.97	0.95	0.93	0.92	2.29
Recovery	depth(m)	3.1	2.7	6.9	11	23.4	-
Malakal slv		1.81	1.86	1.83	1.83	1.82	1.85
LAT = depth-slv		1.3	1.5	5.1	9.2	21.6	27.7

T3 Rock Islands, inside channel

7° 19.570' N 134 ° 29.418 E 19m Total Depth

First Good: 29 Aug 2003, 15:30:00
Last Good: 30 Dec 2003, 15:00:00

	Depth (LAT)	Instrument	Serial	Filename
T3i5	1.0m	SBE39T	1055	10550301.asc
T3i4	1.9m	SBE39T	1058	10583112.asc
T3i3	4.3m	SBE39T	0676	06763112.asc
T3i2	8.9m	SBE39T	0675	06753112.asc
T3i1	18.9m	SBE39T	1057	10573112.asc

		T35	T34	T33	T32	T31
Recovery	depth(m)	2.6	3.5	5.9	10.5	20.5
Malakal slv		1.65	1.65	1.65	1.64	1.63
LAT = depth-slv		1.0	1.9	4.3	8.9	18.9

T4 Rock Islands, Nikko Lake

7° 22'.424 N 134 ° 23'.232 E 19.7m Total Depth

First Good: 30 Aug 2003, 18:00:00
Last Good: 30 Dec 2003, 15:30:00

	Depth	Instrument	Serial	Filename
T4i5	0.9m	SBE39T	1059	10593112.asc
T4i4	1.1m	SBE39T	1051	10513112.asc
T4i3	3.9m	SBE39T	1061	10613112.asc
T4i2	9.3m	SBE39T	1060	10603112.asc
T4i1	16.2m	SBE39T	1053	10533112.asc

		T45	T44	T43	T42	T41
Deployment	depth(m)	1	2.5	5	10.6	17.6
Malakal slv		1.48	1.45	1.38	1.34	1.26
Recovery	depth(m)	2.4	2.6	5.4	10.8	17.6
Malakal slv		1.52	1.51	1.50	1.50	1.49
LAT = depth-slv		0.9	1.1	3.9	9.3	16.1

T5 + A5 + C5 Uchelbeluu (deepwater mooring)

07°15.545'N 134° 33.167 E 124m Total Depth

First Good: 17 Sep 2003, 12:00:00
Last Good: 13 Jan 2004, 14:00:00

	Depth (LAT)	Instrument	Serial	Filename	
T5i6 C5	150m	SBE16	2125	21251401.hex	Bad data
T5i5	160m	SBE39PT	1062	10621401.asc	
T5i4	170m	SBE39T	931	09311401.asc	
T5i3	190m	SBE39T	923	09231401.asc	
T5i2 A5	215m	RDI	412	Pal09000.000	
T5i1	225m	SBE39T	927	09271401.asc	

		Sounder	t55	t52
Deployment	depth(m)	126m 1100 17/9/03	159.5	215
Malakal slv		1.9m	1.9	1.9
LAT = depth-slv		124	157.6	213

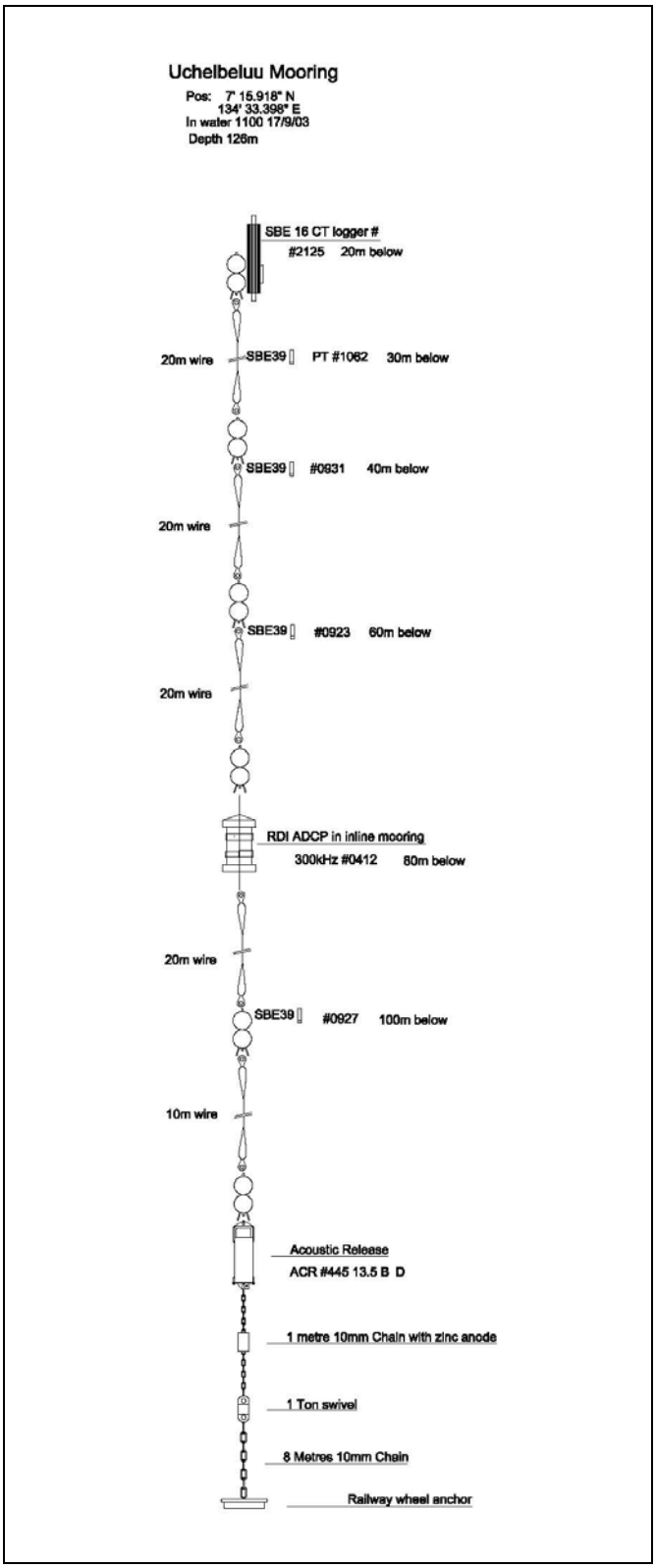


Figure 12 T5 Mooring design.

T6 + C1 Central Philippine Sea – West Reef flat

7° 16.955' N 134° 27.932' E 16 m Total Depth

First Good: 12 Sep 2003, 11:00:00
Last Good: 14 Jan 2004, 11:00:00

	Depth	Instrument	Serial	Filename
T6i5	1m	SBE39T	1137	Not recovered
T6i4	3m	SBE39T	928	09281401.asc
T6i3 C1	5.5m	SBE16	2123	21231401.hex
T6i2	10.5m	SBE39T	917	09171401.asc
T6i1	22.5m	SBE39T	924	09241401.asc

		T65	T64	T63	T62	T61
Deployment	depth(m)	3	4.5	7	12	24
Malakal slv		2.00	1.82	1.96	1.91	1.89
Recovery	depth(m)	-	5.3	7.5	12.5	24.5
Malakal slv		-	1.96	1.96	1.96	1.96
LAT = depth-slv		1	3	5.5	10.5	22.5

T7 + B3 Southern Rock Islands

7° 16.955' N 134° 27.932' E 16 m Total Depth

First Good: 2 Sep 2003, 10:00:00
Last Good: 2 Jan 2004, 15:30:00

	Depth	Instrument	Serial	Filename
T7i5	0.2m	SBE39T	1056	10560301.asc
T7i4	1.5m	SBE39T	0926	9260301.asc
T7i3	3.7m	SBE39T	0919	09190903.asc
T7i3b B3	3.7m	XR420	10093	100931103.dat
T7i3c	3.7m	SBE39T	0732	From T7i1
T7i2	11.3m	SBE39T	0930	09300301.asc
T7i1	16.0m	SBE39T	0732	07320401.asc

n.b., 23 Sep, 2003 SBE39 #0919 replaced with Brancker XR420 #10093
n.b., 5 Nov, 2003 Brancker XR420 #10093 replaced with SBE39 #0732 from 19m into the 3.8m position.

		T75	T74	T73	T73b	T73c	T72	T71
Deployment	depth(m)	1.5	3.0	6.0	5.0	-	12.0	18.0
Malakal slv		2.0	2.05	2.03	1.26	-	2.00	1.96
Recovery	depth(m)	2.0	3.3	5.0	-	5.5	13.2	-
Malakal slv		1.83	1.83	1.28	-	1.84	1.86	-
LAT = depth-slv		0.2	1.5	3.7	3.7	3.7	11.3	16.0

T8 Ulong East Channel

7° 16'.621 N 134° 18'.802 E 42m Total Depth

First Good: 23 Sep 2003, 09:00:00
Last Good: 13 Jan 2004, 12:30:00

	Depth	Instrument	Serial	Filename
T8i6	4m	SBE39T	918	09181401.asc
T8i5	4.2m	XR420	10092	0100921401.dat
T8i4	8m	SBE39T	932	09321401.asc
T8i3	13m	SBE39T	922	09221401.asc
T8i2	23m	SBE39T	921	09211401.asc
T8i1	43m	SBE39T	916	09161401.asc

n.b., top logger was 6m at high water from diver obs. 0818 23/9/03
Use tide gauge for final datum adjustment

		T8
Deployment	depth(m)	43m 1135 22/9/03
Malakal slv		0.93
LAT = depth-slv		42m

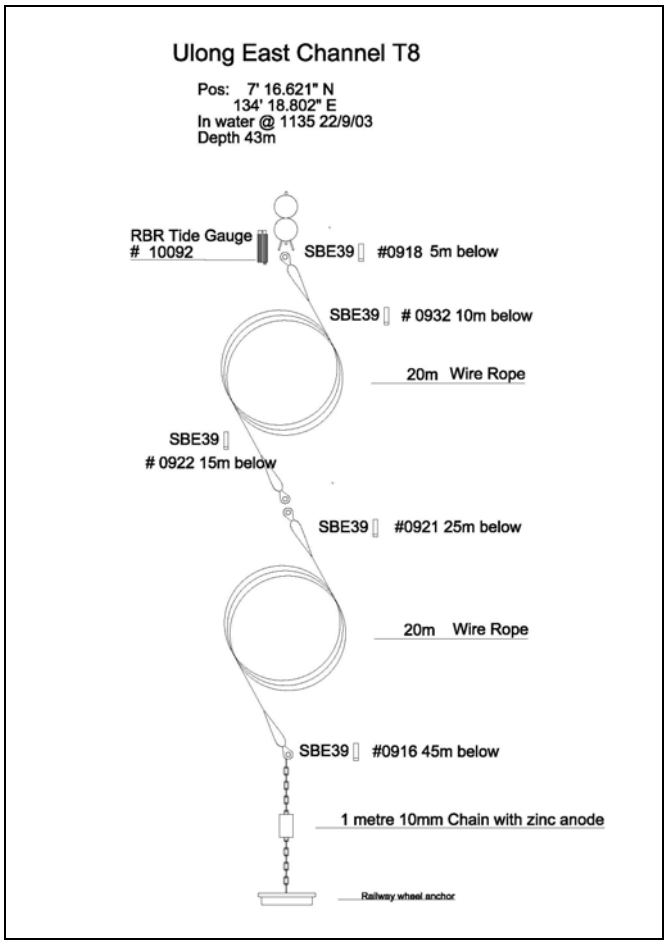


Figure 13 T8 mooring design.

Instruments and Processing

This section provides internet links to descriptions of each of the instruments by the manufacturer. Specifications and capabilities are outlined. The sheets can be obtained from the manufacturers' websites directly through the links and are also included on the companion archive DVD-ROM of this report. See Appendix N for a description of where they are located.

Calibrations

The calibration information for each instrument is contained within the headers of the binary and ASCII files directly downloaded from the instrument.

The current meters are acoustic and are difficult to calibrate in the field. The point current meters can, in general, be placed in a flow tank for calibration; however, such a facility was not available. As the Nobska point current meters had not been previously deployed, they were placed in a water bath for calibration to a zero flow reading. They were subsequently placed off the wharf at PICRC on short deployments (one tidal cycle) to gain confidence in the readings.

The tide gauges and most of the SBE39 temperature loggers were less than 12 months old and so the calibrations supplied by the manufacturer were assumed to still be valid. The Brancker tide gauges initially had unacceptably large clock drift, due to a poor batch of electronic chips. These instruments were replaced in time for the field programme.

Temperature inter-calibrations were undertaken after deployment to check the consistency of the instruments with each other. After recovery, the instruments collected that day were placed together in the ocean water outside of PICRC, usually overnight. They were then brought inside an air-conditioned room and placed in a water bath for a number of hours in order for the temperature to equilibrate. This ensured a reasonable temperature range for any linear adjustment, if found to be necessary.

Plots of all the temperatures collected from all the loggers have been made and are shown in Appendix G. By grouping them from the same mooring or transect, an effective inter-calibration can be made during well-mixed periods. The best period for this was late November as the water cooled by at least one degree Celsius from near bleaching conditions. The temperatures converge and track down together until more benign weather conditions prevailed, allowing stratification to re-establish.

Of all the instruments, only two look anomalous; both were on the T2 transect. The deepest instrument, at 30.6m (red line), was the ADCP A8 and its temperature record indicates slightly higher readings than instruments above it. A linear correction in this case should be adequate. The second anomalous instrument was SBE39, serial number 1054. It was located at a depth of 9m and shows significantly higher readings than instruments above and below it. It appears a linear correction will also suffice in this case.

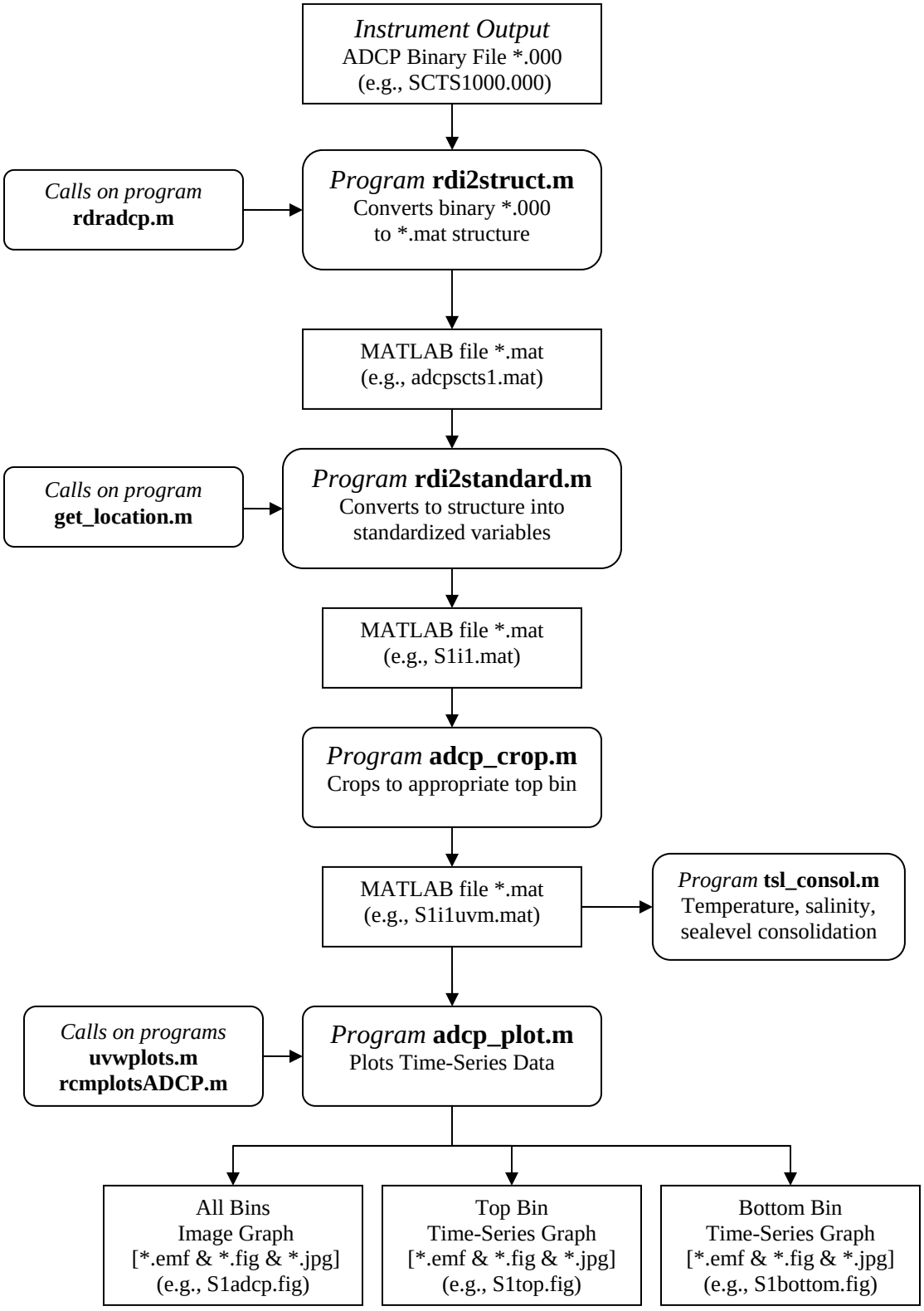
The SBE16CT logger called C5 and T5i6 only worked intermittently, so care should be taken when using this record. For this reason, it was not included in the consolidated mooring plot of temperatures. The data plot for this instrument is shown with the conductivity loggers in Appendix J.

Data Processing

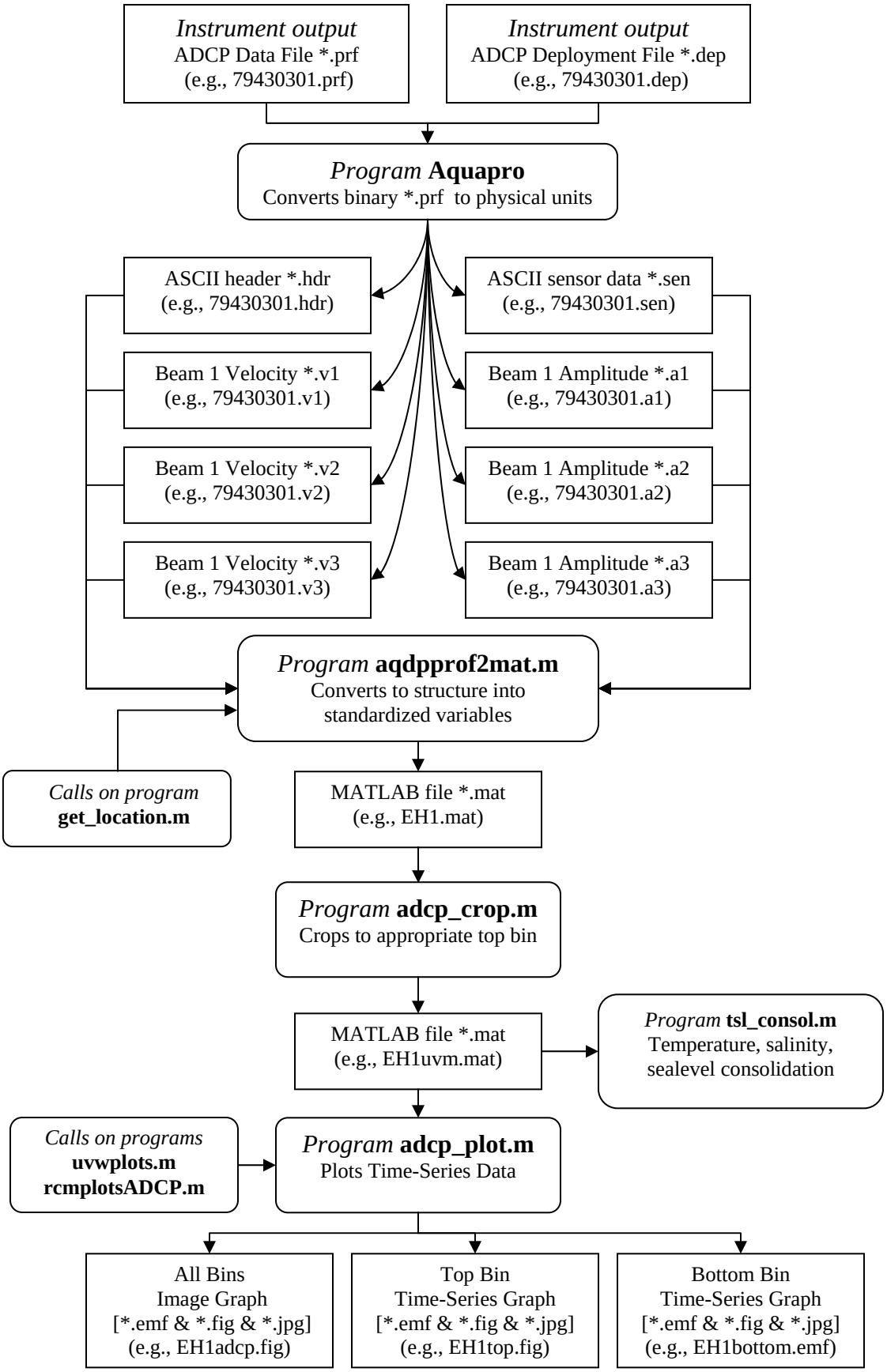
Data processing algorithms are described here using flow charts (pp. 24-34).

Current Meters

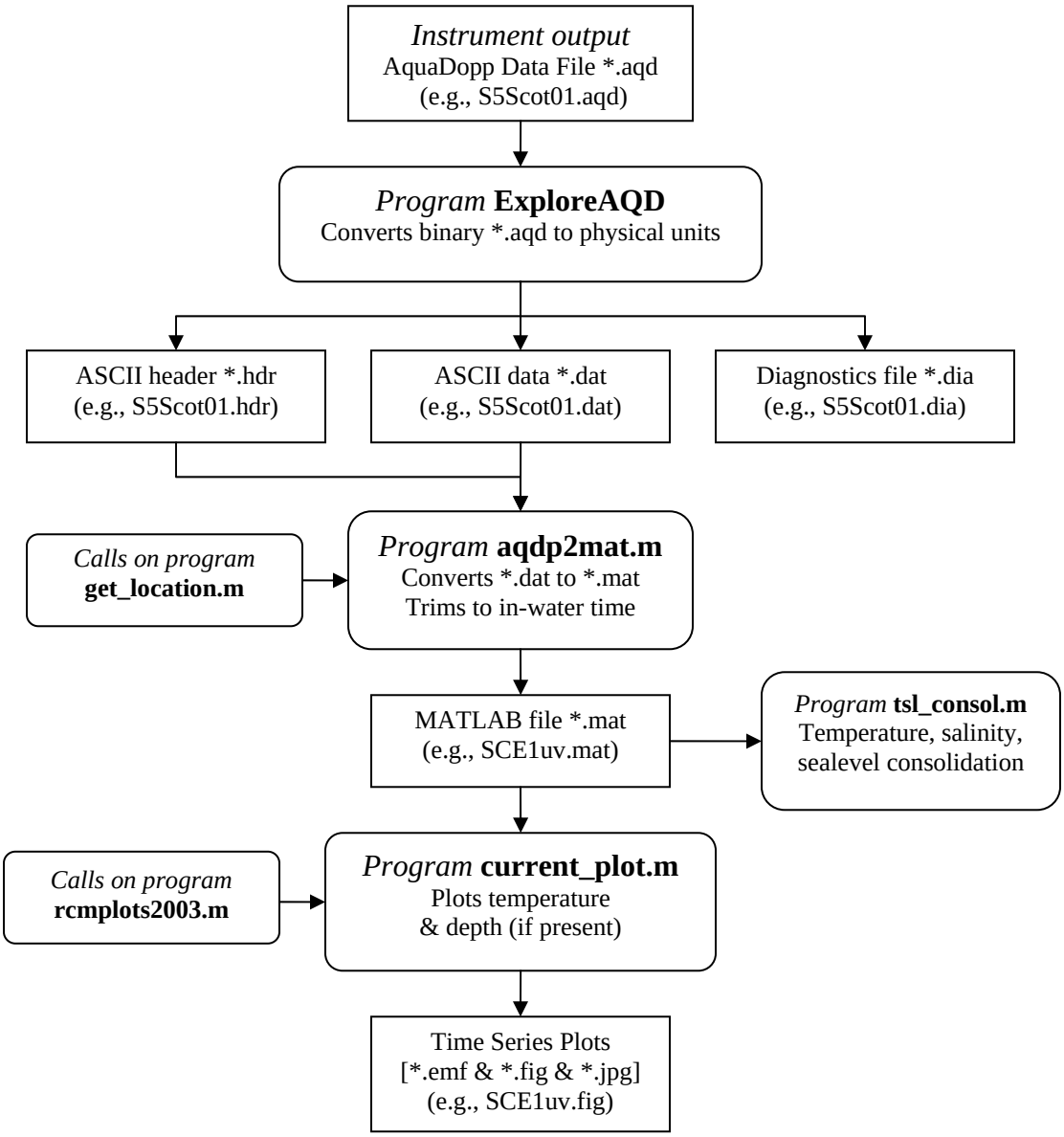
RD Instruments ADCP http://www.rdinstruments.com/sen.html



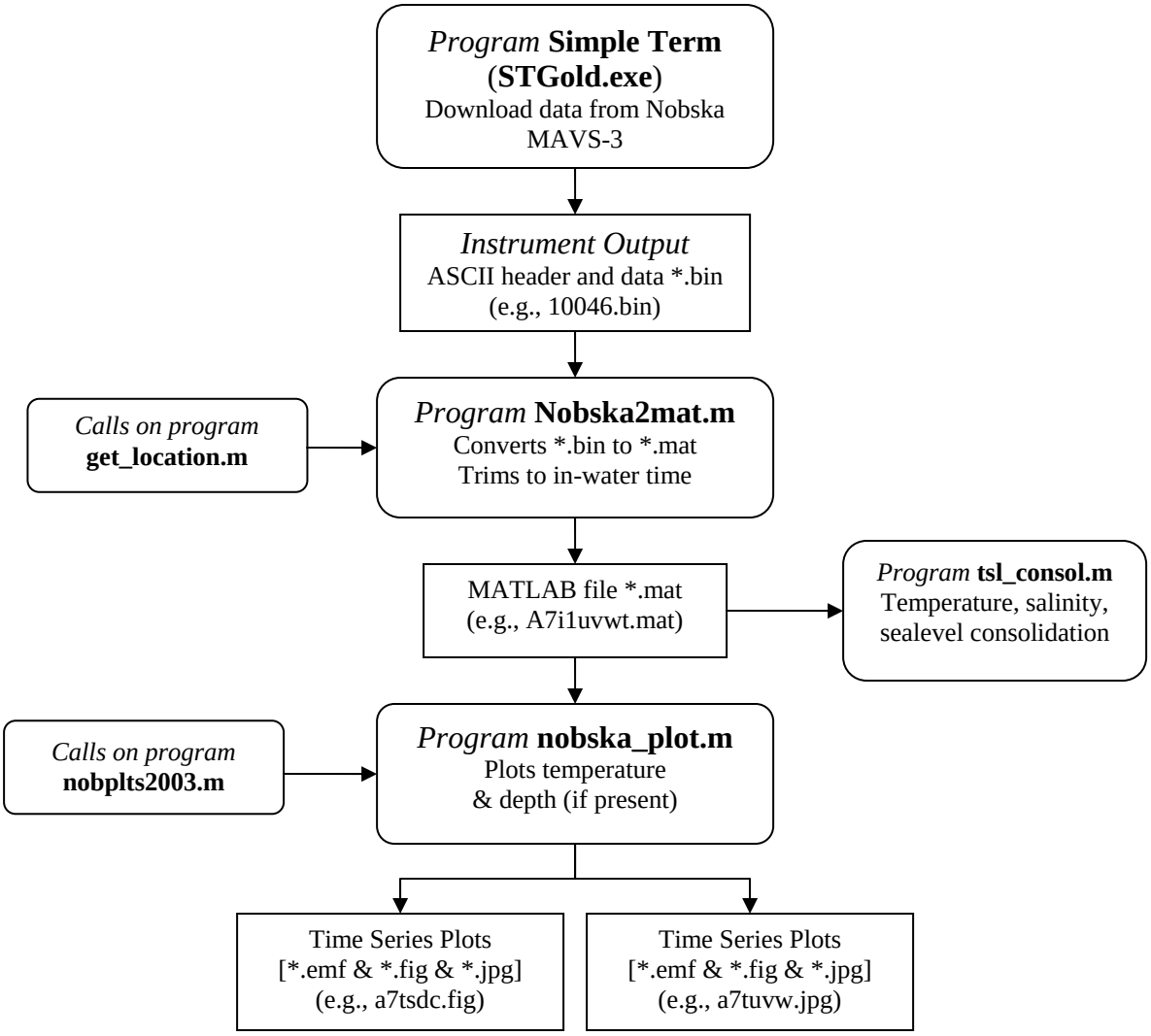
Nortek Aquapro current profiler http://www.nortekusa.com/acp.html



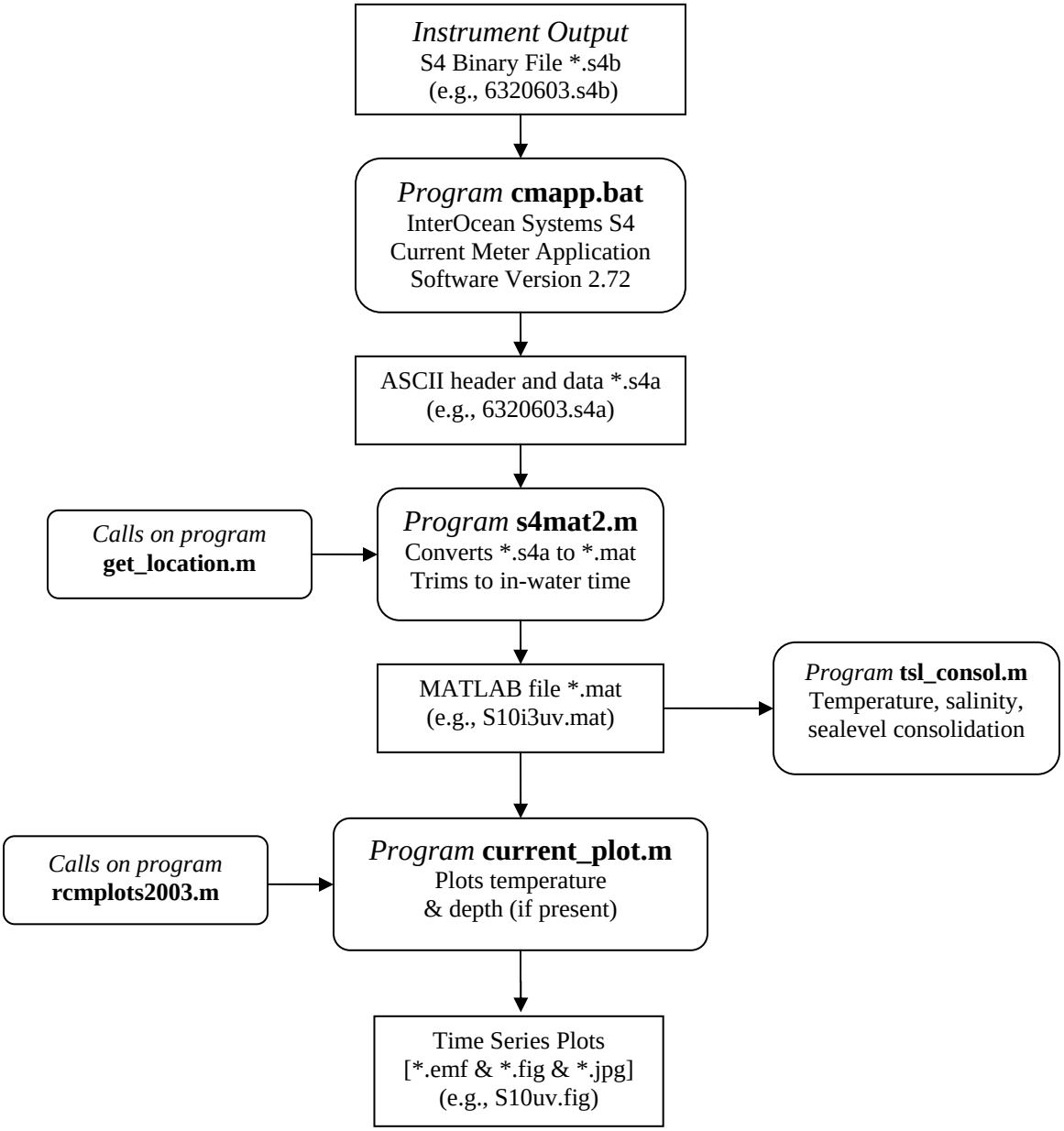
Nortek Aquadopp current meter http://www.nortekusa.com/acm.html



Nobska MAVS-3 http://www.nobska.net/

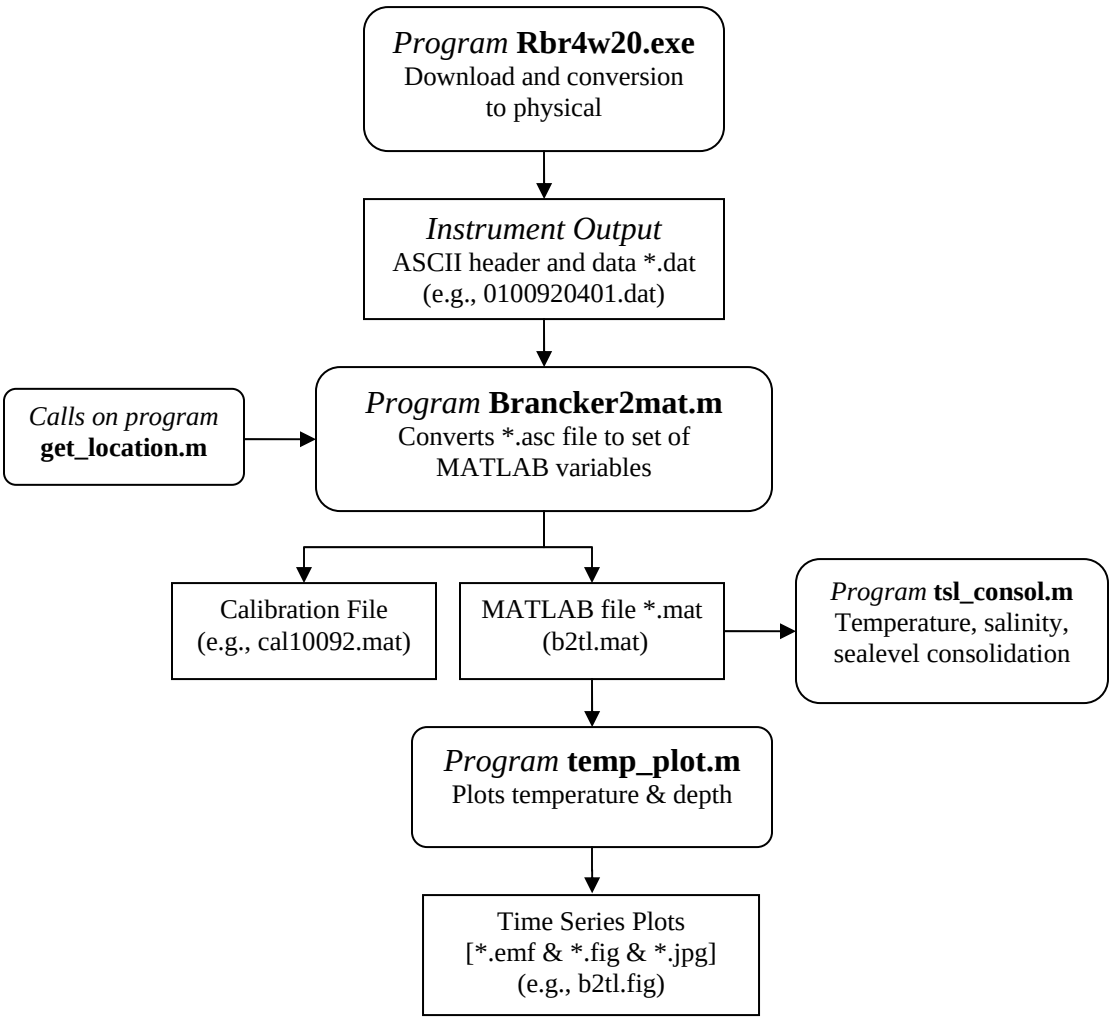


Interocean S4 http://www.interoceansystems.com/s4main.htm



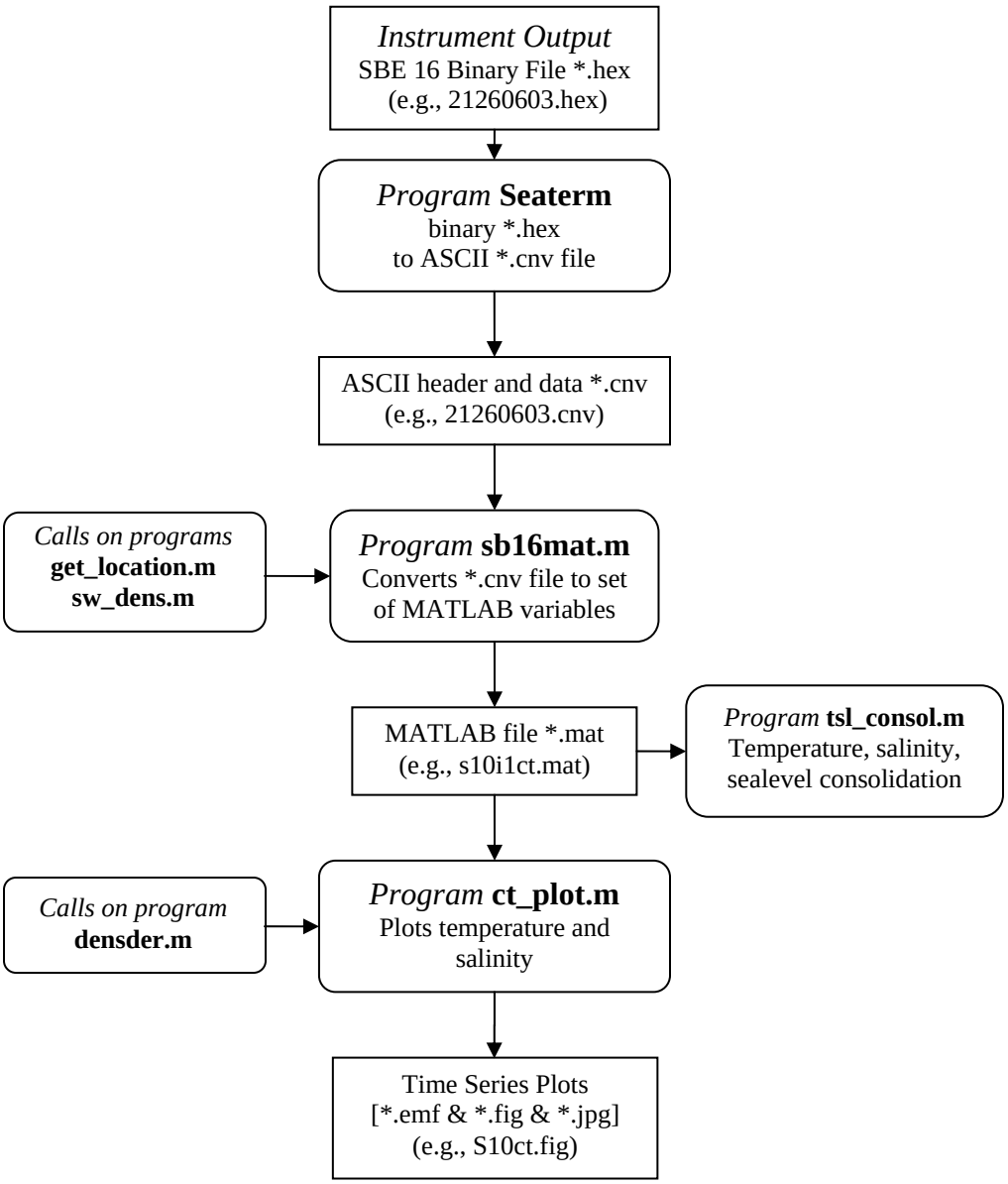
Tide Gauge

Brancker XR-420 TD http://www.rbr-global.com/XR-420TG.htm



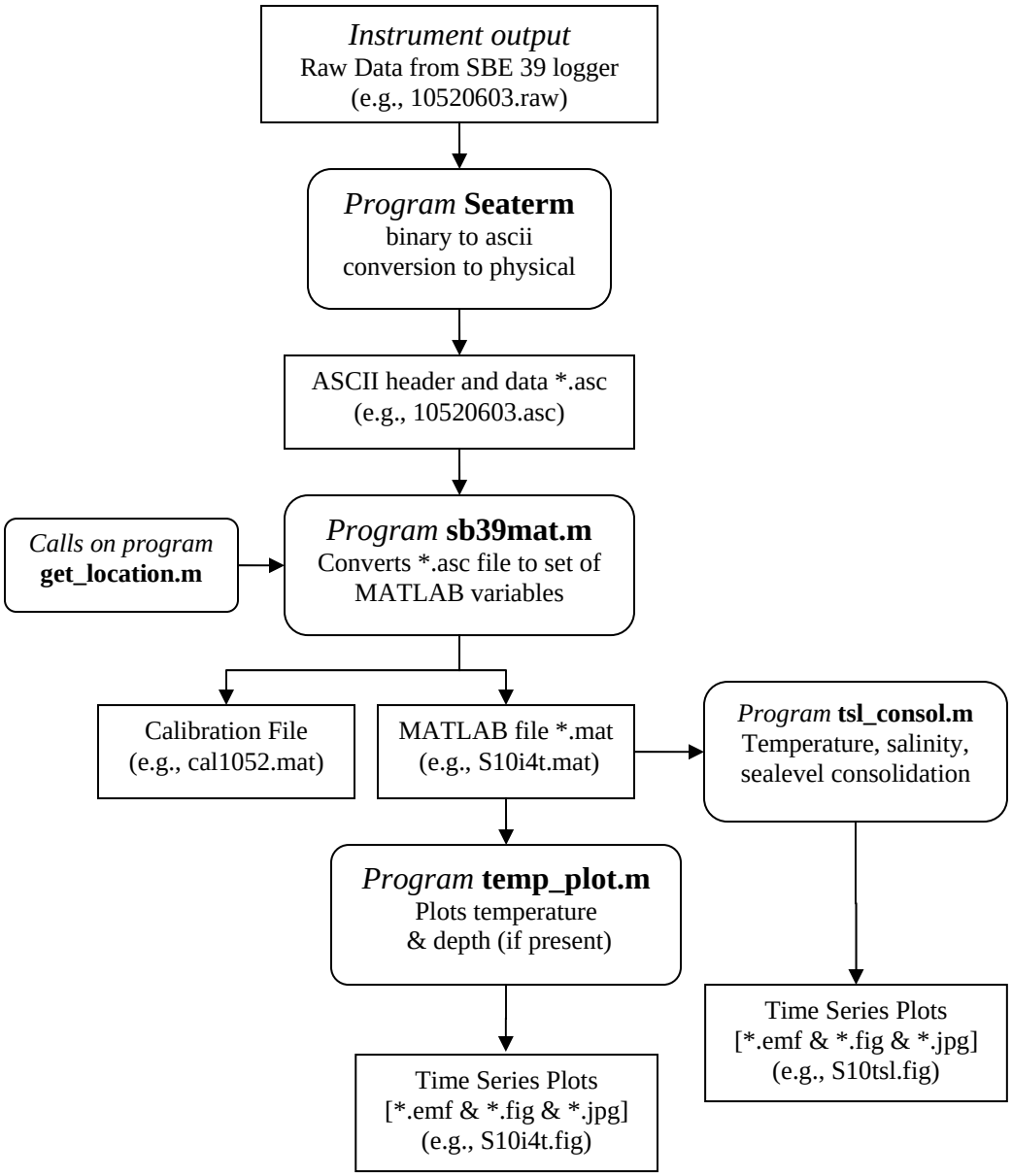
Conductivity Logger

SBE16 http://www.seabird.com/products/spec_sheets/16plusdata.htm



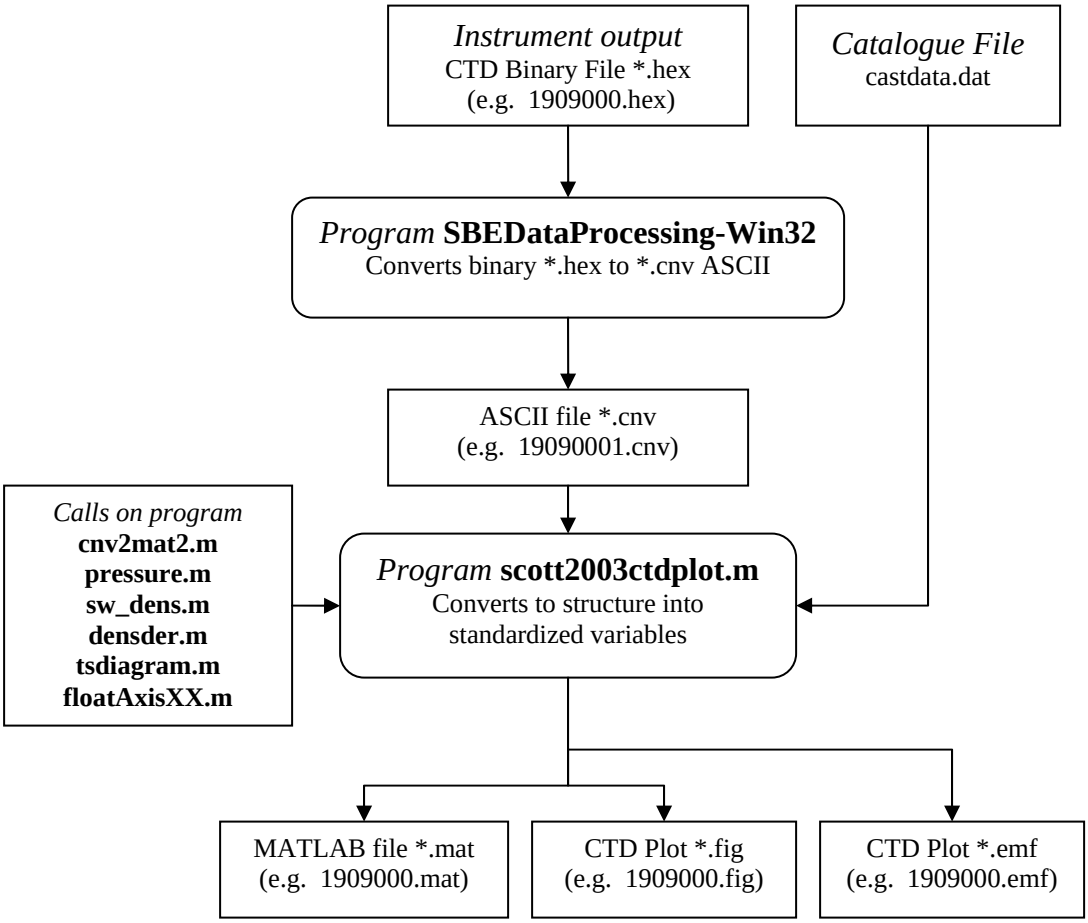
Temperature Loggers

SBE39 http://www.seabird.com/products/spec_sheets/39data.htm



CTD Profiler

SBE19 http://www.seabird.com/products/spec_sheets/19plusdata.htm

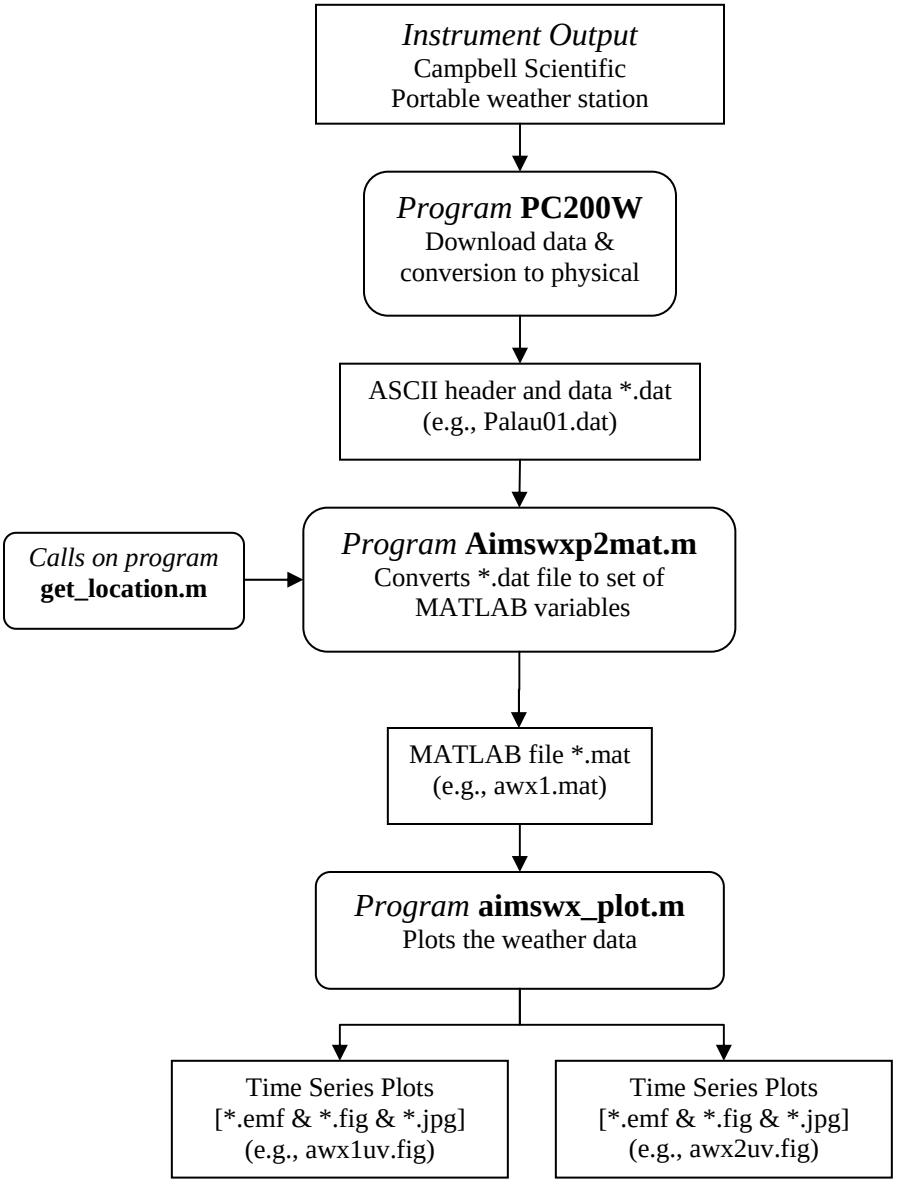


Weather Station

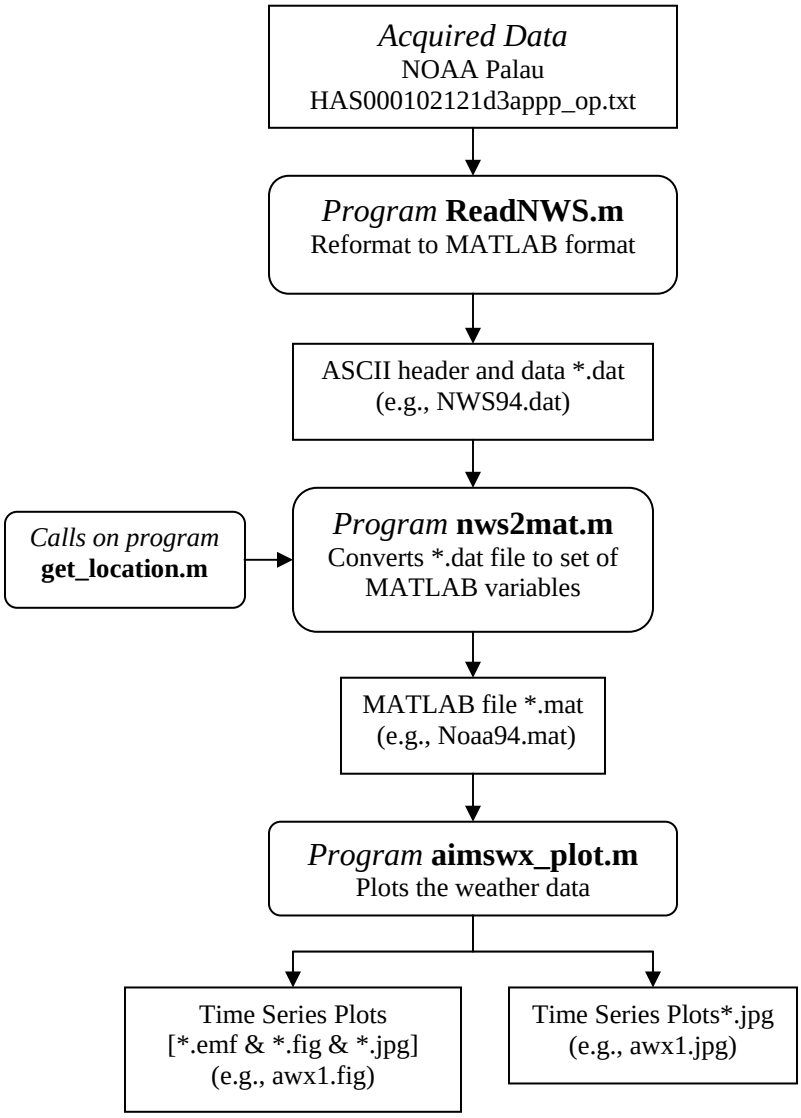
Campbell Scientific http://www.campbellsci.com/

This measures wind speed, direction, air temperature, photosynthetically active radiation (PAR), short wave radiation.

Relative humidity: http://www.campbellsci.com/temp_rh.html
Solar radiation sensors: http://www.campbellsci.com/solarrad.html#li190sb
http://env.licor.com/Products/Sensors/rad.htm



NOAA National Weather Service, Palau
(data acquired from National Climatic Data Center, http://www.ncdc.noaa.gov/)



Notable events

The principle goal was to observe bleaching-like conditions whilst laying the foundation for establishing a quality observational dataset to aid in setting up numerical models. Bleaching-like conditions developed over the period between late October and late November 2003. A general warming and stratification of the waters is evident in the mooring and transect summary plots in Appendix G. The plots are similar in the heating, stratification and subsequent cooling through this period. Winds were low during this warming trend, assisting the intensification of the surface warming. The winds then increased and were, in part, responsible for the subsequent cooling in late October and November.

Acronyms and Instrument Notations

A	Current meter
AIMS	Australian Institute of Marine Science
ADCP	Acoustic Doppler Current Profiler
B	Tide gauge
BT	Bottom Tracking
C	Conductivity meter
CT	Conductivity and Temperature
CTD	Conductivity, Temperature and Depth
CRRF	Coral Reef Research Foundation
LAT	Lowest Astronomical Tide
NOAA	National Oceanic and Atmospheric Administration
P	Pressure sensor
PICRC	Palau International Coral Reef Research Center
RI	Rock Islands
RDI	RD Instruments – manufacturer of ADCPs
S4	Interocean S4 current meter
S16	SBE 16 CT logger
S39	SBE 39 logger
SBE	Sea Bird Electronics
T	Temperature logger or transect
TNC	The Nature Conservancy
UoG	University of Guam
WX	Weather Station

References

Bruno J.F., Siddon C.E., Witman J.D., Colin P.L. and Toscano M.A. (2001) El Nino related coral bleaching in Palau, Western Caroline Islands. Coral Reefs 20:127-136.

Colin P.L. (2000) Water temperature on the Palauan Reef tract: Year 2000. Technical Report No. 1, Coral Reef Research Foundation, Koror, Palau.

Penland L., Kloulechad J, Idip D., Van Woesik R. (2004) Coral spawning in the western Pacific Ocean is related to solar insolation: evidence of multiple spawning events in Palau. Coral Reefs 23:133-140.

Wilkinson, C.R. (Ed.) (2002) Status of Coral Reefs of the World: 2002. Global Coral Reef Monitoring Network, Australian Institute of Marine Science. Townsville, Australia, 2002.

Appendix A – Daily Schedule

Deployment, AIMS Trip#3553 24 Aug - 18 Sep 2003

Personnel	Severine Choukroun, Cary McLean, Craig Steinberg (AIMS) Scott Heron, William Skirving (NOAA)				
Wed 20 Aug	Freight sent from AIMS				
Sun 24 Aug	AIMS personnel travel Townsville – Cairns NOAA personnel travel Washington DC – Guam				
Mon 25 Aug	AIMS personnel travel Cairns – Guam – Palau NOAA personnel travel Guam – Palau				
Tue 26 Aug	Pick up freight, meet and greet, find accommodation				
Wed 27 Aug	Setup lab				
Thu 28 Aug	Pat Colin, CRRF shows us around rock islands and lighthouse, check out TNC boat				
Fri 29 Aug	T3	5 SBE39		20m	RI inside channel
Sat 30 Aug	B1a	Brancker XR420	10083	4m	RI northern reef opening in 2.5m hole
	A11	ADCP 600kHz	1673	25m	RI northern channel entrance
	T4	5 SBE39		18m	RI Nikko Lake
Sun 31 Aug	A8	ADCP 600kHz BTPW	3228	30m	Lighthouse Toachel Ra Kesebekuu
	T2	4 SBE39		30m	Lighthouse Toachel Ra Kesebekuu
	C4	SBE16CT	2124	2.5m	Lighthouse Toachel Ra Kesebekuu
Mon 1 Sep	Complete A8				
	A2	S4	615	4m	Ngetalau Passage, outside Rock Islands
	Recover B1a				
	B1	Brancker XR420	10079	4m	RI northern reef opening in 2.5m hole
	Setup instruments				
Tue 2 Sep	T7	5 SBE39		18m	Central Rock Islands, Urukthapel
	A4	RDIADCP 300kHz BT	584	30+m	Ulong east
Wed 3 Sep	A12	Nortek Aquadopp CRRF	0970	12m	RI southern reef opening
	Setup instruments				
Thu 4 Sep	Severine departs 0145 Palau – Guam. Setup instruments and bathymetry sounder 1400 Presentation to Palau Govt & groups				
Fri 5 Sep	A10	ADCP 1200kHz UoG	1292	17m	Toachel Ra Ngel
	B2	SBE39PT		4m	Reef flat Ngedarrak Reef
	A13	Nortek Aquapro CRRF	0866	30m	NE channel Toachel mid
Sat 6 Sep	Too windy for deployment of Philippine Sea transect				
Sun 7 Sep	Craig departs 0030 Palau - Guam				

Mon 8 Sep	T1	4 SBE39		20m	Falcon Reef
	C2	SBE16CT	2127	6m	Falcon Reef
Tue 9 Sep	A9	Nortek Aquapro	794	27m	Malakal Harbour pincers
	C3	SBE16CT	2126	3m	Malakal Harbour pincers
Wed 10 Sep	Setup instruments				
Thu 11 Sep	William departs Perform CT calibration				
Fri 12 Sep	Setup Nobskas and deploy for testing at PICRC				
	T6	4 SBE39		20m	Philippine Sea – West Reef flat
	C1	SBE16	2123	7m	Philippine Sea – West Reef flat
	B5	SBE39PT	760	5m	Central Philippine Sea – East Reef
Sat 13 Sep	Recover Nobskas and compare data				
	A3	Nobska	10045	16m	Ulong west
Sun 14 Sep	Setup instruments				
Mon 15 Sep	A7	Nobska	10046	25m	Falcon Reef - lagoon central
	A6	S4	564	30m	Paleo Channel - Toachel Mlengui
Tue 16 Sep	A1	ADCP 1200kHz	974	25m	RI mid channel - Subject to Ada
	Bathymetry logging set up Prepare Deep water mooring				
Wed 17 Sep	A5	RDIADCP 300kHz BTP412		126m	Uchelbeluu – Deep water mooring
	T5	4 SBE39		126m	Uchelbeluu – Deep water mooring
	C5	SBE16CT		126m	Uchelbeluu – Deep water mooring
Thu 18 Sep	Boat maintenance				
Fri 19 Sep	CTD transect Blue Corner – PICRC				
Sat 20 Sep	Clean up Koror day				
Sun 21 Sep	Scott departs CTD transect A2 through SE entrance to shelf edge & north to Toachel mid channel & KB Bridge. CTD transect from A9 Pincers to central harbour				
Mon 22 Sep	T8	5 SBE39 + 1 XR420		43m	Ulong East Channel
	Pack up				
Tue 23 Sep	Recover T73				
	B4	Brancker XR420	10091	4.5m	Ulong East
	B3/T73b	Brancker XR420	10093	5m	Central Rock Islands, Urukthapel
	WX	Campbell Scientific	WX1		Shalom Etpison's residence
Wed 24 Sep	Cary departs				

Mid-deployment, AIMS Trip# 3585 2 – 9 Nov 2003

Personnel	Cary McLean (AIMS) William Skirving, Alan Strong (NOAA)				
2-12 Nov	Bathymetry validation, instrument check and CTD transects				
Wed 5 Nov	Recover B3/T73b Move T71 to T73c B3b Recover B3b	Brancker XR420	10093		Blue Corner, 1015-1519
Fri 7 Nov	B3c Recover B3c	Brancker XR420	10093		north of Babeldaob, 0730-1437 (bathymetry transect 2a)
Wed 12 Nov	B6 Check WX	Brancker XR420	10093	2m	Malakal Harbour Tide Gauge

Recovery, AIMS Trip # 3587 27 Dec 2003 – 18 Jan 2004

Personnel	Cary McLean, Craig Steinberg (AIMS) Felipe Arzayus, William Skirving, Alan Strong (NOAA)
Mon 22 Dec	Freight sent from AIMS
Sat 27 Dec	Townsville 1315–1410 Cairns QF2308
Sun 28 Dec	Cairns 0135-0610 Guam CO903, Guam 1940-2050 Koror CO953
Mon 29 Dec	Pick up freight & preparation
Tue 30 Dec	Prepare boat and gear, Recover T3, T4, A1, A2 & B1
Wed 31 Dec	Recover A9, C3, B2, C2, C4 & B6
Thu 01 Jan	New Year's Day
Fri 02 Jan	Recover A3 & T7
Sat 03 Jan	Recover A11, A7, T1 & C2
Sun 04 Jan	Recover A12
Mon 05 Jan	Freight urgent gear to Townsville, Felipe Arzayus arrives & has check out dive
Tue 06 Jan	Blue Corner, Lighthouse channel attempt – storm.
Wed 07 Jan	Deep water mooring (A5+T5+C5) recovery attempt – too rough Recover A8+T2 Recover A10 and redeploy as A11b A11b ADCP 1200kHz UoG 1292 23m RI Northern channel entrance
Thu 08 Jan	Deep water mooring (A5+T5+C5) recovery attempt – too rough A13 recovery attempt – found subsurface buoy. Waypoint not very good today.

Fri 09 Jan Recover A13, A4, B4 & WX
Presentations to World Bank
"Development of CRW Products: Prediction and mapping with the use of hydrodynamic models and satellite data" William Skirving, Craig Steinberg, Scott Heron, Alan Strong, Cary McLean
"NOAA's Coral Reef Watch – An Update" Alan Strong

Sat 10 Jan Winds 20-25kts from NE. Lab day

Sun 11 Jan Winds still 20-25kts from NE. Lab day. Pat Colin arrives
Recover A11b

A11c	Nortek Aquapro CRRF	0866	23m	RI Northern channel entrance
A14	ADCP 1200kHz UoG	1292	4m	Japanese Channel

Mon 12 Jan Recover A6 with Alma Ridep-Morris team

Tue 13 Jan Recover B5, T8, A14 & A5+T5+C5

Wed 14 Jan Recover T6 & C1
Pack up

Thu 15 Jan Felipe leaves 0230

Fri 16 Jan Freight gear

Sat 17 Jan Pack up accommodation

Sun 18 Jan Remaining personnel travel Koror 0115-0530 Guam, Guam 1955-1235 Cairns

Mon 19 Jan Cairns 1005-1100 Townsville

Thu 5 Feb Recover A11c (Pat Colin)

Appendix B – Tide gauge deployment information

B1a RI northern reef opening in 2.5m hole, off Toirius Island

Instrument: Brancker XR-420-TG, 10083
(serial no.)
Capability: Maximum depth 90m pressure sensor, temperature sensor
Location: 07°19.821'N 134°28.878'E
Sampling : 5 minute sampling interval, 60 second averaging interval

Filename : 010083test.dat
All times listed as local time UTC+9.
Switch on: 102930 30/08/03
Time check: 0839 30/08/03
In water: 1050 30/08/03
in posn : 1057 30/08/03
First good: -
Last in posn : -
Out of water : 1102 01/09/03
Switch off

Comments : Time drift of logger, gained 59 sec in 53 hours ! Withdrawn

B1 RI northern reef opening in 2.5m hole, off Toirius Island

Instrument : Brancker XR-420-TG, 10079
(serial no.)
Capability : Maximum depth 90m pressure sensor, temperature sensor
Location : 07°19.821'N 134°28.878'E
Sampling : 5 minute sampling interval, 60 second averaging interval

Filename : 0100790301.dat
All times listed as local time UTC+9.
Switch on: 102930 31/08/03
Time check: 072421 01/09/03
In water: 1050 01/09/03
in posn : 1100 01/09/03 4.1m
First good: 1100 01/09/03 01-Sep-2003 11:00:00
Last good : 03-Nov-2003 00:05:00
Last in posn :
Out of water : 1432 30/12/03
Switch off

Comments : Flat battery 3.0V, clock lost time so no time off available
5.6% memory used 18K readings, 2 months

B2 Reef flat, Ngederrak Reef

Instrument: SBE39PT Pressure & Temperature logger, #0759
(serial no.)

Capability :	Pressure and Temperature, 230K samples	
Location :	07°17.472'N, 134°28.282'E, 1.9m	
Sampling :	Sampling Interval 5 min	
Filename :	07590301.asc	
	All times listed as local time UTC+9.	
	Time	
Switch on:	1500 03/09/03	
In water:		
in posn :	1208 05/09/03	05-Sep-2003 12:30:00 1.9m
First good:		
Last in posn :	0752 31/12/03	31-Dec-2003 07:30:00
Out of water :		
Switch off	1055 03/01/04	35087 Samples
	Logger 1 second slow	
Comments :	Lionfish under rock. Pressure sensor not working properly initially – good from 21-Sep-2003 12:00:00	

B3 Central Rock Islands, Urukthapel (T73b)

Instrument : (serial no.)	Brancker XR-420-TG, 10093	
Capability :	Maximum depth 90m pressure sensor, temperature sensor	
Location :	07°16.376'N 134°24.667'E	
Sampling :	5 minute sampling interval, 60 second averaging interval	
Filename :	100931103.dat	
	All times listed as local time UTC+9.	
Switch on:	00:14:30 3/9/03	
In water:		
in posn :	0849 23/9/03	23-sep-2003 10:00:00 5m
First good:	0900 23/9/03	
Last in posn :	0900 05/11/03	05-nov-2003 09:00:00
Filename :	**B3B**	
Location :	7 08.4912',134 17.8275'	East of Blue Corner
First good :	1015 5/11/03	
Last good :	1515 5/11/03	
Filename :	**B3C**	
Location :	7 46.60848, 134 35.1582	North Babeldaup
First good :	0730 7/11/03	
Last good :	1435 7/11/03	
Out of water :	1437 7/11/03	
Switch Off :	1122 8/11/2003	

Comments : Flat battery, clock lost time so no time off available, Clock +15 seconds, 4.1% memory
B3B
Moved to Blue corner 5/11/03 1015-1519 wpt TIDE Region 13 transect C 7 08.4912',134 17.8275'
B3C
Moved to north of Babeldaup 7/11/03 0730-1437 Region 2 transect A 7 46.60848, 134 35.1582; then B6 Malakal Harbour on Nov 5 2003
Last 2 records look bad

B4 Ulong East

Instrument : Brancker XR-420-TG, 10091
(serial no.)
Capability : Maximum depth 90m pressure sensor, temperature sensor
Location : 07°16.621'N 134°18.680'E 4.5m LAT
Sampling : 5 minute sampling interval, 60 second averaging interval

Filename : 0100911001.dat
All times listed as local time UTC+9.

Switch on:	214430 22/09/03	
In water:		
in posn :	0805 23/09/03	5.5m
First good:	0805 23/09/03	23-Sep-2003 08:15:00
Last in posn :	1017 09/01/04	6.1m
Out of water :		19-Dec-2003 20:00:00
Last record:		19-Dec-2003 23:05:00
Switch off	Flat battery	

Comments : Flat battery, clock lost time so no time off available
Second deployment for intercalibration with SBE39PT#732
On @1513 10/1/04 Off @1605 11/1/04 10091calib.dat

B5 Central Philippine Sea – East Reef (Lagoon side)

Instrument : SBE39PT Pressure & Temperature logger, #0760
(serial no.)
Capability : Pressure and Temperature, 230K samples
Location : 07°24.380'N, 134°21.065'E, 5m
Sampling : Sampling Interval 5 min

Filename : 07601401.asc
All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	1120 12/09/03	
in posn:	1125 12/09/03	
First good:	1135 12/09/03	5m 12-Sep-2003 12:00:00
Last in posn :	1030 13/01/04	5.8m
Out of water :		
Last record :		14-Jan-2004 18:44:59
Switch off :	1853 14/01/04	38351 samples

Logger 2 secs slow
Comments : Lionfish under rock.

B6 Malakal Harbour Tide Gauge

Instrument : Brancker XR-420-TG, 10093
(serial no.)
Capability : Maximum depth 90m pressure sensor, temperature sensor. 60 sec ave
Location : 07°20.016'N 134°27.429'E
Sampling : 5 minute sampling interval, 60 second averaging interval

Filename : 0100930301.dat

All times listed as local time UTC+9.

Switch on:	1230 08/11/03	From file header
Time check:		
In water:	0859 12/11/03	
in posn :		
First good:	0915 12/11/03	12-Nov-2003 10:00:00
Last good :		20-Dec-2003 04 :00:00
Out of water :	0853 31/12/03	~2m
Last record :		20-Dec-2003 04:45:30
Switch off		

Comments : Flat battery, clock lost time so no time off available
3.7% memory used 12K readings, 1.5 months
Moved from B3 in November

Appendix C – Current meter deployment information

A1 Rock Islands, mid channel

Instrument : (serial no.)	ADCP 1200kHz, #0974	
Capability :	40M card	
Location :	07°19.786'N, 134°29.637'E, 24.2m	
Sampling :	15min ensembles, continuous; 144 pings/ensemble, 24*1m bins, SD=0.26cm/s	
Filename :	pal08000.000	
	All times listed as local time UTC+9.	
Switch on:	095230 16/09/03	
In water:	1140 16/09/03	
in posn :	1155 16/09/03	24.2m
First good:	1230 16/09/03	16-Sep-2003 12:30:00
Last in posn :	1614 30/12/03	30-Dec-2003 16:00:00, 23.8m
Out of water :		
Switch off:	1033 31/12/03	10178 ensembles
	Logger 1:04 fast	
Comments :		

A2 Ngetalau Passage, outside Rock Islands

Instrument : (serial no.)	Interocean S4 current meter, #615	
Capability :	20 Mb RAM, high resolution pressure sensor draws 49mA no Temp	
Location :	07°19.315'N, 134°29.400'E, 4m	
Sampling :	1 min average every 30 minutes	
Filename :	6150903.s4a	setup 6150903.su
	All times listed as local time UTC+9.	
Switch on:	1500 01/09/03	
In water:	1600 01/09/03	
in posn :	1610 01/09/03	4m
First good:	1630 01/09/03	01-Sep-2003 16:30:00
Last in posn :	1642 30/12/03	30-Dec-2003 16:30:00 3.7m
Out of water :		
Switch off:	1015 31/12/03	
	No clock drift	
Comments :		

A3 Ulong West

Instrument : (serial no.)	Nobska , #10045 – UoG (Bob Richmond)
Capability :	UVW velocity component output, temperature, conductivity
Location :	07°18.293'N, 134°16.726'E, 20m
Sampling :	120 measurements at 2Hz averaged (1min sampling) every 15min

Filename :	10045.txt	
	All times listed as local time UTC+9.	
Switch on:	1030 13/09/03	
In water:	1250 13/09/03	
in posn :	1310 13/09/03	20m
First good:		
Last in posn :	1432 02/01/04	20.7m
Out of water :		
Last Read:		

Comments : Subsurface buoy 5m

A4 Ulong East

Instrument : (serial no.)	RDI ADCP 300kHz, #584 BT	
Capability :	48M card Bottom tracking, No Pressure and temperature	
Location :	07°16.617'N, 134°18.716'E, 30m	
Sampling :	15min ensembles, continuous; 18*2m bins, SD=0.61cm/s, 6M mem – 140 days	

Filename :	pal03000.000	
	All times listed as local time UTC+9.	
Switch on:	185230 01/09/03	01-Sep-2003 19:00:00
In water:	1100 02/09/03	
in posn :	1115 02/09/03	30+m
First good:	1130 02/09/03	02-Sep-2003 11:30:00
Last in posn :	1025 09/01/04	09-Jan-2004 10:00:00 33.1m
Out of water :		
Last Read:	1141 10/01/04	12546 ensembles, 12530 works 10-Jan-2004 07:15:00
	Logger 59 seconds fast	

Comments : Subsurface buoy at 7°16.621'N, 134°18.680'E

A5 Uchelbeluu (deepwater mooring)

Instrument : (serial no.)	RDI ADCP 300kHz, #412BTP	
Capability :	Bottom Tracking, Temperature and Pressure	
Location :	07°15.545'N, 134°33.167'E, "215m" on 126m mooring	
Sampling :	15min ensembles, continuous; 23*5m bins, SD=0.33cm/s, 10M mem in 170 days	

Filename :	pal09000.000	
	All times listed as local time UTC+9.	
Switch on:	082230 17/09/03	
In water:	1045 17/09/03	
in posn :	1100 17/09/03	
First good:	1115 17/09/03	17-Sep-2003 11:30:00
Last in posn :	1445 13/01/04	13-Jan-2004 14:45:00
Popped:	1450 13/01/04	

Out of water : 1505 13/01/04
Last Read: 2210 14/01/04 11479 ensembles
Logger 40 seconds slow
Comments : with T5,C5, Acoustic Release #445 (13.5 B/D)

A6 Paleo Channel – Toachel Mlengui (West Passage)

Instrument : S4, #564
(serial no.)
Capability : Temperature and pressure.
Location : 07°28.927'N, 134°27.776'E, 33m
Sampling : 1min sampling every 30 minutes

Filename : 5640104.s4a 5640903.su
All times listed as local time UTC+9.
Switch on: 1330 04/09/03
In water: 0930 15/09/03
in posn : 0938 15/09/03 30.0m
First good: 1000 15/09/03 15-Sep-2003 10:00:00
Last in posn : 1028 12/01/04 12-Jan-2004 10:00:00 32.5m
Out of water :
Last Read: 0830 05/02/04

Comments : Comms box didn't work – downloaded later in Darwin !

A7 Falcon Reef

Instrument : Nobska , #10046 – UoG (Bob Richmond)
(serial no.)
Capability : UVW velocity component output, temperature
Location : 07°22.445'N, 134°23.177'E, 14.5m
Sampling : 120 measurements at 2Hz averaged (1min sampling) every 15min

Filename : 10046.txt
All times listed as local time UTC+9.
Switch on: 1030 13/09/03
In water: 1129 15/09/03
in posn : 1145 15/09/03
First good:
Last in posn : 1507 03/01/04 13.1m
Out of water :
Last Read: Flat battery

Comments : with transect T1

A8 Lighthouse Channel

Instrument : RDI ADCP 600kHz, #3228
(serial no.)
Capability : Bottom tracking, pressure and temperature

Location :	07°16.955'N, 134°27.932'E, 30m	
Sampling :	15min ensembles, continuous; 150 pings/ensemble, 35*1m bins, 10M card	
Filename :	Pal02000.000	setup pal02.whp
	All times listed as local time UTC+9.	
Switch on:	120730 31/08/03	
In water:	1600 31/08/03	
in posn :	0940 01/09/03	
First good:	1000 01/09/03	01-Sep-2003 10:00:00
Last in posn :	0825 07/01/04	07-Jan-2004 08:00:00
Out of water :		
Switch off:	1411 08/01/04	10Mb data 12488
	Logger 2 mins 13 sec fast	
Comments :	with T2; strong tidal currents – didn't complete deploy until next day.	
	Internal clock is Australian Eastern Standard Time (UTC+10hr), so 1 hour fast	

A9 Malakal Harbour pincers

Instrument :	Nortek Aquapro, #0794	
(serial no.)		
Capability :	50cm blanking distance, 2.1M mem	
Location :	07°20.163'N, 134°25.483'E, 27.7m	
Sampling :	1min sampling interval every 15min, 30*1m bins, 75 days	
Filename :	pal0701.prf	setup pal07.dlp
	All times listed as local time UTC+9.	
Switch on:	095930 08/09/03	
In water:	0855 09/09/03	
in posn :	0910 09/09/03	27m
First good:		09-Sep-2003 10:00:00
Last good :		22-Dec-2003 02:45:00
Last in posn :	0716 31/12/03	27.2m
Out of water :		
Switch off:	102322 03/01/04	
	Loggers 20 seconds fast	
Comments :	Subsurface buoy, turnaround in October	
	24 good bins, shorter than deployed record – 75 days	
	some initial currents high at the bottom	

A10 Toachel ra Ngel (Ngel Channel)

Instrument :	ADCP 1200kHz, #1292 – UoG (Bob Richmond)	
(serial no.)		
Capability :	Temperatue and Pressure	
Location :	07° 17.786'N, 134° 28.958'E, 22 m	
Sampling :	15min ensembles, continuous; 180 pings/ensemble, 22*1m bins, SD=0.2cm/s	
Filename :	pal05000.000	
	All times listed as local time UTC+9.	
Switch on:	085230 05/09/03	05-Sep-2003 09:00:00

In water:	1100 05/09/03	
in posn :	1113 05/09/03	19.3m
First good:	1130 05/09/03	05-Sep-2003 11:30:00
Last in posn :	1310 07/01/04	07-Jan-2004 13:00:00
Out of water :		
Last Read:		

Comments : This instrument was moved to A11b and afterwards to A14

A11 Rock Islands northern channel entrance

Instrument : (serial no.)	RDI ADCP 600kHz, #1673	
Capability :		
Location :	07°19.400'N, 134°28.949'E, 22m	
Sampling :	15min ensembles, continuous; 150 pings/ensemble, 30*1m bins, SD=0.57cm/s, 424 Wh, 9.7m, 140 days	
Filename :	No Data	setup pal01.whp
	All times listed as local time UTC+9.	
Switch on:	100730 30/08/03	
In water:	1600 30/08/03	
in posn :	1616 30/08/03	
First good:		
Last in posn :	1613 03/01/04	23.6m
Out of water :		
Last Read:	1013 07/01/04	No data

Comments : No data – battery failed, put UoG ADCP#1292 in 7/1/04

A11b Rock Islands northern channel entrance

Instrument : (serial no.)	ADCP 1200kHz, #1292 – UoG (Bob Richmond)	
Capability :	Temperatue and Pressure	
Location :	07° 17.786'N, 134° 28.958'E, 22 m	
Sampling :	15min ensembles, continuous; 180 pings/ensemble, 22*1m bins, SD=0.2cm/s	
Filename :	pal05000.000	
In water:		
in posn :	1402 07/01/04	22.6m deep
First good:	1415 07/01/04	
Last in posn :	1430 11/01/04	
Popped:	1438 11/01/04	
Out of water :		
Last Read:		

Comments : The above instrument was moved from A10 and afterwards to A14

A11c Rock Islands northern channel entrance

Instrument : Nortek Aquapro, #0866/784 – CRRF (Pat Colin)
(serial no.)
Capability : 50cm blanking distance
Location : 07°19.023'N, 134°31.490'E, 30+m
Sampling : 1min sampling interval every 15min, 30*1m bins

Filename : Pal1001.prf setup Pal10
All times listed as local time UTC+9.

Switch on:	125930 11/01/04	
In water:		
in posn :	1438 11/01/04	22.6 m
First good:	1500 11/01/04	11-Jan-2004 15:30:00
Last in posn :	1430 05/02/04	05-Feb-2004 14:30:00
Out of water :		
Last Read:	125930 10/02/04	2004-02-10 13:00:00

Comments : Replaced failed current meter #1673 A11 and short A11b deployments.
21 good bins
This instrument was moved from A13

A12 Rock Islands southern reef opening

Instrument : Nortek Aquadopp, #0970/0855 – CRRF (Pat Colin)
(serial no.)
Capability : 50cm blanking distance, 5M mem
Location : 07°19.223'N, 134°29.795'E, 11.4m
Sampling : 5min sampling interval every 15min, SD=0.4cm/s, 0.3M mem, 107% battery in 75 days

Filename : Pal0401.AQD,*.HDR & *.DAT setup pal04
All times listed as local time UTC+9.

Switch on:	151230 03/09/03	
In water:	1700 03/09/03	
in posn :	1715 03/09/03	11.4m
First good:	1730 03/09/03	03-Sep-2003 17:30:00
Last good :	204230 03/10/01	01-Oct-2003 20:45:00
Last in posn :	1056 04/01/04	11.2m
Out of water :		
Last Read:		
Switch off :	1100 07/01/04	

1 sec/ 6mths specification
Comments : Battery flat as expected although should have lasted 70 days
1230 in cold box for intercalibration

A13 Toachel mid

Instrument : Nortek Aquapro, #0866/784 – CRRF (Pat Colin)
(serial no.)
Capability : 50cm blanking distance

Location :	07°19.023'N, 134°31.490'E, 30+m	
Sampling :	1min sampling interval every 15min, 30*1m bins	
Filename :	pal0601.prf	
	All times listed as local time UTC+9.	
Switch on:	135930 05/09/03	
In water:	1510 05/09/03	
in posn :	1530 05/09/03	30+m
First good:		05-Sep-2003 15:30:00
Last good :	0230 30/11/03	30-Nov-2003 02:30:00
Last in posn :	0830 09/01/04	09-Jan-2004 08:30:00
Popped:	0840 09/01/04	31.5m
Out of water :		
Last Read:	1153 10/01/04	
	Logger 23 seconds fast	
Comments :	26 good bins, shorter than deployed record – 75 days	
	This instrument was moved to A11c	

A14 Japanese Channel

Instrument : (serial no.)	ADCP 1200kHz, #1292 – UoG (Bob Richmond)	
Capability :	Temperature and Pressure	
Location :	07° 17.786'N, 134° 28.958'E, 22 m	
Sampling :	15min ensembles, continuous; 180 pings/ensemble, 22*1m bins, SD=0.2cm/s	
Filename :	pal05000.000	
	All times listed as local time UTC+9.	
In water:		
in posn :	1520 11/01/04	4m deep
First good:	1530 11/01/04	
Last in posn :		
Popped:		
Out of water :		
Switch off :	2135 14/01/04	12626 ensembles
	Logger 16 seconds fast	
Comments :	This instrument was moved from A10 and A11b	

Appendix D – Temperature deployment information

T1 Falcon Reef

T16

Instrument : SBE39T Temperature logger, #0935
(serial no.)
Capability :
Location : 07°22.424'N, 134°23.232'E, 2.5m
Sampling : Sampling Interval 5 min

Filename : 09350401.asc
All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	1330 08/09/03	
in posn :	1408 08/09/03	2.5m
First good:	1410 08/09/03	
Last in posn :	1443 03/01/04	3.7m
Out of water :	1525 03/01/04	
Switch off	1601 04/01/04	

Logger 1 second fast
Comments : Long transect, 4 SBE39T & 1 SBE16CT

T15

Instrument : SBE39T Temperature logger, #0929
(serial no.)
Capability :
Location : 07°22.424'N, 134°23.232'E, 3.5m
Sampling : Sampling Interval 5 min

Filename : 09290401.asc
All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	1330 08/09/03	
in posn :	1355 08/09/03	3.5m
First good:	1400 08/09/03	
Last in posn :	1448 03/01/04	4.7m
Out of water :	1525 03/01/04	
Switch off	1606 04/01/04	35438 samples

Logger 1 second fast
Comments :

T14 C2

Instrument : SBE16CT Conductivity & Temperature logger, #2127
(serial no.)
Capability :
Location : 07°22.424'N, 134°23.232'E, 6m
Sampling : Sampling Interval 5 min

Filename : 21270401.hex
All times listed as local time UTC+9.

Time	**Depth**

Switch on:	1500 04/09/03	
In water:		
in posn :	1345 08/09/03	6m
First good:	1345 08/09/03	8 Sep 2003, 14:00:00
Last in posn :	1450 03/01/04	3 Jan 2004, 14:30:00 6.9m
Out of water :	1525 03/01/04	
Switch off	1808 04/01/04	35170 samples
	Logger 2 seconds fast	
Comments :		

T13

Instrument :	SBE39T Temperature logger, #0920	
(serial no.)		
Capability :		
Location :	07° 22.445'N, 134° 23.177'E, 9m	
Sampling :	Sampling Interval 5 min	
Filename :	09200401.asc	
	All times listed as local time UTC+9.	
	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	1118 08/09/03	
in posn :	1132 08/09/03	9m
First good:	1135 08/09/03	
Last in posn :	1454 03/01/04	10.0m
Out of water :	1525 03/01/04	
Switch off	1557 04/01/04	35436 samples
	Logger 1 second early	
Comments :	Next to CRRF logger	

T12 – current meter A7

T11

Instrument :	SBE39T Temperature logger, #0934	
(serial no.)		
Capability :		
Location :	07°22.445'N, 134°23.177'E, 20m	
Sampling :	Sampling Interval 5 min	
Filename :	09340401.asc	
	All times listed as local time UTC+9.	
	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	1118 08/09/03	
in posn :	1142 08/09/03	20m
First good:	1145 08/09/03	
Last in posn :	1509 03/01/04	21.4m
Out of water :	1525 03/01/04	
Switch off	1551 04/01/04	35435 samples
	No clock drift	
Comments :		

T2 Lighthouse, Toachel ra Kesebekuu

T26

Instrument : SBE39T Temperature logger, #0925
(serial no.)
Capability :
Location : 07°16.955'N, 134°27.932'E, 1m
Sampling : Sampling Interval 5 min

Filename : 09250801.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 30/08/03	
In water:		
in posn :	1444 31/08/03	1m
First good:	1445 31/08/03	
Last in posn :	0846 07/01/04	3.1m
Out of water :		
Switch off	1607 08/01/04	37742 samples
	Logger 9 seconds fast	

Comments : Transect : 4 SBE39T, 1 SBE16CT ; with A8

T25 C4

Instrument : SBE16CT Conductivity & Temperature logger, #2124
(serial no.)
Capability :
Location : 07°16.955'N, 134°27.932'E, 3 m
Sampling : Sampling Interval 5 min

Filename : 21240301.asc

All times listed as local time UTC+9.

	Time	**Depth**	
Switch on:	1230 31/08/03		
In water:			
in posn :	1452 31/08/03	2.5m	
First good:	1455 31/08/03	31-Aug-2003 16:00:00	
Last in posn :	0815 31/12/03	31-Dec-2003 08:00:00	2.7m
Out of water :			
Switch off	1208 03/01/04	35996 samples	
	Logger 6 seconds fast		

Comments :

T24

Instrument : SBE39T Temperature logger, #0933
(serial no.)
Capability :
Location : 07°16.955'N, 134°27.932'E, 5m
Sampling : Sampling Interval 5 min

Filename : 09330801.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 30/08/03	
In water:		

in posn :	1500 31/08/03	5m
First good:	1500 31/08/03	
Last in posn :	0837 07/01/04	7.2m
Out of water :		
Switch off	1558 08/01/04	37740 samples
	Logger 10 seconds fast	
Comments :		

T23

Instrument :	SBE39T Temperature logger, #1054	
(serial no.)		
Capability :		
Location :	07°16.955'N, 134°27.932'E, 10m	
Sampling :	Sampling Interval 5 min	
Filename :	10540801.asc	
	List all times as local time.	
	Time	**Depth**
Switch on:	1500 30/08/03	
In water:		
in posn :	1509 31/08/03	10m
First good:	1510 31/08/03	
Last in posn :	0834 07/01/04	11.0m
Out of water :		
Switch off	1541 08/01/04	37737 samples
	Logger 2 seconds slow	
Comments :		

T22

Instrument :	SBE39T Temperature logger, #1052	
(serial no.)		
Capability :		
Location :	07°16.955'N, 134°27.932'E, 20m	
Sampling :	Sampling Interval 5 min	
Filename :	10520801.asc	
	All times listed as local time UTC+9.	
	Time	**Depth**
Switch on:	1500 30/08/03	
In water:		
in posn :	1516 31/08/03	20m
First good:	1520 31/08/03	
Last in posn :	0840 07/01/04	23.4m
Out of water :		
Switch off	1530 08/01/04	37737 samples
	Logger 1 second slow	
Comments :		

T21 – current meter A8

T3 Rock Islands, inside channel

T35

Instrument : SBE39T Temperature logger, #1055
(serial no.)
Capability :
Location : 07°19.570'N, 134°29.418'E, 1m
Sampling : Sampling Interval 5 min

Filename : 10550301.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1030 29/08/03	
In water:		
in posn :	1517 29/08/03	1.0m
First good:	1520 29/08/03	
Last in posn :	1459 30/12/03	2.6m
Out of water :		
Switch off	1801 03/01/04	36667 samples

Logger 7 seconds slow

Comments : Transect of 5 loggers, put in at low water on cloudy day.

T34

Instrument : SBE39T Temperature logger, #1058
(serial no.)
Capability :
Location : 07°19.570'N, 134°29.418'E, 2.5m
Sampling : Sampling Interval 5 min

Filename : 10583112.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1030 29/08/03	
In water:		
in posn :	1510 29/08/03	2.5m
First good:	1510 29/08/03	
Last in posn :	1500 30/12/03	3.5m
Out of water :		
Switch off	1204 31/12/03	35731 samples

Logger 2 seconds slow

Comments :

T33

Instrument : SBE39T Temperature logger, #0676
(serial no.)
Capability :
Location : 07°19.570'N, 134°29.418'E, 5m
Sampling : Sampling Interval 5 min

Filename : 06763112.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1030 29/08/03	
In water:		
in posn :	1500 29/08/03	5m
First good:	1500 29/08/03	
Last in posn :	1502 30/12/03	5.9m
Out of water :		

Switch off	1135 31/12/03	35725 samples
	Logger 1 second slow	
Comments :		

T32

Instrument :	SBE39T Temperature logger, #0675	
(serial no.)		
Capability :		
Location :	07°19.570'N, 134°29.418'E, 10m	
Sampling :	Sampling Interval 5 min	
Filename :	06753112.asc	
	All times listed as local time UTC+9.	
	Time	**Depth**
Switch on:	1030 29/08/03	
In water:		
in posn :	1444 29/08/03	10.0m
First good:	1445 29/08/03	
Last in posn :	1504 30/12/03	10.4m
Out of water :		
Switch off	1332 31/12/03	35749 samples
	Logger 8 seconds fast	
Comments :		

T31

Instrument :	SBE39T Temperature logger, #1057	
(serial no.)		
Capability :		
Location :	07°19.570'N, 134°29.418'E, 20m	
Sampling :	Sampling Interval 5 min	
Filename :	10573112.asc	
	All times listed as local time UTC+9.	
	Time	**Depth**
Switch on:	1030 29/08/03	
In water:		
in posn :	1432 29/08/03	20m
First good:	1435 29/08/03	
Last in posn :	1506 30/12/03	20.5m
Out of water :		
Switch off	124710 31/12/03	347410 samples
	Logger 9 seconds fast	
Comments :		

T4 Rock Islands, Nikko Bay

T45

Instrument :	SBE39T Temperature logger, #1059
(serial no.)	
Capability :	
Location :	07°19.772'N, 134°30.034'E, 1m
Sampling :	Sampling Interval 5 min
Filename :	10593112.asc

All times listed as local time UTC+9.

	Time	Depth
Switch on:	0930 30/08/03	
in posn :	1735 30/08/03	1m
First good:	1735 30/08/03	
Last in posn :	1537 30/12/03	2.4m
Out of water :		
Switch off	1153 31/12/03	35453 samples
	Logger 1 second slow	
Comments :		

T44

Instrument : SBE39T Temperature logger, #1051
(serial no.)
Capability :
Location : 07°19.772'N, 134°30.034'E, 2.5m
Sampling : Sampling Interval 5 min

Filename : 10513112.asc

All times listed as local time UTC+9.

	Time	Depth
Switch on:	0930 30/08/03	
in posn :	1730 30/08/03	2.5m
First good:	1730 30/08/03	
Last in posn :	1540 30/12/03	2.6m
Out of water :		
Switch off	1300 31/12/03	35466 samples
	Logger 6 seconds slow	
Comments :		

T43

Instrument : SBE39T Temperature logger, #1061
(serial no.)
Capability :
Location : 07°19.772'N, 134°30.034'E, 5m
Sampling : Sampling Interval 5 min

Filename : 1061311203.asc

All times listed as local time UTC+9.

	Time	Depth
Switch on:	0930 30/08/03	
in posn :	1720 30/08/03	5m
First good:	1720 30/08/03	
Last in posn :	1541 30/12/03	5.4m
Out of water :		
Switch off	1214 31/12/03	35457 samples
	No clock drift	
Comments :		

T42

Instrument : SBE39T Temperature logger, #1060
(serial no.)
Capability :
Location : 07°19.772'N, 134°30.034'E, 10m

Sampling : Sampling Interval 5 min

Filename : 10603112.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	0930 30/08/03	
in posn :	1715 30/08/03	10.6m
First good:	1715 30/08/03	
Last in posn :	1544 30/12/03	10.8m
Out of water :		
Switch off	1225 31/12/03	35460 samples

Logger 5 seconds slow

Comments :

T41

Instrument : SBE39T Temperature logger, #1053
(serial no.)
Capability :
Location : 07°19.772'N, 134°30.034'E, 17.6m
Sampling : Sampling Interval 5 min

Filename : 10533112.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	0930 30/08/03	
in posn :	1705 30/08/03	17.6m
First good:	1705 30/08/03	
Last in posn :	1546 30/12/03	17.6m
Out of water :		
Switch off	1236 31/12/03	35462 samples

Logger 2 seconds slow

Comments :

T5 Uchelbeluu (deepwater mooring)

T56 C5

Instrument : SBE16CT Conductivity & Temperature logger, #2125
(serial no.)
Capability :
Location : 07°15.545'N, 134° 33.167'E, "150m below" on 126m mooring
Sampling : Sampling Interval 10 min, 600secs

Filename : 21251401.hex

All times listed as local time UTC+9.

	Time	
Switch on:	0810 17/09/03	
In water:	1045 17/09/03	
in posn :	1100 17/09/03	
First good:	1100 17/09/03	17 Sep 2003, 12:00:00
Last in posn :	1440 13/01/04	13 Jan 2004, 14:00:00
Out of water :	1501 13/01/04	
Switch off	1628 14/01/04	

Comments : with A5,C5, Acoustic Release #445 (13.5 B/D)
Poor data set, 50% OK

T55

Instrument : SBE39PT **Pressure & Temperature** logger, #1062
(serial no.)
Capability :
Location : 07°15.545’N, 134°33.167’E, "160m below" on 126m mooring
Sampling : Sampling Interval 5 min

Filename : 10621401.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1030 14/09/03	
In water:	1045 17/09/03	
in posn :	1100 17/09/03	
First good:	1100 17/09/03	
Last in posn :	1440 13/01/04	
Out of water :	1501 13/01/04	
Switch off	2233 14/01/04	35279 samples

Comments : with A5,C5, Acoustic Release #445 (13.5 B/D)

T54

Instrument : SBE39T Temperature logger, #0931
(serial no.)
Capability :
Location : 07°15.545’N, 134°33.167’E, "170m below" on 126m mooring
Sampling : Sampling Interval 5 min

Filename : 09311401.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	1045 17/09/03	
in posn :	1100 17/09/03	
First good:	1100 17/09/03	
Last in posn :	1440 13/01/04	
Out of water :	1501 13/01/04	
Switch off	221212 14/01/01	28391 samples

Comments : with A5,C5, Acoustic Release #445 (13.5 B/D)
File date is worn shows wnd date 15th !

T53

Instrument : SBE39T Temperature logger, #0923
(serial no.)
Capability :
Location : 07°15.545’N, 134°33.167’E, "190m below" on 126m mooring
Sampling : Sampling Interval 5 min

Filename : 09231401.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	1045 17/09/03	

In posn :	1100 17/09/03	
First good:	1100 17/09/03	
Last in posn :	1440 13/01/04	
Out of water :	1501 13/01/04	
Switch off	210955 14/01/04	38378 samples
	Logger 19 seconds slow	
Comments :	with A5,C5, Acoustic Release #445 (13.5 B/D)	

T52 – current meter A5

T51

Instrument :	SBE39T Temperature logger, #0927	
(serial no.)		
Capability :		
Location :	07°15.545'N, 134°33.167'E, "225m below" on 126m mooring	
Sampling :	Sampling Interval 5 min	
Filename :	09271401.asc	
	All times listed as local time UTC+9.	
	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	1045 17/09/03	
in posn :	1100 17/09/03	
First good:	1100 17/09/03	
Last in posn :	1440 13/01/04	
Out of water :	1501 13/01/04	
Switch off	2233 14/01/04	38395 samples
	Logger 7 seconds slow	
Comments :	with A5,C5, Acoustic Release #445 (13.5 B/D)	

T6 Central Philippine Sea – West Reef flat

T65

Instrument :	SBE39T Temperature logger, #1137	
(serial no.)		
Capability :		
Location :	07°24.713'N, 134°20.258'E, 3m (high water)	
Sampling :	Sampling Interval 5 min	
Filename :	No Data	
	All times listed as local time UTC+9.	
	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	0955 12/09/03	
in posn :	1040 12/09/03	
First good:	1040 12/09/03	
Last in posn :		
Out of water :		
Switch off		NOT RECOVERED
Comments :	Black subsurface buoy mid-transect, 4 SBE39T + SBE16CT	
	Wire securing logger recovered but had been cut through and had weed growth on the cut	

T64

Instrument : SBE39T Temperature logger, #0928
(serial no.)
Capability :
Location : 07°24.713'N, 134°20.258'E, 4.5m (high water)
Sampling : Sampling Interval 5 min

Filename : 09281401.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	0955 12/09/03	
in posn :	1028 12/09/03	
First good:	1030 12/09/03	12 Sep 2003, 11:00:00 4.5m
Last in posn :	1110 14/01/04	14 Jan 2004, 11:00:00 5.3m
Out of water :	1150 14/01/04	
Switch off	2324 14/01/04	38405 samples

Comments : Black subsurface buoy mid-transect, 4 SBE39T + SBE16CT

T63 C1

Instrument : SBE16CT Conductivity & Temperature logger, #2123
(serial no.)
Capability :
Location : 07°24.713'N, 134°20.258'E, 7m (high water)
Sampling : Sampling Interval 5 min

Filename : 21231401.hex

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	0750 10/09/03	
In water:	0955 12/09/03	
in posn :	1003 12/09/03	
First good:	1005 12/09/03	7m
Last in posn :	1115 14/01/04	7.5m
Out of water :	1150 14/01/04	
Switch off		

Comments : Black subsurface buoy mid-transect, 4 SBE39T + SBE16CT

T62

Instrument : SBE39T Temperature logger, #0917
(serial no.)
Capability :
Location : 07°24.713'N, 134°20.258'E, 12m (high water)
Sampling : Sampling Interval 5 min

Filename : 09171401.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	0955 12/09/03	
in posn :	1010 12/09/03	

First good:	1010 12/09/03	12m
Last in posn :	1135 14/1/04	12.5m
Out of water :	1150 14/1/04	
Switch off	2317 14/01/04	38404 samples
	4 seconds fast	
Comments :	Black subsurface buoy mid-transect, 4 SBE39T + SBE16CT	

T61

Instrument :	SBE39T Temperature logger, #0924
(serial no.)	
Capability :	
Location :	07°24.713'N, 134°20.258'E, 24m (high water)
Sampling :	Sampling Interval 5 min

Filename : 09241401.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 03/09/03	
In water:	0955 12/09/03	
in posn :	1015 12/09/03	
First good:	1015 12/09/03	24
Last in posn :	1140 14/01/04	24.5
Out of water :	1150 14/01/04	
Switch off	2329 14/01/04	38406 samples
	Logger is 6 seconds fast	
Comments :	Black subsurface buoy mid-transect, 4 SBE39T + SBE16CT	

T7 Southern Rock Islands

T75

Instrument :	SBE39T Temperature logger, #1056
(serial no.)	
Capability :	
Location :	07°16.955'N, 134°27.932'E, 1.5m
Sampling :	Sampling Interval 5 min

Filename : 10560301.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 30/08/03	
In water:		
in posn :	0957 02/09/03	1.5m
First good:	1000 02/09/03	
Last in posn :	1604 02/01/04	2.0m
Out of water :		
Switch off	1822 03/01/04	36329 samples
	6 seconds slow	
Comments :		

T74

Instrument :	SBE39T Temperature logger, #0926
(serial no.)	
Capability :	
Location :	07°16.955'N, 134°27.932'E, 3m

Sampling : Sampling Interval 5 min

Filename : 9260301.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1415 01/09/03	
In water:		
in posn :	0945 02/09/03	3m
First good:	0945 02/09/03	
Last in posn :	1603 02/01/04	3.3m
Out of water :		
Switch off	175640 03/01/04	35756 samples

Logger 4 seconds fast

Comments :

T73

Instrument : SBE39T Temperature logger, #0919
(serial no.)
Capability :
Location : 07°16.955'N, 134°27.932'E, 6m
Sampling : Sampling Interval 5 min

Filename : 09190903.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1415 01/09/03	
In water:		
in posn :	0940 02/09/03	5m
First good:	0940 02/09/03	02 Sep 2003, 10:00:00
Last in posn :	0845 23/09/03	23 Sep 2003, 08:45:00 5m
Out of water :		
Switch off	1134 23/09/03	6304 samples

Comments : Tide gauge B3 replaced this in late Sep and bottom logger (T71) brought up in Nov

T73b – tide gauge B3

T73c

Instrument : SBE39PT Pressure & Temperature logger, #0732
(serial no.)
Capability :
Location : 07°16.955'N, 134°27.932'E, 5m
Sampling : Sampling Interval 5 min

Filename : 07321401.asc

First good :	0915 05/11/03	05 Nov 2003, 09:15:00
Last in posn :	1601 02/01/04	02 Jan 2004, 15:30:00 5.5m
Out of water :		
Switch off	2320 14/01/04	38990 samples

Comments : Logger moved from T71

T72

Instrument : (serial no.)	SBE39T Temperature logger, #0930	
Capability :		
Location :	07°16.955'N, 134°27.932'E, 12m	
Sampling :	Sampling Interval 5 min	
Filename :	09300301.asc	
	All times listed as local time UTC+9.	
	Time	**Depth**
Switch on:	1415 01/09/03	
In water:		
in posn :	0930 02/09/03	12m
First good:	0930 02/09/03	
Last in posn :	1539 02/01/04	13.2m
Out of water :		
Switch off	1815 03/01/04	35761 samples
	No clock drift	
Comments :		

T71

Instrument : (serial no.)	SBE39PT Pressure & Temperature logger, #0732	
Capability :		
Location :	07°16.376'N, 134°24.667'E ,19m	07°16.955'N, 134°27.932'E, 18m
Sampling :	Sampling Interval 5 min	
Filename :	**07321401.asc**	
	All times listed as local time UTC+9.	
	Time	**Depth**
Switch on:	1415 01/09/03	
In water:		
in posn :	0918 02/09/03	18m
First good:	0920 02/09/03	02 Sep 2003, 10:00:00
Last in posn :	0900 05/11/03	05 Nov 2003, 09:00:00
Comments :	Moved from bottom in November to 5m T73c at the same transect	
	Temperature sub-standard for post deployment inter-calibration	

T8 Ulong East Channel

T86

Instrument : (serial no.)	SBE39T Temperature logger, #918	
Capability :	Temperature 300K samples	
Location :	07° 16.621'N, 134° 18.802'E, 1m in 42m of water	
Sampling :	Sampling Interval 5 min	
Filename :	09181401.asc	
	All times listed as local time UTC+9.	
	Time	**Depth**
Switch on:	1500 03/09/03	
In water:		
in posn :	1135 22/09/03	
First good:	1140 22/09/03	22-Sep-2003 12:00:00

Last in posn :	1230 13/01/04	13-Jan-2004 12:30:00
Out of water :		
Switch off	164034 14/1/04	38349 samples
	Logger 2 seconds fast	
Comments :		

T85

Instrument :	Brancker XR-420-TG tide gauge, #10092	
(serial no.)		
Capability :	Temperature and pressure gauge, 60 sec ave, max depth 90m	
Location :	07° 16.621'N, 134° 18.802'E, 1m in 42m of water	
Sampling :	Sampling Interval 5 min, 60 sec ave	
Filename :	0100921401.dat	
	All times listed as local time UTC+9.	
	Time	**Depth**
Switch on:	214930 22/09/03	2150 22/9/03
In water:		
in posn :	0818 23/09/03	
First good:	0830 23/09/03	23-Sep-2003 08:30:00
Last good :		
Last record :	1040 19/12/03	19-Dec-2003 06:00:00
Last in posn :	1230 13/01/04	
Out of water :		
Switch off	No power	25212 samples
Comments :	Battery flat on recovery	
	Temp calibration	
	on 1555 14/1/04, 5'si 60 sec ave with 732 @1550 14/1/04 in ocean	
	in bath 2100 14/1/04 off @2400 14/1/04 10092calib.dat	

T84

Instrument :	SBE39T Temperature logger, #932	
(serial no.)		
Capability :	Temperature 300K samples	
Location :	07° 16.621'N, 134° 18.802'E, 5m in 42m of water	
Sampling :	Sampling Interval 5 min	
Filename :	09321401.asc	
	All times listed as local time UTC+9.	
	Time	
Switch on:	1500 03/09/03	
In water:		
in posn :	1135 22/09/03	
First good:	1140 22/09/03	
Last in posn :	1230 13/01/04	
Out of water :		
Switch off	214202 14/1/04	38385 samples
	Logger 1 second fast	
Comments :		

T83

Instrument :	SBE39T Temperature logger, #922	
(serial no.)		
Capability :	Temperature 300K samples	

Location : 07° 16.621'N, 134° 18.802'E, 10m in 42m of water
Sampling : Sampling Interval 5 min

Filename : 09221401.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 03/09/03	
In water:		
in posn :	1135 22/09/03	
First good:	1140 22/09/03	
Last in posn :	1230 13/01/04	
Out of water :		
Switch off	1741 14/01/04	38337 samples

Logger 1 second fast

Comments :

T82

Instrument : SBE39T Temperature logger, #921
(serial no.)
Capability : Temperature 300K samples
Location : 07° 16.621'N, 134° 18.802'E, 20m in 42m of water
Sampling : Sampling Interval 5 min

Filename : 09211401.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 03/09/03	
In water:		
in posn :	1135 22/09/03	
First good:	1140 22/09/03	
Last in posn :	1230 13/01/04	
Out of water :		
Switch off	1749 14/01/04	38338 samples

Logger 3 seconds slow

Comments :

T81

Instrument : SBE39T Temperature logger, #916
(serial no.)
Capability : Temperature 300K samples
Location : 07° 16.621'N, 134° 18.802'E, 40m in 42m of water
Sampling : Sampling Interval 5 min

Filename : 09161401.asc

All times listed as local time UTC+9.

	Time	**Depth**
Switch on:	1500 03/09/03	
In water:		
in posn :	1135 22/09/03	
First good:	1140 22/09/03	
Last in posn :	1230 13/01/04	
Out of water :		
Switch off	1727 14/01/04	38334 samples

Logger 4 seconds slow

Comments :

Appendix E – Salinity deployment information

C1 Philippine Sea – West reef flat

See T63

C2 Falcon Reef – lagoon central

See T14

C3 Malakal Harbour Pincers

Instrument : (serial no.)	SBE16CT Conductivity & Temperature logger, #2126		
Capability :	Conductivity and Temperature		
Location :	07°20.163'N, 134°25.483'E, 3 m		
Sampling :	Sampling Interval 5 min		
Filename :	21260301.hex		
	All times listed as local time UTC+9.		
	Time	**Depth**	
Switch on:	1500 04/09/03		
In water:	1615 09/09/03		
in posn :	1627 09/09/03	2.6m	
First good:	1630 09/09/03	09-Sep-2003 16:30:00	
Last in posn :	0732 31/12/03	31-Dec-2003 07:30:00	2.1m
Out of water :			
Switch off	1112 03/01/04	34803 Samples	
Comments :	Logger 5 seconds fast with A9		

C4 Lighthouse Toachel Ra Kesebekuu

See T25

C5 Uchelbeluu

See T56

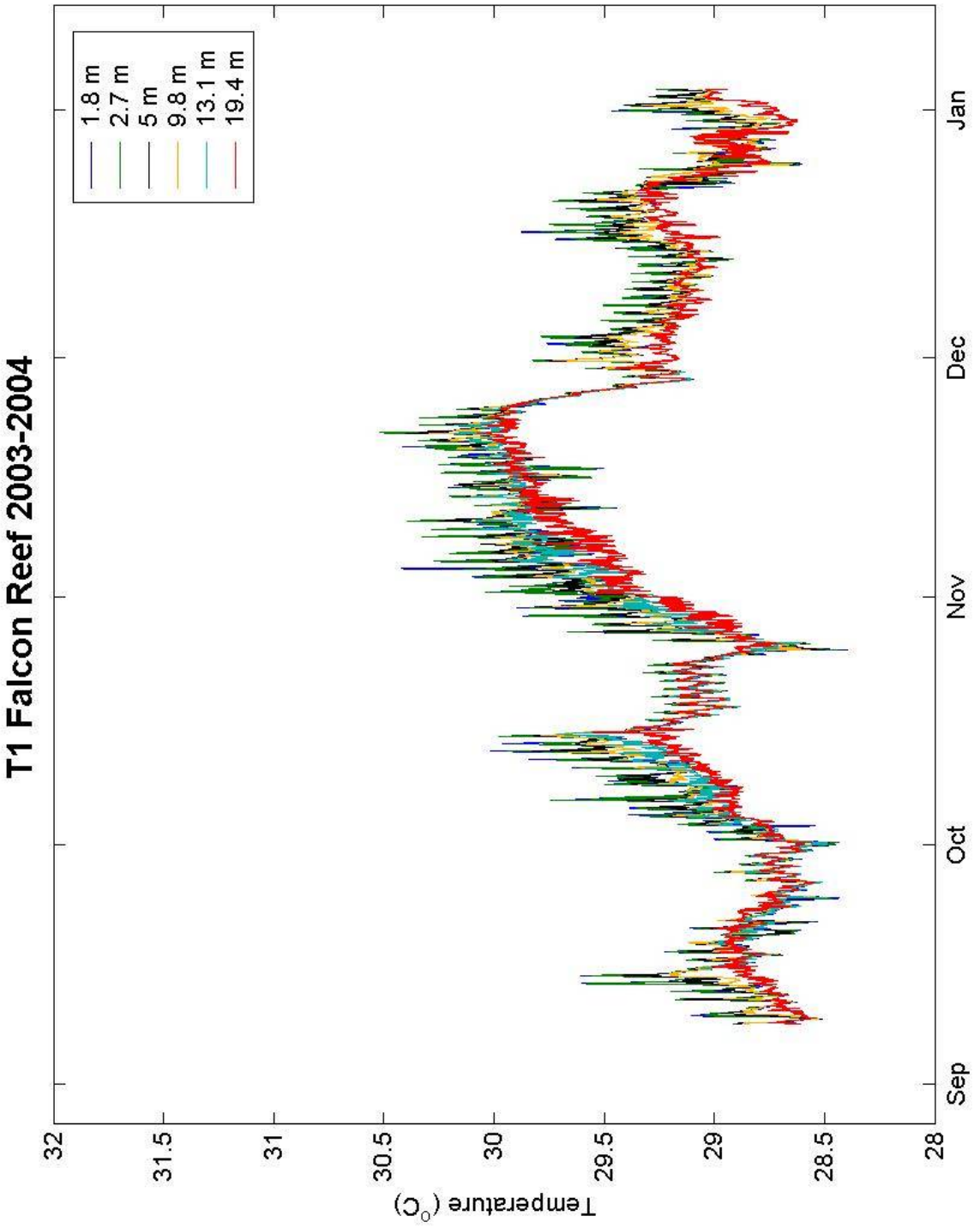
Appendix F – Weather station deployment information

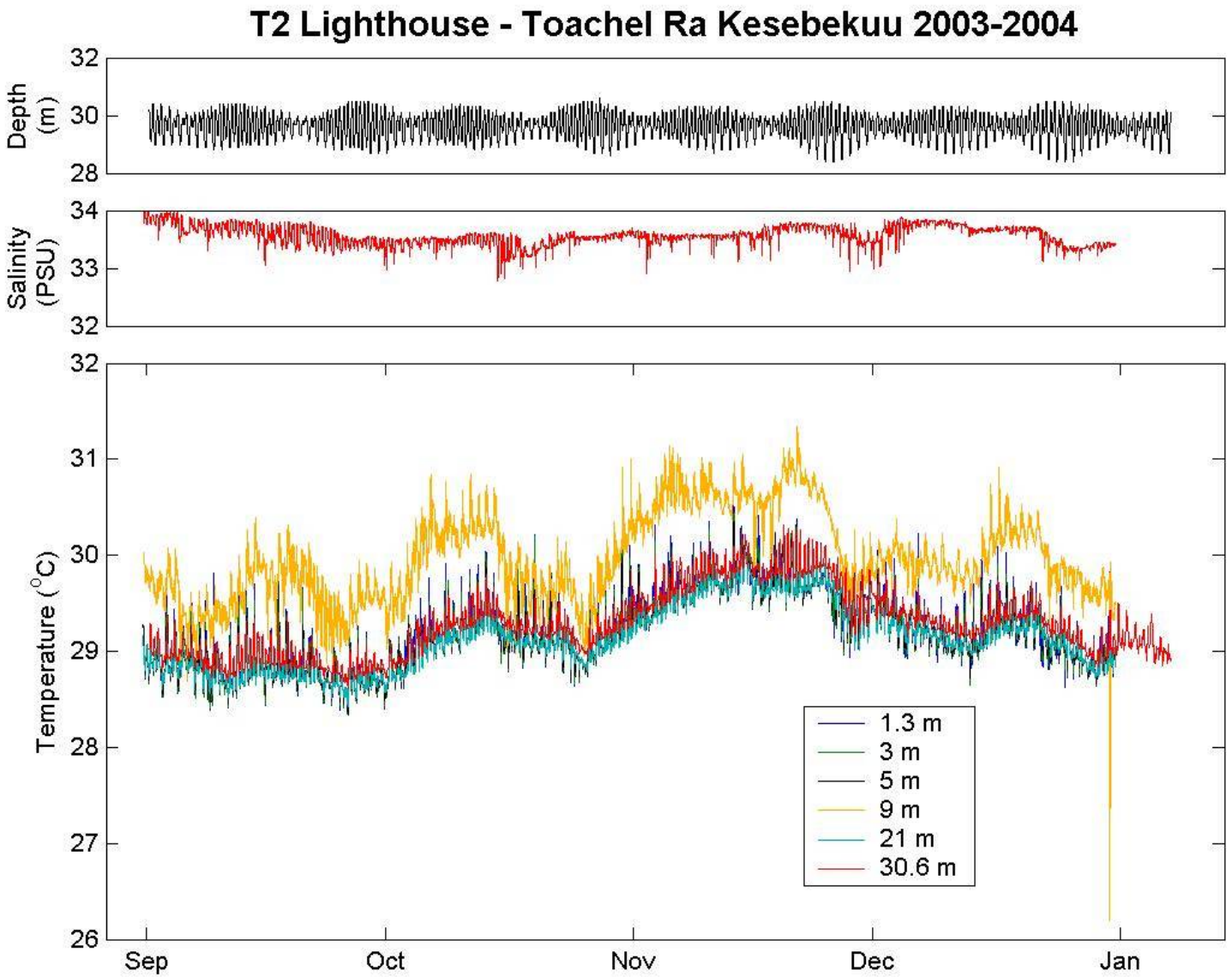
WX

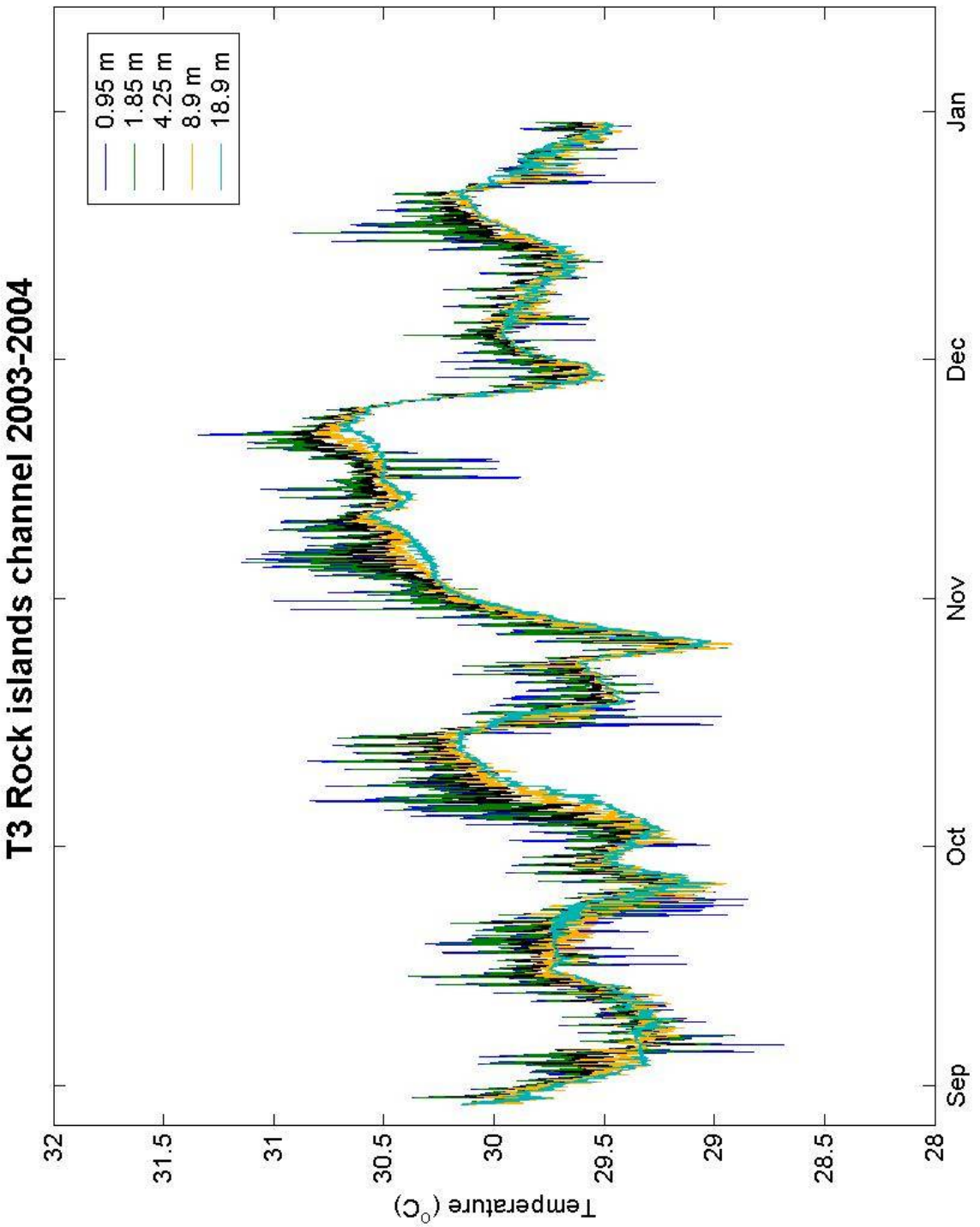
Instrument : (serial no.)	Campbell Scientific WX1
Capability :	Wind Speed and direction RM Young Air temperature Pyranometer Kipp & Zonen CM3 #026233 22.24e-6 V/Wm^{-2} PAR Licor Quantum Q31622
Location :	07°20.969'N 134°30.018'E, 210m Shalom Etpisons residence
Sampling :	5 minute sampling interval, 60 second averaging interval
Filename :	0100930301.dat All times listed as local time UTC+9.
Switch on: in posn :	
First good:	1350 23/09/03
Last in posn : Switch off	1430 09/01/04
Comments :	Flat battery – gap

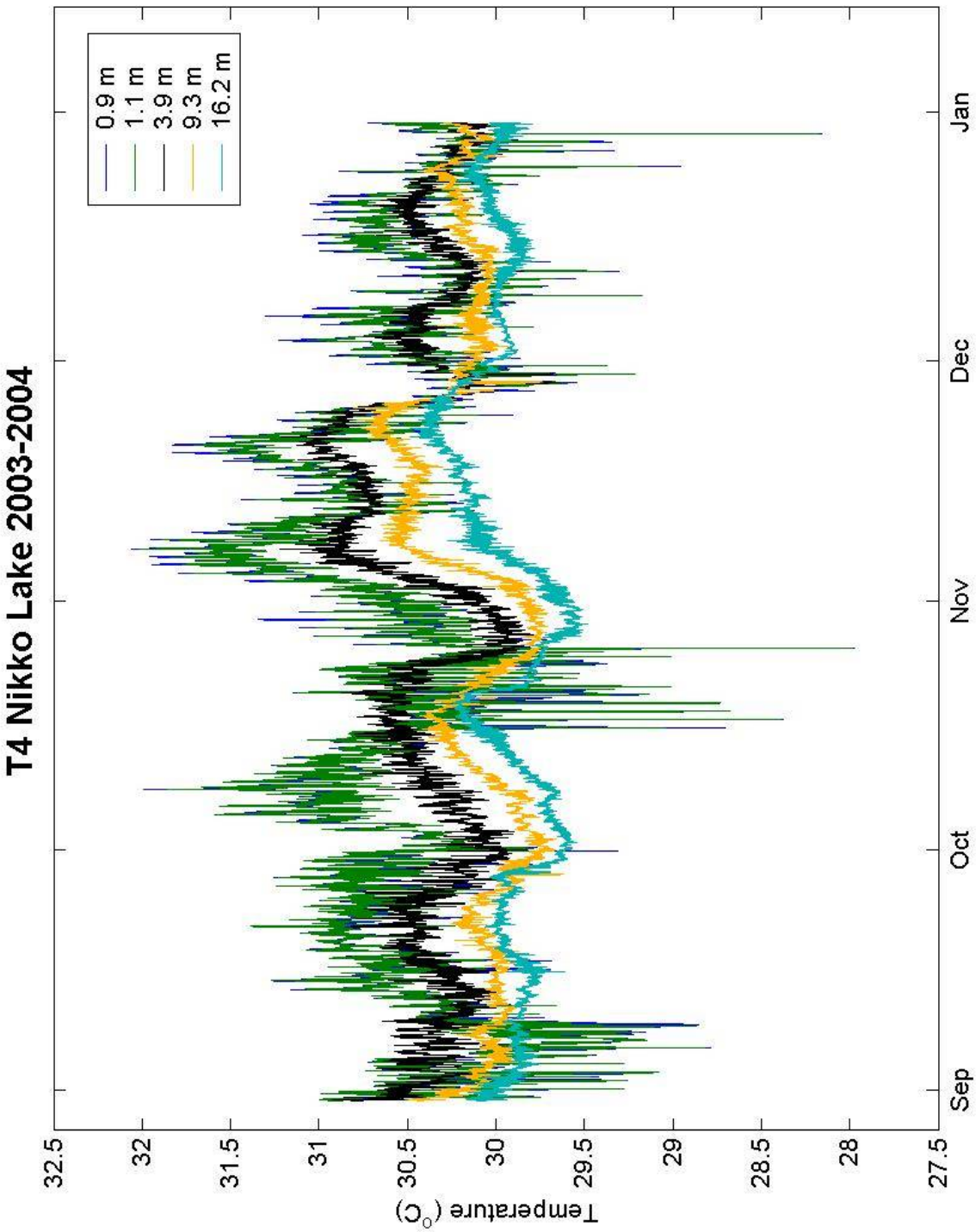
Appendix G – Mooring and Transect Summary Plots

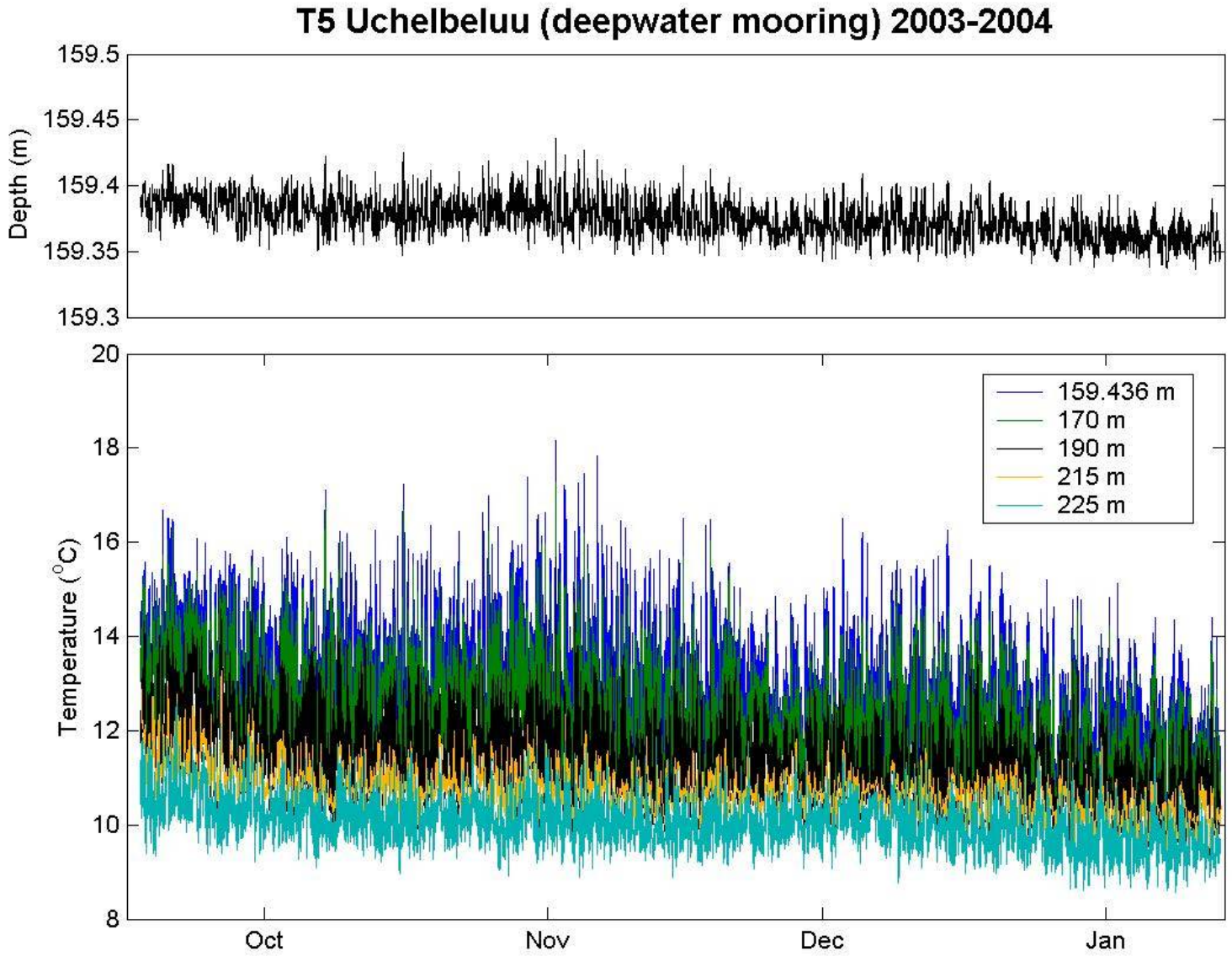
Summary plots from the moorings and transects of temperature loggers are presented for observation of temperature variations with depth. Where available, depth and salinity data are also shown for each location.

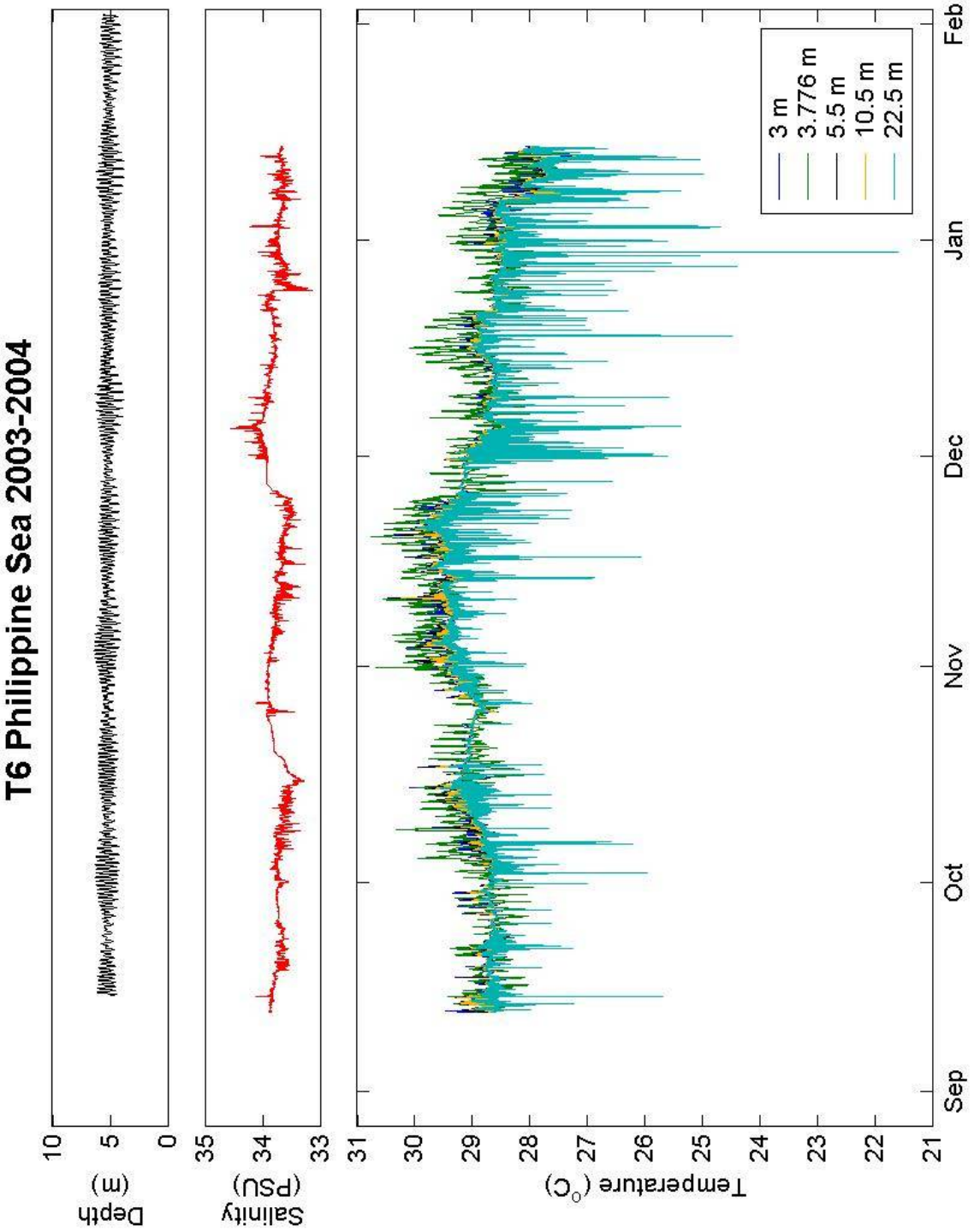

T1 Falcon Reef 2003-2004
1.8 m
2.7 m
5 m
9.8 m
13.1 m
19.4 m
Temperature (°C)
32
31.5
31
30.5
30
29.5
29
28.5
28
Sep
Oct
Nov
Dec
Jan

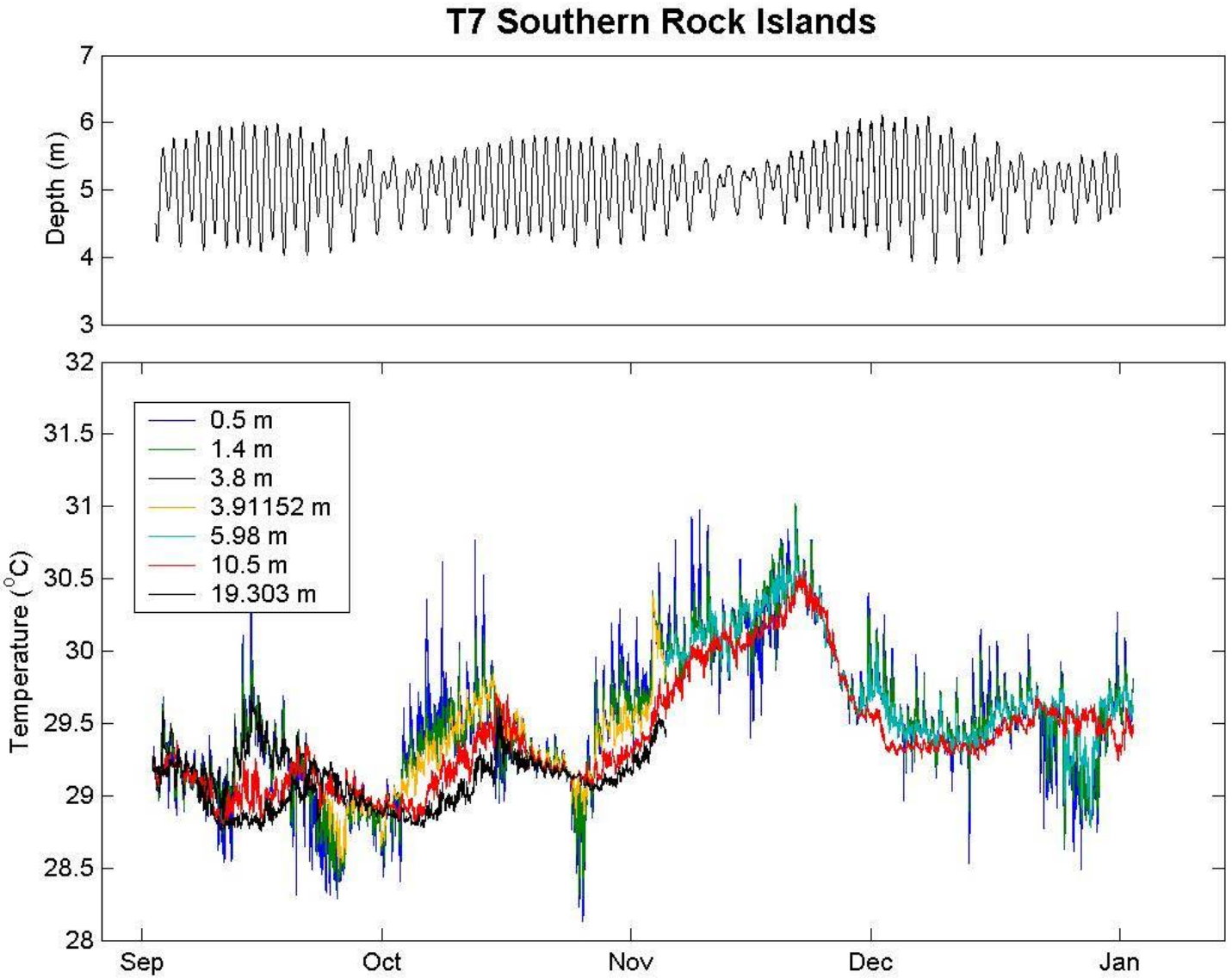

T2 Lighthouse - Toachel Ra Kesebekuu 2003-2004
Depth (m)
32
30
28
Salinity (PSU)
34
33
32
Temperature (°C)
32
31
30
29
28
27
26
Sep
Oct
Nov
Dec
Jan
1.3 m
3 m
5 m
9 m
21 m
30.6 m

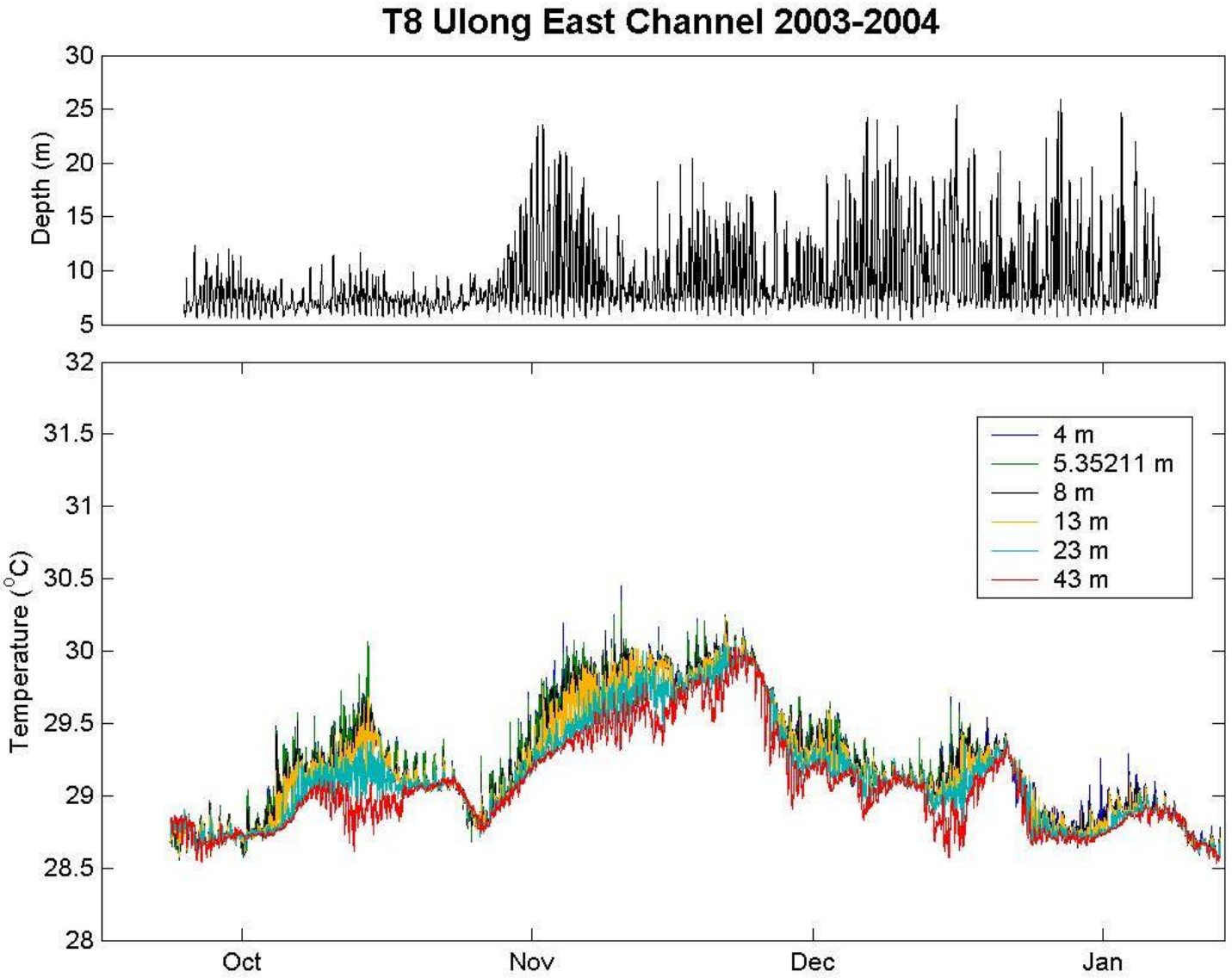

T3 Rock islands channel 2003-2004
0.95 m
1.85 m
4.25 m
8.9 m
18.9 m
Temperature (°C)
32
31.5
31
30.5
30
29.5
29
28.5
28
Sep
Oct
Nov
Dec
Jan


T4 Nikko Lake 2003-2004
0.9 m
1.1 m
3.9 m
9.3 m
16.2 m
Temperature (°C)
32.5
32
31.5
31
30.5
30
29.5
29
28.5
28
27.5
Sep
Oct
Nov
Dec
Jan


T5 Uchelbeluu (deepwater mooring) 2003-2004
Depth (m)
159.5
159.45
159.4
159.35
159.3
Temperature (°C)
20
18
16
14
12
10
8
Oct
Nov
Dec
Jan
159.436 m
170 m
190 m
215 m
225 m


T6 Philippine Sea 2003-2004
Depth (m)
10
5
0
Salinity (PSU)
35
34
33
Temperature (°C)
31
30
29
28
27
26
25
24
23
22
21
Sep
Oct
Nov
Dec
Jan
Feb
3 m
3.776 m
5.5 m
10.5 m
22.5 m


T7 Southern Rock Islands
Depth (m)
7
6
5
4
3
Temperature (°C)
32
31.5
31
30.5
30
29.5
29
28.5
28
0.5 m
1.4 m
3.8 m
3.91152 m
5.98 m
10.5 m
19.303 m
Sep
Oct
Nov
Dec
Jan


T8 Ulong East Channel 2003-2004
Depth (m)
30
25
20
15
10
5
Temperature (°C)
32
31.5
31
30.5
30
29.5
29
28.5
28
4 m
5.35211 m
8 m
13 m
23 m
43 m
Oct
Nov
Dec
Jan

Appendix H – Time Series Plots of Current Meter Data

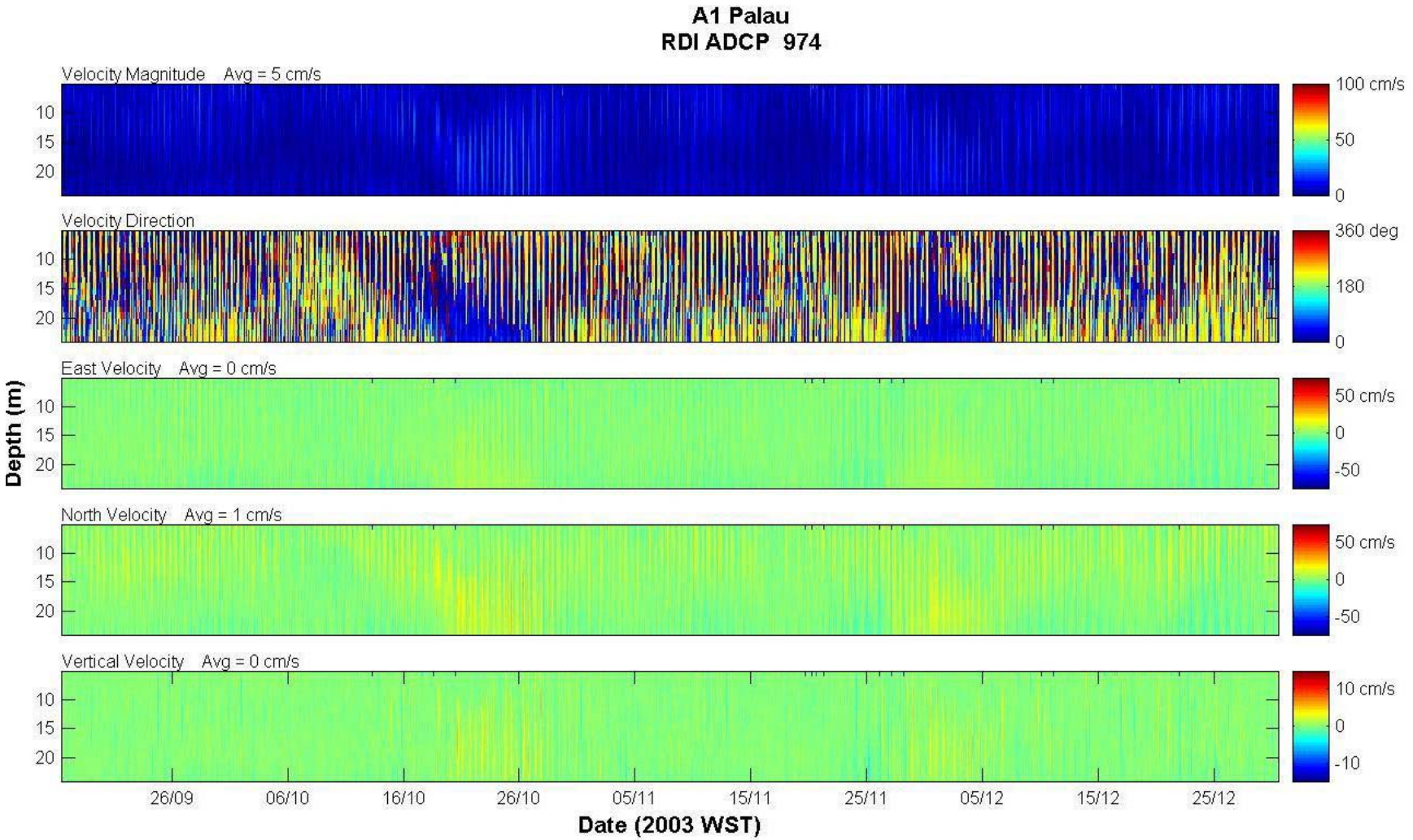
The following data plots vary according to the type of instrument used to record the currents.

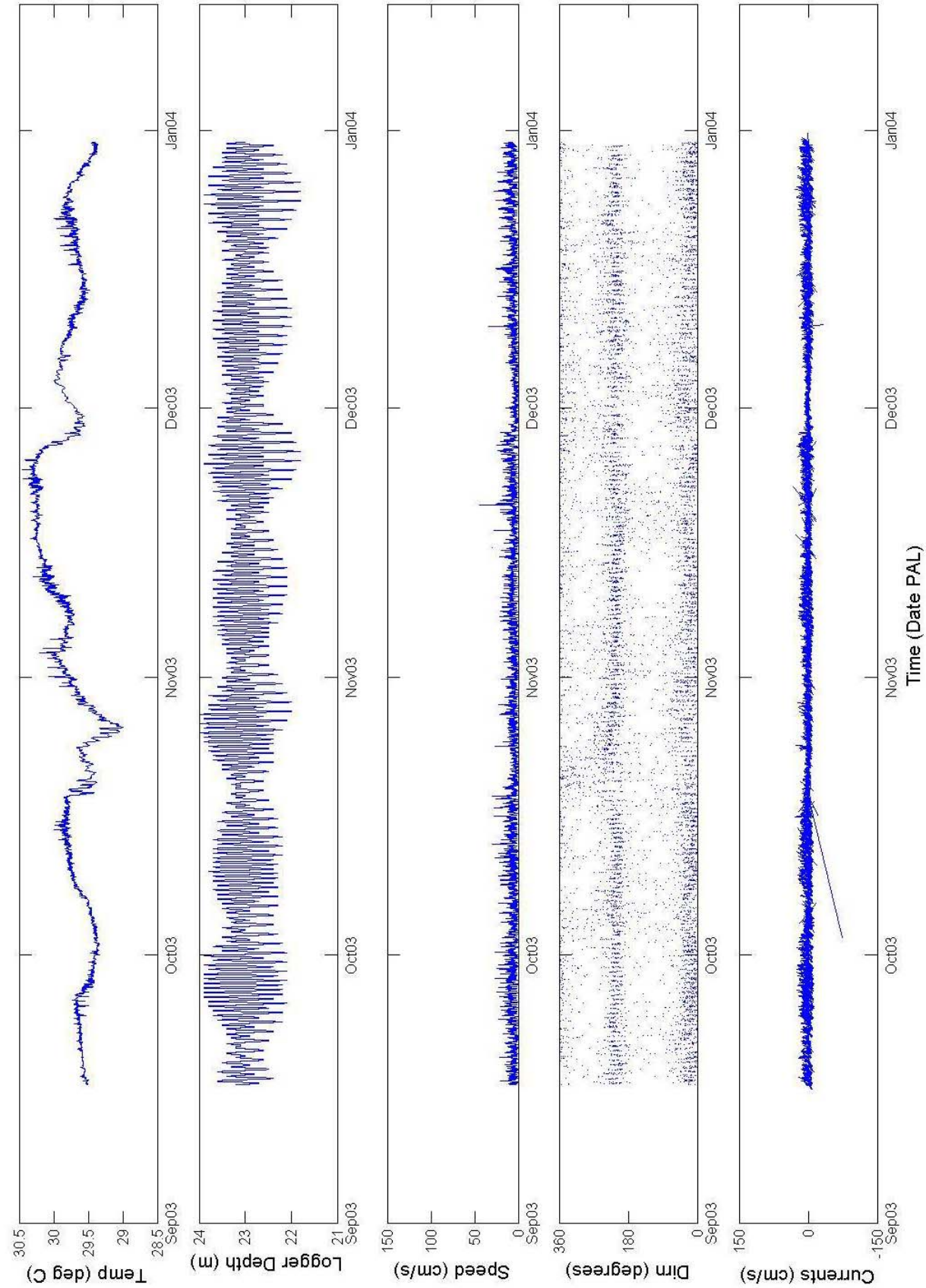
ADCP data (A1, A4, A5, A8, A9, A10, A11b, A11c, A13, A14) are presented using three figures. The first of these provides plots of current magnitude, direction and components (east, north and vertical) for all depth bins and throughout the deployment. The second and third figures show time series from the top and bottom bins of the vertical profile (i.e., nearest to the ocean surface and nearest to the instrument, respectively). These figures provide plots of temperature, depth (where available), current speed, current direction and a quiver plot of the currents. The quiver plot representation draws a line segment, originating at the axis, whose length is proportional to the current speed and whose direction represents that of the current (north and east directions are along the ordinate and abscissae, respectively). The scale on the ordinate axis reflects the current speed, as represented by the length of the line segment.

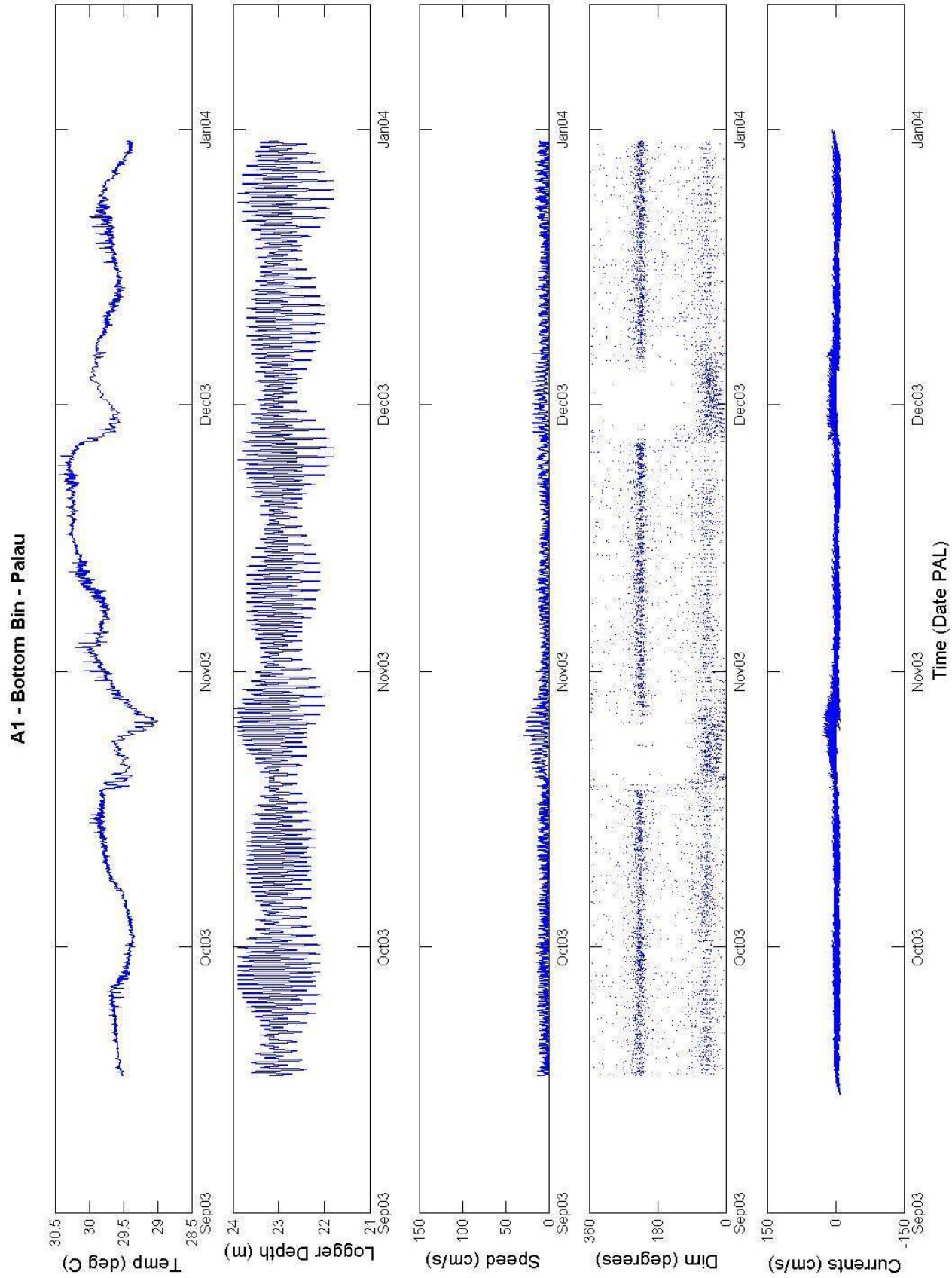
S4 current meter data (A2, A6) are presented in a single figure with time series plots of temperature (where available), depth, current magnitude, current direction and the quiver plot of currents, as described previously.

Nobska current meter data (A3, A7) are presented in two figures. The first of these shows time series of temperature, pressure in depth units (where available), current speed, current direction and the quiver plot of currents, as described previously. The second figure repeats the temperature plot accompanied by plots of conductivity (where available) and current components (east – u; north – v; and vertical – w).

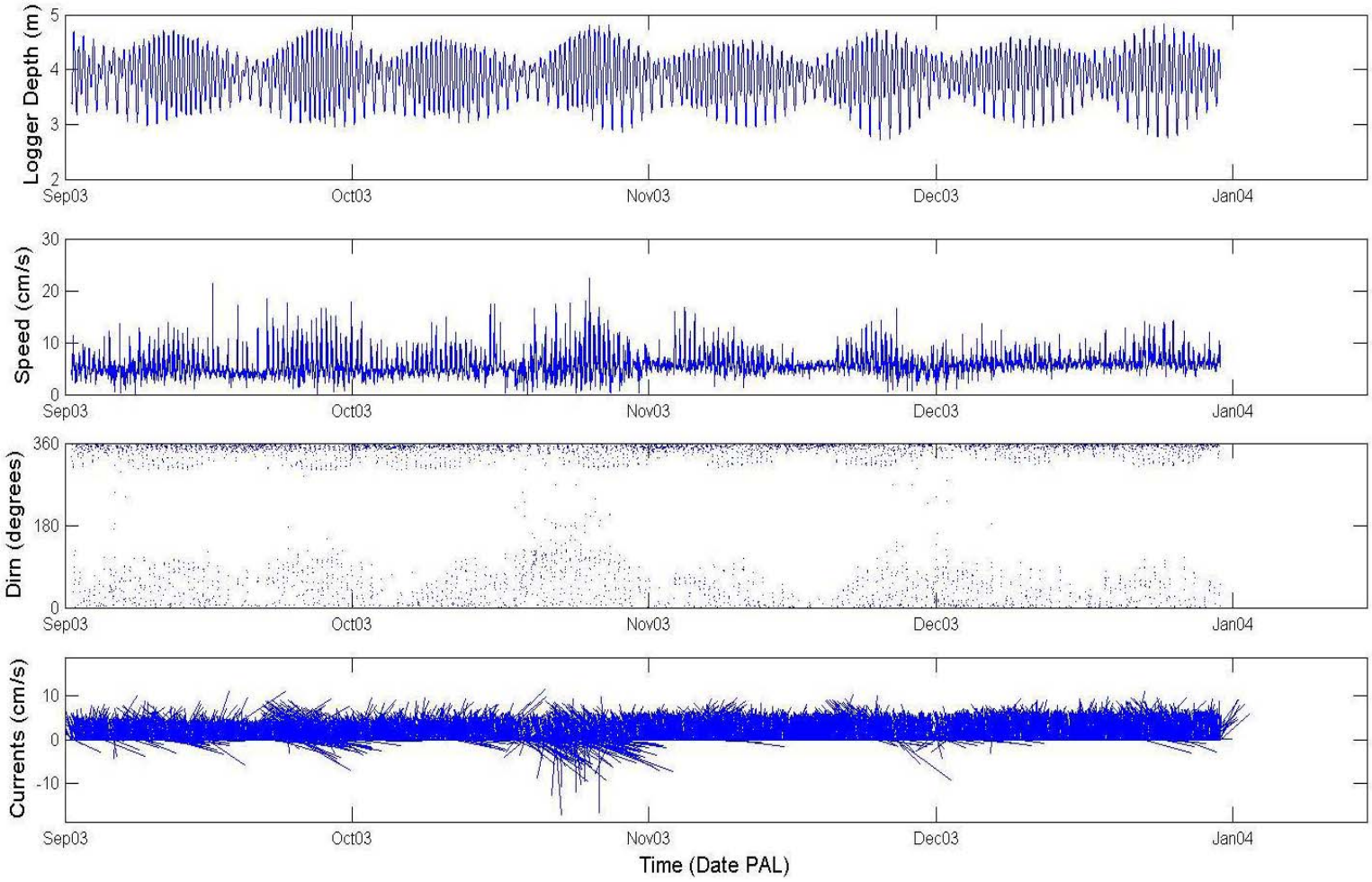
No data were recorded for deployments A11 and A12.

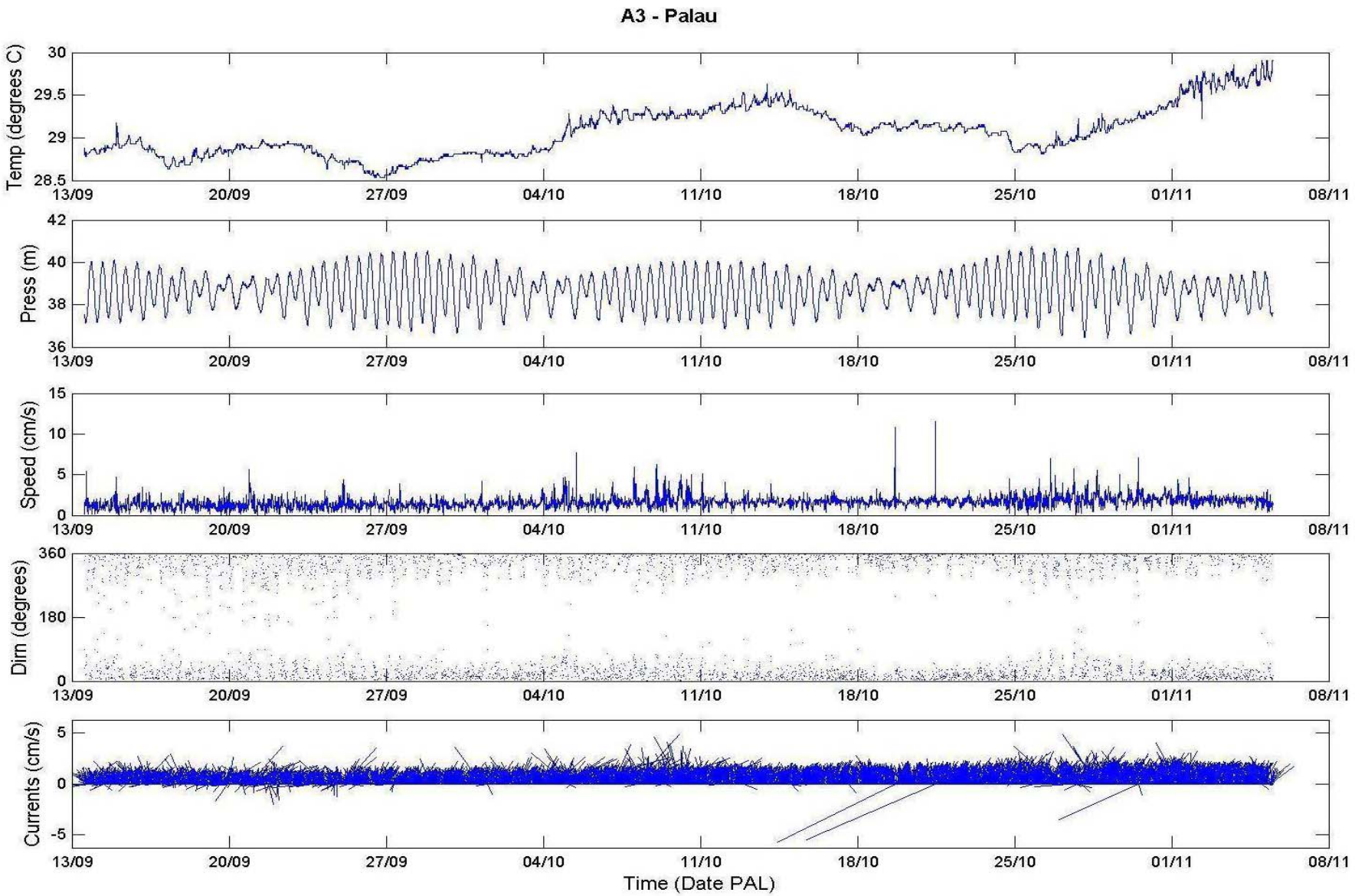

A1 Palau
RDI ADCP 974
Velocity Magnitude Avg = 5 cm/s
100 cm/s
50
0
Velocity Direction
360 deg
180
0
East Velocity Avg = 0 cm/s
50 cm/s
0
-50
North Velocity Avg = 1 cm/s
50 cm/s
0
-50
Vertical Velocity Avg = 0 cm/s
10 cm/s
0
-10
10
15
20
Depth (m)
26/09
06/10
16/10
26/10
05/11
15/11
25/11
05/12
15/12
25/12
Date (2003 WST)

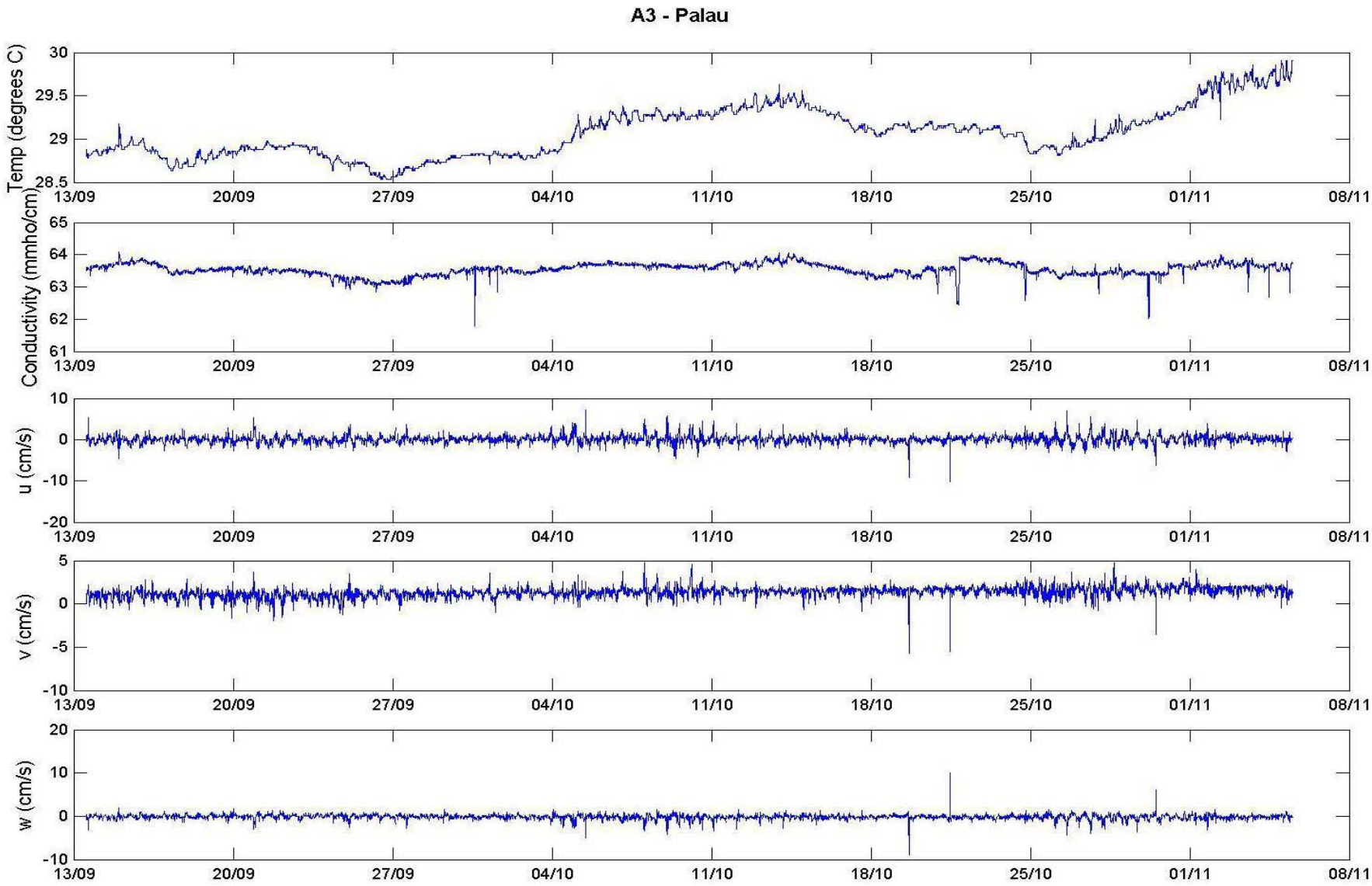

A1 - Top Bin - Palau
Temp (deg C)
30.5
30
29.5
29
28.5
Logger Depth (m)
24
23
22
21
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)

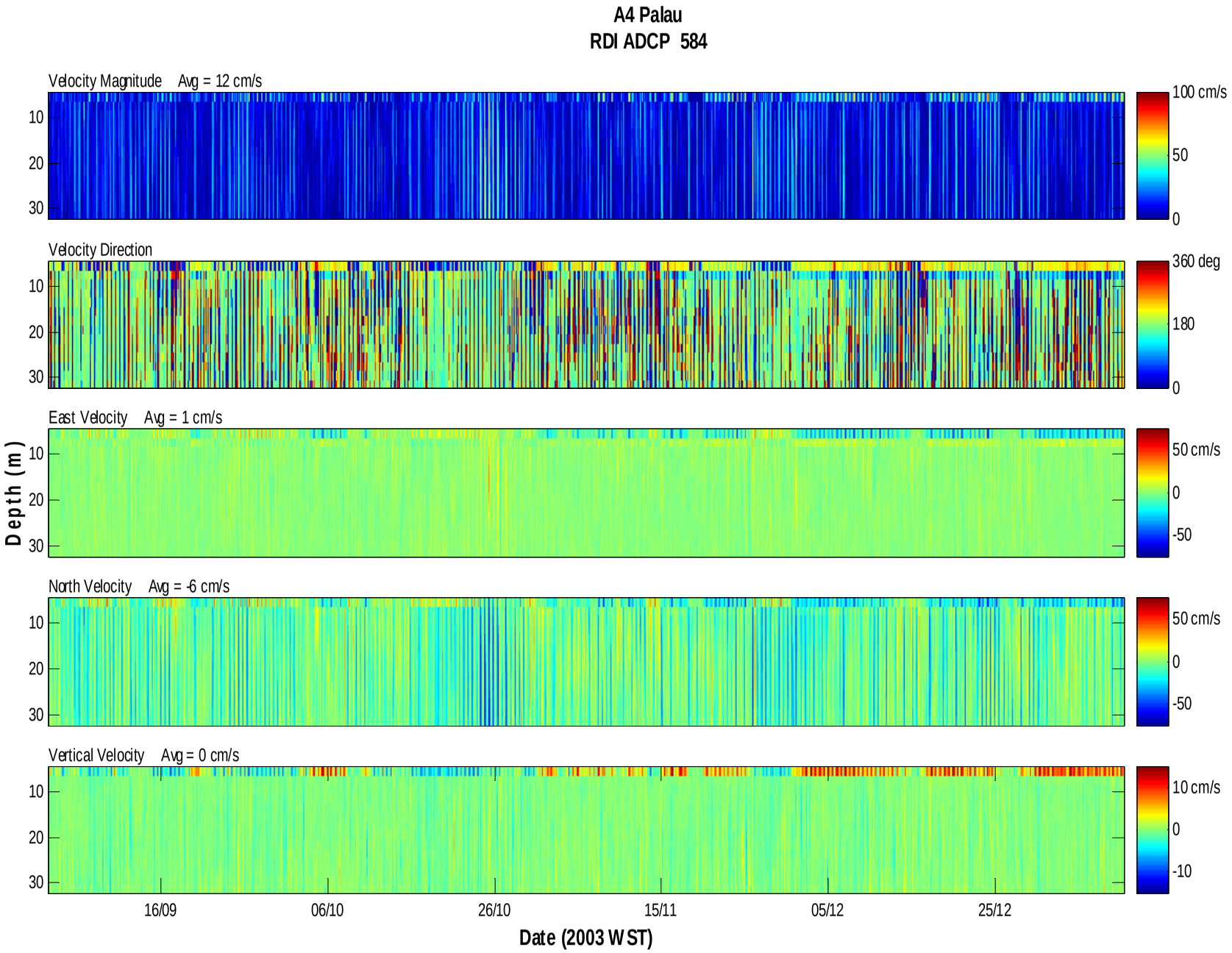

A1 - Bottom Bin - Palau
Temp (deg C)
30.5
30
29.5
29
28.5
Logger Depth (m)
24
23
22
21
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)

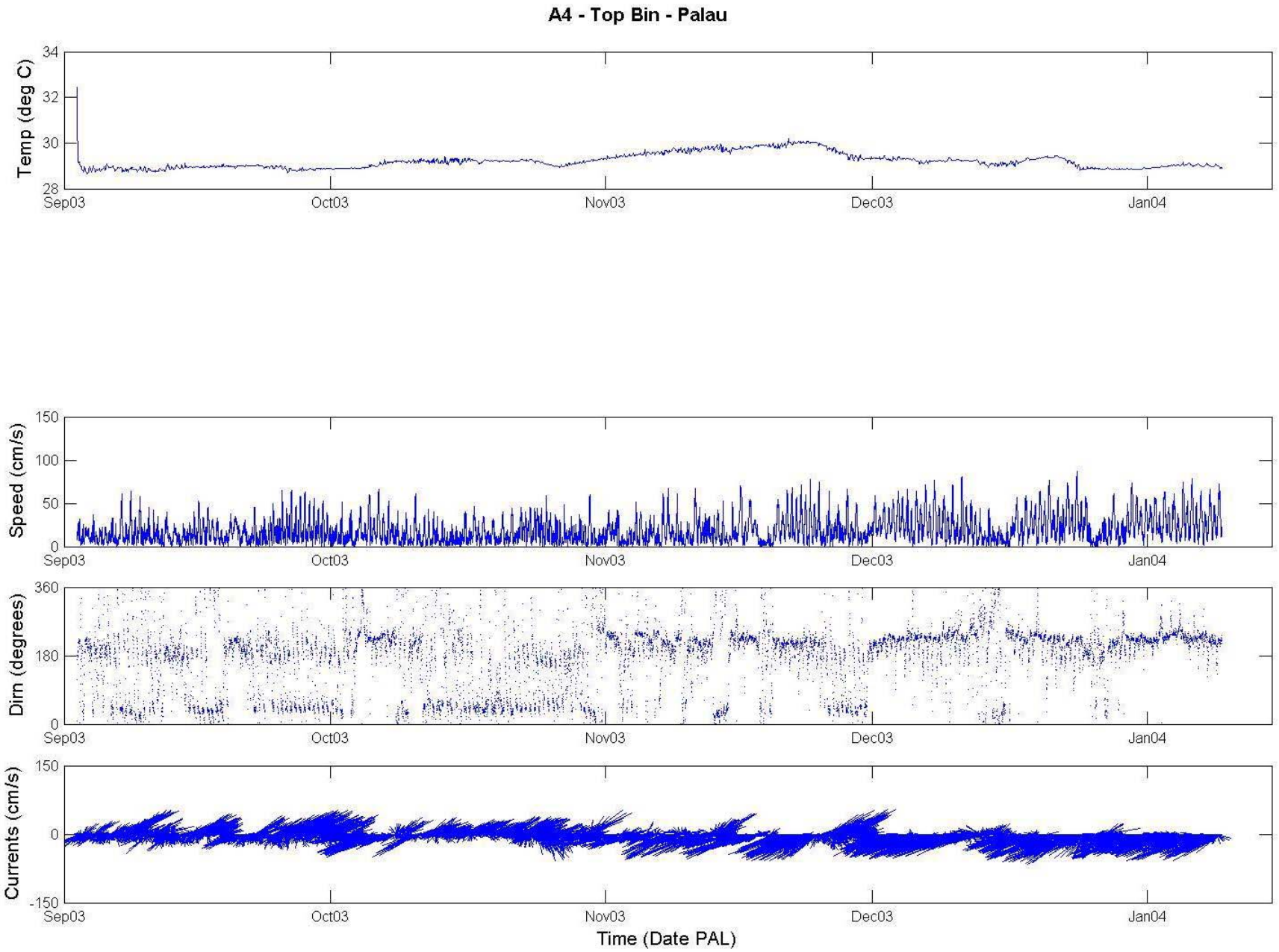
A2 - Palau

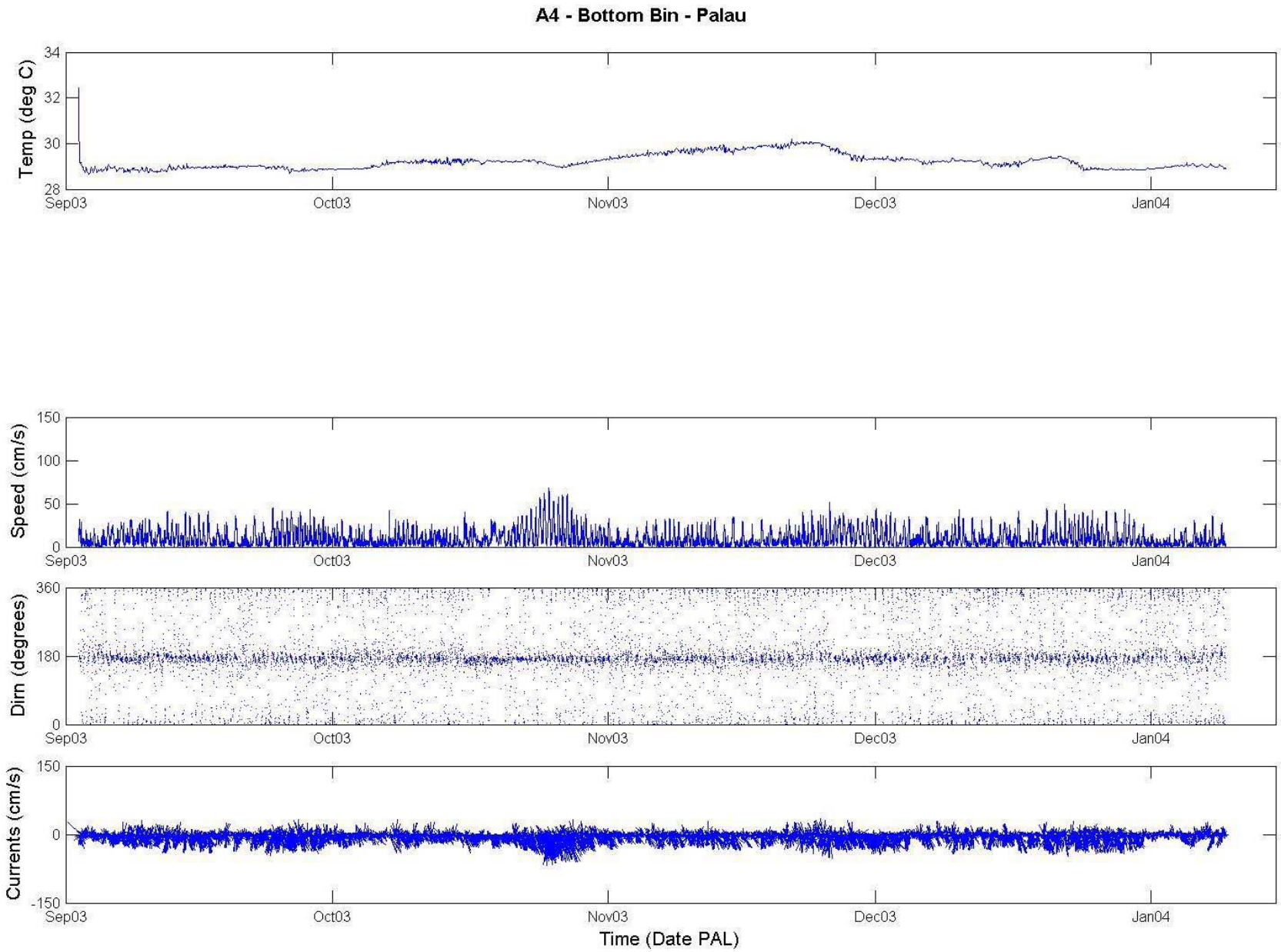

Logger Depth (m)
5
4
3
2
Sep03
Oct03
Nov03
Dec03
Jan04
Speed (cm/s)
30
20
10
0
Dirn (degrees)
360
180
0
Currents (cm/s)
10
0
-10
Time (Date PAL)

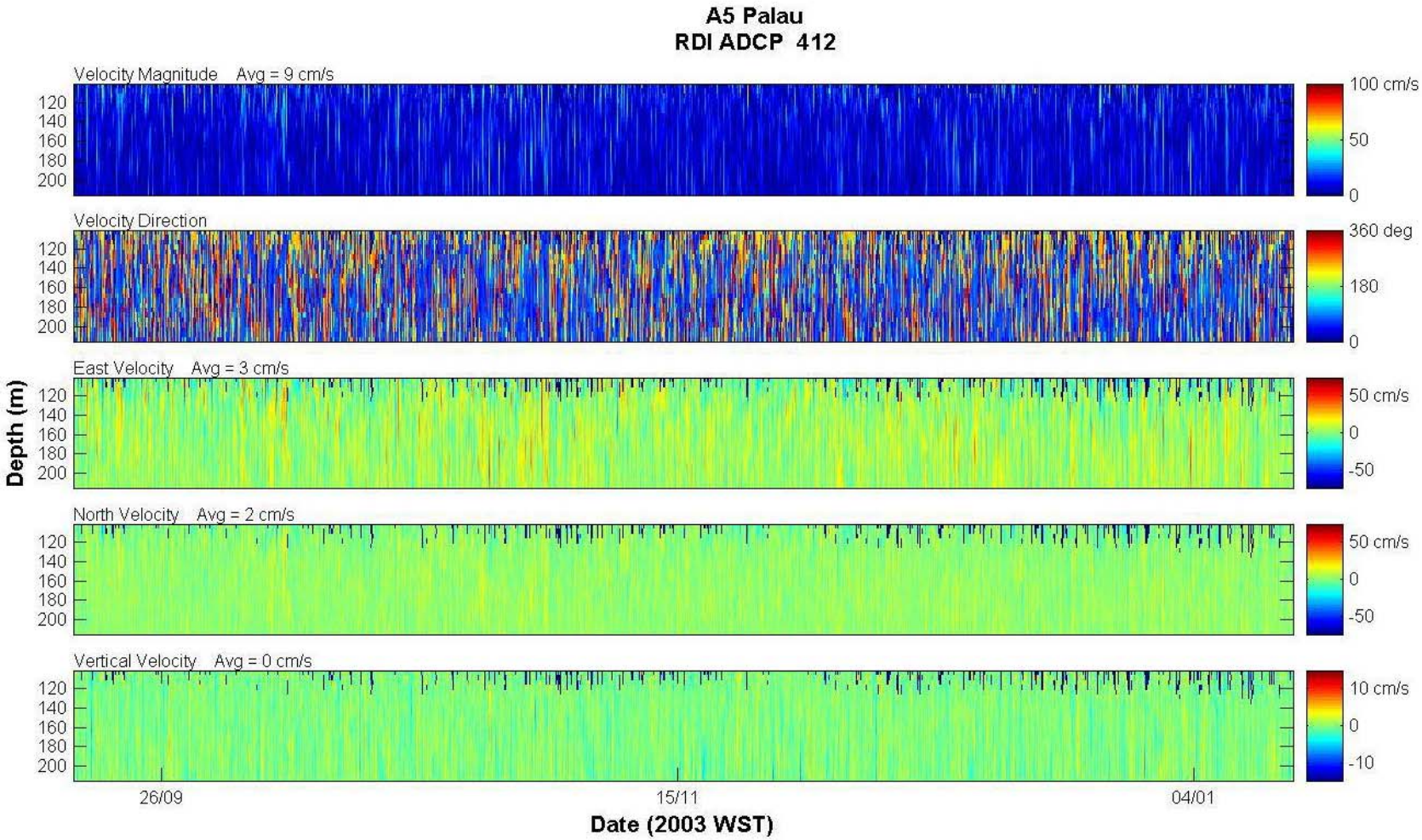

A3 - Palau
Temp (degrees C)
30
29.5
29
28.5
Press (m)
42
40
38
36
Speed (cm/s)
15
10
5
0
Dirn (degrees)
360
180
0
Currents (cm/s)
5
0
-5
13/09
20/09
27/09
04/10
11/10
18/10
25/10
01/11
08/11
Time (Date PAL)

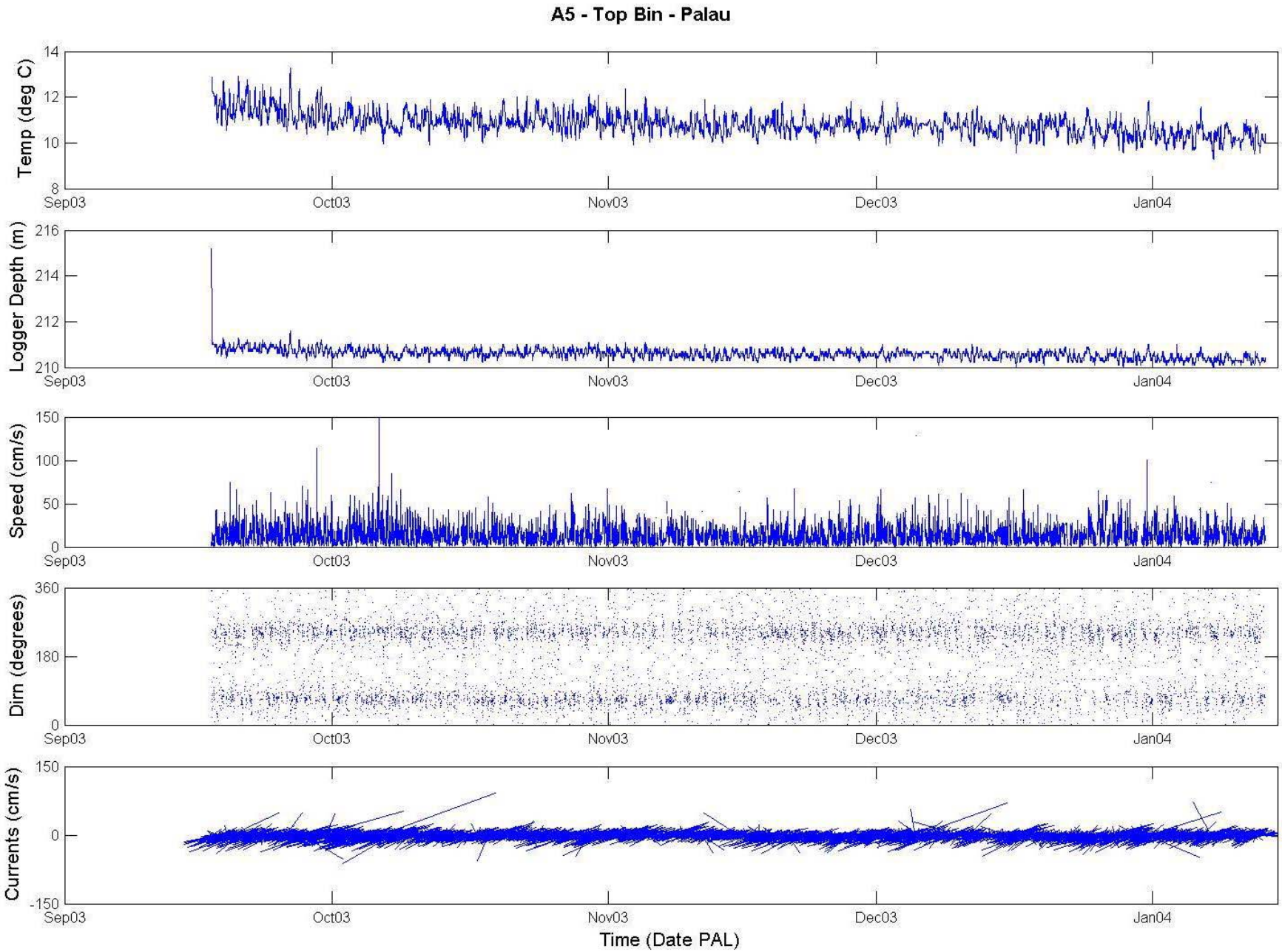

A3 - Palau
Temp (degrees C)
30
29.5
29
28.5
13/09
20/09
27/09
04/10
11/10
18/10
25/10
01/11
08/11
Conductivity (mmho/cm)
65
64
63
62
61
u (cm/s)
10
0
-10
-20
v (cm/s)
5
0
-5
-10
w (cm/s)
20
10
0
-10

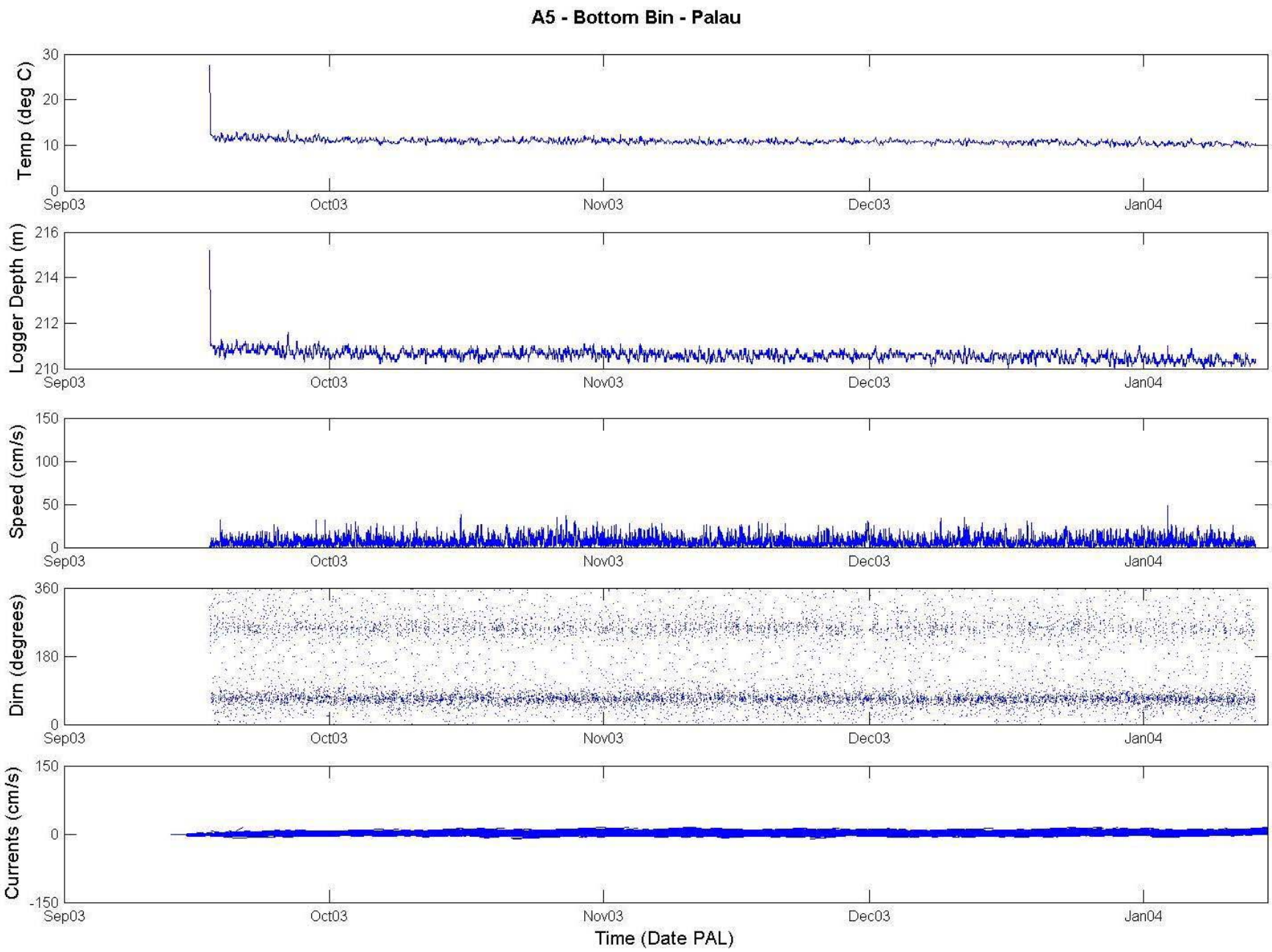

A4 Palau
RDI ADCP 584
Velocity Magnitude Avg = 12 cm/s
100 cm/s
50
0
Velocity Direction
360 deg
180
0
East Velocity Avg = 1 cm/s
50 cm/s
0
-50
North Velocity Avg = -6 cm/s
50 cm/s
0
-50
Vertical Velocity Avg = 0 cm/s
10 cm/s
0
-10
Depth (m)
10
20
30
16/09
06/10
26/10
15/11
05/12
25/12
Date (2003 WST)

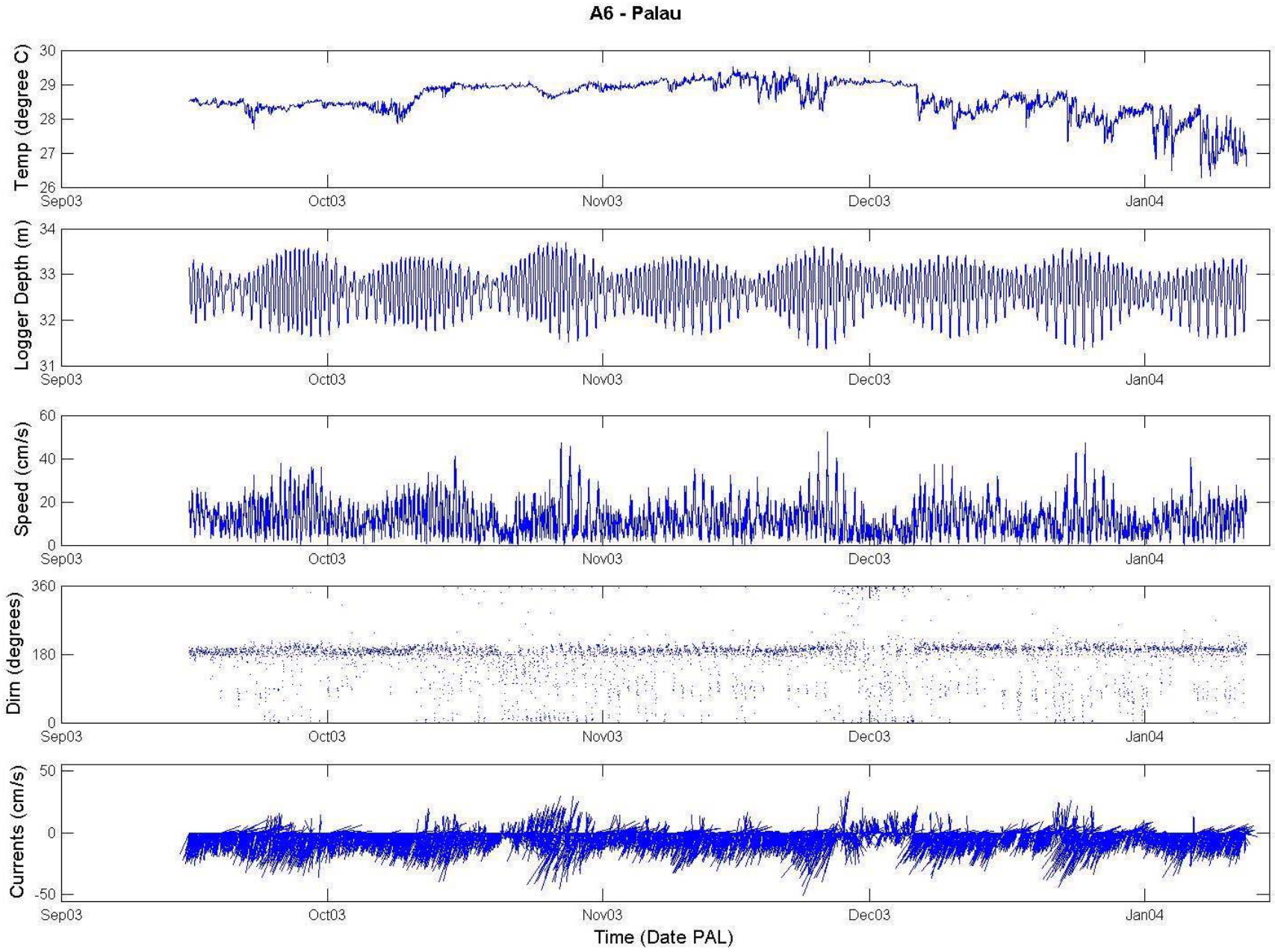

A4 - Top Bin - Palau
Temp (deg C)
34
32
30
28
Sep03
Oct03
Nov03
Dec03
Jan04
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Time (Date PAL)

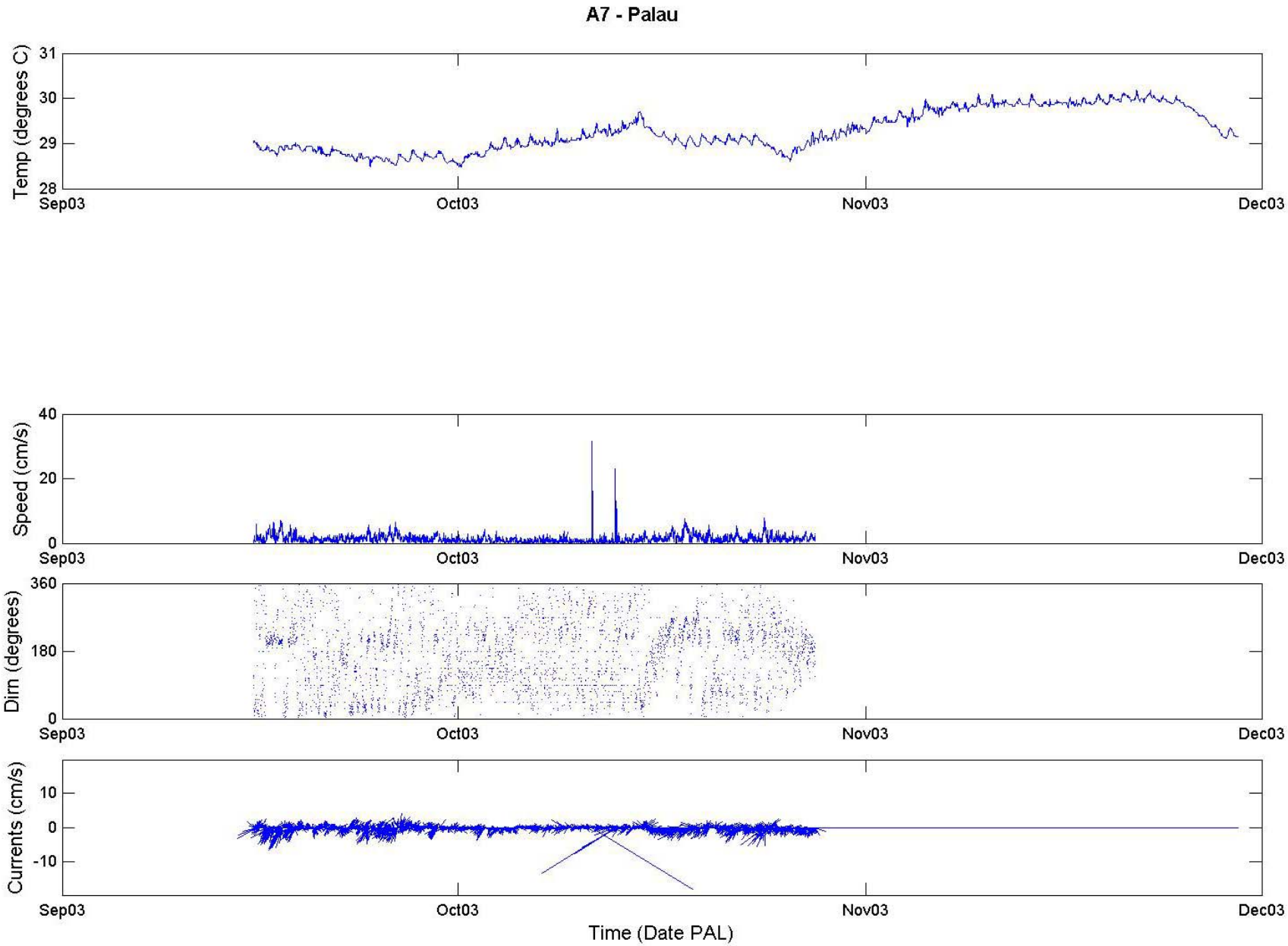

A4 - Bottom Bin - Palau
Temp (deg C)
34
32
30
28
Sep03
Oct03
Nov03
Dec03
Jan04
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Time (Date PAL)

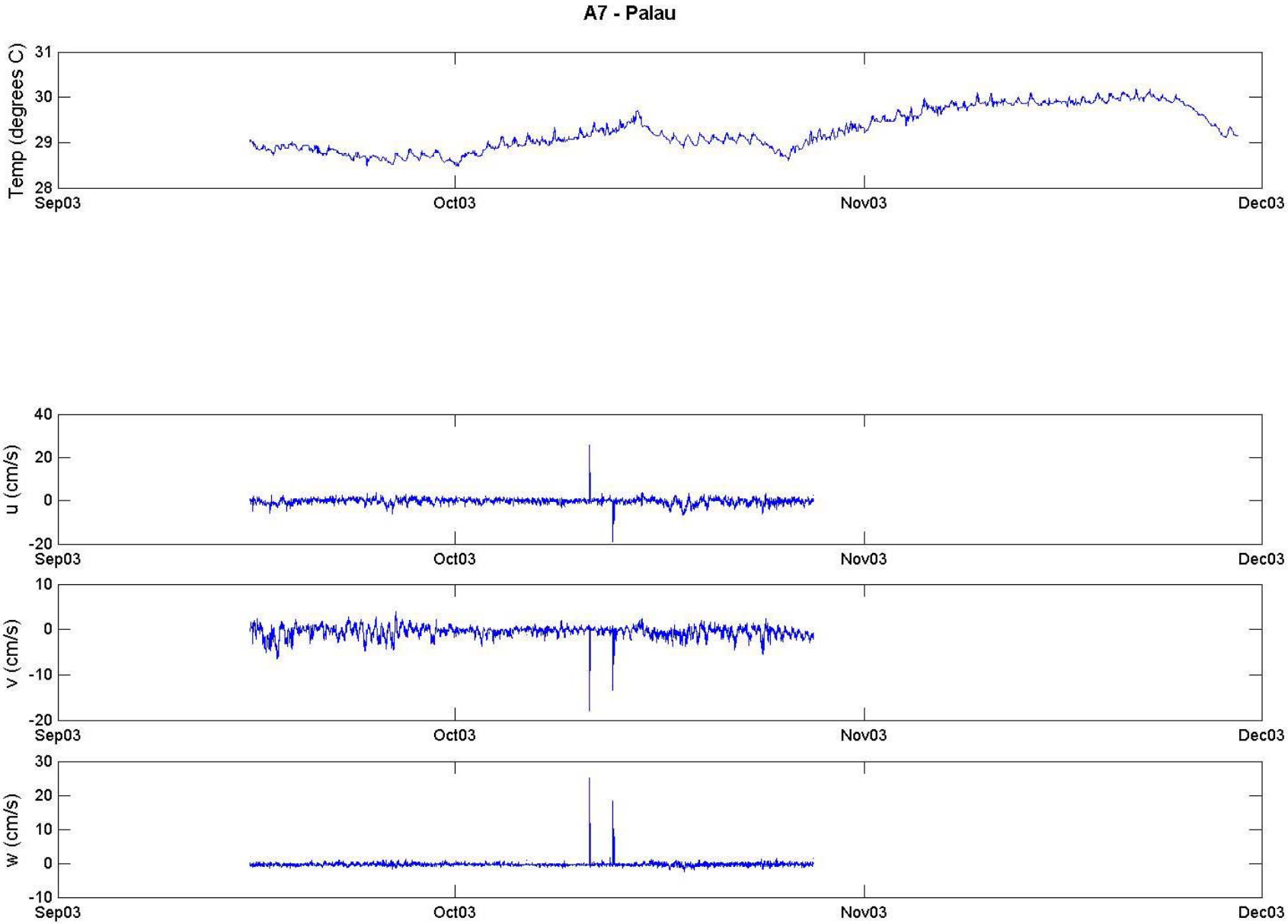

A5 Palau
RDI ADCP 412
Velocity Magnitude Avg = 9 cm/s
100 cm/s
50
0
Velocity Direction
360 deg
180
0
East Velocity Avg = 3 cm/s
50 cm/s
0
-50
North Velocity Avg = 2 cm/s
50 cm/s
0
-50
Vertical Velocity Avg = 0 cm/s
10 cm/s
0
-10
120
140
160
180
200
Depth (m)
26/09
15/11
04/01
Date (2003 WST)

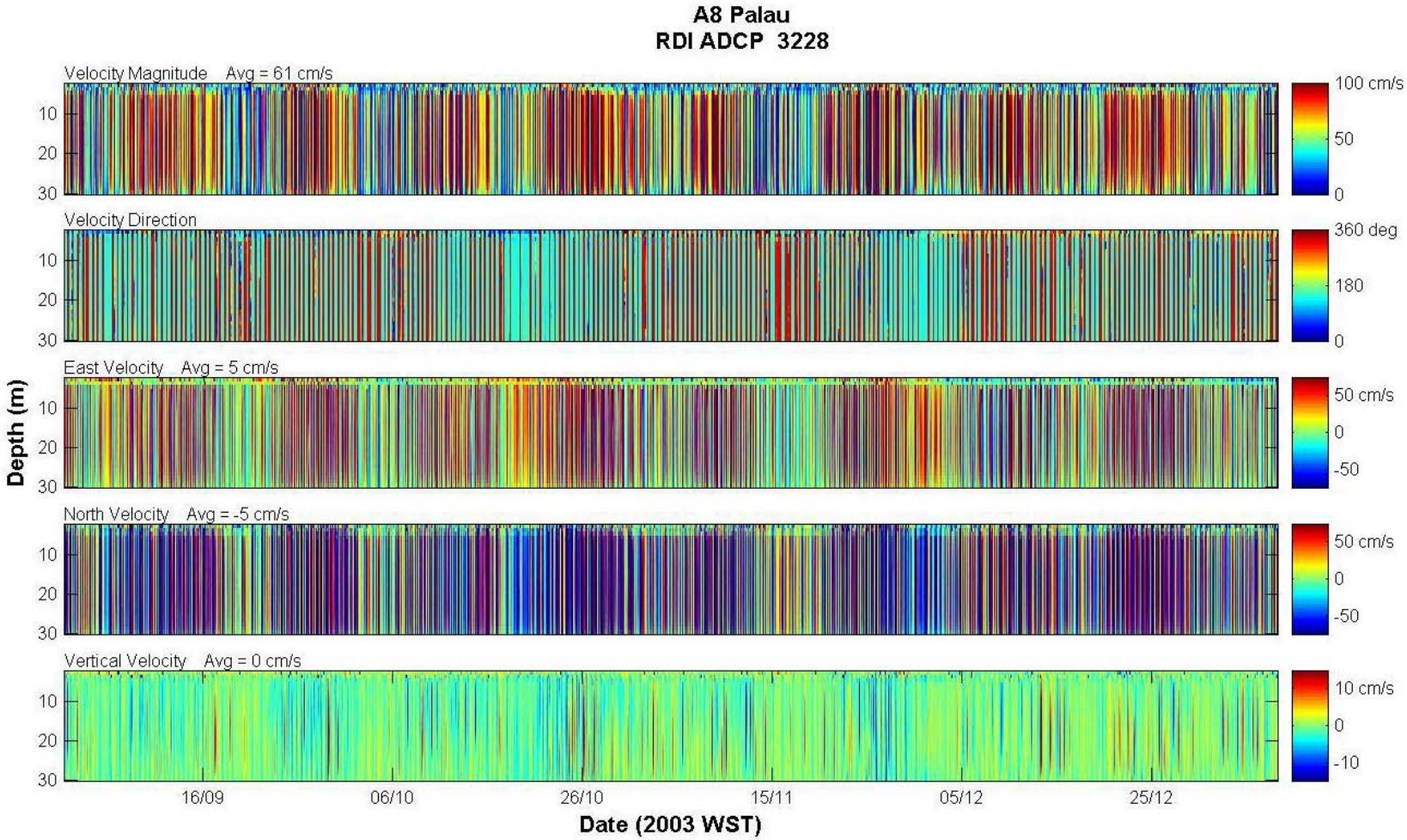

A5 - Top Bin - Palau
Temp (deg C)
14
12
10
8
Logger Depth (m)
216
214
212
210
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)

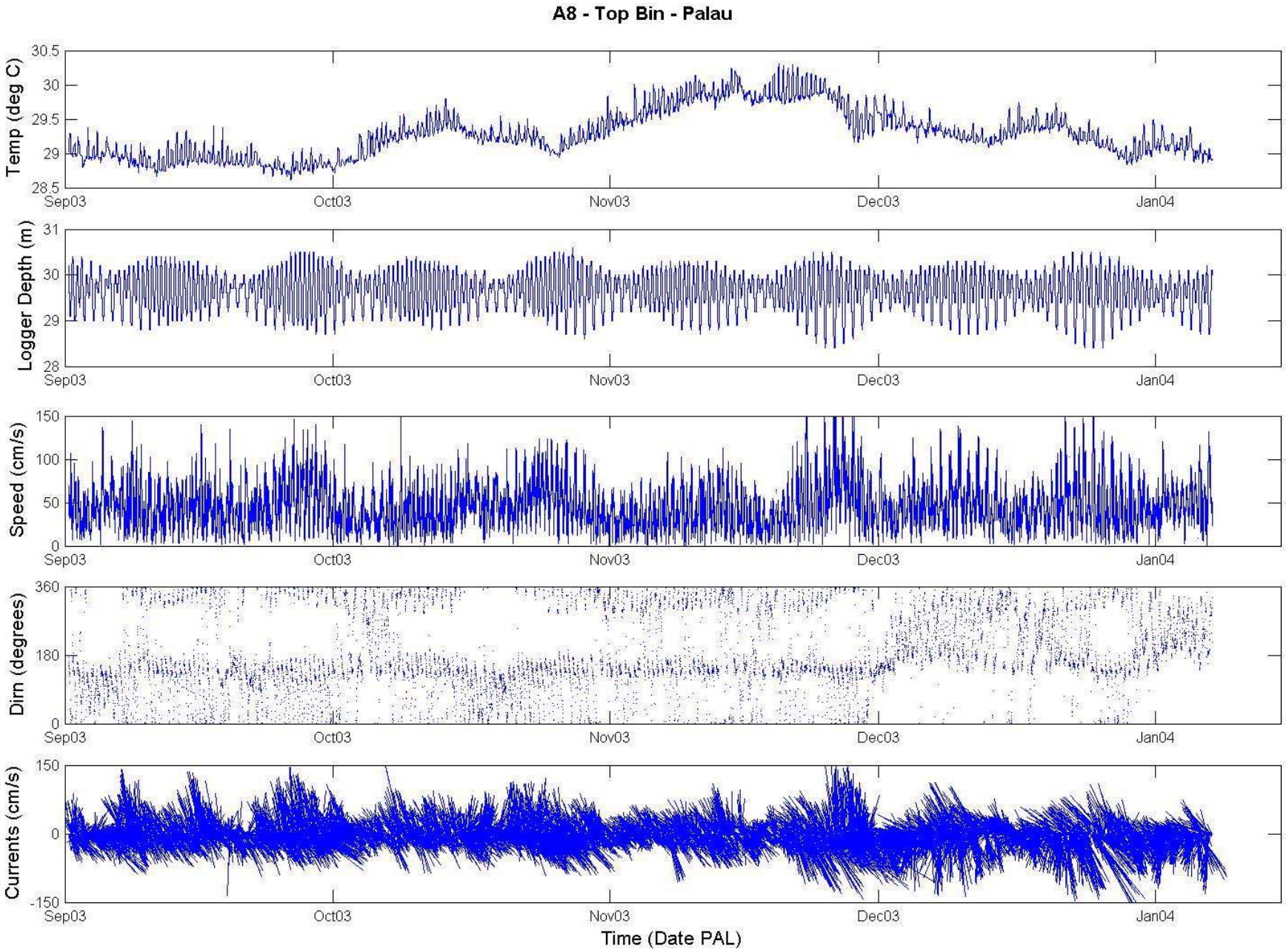

A5 - Bottom Bin - Palau
Temp (deg C)
30
20
10
0
Logger Depth (m)
216
214
212
210
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)

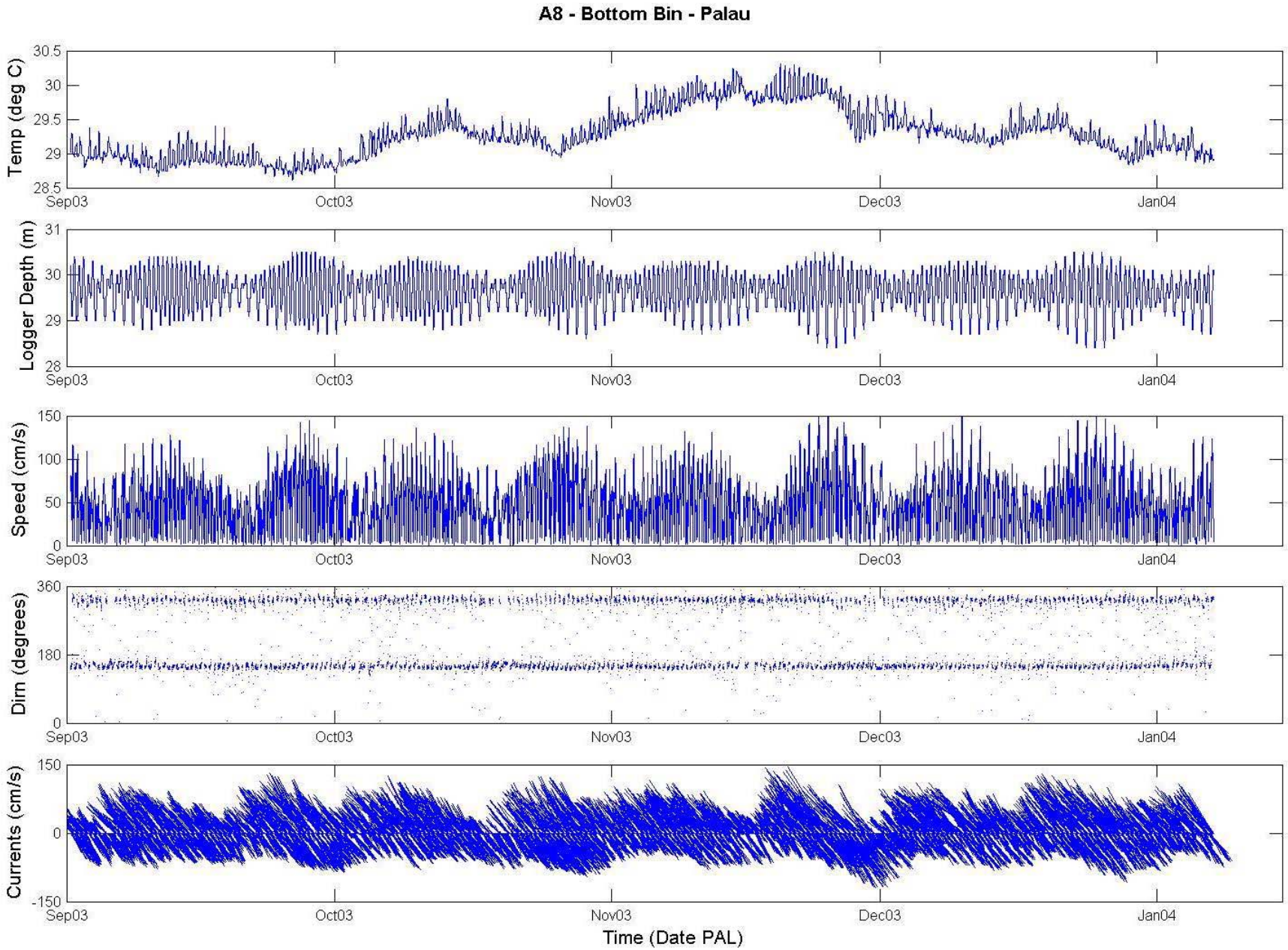

A6 - Palau
Temp (degree C)
30
29
28
27
26
Logger Depth (m)
34
33
32
31
Speed (cm/s)
60
40
20
0
Dirn (degrees)
360
180
0
Currents (cm/s)
50
0
-50
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)

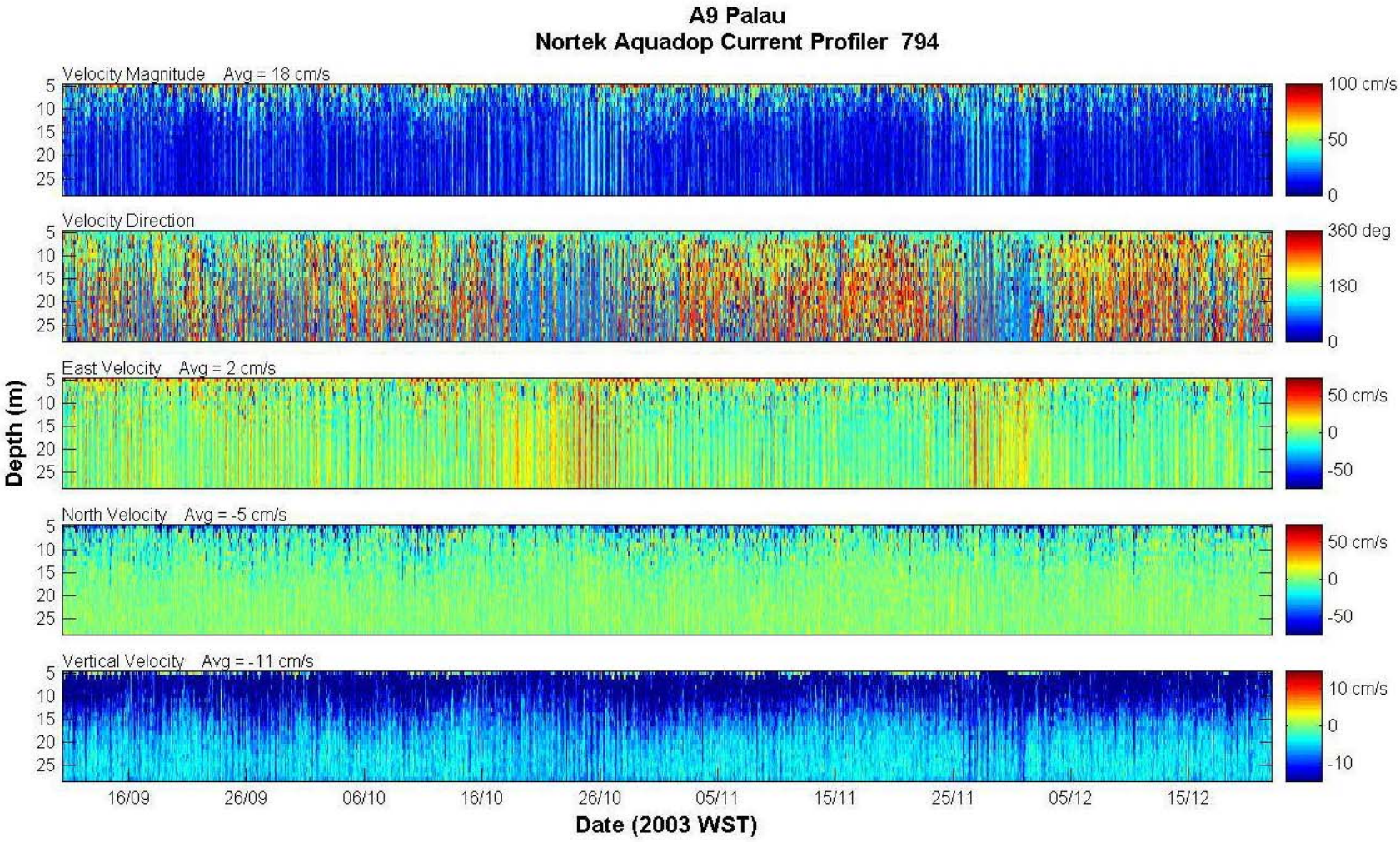

A7 - Palau
Temp (degrees C)
31
30
29
28
Sep03
Oct03
Nov03
Dec03
Speed (cm/s)
40
20
0
Dirn (degrees)
360
180
0
Currents (cm/s)
10
0
-10
Time (Date PAL)

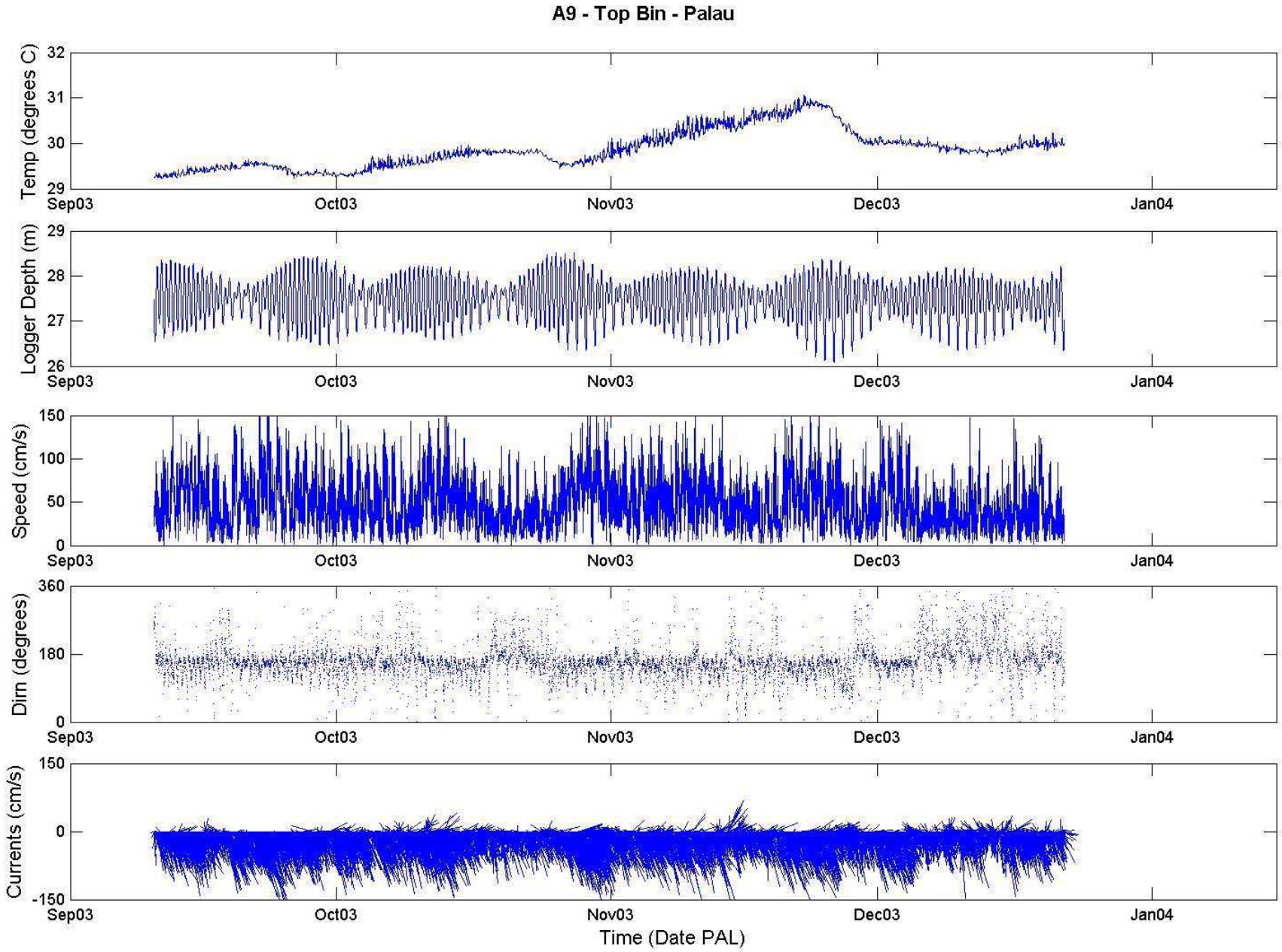

A7 - Palau
Temp (degrees C)
31
30
29
28
Sep03
Oct03
Nov03
Dec03
u (cm/s)
40
20
0
-20
v (cm/s)
10
0
-10
-20
w (cm/s)
30
20
10
0
-10

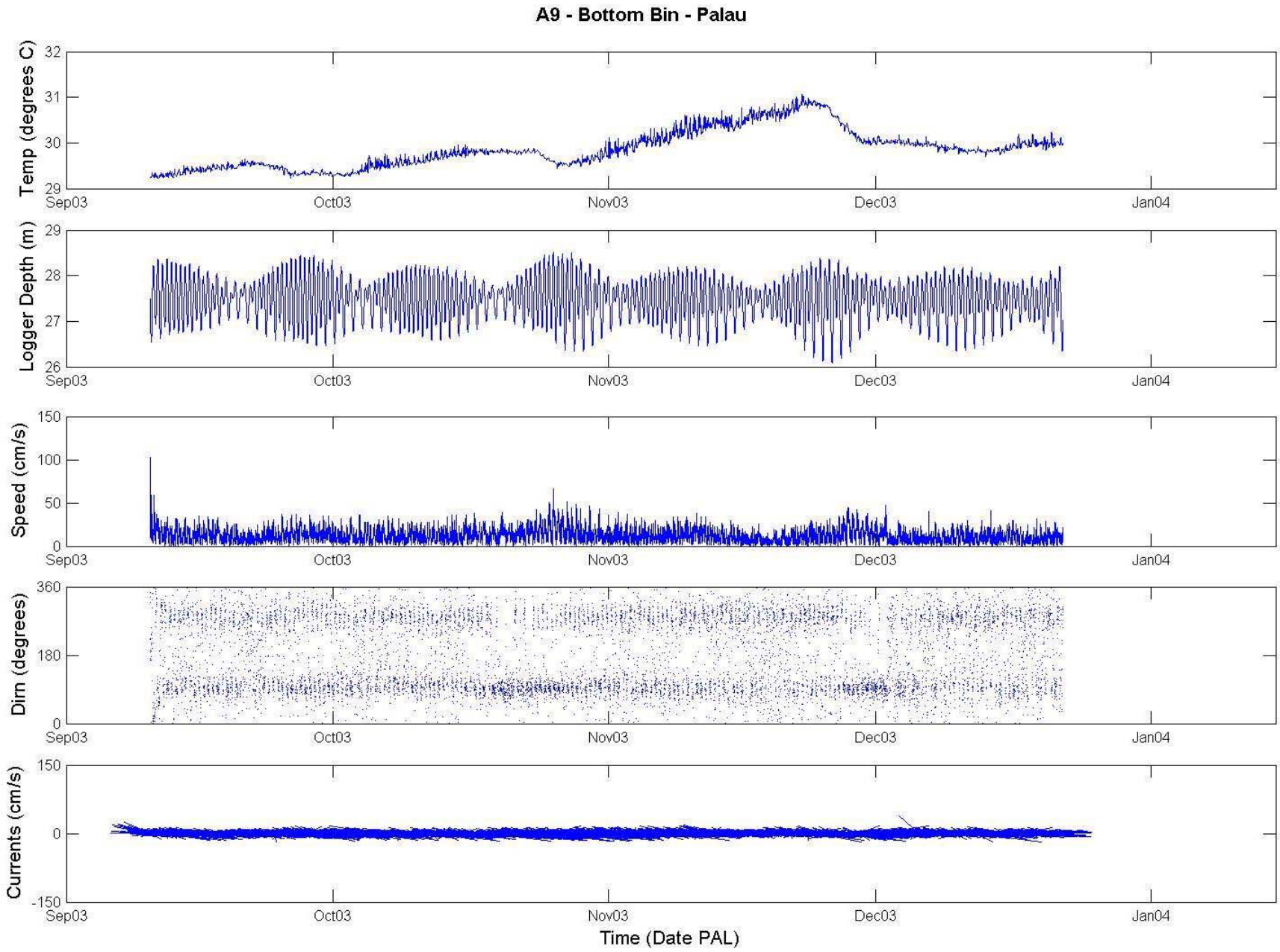

A8 Palau
RDI ADCP 3228
Velocity Magnitude Avg = 61 cm/s
100 cm/s
50
0
Velocity Direction
360 deg
180
0
East Velocity Avg = 5 cm/s
50 cm/s
0
-50
North Velocity Avg = -5 cm/s
50 cm/s
0
-50
Vertical Velocity Avg = 0 cm/s
10 cm/s
0
-10
Depth (m)
10
20
30
16/09
06/10
26/10
15/11
05/12
25/12
Date (2003 WST)

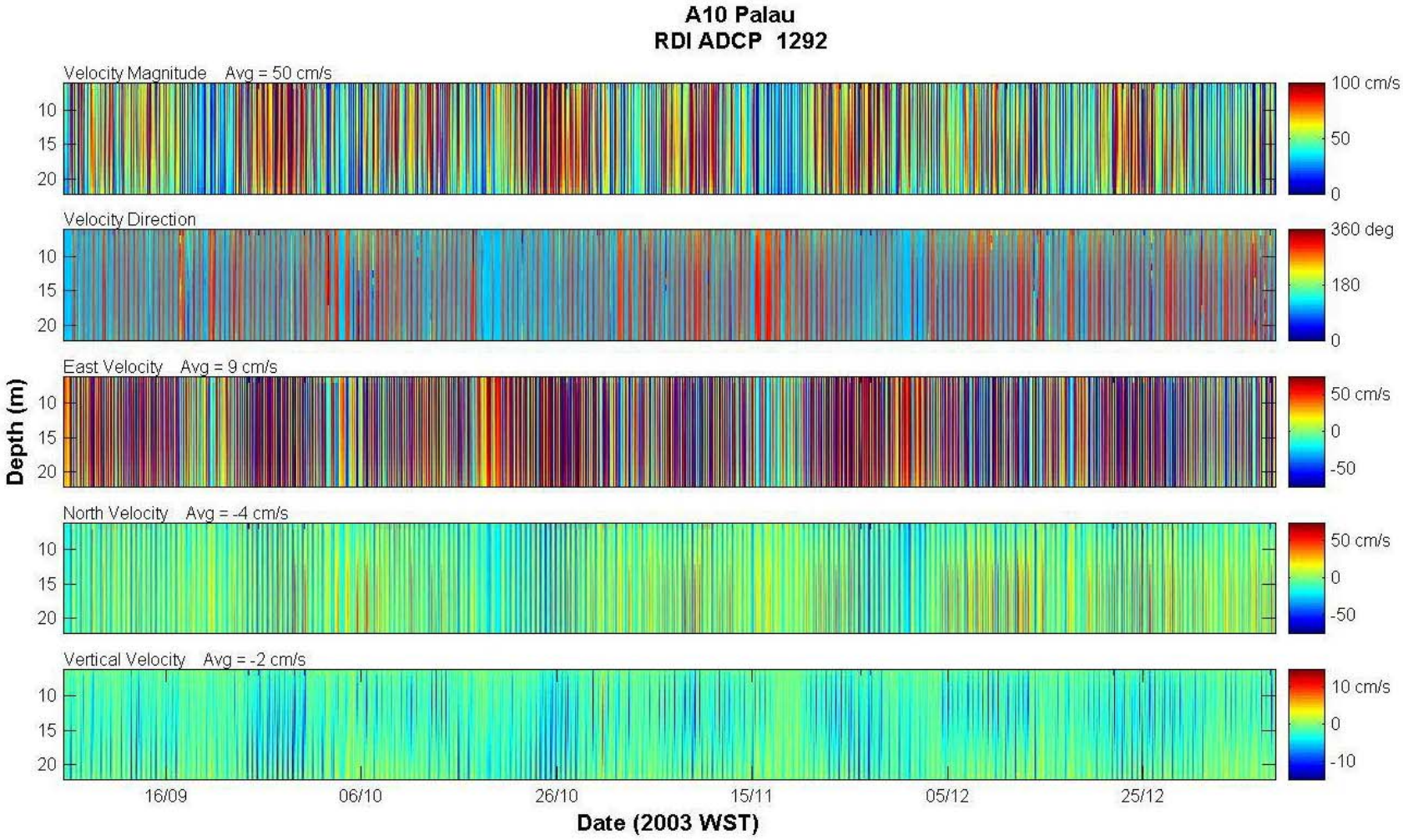

A8 - Top Bin - Palau
Temp (deg C)
30.5
30
29.5
29
28.5
Logger Depth (m)
31
30
29
28
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)

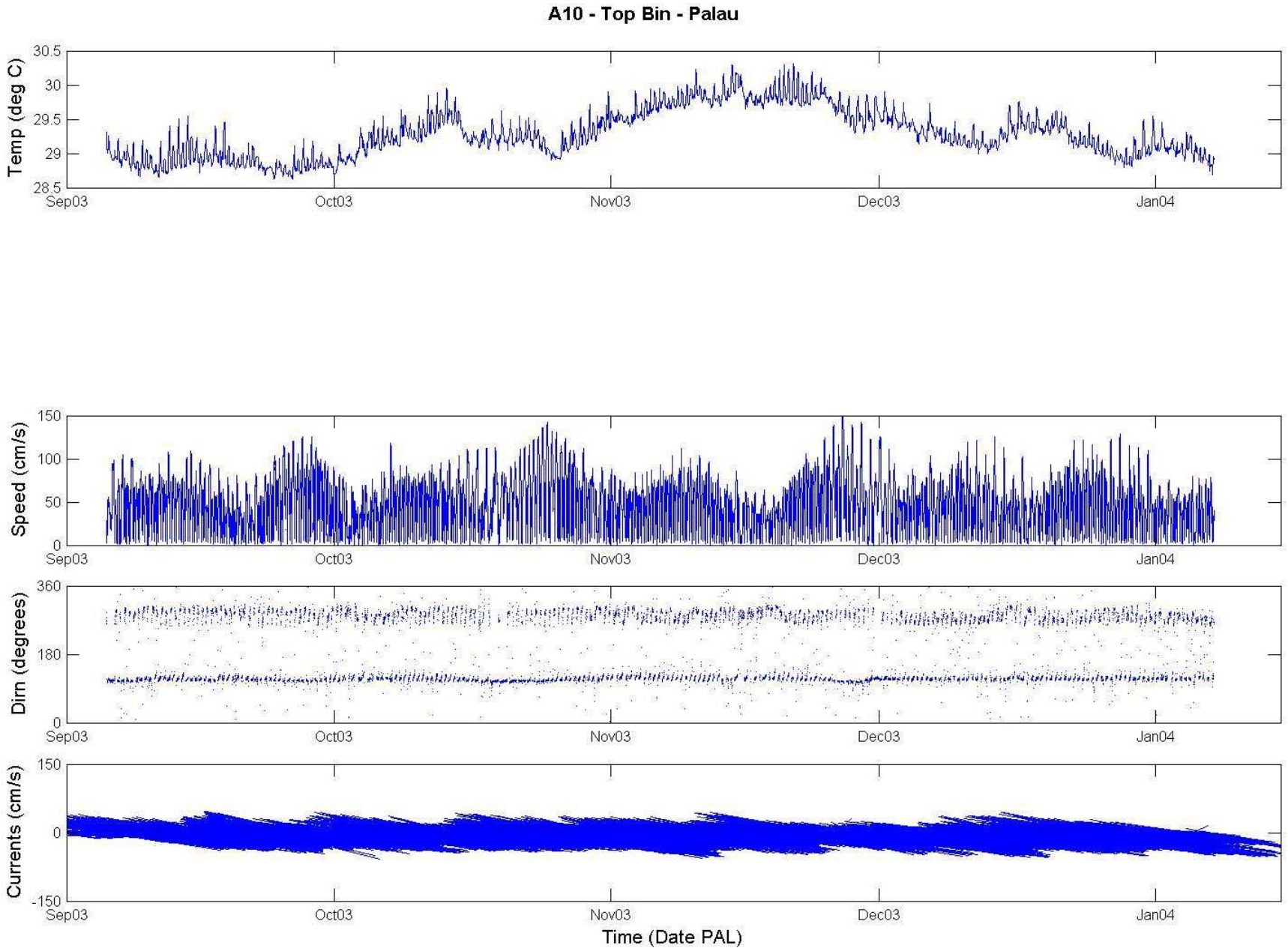

A8 - Bottom Bin - Palau
Temp (deg C)
30.5
30
29.5
29
28.5
Logger Depth (m)
31
30
29
28
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)

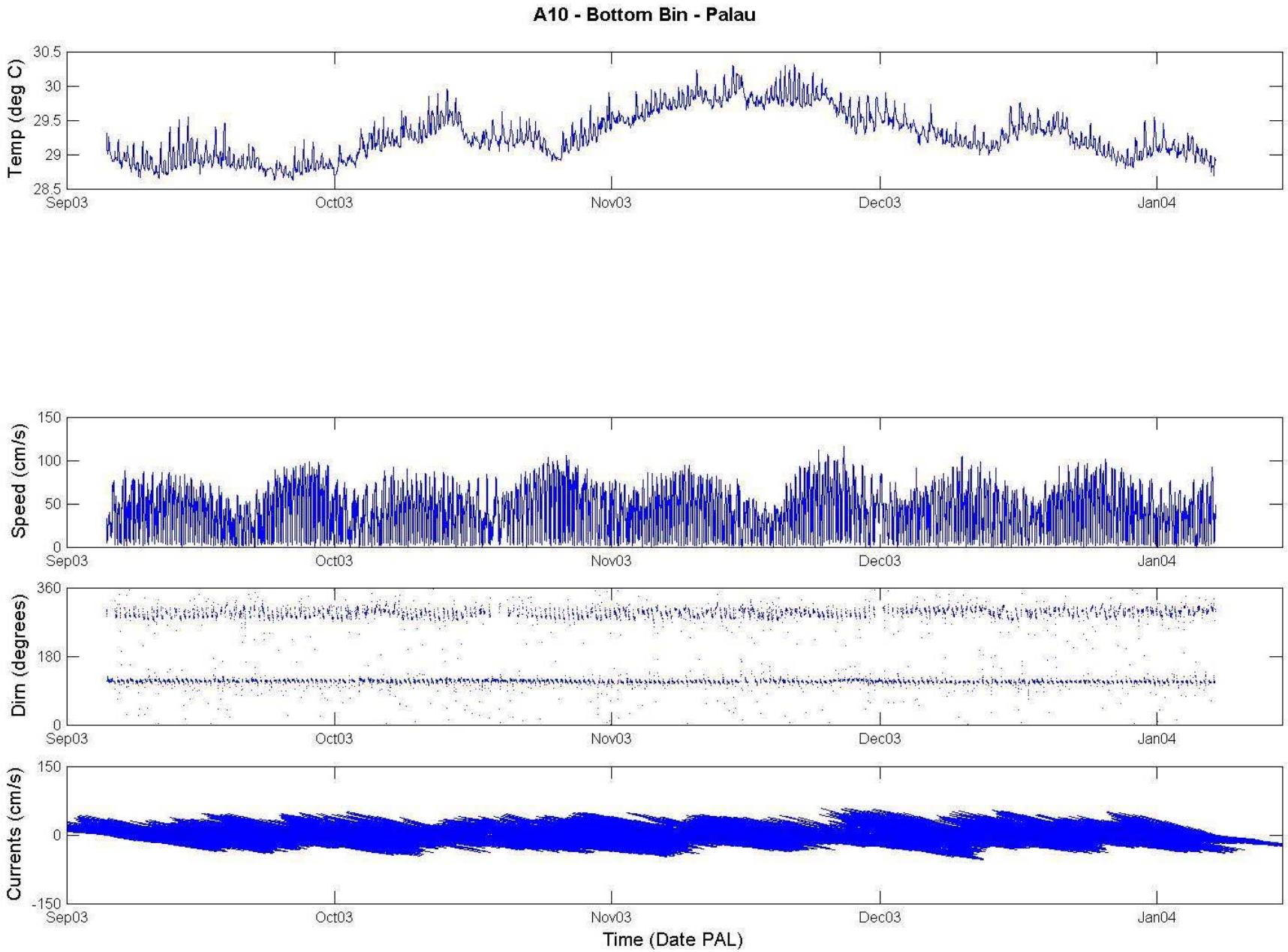

A9 Palau
Nortek Aquadop Current Profiler 794
Velocity Magnitude Avg = 18 cm/s
Velocity Direction
East Velocity Avg = 2 cm/s
North Velocity Avg = -5 cm/s
Vertical Velocity Avg = -11 cm/s
Depth (m)
5
10
15
20
25
100 cm/s
50
0
360 deg
180
0
50 cm/s
0
-50
50 cm/s
0
-50
10 cm/s
0
-10
16/09
26/09
06/10
16/10
26/10
05/11
15/11
25/11
05/12
15/12
Date (2003 WST)

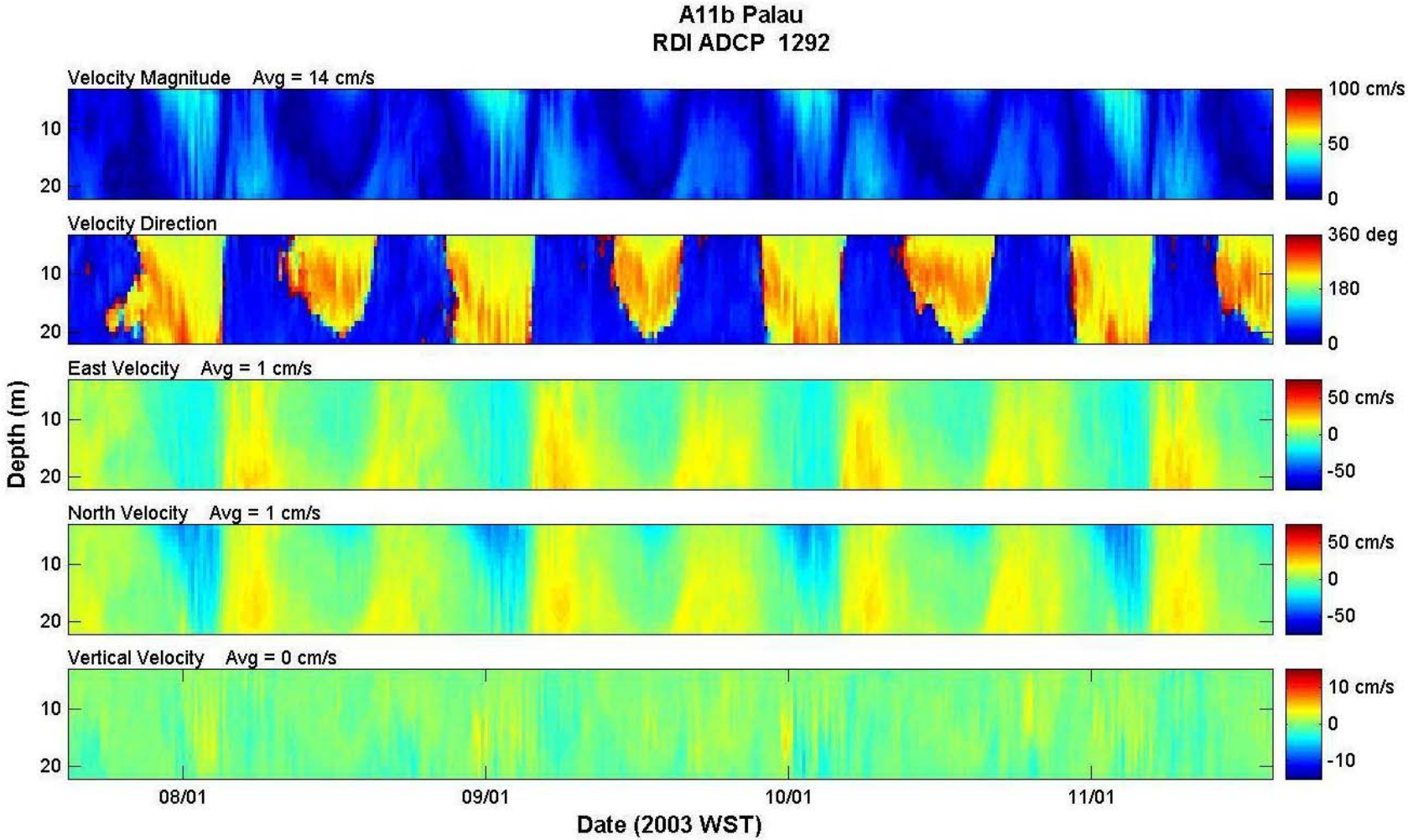

A9 - Top Bin - Palau
Temp (degrees C)
32
31
30
29
Logger Depth (m)
29
28
27
26
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)

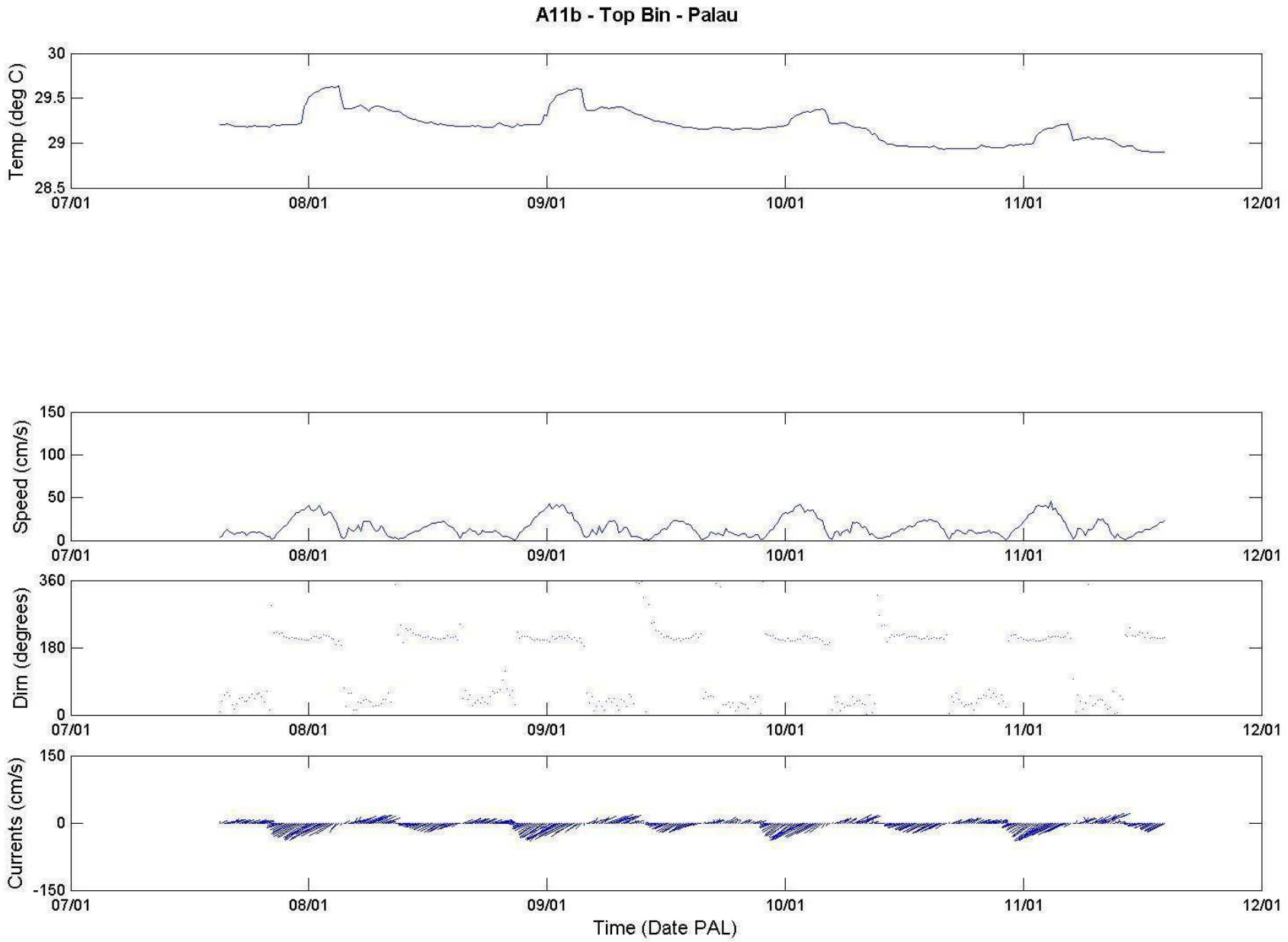

A9 - Bottom Bin - Palau
Temp (degrees C)
32
31
30
29
Logger Depth (m)
29
28
27
26
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)

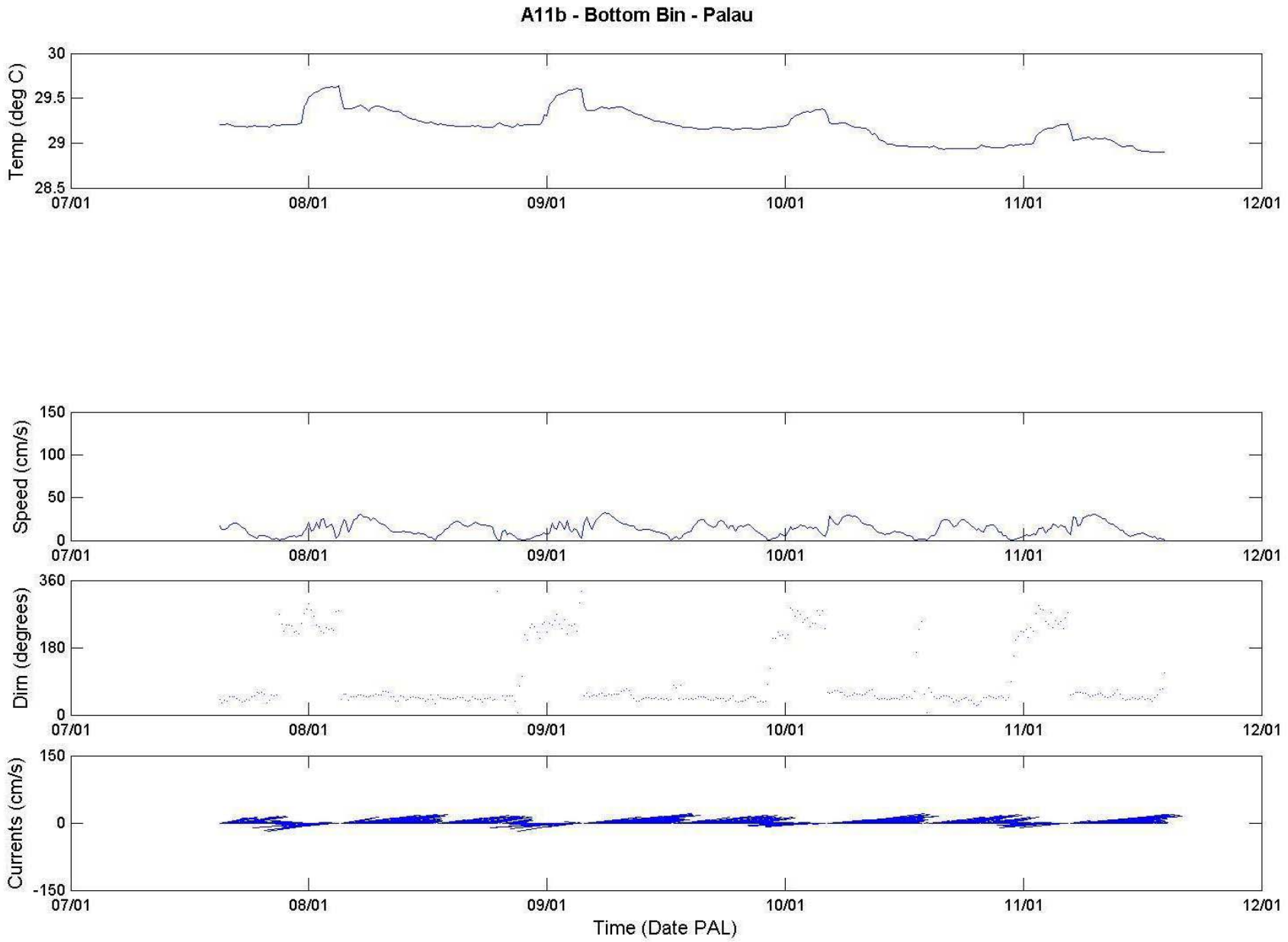

A10 Palau
RDI ADCP 1292
Velocity Magnitude Avg = 50 cm/s
100 cm/s
50
0
Velocity Direction
360 deg
180
0
East Velocity Avg = 9 cm/s
50 cm/s
0
-50
North Velocity Avg = -4 cm/s
50 cm/s
0
-50
Vertical Velocity Avg = -2 cm/s
10 cm/s
0
-10
Depth (m)
10
15
20
16/09
06/10
26/10
15/11
05/12
25/12
Date (2003 WST)

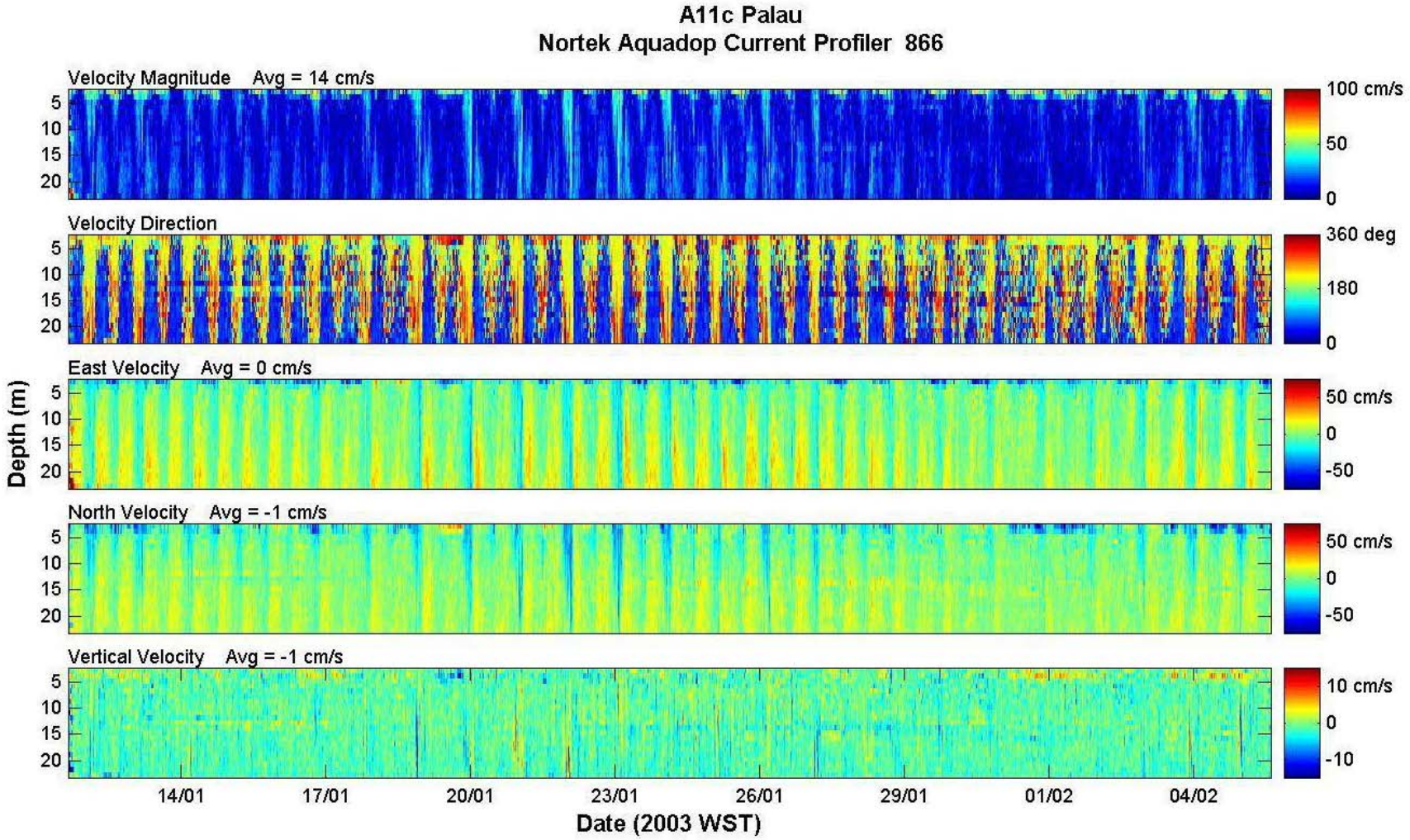

A10 - Top Bin - Palau
Temp (deg C)
30.5
30
29.5
29
28.5
Sep03
Oct03
Nov03
Dec03
Jan04
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Time (Date PAL)

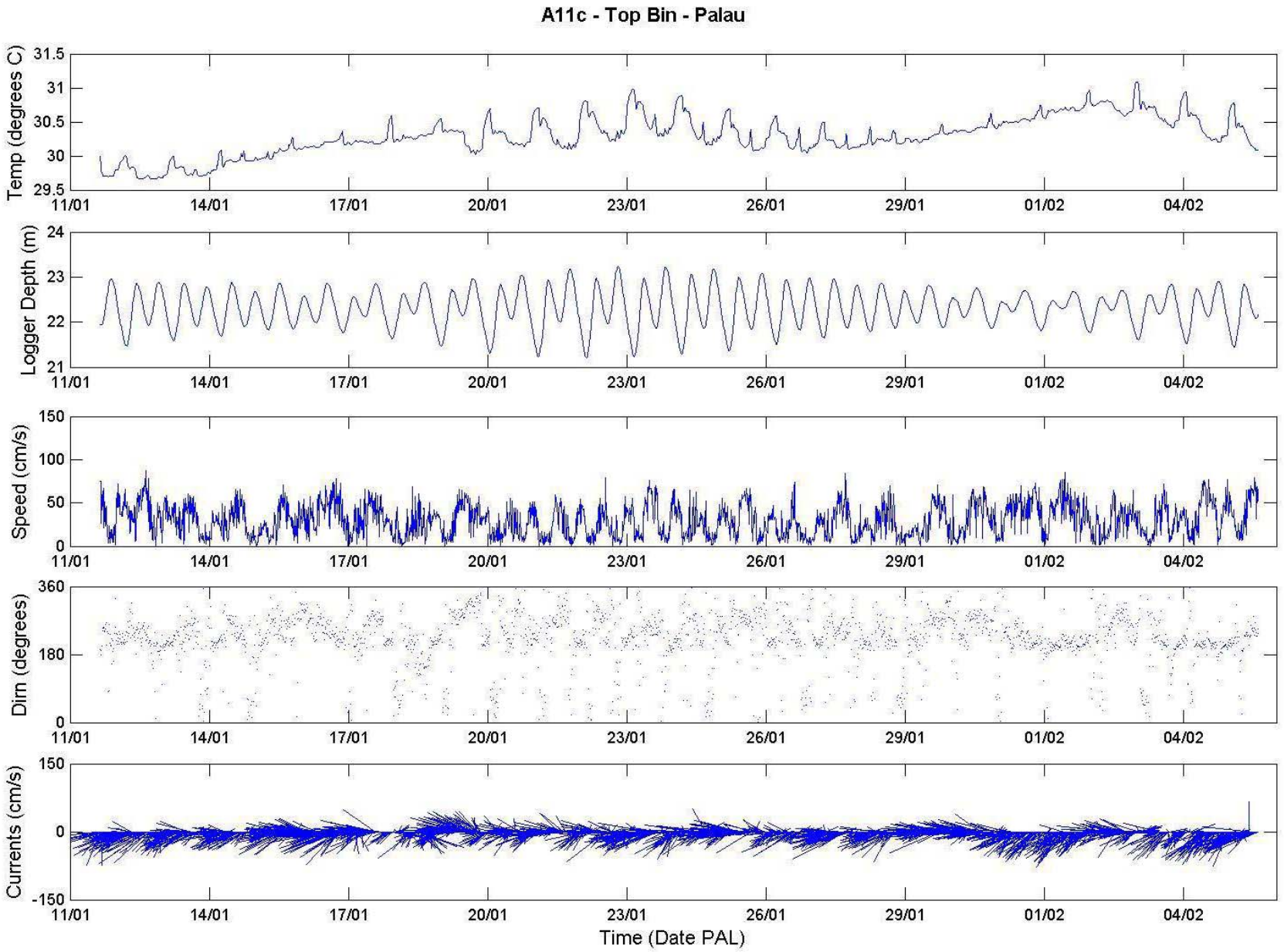

A10 - Bottom Bin - Palau
Temp (deg C)
30.5
30
29.5
29
28.5
Sep03
Oct03
Nov03
Dec03
Jan04
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Time (Date PAL)

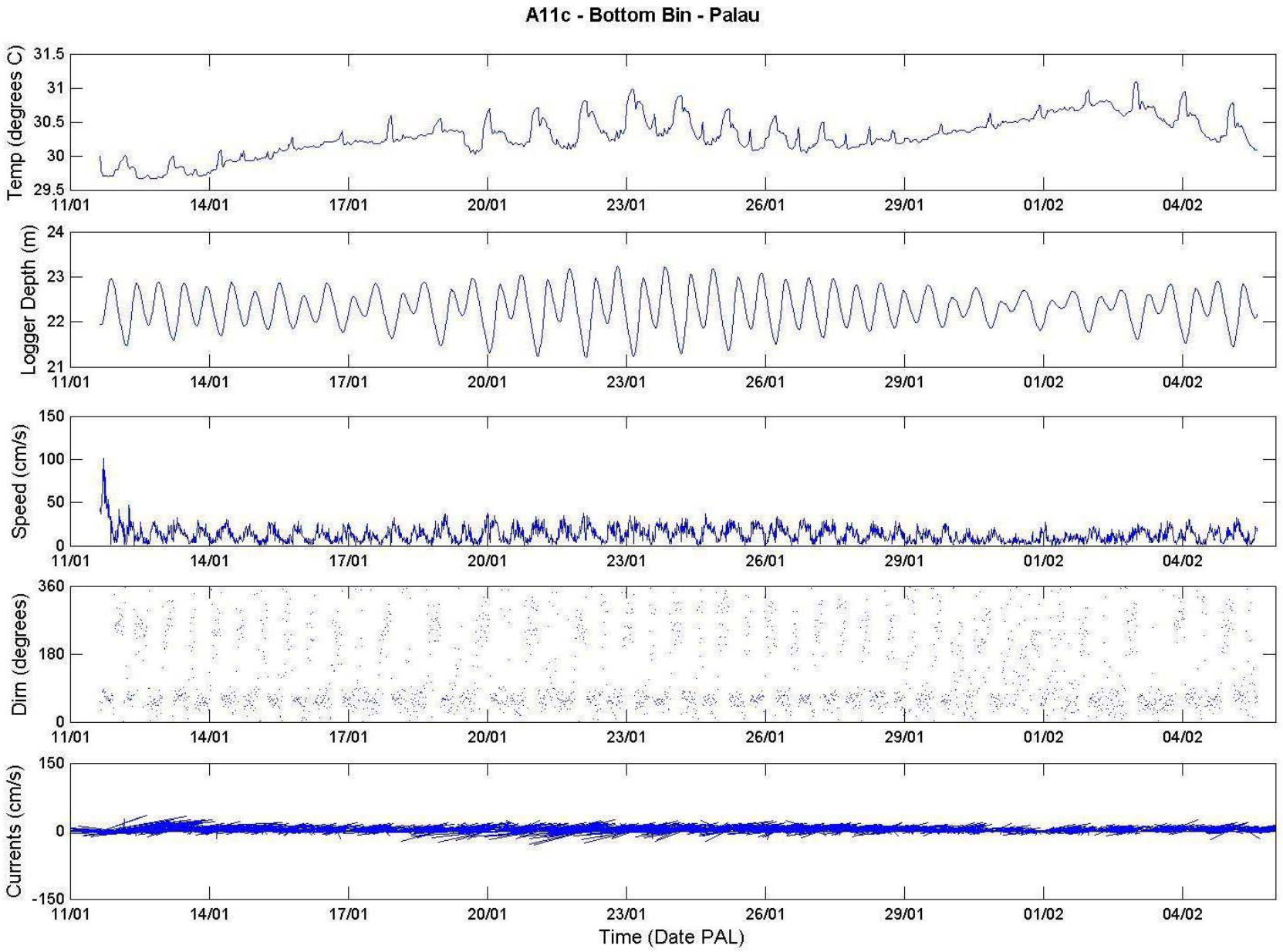

A11b Palau
RDI ADCP 1292
Velocity Magnitude Avg = 14 cm/s
100 cm/s
50
0
Velocity Direction
360 deg
180
0
East Velocity Avg = 1 cm/s
50 cm/s
0
-50
North Velocity Avg = 1 cm/s
50 cm/s
0
-50
Vertical Velocity Avg = 0 cm/s
10 cm/s
0
-10
Depth (m)
10
20
08/01
09/01
10/01
11/01
Date (2003 WST)

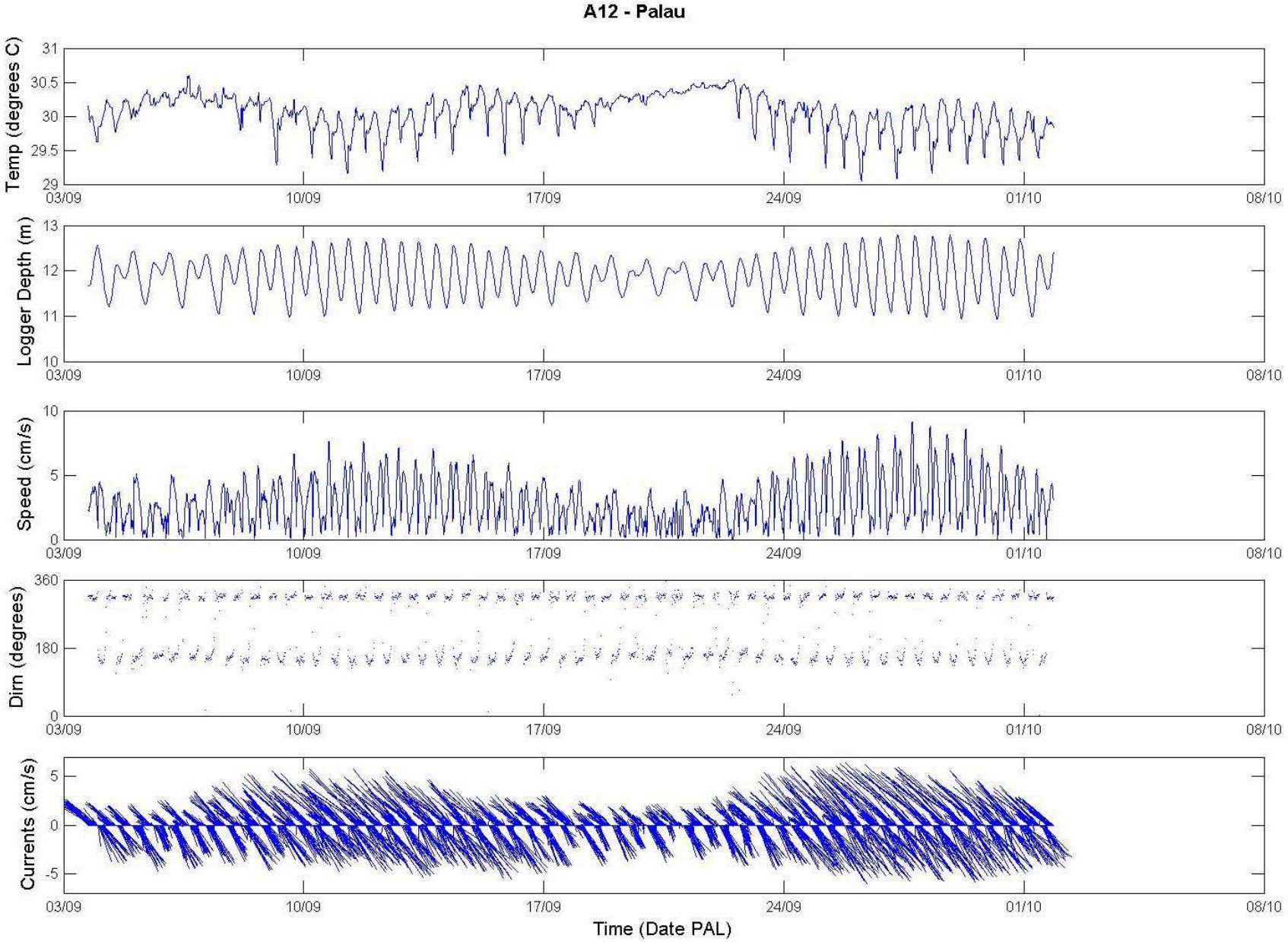

A11b - Top Bin - Palau
Temp (deg C)
30
29.5
29
28.5
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
07/01
08/01
09/01
10/01
11/01
12/01
Time (Date PAL)

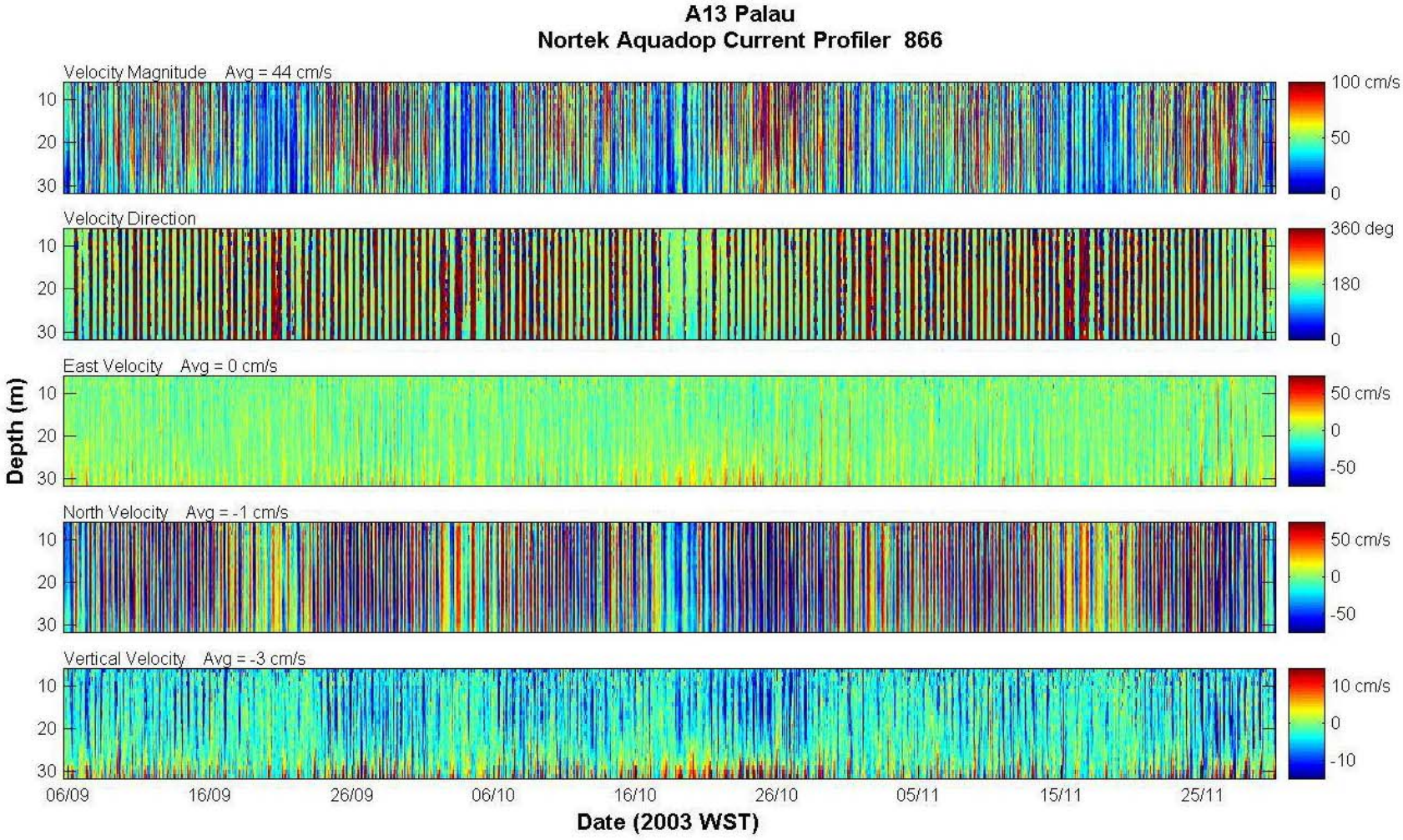

A11b - Bottom Bin - Palau
Temp (deg C)
30
29.5
29
28.5
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
07/01
08/01
09/01
10/01
11/01
12/01
Time (Date PAL)

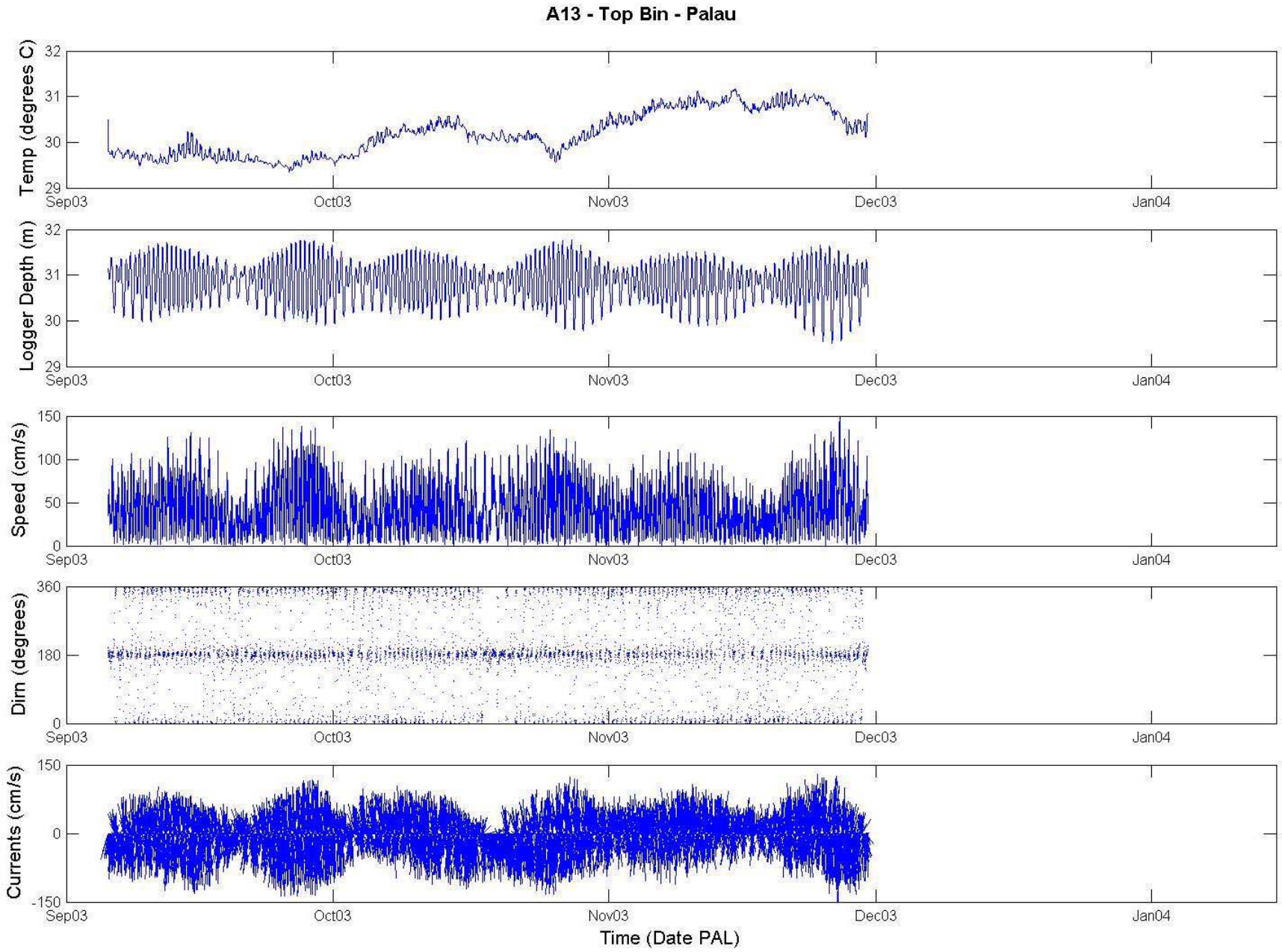

A11c Palau
Nortek Aquadop Current Profiler 866
Velocity Magnitude Avg = 14 cm/s
100 cm/s
50
0
Velocity Direction
360 deg
180
0
East Velocity Avg = 0 cm/s
50 cm/s
0
-50
North Velocity Avg = -1 cm/s
50 cm/s
0
-50
Vertical Velocity Avg = -1 cm/s
10 cm/s
0
-10
Depth (m)
5
10
15
20
14/01
17/01
20/01
23/01
26/01
29/01
01/02
04/02
Date (2003 WST)

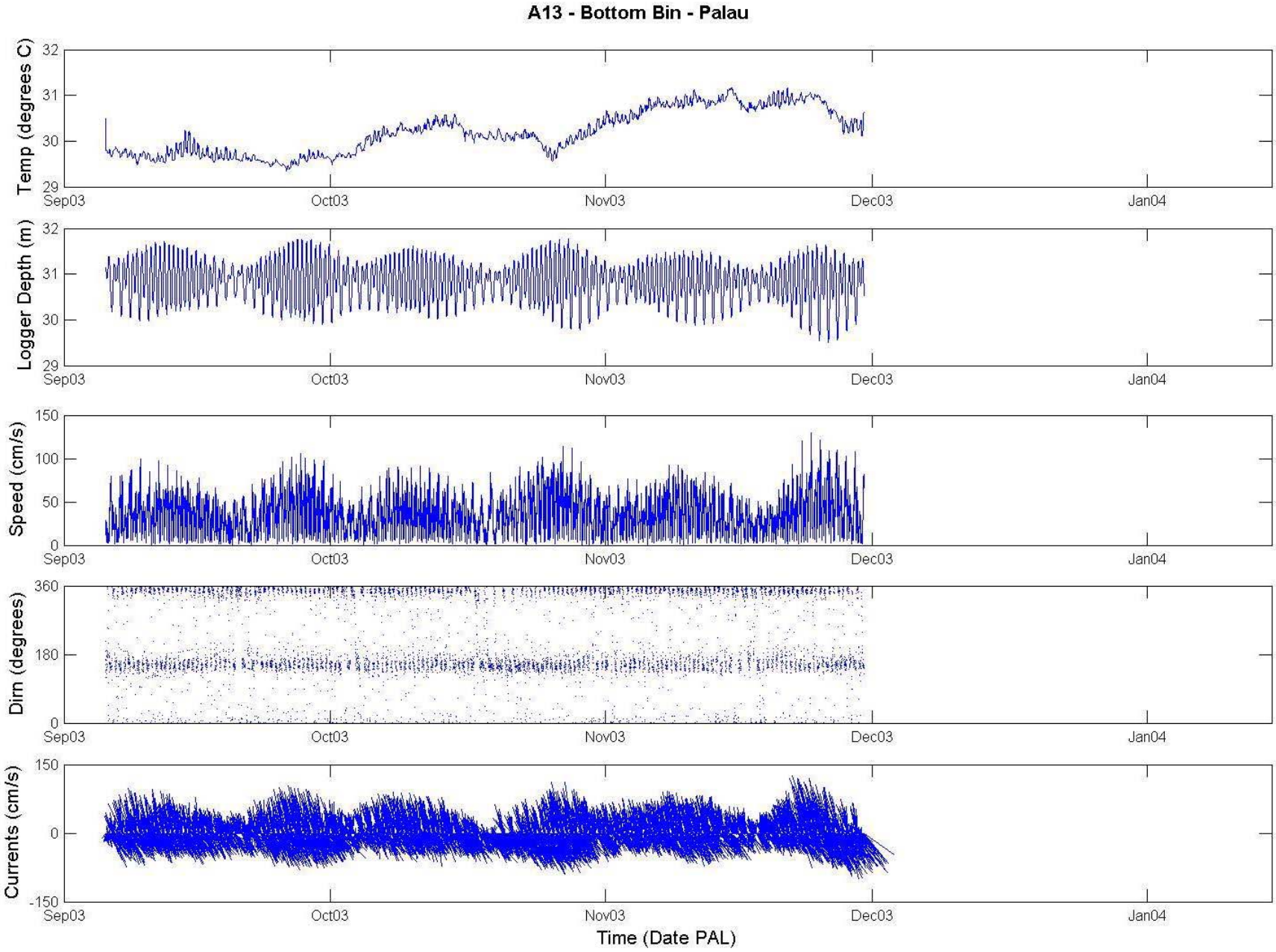

A11c - Top Bin - Palau
Temp (degrees C)
31.5
31
30.5
30
29.5
Logger Depth (m)
24
23
22
21
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
11/01
14/01
17/01
20/01
23/01
26/01
29/01
01/02
04/02
Time (Date PAL)

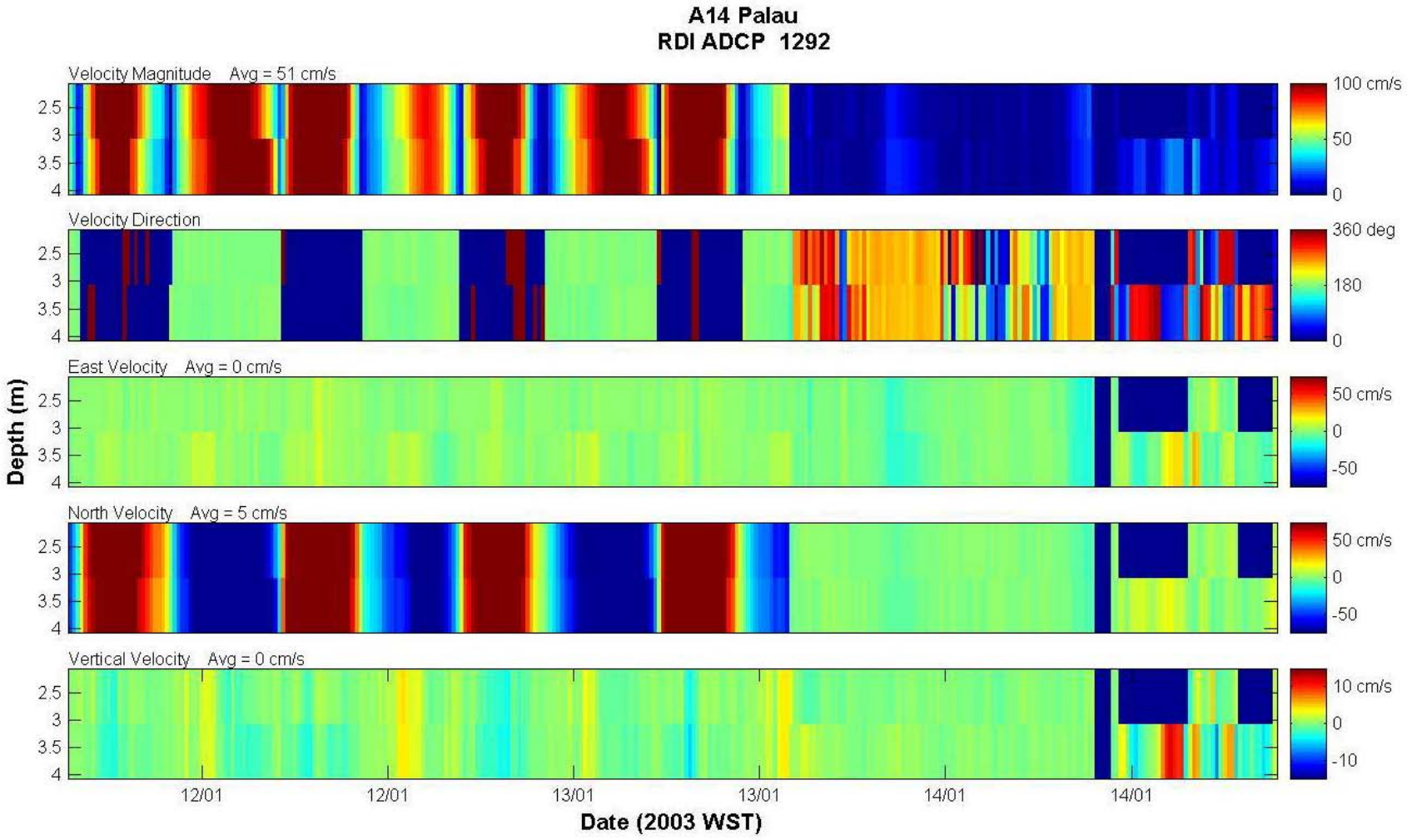

A11c - Bottom Bin - Palau
Temp (degrees C)
31.5
31
30.5
30
29.5
Logger Depth (m)
24
23
22
21
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
11/01
14/01
17/01
20/01
23/01
26/01
29/01
01/02
04/02
Time (Date PAL)

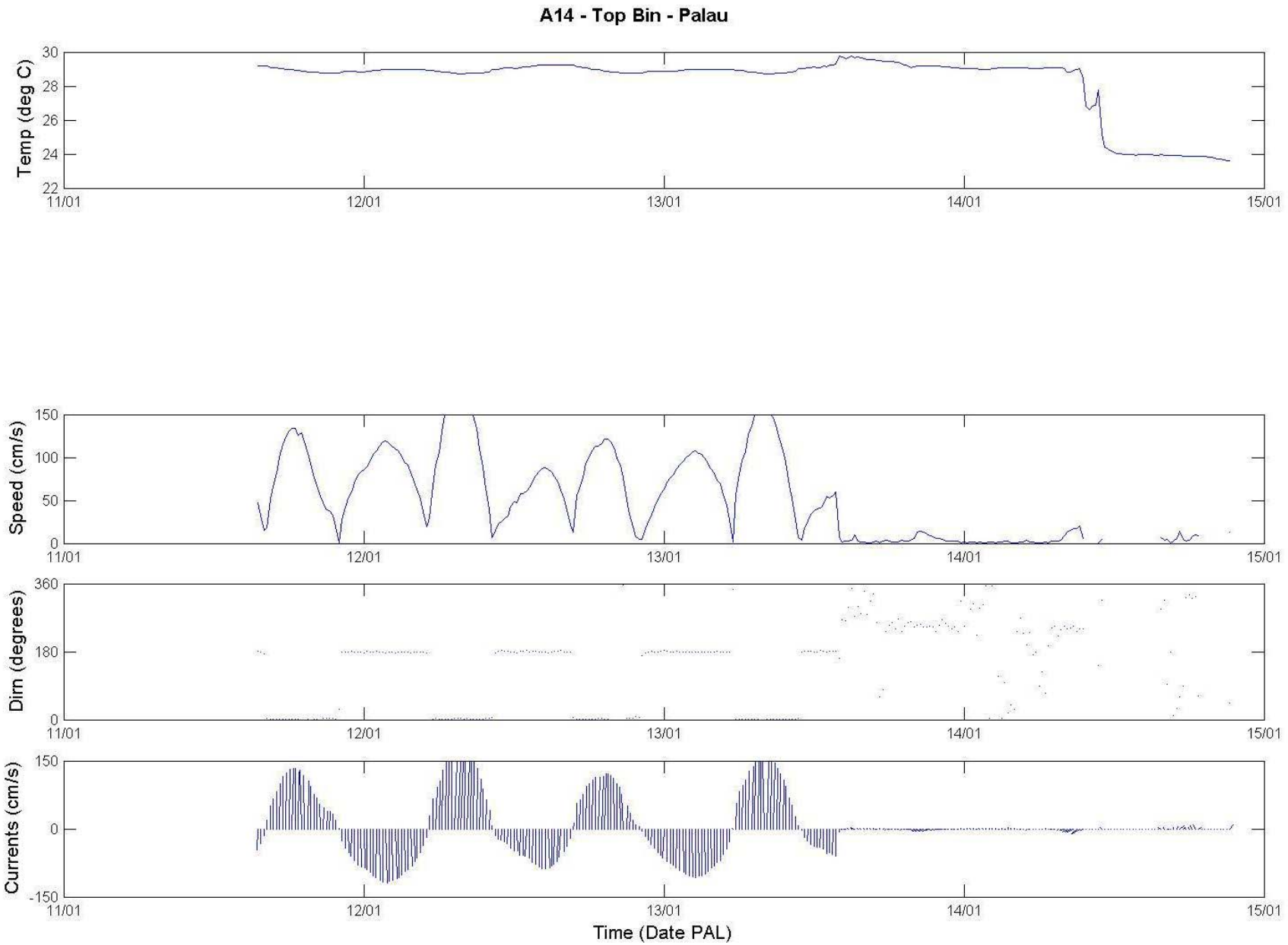

A12 - Palau
Temp (degrees C)
31
30.5
30
29.5
29
Logger Depth (m)
13
12
11
10
Speed (cm/s)
10
5
0
Dirn (degrees)
360
180
0
Currents (cm/s)
5
0
-5
03/09
10/09
17/09
24/09
01/10
08/10
Time (Date PAL)

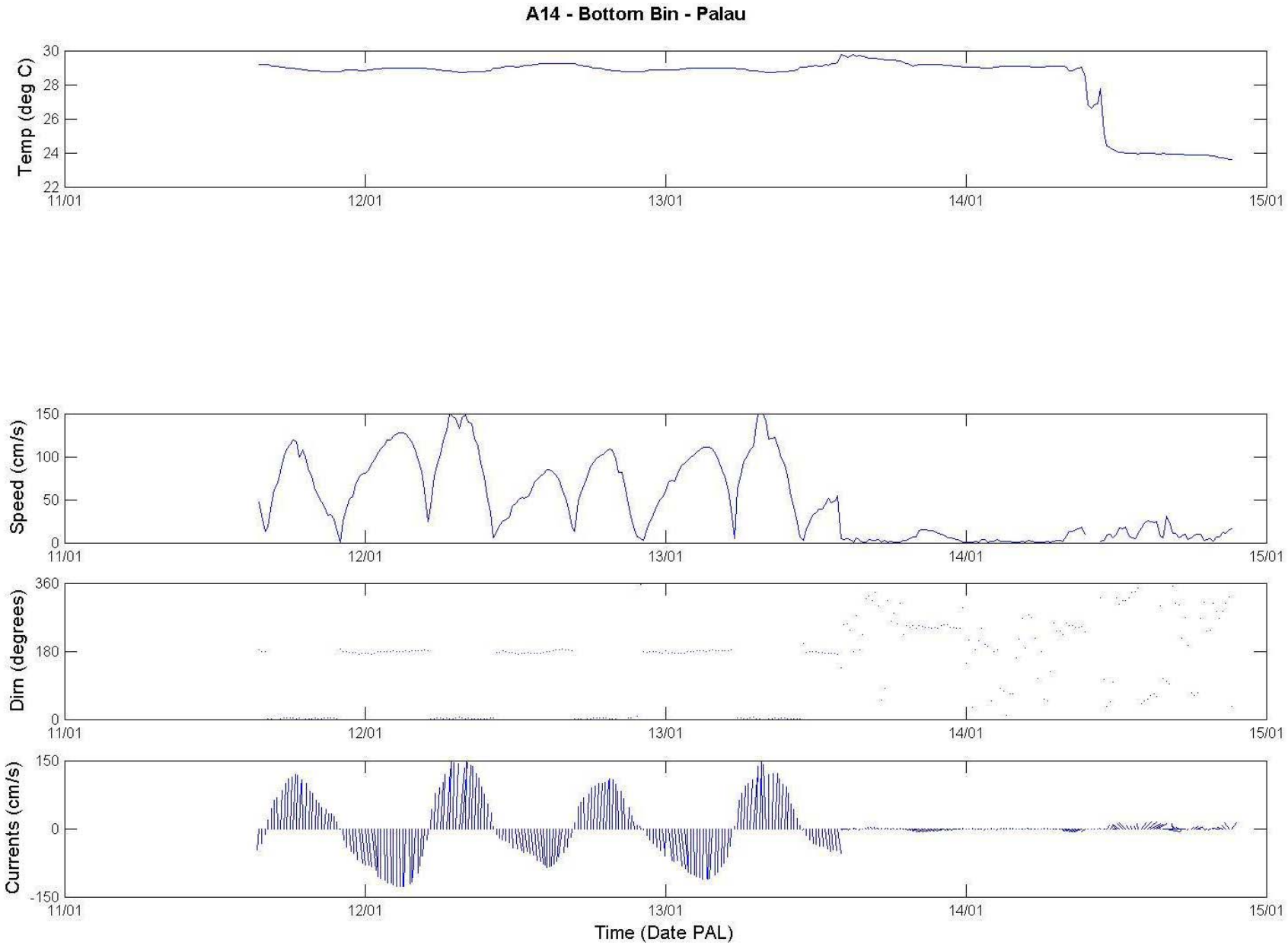

A13 Palau
Nortek Aquadop Current Profiler 866
Velocity Magnitude Avg = 44 cm/s
100 cm/s
50
0
Velocity Direction
360 deg
180
0
East Velocity Avg = 0 cm/s
50 cm/s
0
-50
North Velocity Avg = -1 cm/s
50 cm/s
0
-50
Vertical Velocity Avg = -3 cm/s
10 cm/s
0
-10
Depth (m)
10
20
30
06/09
16/09
26/09
06/10
16/10
26/10
05/11
15/11
25/11
Date (2003 WST)


A13 - Top Bin - Palau
Temp (degrees C)
32
31
30
29
Logger Depth (m)
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
-150
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)


A13 - Bottom Bin - Palau
Temp (degrees C)
32
31
30
29
Logger Depth (m)
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
-150
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)

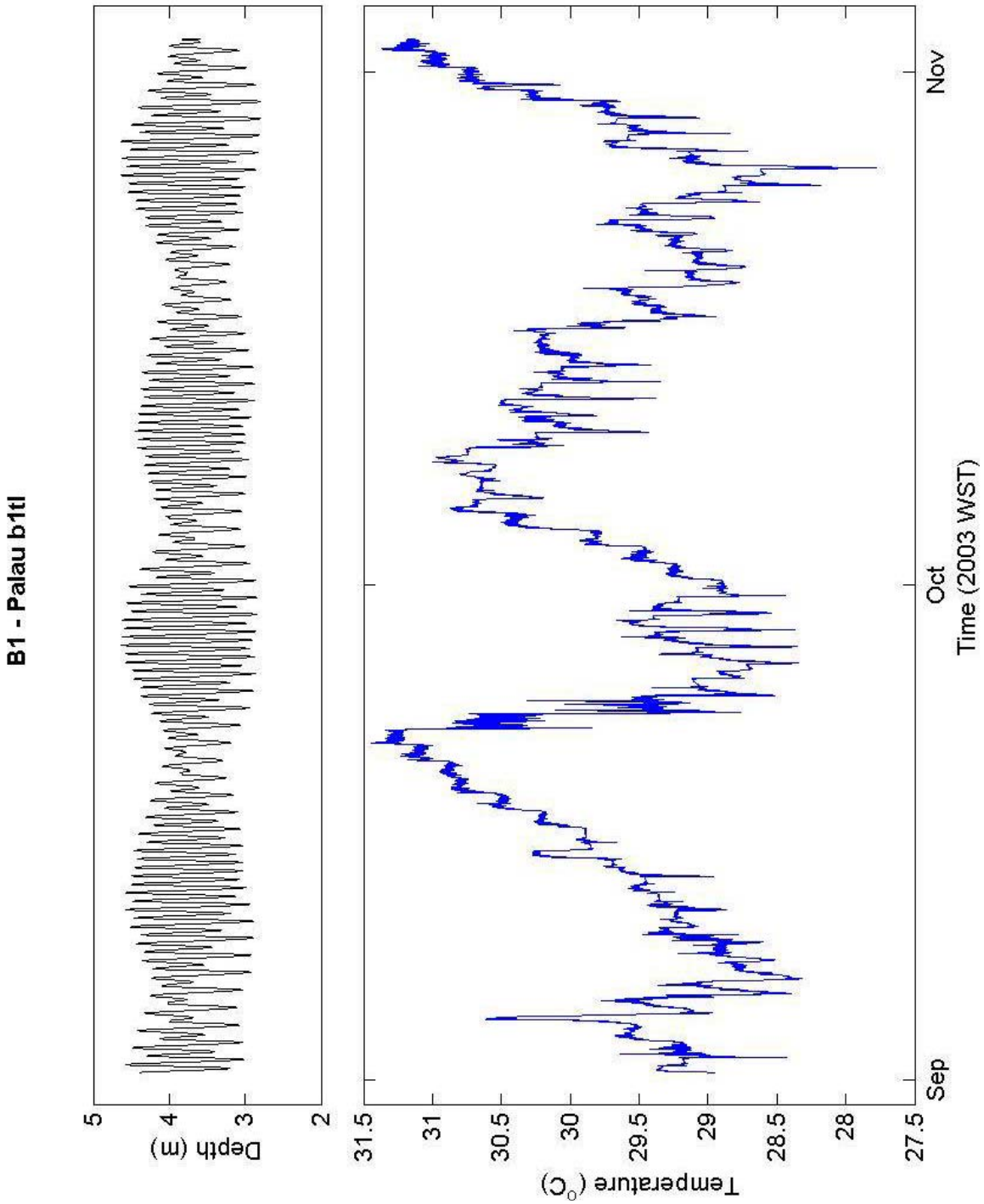

A14 Palau
RDI ADCP 1292
Velocity Magnitude Avg = 51 cm/s
100 cm/s
50
0
Velocity Direction
360 deg
180
0
East Velocity Avg = 0 cm/s
50 cm/s
0
-50
North Velocity Avg = 5 cm/s
50 cm/s
0
-50
Vertical Velocity Avg = 0 cm/s
10 cm/s
0
-10
Depth (m)
2.5
3
3.5
4
12/01
12/01
13/01
13/01
14/01
14/01
Date (2003 WST)

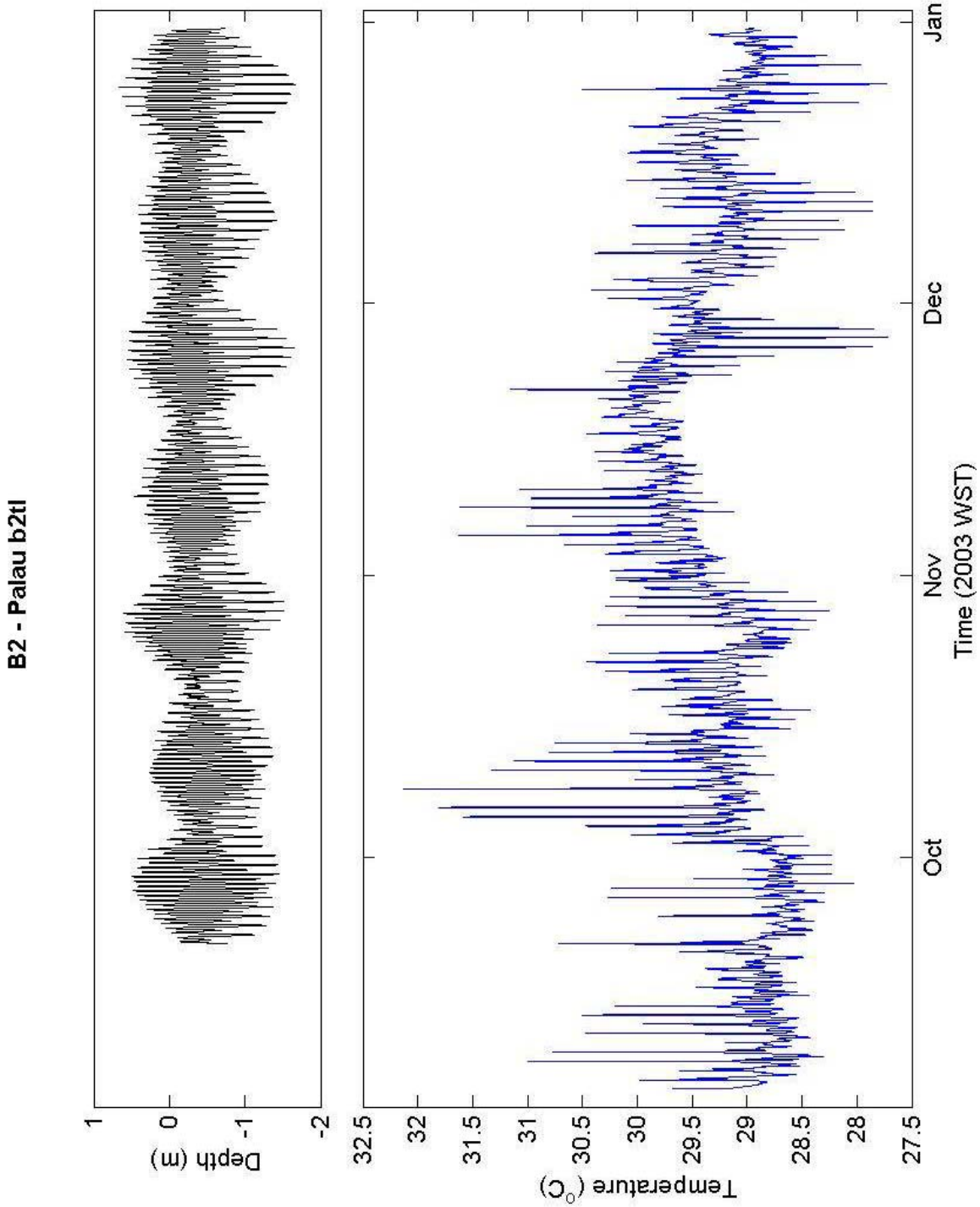

A14 - Top Bin - Palau
Temp (deg C)
30
28
26
24
22
11/01
12/01
13/01
14/01
15/01
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Time (Date PAL)

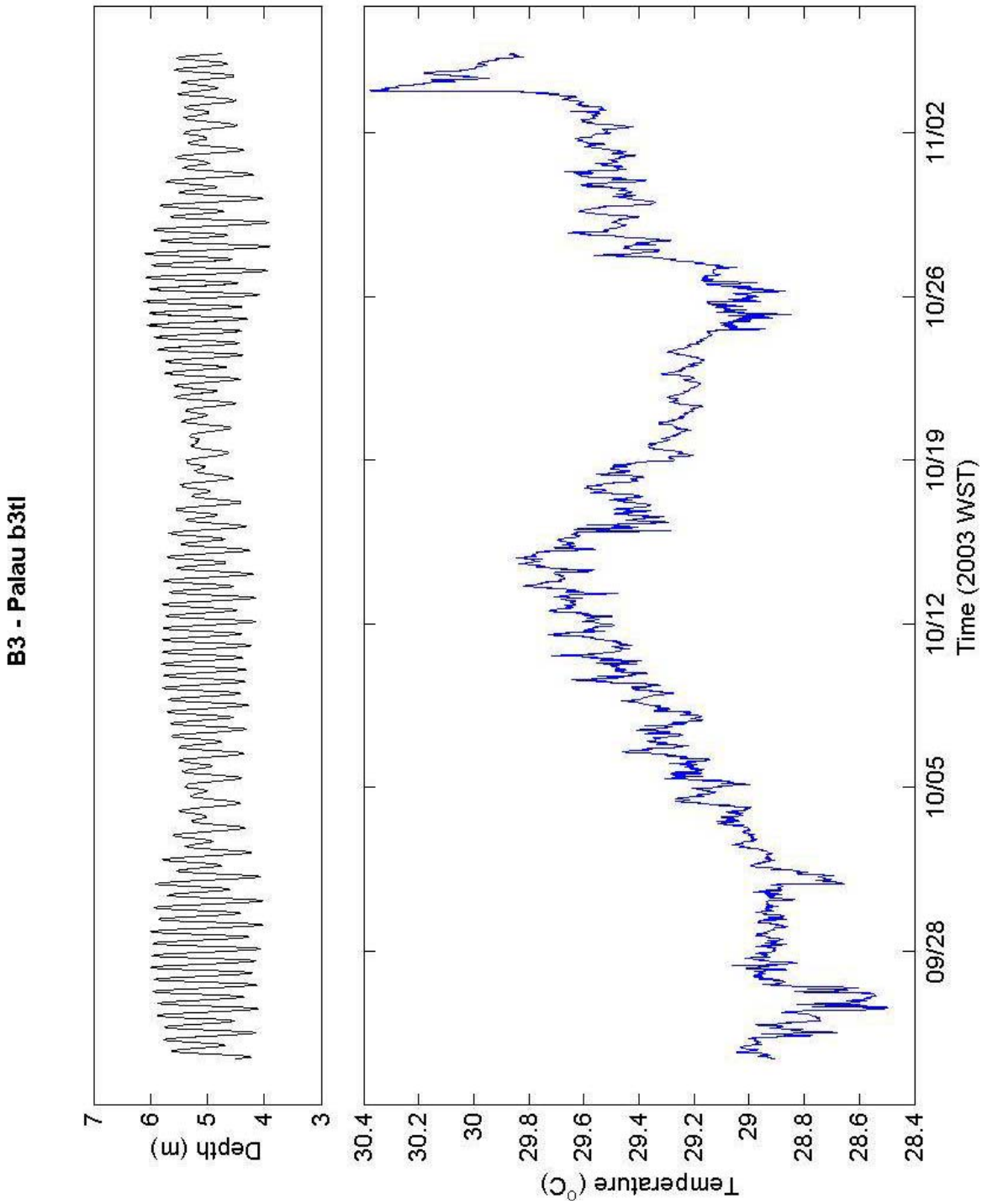

A14 - Bottom Bin - Palau
Temp (deg C)
30
28
26
24
22
11/01
12/01
13/01
14/01
15/01
Speed (cm/s)
150
100
50
0
Dirn (degrees)
360
180
0
Currents (cm/s)
150
0
-150
Time (Date PAL)

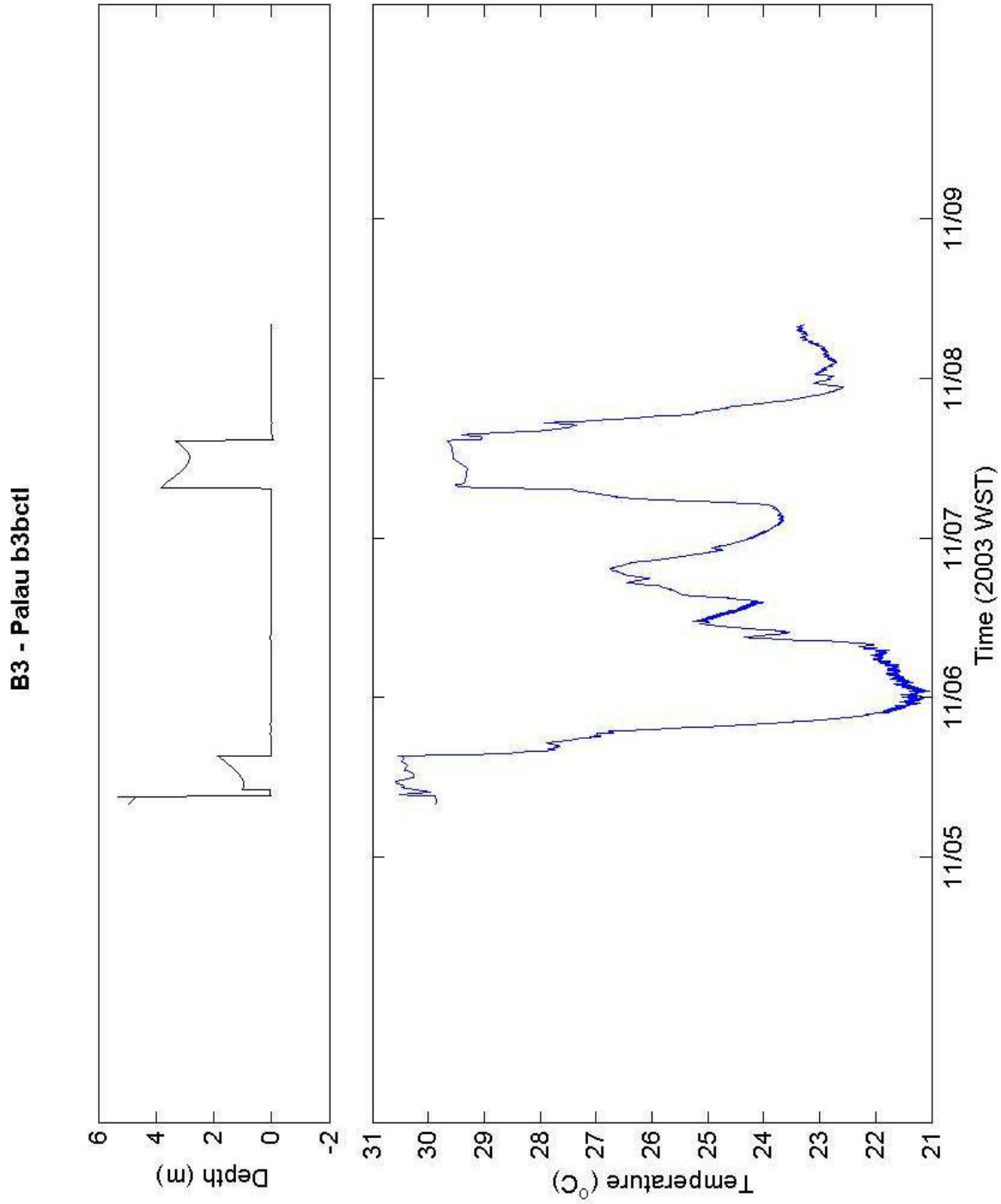
Appendix I – Time Series Plots of Tide Gauge Data

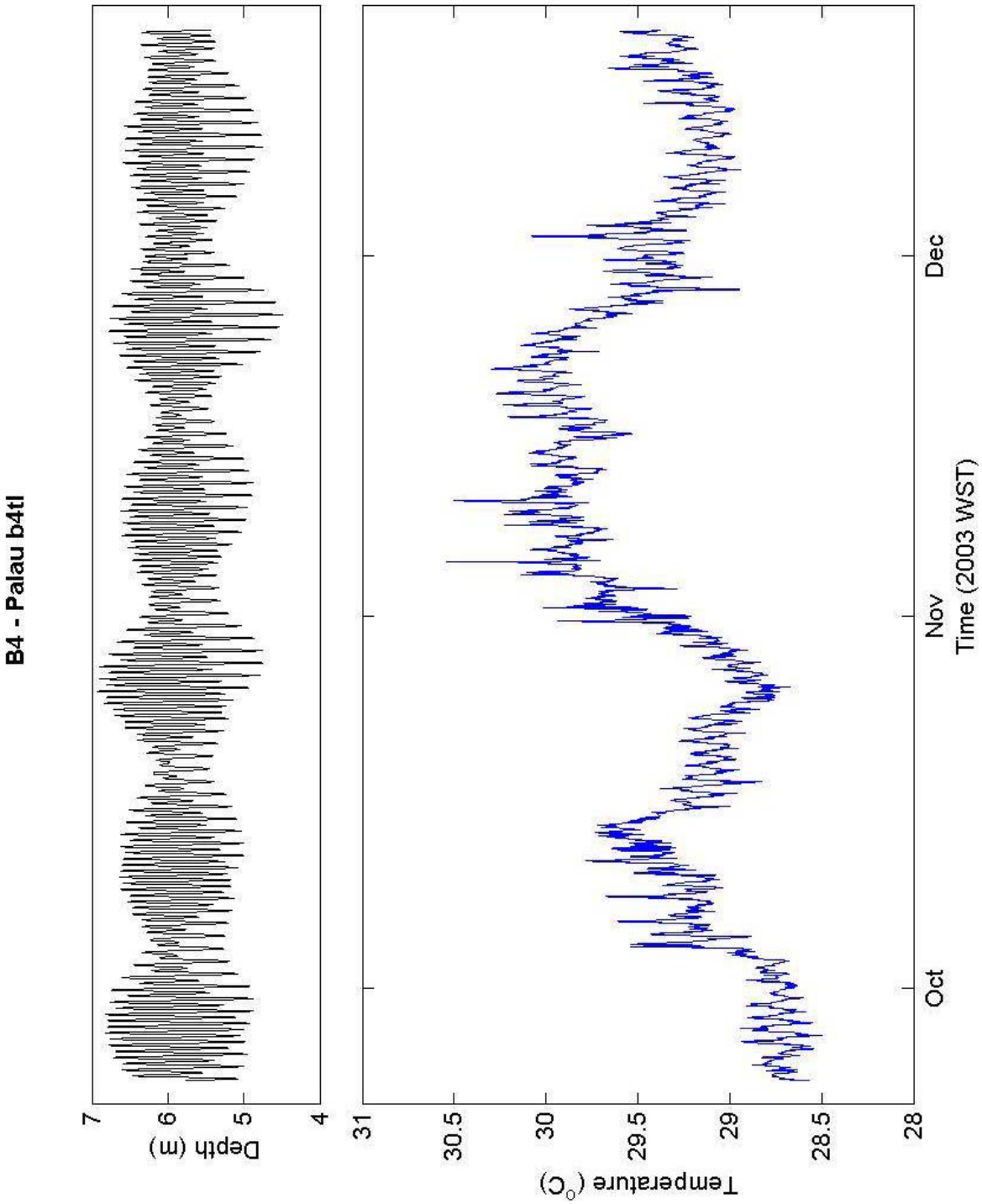
Tide gauge data are presented as plots of depth and temperature for each deployment. Note that deployments B3b and B3c are presented as a single graph. The two deployments can be clearly seen from the depth graph by observing the surface-interval between them.

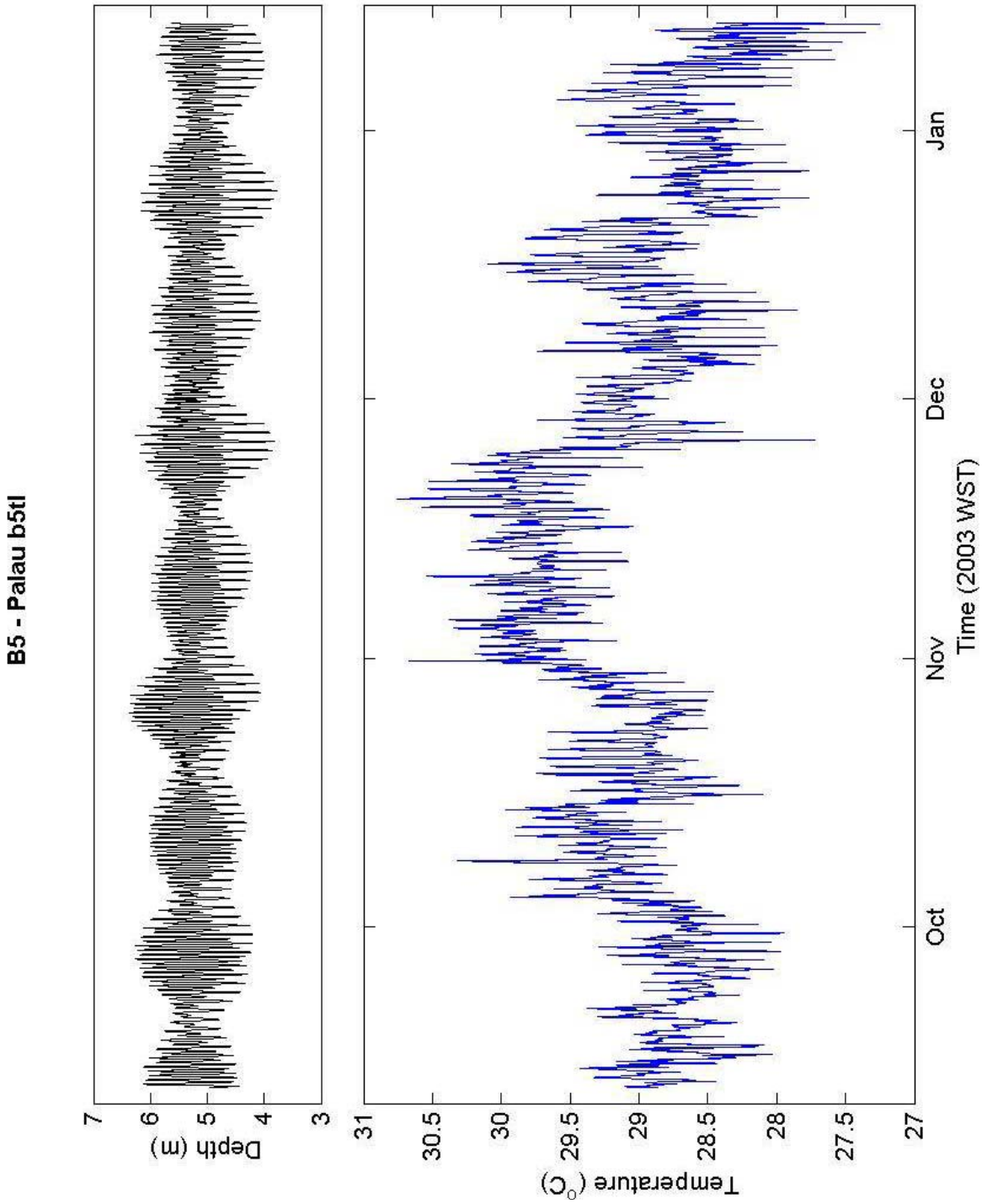

B1 - Palau b1tl
Depth (m)
5
4
3
2
Temperature (°C)
31.5
31
30.5
30
29.5
29
28.5
28
27.5
Sep
Oct
Nov
Time (2003 WST)

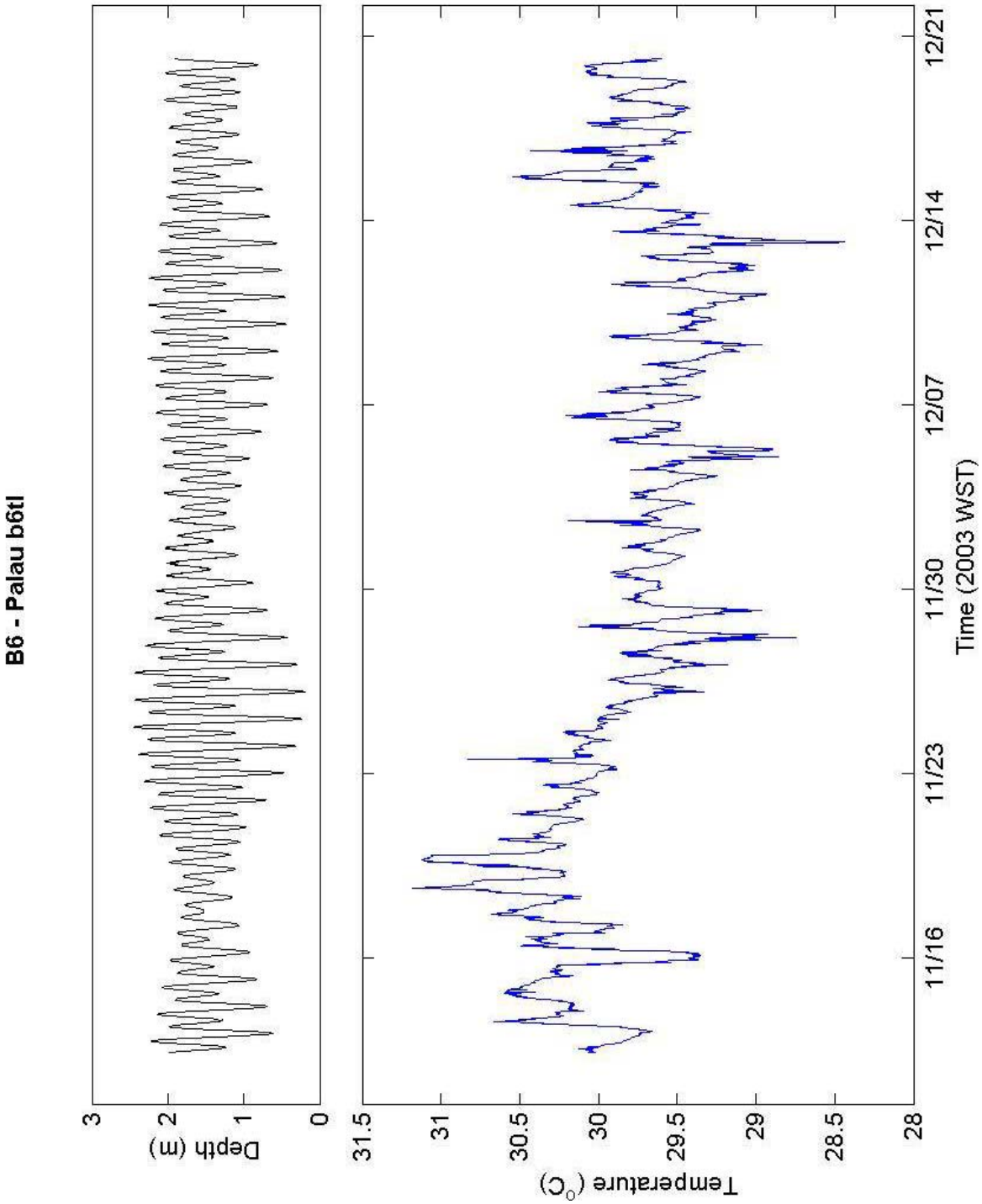

B2 - Palau b2tl
Depth (m)
1
0
-1
-2
Temperature (°C)
32.5
32
31.5
31
30.5
30
29.5
29
28.5
28
27.5
Oct
Nov
Dec
Jan
Time (2003 WST)


B3 - Palau b3tl
Depth (m)
7
6
5
4
3
Temperature (°C)
30.4
30.2
30
29.8
29.6
29.4
29.2
29
28.8
28.6
28.4
09/28
10/05
10/12
10/19
10/26
11/02
Time (2003 WST)


B3 - Palau b3bctl
Depth (m)
6
4
2
0
-2
Temperature (°C)
31
30
29
28
27
26
25
24
23
22
21
11/05
11/06
11/07
11/08
11/09
Time (2003 WST)

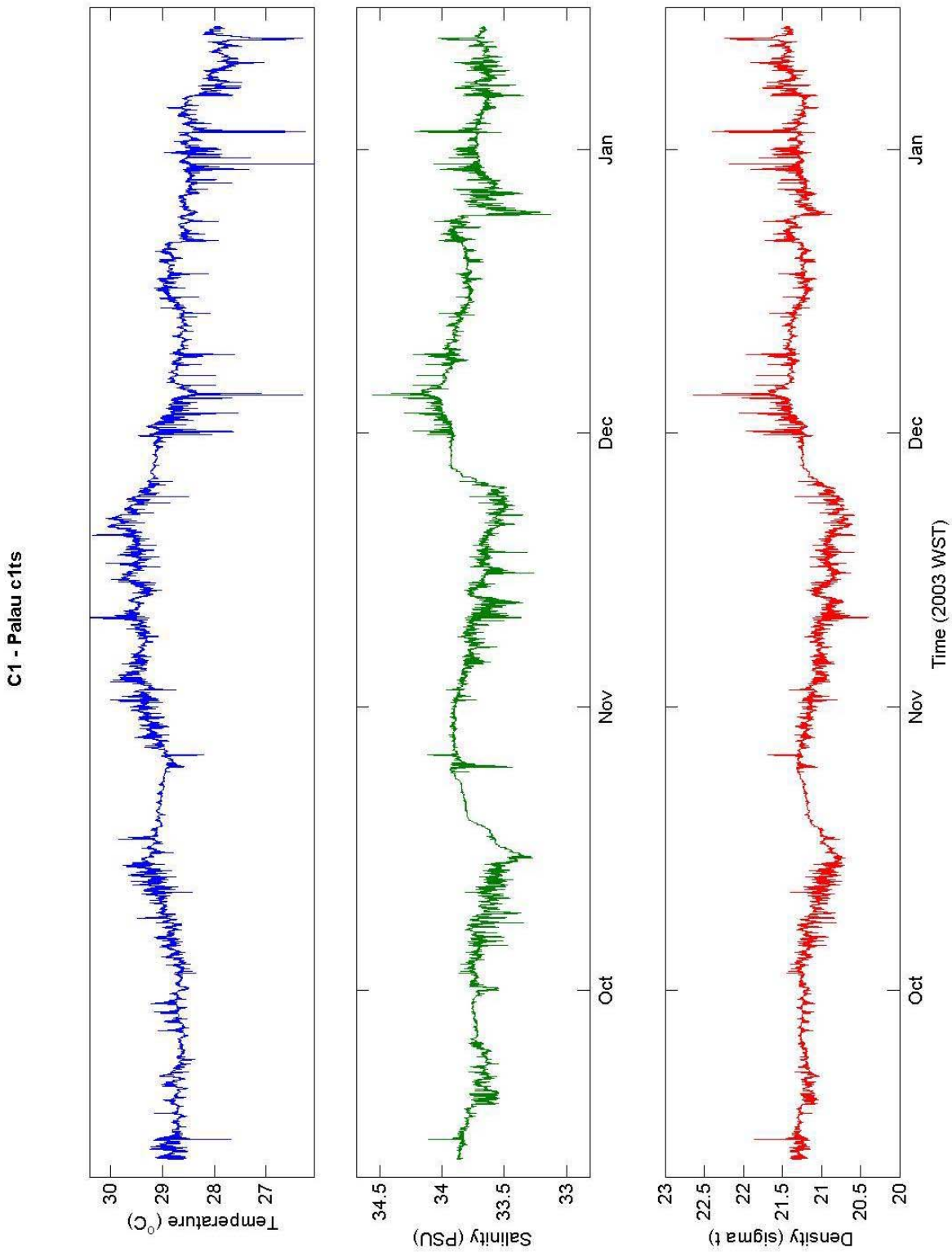

B4 - Palau b4tl
Depth (m)
7
6
5
4
Temperature (°C)
31
30.5
30
29.5
29
28.5
28
Oct
Nov
Dec
Time (2003 WST)

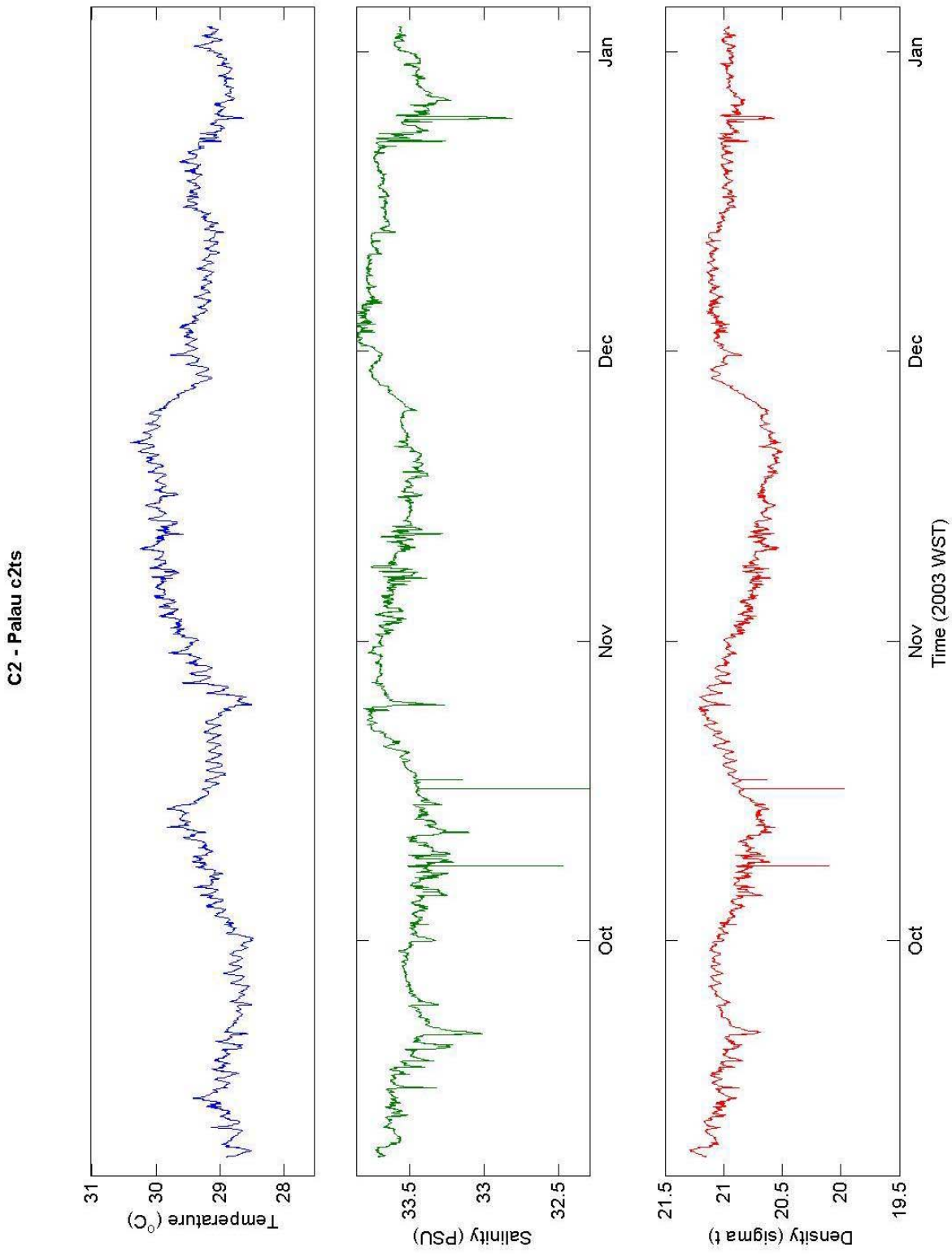

B5 - Palau b5tl
Depth (m)
7
6
5
4
3
Temperature (°C)
31
30.5
30
29.5
29
28.5
28
27.5
27
Oct
Nov
Dec
Jan
Time (2003 WST)

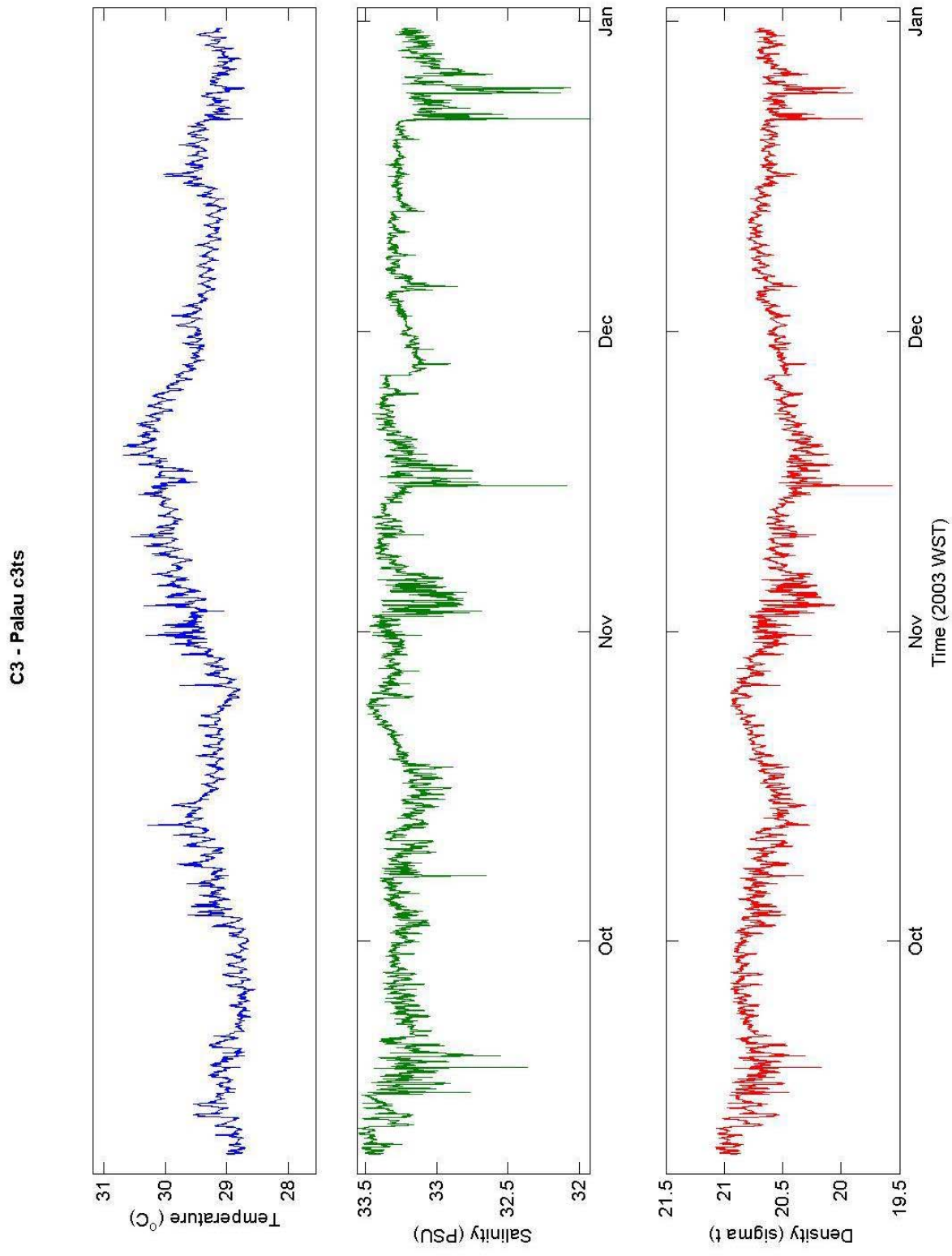

B6 - Palau b6tl
Depth (m)
3
2
1
0
Temperature (°C)
31.5
31
30.5
30
29.5
29
28.5
28
11/16
11/23
11/30
12/07
12/14
12/21
Time (2003 WST)

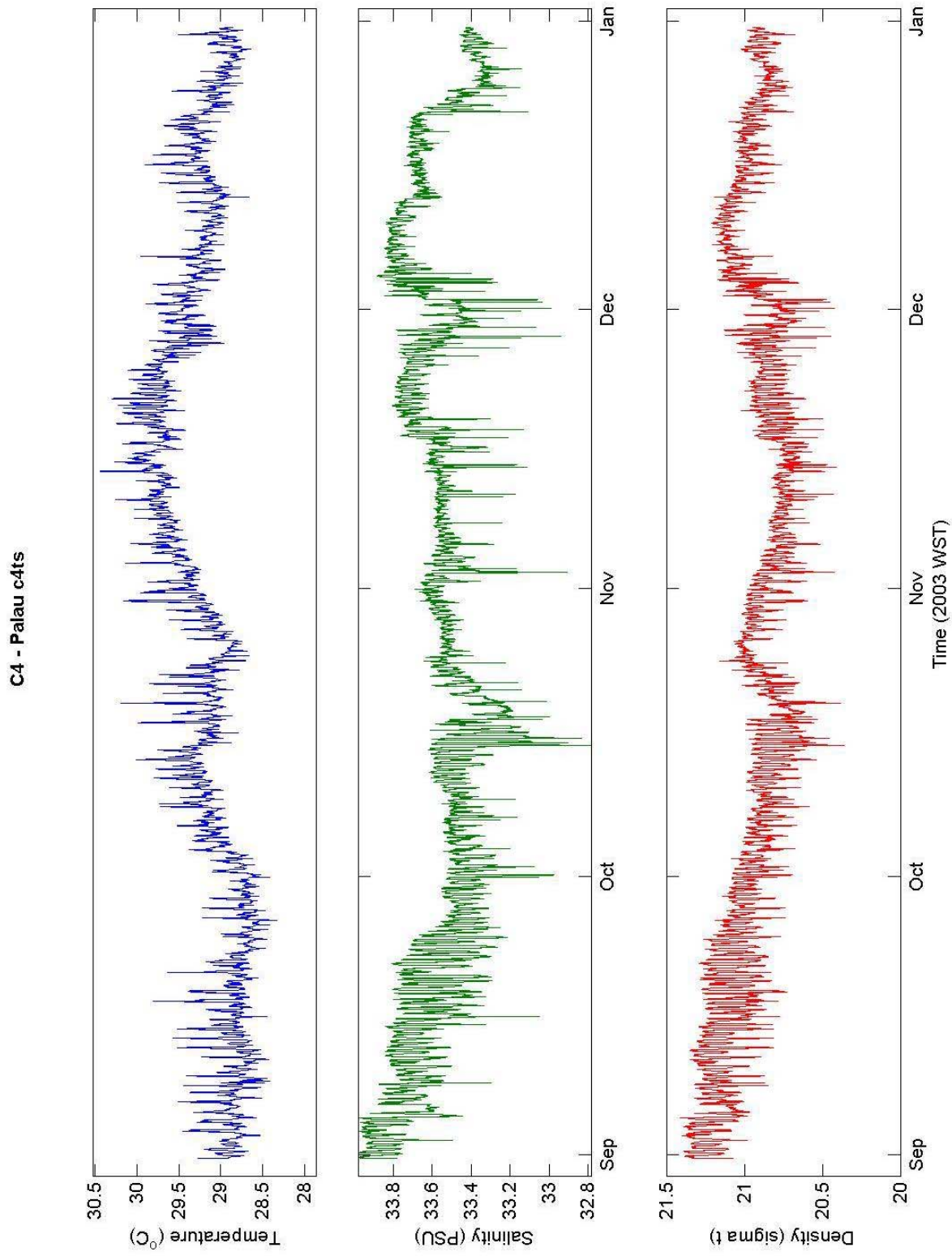
Appendix J – Time Series Plots of Salinity Data

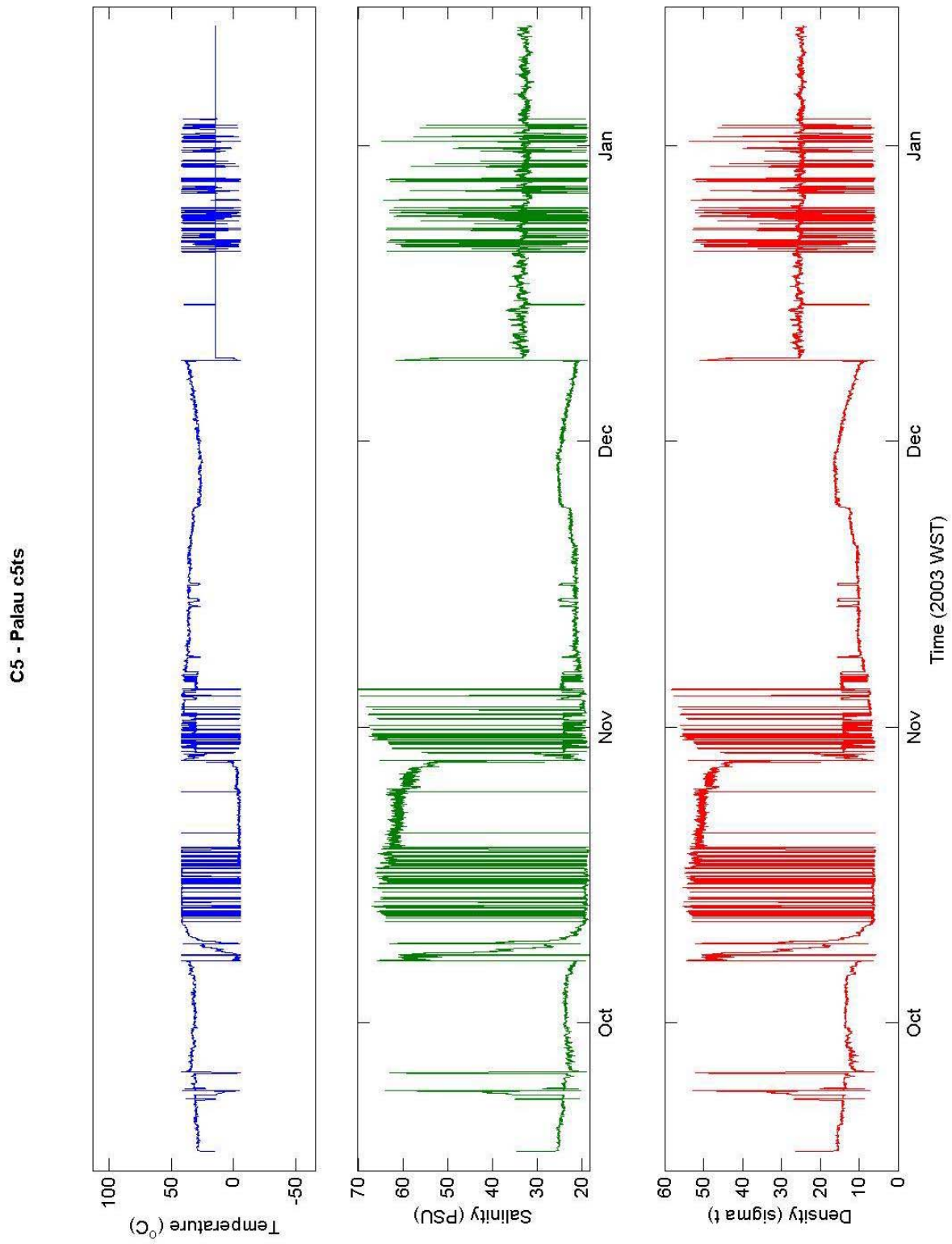
Salinity values were determined from measurements of conductivity and temperature. The density anomaly (sigma-t), the increase in the density of the sea-water sample from that of fresh-water (1000 $kg.m^{-3}$), can be derived from the temperature and salinity. Three time-series plots (temperature, salinity and density anomaly) are presented for each instrument.


C1 - Palau c1ts
Temperature (°C)
30
29
28
27
Salinity (PSU)
34.5
34
33.5
33
Density (sigma t)
23
22.5
22
21.5
21
20.5
20
Oct
Nov
Dec
Jan
Time (2003 WST)


C2 - Palau c2ts
Temperature (°C)
31
30
29
28
Salinity (PSU)
33.5
33
32.5
Density (sigma t)
21.5
21
20.5
20
19.5
Oct
Nov
Dec
Jan
Time (2003 WST)


C3 - Palau c3ts
Temperature (°C)
31
30
29
28
Salinity (PSU)
33.5
33
32.5
32
Density (sigma t)
21.5
21
20.5
20
19.5
Oct
Nov
Dec
Jan
Time (2003 WST)


C4 - Palau c4ts
Temperature (°C)
30.5
30
29.5
29
28.5
28
Salinity (PSU)
33.8
33.6
33.4
33.2
33
32.8
Density (sigma t)
21.5
21
20.5
20
Sep
Oct
Nov
Dec
Jan
Time (2003 WST)


C5 - Palau c5ts
Temperature (°C)
100
50
0
-50
Salinity (PSU)
70
60
50
40
30
20
Density (sigma t)
60
50
40
30
20
10
0
Oct
Nov
Dec
Jan
Time (2003 WST)

Appendix K – CTD Profiles

Conductivity Temperature and Depth (CTD) Cast Summary

CTD casts are named using the following naming convention: ddmmnnn, with dd being the day, mm the month and nnn being the cast number starting from zero. Data were processed from raw *.hex files to *.cnv using the manufacturer software. They were then edited to in-water values.

The tables below summarise the cast locations from each survey in September and November 2003. The *Site* column identifies the CTD location. If the profile was recorded near deployed instruments, the site is referenced by the instrument code; e.g., cast 2109000 was taken near temperature profile T4. The information is contained in the ASCII file castdata.dat.

MATLAB uses this information to process the data into *.mat files and produce figures (*.emf). The data from each cast are presented here in two plots. The time, locations and depths, obtained from the original file header information, are included in the title. The first plot illustrates the variation with depth of the temperature, salinity and density anomaly. The second plot combines these three variables (contours of density anomaly are shown on the axes) on a two-dimensional graph. In this representation, a grouping of data indicates a specific type of water.

As an example, the second plot from cast 1909001 (page 136) is analysed. Two distinct water types are observed; to the right of the diagram, water with near-constant salinity (33.7 psu) and density anomaly (21.12) shows a temperature range of 28.88 – 28.91°C; on the left of the diagram, water with near-constant temperature (28.89°C) has variable salinity (33.5 – 33.6 psu) and density anomaly (20.99 – 21.07).

Table 5 List of CTD profiles taken during September 2003

Cast	Site	Lat [°]	Lat [min]	Lon [°]	Lon [min]	Cast Depth
1909000	018	7	6.857	134	15.937	24.5
1909001	019	7	8.073	134	17.910	15.8
1909002	020	7	9.686	134	19.861	25
1909003	021	7	10.880	134	21.754	26
1909004	022	7	12.783	134	23.249	18.5
1909005	023	7	13.054	134	26.643	27
1909006	026	7	15.351	134	27.651	28
1909007	025	7	16.966	134	27.922	22
1909008	026	7	17.672	134	27.459	13.8
1909009	027	7	18.653	134	27.605	14.7
1909010	028	7	19.858	134	27.887	29.5

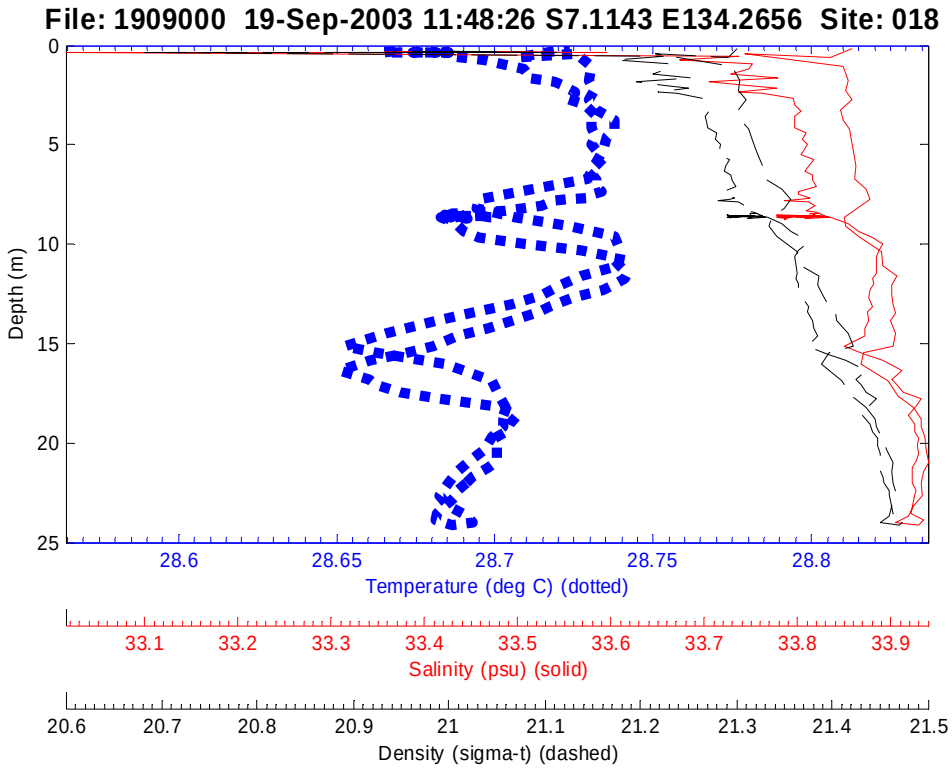
1909011	029	7	20.230	134	27.941	13
2109000	T4	7	19.772	134	30.034	15
2109001	A2	7	19.315	134	29.400	13
2109002	031	7	19.071	134	29.707	20
2109003	032	7	18.689	134	30.115	1.9
2109004	033	7	18.493	134	30.627	1.4
2109005	034	7	18.557	134	31.463	32
2109006	A13	7	19.034	134	31.459	33
2109007	036	7	20.033	134	31.250	33
2109008	037	7	20.430	134	31.025	26
2109009	038	7	21.106	134	30.723	29
2109010	KB	7	21.757	134	30.253	27.5
2109011	040	7	20.309	134	25.685	31
2109012	041	7	19.958	134	26.143	27.5
2109013	042	7	19.249	134	27.220	31
2209000	043	7	16.733	134	19.770	7.8
2209001	044	7	16.700	134	19.451	27
2209002	045	7	16.674	134	19.018	28
2209003	A4	7	16.621	134	18.807	20
2209004	048	7	17.468	134	16.796	9
2209005	049	7	17.426	134	16.410	15
2209006	050	7	17.487	134	16.000	13.8
2209007	051	7	17.378	134	15.676	3.7
2209008	052	7	16.579	134	20.219	24
2209009	053	7	15.444	134	21.278	29.7
2209010	054	7	15.959	134	22.529	26
2209011	055	7	15.839	134	23.821	22
2209012	T7	7	16.382	134	24.664	32
2209013	056	7	17.285	134	25.216	28
2209014	057	7	18.796	134	25.321	15

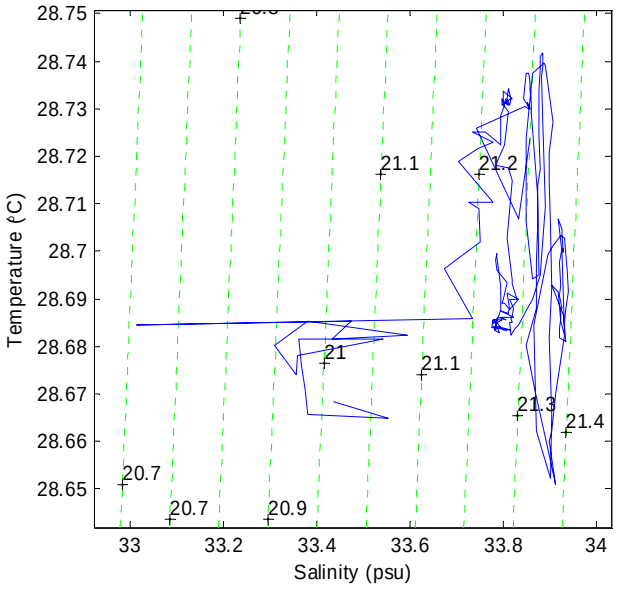
Table 6 List of CTD profiles taken during November 2003

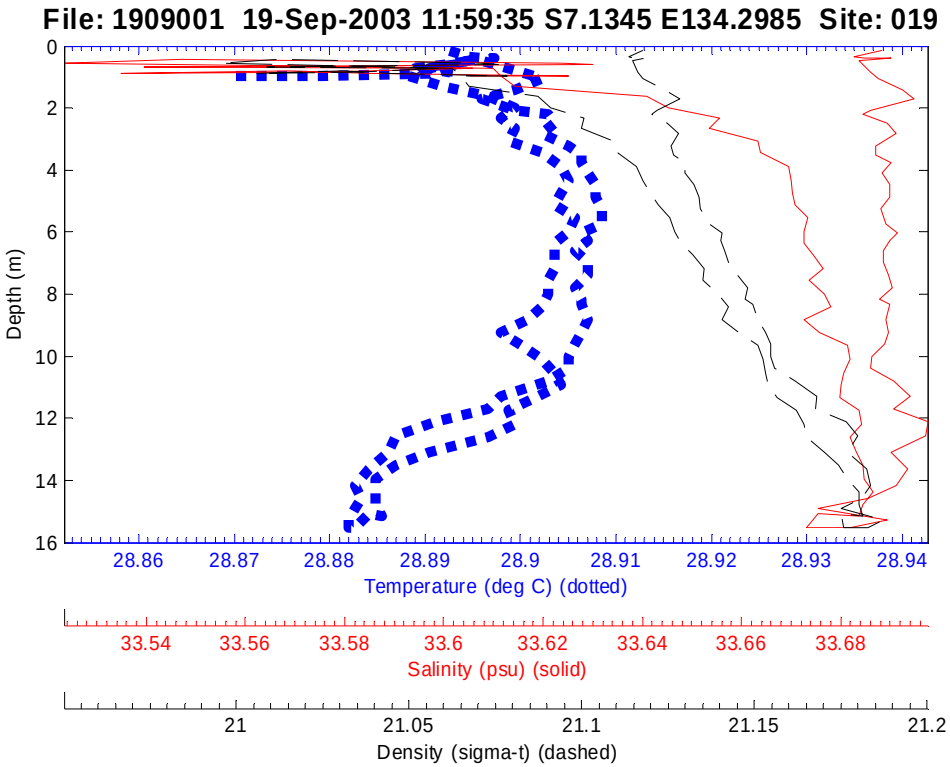
Cast	Site	Lat [°]	Lat [min]	Lon [°]	Lon [min]	Cast Depth	Sounder Depth
0311000	11b	7	18.8864	134	27.3167	29	33
0411000	CTD0	7	14.0504	134	27.0888	15	14.6
0411001	CTD1	7	14.0386	134	27.0801	20	14.8
0411002	CTD2	7	14.0366	134	27.0790	24	14.2
0411003	CTD3	7	12.6739	134	26.8814	27	134.5
0411004	CTD4	7	12.6008	134	25.3299	25	17.9
0411005	CTD5	7	12.5031	134	23.9171	3.2	0
0411006	CTD6	7	09.3991	134	25.0446	13.8	12.3

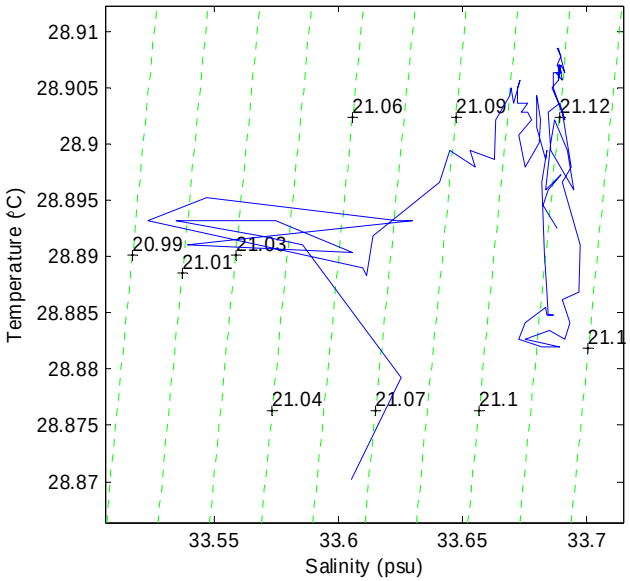
0411007	CTD7	7	12.7256	134	25.0439	21	21
0411008	CTD8	7	15.6579	134	24.9592	5.5	5.9
0411009	CTD9	7	16.1055	134	25.7940	6	5.8
0411010	CTD10	7	12.6050	134	25.8862	22.5	20.1
0411011	CTD11	7	09.4580	134	25.8855	27	282.8
0411012	CTD12	7	16.4348	134	26.6251	10	9.4
0411013	CTD13	7	17.3838	134	27.5574	14.9	14
0411014	CTD14	7	18.1537	134	28.3293	17	16.3
0511000	Tide	7	08.4912	134	17.8275	1	17.9
0511001	C2	7	08.4912	134	17.8275	19	17.9
0511002	CTD2	7	08.5862	134	16.1945	5.2	4.3
0511003	C1	7	08.6464	134	15.1383	7	8
0511004	CTD4	7	07.6638	134	15.0724	5.7	5.7
0511005	CTD5	7	08.9591	134	15.7566	5.5	10.2
0511006	CTD6	7	09.5599	134	16.0855	16	-
0511007	CTD7	7	09.8933	134	15.2803	17	16.5
0511008	CTD8	7	08.8731	134	16.4170	13.8	5.3
0511009	CTD9	7	08.0643	134	17.4009	4.2	4.2
0511010	CTD10	7	19.2354	134	21.0854	27.5	38
0511011	CTD11	7	21.5479	134	19.6039	26	24
0511012	CTD12	7	23.2839	134	18.4827	27	167.1
0511013	CTD13	7	26.8286	134	21.3439	27	111.8
0511014	CTD14	7	22.5419	134	23.2218	21	20.2
0511015	CTD14	7	21.7790	134	23.7905	27	28.1
0611000	CTD0	7	28.6144	134	23.7271	0.5	1.7
0611001	CTD1	7	29.5474	134	24.9141	15.5	14.6
0611002	CTD2	7	30.6139	134	26.1717	1.4	1.5
0611003	CTD3	7	31.0064	134	23.1289	0.5	3.1
0611004	CTD4	7	29.5404	134	25.0558	12.9	12.9
0611005	CTD5	7	29.5404	134	25.0558	27	-
0711000	CTD0	7	46.3574	134	35.6308	14.5	15.4
0711001	CTD1	7	50.7233	134	32.5500	12.7	11.9
0711002	CTD2	7	54.8317	134	30.2406	3.5	5
0711003	CTD3	7	56.3801	134	38.1900	28	29.5
0711004	CTD4	7	58.5619	134	40.2784	8	7.3
0711005	CTD5	7	59.5498	134	41.3447	1.1	1.1
0711006	CTD6	7	52.7399	134	39.9645	17	15.5
0711007	CTD7	7	50.9388	134	38.4327	22.5	21.9
0711008	CTD8	7	49.0609	134	36.6004	24	23.5
0711009	CTD9	7	46.3673	134	35.2366	13	10.7
0711010	CTD10	7	44.6621	134	34.6736	8.2	7.4
0711011	CTD11	7	43.5478	134	34.8441	2	2
0911000	11C1	7	16.9557	134	30.1576	17.7	27
0911001	11C2	7	15.8782	134	28.9070	21	20.1
0911002	11C3	7	14.8337	134	27.9863	19.3	18

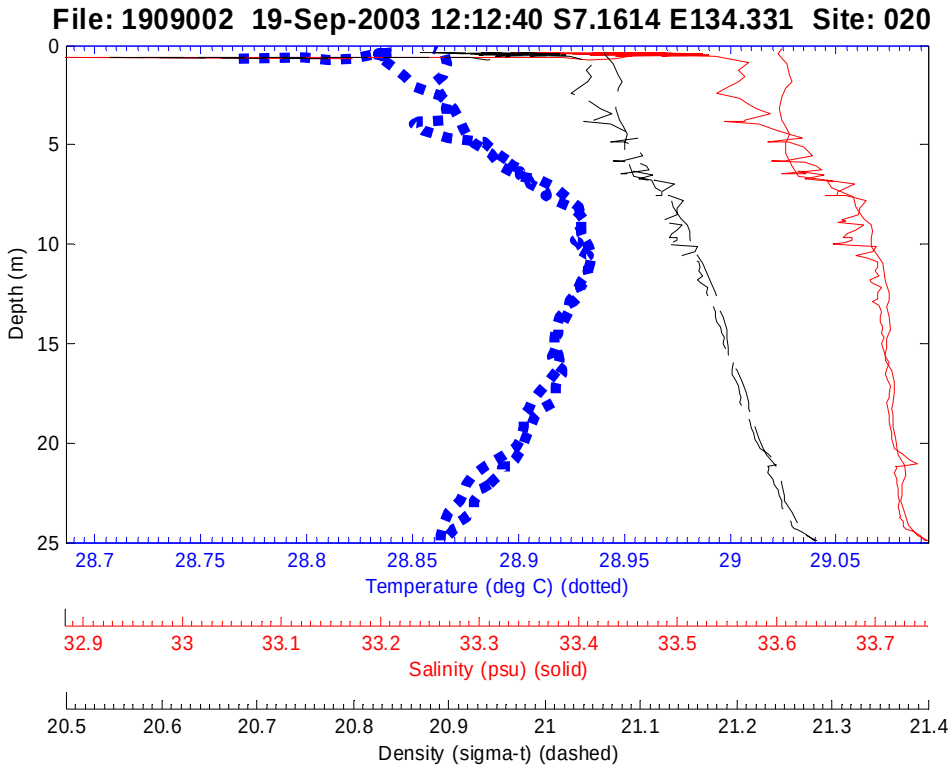
0911003	10A1	7	20.6072	134	34.3320	27	37.3
0911004	CTD4	7	22.0578	134	35.9943	27	1.5
1111000	6A	7	36.5044	134	31.3058	29	35.2
1111001	6Af	7	37.6915	134	33.0635	28	36.6
1111002	5As	7	39.6513	134	37.4472	6.9	1.1
1111003	5Af	7	38.1567	134	35.4293	24.5	33.5
1111004	5bs	7	37.7145	134	36.1149	19.5	19.5
1111005	5bf	7	40.6068	134	36.9029	26	0.9

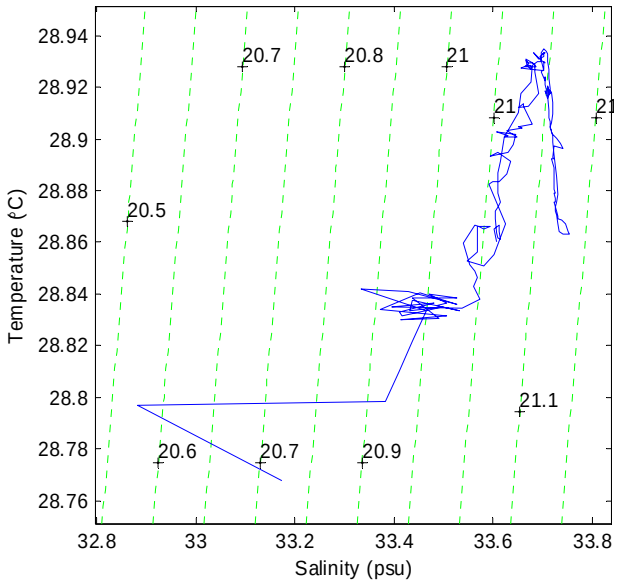

File: 1909000 19-Sep-2003 11:48:26 S7.1143 E134.2656 Site: 018
Depth (m)
0
5
10
15
20
25
28.6
28.65
28.7
28.75
28.8
Temperature (deg C) (dotted)
33.1
33.2
33.3
33.4
33.5
33.6
33.7
33.8
33.9
Salinity (psu) (solid)
20.6
20.7
20.8
20.9
21
21.1
21.2
21.3
21.4
21.5
Density (sigma-t) (dashed)

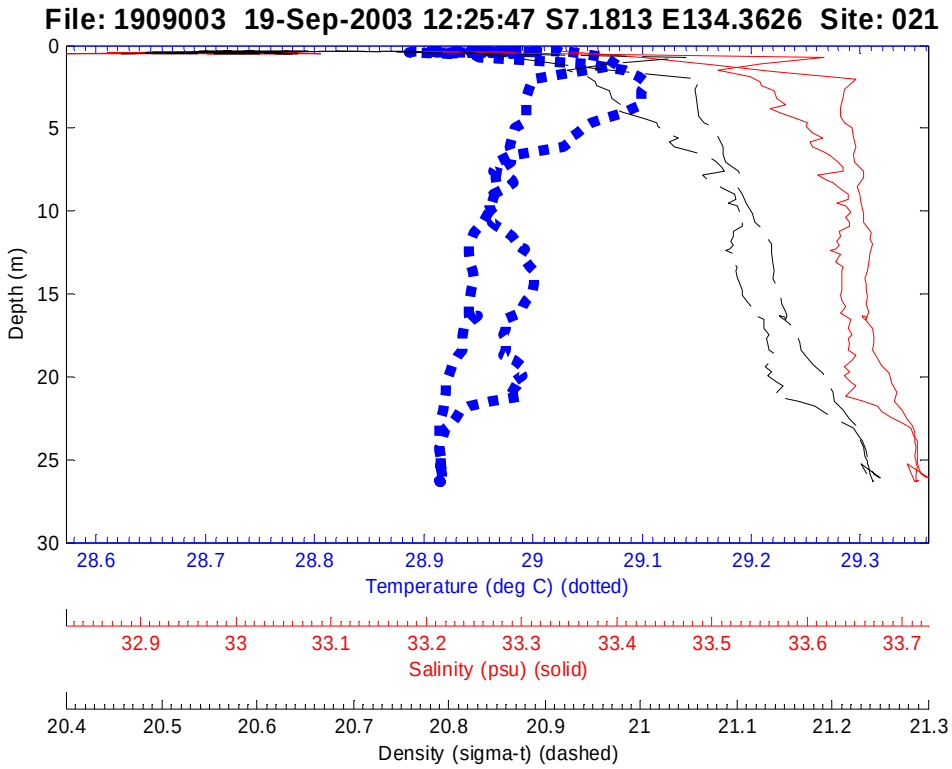

Temperature (C)
28.75
28.74
28.73
28.72
28.71
28.7
28.69
28.68
28.67
28.66
28.65
21.1
21.2
21
21.1
21.3
21.4
20.7
20.7
20.9
33
33.2
33.4
33.6
33.8
34
Salinity (psu)

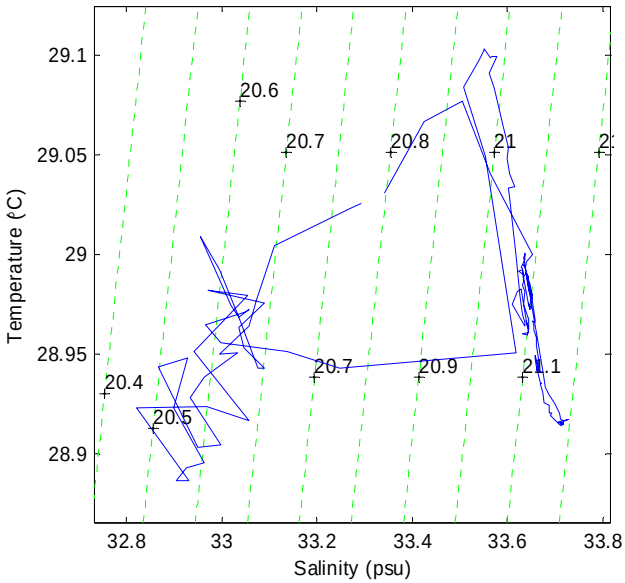

File: 1909001 19-Sep-2003 11:59:35 S7.1345 E134.2985 Site: 019
Depth (m)
0
2
4
6
8
10
12
14
16
28.86
28.87
28.88
28.89
28.9
28.91
28.92
28.93
28.94
Temperature (deg C) (dotted)
33.54
33.56
33.58
33.6
33.62
33.64
33.66
33.68
Salinity (psu) (solid)
21
21.05
21.1
21.15
21.2
Density (sigma-t) (dashed)

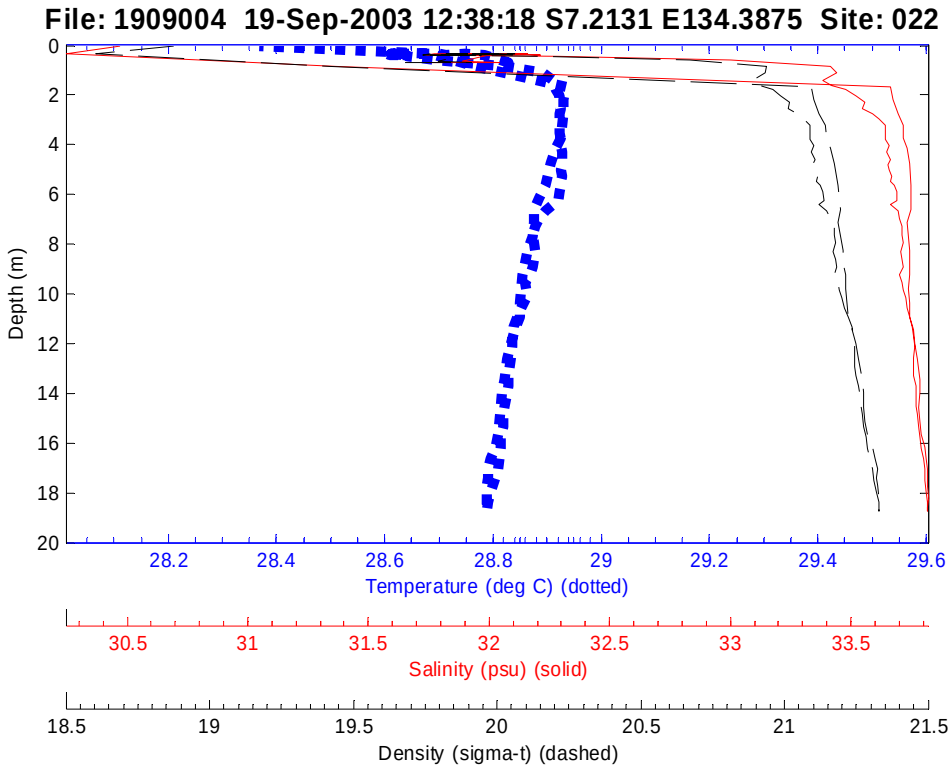

Temperature (°C)
28.91
28.905
28.9
28.895
28.89
28.885
28.88
28.875
28.87
21.06
21.09
21.12
20.99
21.03
21.01
21.1
21.04
21.07
21.1
33.55
33.6
33.65
33.7
Salinity (psu)

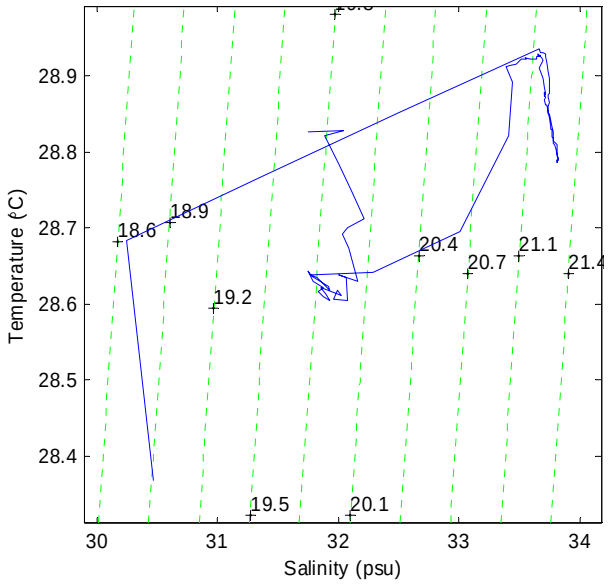

File: 1909002 19-Sep-2003 12:12:40 S7.1614 E134.331 Site: 020
Depth (m)
0
5
10
15
20
25
28.7
28.75
28.8
28.85
28.9
28.95
29
29.05
Temperature (deg C) (dotted)
32.9
33
33.1
33.2
33.3
33.4
33.5
33.6
33.7
Salinity (psu) (solid)
20.5
20.6
20.7
20.8
20.9
21
21.1
21.2
21.3
21.4
Density (sigma-t) (dashed)

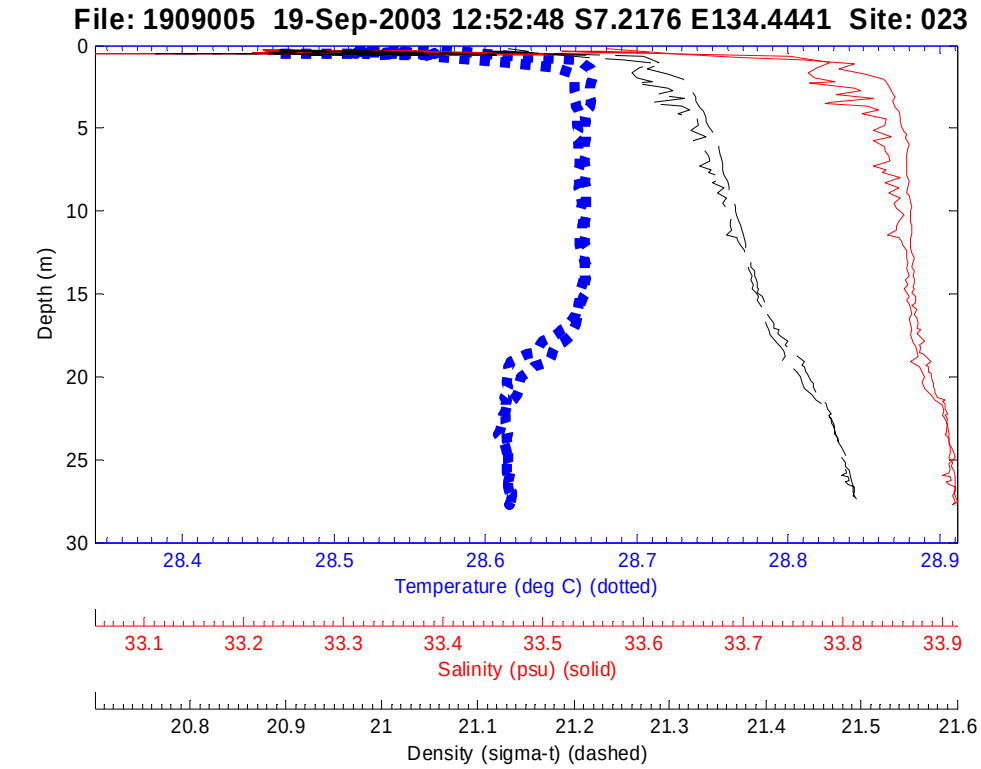

Temperature (C)
28.94
28.92
28.9
28.88
28.86
28.84
28.82
28.8
28.78
28.76
20.5
20.7
20.8
21
21
21
20.6
20.7
20.9
21.1
32.8
33
33.2
33.4
33.6
33.8
Salinity (psu)

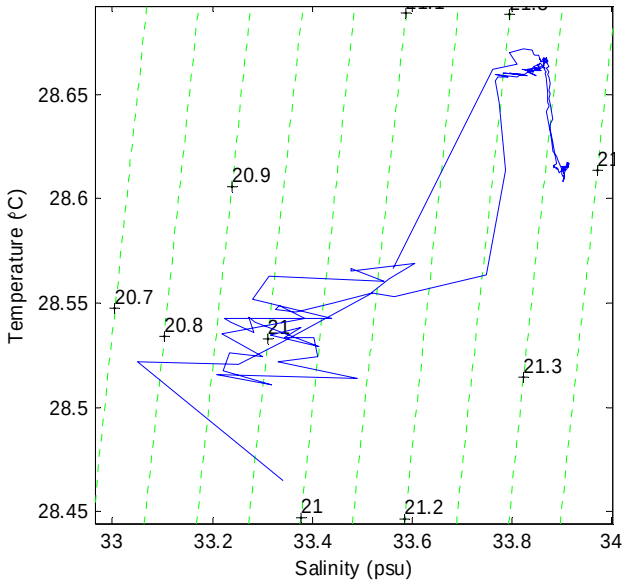

File: 1909003 19-Sep-2003 12:25:47 S7.1813 E134.3626 Site: 021
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

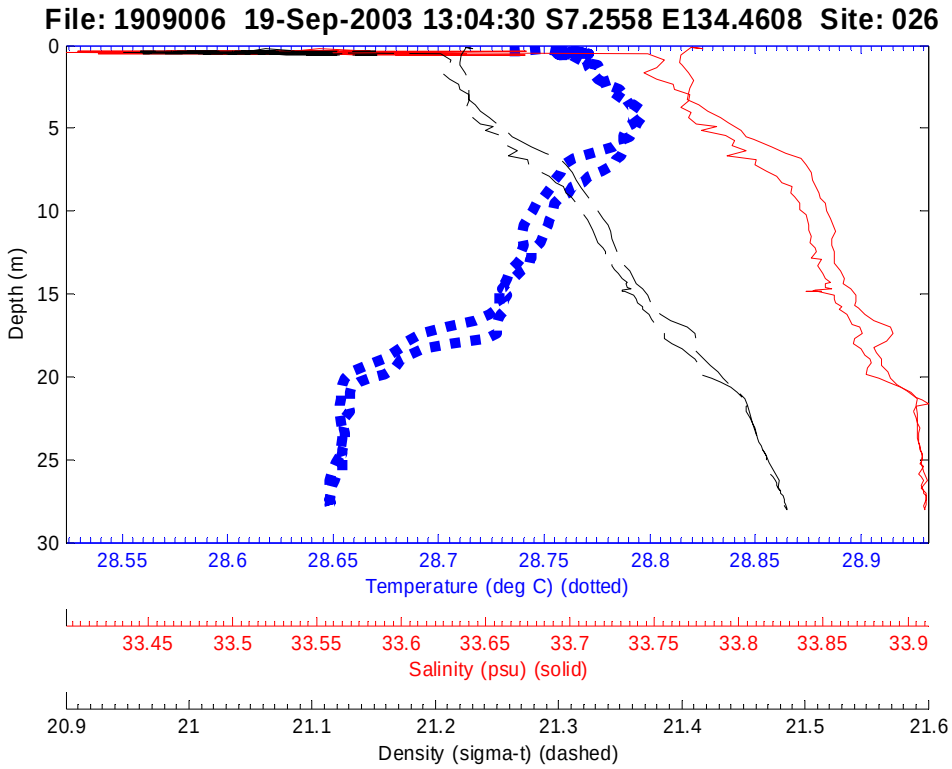

Temperature (C)
Salinity (psu)
20.4
20.5
20.6
20.7
20.8
20.9
21
21.1

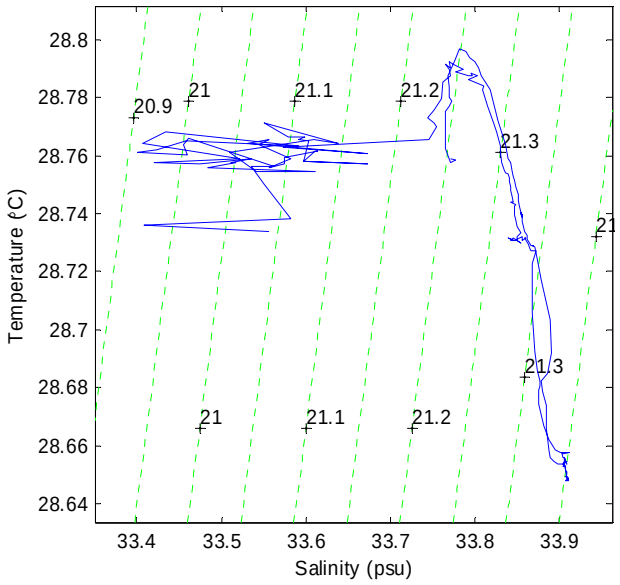

File: 1909004 19-Sep-2003 12:38:18 S7.2131 E134.3875 Site: 022
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

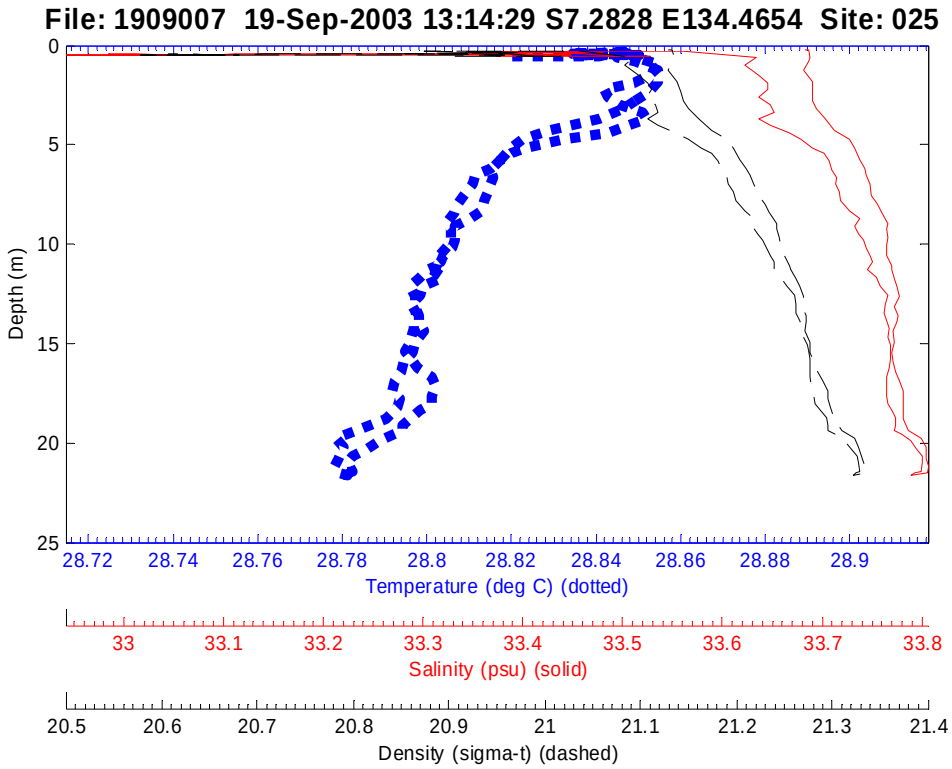

Temperature (C)
Salinity (psu)
18.6
18.9
19.2
19.5
20.1
20.4
20.7
21.1
21.4

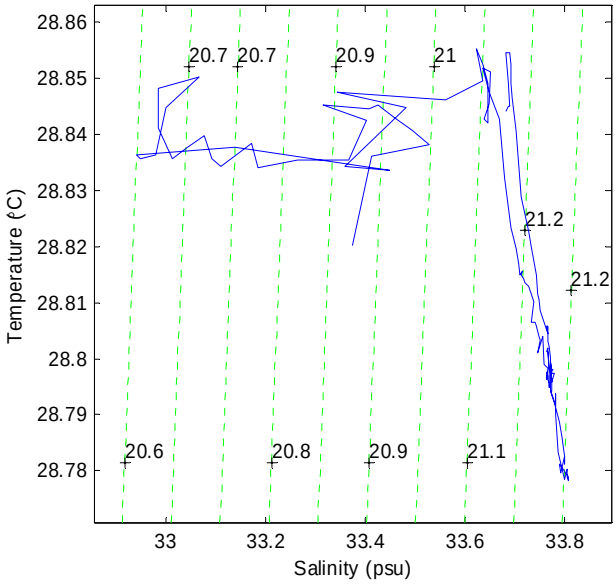

File: 1909005 19-Sep-2003 12:52:48 S7.2176 E134.4441 Site: 023
Depth (m)
0
5
10
15
20
25
30
28.4
28.5
28.6
28.7
28.8
28.9
Temperature (deg C) (dotted)
33.1
33.2
33.3
33.4
33.5
33.6
33.7
33.8
33.9
Salinity (psu) (solid)
20.8
20.9
21
21.1
21.2
21.3
21.4
21.5
21.6
Density (sigma-t) (dashed)

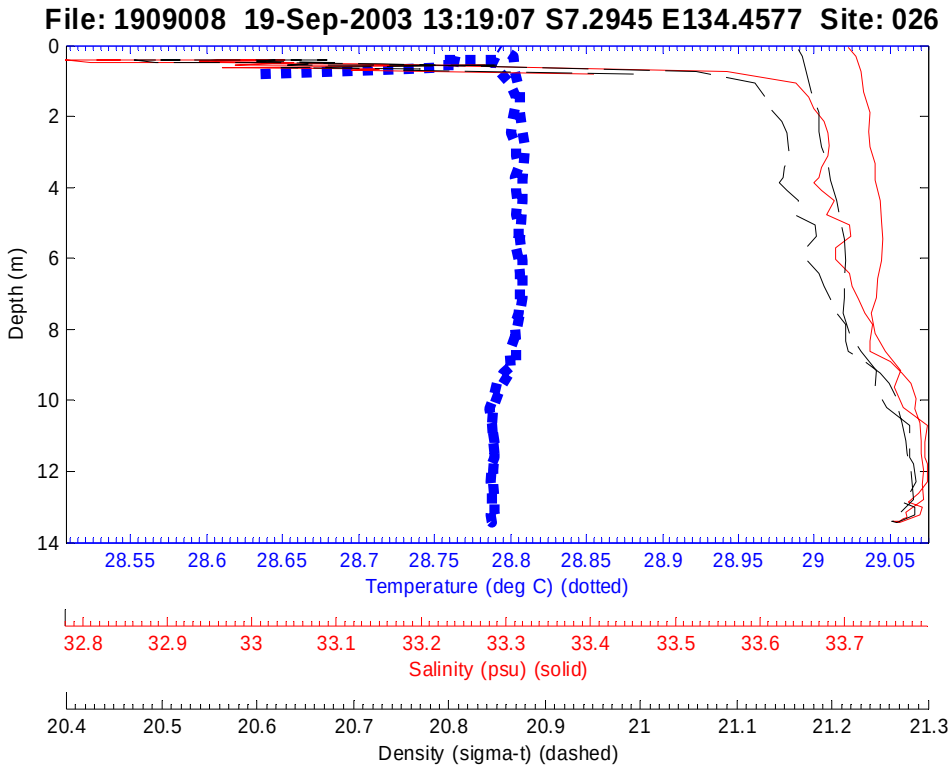

Temperature (C)
28.65
28.6
28.55
28.5
28.45
20.9
20.7
20.8
21
21.3
21
21.2
33
33.2
33.4
33.6
33.8
34
Salinity (psu)

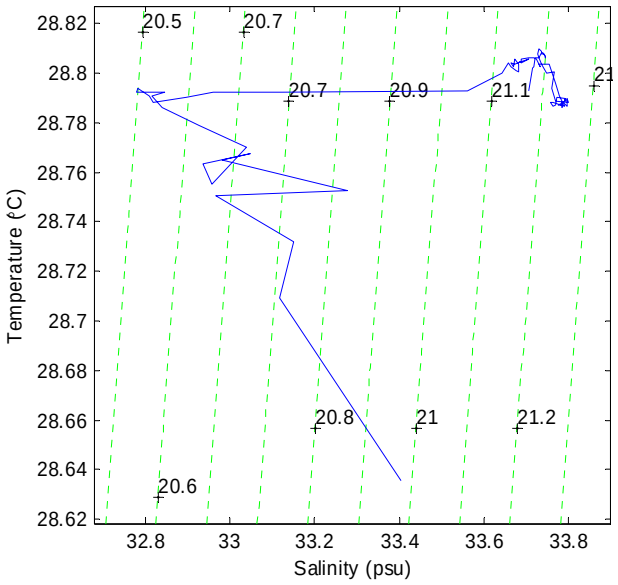

File: 1909006 19-Sep-2003 13:04:30 S7.2558 E134.4608 Site: 026
Depth (m)
0
5
10
15
20
25
30
28.55
28.6
28.65
28.7
28.75
28.8
28.85
28.9
Temperature (deg C) (dotted)
33.45
33.5
33.55
33.6
33.65
33.7
33.75
33.8
33.85
33.9
Salinity (psu) (solid)
20.9
21
21.1
21.2
21.3
21.4
21.5
21.6
Density (sigma-t) (dashed)

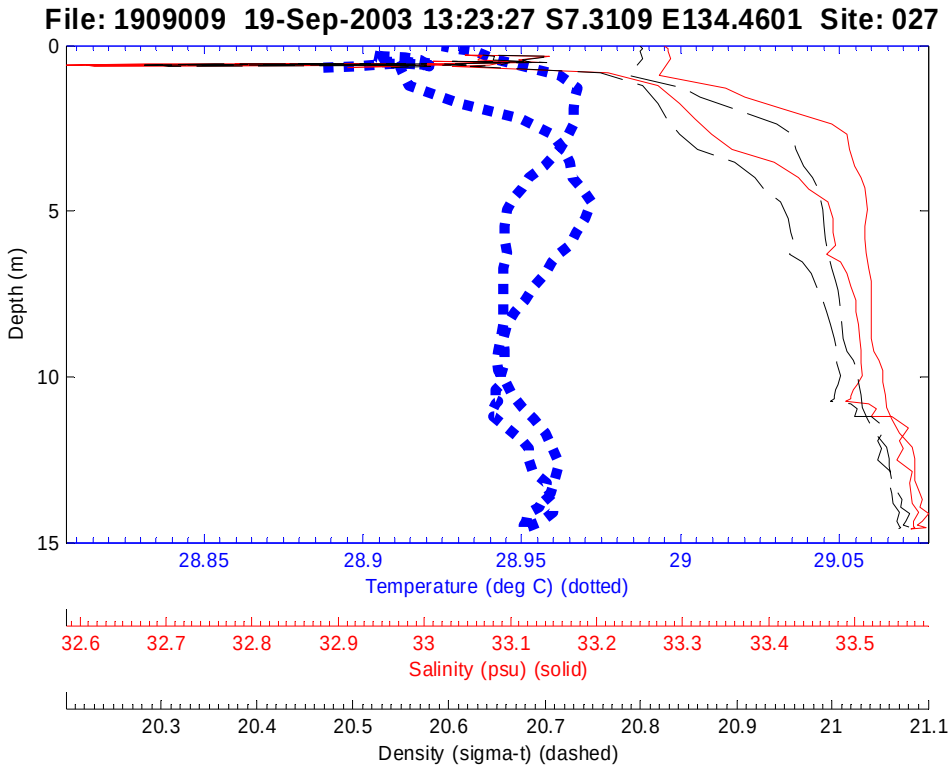

Temperature (C)
28.8
28.78
28.76
28.74
28.72
28.7
28.68
28.66
28.64
20.9
21
21.1
21.2
21.3
21
21.3
21
21.1
21.2
33.4
33.5
33.6
33.7
33.8
33.9
Salinity (psu)

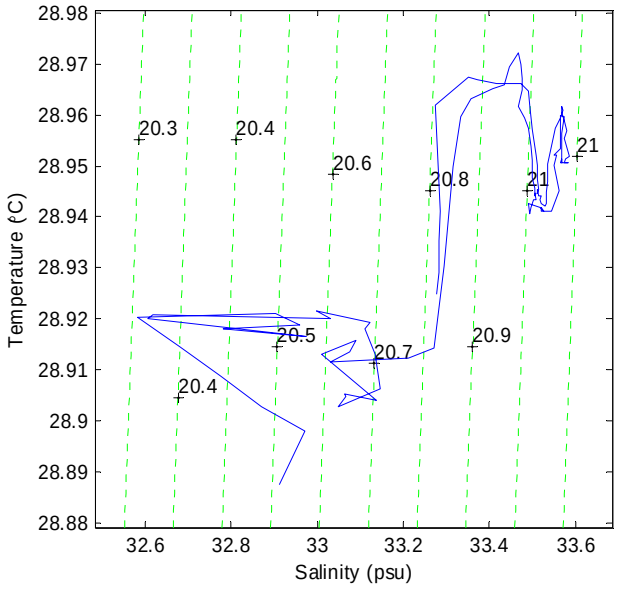

File: 1909007 19-Sep-2003 13:14:29 S7.2828 E134.4654 Site: 025
Depth (m)
0
5
10
15
20
25
28.72 28.74 28.76 28.78 28.8 28.82 28.84 28.86 28.88 28.9
Temperature (deg C) (dotted)
33 33.1 33.2 33.3 33.4 33.5 33.6 33.7 33.8
Salinity (psu) (solid)
20.5 20.6 20.7 20.8 20.9 21 21.1 21.2 21.3 21.4
Density (sigma-t) (dashed)

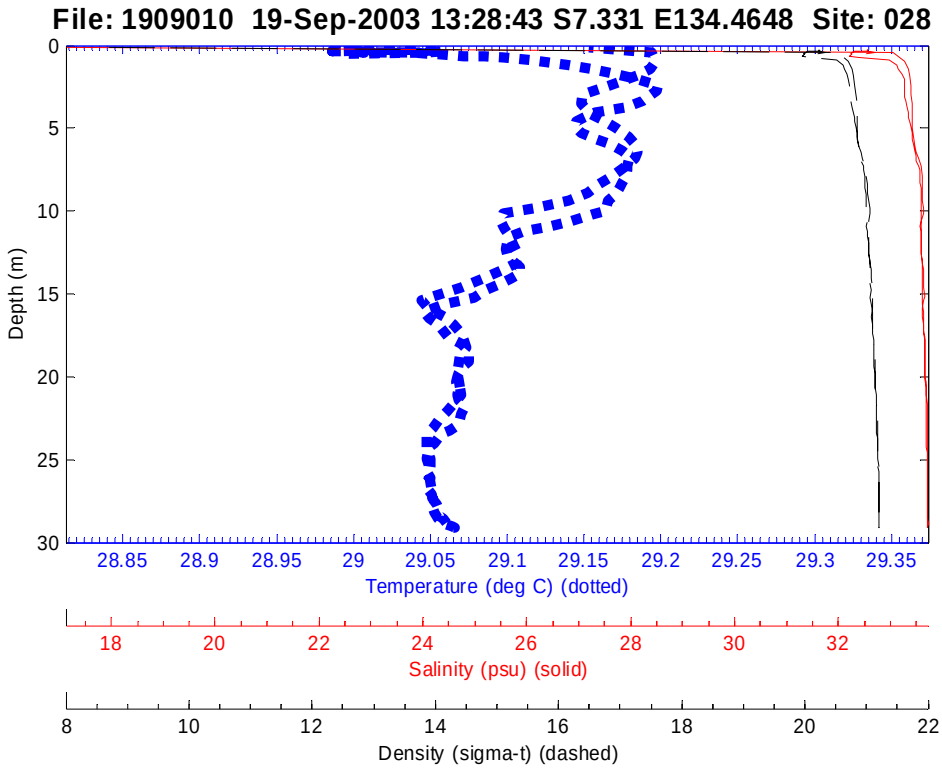

Temperature (C)
28.86
28.85
28.84
28.83
28.82
28.81
28.8
28.79
28.78
20.7 20.7 20.9 21
21.2
21.2
20.6 20.8 20.9 21.1
33 33.2 33.4 33.6 33.8
Salinity (psu)

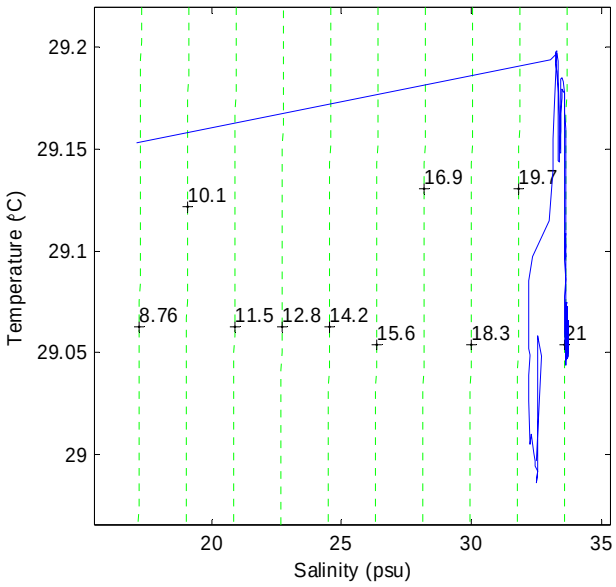

File: 1909008 19-Sep-2003 13:19:07 S7.2945 E134.4577 Site: 026
Depth (m)
0
2
4
6
8
10
12
14
28.55 28.6 28.65 28.7 28.75 28.8 28.85 28.9 28.95 29 29.05
Temperature (deg C) (dotted)
32.8 32.9 33 33.1 33.2 33.3 33.4 33.5 33.6 33.7
Salinity (psu) (solid)
20.4 20.5 20.6 20.7 20.8 20.9 21 21.1 21.2 21.3
Density (sigma-t) (dashed)

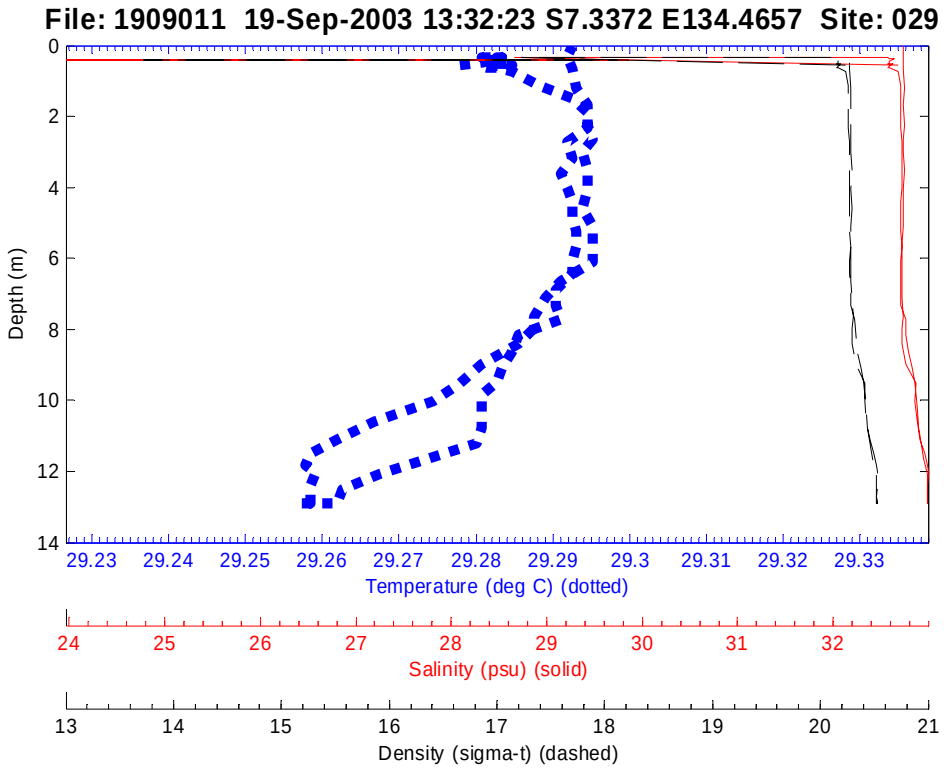

Temperature (°C)
28.82
28.8
28.78
28.76
28.74
28.72
28.7
28.68
28.66
28.64
28.62
20.5
20.7
20.7
20.9
21.1
21
20.8
21
21.2
20.6
32.8 33 33.2 33.4 33.6 33.8
Salinity (psu)

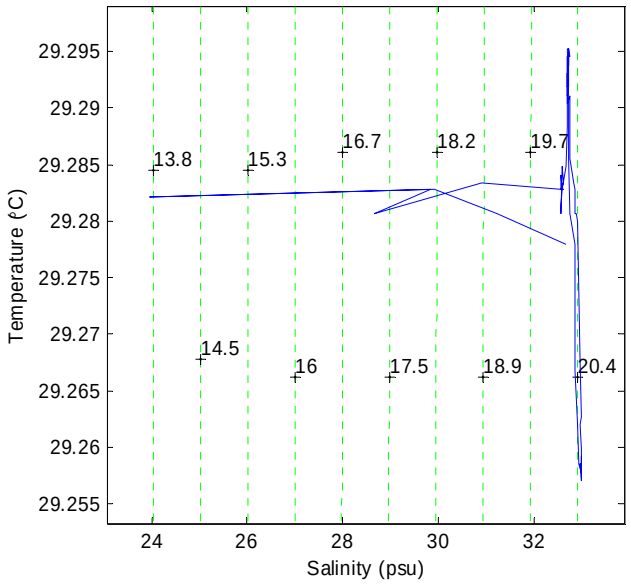

File: 1909009 19-Sep-2003 13:23:27 S7.3109 E134.4601 Site: 027
Depth (m)
0
5
10
15
28.85
28.9
28.95
29
29.05
Temperature (deg C) (dotted)
32.6
32.7
32.8
32.9
33
33.1
33.2
33.3
33.4
33.5
Salinity (psu) (solid)
20.3
20.4
20.5
20.6
20.7
20.8
20.9
21
21.1
Density (sigma-t) (dashed)

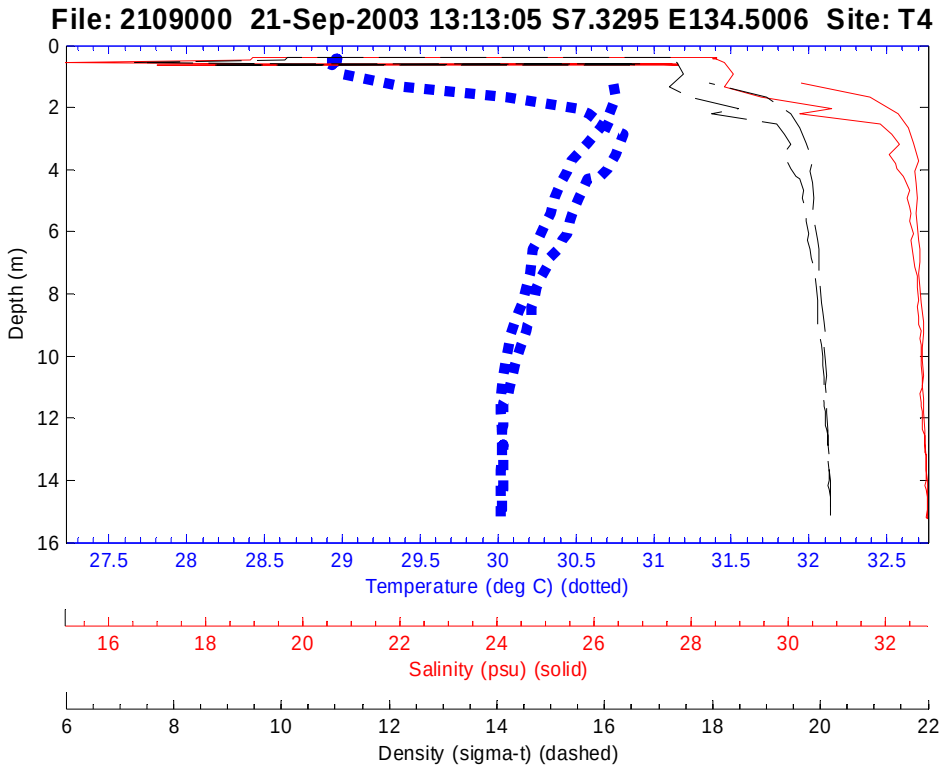

Temperature (C)
28.98
28.97
28.96
28.95
28.94
28.93
28.92
28.91
28.9
28.89
28.88
20.3
20.4
20.6
20.8
21
21
20.5
20.7
20.9
20.4
32.6
32.8
33
33.2
33.4
33.6
Salinity (psu)

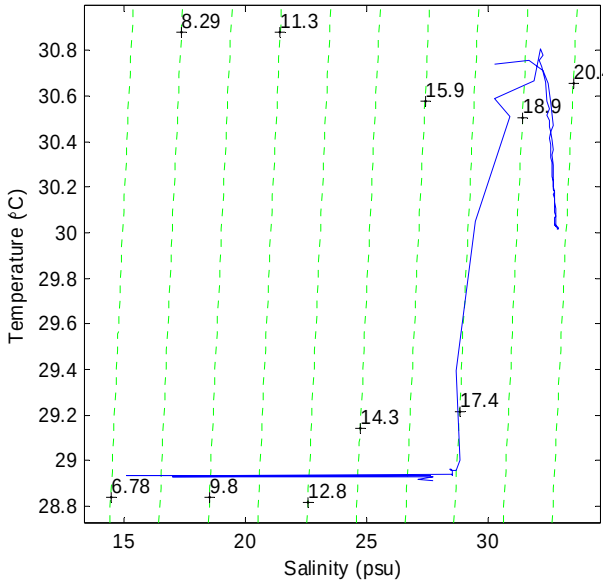

File: 1909010 19-Sep-2003 13:28:43 S7.331 E134.4648 Site: 028
Depth (m)
0
5
10
15
20
25
30
28.85 28.9 28.95 29 29.05 29.1 29.15 29.2 29.25 29.3 29.35
Temperature (deg C) (dotted)
18 20 22 24 26 28 30 32
Salinity (psu) (solid)
8 10 12 14 16 18 20 22
Density (sigma-t) (dashed)

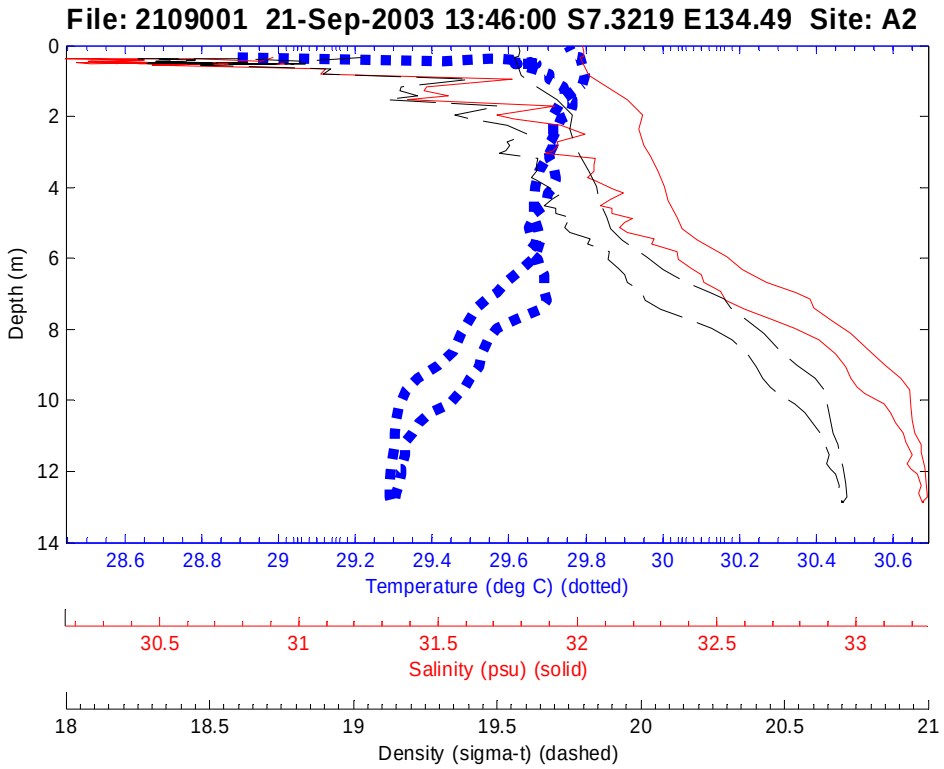

Temperature (C)
29.2
29.15
29.1
29.05
29
20 25 30 35
Salinity (psu)
8.76
10.1
11.5
12.8
14.2
15.6
16.9
18.3
19.7
21

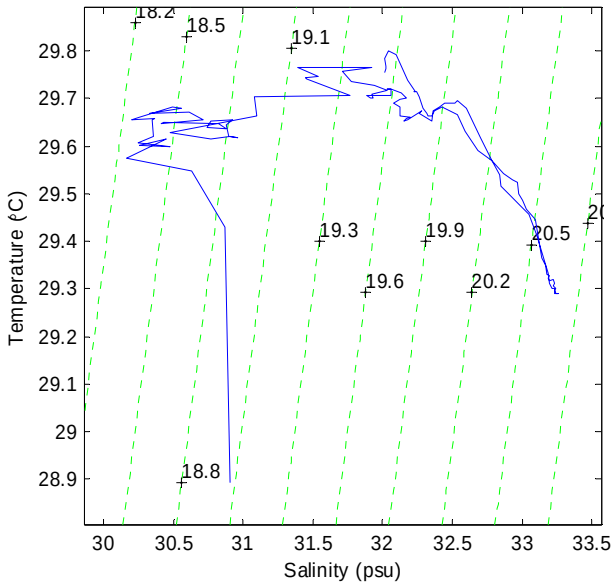

File: 1909011 19-Sep-2003 13:32:23 S7.3372 E134.4657 Site: 029
Depth (m)
0
2
4
6
8
10
12
14
29.23
29.24
29.25
29.26
29.27
29.28
29.29
29.3
29.31
29.32
29.33
Temperature (deg C) (dotted)
24
25
26
27
28
29
30
31
32
Salinity (psu) (solid)
13
14
15
16
17
18
19
20
21
Density (sigma-t) (dashed)

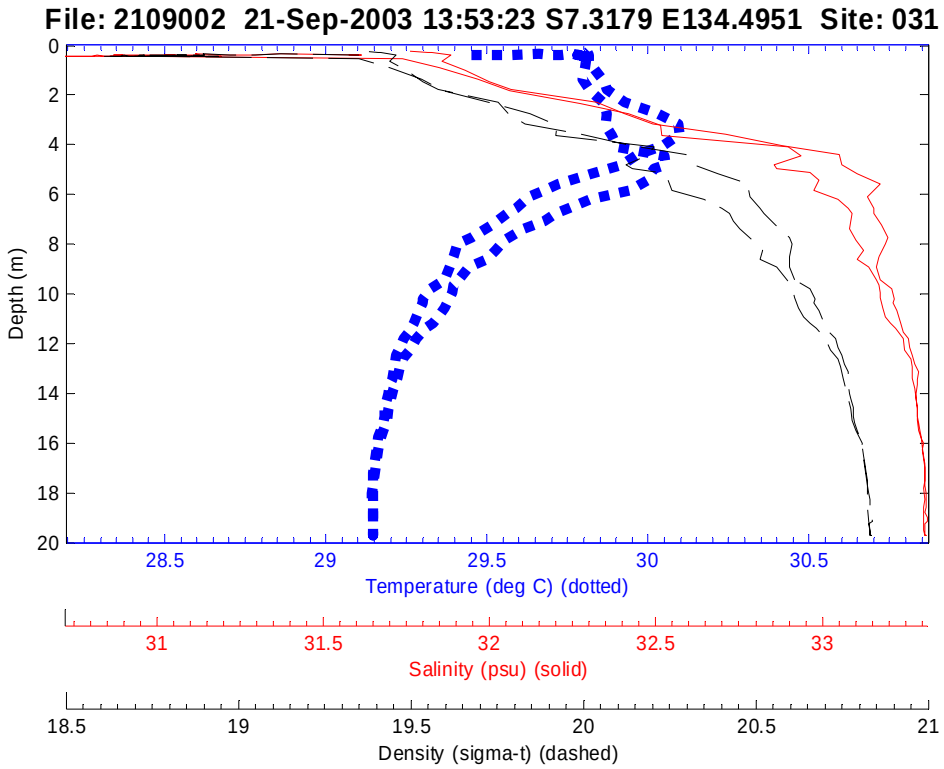

Temperature (C)
29.295
29.29
29.285
29.28
29.275
29.27
29.265
29.26
29.255
13.8
15.3
16.7
18.2
19.7
14.5
16
17.5
18.9
20.4
24
26
28
30
32
Salinity (psu)

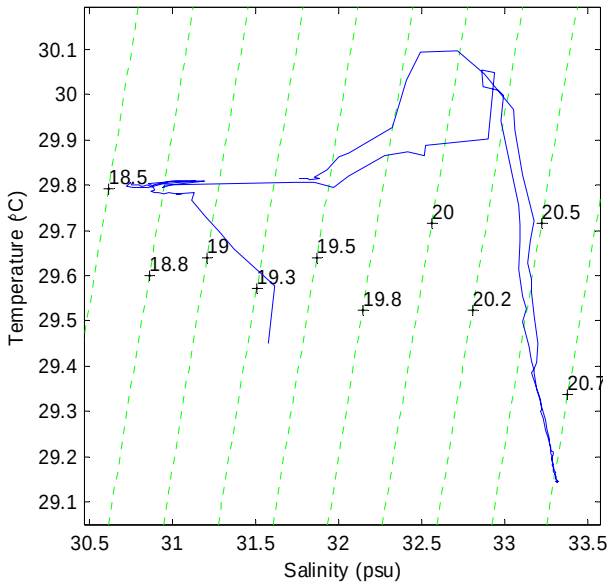

File: 2109000 21-Sep-2003 13:13:05 S7.3295 E134.5006 Site: T4
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

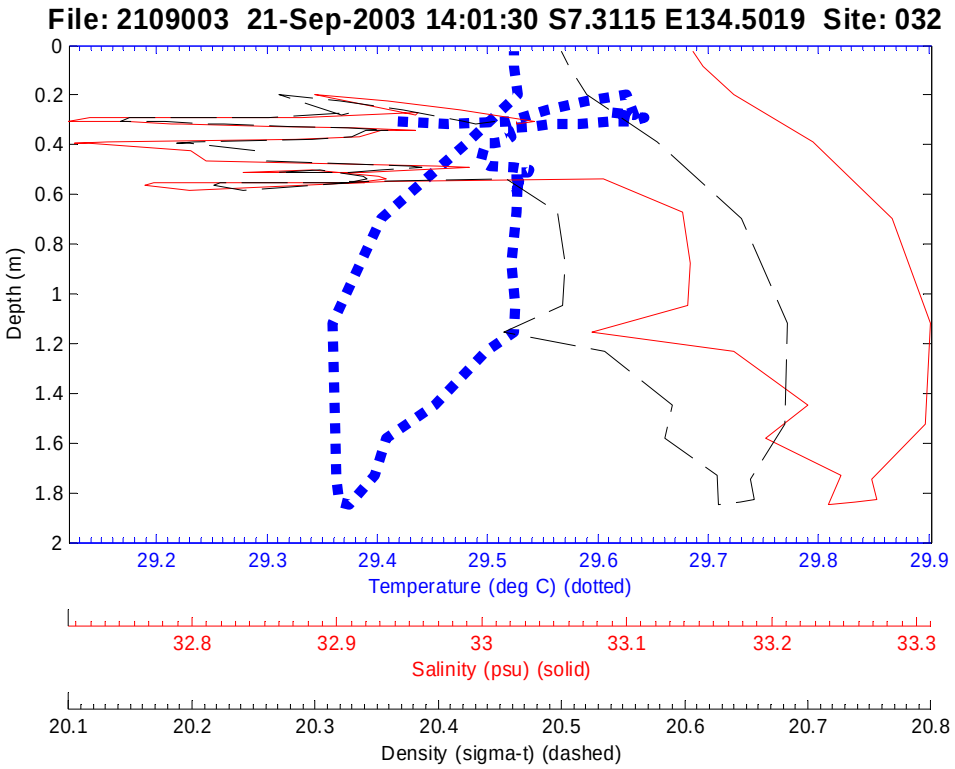

Temperature (C)
Salinity (psu)
8.29
11.3
15.9
18.9
14.3
17.4
6.78
9.8
12.8

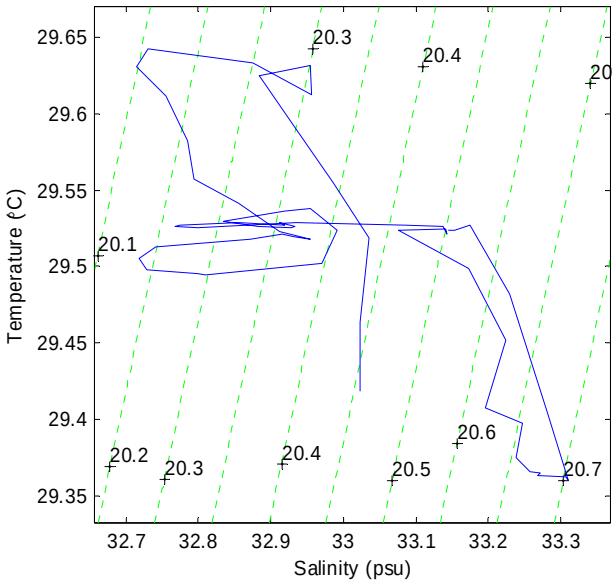

File: 2109001 21-Sep-2003 13:46:00 S7.3219 E134.49 Site: A2
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

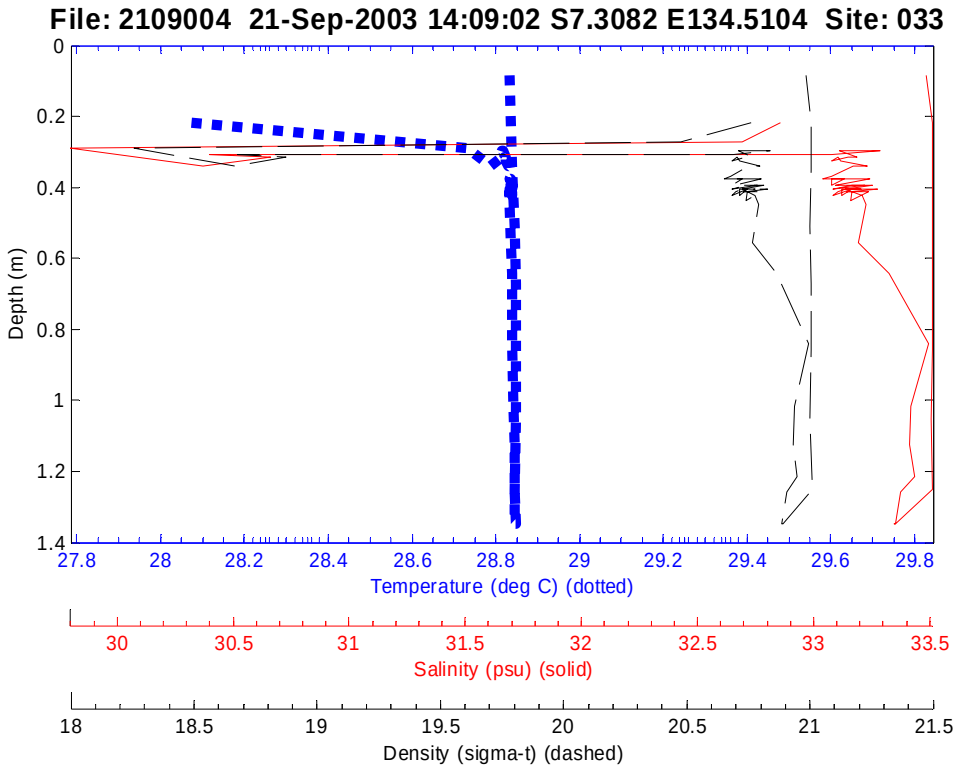

Temperature (C)
Salinity (psu)
18.5
19.1
19.3
19.9
20.5
19.6
20.2
18.8

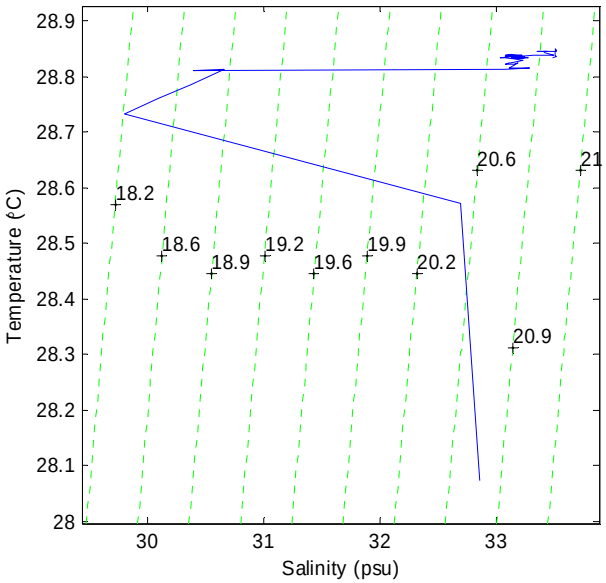

File: 2109002 21-Sep-2003 13:53:23 S7.3179 E134.4951 Site: 031
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

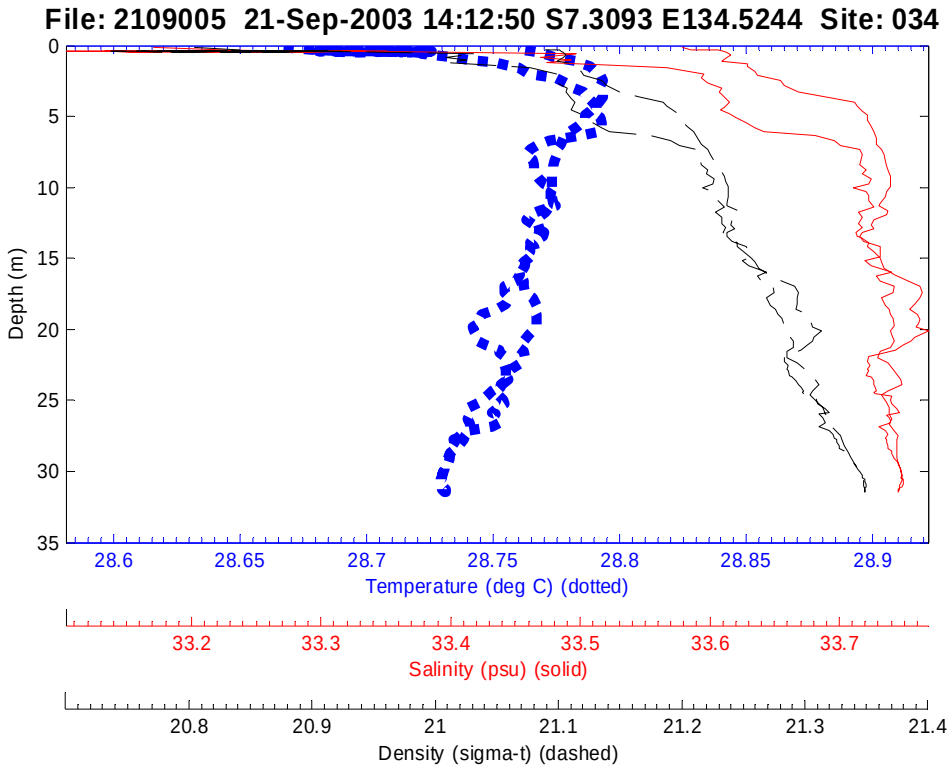

Temperature (C)
Salinity (psu)
18.5
18.8
19
19.3
19.5
19.8
20
20.2
20.5
20.7

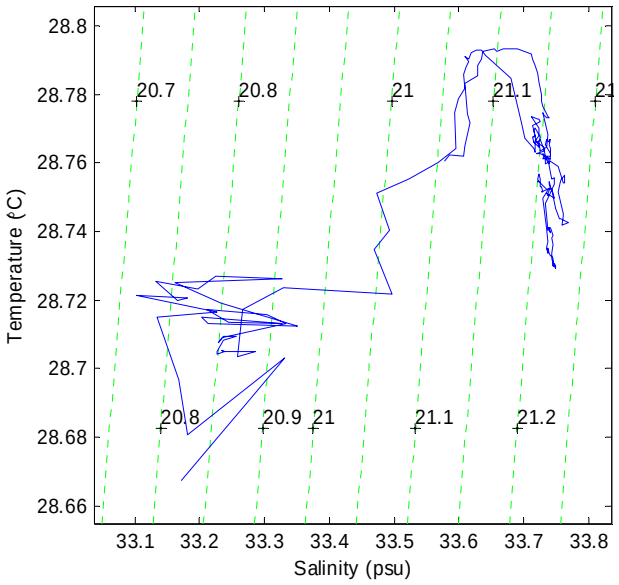

File: 2109003 21-Sep-2003 14:01:30 S7.3115 E134.5019 Site: 032
Depth (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
29.2
29.3
29.4
29.5
29.6
29.7
29.8
29.9
Temperature (deg C) (dotted)
32.8
32.9
33
33.1
33.2
33.3
Salinity (psu) (solid)
20.1
20.2
20.3
20.4
20.5
20.6
20.7
20.8
Density (sigma-t) (dashed)

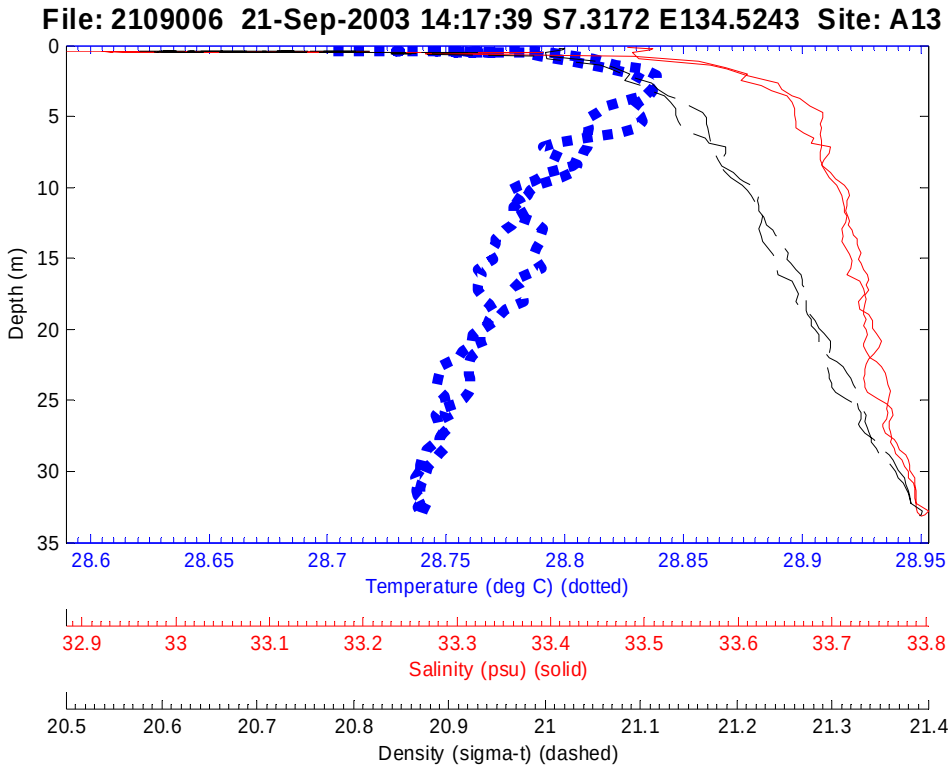

Temperature (C)
29.65
29.6
29.55
29.5
29.45
29.4
29.35
20.1
20.2
20.3
20.4
20.5
20.6
20.7
32.7
32.8
32.9
33
33.1
33.2
33.3
Salinity (psu)

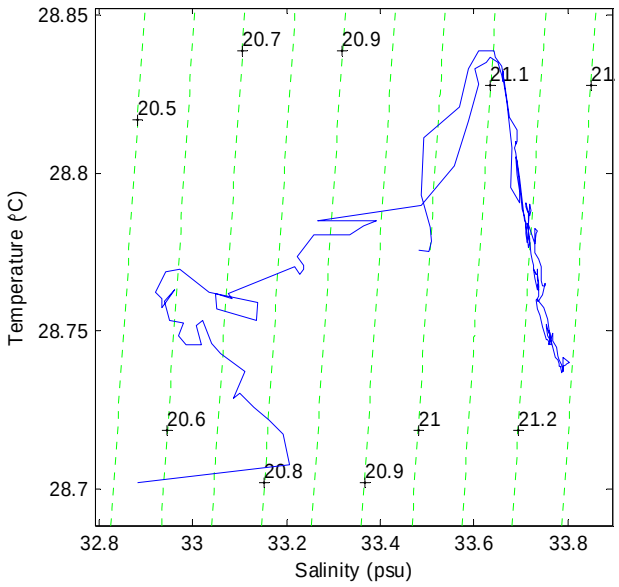

File: 2109004 21-Sep-2003 14:09:02 S7.3082 E134.5104 Site: 033
Depth (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
27.8
28
28.2
28.4
28.6
28.8
29
29.2
29.4
29.6
29.8
Temperature (deg C) (dotted)
30
30.5
31
31.5
32
32.5
33
33.5
Salinity (psu) (solid)
18
18.5
19
19.5
20
20.5
21
21.5
Density (sigma-t) (dashed)

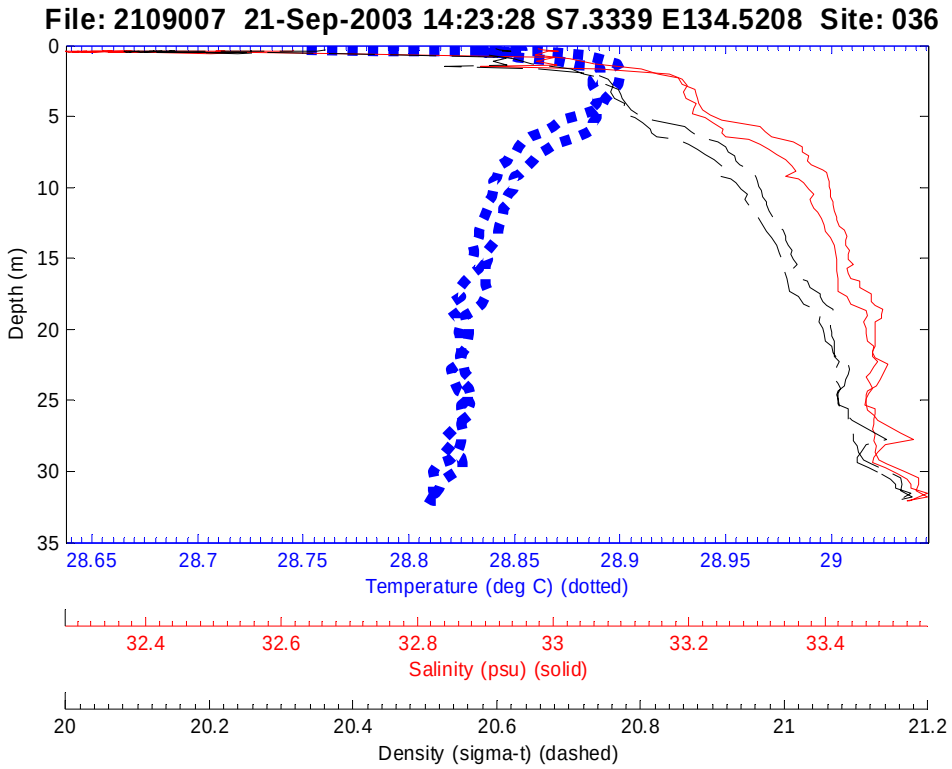

Temperature (C)
28.9
28.8
28.7
28.6
28.5
28.4
28.3
28.2
28.1
28
30
31
32
33
Salinity (psu)
18.2
18.6
18.9
19.2
19.6
19.9
20.2
20.6
20.9
21

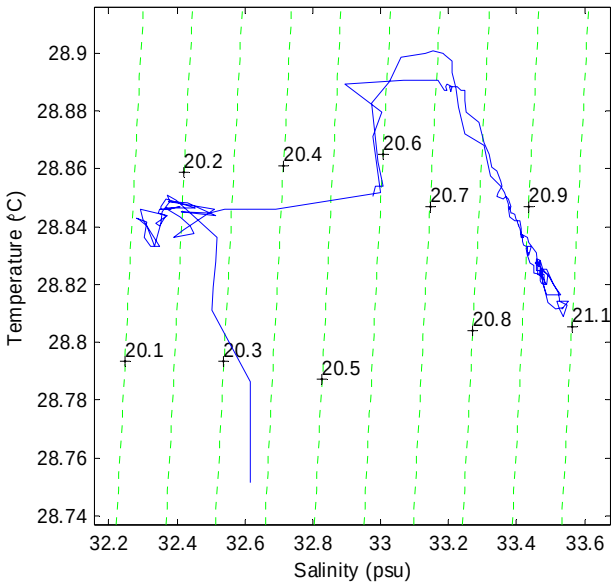

File: 2109005 21-Sep-2003 14:12:50 S7.3093 E134.5244 Site: 034
Depth (m)
0
5
10
15
20
25
30
35
28.6
28.65
28.7
28.75
28.8
28.85
28.9
Temperature (deg C) (dotted)
33.2
33.3
33.4
33.5
33.6
33.7
Salinity (psu) (solid)
20.8
20.9
21
21.1
21.2
21.3
21.4
Density (sigma-t) (dashed)

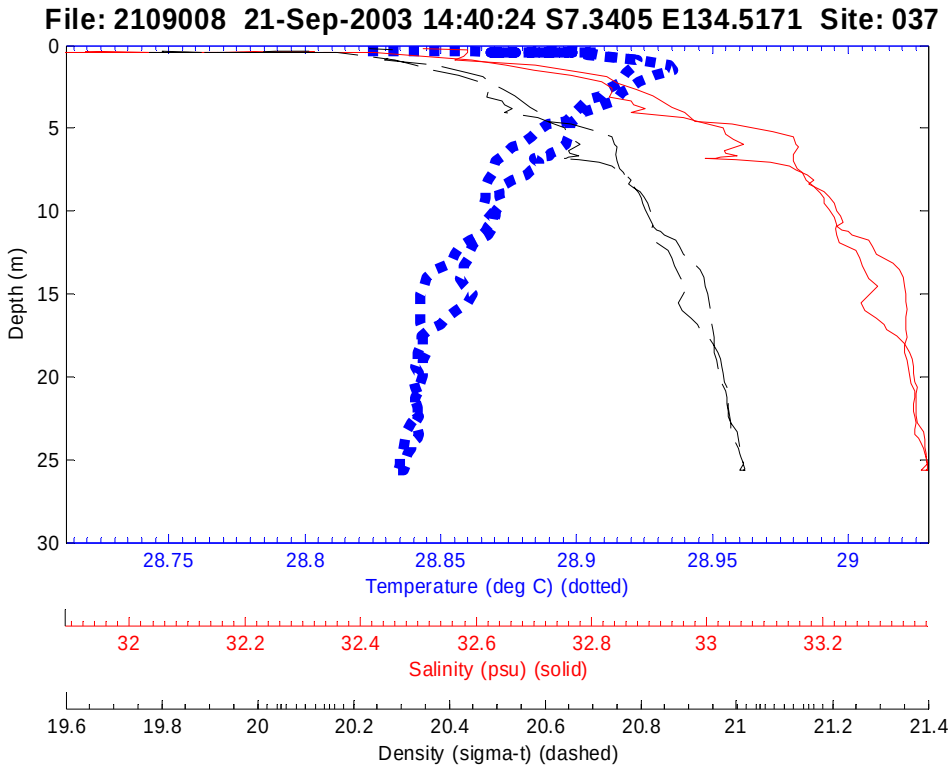

Temperature (C)
28.8
28.78
28.76
28.74
28.72
28.7
28.68
28.66
20.7
20.8
21
21.1
21
20.8
20.9
21
21.1
21.2
33.1
33.2
33.3
33.4
33.5
33.6
33.7
33.8
Salinity (psu)

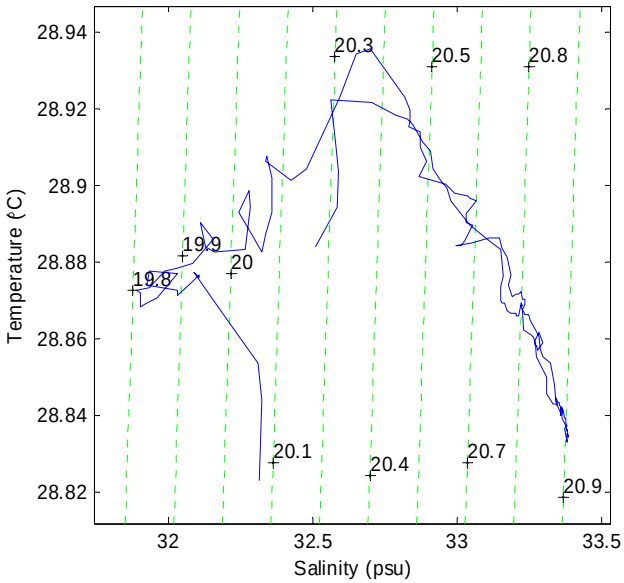

File: 2109006 21-Sep-2003 14:17:39 S7.3172 E134.5243 Site: A13
Depth (m)
0
5
10
15
20
25
30
35
28.6
28.65
28.7
28.75
28.8
28.85
28.9
28.95
Temperature (deg C) (dotted)
32.9
33
33.1
33.2
33.3
33.4
33.5
33.6
33.7
33.8
Salinity (psu) (solid)
20.5
20.6
20.7
20.8
20.9
21
21.1
21.2
21.3
21.4
Density (sigma-t) (dashed)

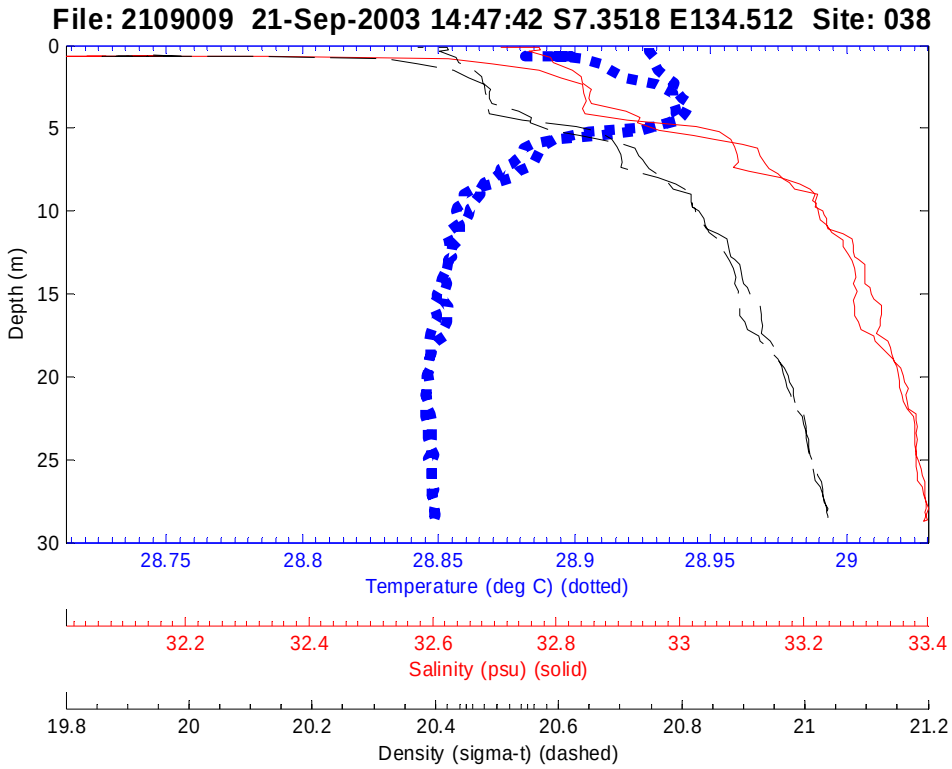

Temperature (C)
28.85
28.8
28.75
28.7
20.7
20.9
21.1
21
20.5
20.6
21
21.2
20.8
20.9
32.8
33
33.2
33.4
33.6
33.8
Salinity (psu)

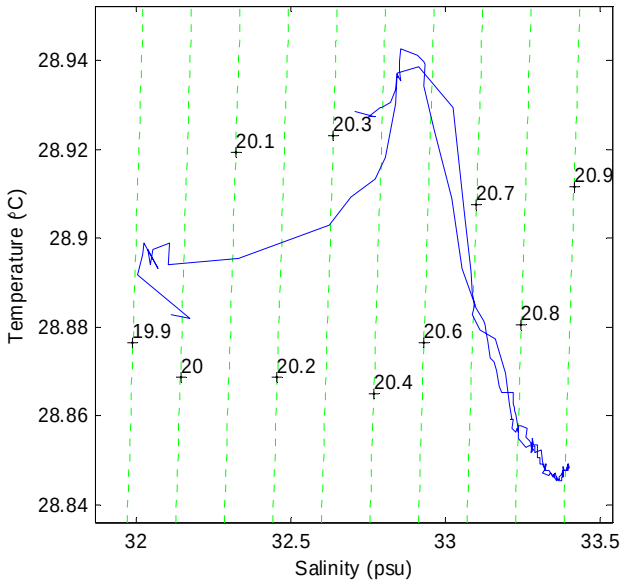

File: 2109007 21-Sep-2003 14:23:28 S7.3339 E134.5208 Site: 036
Depth (m)
0
5
10
15
20
25
30
35
28.65
28.7
28.75
28.8
28.85
28.9
28.95
29
Temperature (deg C) (dotted)
32.4
32.6
32.8
33
33.2
33.4
Salinity (psu) (solid)
20
20.2
20.4
20.6
20.8
21
21.2
Density (sigma-t) (dashed)

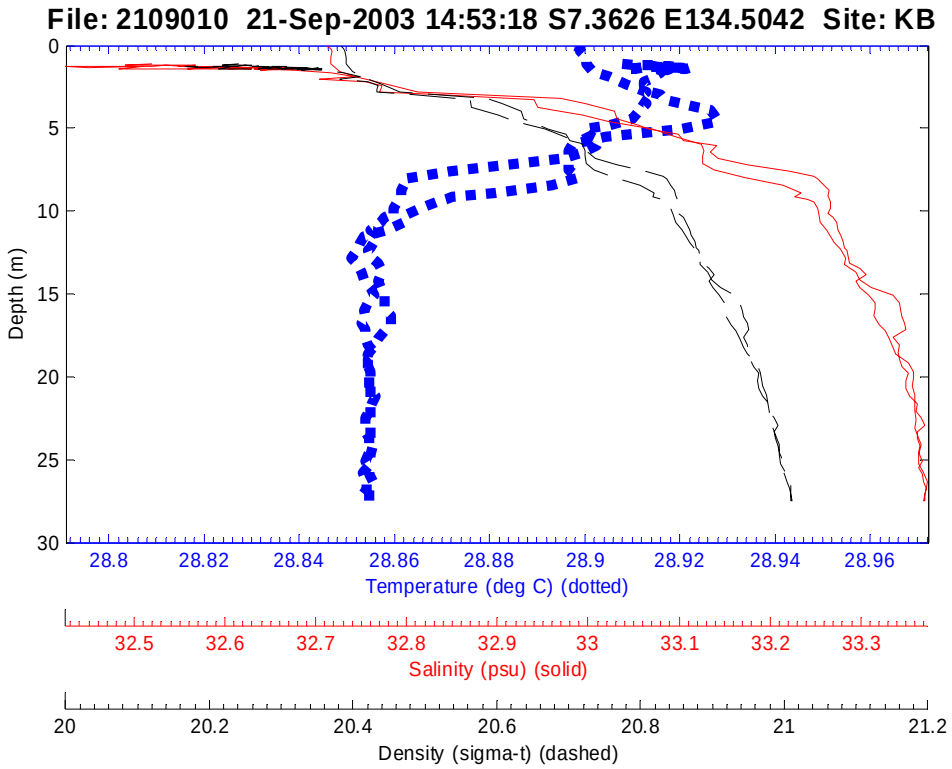

Temperature (C)
28.9
28.88
28.86
28.84
28.82
28.8
28.78
28.76
28.74
20.1
20.2
20.3
20.4
20.5
20.6
20.7
20.8
20.9
21.1
32.2
32.4
32.6
32.8
33
33.2
33.4
33.6
Salinity (psu)

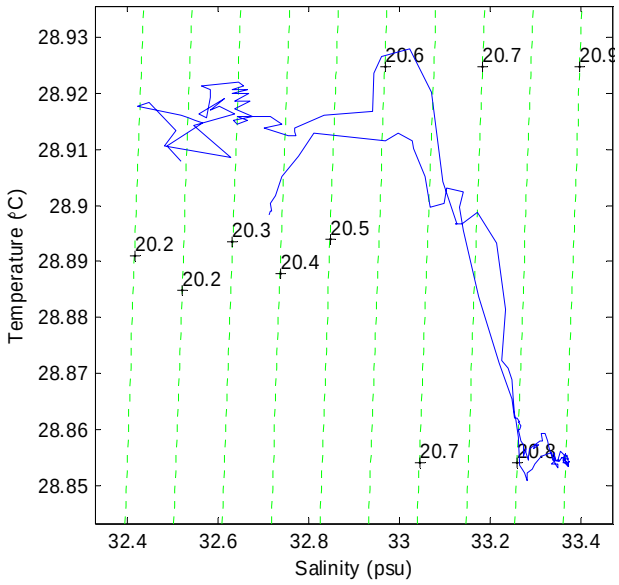

File: 2109008 21-Sep-2003 14:40:24 S7.3405 E134.5171 Site: 037
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

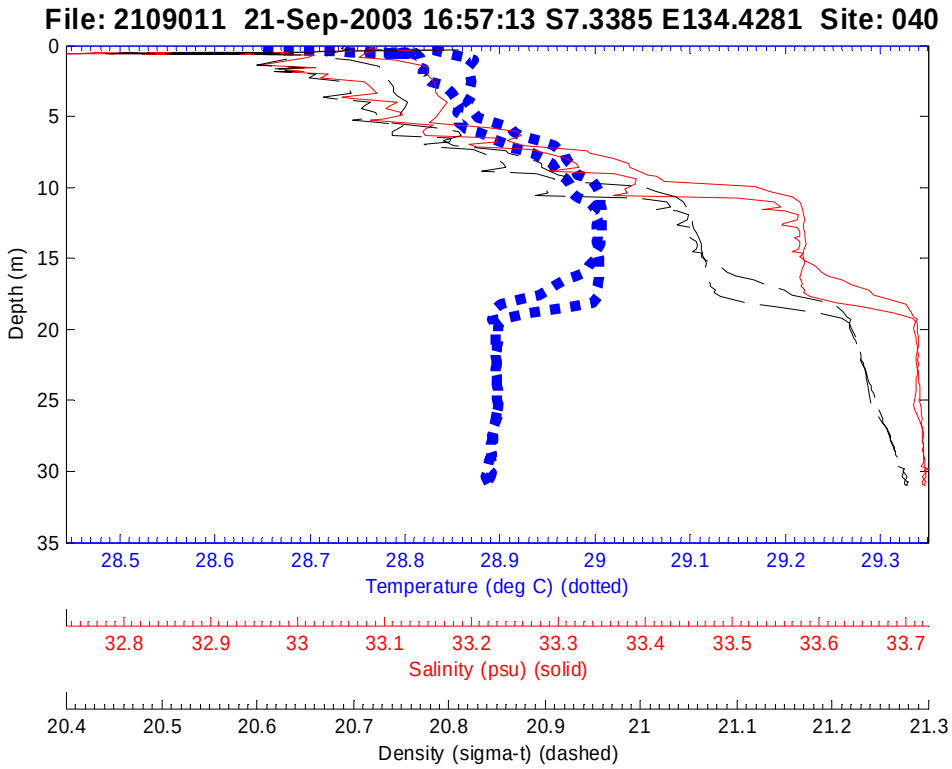

Temperature (°C)
Salinity (psu)
19.8
19.9
20
20.1
20.3
20.4
20.5
20.7
20.8
20.9

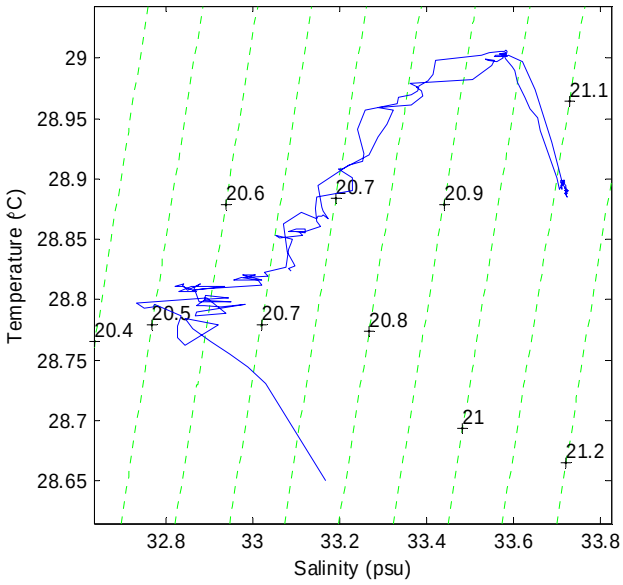

File: 2109009 21-Sep-2003 14:47:42 S7.3518 E134.512 Site: 038
Depth (m)
0
5
10
15
20
25
30
28.75
28.8
28.85
28.9
28.95
29
Temperature (deg C) (dotted)
32.2
32.4
32.6
32.8
33
33.2
33.4
Salinity (psu) (solid)
19.8
20
20.2
20.4
20.6
20.8
21
21.2
Density (sigma-t) (dashed)

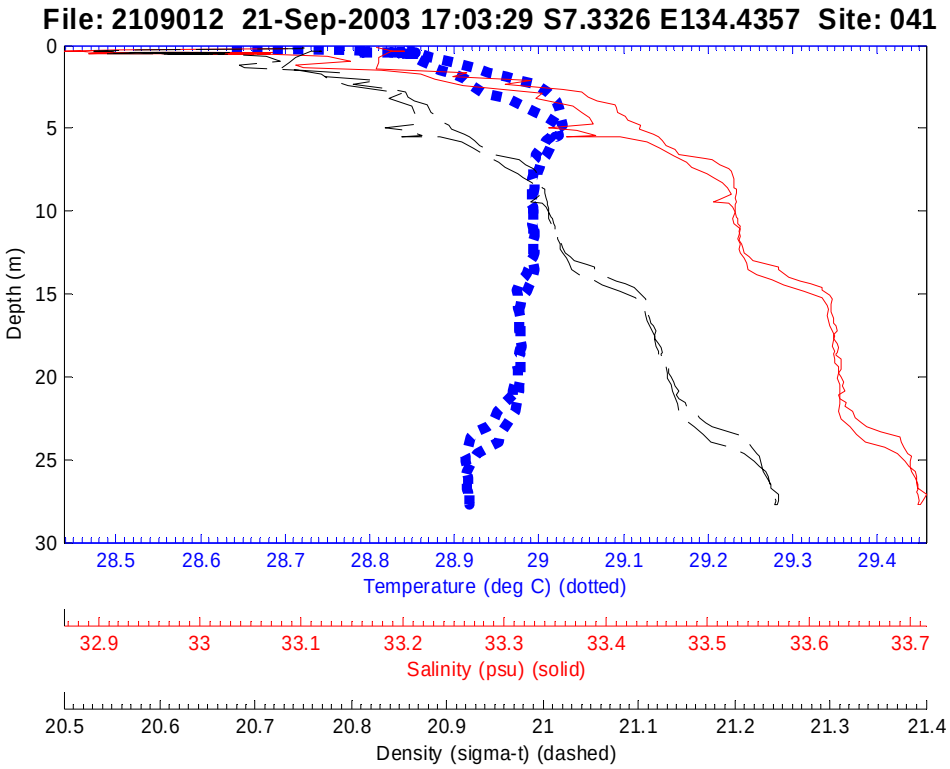

Temperature (C)
28.94
28.92
28.9
28.88
28.86
28.84
19.9
20
20.1
20.2
20.3
20.4
20.6
20.7
20.8
20.9
32
32.5
33
33.5
Salinity (psu)

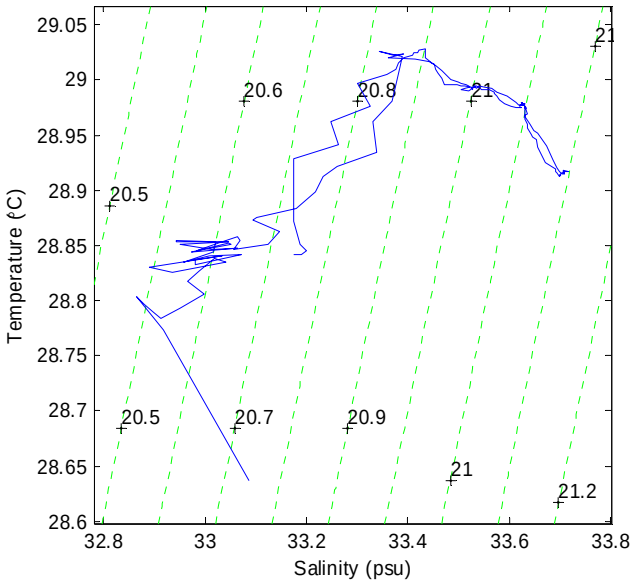

File: 2109010 21-Sep-2003 14:53:18 S7.3626 E134.5042 Site: KB
Depth (m)
0
5
10
15
20
25
30
28.8
28.82
28.84
28.86
28.88
28.9
28.92
28.94
28.96
Temperature (deg C) (dotted)
32.5
32.6
32.7
32.8
32.9
33
33.1
33.2
33.3
Salinity (psu) (solid)
20
20.2
20.4
20.6
20.8
21
21.2
Density (sigma-t) (dashed)

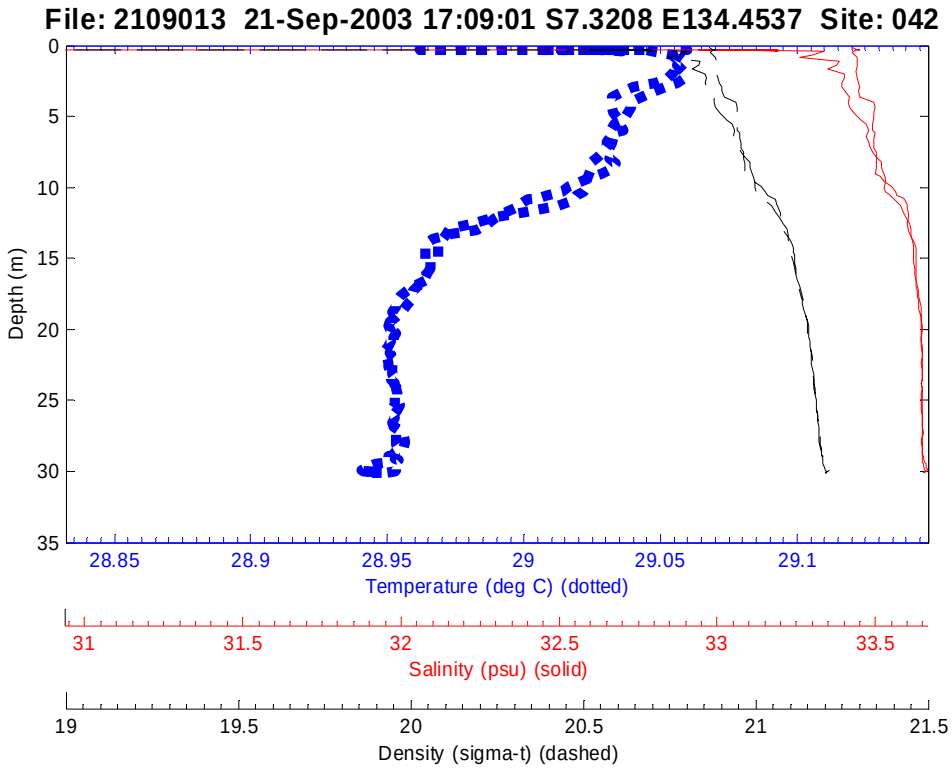

Temperature (C)
28.93
28.92
28.91
28.9
28.89
28.88
28.87
28.86
28.85
20.6
20.7
20.2
20.3
20.5
20.2
20.4
20.7
20.8
32.4
32.6
32.8
33
33.2
33.4
Salinity (psu)

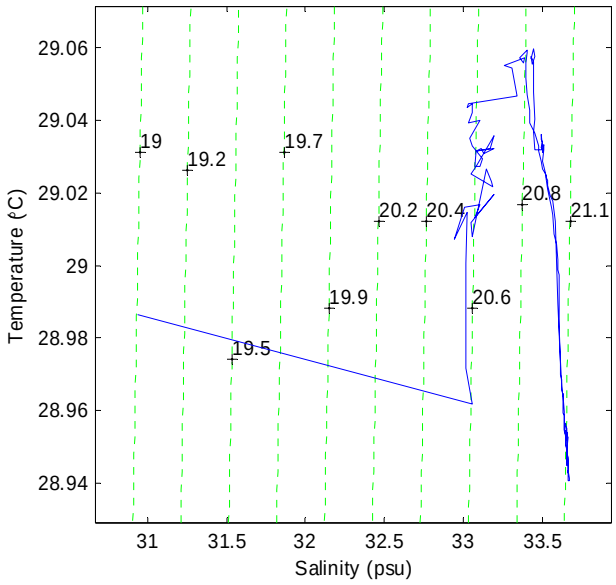

File: 2109011 21-Sep-2003 16:57:13 S7.3385 E134.4281 Site: 040
Depth (m)
0
5
10
15
20
25
30
35
28.5
28.6
28.7
28.8
28.9
29
29.1
29.2
29.3
Temperature (deg C) (dotted)
32.8
32.9
33
33.1
33.2
33.3
33.4
33.5
33.6
33.7
Salinity (psu) (solid)
20.4
20.5
20.6
20.7
20.8
20.9
21
21.1
21.2
21.3
Density (sigma-t) (dashed)

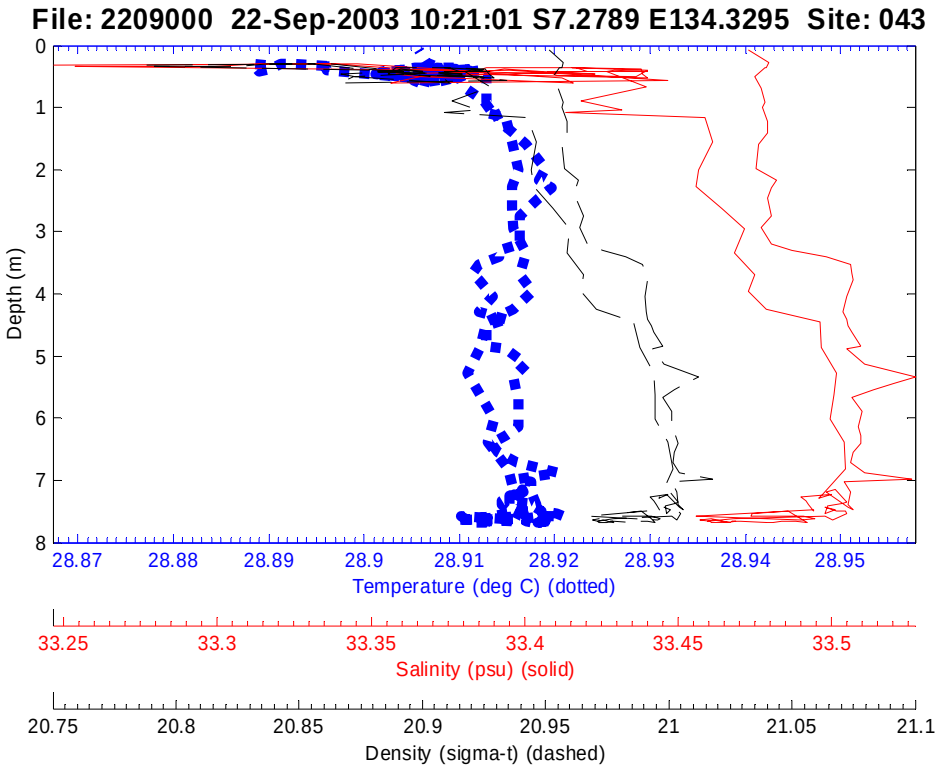

Temperature (C)
29
28.95
28.9
28.85
28.8
28.75
28.7
28.65
32.8
33
33.2
33.4
33.6
33.8
Salinity (psu)
20.4
20.5
20.6
20.7
20.7
20.8
20.9
21
21.1
21.2

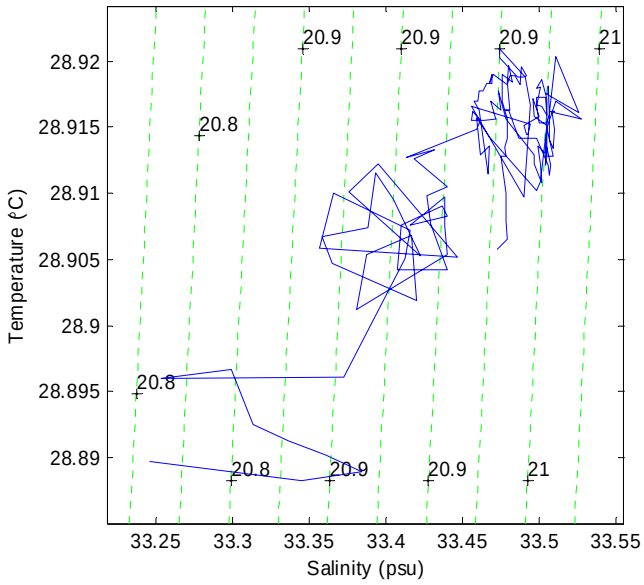

File: 2109012 21-Sep-2003 17:03:29 S7.3326 E134.4357 Site: 041
Depth (m)
0
5
10
15
20
25
30
28.5
28.6
28.7
28.8
28.9
29
29.1
29.2
29.3
29.4
Temperature (deg C) (dotted)
32.9
33
33.1
33.2
33.3
33.4
33.5
33.6
33.7
Salinity (psu) (solid)
20.5
20.6
20.7
20.8
20.9
21
21.1
21.2
21.3
21.4
Density (sigma-t) (dashed)

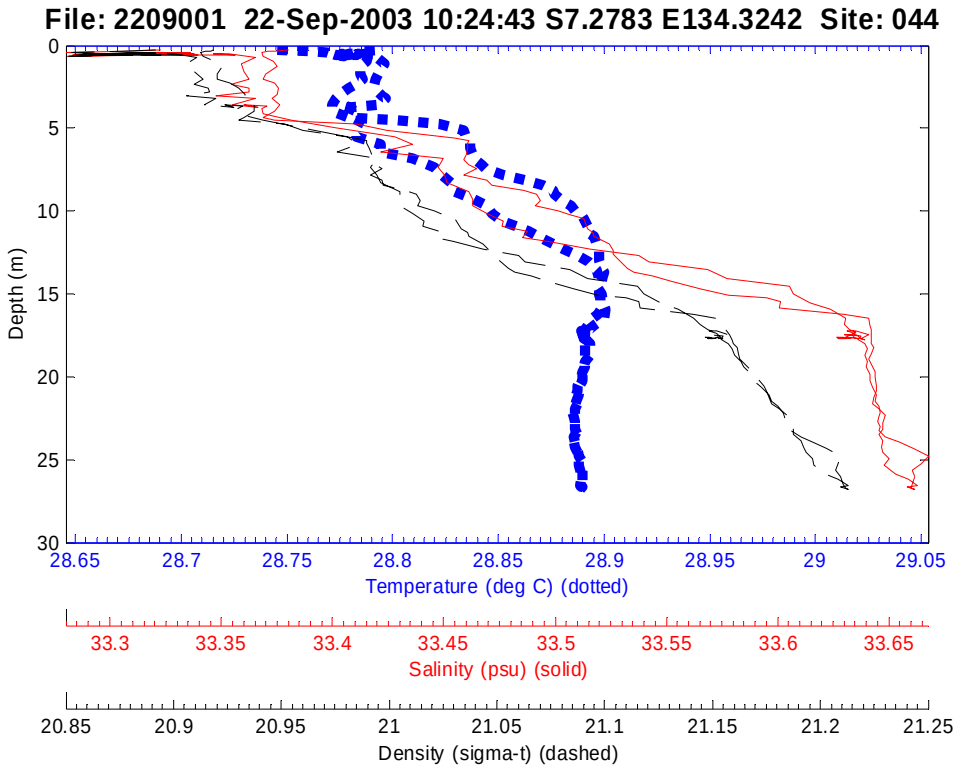

Temperature (C)
29.05
29
28.95
28.9
28.85
28.8
28.75
28.7
28.65
28.6
32.8
33
33.2
33.4
33.6
33.8
Salinity (psu)
20.5
20.6
20.8
21
21
20.5
20.7
20.9
21
21.2

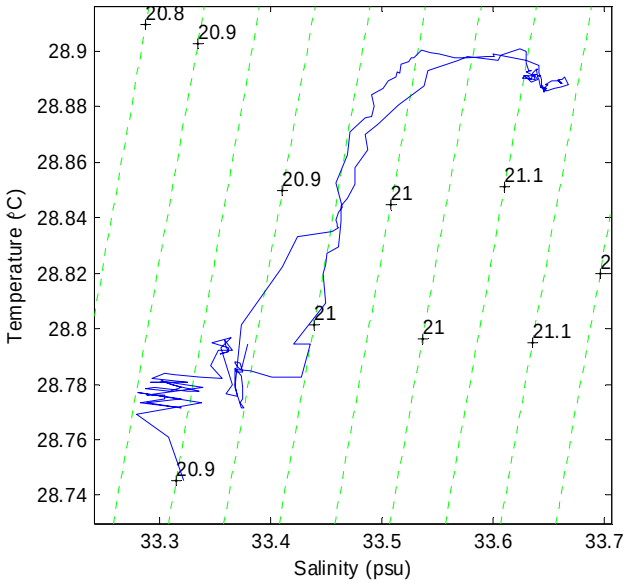

File: 2109013 21-Sep-2003 17:09:01 S7.3208 E134.4537 Site: 042
Depth (m)
0
5
10
15
20
25
30
35
28.85
28.9
28.95
29
29.05
29.1
Temperature (deg C) (dotted)
31
31.5
32
32.5
33
33.5
Salinity (psu) (solid)
19
19.5
20
20.5
21
21.5
Density (sigma-t) (dashed)

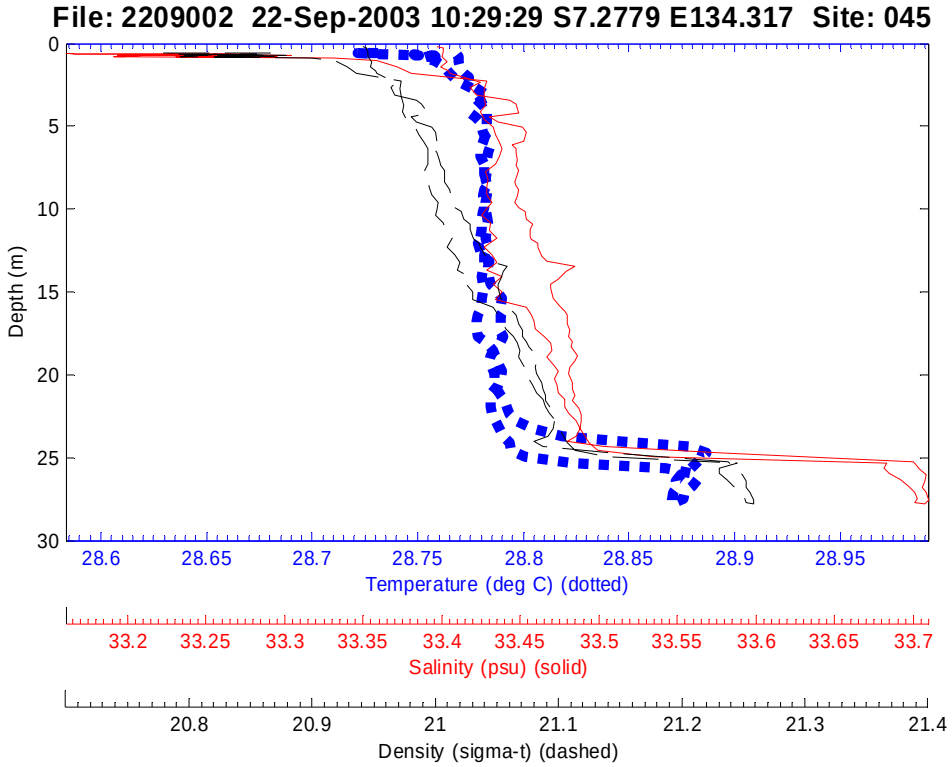

Temperature (C)
29.06
29.04
29.02
29
28.98
28.96
28.94
19
19.2
19.7
19.9
19.5
20.2
20.4
20.6
20.8
21.1
31
31.5
32
32.5
33
33.5
Salinity (psu)

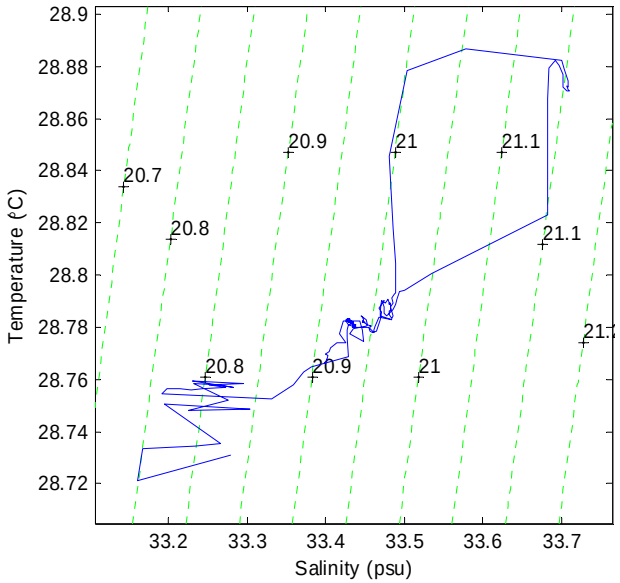

File: 2209000 22-Sep-2003 10:21:01 S7.2789 E134.3295 Site: 043
Depth (m)
0
1
2
3
4
5
6
7
8
28.87
28.88
28.89
28.9
28.91
28.92
28.93
28.94
28.95
Temperature (deg C) (dotted)
33.25
33.3
33.35
33.4
33.45
33.5
Salinity (psu) (solid)
20.75
20.8
20.85
20.9
20.95
21
21.05
21.1
Density (sigma-t) (dashed)

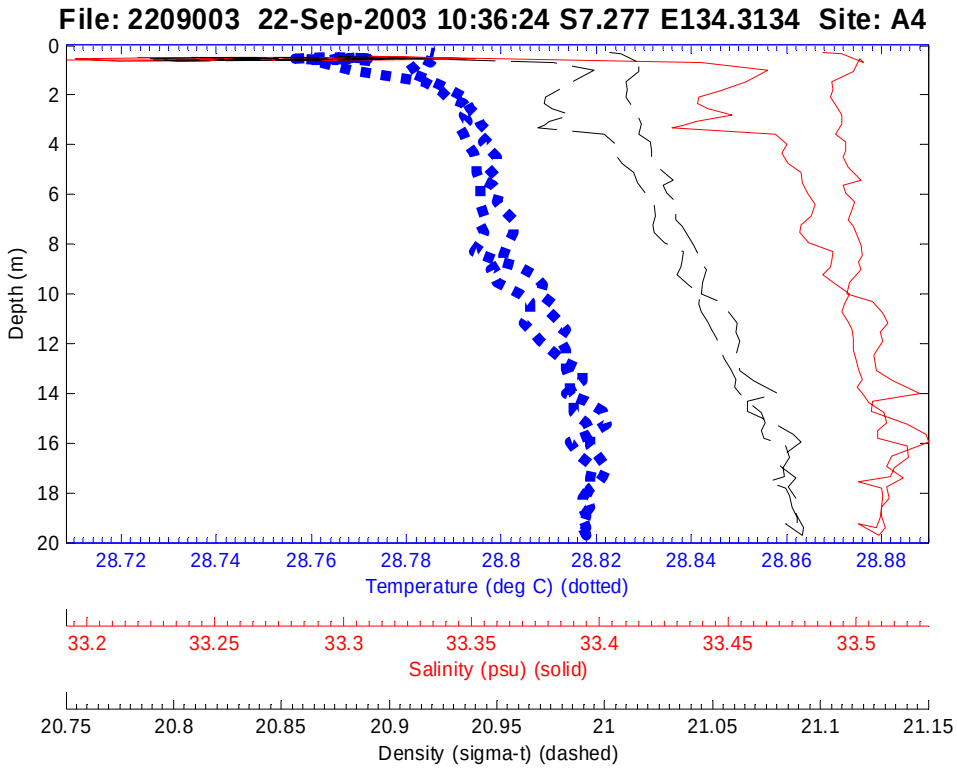

Temperature (C)
28.92
28.915
28.91
28.905
28.9
28.895
28.89
20.9
20.9
20.9
21
20.8
20.8
20.8
20.9
20.9
21
33.25
33.3
33.35
33.4
33.45
33.5
33.55
Salinity (psu)

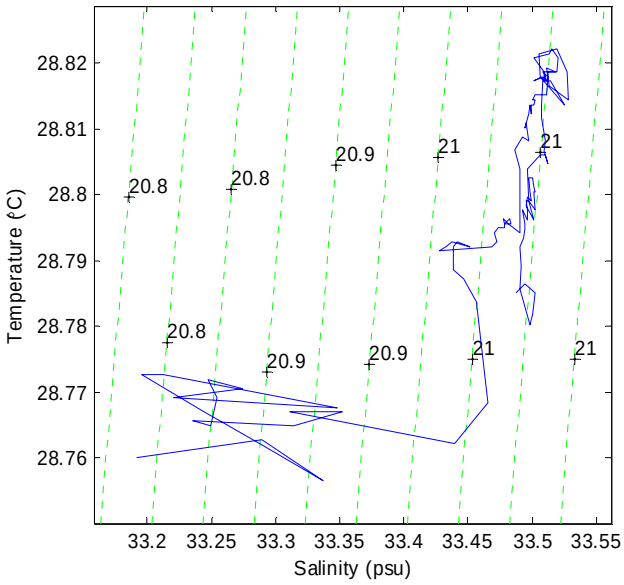

File: 2209001 22-Sep-2003 10:24:43 S7.2783 E134.3242 Site: 044
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

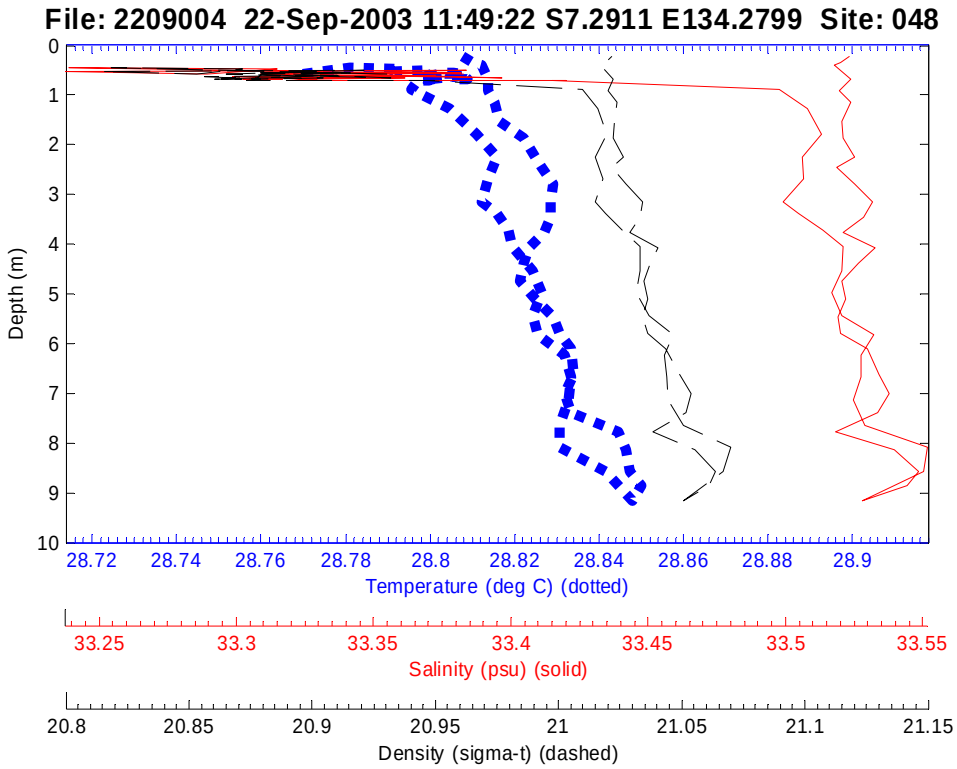

Temperature (C)
Salinity (psu)

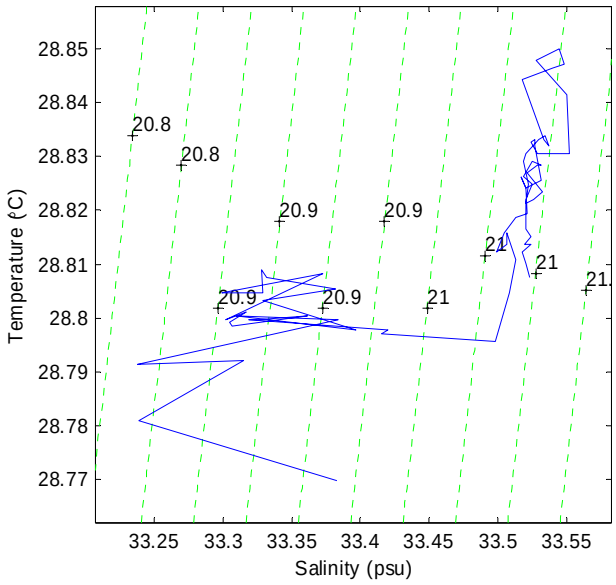

File: 2209002 22-Sep-2003 10:29:29 S7.2779 E134.317 Site: 045
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

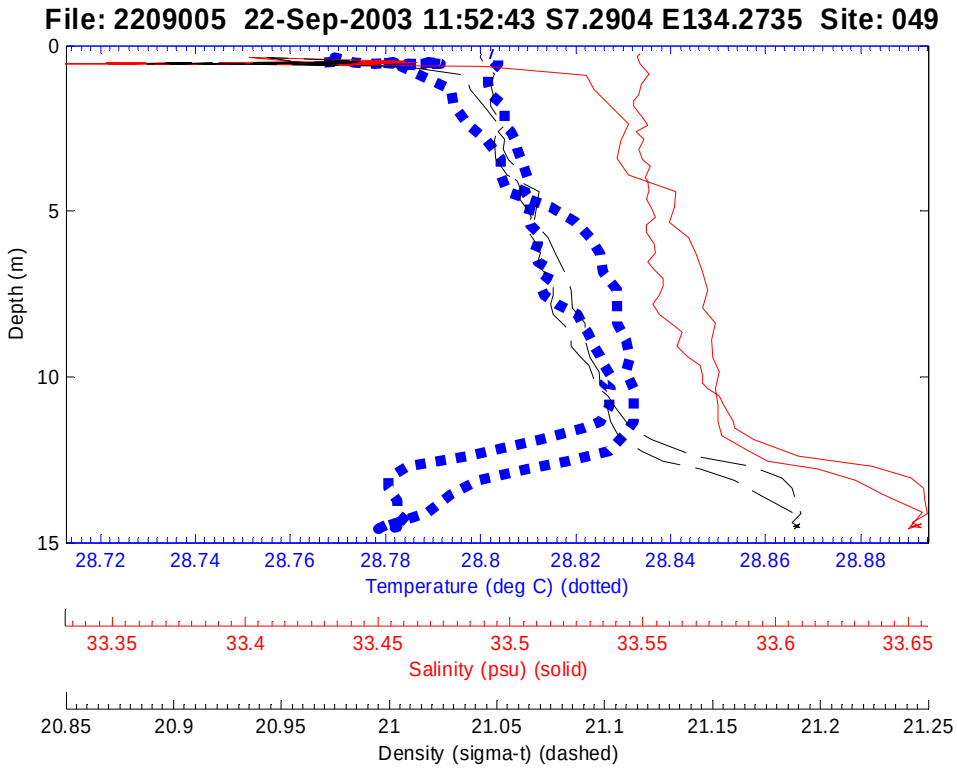

Temperature (C)
Salinity (psu)
20.7
20.8
20.9
21
21.1

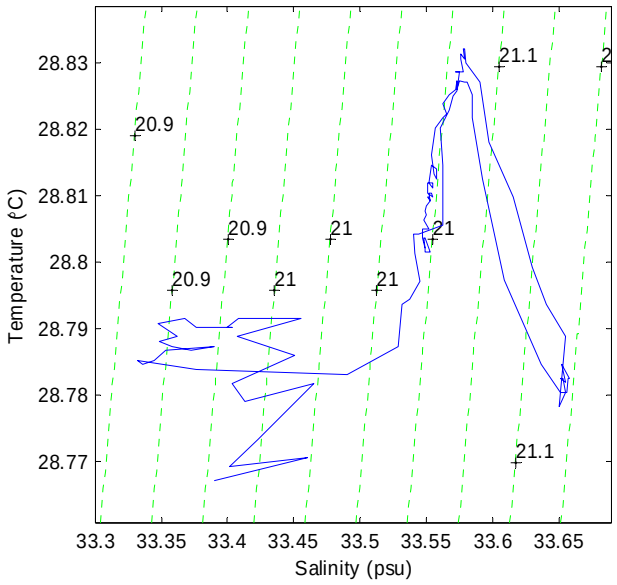

File: 2209003 22-Sep-2003 10:36:24 S7.277 E134.3134 Site: A4
Depth (m)
0
2
4
6
8
10
12
14
16
18
20
28.72
28.74
28.76
28.78
28.8
28.82
28.84
28.86
28.88
Temperature (deg C) (dotted)
33.2
33.25
33.3
33.35
33.4
33.45
33.5
Salinity (psu) (solid)
20.75
20.8
20.85
20.9
20.95
21
21.05
21.1
21.15
Density (sigma-t) (dashed)

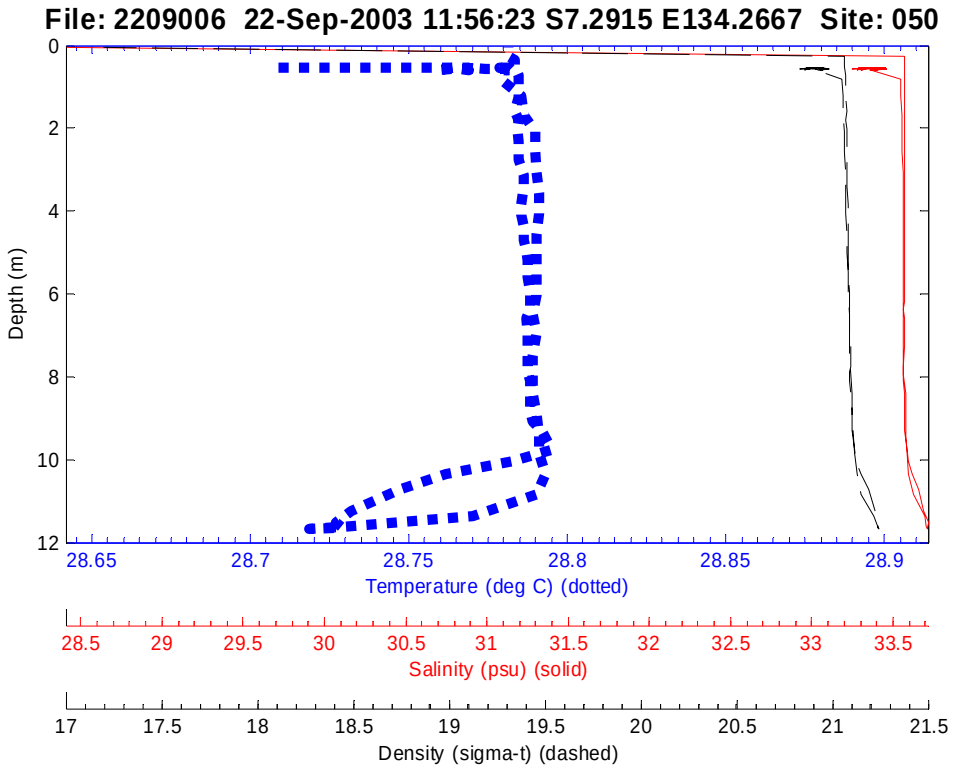

Temperature (C)
28.82
28.81
28.8
28.79
28.78
28.77
28.76
20.8
20.8
20.9
21
21
20.8
20.9
20.9
21
21
33.2
33.25
33.3
33.35
33.4
33.45
33.5
33.55
Salinity (psu)

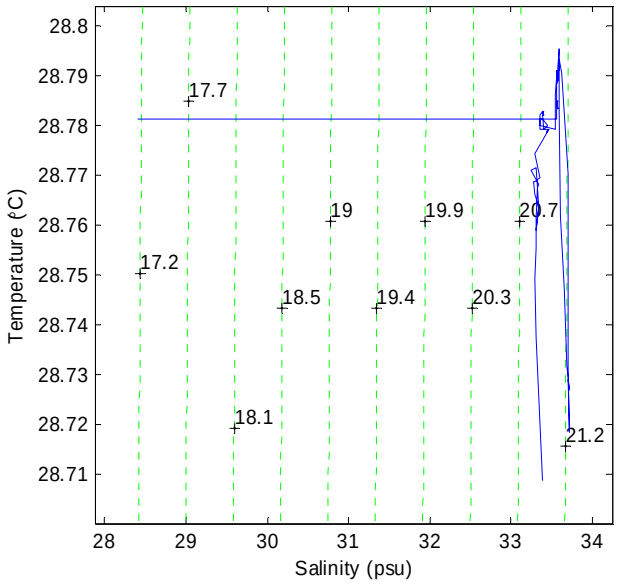

File: 2209004 22-Sep-2003 11:49:22 S7.2911 E134.2799 Site: 048
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
28.72
28.74
28.76
28.78
28.8
28.82
28.84
28.86
28.88
28.9
Temperature (deg C) (dotted)
33.25
33.3
33.35
33.4
33.45
33.5
33.55
Salinity (psu) (solid)
20.8
20.85
20.9
20.95
21
21.05
21.1
21.15
Density (sigma-t) (dashed)

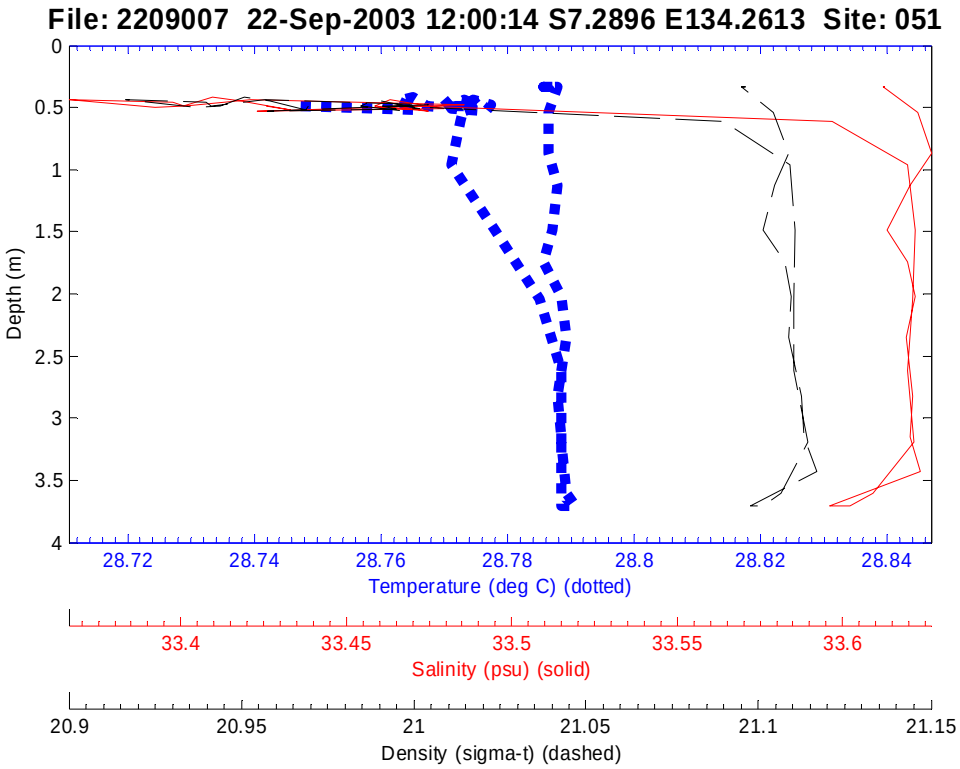

Temperature (C)
28.85
28.84
28.83
28.82
28.81
28.8
28.79
28.78
28.77
20.8
20.8
20.9
20.9
20.9
20.9
21
21
21
21
33.25
33.3
33.35
33.4
33.45
33.5
33.55
Salinity (psu)

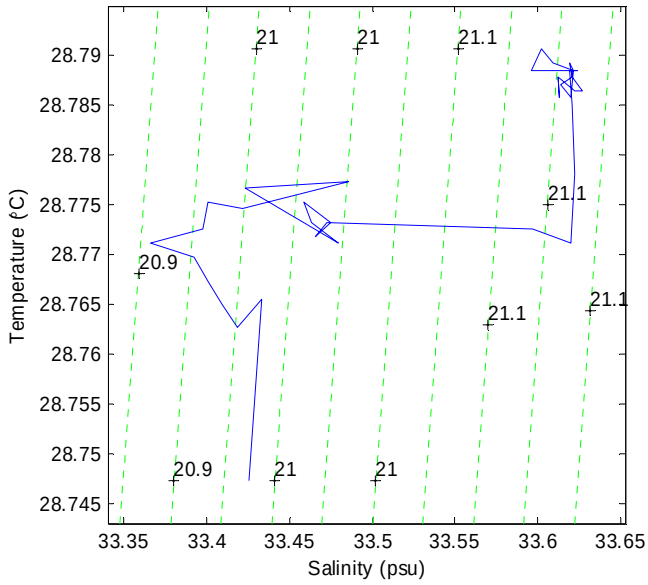

File: 2209005 22-Sep-2003 11:52:43 S7.2904 E134.2735 Site: 049
Depth (m)
0
5
10
15
28.72
28.74
28.76
28.78
28.8
28.82
28.84
28.86
28.88
Temperature (deg C) (dotted)
33.35
33.4
33.45
33.5
33.55
33.6
33.65
Salinity (psu) (solid)
20.85
20.9
20.95
21
21.05
21.1
21.15
21.2
21.25
Density (sigma-t) (dashed)

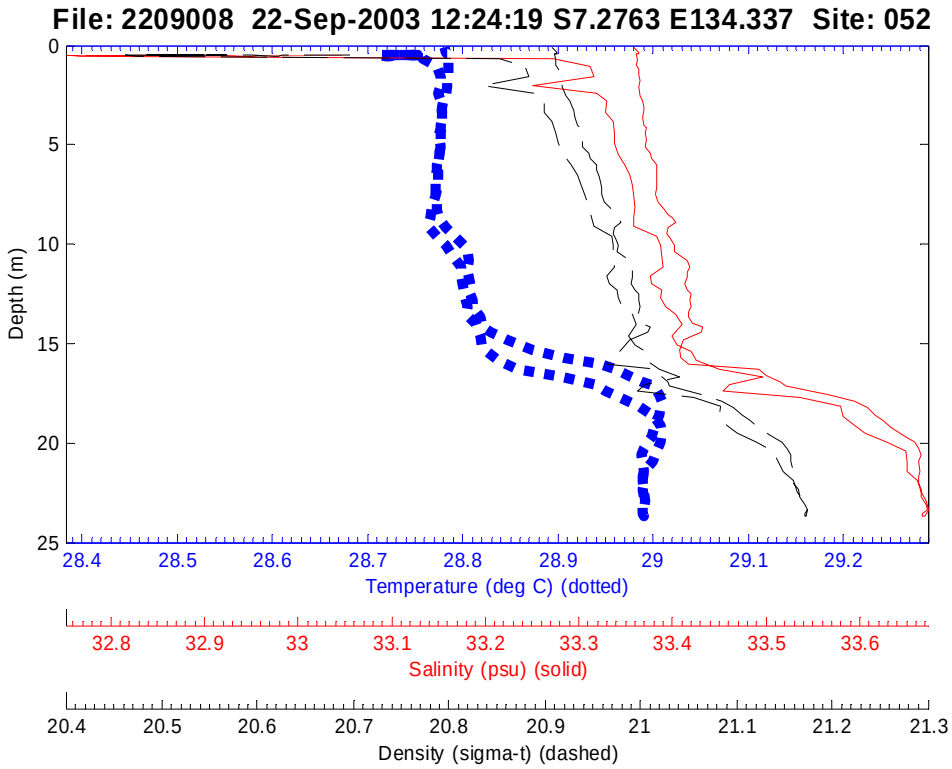

Temperature (C)
28.83
28.82
28.81
28.8
28.79
28.78
28.77
20.9
20.9
20.9
21
21
21
21
21.1
21.1
33.3
33.35
33.4
33.45
33.5
33.55
33.6
33.65
Salinity (psu)

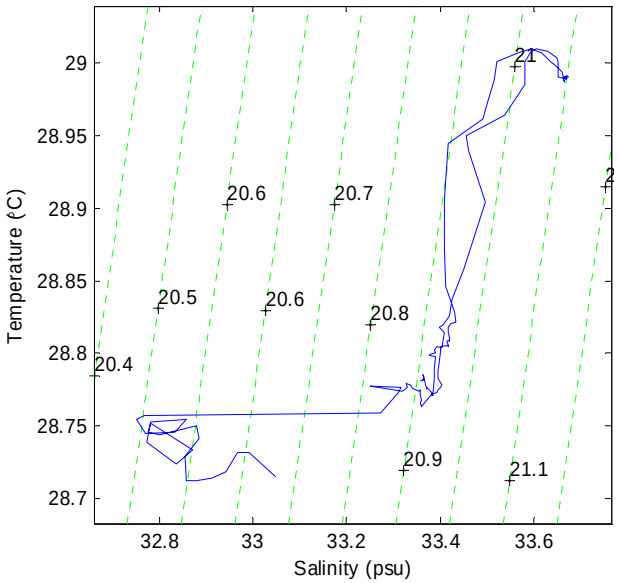

File: 2209006 22-Sep-2003 11:56:23 S7.2915 E134.2667 Site: 050
Depth (m)
0
2
4
6
8
10
12
28.65
28.7
28.75
28.8
28.85
28.9
Temperature (deg C) (dotted)
28.5
29
29.5
30
30.5
31
31.5
32
32.5
33
33.5
Salinity (psu) (solid)
17
17.5
18
18.5
19
19.5
20
20.5
21
21.5
Density (sigma-t) (dashed)

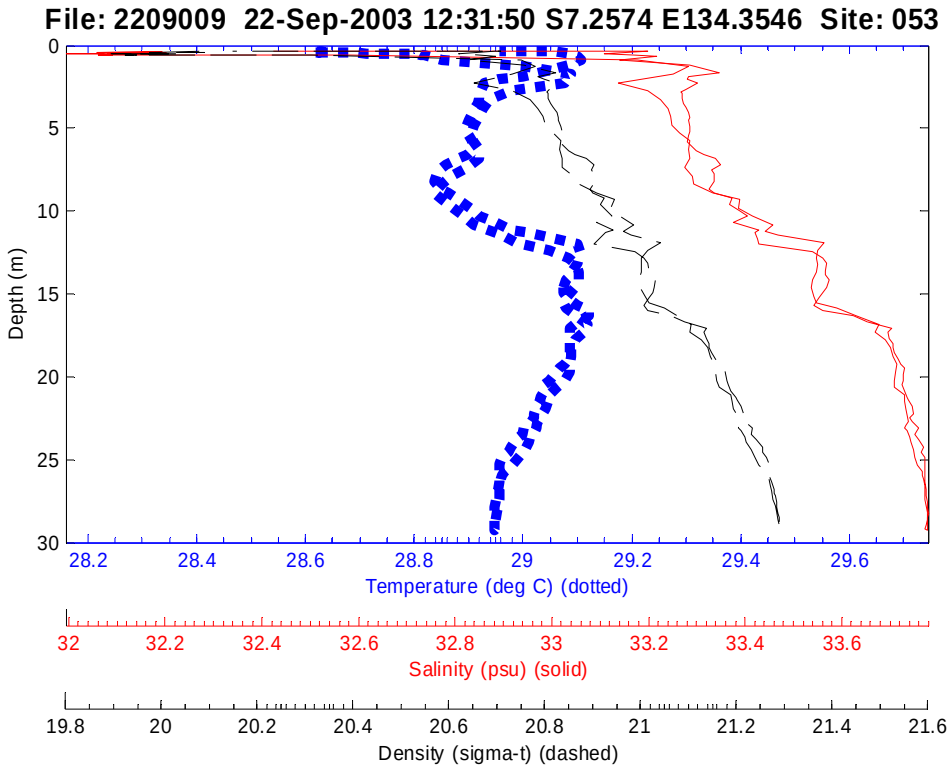

Temperature (C)
28.8
28.79
28.78
28.77
28.76
28.75
28.74
28.73
28.72
28.71
17.7
17.2
19
19.9
20.7
18.5
19.4
20.3
18.1
21.2
28
29
30
31
32
33
34
Salinity (psu)

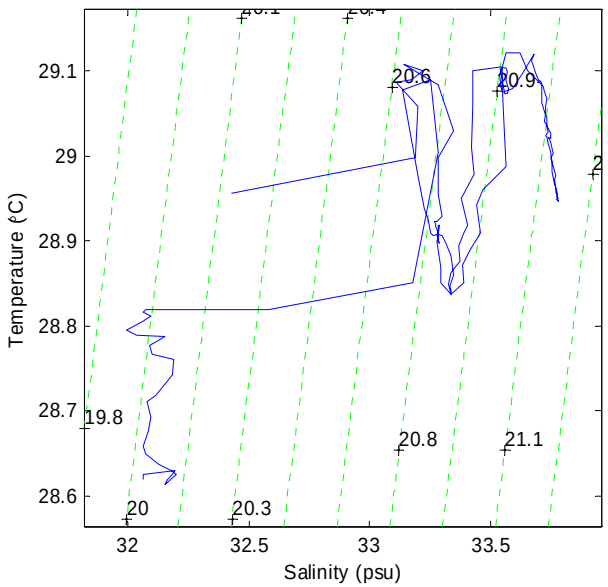

File: 2209007 22-Sep-2003 12:00:14 S7.2896 E134.2613 Site: 051
Depth (m)
0
0.5
1
1.5
2
2.5
3
3.5
4
28.72
28.74
28.76
28.78
28.8
28.82
28.84
Temperature (deg C) (dotted)
33.4
33.45
33.5
33.55
33.6
Salinity (psu) (solid)
20.9
20.95
21
21.05
21.1
21.15
Density (sigma-t) (dashed)

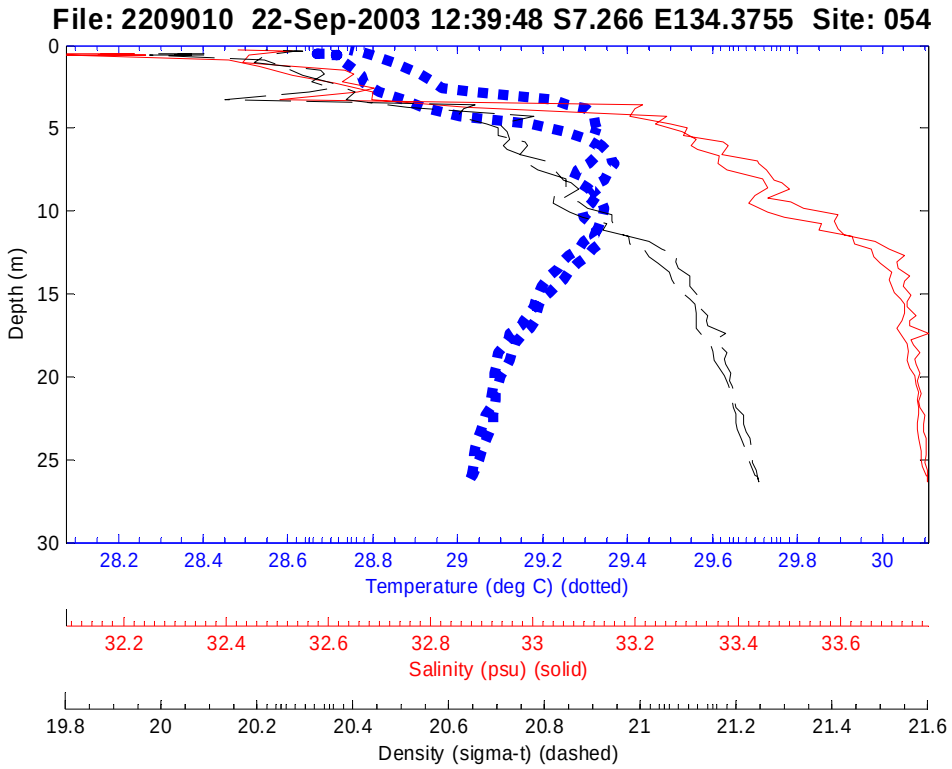

Temperature (C)
28.79
28.785
28.78
28.775
28.77
28.765
28.76
28.755
28.75
28.745
21
21
21.1
21.1
20.9
21.1
20.9
21
21
33.35
33.4
33.45
33.5
33.55
33.6
33.65
Salinity (psu)

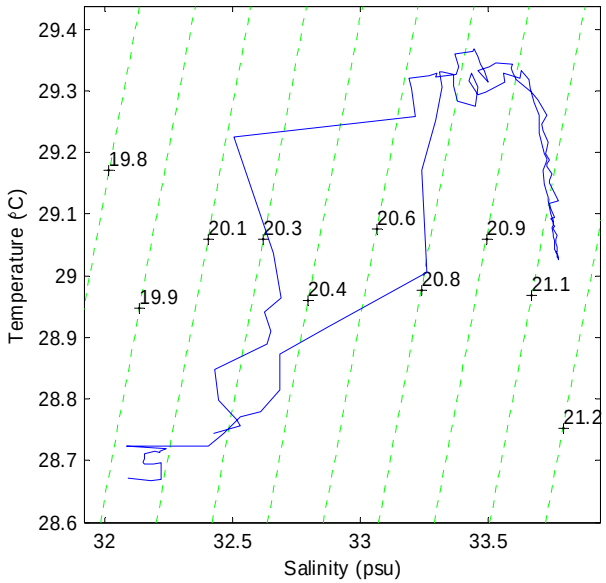

File: 2209008 22-Sep-2003 12:24:19 S7.2763 E134.337 Site: 052
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

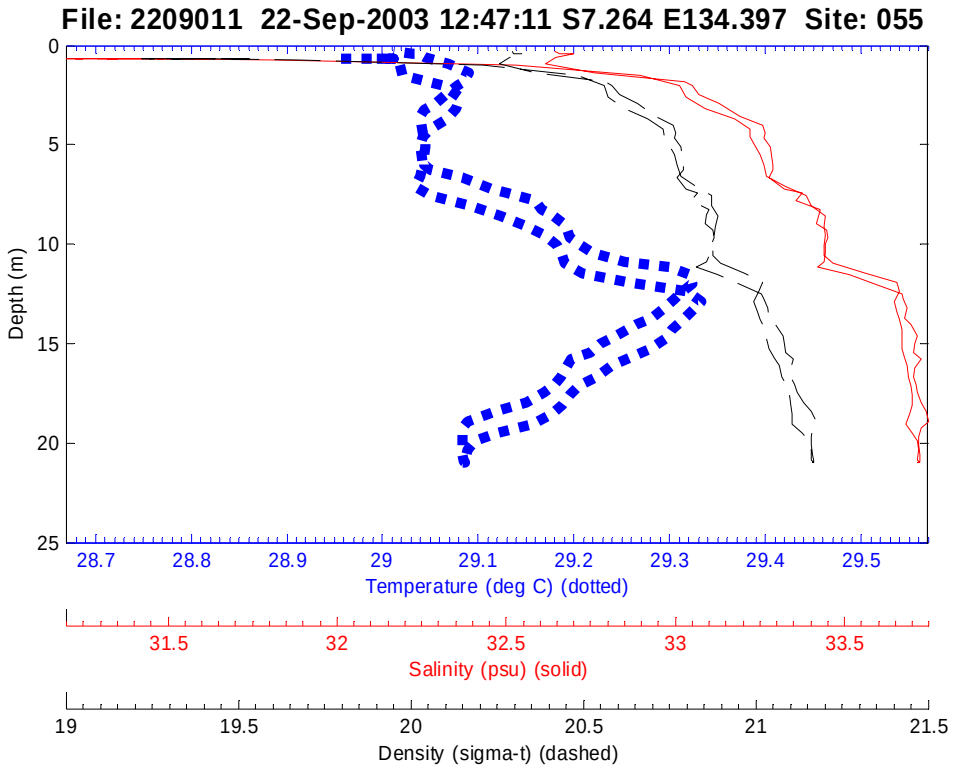

Temperature (C)
Salinity (psu)
20.4
20.5
20.6
20.7
20.8
20.9
21
21.1

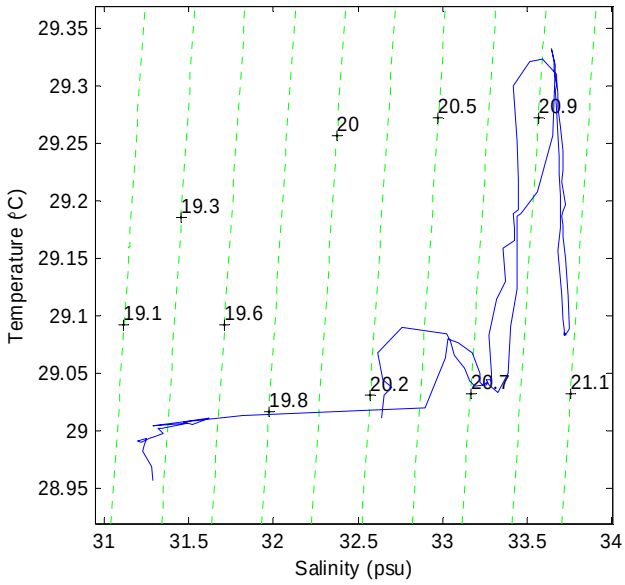

File: 2209009 22-Sep-2003 12:31:50 S7.2574 E134.3546 Site: 053
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

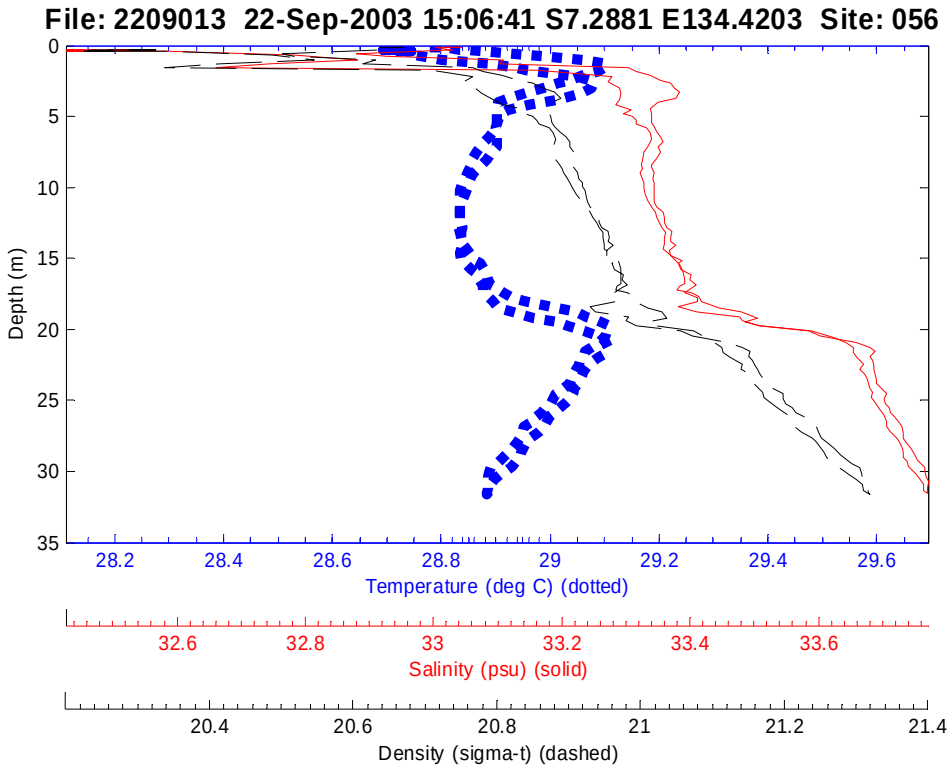

Temperature (C)
Salinity (psu)
19.8
20
20.3
20.8
21.1

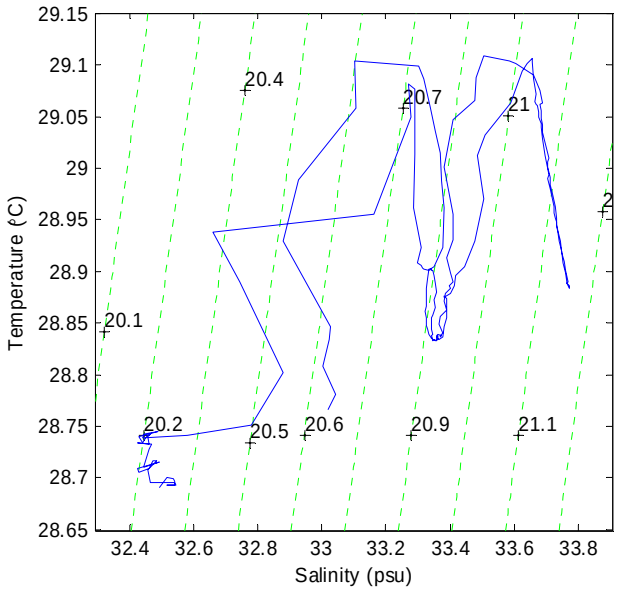

File: 2209010 22-Sep-2003 12:39:48 S7.266 E134.3755 Site: 054
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

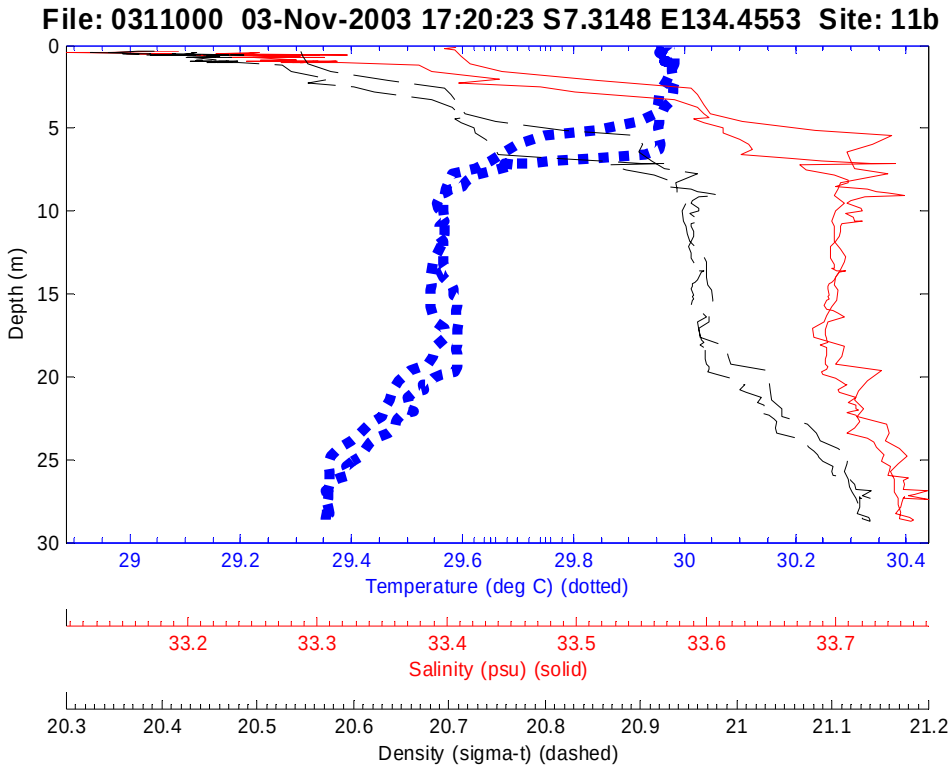

Temperature (C)
Salinity (psu)
19.8
19.9
20.1
20.3
20.4
20.6
20.8
20.9
21.1
21.2

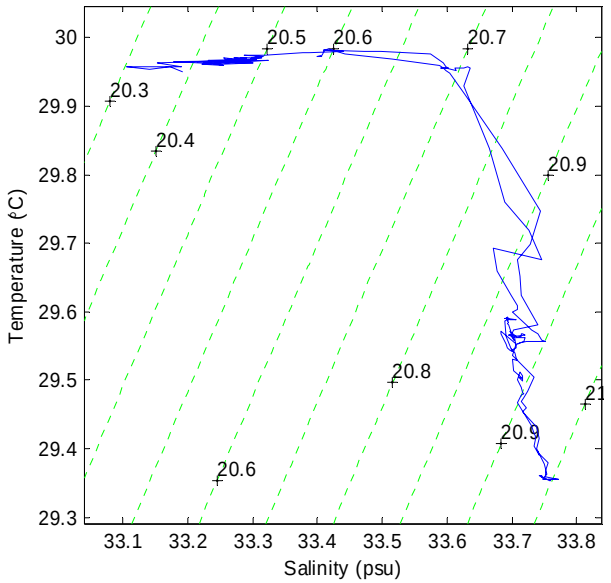

File: 2209011 22-Sep-2003 12:47:11 S7.264 E134.397 Site: 055
Depth (m)
0
5
10
15
20
25
28.7
28.8
28.9
29
29.1
29.2
29.3
29.4
29.5
Temperature (deg C) (dotted)
31.5
32
32.5
33
33.5
Salinity (psu) (solid)
19
19.5
20
20.5
21
21.5
Density (sigma-t) (dashed)

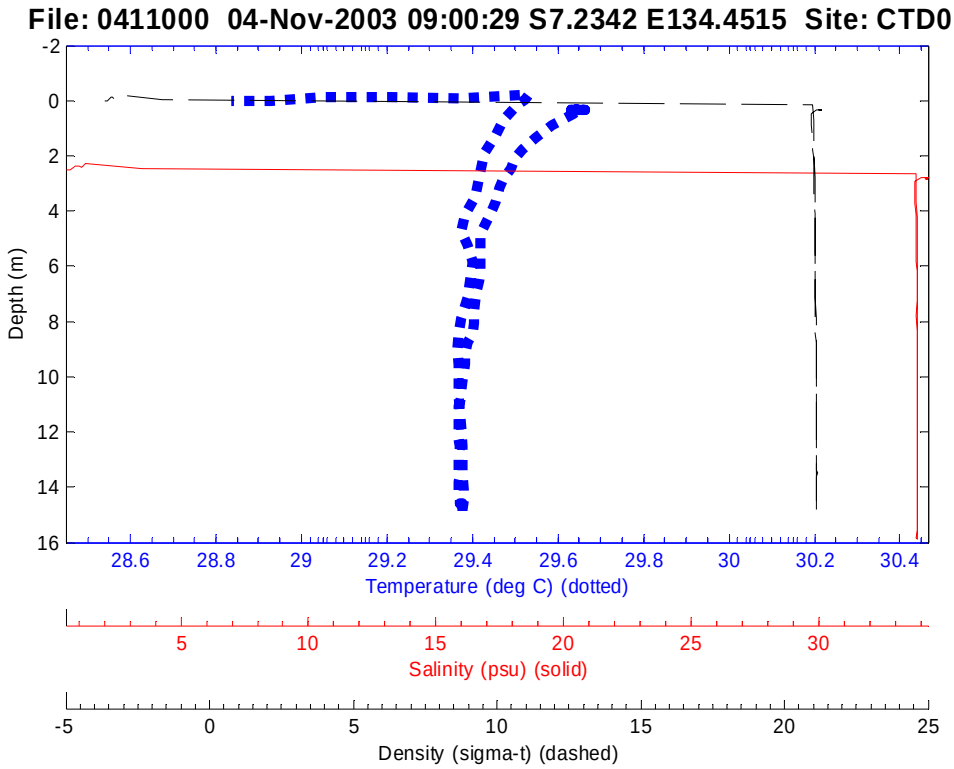

Temperature (C)
29.35
29.3
29.25
29.2
29.15
29.1
29.05
29
28.95
19.1
19.3
19.6
19.8
20
20.2
20.5
20.7
20.9
21.1
31
31.5
32
32.5
33
33.5
34
Salinity (psu)

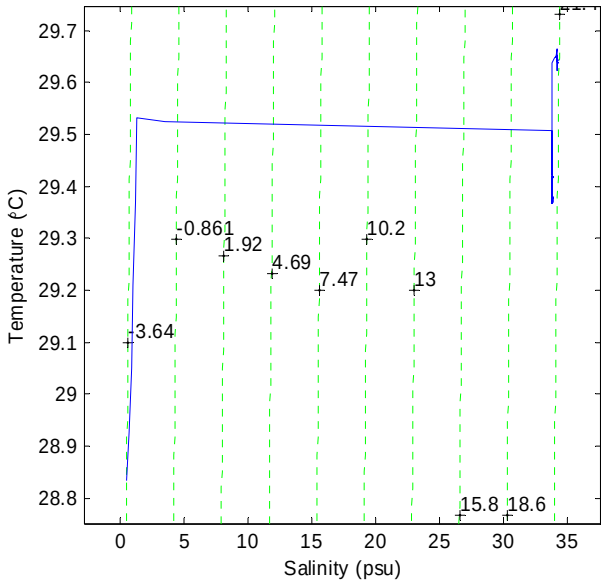

File: 2209013 22-Sep-2003 15:06:41 S7.2881 E134.4203 Site: 056
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

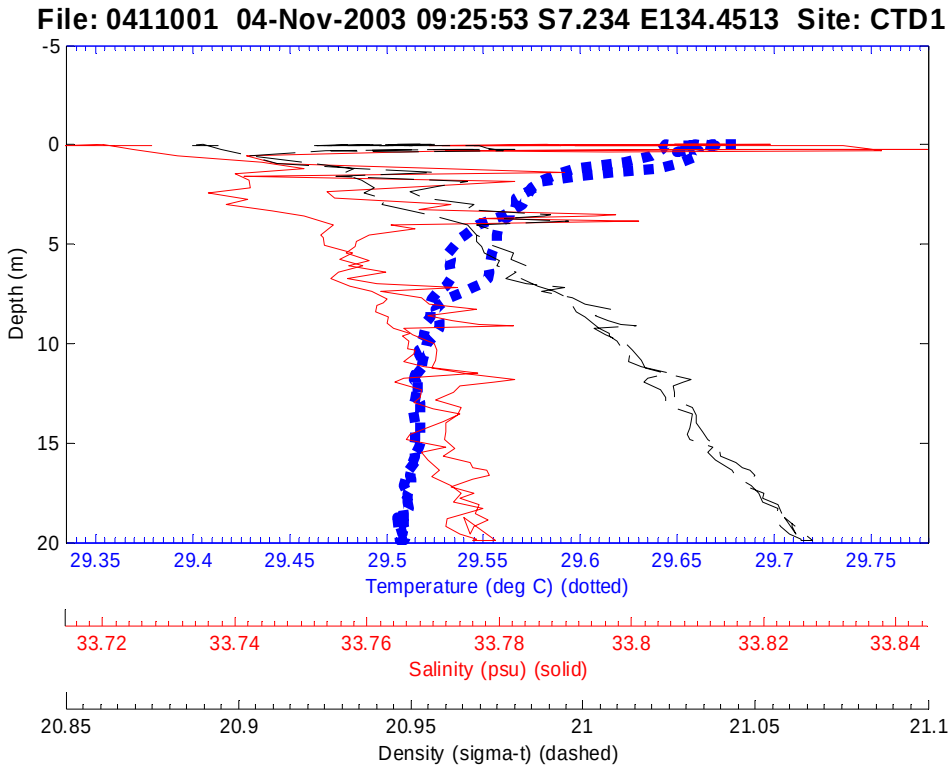

Temperature (°C)
Salinity (psu)
20.1
20.2
20.4
20.5
20.6
20.7
20.9
21
21.1

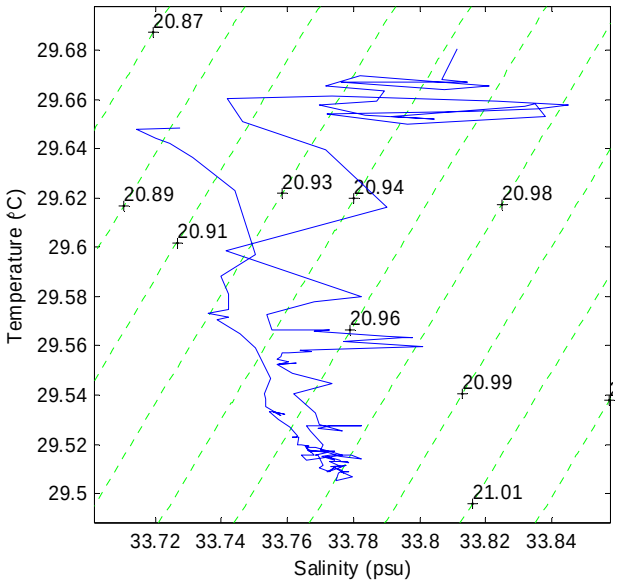

File: 0311000 03-Nov-2003 17:20:23 S7.3148 E134.4553 Site: 11b
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

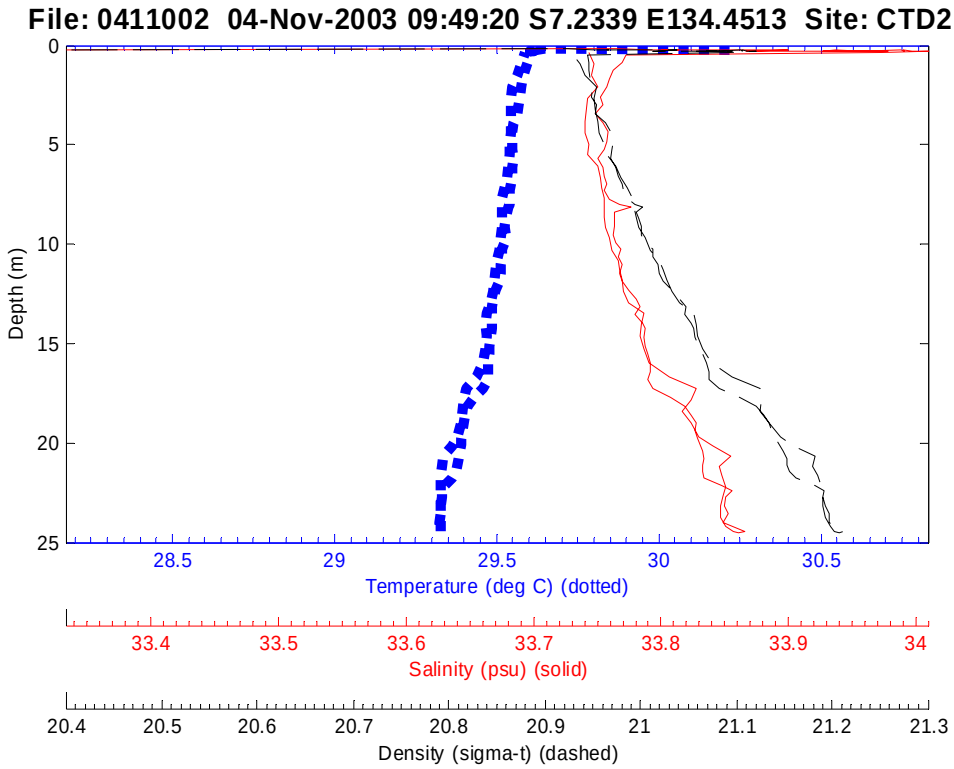

Temperature (C)
Salinity (psu)
20.3
20.4
20.5
20.6
20.7
20.8
20.9
21
20.9
20.6

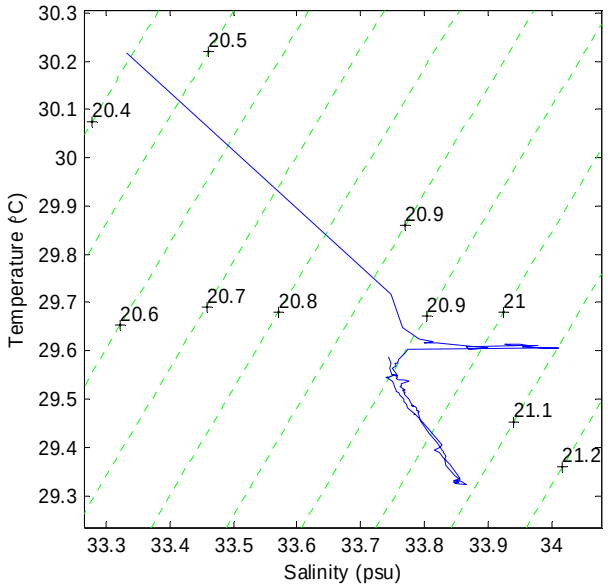

File: 0411000 04-Nov-2003 09:00:29 S7.2342 E134.4515 Site: CTD0
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

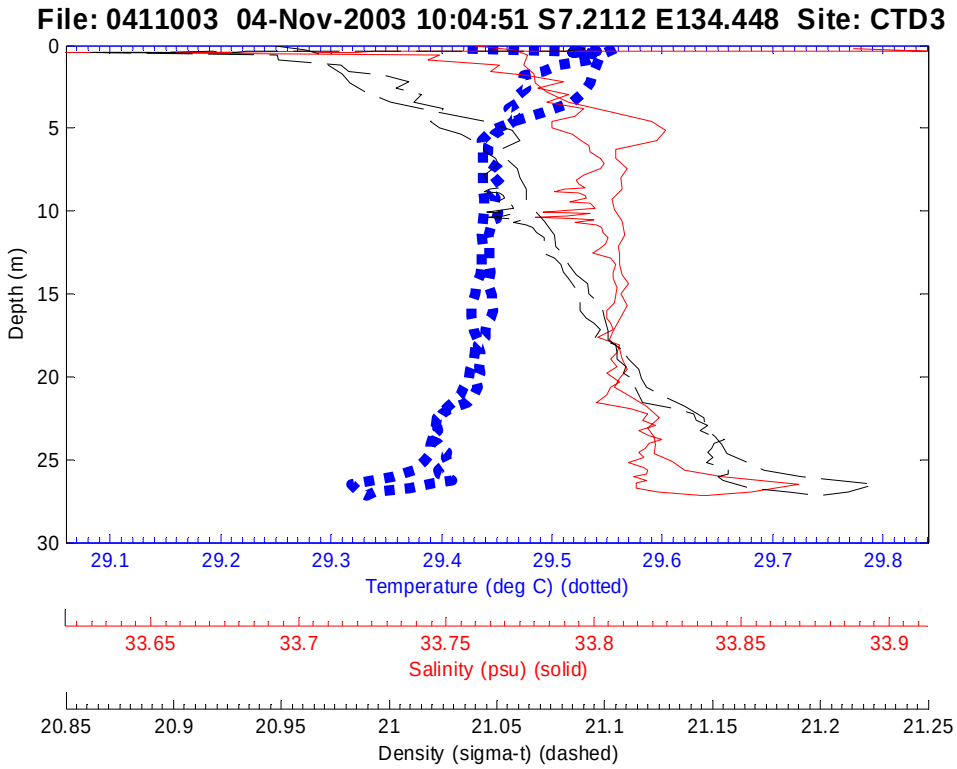

Temperature (C)
Salinity (psu)
0.861
1.92
3.64
4.69
7.47
10.2
13
15.8
18.6

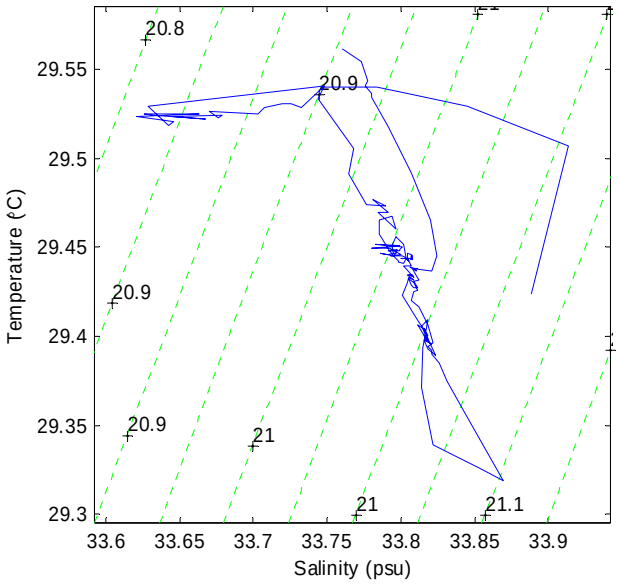

File: 0411001 04-Nov-2003 09:25:53 S7.234 E134.4513 Site: CTD1
Depth (m)
-5
0
5
10
15
20
29.35
29.4
29.45
29.5
29.55
29.6
29.65
29.7
29.75
Temperature (deg C) (dotted)
33.72
33.74
33.76
33.78
33.8
33.82
33.84
Salinity (psu) (solid)
20.85
20.9
20.95
21
21.05
21.1
Density (sigma-t) (dashed)

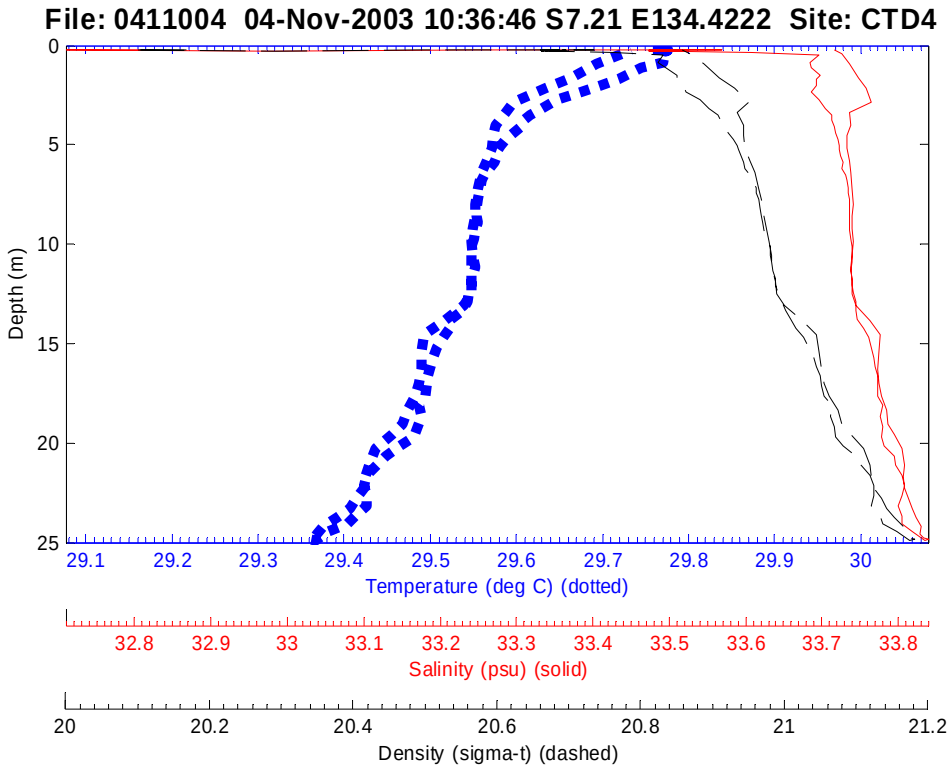

Temperature (C)
29.68
29.66
29.64
29.62
29.6
29.58
29.56
29.54
29.52
29.5
20.87
20.89
20.91
20.93
20.94
20.96
20.98
20.99
21.01
33.72
33.74
33.76
33.78
33.8
33.82
33.84
Salinity (psu)

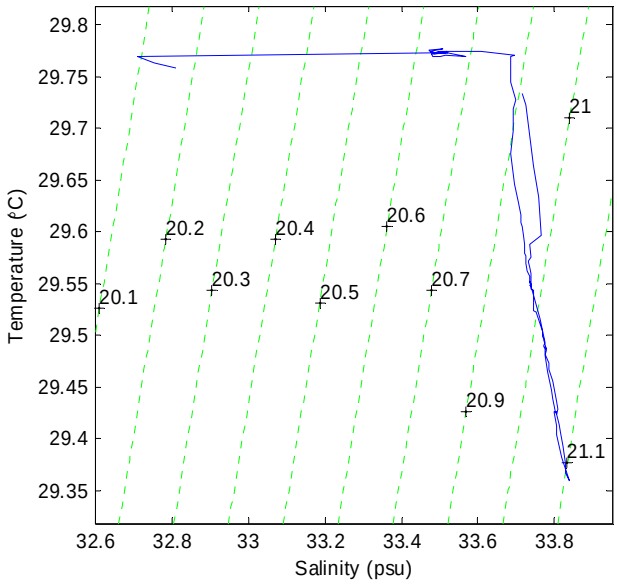

File: 0411002 04-Nov-2003 09:49:20 S7.2339 E134.4513 Site: CTD2
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

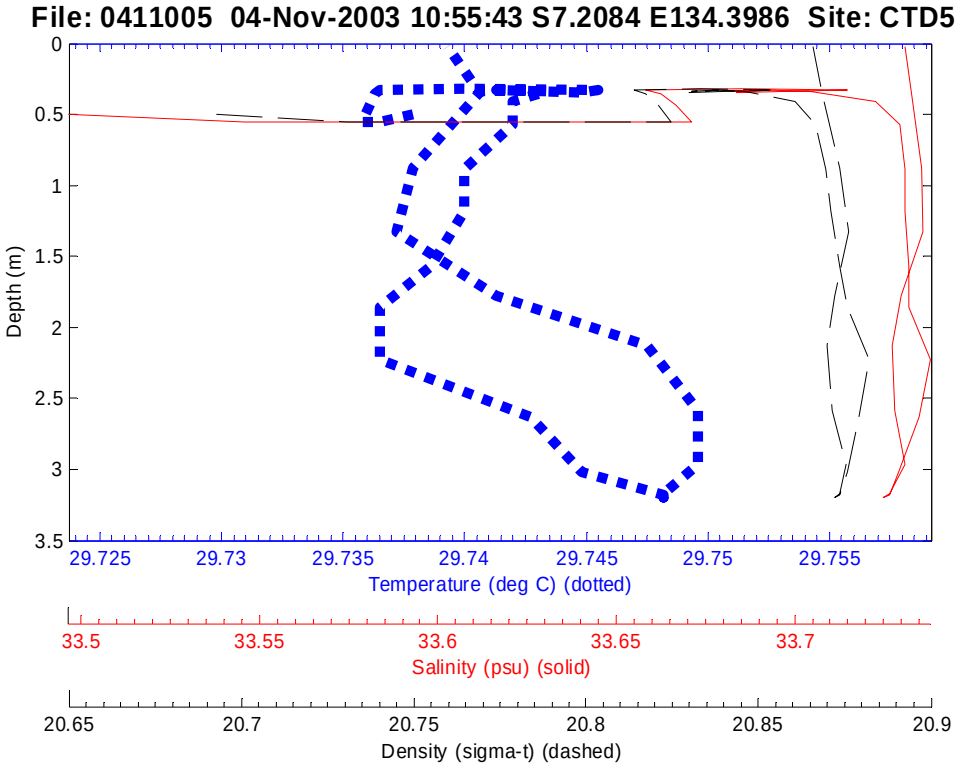

Temperature (C)
Salinity (psu)
20.4
20.5
20.6
20.7
20.8
20.9
20.9
21
21.1
21.2

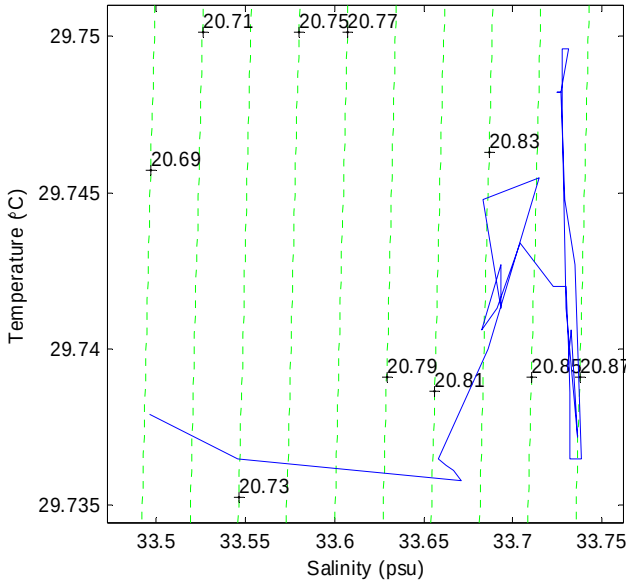

File: 0411003 04-Nov-2003 10:04:51 S7.2112 E134.448 Site: CTD3
Depth (m)
0
5
10
15
20
25
30
29.1
29.2
29.3
29.4
29.5
29.6
29.7
29.8
Temperature (deg C) (dotted)
33.65
33.7
33.75
33.8
33.85
33.9
Salinity (psu) (solid)
20.85
20.9
20.95
21
21.05
21.1
21.15
21.2
21.25
Density (sigma-t) (dashed)

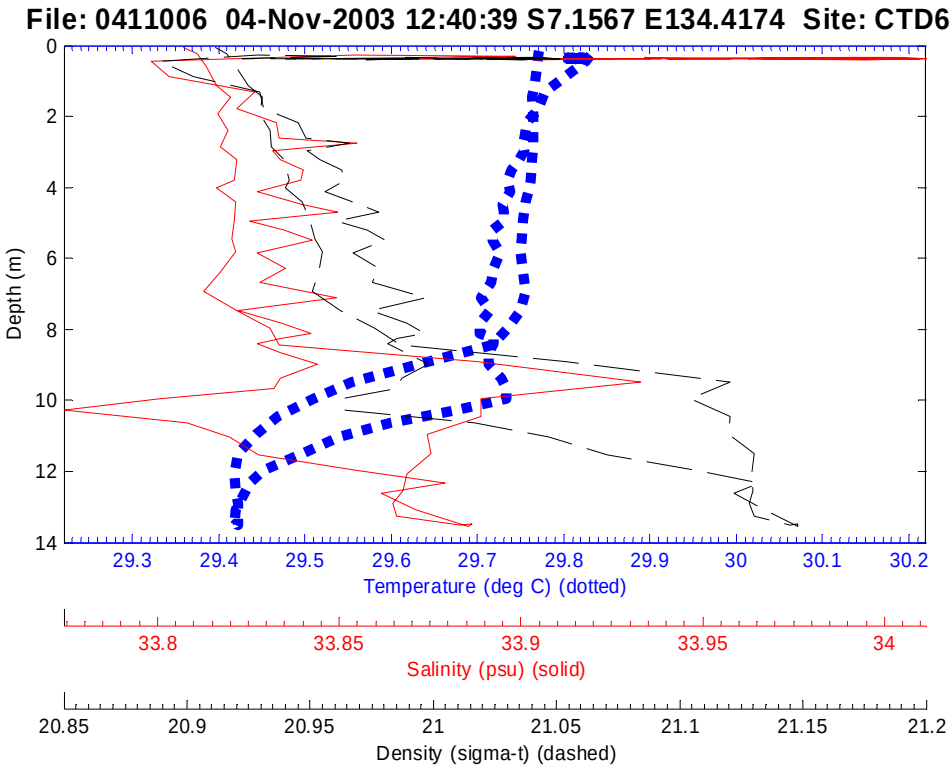

Temperature (C)
29.55
29.5
29.45
29.4
29.35
29.3
20.8
20.9
20.9
20.9
21
21
21.1
33.6
33.65
33.7
33.75
33.8
33.85
33.9
Salinity (psu)

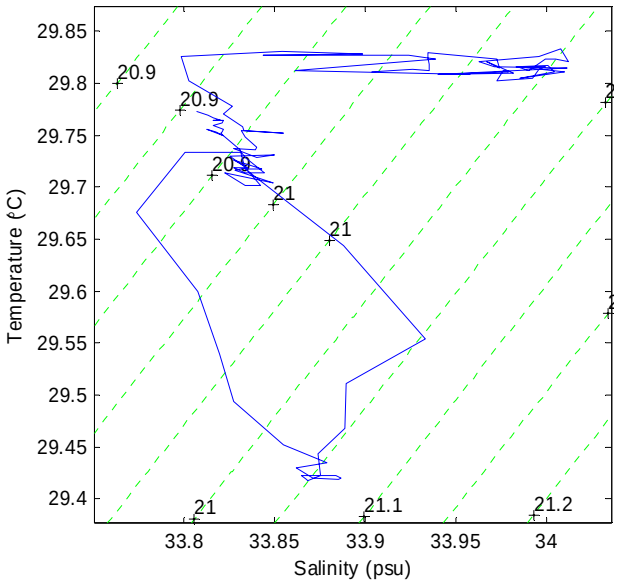

File: 0411004 04-Nov-2003 10:36:46 S7.21 E134.4222 Site: CTD4
Depth (m)
0
5
10
15
20
25
29.1
29.2
29.3
29.4
29.5
29.6
29.7
29.8
29.9
30
Temperature (deg C) (dotted)
32.8
32.9
33
33.1
33.2
33.3
33.4
33.5
33.6
33.7
33.8
Salinity (psu) (solid)
20
20.2
20.4
20.6
20.8
21
21.2
Density (sigma-t) (dashed)

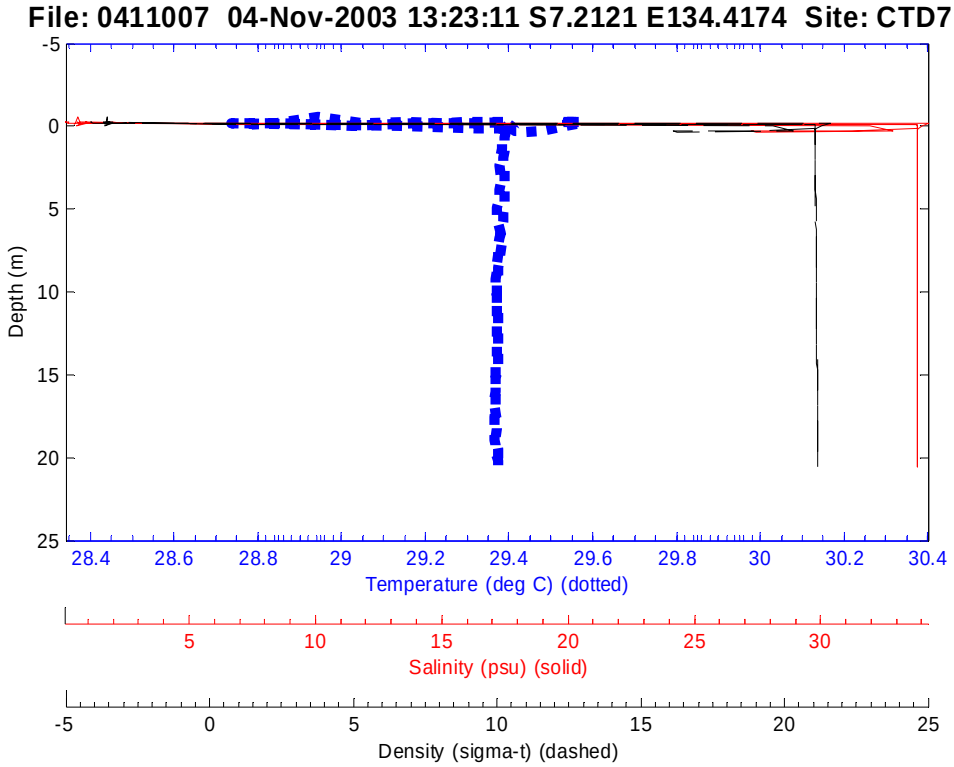

Temperature (C)
29.8
29.75
29.7
29.65
29.6
29.55
29.5
29.45
29.4
29.35
20.1
20.2
20.3
20.4
20.5
20.6
20.7
20.9
21
21.1
32.6
32.8
33
33.2
33.4
33.6
33.8
Salinity (psu)

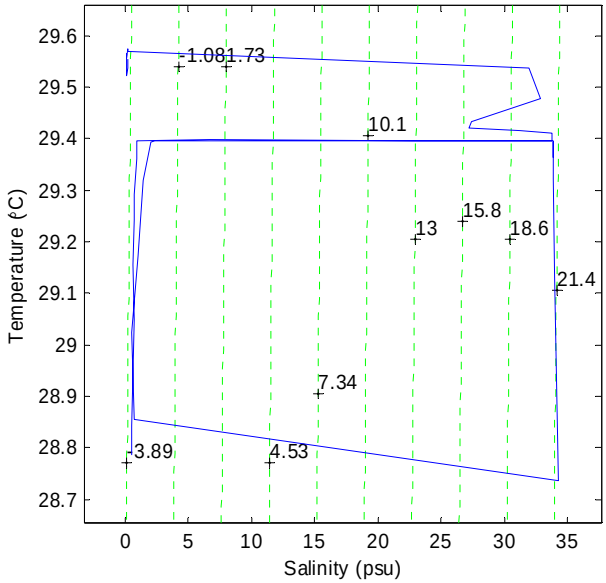

File: 0411005 04-Nov-2003 10:55:43 S7.2084 E134.3986 Site: CTD5
Depth (m)
0
0.5
1
1.5
2
2.5
3
3.5
29.725
29.73
29.735
29.74
29.745
29.75
29.755
Temperature (deg C) (dotted)
33.5
33.55
33.6
33.65
33.7
Salinity (psu) (solid)
20.65
20.7
20.75
20.8
20.85
20.9
Density (sigma-t) (dashed)

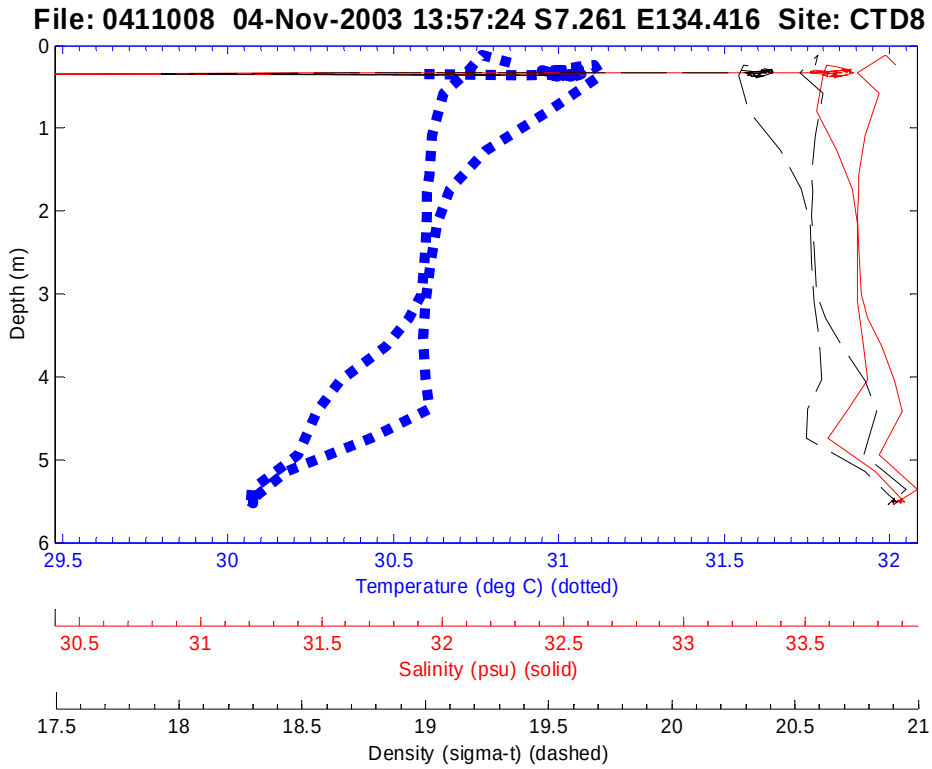

Temperature (C)
29.75
29.745
29.74
29.735
20.71
20.75
20.77
20.69
20.83
20.79
20.81
20.85
20.87
20.73
33.5
33.55
33.6
33.65
33.7
33.75
Salinity (psu)

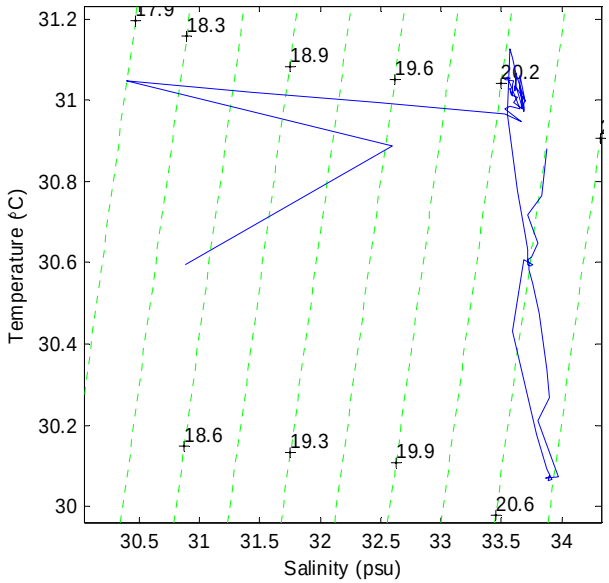

File: 0411006 04-Nov-2003 12:40:39 S7.1567 E134.4174 Site: CTD6
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

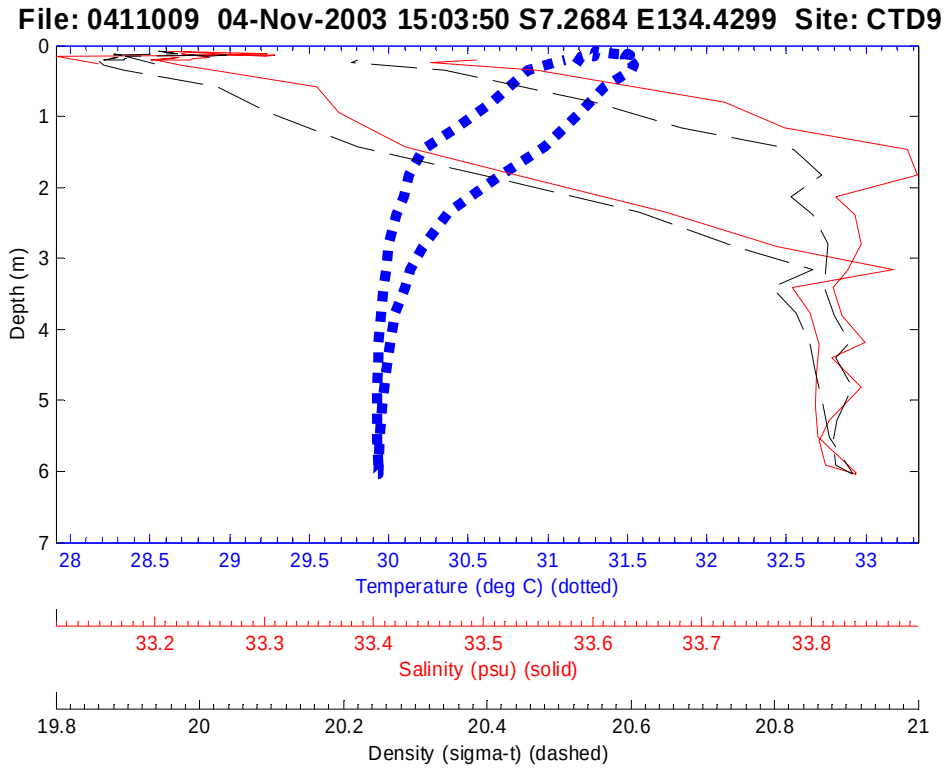

Temperature (C)
Salinity (psu)
20.9
21
21.1
21.2

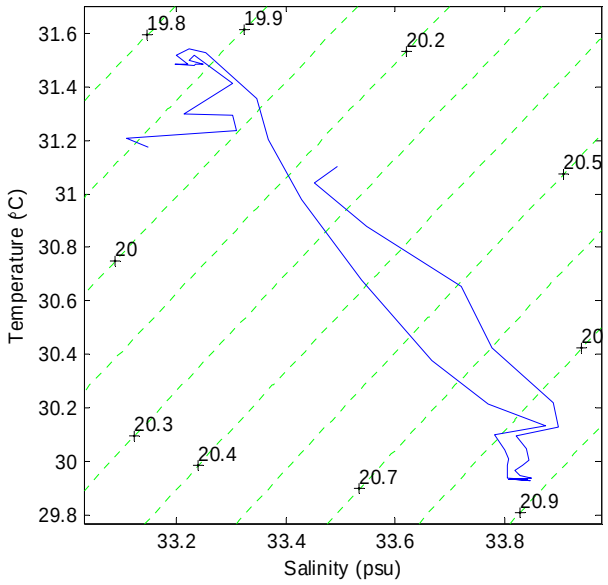

File: 0411007 04-Nov-2003 13:23:11 S7.2121 E134.4174 Site: CTD7
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

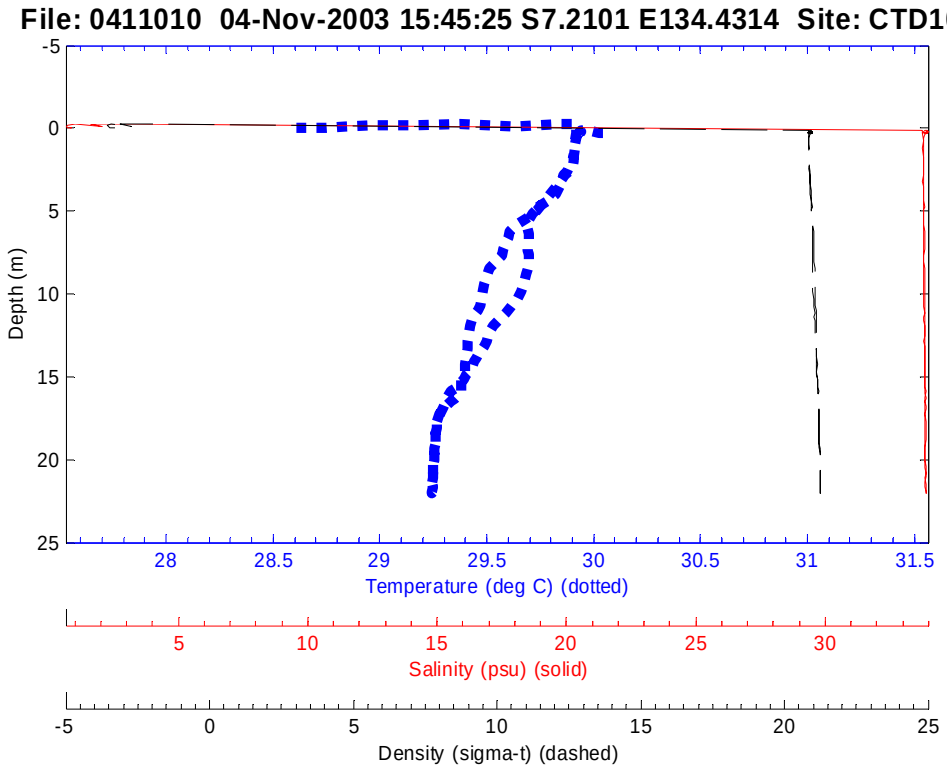

Temperature (C)
Salinity (psu)
1.08
1.73
10.1
13
15.8
18.6
21.4
7.34
3.89
4.53

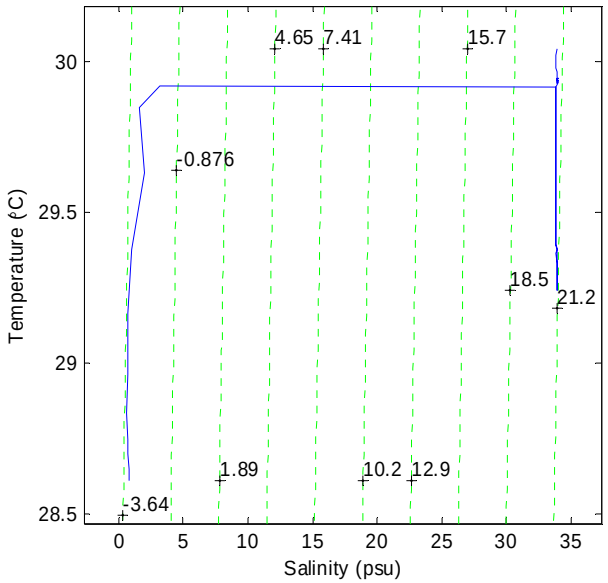

File: 0411008 04-Nov-2003 13:57:24 S7.261 E134.416 Site: CTD8
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)


Temperature (C)
Salinity (psu)
18.3
18.9
19.6
20.2
18.6
19.3
19.9
20.6

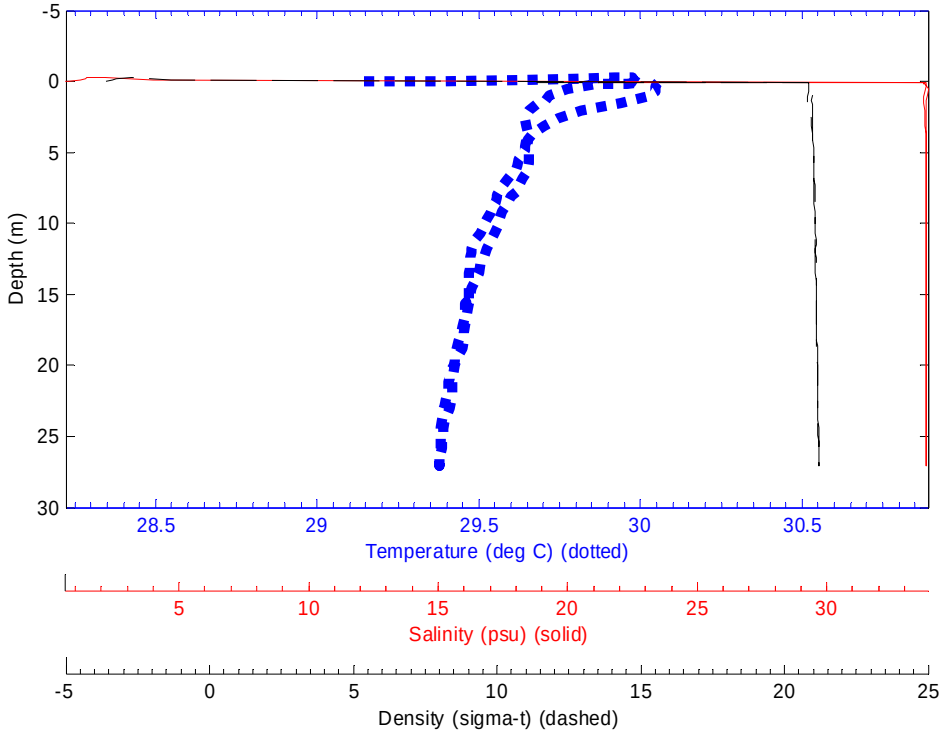

File: 0411009 04-Nov-2003 15:03:50 S7.2684 E134.4299 Site: CTD9
Depth (m)
0
1
2
3
4
5
6
7
28
28.5
29
29.5
30
30.5
31
31.5
32
32.5
33
Temperature (deg C) (dotted)
33.2
33.3
33.4
33.5
33.6
33.7
33.8
Salinity (psu) (solid)
19.8
20
20.2
20.4
20.6
20.8
21
Density (sigma-t) (dashed)

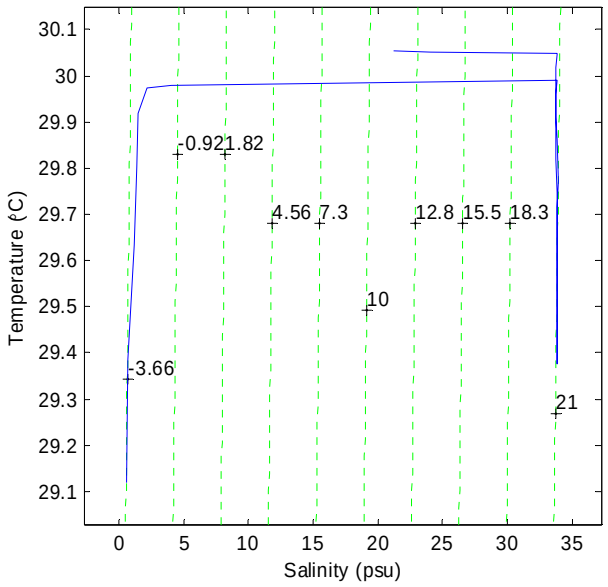

Temperature (C)
31.6
31.4
31.2
31
30.8
30.6
30.4
30.2
30
29.8
19.8
19.9
20.2
20.5
20
20.3
20.4
20.7
20.9
33.2
33.4
33.6
33.8
Salinity (psu)

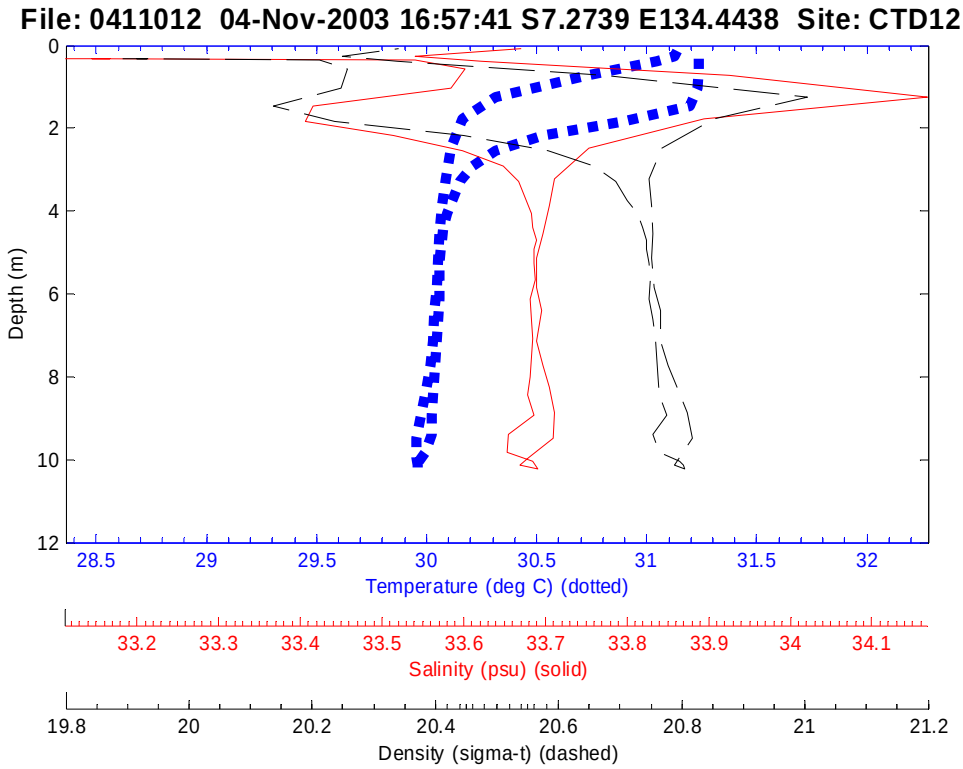

File: 0411010 04-Nov-2003 15:45:25 S7.2101 E134.4314 Site: CTD10
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

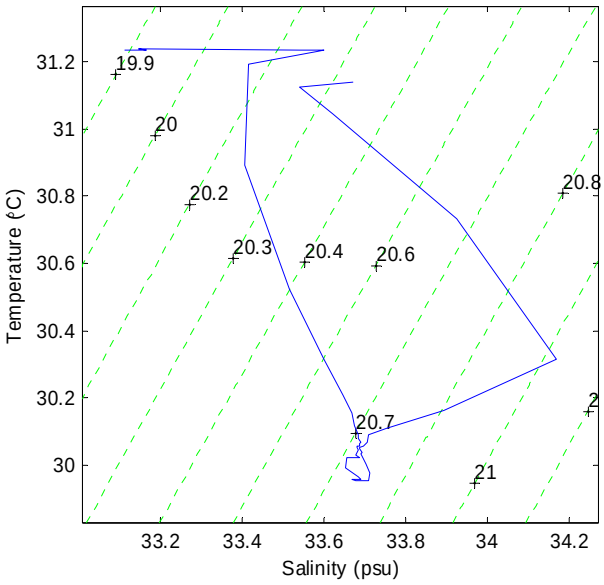

Temperature (C)
Salinity (psu)
4.65
7.41
15.7
0.876
18.5
21.2
1.89
10.2
12.9
3.64

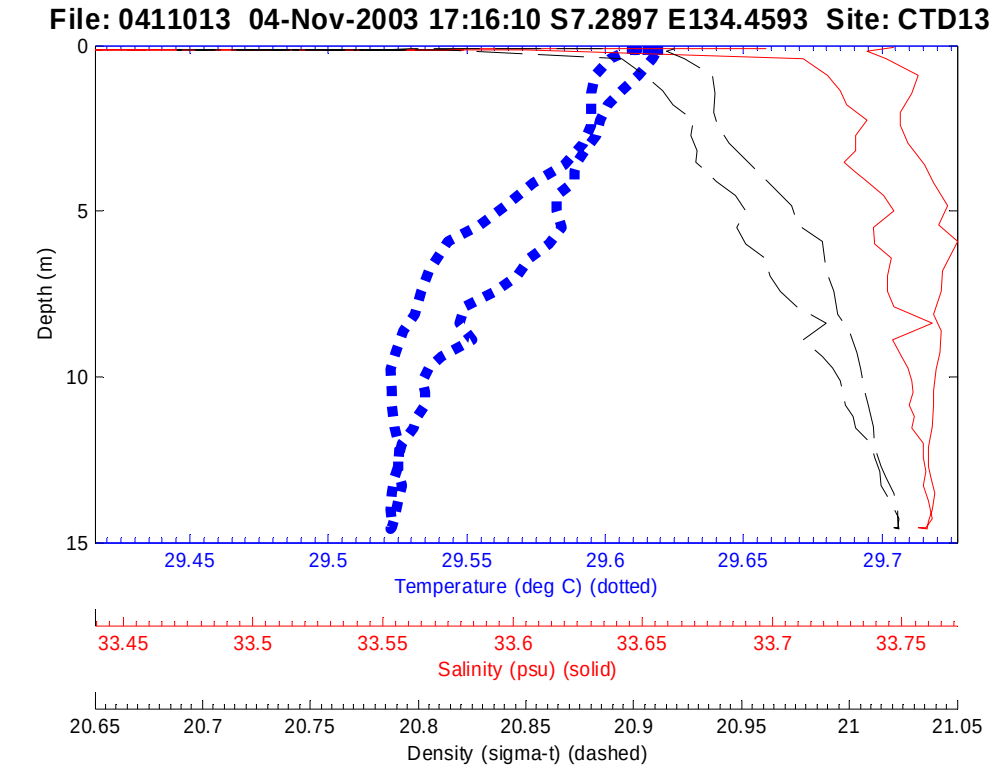
File: 0411011 04-Nov-2003 16:26:20 S7.1576 E134.4314 Site: CTD11

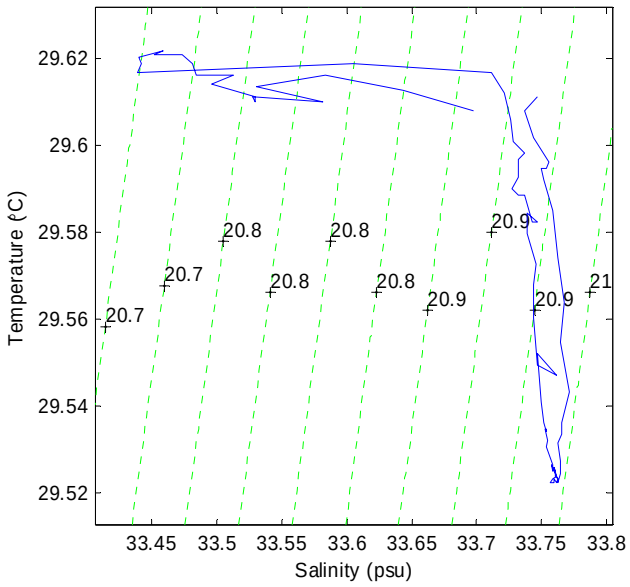


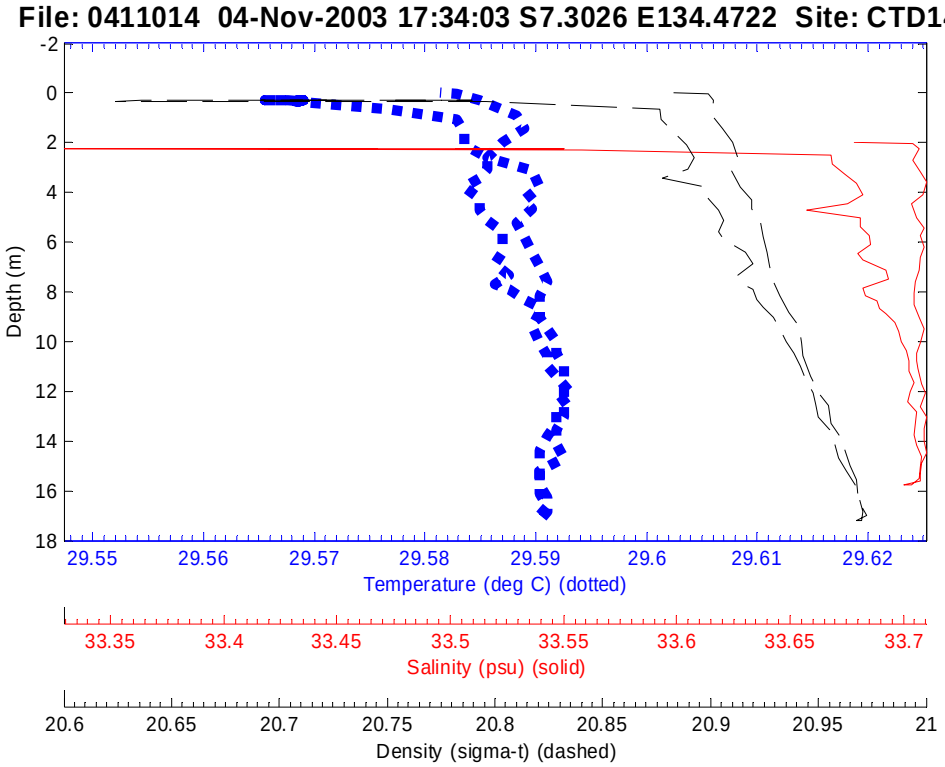


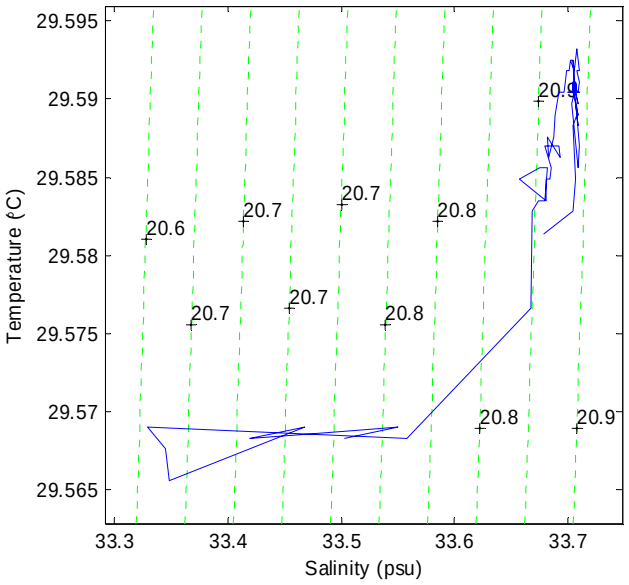

File: 0411012 04-Nov-2003 16:57:41 S7.2739 E134.4438 Site: CTD12
Depth (m)
0
2
4
6
8
10
12
28.5
29
29.5
30
30.5
31
31.5
32
Temperature (deg C) (dotted)
33.2
33.3
33.4
33.5
33.6
33.7
33.8
33.9
34
34.1
Salinity (psu) (solid)
19.8
20
20.2
20.4
20.6
20.8
21
21.2
Density (sigma-t) (dashed)

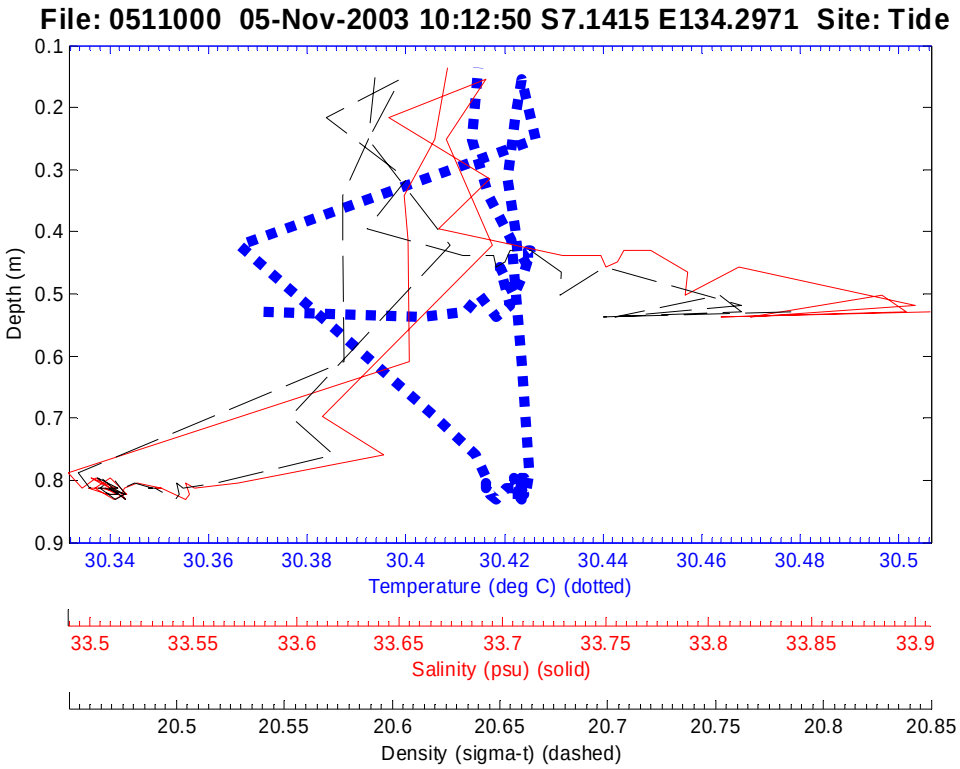

Temperature (C)
31.2
31
30.8
30.6
30.4
30.2
30
19.9
20
20.2
20.3
20.4
20.6
20.7
20.8
21
33.2
33.4
33.6
33.8
34
34.2
Salinity (psu)

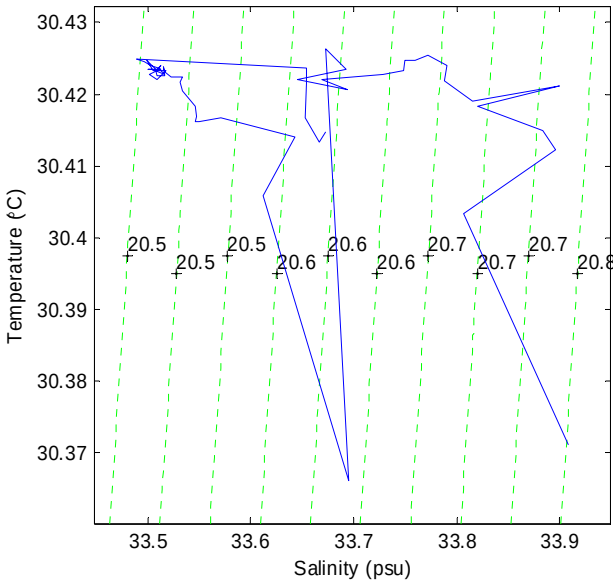

File: 0411013 04-Nov-2003 17:16:10 S7.2897 E134.4593 Site: CTD13
Depth (m)
0
5
10
15
29.45
29.5
29.55
29.6
29.65
29.7
Temperature (deg C) (dotted)
33.45
33.5
33.55
33.6
33.65
33.7
33.75
Salinity (psu) (solid)
20.65
20.7
20.75
20.8
20.85
20.9
20.95
21
21.05
Density (sigma-t) (dashed)

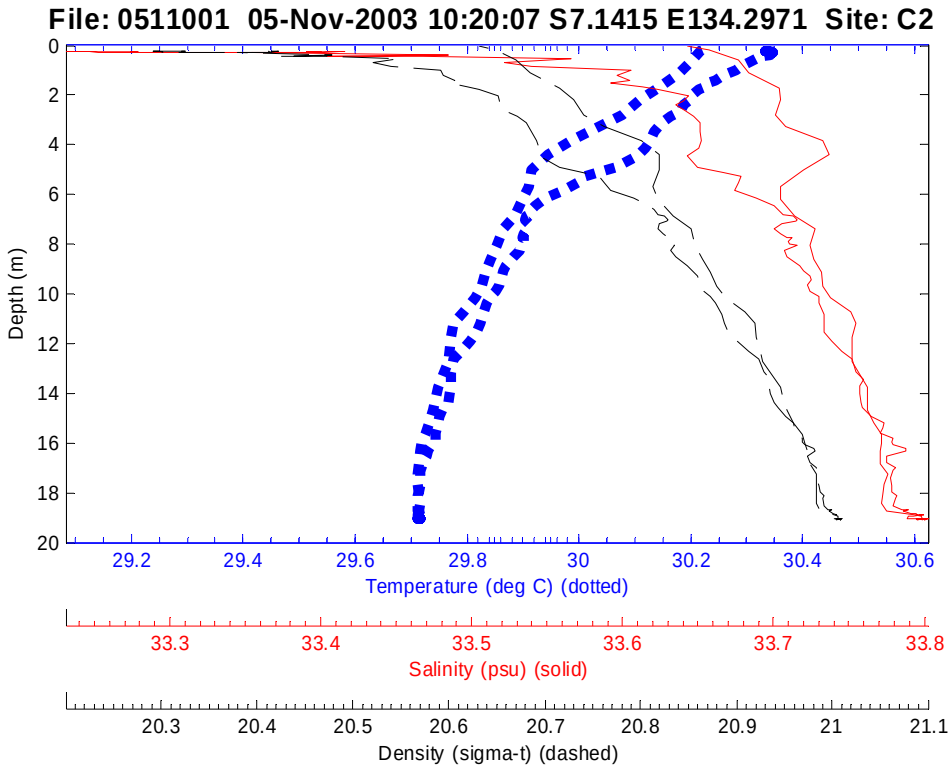

Temperature (C)
29.62
29.6
29.58
29.56
29.54
29.52
20.7
20.7
20.8
20.8
20.8
20.9
20.9
20.9
21
33.45
33.5
33.55
33.6
33.65
33.7
33.75
33.8
Salinity (psu)

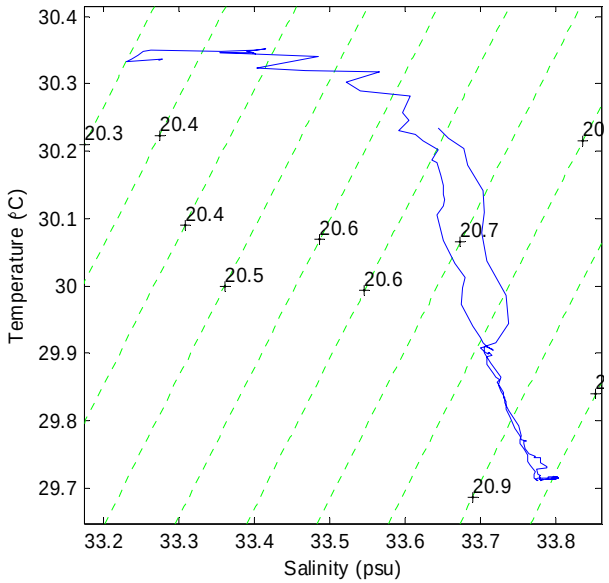

File: 0411014 04-Nov-2003 17:34:03 S7.3026 E134.4722 Site: CTD14
Depth (m)
-2
0
2
4
6
8
10
12
14
16
18
29.55
29.56
29.57
29.58
29.59
29.6
29.61
29.62
Temperature (deg C) (dotted)
33.35
33.4
33.45
33.5
33.55
33.6
33.65
33.7
Salinity (psu) (solid)
20.6
20.65
20.7
20.75
20.8
20.85
20.9
20.95
21
Density (sigma-t) (dashed)

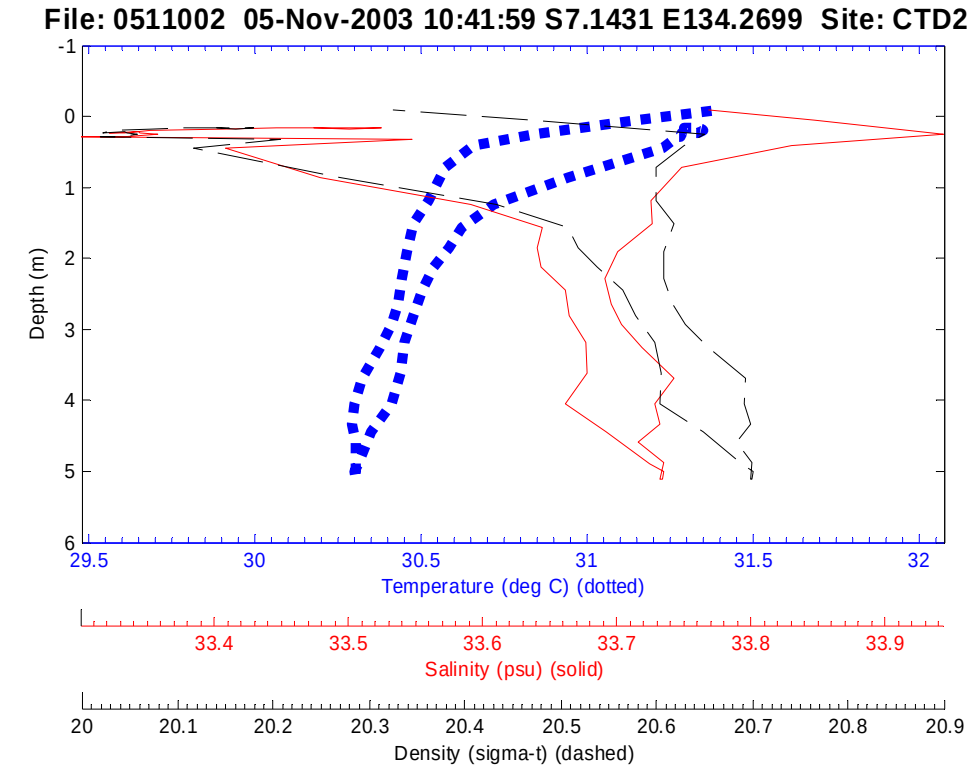

Temperature (C)
29.595
29.59
29.585
29.58
29.575
29.57
29.565
33.3
33.4
33.5
33.6
33.7
Salinity (psu)
20.6
20.7
20.7
20.7
20.8
20.8
20.8
20.9
20.9

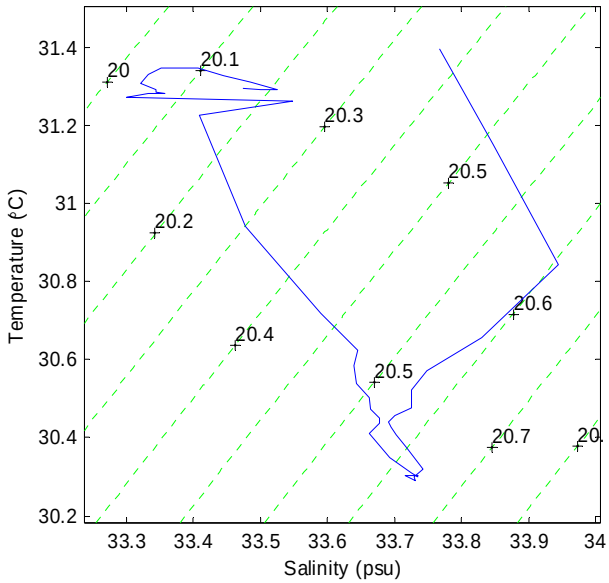

File: 0511000 05-Nov-2003 10:12:50 S7.1415 E134.2971 Site: Tide
Depth (m)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
30.34
30.36
30.38
30.4
30.42
30.44
30.46
30.48
30.5
Temperature (deg C) (dotted)
33.5
33.55
33.6
33.65
33.7
33.75
33.8
33.85
33.9
Salinity (psu) (solid)
20.5
20.55
20.6
20.65
20.7
20.75
20.8
20.85
Density (sigma-t) (dashed)

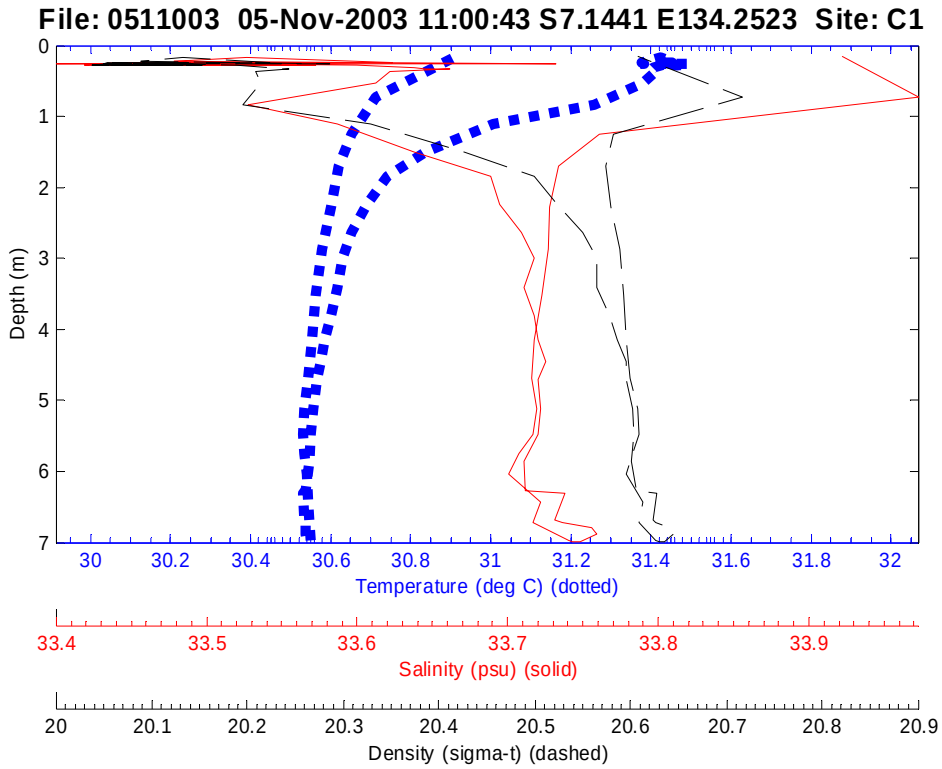

Temperature (C)
30.43
30.42
30.41
30.4
30.39
30.38
30.37
20.5
20.5
20.5
20.6
20.6
20.6
20.7
20.7
20.7
33.5
33.6
33.7
33.8
33.9
Salinity (psu)

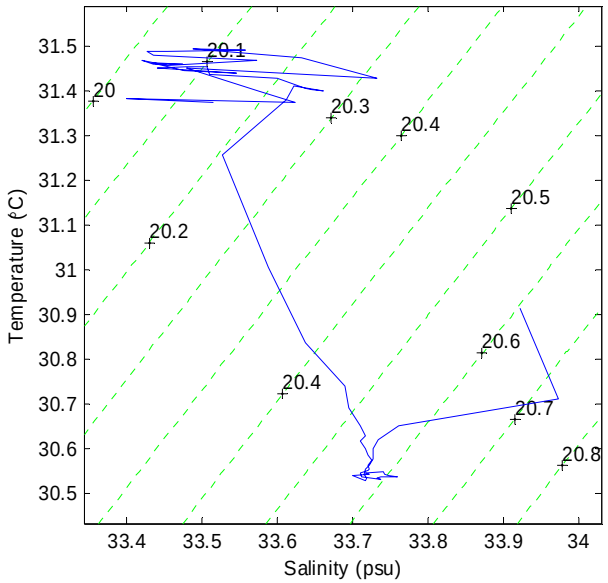

File: 0511001 05-Nov-2003 10:20:07 S7.1415 E134.2971 Site: C2
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

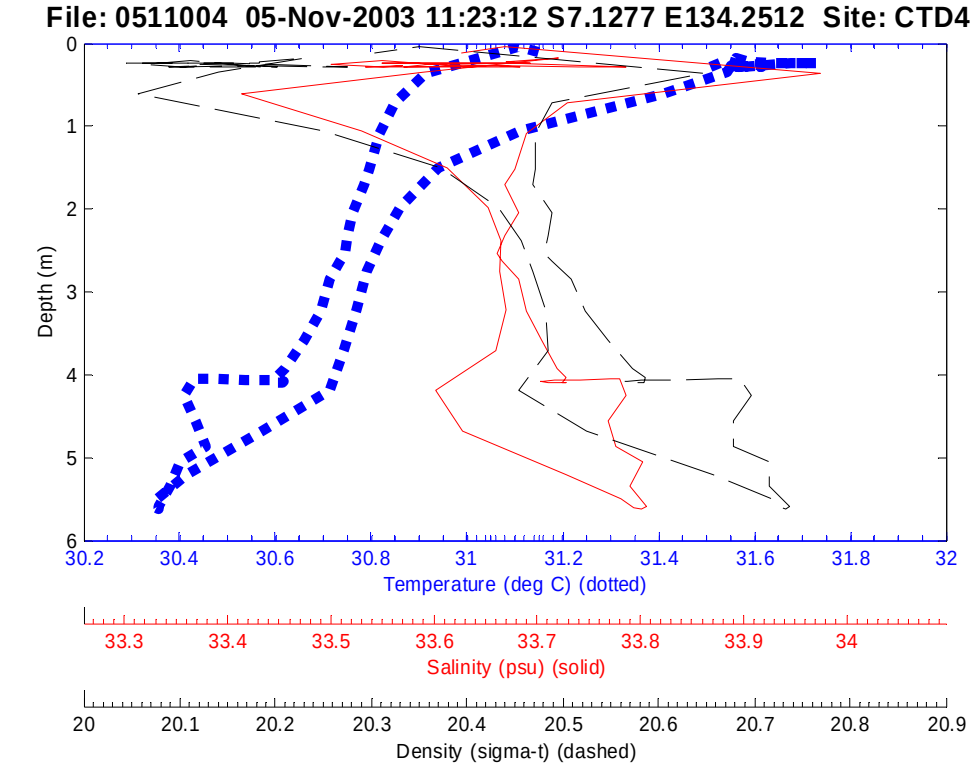

Temperature (C)
Salinity (psu)

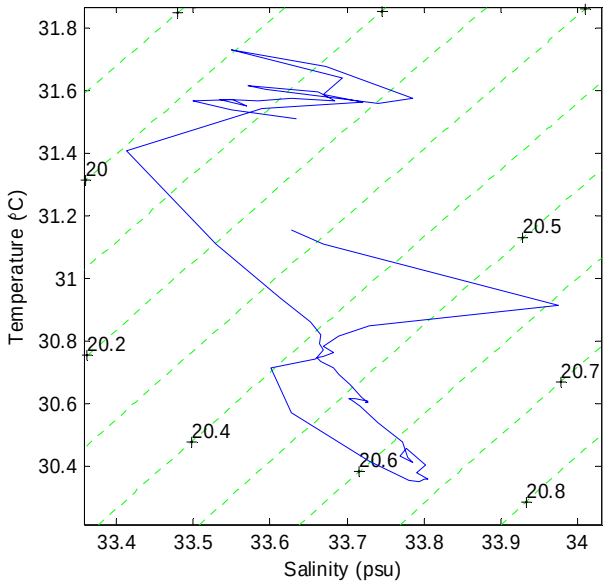

File: 0511002 05-Nov-2003 10:41:59 S7.1431 E134.2699 Site: CTD2
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

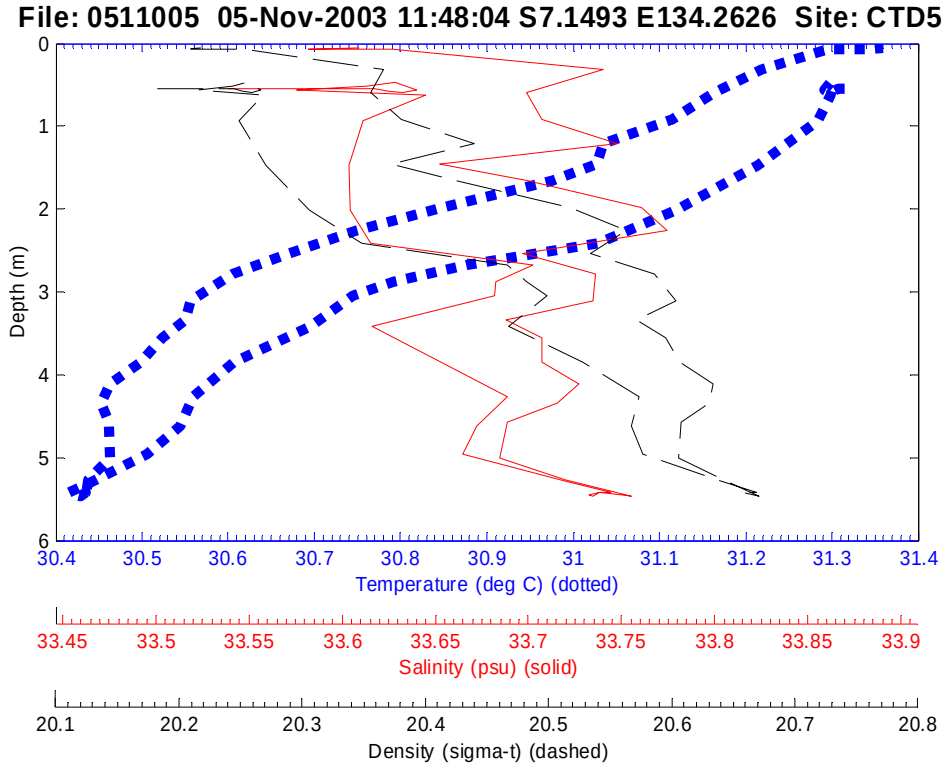

Temperature (C)
Salinity (psu)

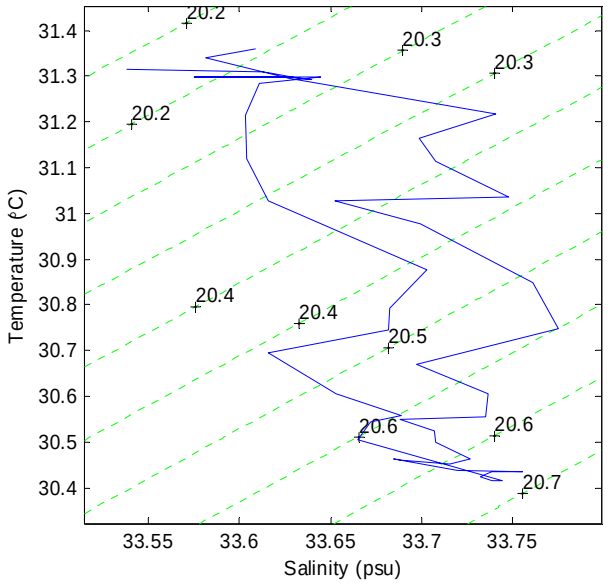

File: 0511003 05-Nov-2003 11:00:43 S7.1441 E134.2523 Site: C1
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

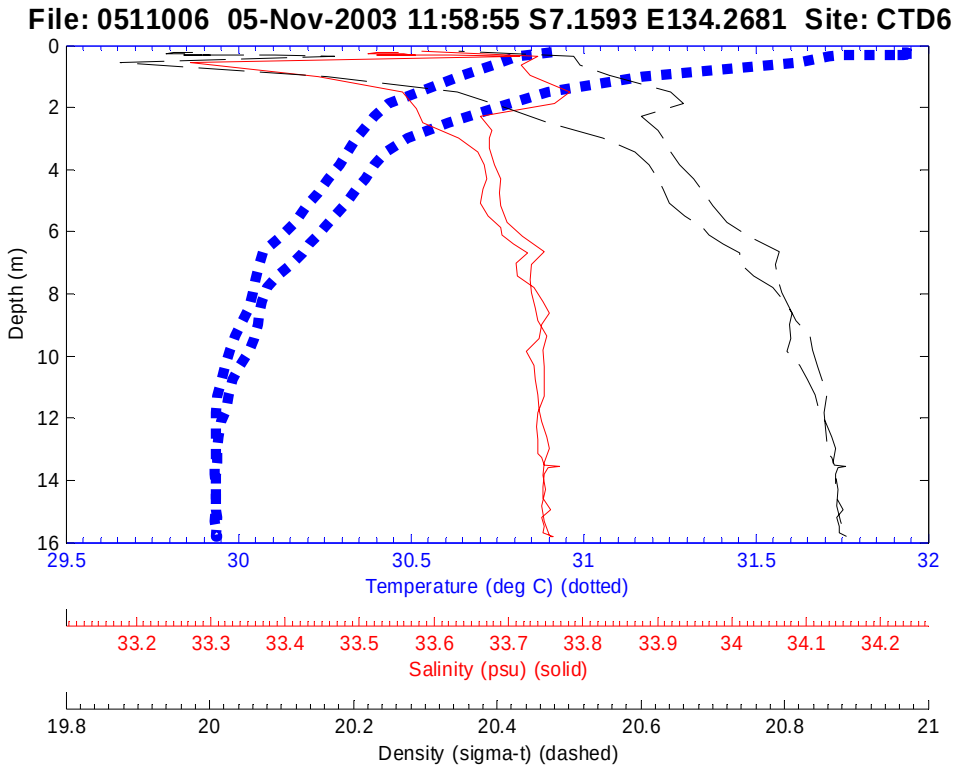

Temperature (C)
Salinity (psu)
20
20.1
20.2
20.3
20.4
20.5
20.6
20.7
20.8

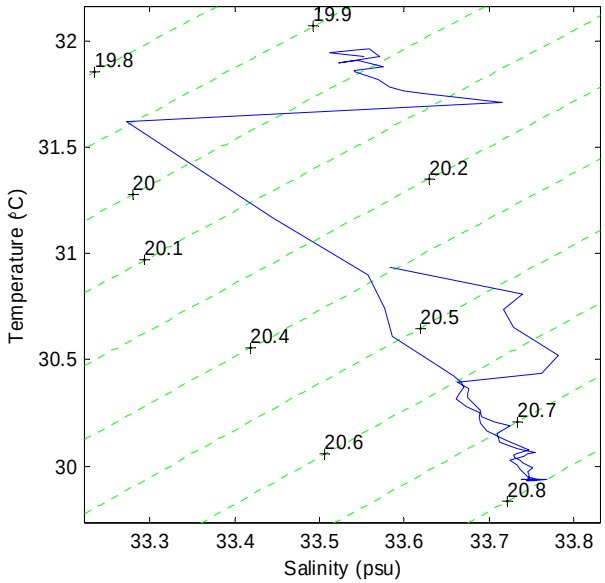

File: 0511004 05-Nov-2003 11:23:12 S7.1277 E134.2512 Site: CTD4
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

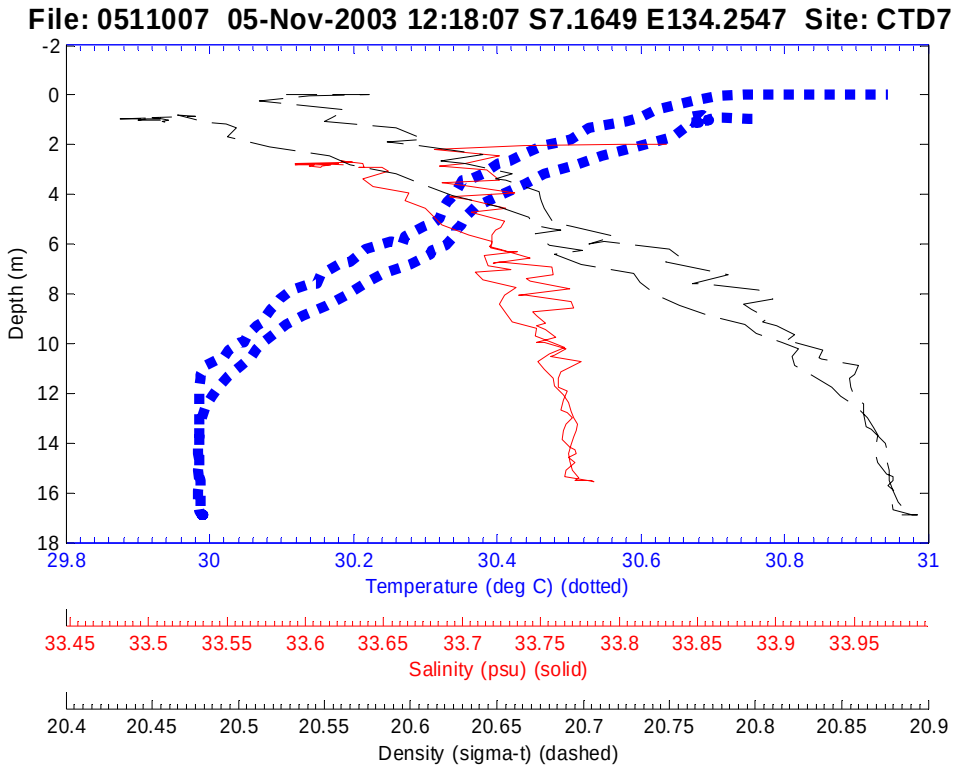

Temperature (C)
Salinity (psu)
20
20.2
20.4
20.5
20.6
20.7
20.8

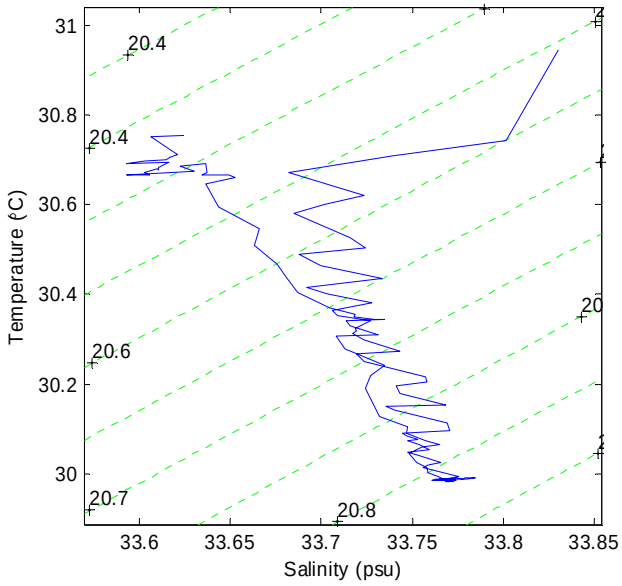

File: 0511005 05-Nov-2003 11:48:04 S7.1493 E134.2626 Site: CTD5
Depth (m)
0
1
2
3
4
5
6
30.4 30.5 30.6 30.7 30.8 30.9 31 31.1 31.2 31.3 31.4
Temperature (deg C) (dotted)
33.45 33.5 33.55 33.6 33.65 33.7 33.75 33.8 33.85 33.9
Salinity (psu) (solid)
20.1 20.2 20.3 20.4 20.5 20.6 20.7 20.8
Density (sigma-t) (dashed)

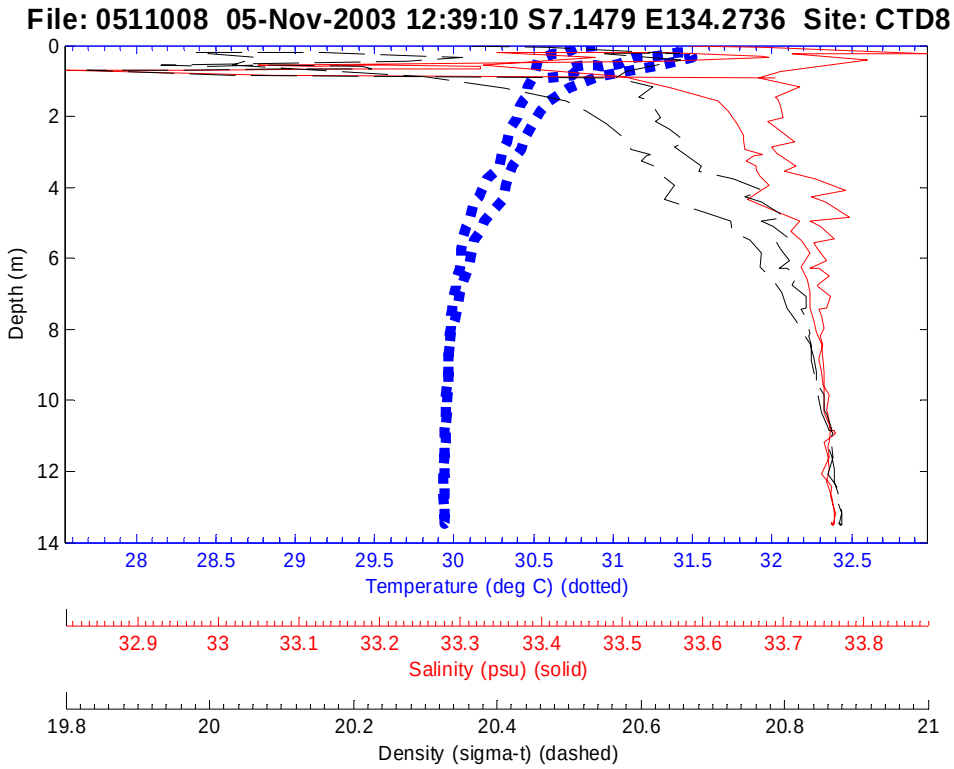

Temperature (C)
31.4
31.3
31.2
31.1
31
30.9
30.8
30.7
30.6
30.5
30.4
20.2
20.3
20.3
20.2
20.4
20.4
20.5
20.6
20.6
20.7
33.55 33.6 33.65 33.7 33.75
Salinity (psu)

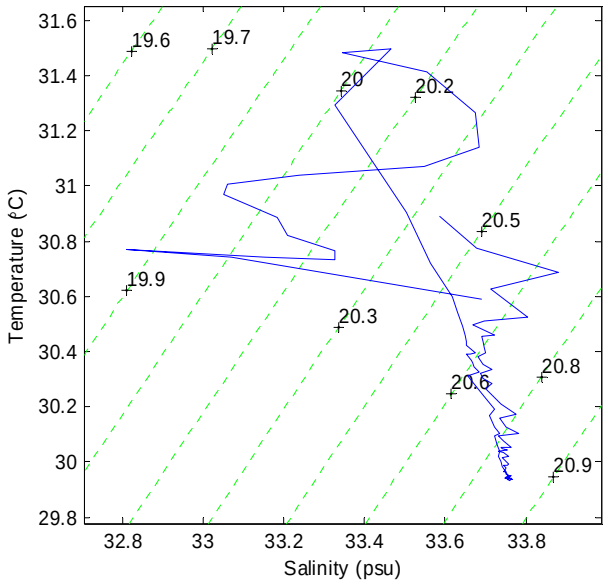

File: 0511006 05-Nov-2003 11:58:55 S7.1593 E134.2681 Site: CTD6
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

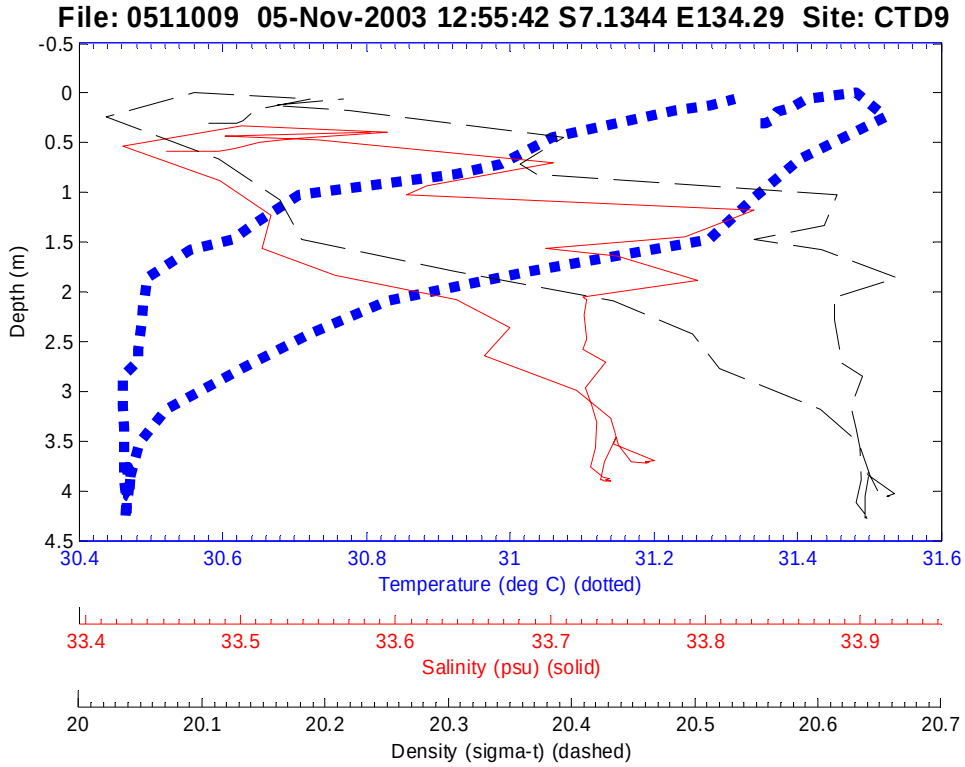

Temperature (C)
Salinity (psu)

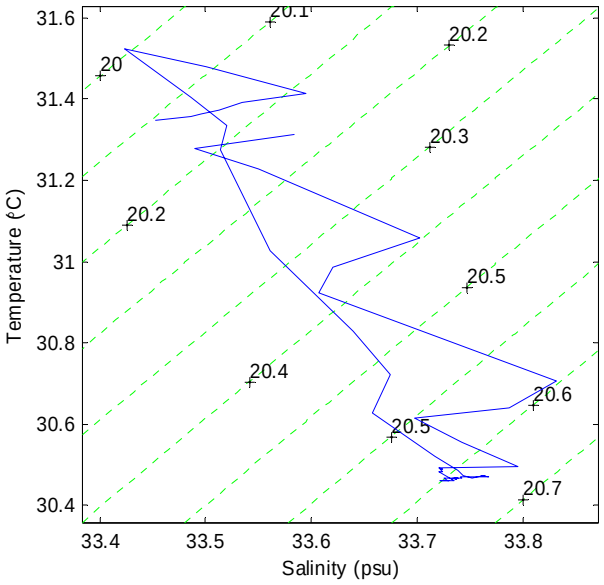

File: 0511007 05-Nov-2003 12:18:07 S7.1649 E134.2547 Site: CTD7
Depth (m)
-2
0
2
4
6
8
10
12
14
16
18
29.8
30
30.2
30.4
30.6
30.8
31
Temperature (deg C) (dotted)
33.45
33.5
33.55
33.6
33.65
33.7
33.75
33.8
33.85
33.9
33.95
Salinity (psu) (solid)
20.4
20.45
20.5
20.55
20.6
20.65
20.7
20.75
20.8
20.85
20.9
Density (sigma-t) (dashed)

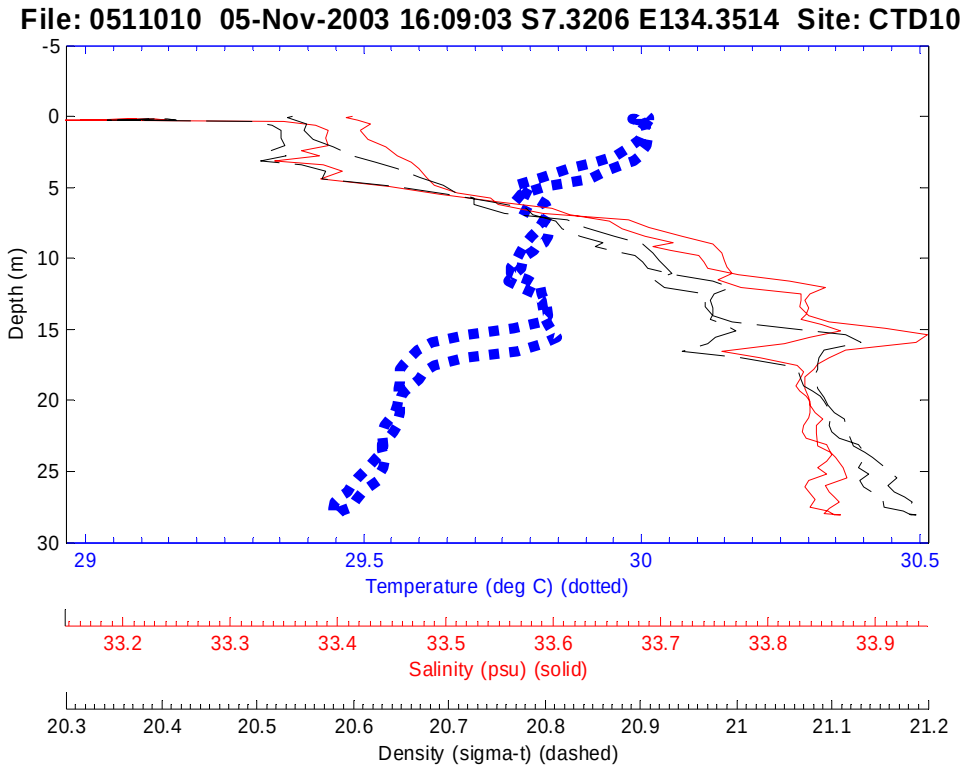

Temperature (C)
31
30.8
30.6
30.4
30.2
30
20.4
20.4
20.6
20.7
20.8
33.6
33.65
33.7
33.75
33.8
33.85
Salinity (psu)

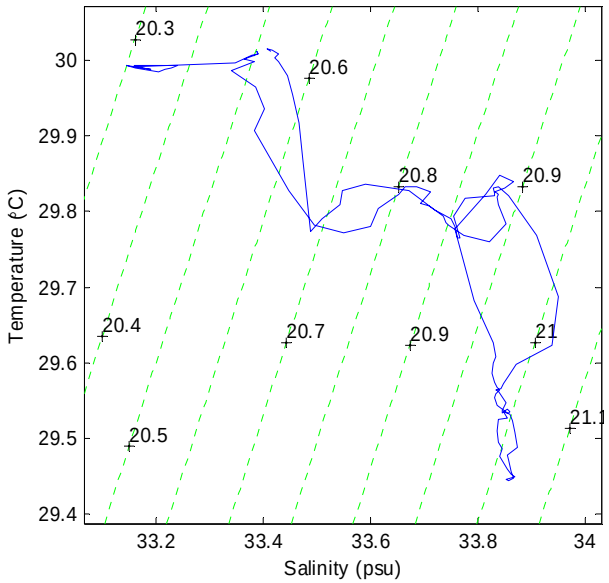

File: 0511008 05-Nov-2003 12:39:10 S7.1479 E134.2736 Site: CTD8
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

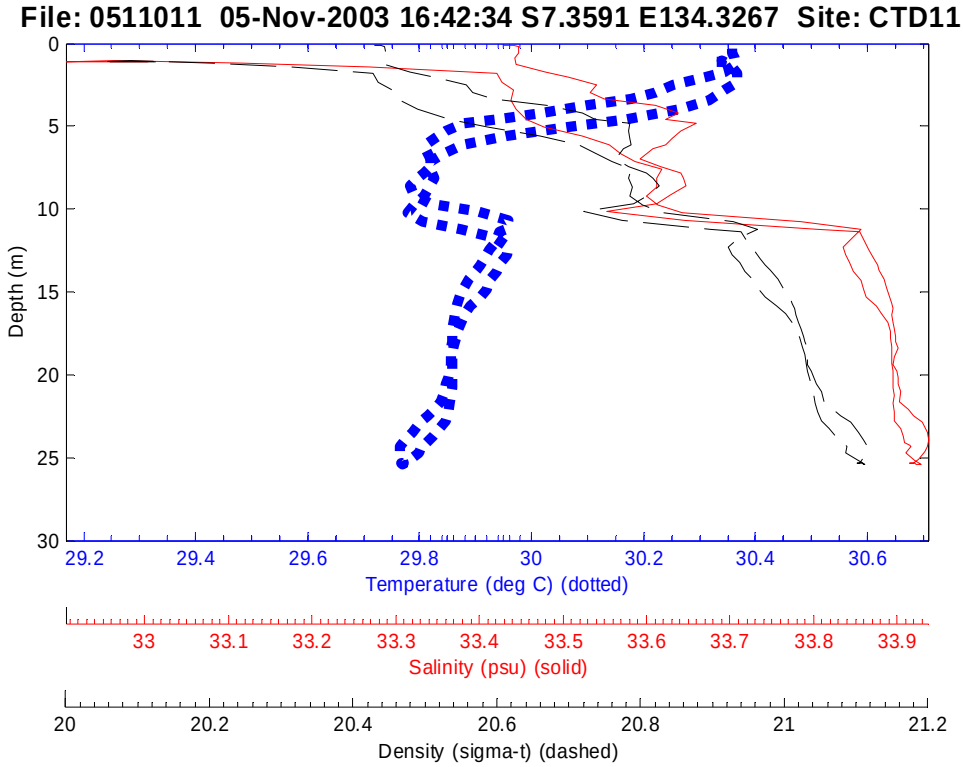

Temperature (C)
Salinity (psu)
19.6
19.7
20
20.2
20.5
19.9
20.3
20.8
20.6
20.9

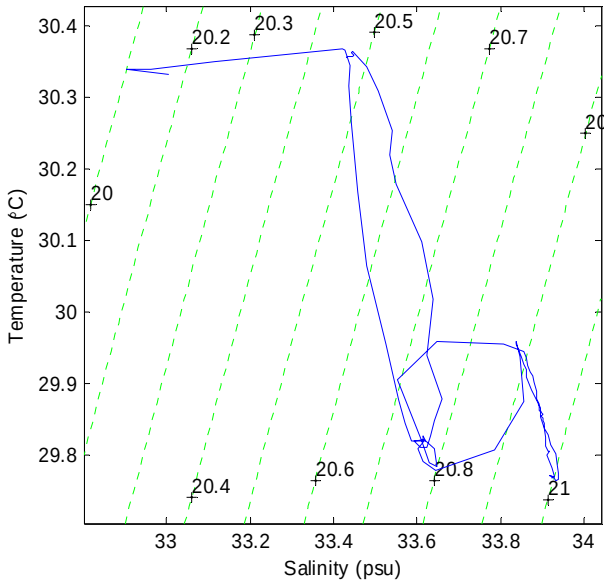

File: 0511009 05-Nov-2003 12:55:42 S7.1344 E134.29 Site: CTD9
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

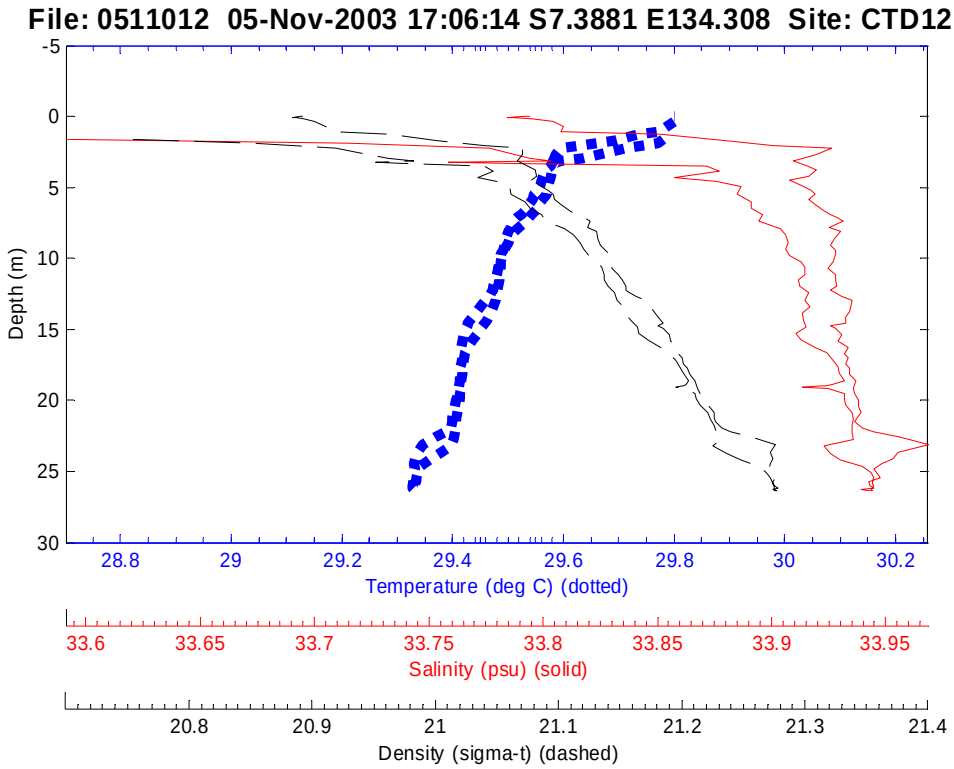

Temperature (C)
Salinity (psu)

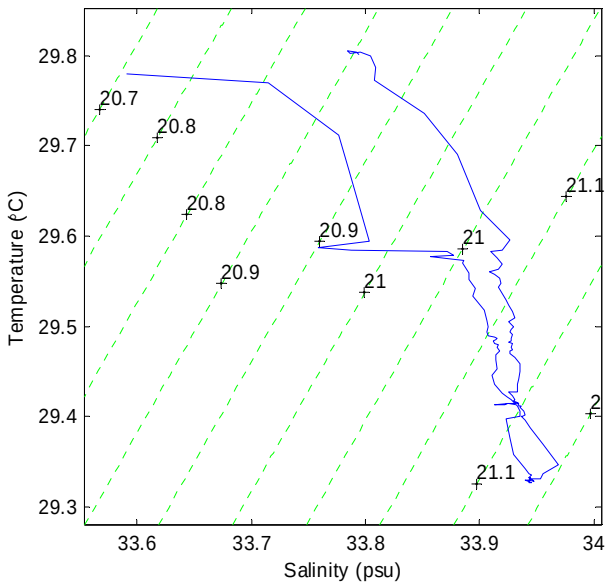

File: 0511010 05-Nov-2003 16:09:03 S7.3206 E134.3514 Site: CTD10
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

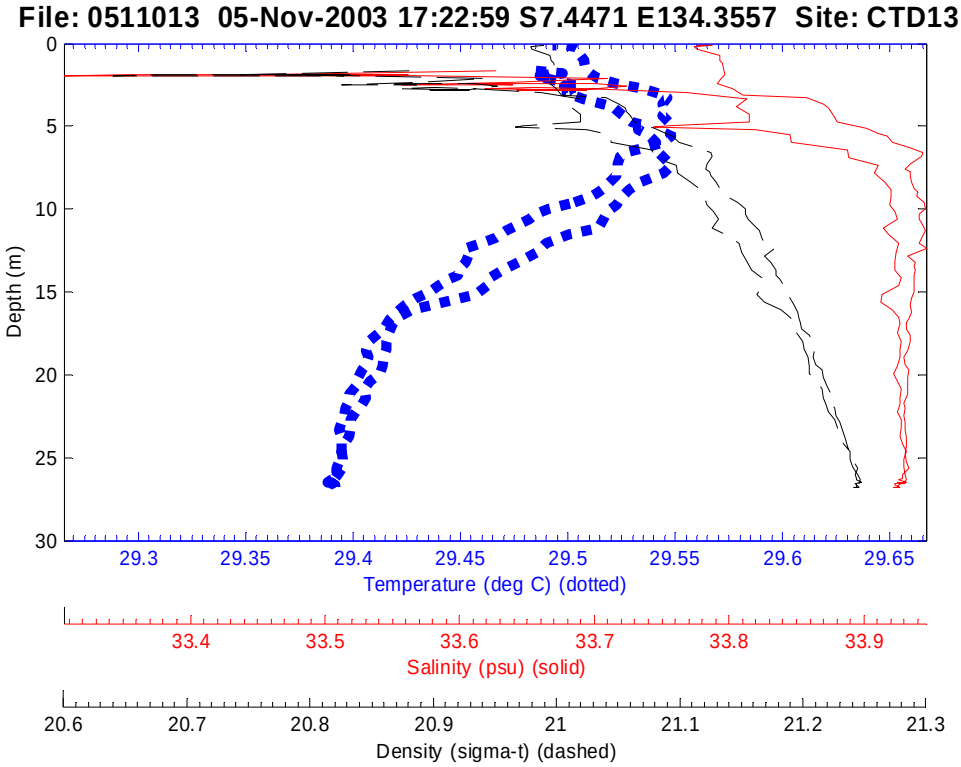

Temperature (C)
Salinity (psu)
20.3
20.6
20.8
20.9
20.4
20.7
20.9
21
20.5
21.1

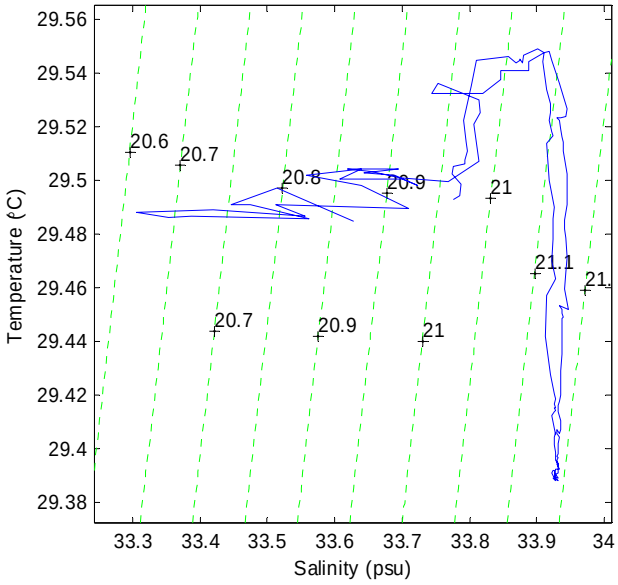

File: 0511011 05-Nov-2003 16:42:34 S7.3591 E134.3267 Site: CTD11
Depth (m)
0
5
10
15
20
25
30
29.2
29.4
29.6
29.8
30
30.2
30.4
30.6
Temperature (deg C) (dotted)
33
33.1
33.2
33.3
33.4
33.5
33.6
33.7
33.8
33.9
Salinity (psu) (solid)
20
20.2
20.4
20.6
20.8
21
21.2
Density (sigma-t) (dashed)

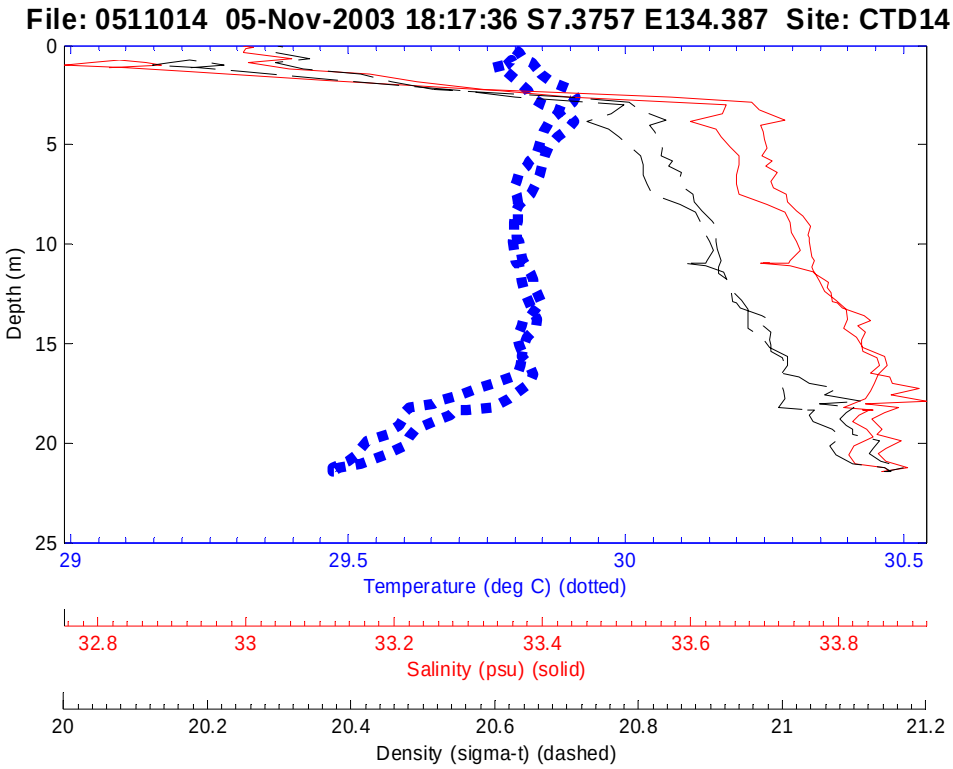

Temperature (C)
30.4
30.3
30.2
30.1
30
29.9
29.8
20
20.2
20.3
20.5
20.7
20.4
20.6
20.8
21
33
33.2
33.4
33.6
33.8
34
Salinity (psu)

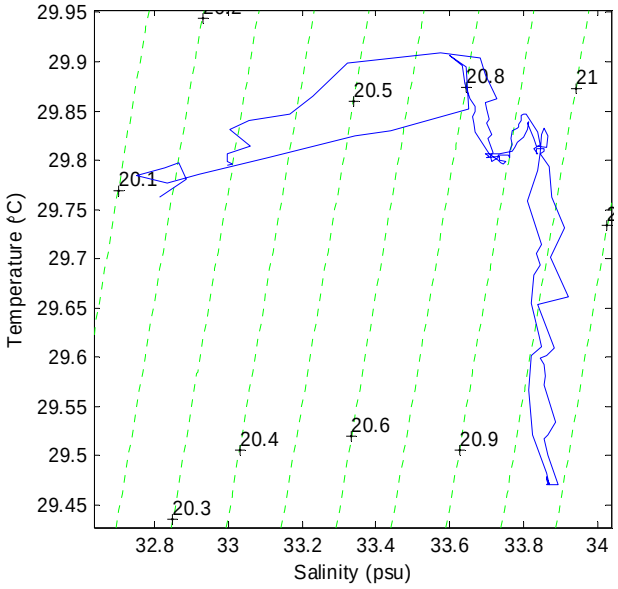

File: 0511012 05-Nov-2003 17:06:14 S7.3881 E134.308 Site: CTD12
Depth (m)
-5
0
5
10
15
20
25
30
28.8
29
29.2
29.4
29.6
29.8
30
30.2
Temperature (deg C) (dotted)
33.6
33.65
33.7
33.75
33.8
33.85
33.9
33.95
Salinity (psu) (solid)
20.8
20.9
21
21.1
21.2
21.3
21.4
Density (sigma-t) (dashed)

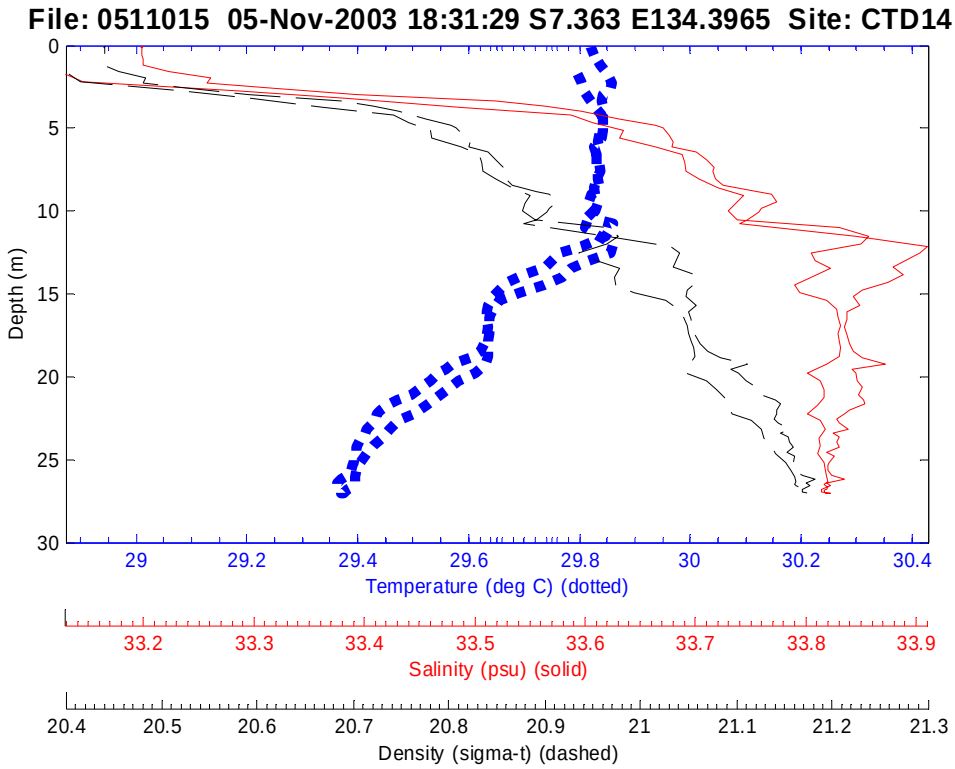

Temperature (C)
29.8
29.7
29.6
29.5
29.4
29.3
20.7
20.8
20.8
20.9
20.9
21
21
21.1
21.1
33.6
33.7
33.8
33.9
34
Salinity (psu)

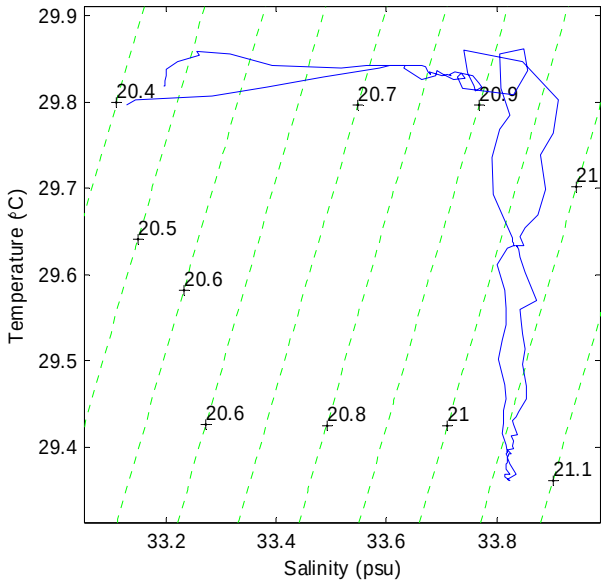

File: 0511013 05-Nov-2003 17:22:59 S7.4471 E134.3557 Site: CTD13
Depth (m)
0
5
10
15
20
25
30
29.3
29.35
29.4
29.45
29.5
29.55
29.6
29.65
Temperature (deg C) (dotted)
33.4
33.5
33.6
33.7
33.8
33.9
Salinity (psu) (solid)
20.6
20.7
20.8
20.9
21
21.1
21.2
21.3
Density (sigma-t) (dashed)

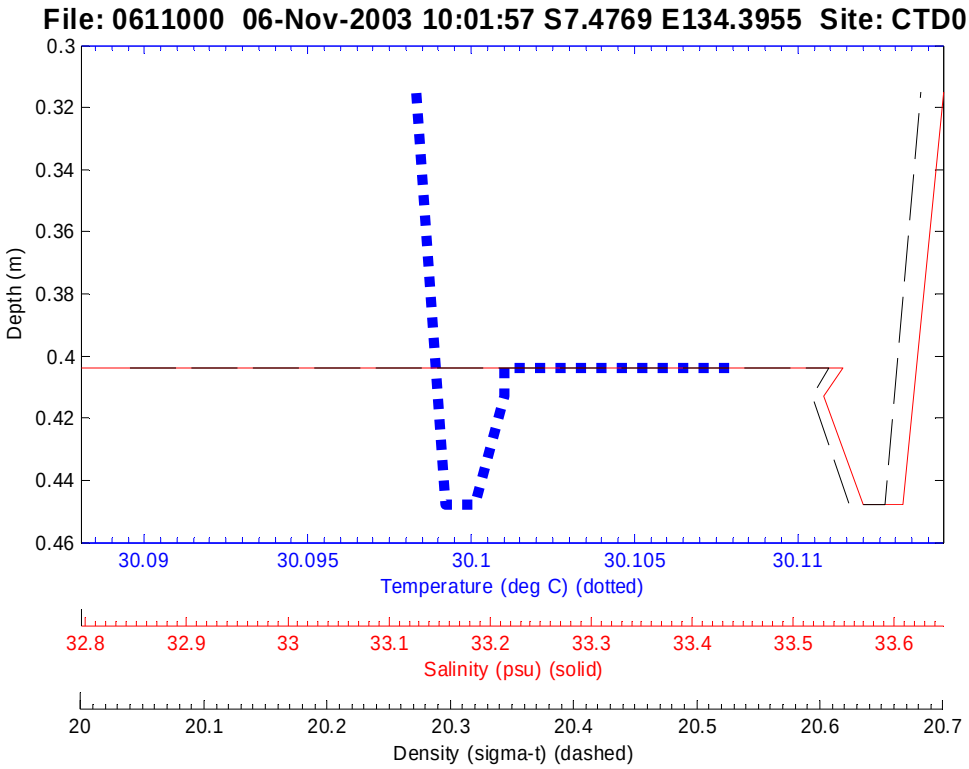

Temperature (C)
29.56
29.54
29.52
29.5
29.48
29.46
29.44
29.42
29.4
29.38
20.6
20.7
20.8
20.9
21
21.1
20.7
20.9
21
33.3
33.4
33.5
33.6
33.7
33.8
33.9
34
Salinity (psu)

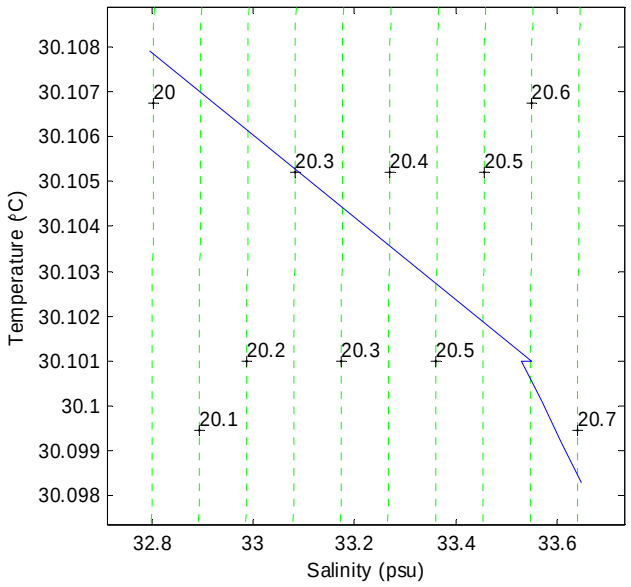

File: 0511014 05-Nov-2003 18:17:36 S7.3757 E134.387 Site: CTD14
Depth (m)
0
5
10
15
20
25
29
29.5
30
30.5
Temperature (deg C) (dotted)
32.8
33
33.2
33.4
33.6
33.8
Salinity (psu) (solid)
20
20.2
20.4
20.6
20.8
21
21.2
Density (sigma-t) (dashed)

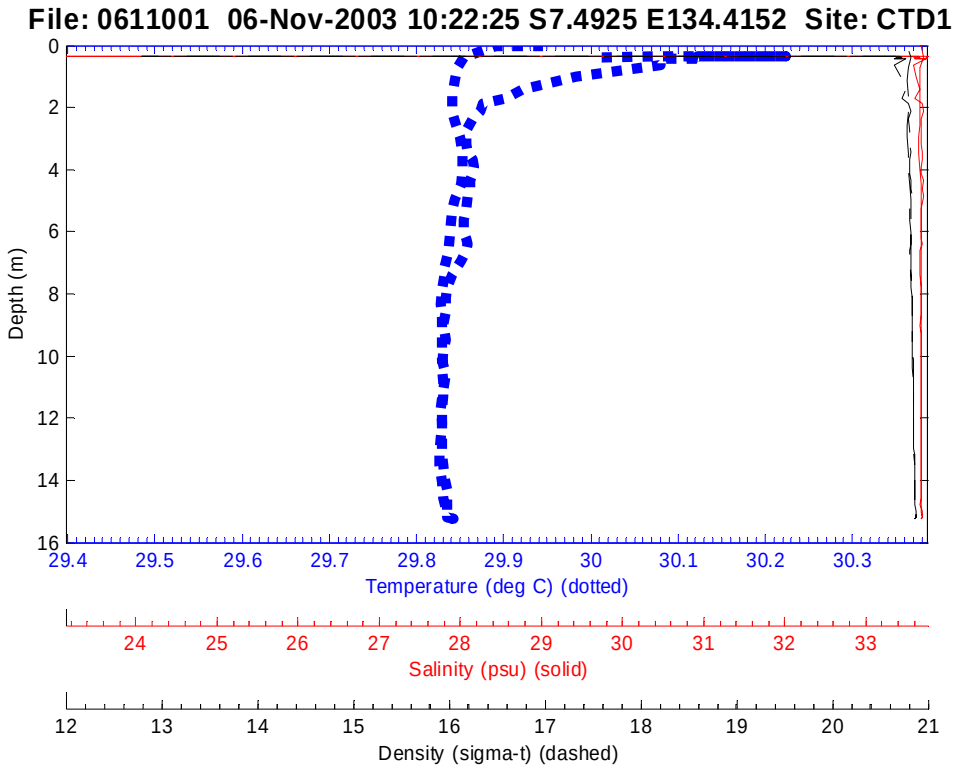

Temperature (C)
29.95
29.9
29.85
29.8
29.75
29.7
29.65
29.6
29.55
29.5
29.45
20.1
20.3
20.4
20.5
20.6
20.8
20.9
21
32.8
33
33.2
33.4
33.6
33.8
34
Salinity (psu)

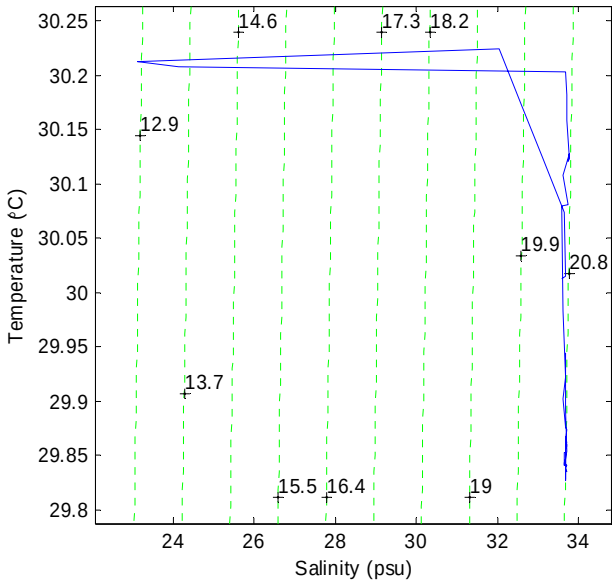

File: 0511015 05-Nov-2003 18:31:29 S7.363 E134.3965 Site: CTD14
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

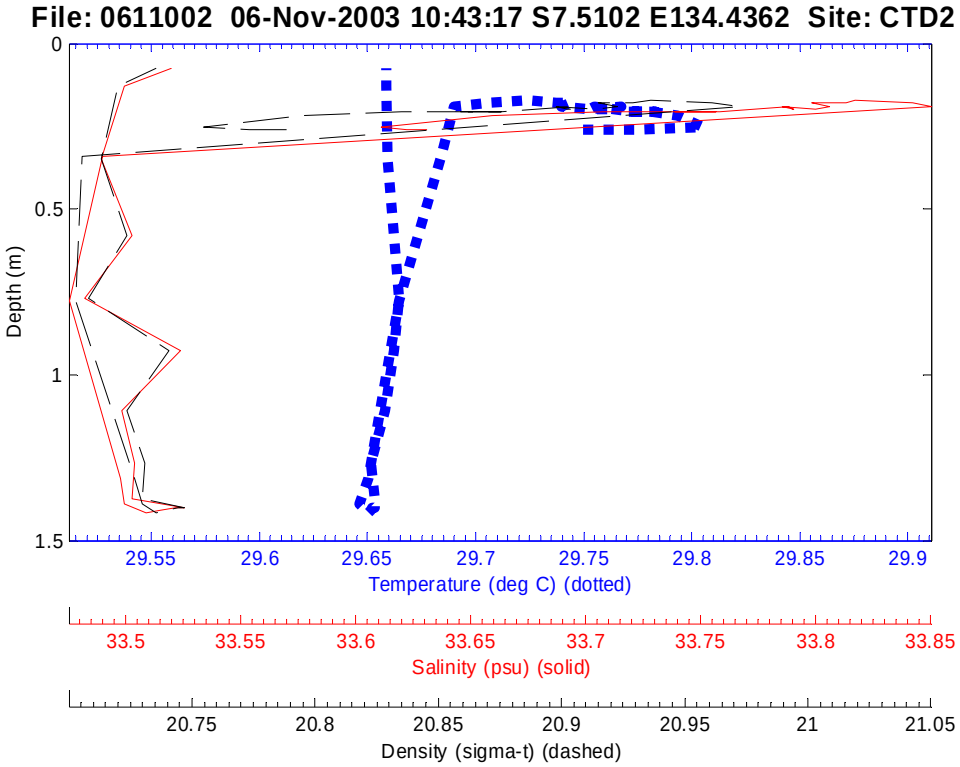

Temperature (C)
Salinity (psu)
20.4
20.5
20.6
20.6
20.7
20.8
20.9
21
21
21.1

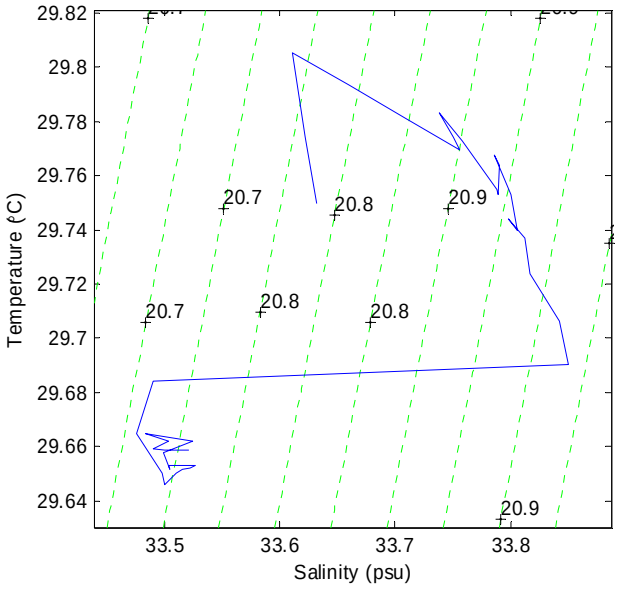

File: 0611000 06-Nov-2003 10:01:57 S7.4769 E134.3955 Site: CTD0
Depth (m)
0.3
0.32
0.34
0.36
0.38
0.4
0.42
0.44
0.46
30.09
30.095
30.1
30.105
30.11
Temperature (deg C) (dotted)
32.8
32.9
33
33.1
33.2
33.3
33.4
33.5
33.6
Salinity (psu) (solid)
20
20.1
20.2
20.3
20.4
20.5
20.6
20.7
Density (sigma-t) (dashed)

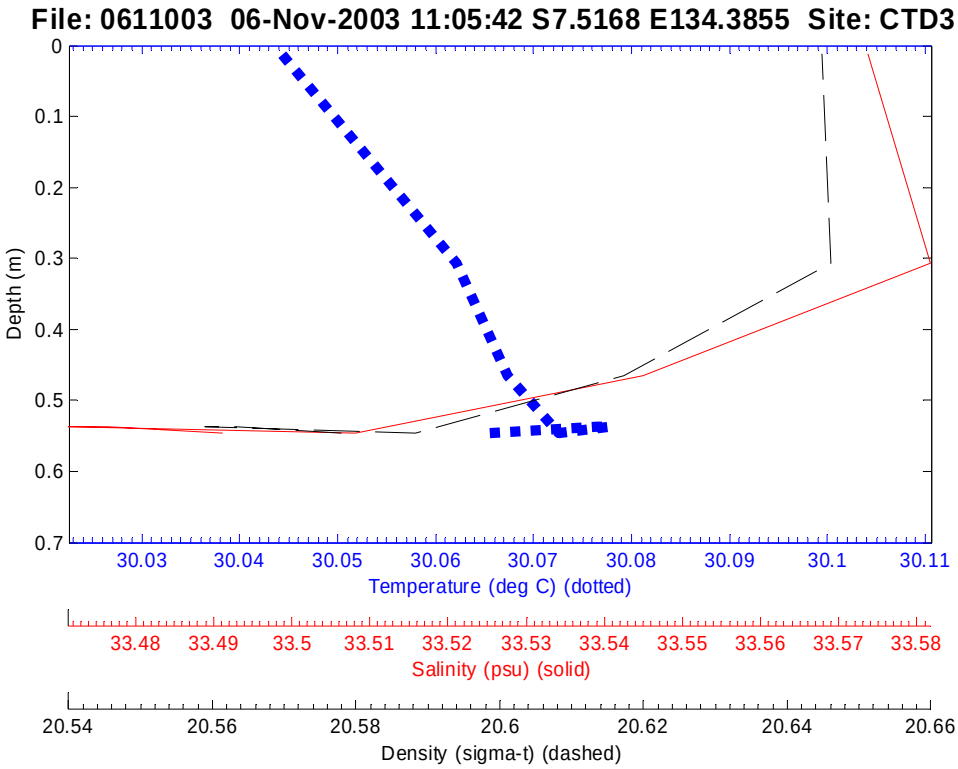

Temperature (C)
30.108
30.107
30.106
30.105
30.104
30.103
30.102
30.101
30.1
30.099
30.098
20
20.6
20.3
20.4
20.5
20.2
20.3
20.5
20.1
20.7
32.8
33
33.2
33.4
33.6
Salinity (psu)

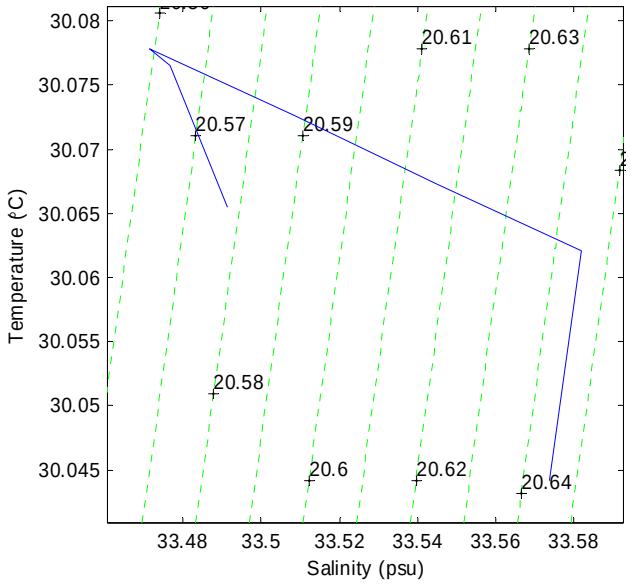

File: 0611001 06-Nov-2003 10:22:25 S7.4925 E134.4152 Site: CTD1
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

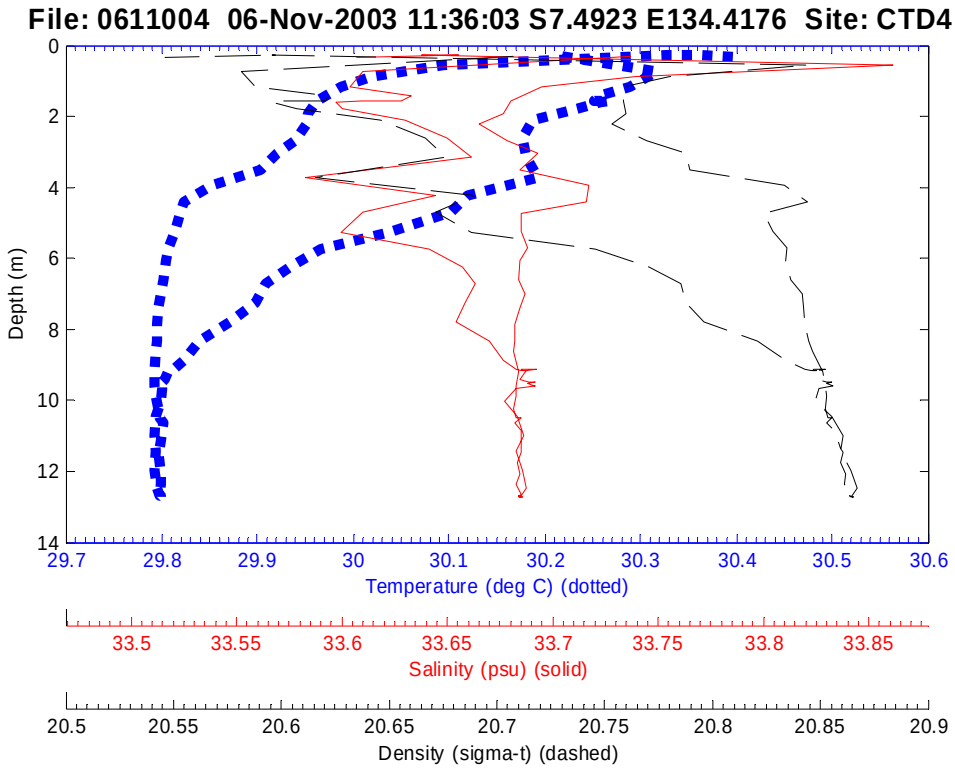

Temperature (C)
Salinity (psu)
14.6
17.3
18.2
12.9
19.9
20.8
13.7
15.5
16.4
19

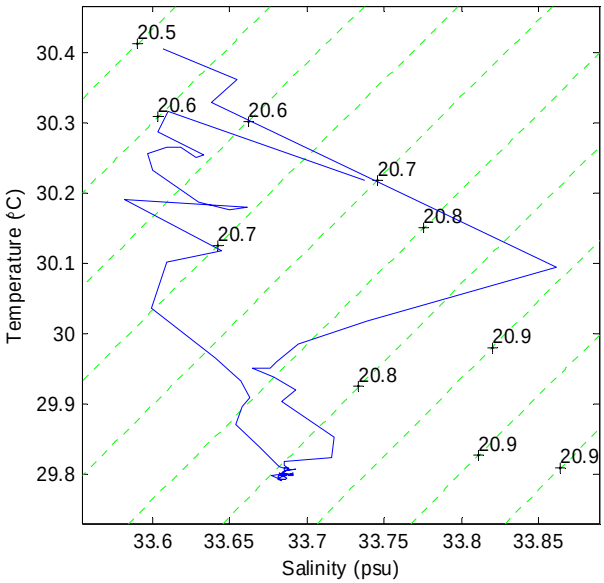

File: 0611002 06-Nov-2003 10:43:17 S7.5102 E134.4362 Site: CTD2
Depth (m)
0
0.5
1
1.5
29.55
29.6
29.65
29.7
29.75
29.8
29.85
29.9
Temperature (deg C) (dotted)
33.5
33.55
33.6
33.65
33.7
33.75
33.8
33.85
Salinity (psu) (solid)
20.75
20.8
20.85
20.9
20.95
21
21.05
Density (sigma-t) (dashed)

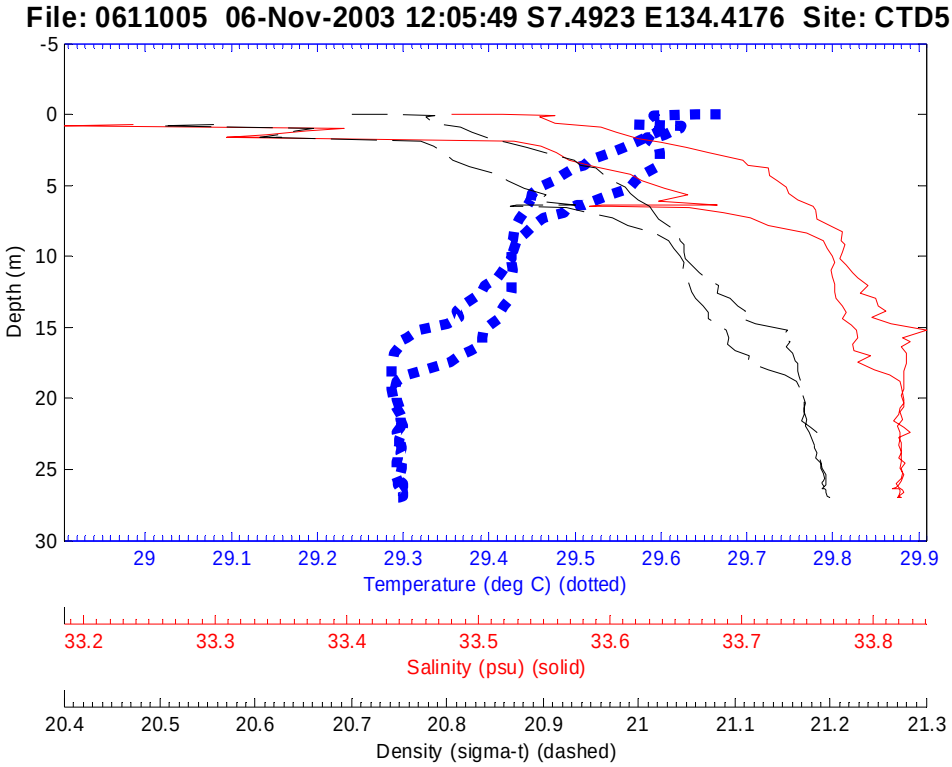

Temperature (C)
29.82
29.8
29.78
29.76
29.74
29.72
29.7
29.68
29.66
29.64
20.7
20.8
20.9
20.7
20.8
20.8
20.9
33.5
33.6
33.7
33.8
Salinity (psu)

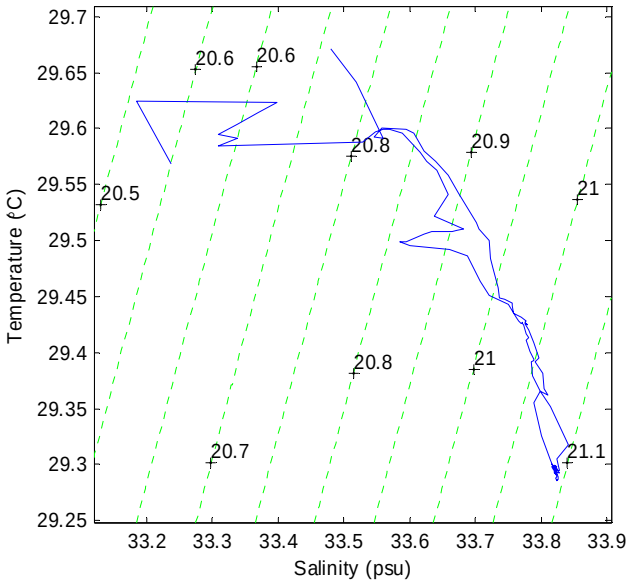

File: 0611003 06-Nov-2003 11:05:42 S7.5168 E134.3855 Site: CTD3
Depth (m)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
30.03
30.04
30.05
30.06
30.07
30.08
30.09
30.1
30.11
Temperature (deg C) (dotted)
33.48
33.49
33.5
33.51
33.52
33.53
33.54
33.55
33.56
33.57
33.58
Salinity (psu) (solid)
20.54
20.56
20.58
20.6
20.62
20.64
20.66
Density (sigma-t) (dashed)

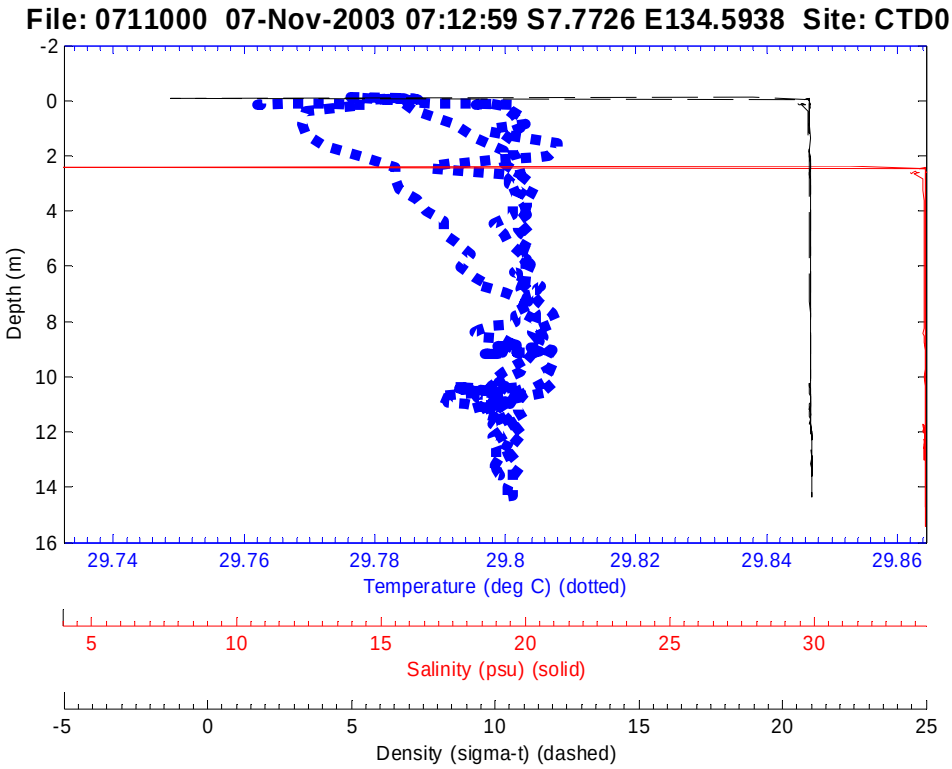

Temperature (C)
30.08
30.075
30.07
30.065
30.06
30.055
30.05
30.045
20.57
20.59
20.61
20.63
20.58
20.6
20.62
20.64
33.48
33.5
33.52
33.54
33.56
33.58
Salinity (psu)

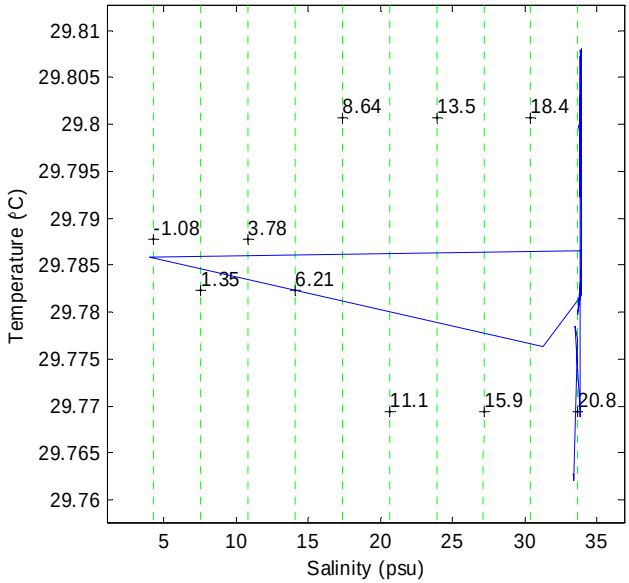

File: 0611004 06-Nov-2003 11:36:03 S7.4923 E134.4176 Site: CTD4
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

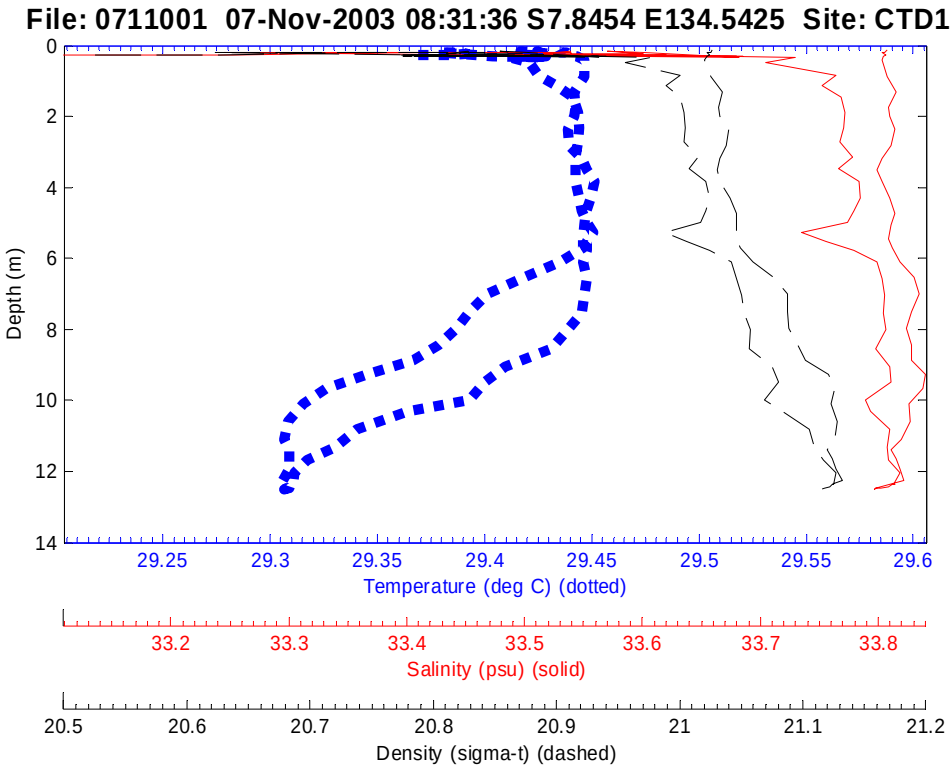

Temperature (C)
Salinity (psu)
20.5
20.6
20.6
20.7
20.8
20.7
20.9
20.8
20.9
20.9

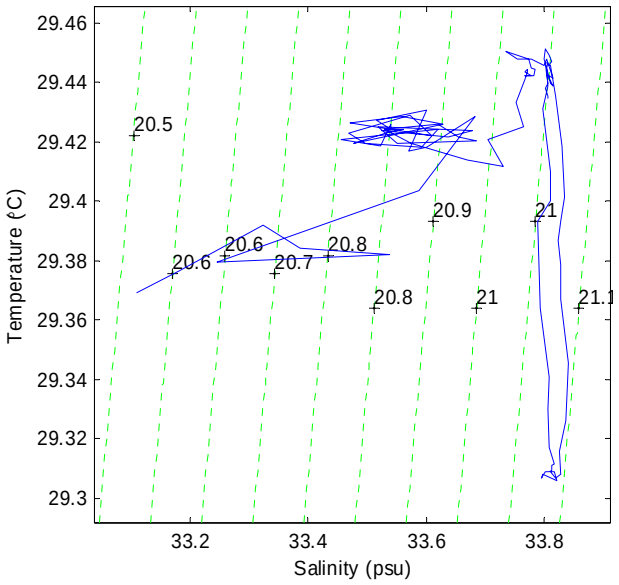

File: 0611005 06-Nov-2003 12:05:49 S7.4923 E134.4176 Site: CTD5
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

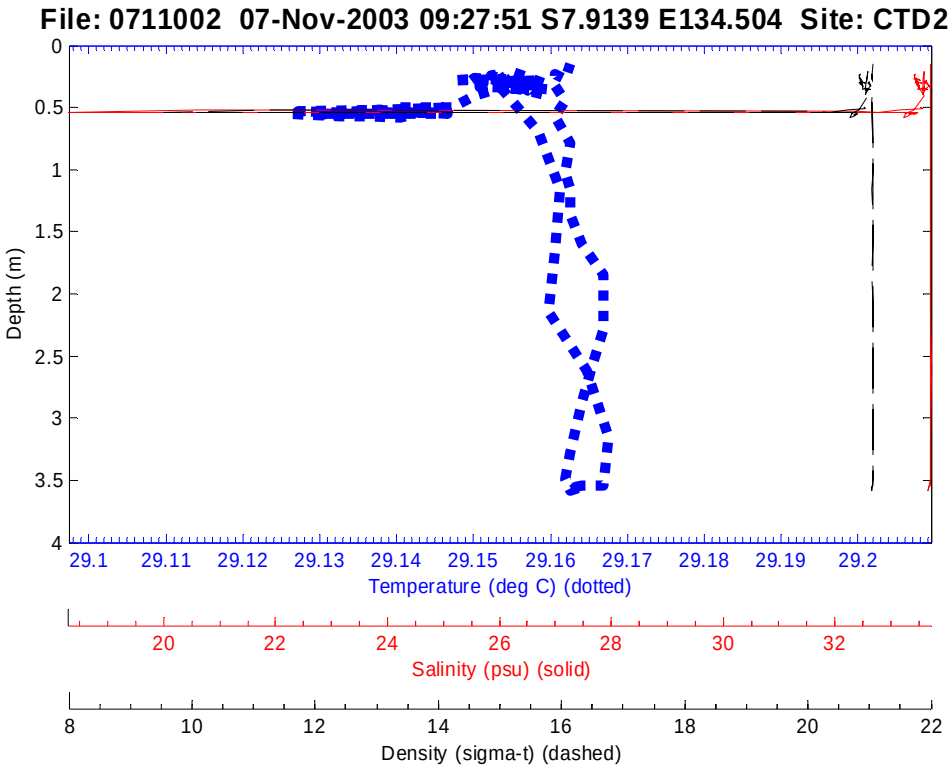

Temperature (C)
Salinity (psu)
20.5
20.6
20.6
20.7
20.8
20.8
20.9
21
21
21.1

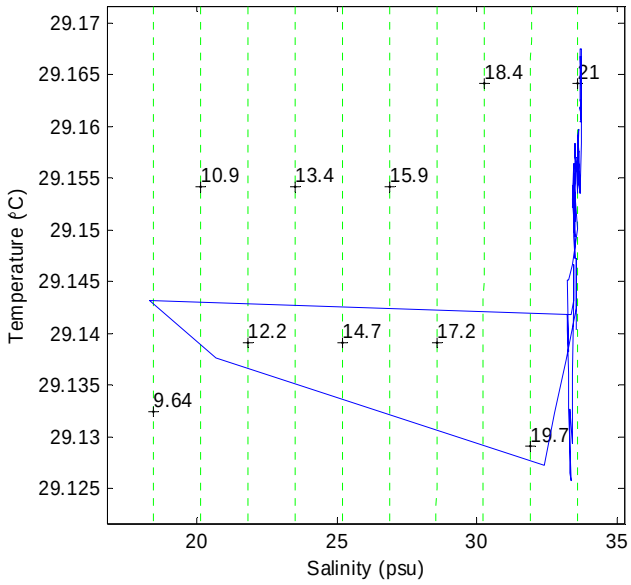

File: 0711000 07-Nov-2003 07:12:59 S7.7726 E134.5938 Site: CTD0
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

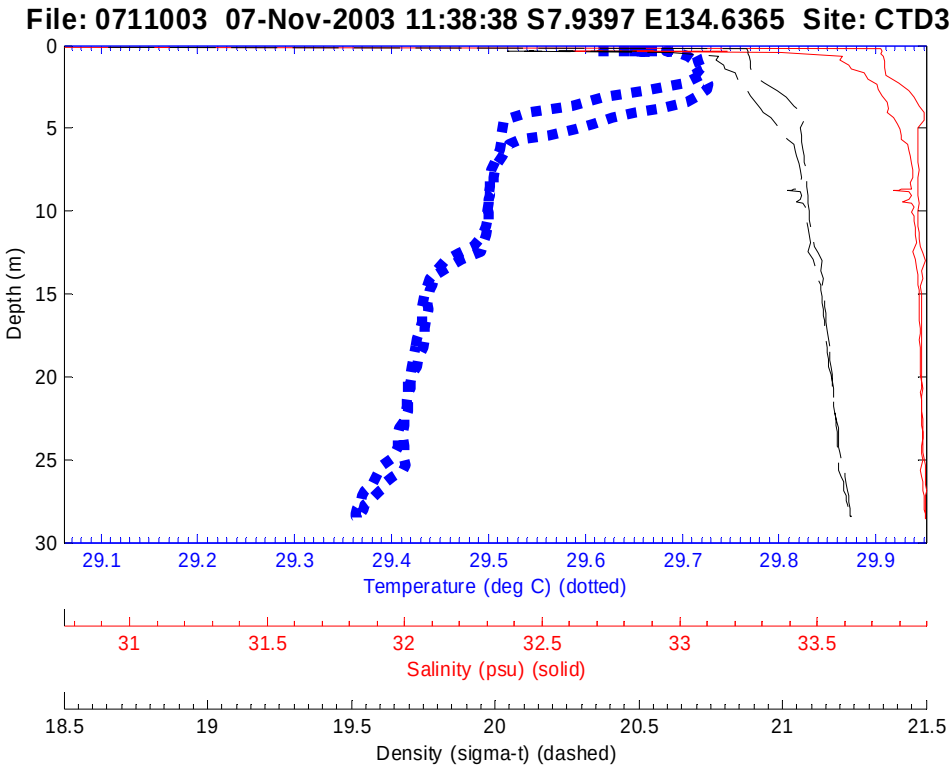

Temperature (C)
Salinity (psu)
1.08
3.78
1.35
6.21
8.64
13.5
18.4
11.1
15.9
20.8

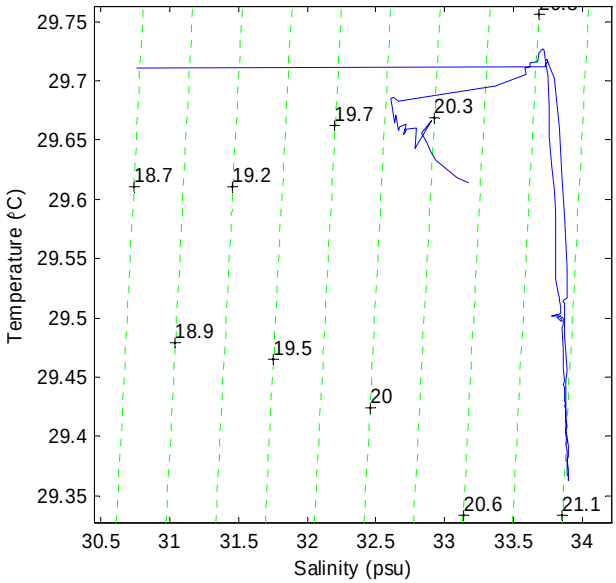

File: 0711001 07-Nov-2003 08:31:36 S7.8454 E134.5425 Site: CTD1
Depth (m)
0
2
4
6
8
10
12
14
29.25
29.3
29.35
29.4
29.45
29.5
29.55
29.6
Temperature (deg C) (dotted)
33.2
33.3
33.4
33.5
33.6
33.7
33.8
Salinity (psu) (solid)
20.5
20.6
20.7
20.8
20.9
21
21.1
21.2
Density (sigma-t) (dashed)

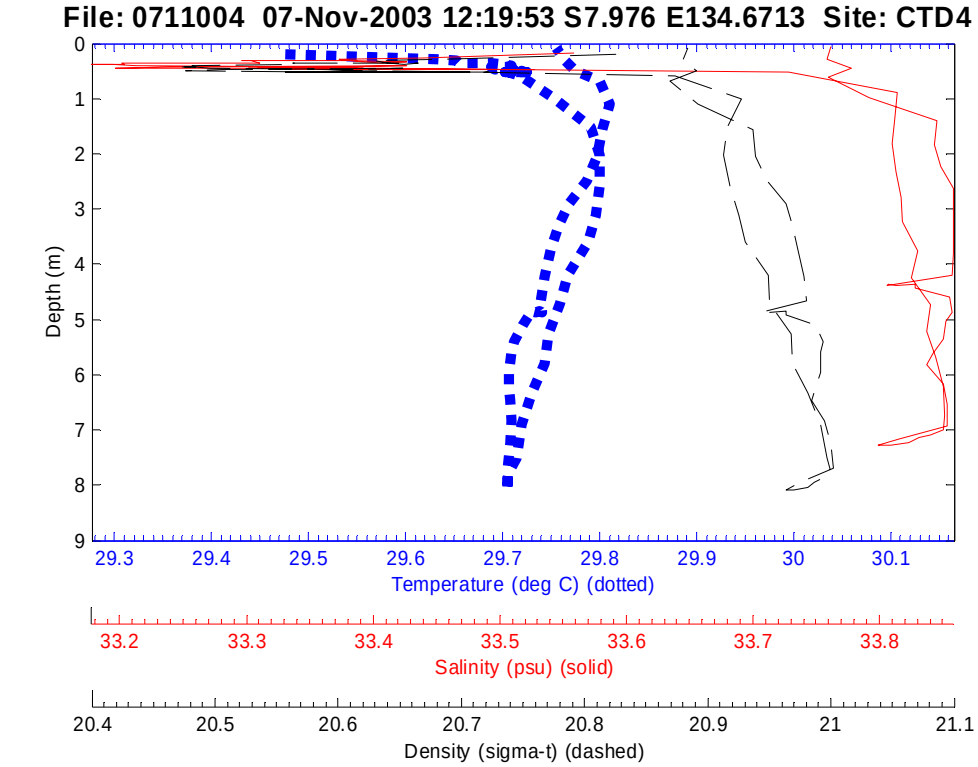

Temperature (C)
29.46
29.44
29.42
29.4
29.38
29.36
29.34
29.32
29.3
33.2
33.4
33.6
33.8
Salinity (psu)
20.5
20.6
20.6
20.7
20.8
20.8
20.9
21
21
21.1

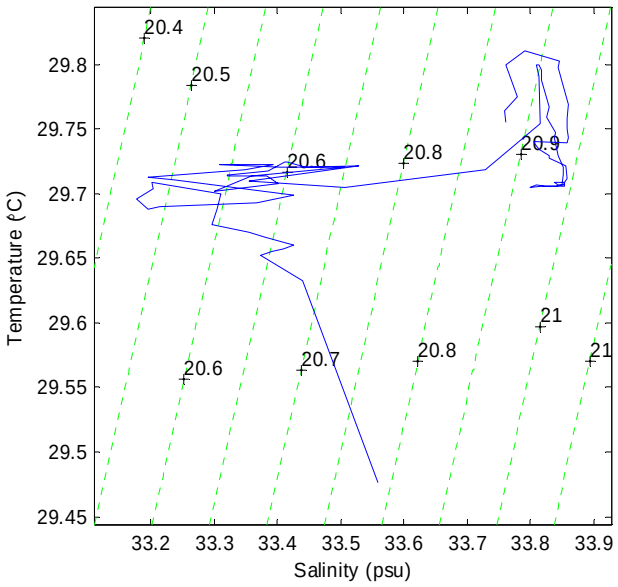

File: 0711002 07-Nov-2003 09:27:51 S7.9139 E134.504 Site: CTD2
Depth (m)
0
0.5
1
1.5
2
2.5
3
3.5
4
29.1
29.11
29.12
29.13
29.14
29.15
29.16
29.17
29.18
29.19
29.2
Temperature (deg C) (dotted)
20
22
24
26
28
30
32
Salinity (psu) (solid)
8
10
12
14
16
18
20
22
Density (sigma-t) (dashed)

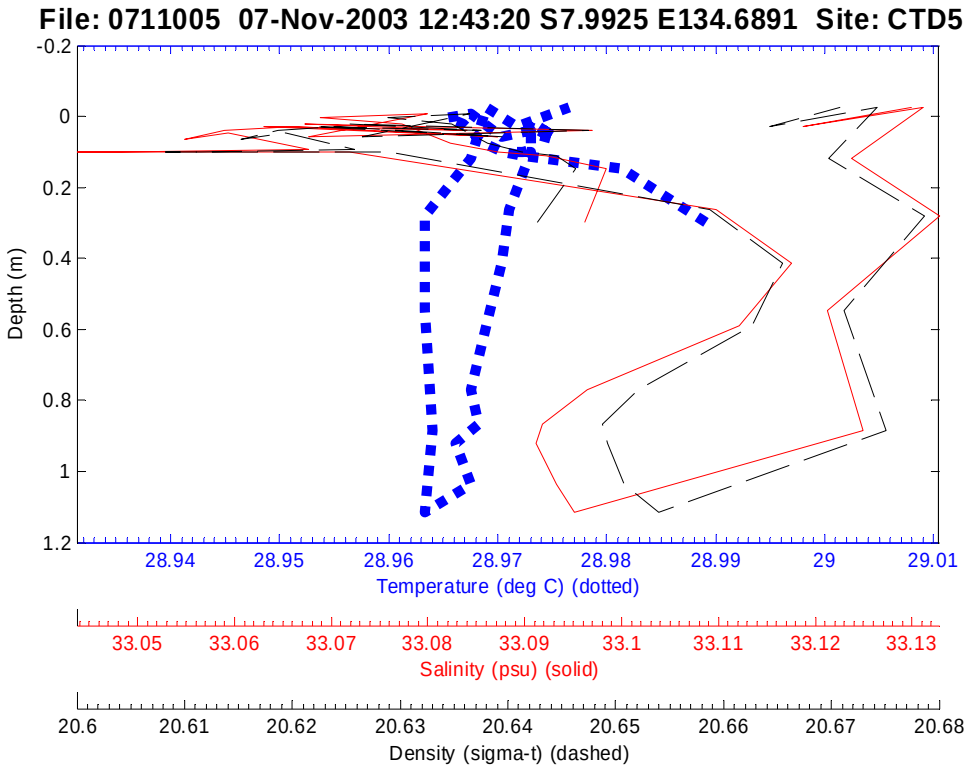

Temperature (C)
29.17
29.165
29.16
29.155
29.15
29.145
29.14
29.135
29.13
29.125
18.4
21
10.9
13.4
15.9
12.2
14.7
17.2
9.64
19.7
20
25
30
35
Salinity (psu)

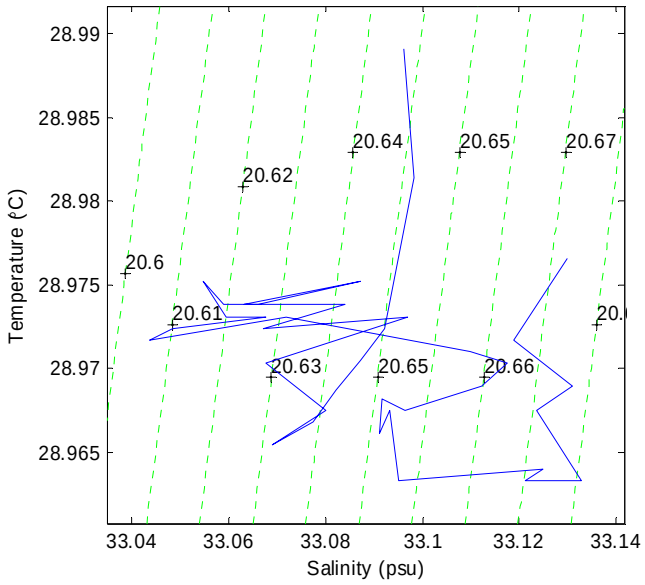

File: 0711003 07-Nov-2003 11:38:38 S7.9397 E134.6365 Site: CTD3
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

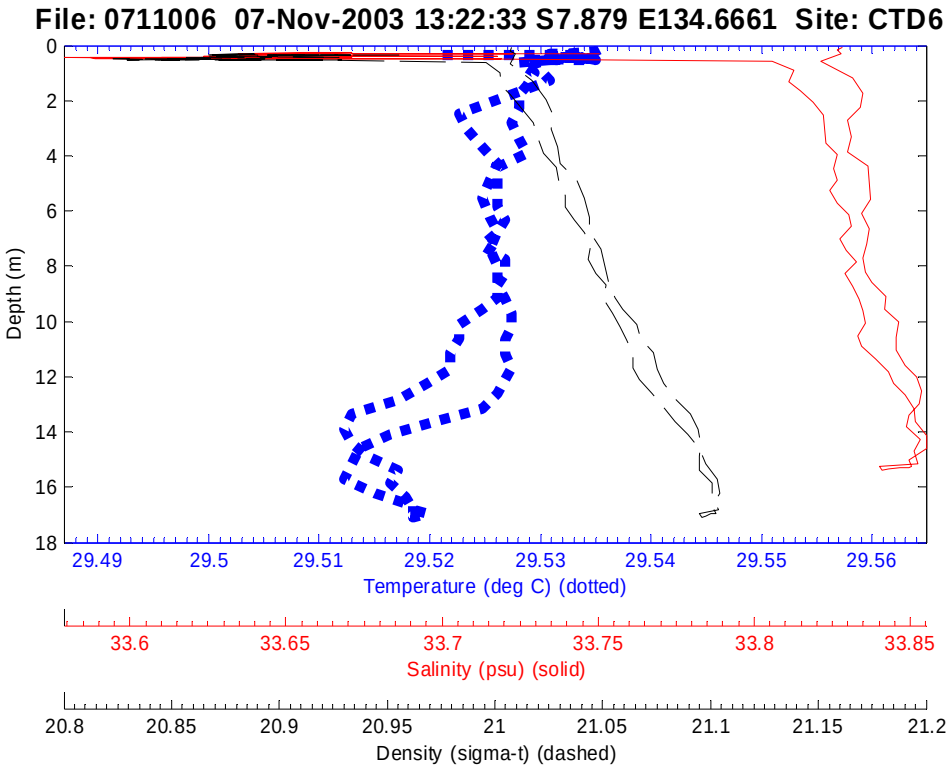

Temperature (C)
Salinity (psu)
18.7
19.2
19.7
20.3
18.9
19.5
20
20.6
21.1

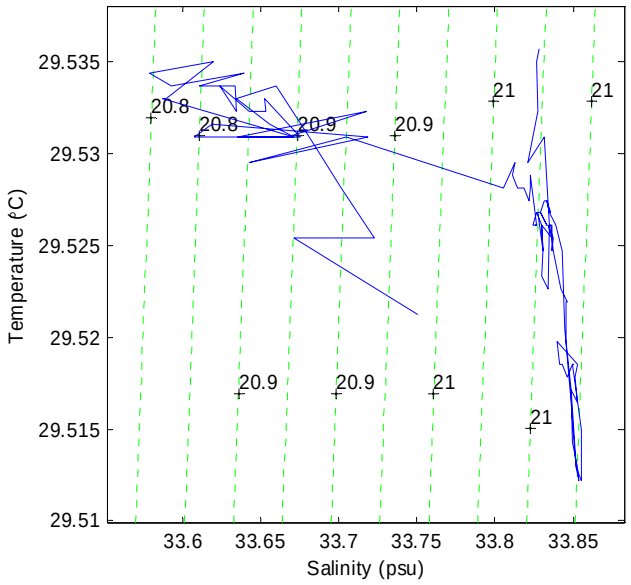

File: 0711004 07-Nov-2003 12:19:53 S7.976 E134.6713 Site: CTD4
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

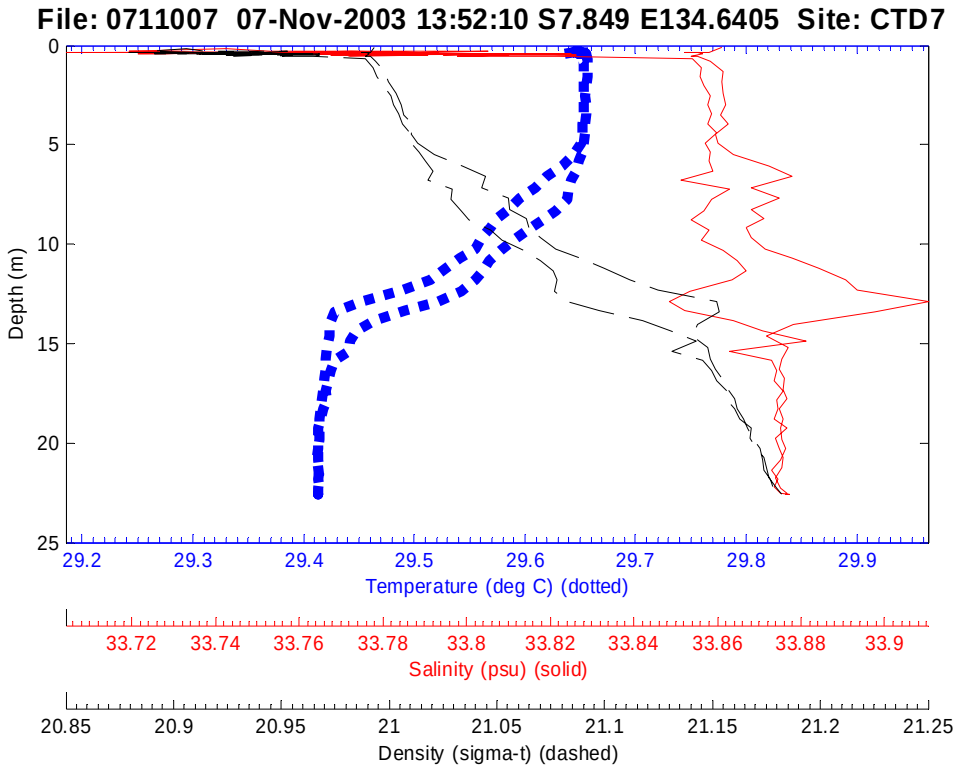

Temperature (C)
Salinity (psu)

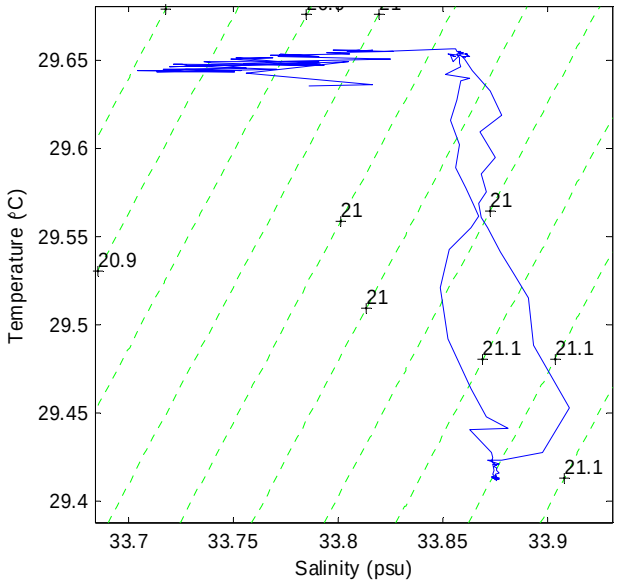

File: 0711005 07-Nov-2003 12:43:20 S7.9925 E134.6891 Site: CTD5
Depth (m)
-0.2
0
0.2
0.4
0.6
0.8
1
1.2
28.94
28.95
28.96
28.97
28.98
28.99
29
29.01
Temperature (deg C) (dotted)
33.05
33.06
33.07
33.08
33.09
33.1
33.11
33.12
33.13
Salinity (psu) (solid)
20.6
20.61
20.62
20.63
20.64
20.65
20.66
20.67
20.68
Density (sigma-t) (dashed)

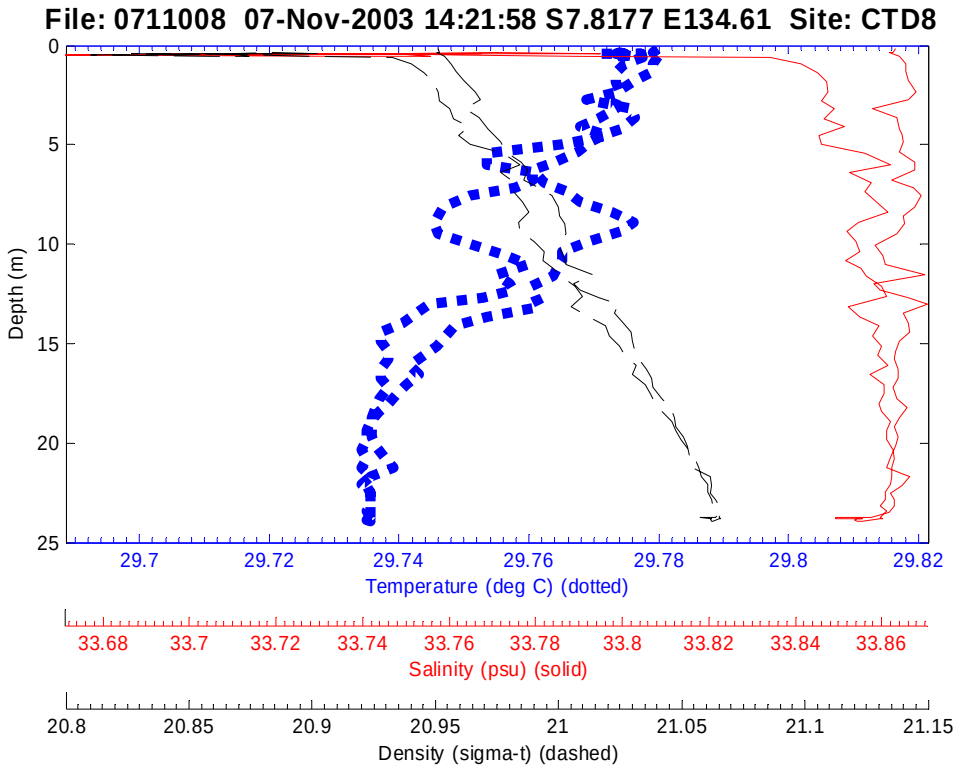

Temperature (C)
28.99
28.985
28.98
28.975
28.97
28.965
20.6
20.61
20.62
20.63
20.64
20.65
20.66
20.67
33.04
33.06
33.08
33.1
33.12
33.14
Salinity (psu)

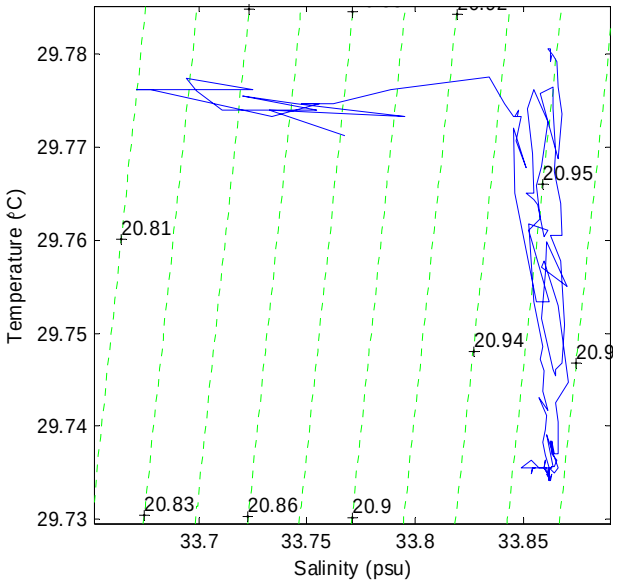

File: 0711006 07-Nov-2003 13:22:33 S7.879 E134.6661 Site: CTD6
Depth (m)
0
2
4
6
8
10
12
14
16
18
29.49
29.5
29.51
29.52
29.53
29.54
29.55
29.56
Temperature (deg C) (dotted)
33.6
33.65
33.7
33.75
33.8
33.85
Salinity (psu) (solid)
20.8
20.85
20.9
20.95
21
21.05
21.1
21.15
21.2
Density (sigma-t) (dashed)

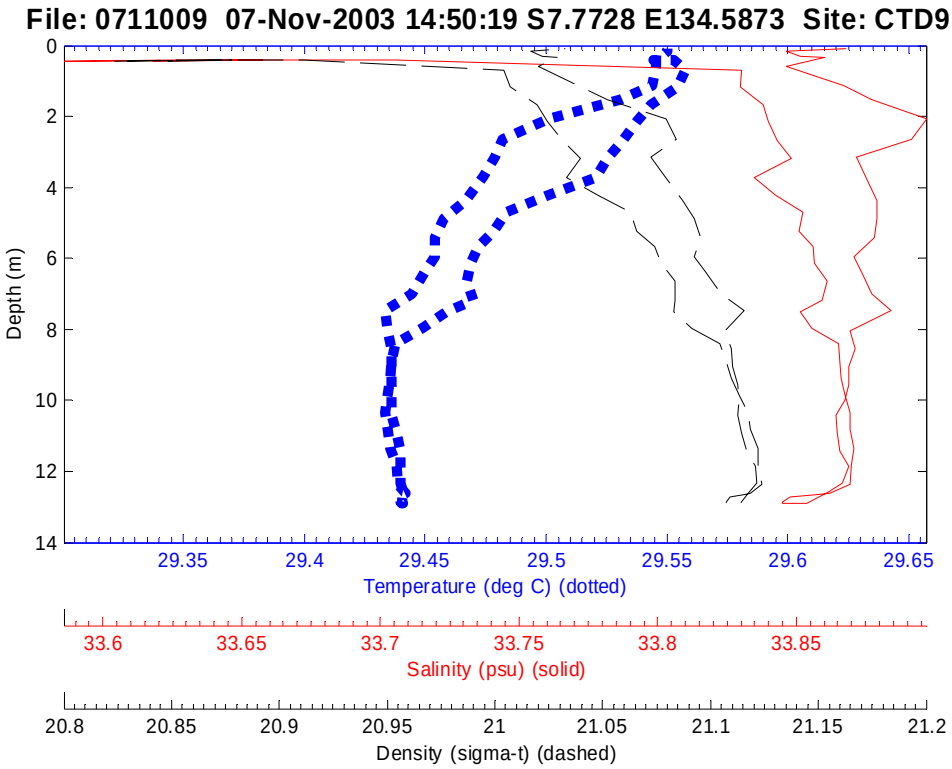

Temperature (C)
29.535
29.53
29.525
29.52
29.515
29.51
20.8
20.8
20.9
20.9
21
21
20.9
20.9
21
21
33.6
33.65
33.7
33.75
33.8
33.85
Salinity (psu)

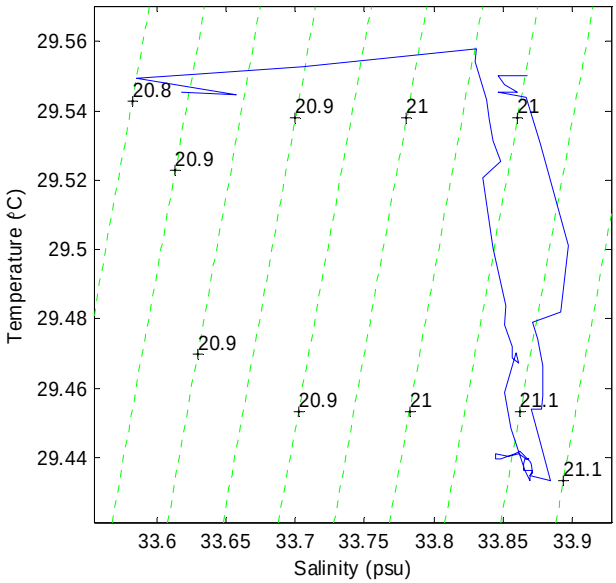

File: 0711007 07-Nov-2003 13:52:10 S7.849 E134.6405 Site: CTD7
Depth (m)
0
5
10
15
20
25
29.2
29.3
29.4
29.5
29.6
29.7
29.8
29.9
Temperature (deg C) (dotted)
33.72
33.74
33.76
33.78
33.8
33.82
33.84
33.86
33.88
33.9
Salinity (psu) (solid)
20.85
20.9
20.95
21
21.05
21.1
21.15
21.2
21.25
Density (sigma-t) (dashed)

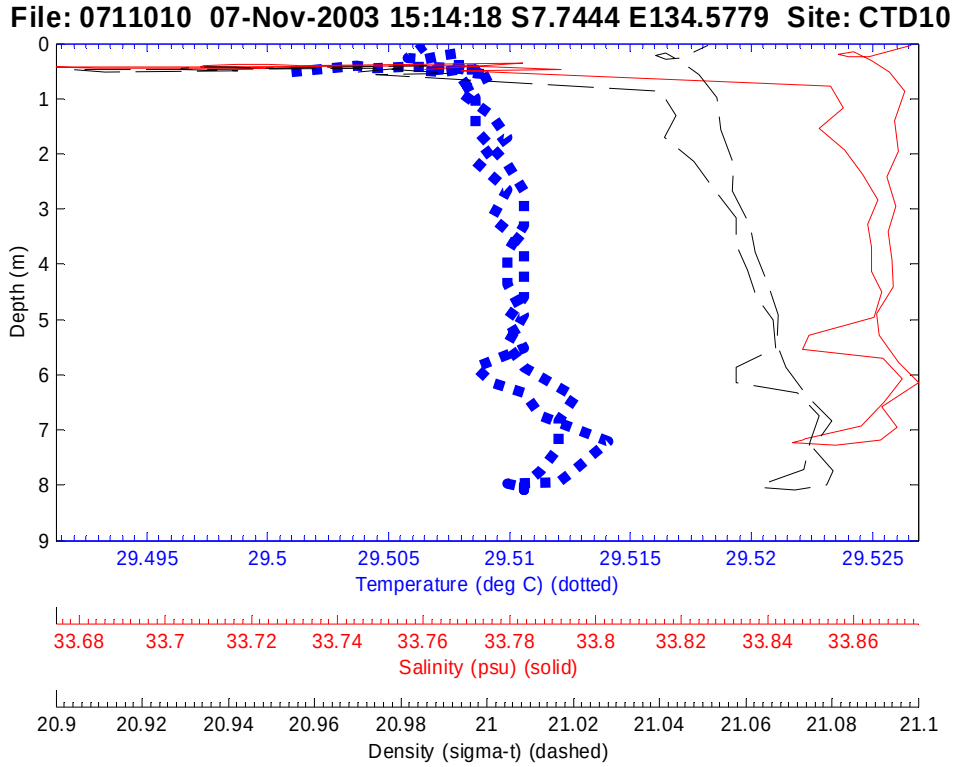

Temperature (C)
29.65
29.6
29.55
29.5
29.45
29.4
33.7
33.75
33.8
33.85
33.9
Salinity (psu)
20.9
21
21
21
21.1
21.1
21.1

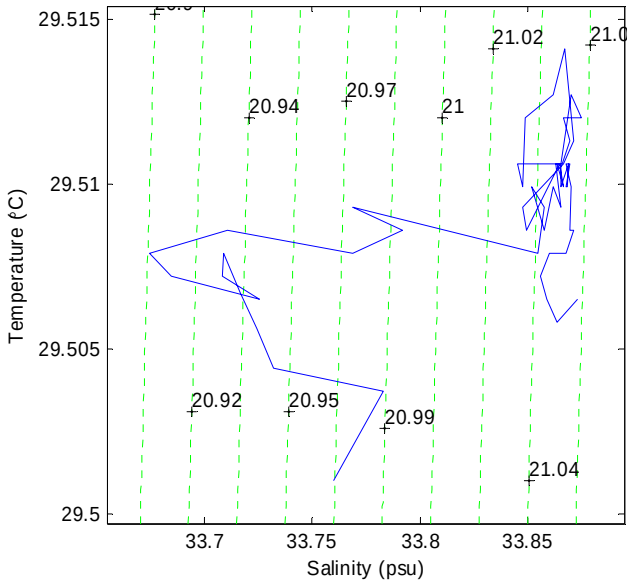

File: 0711008 07-Nov-2003 14:21:58 S7.8177 E134.61 Site: CTD8
Depth (m)
0
5
10
15
20
25
29.7
29.72
29.74
29.76
29.78
29.8
29.82
Temperature (deg C) (dotted)
33.68
33.7
33.72
33.74
33.76
33.78
33.8
33.82
33.84
33.86
Salinity (psu) (solid)
20.8
20.85
20.9
20.95
21
21.05
21.1
21.15
Density (sigma-t) (dashed)

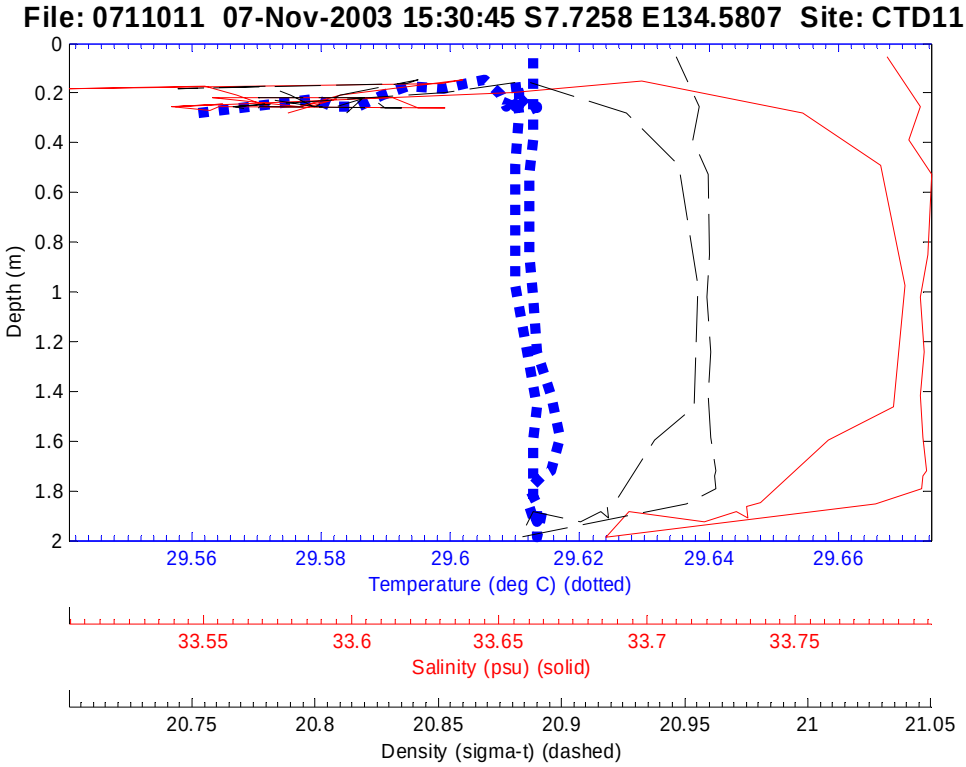

Temperature (C)
29.78
29.77
29.76
29.75
29.74
29.73
20.81
20.95
20.94
20.9
20.83
20.86
20.9
33.7
33.75
33.8
33.85
Salinity (psu)

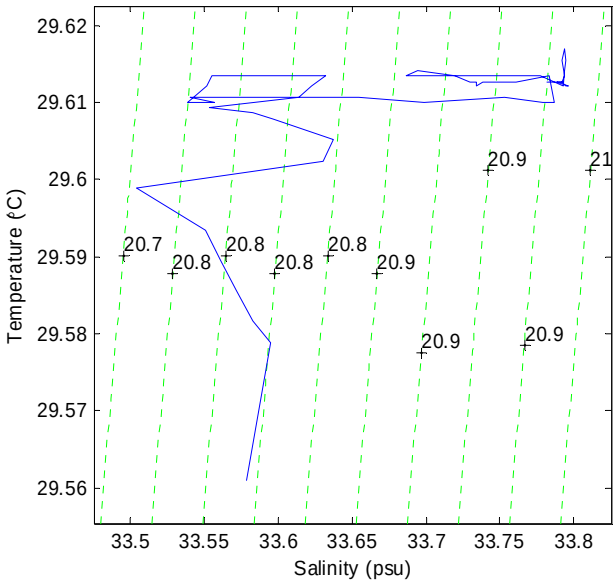

File: 0711009 07-Nov-2003 14:50:19 S7.7728 E134.5873 Site: CTD9
Depth (m)
0
2
4
6
8
10
12
14
29.35
29.4
29.45
29.5
29.55
29.6
29.65
Temperature (deg C) (dotted)
33.6
33.65
33.7
33.75
33.8
33.85
Salinity (psu) (solid)
20.8
20.85
20.9
20.95
21
21.05
21.1
21.15
21.2
Density (sigma-t) (dashed)

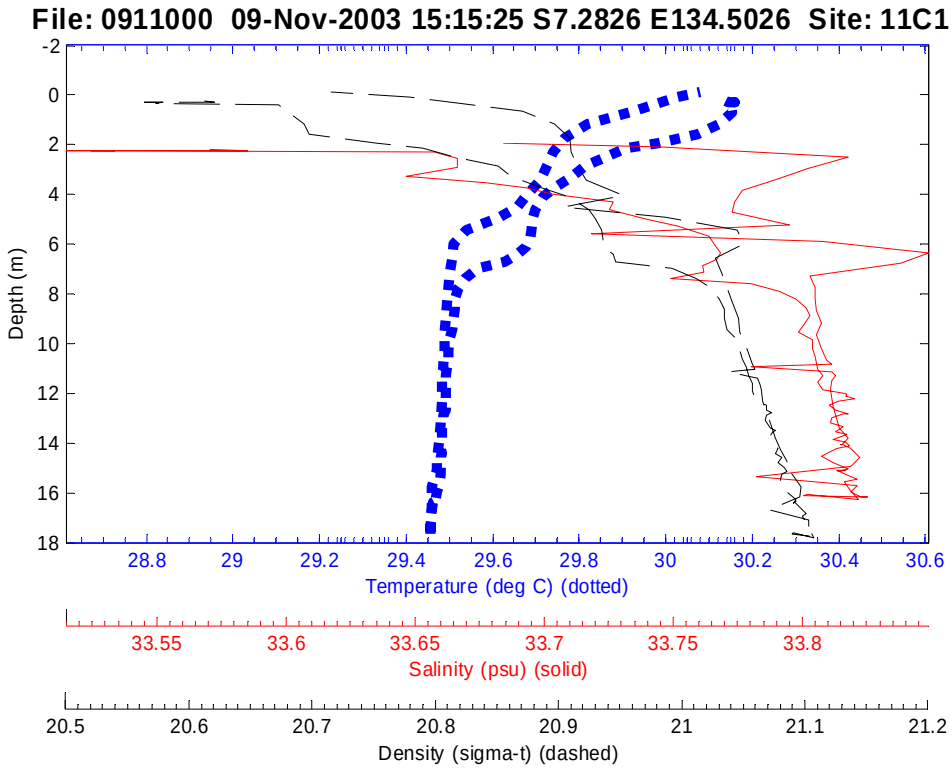

Temperature (C)
29.56
29.54
29.52
29.5
29.48
29.46
29.44
20.8
20.9
20.9
20.9
20.9
21
21
21
21.1
21.1
33.6
33.65
33.7
33.75
33.8
33.85
33.9
Salinity (psu)

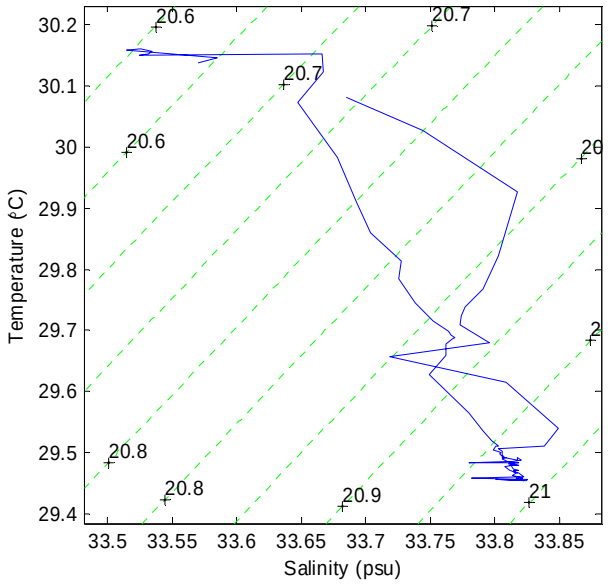

File: 0711010 07-Nov-2003 15:14:18 S7.7444 E134.5779 Site: CTD10
Depth (m)
0
1
2
3
4
5
6
7
8
9
29.495
29.5
29.505
29.51
29.515
29.52
29.525
Temperature (deg C) (dotted)
33.68
33.7
33.72
33.74
33.76
33.78
33.8
33.82
33.84
33.86
Salinity (psu) (solid)
20.9
20.92
20.94
20.96
20.98
21
21.02
21.04
21.06
21.08
21.1
Density (sigma-t) (dashed)

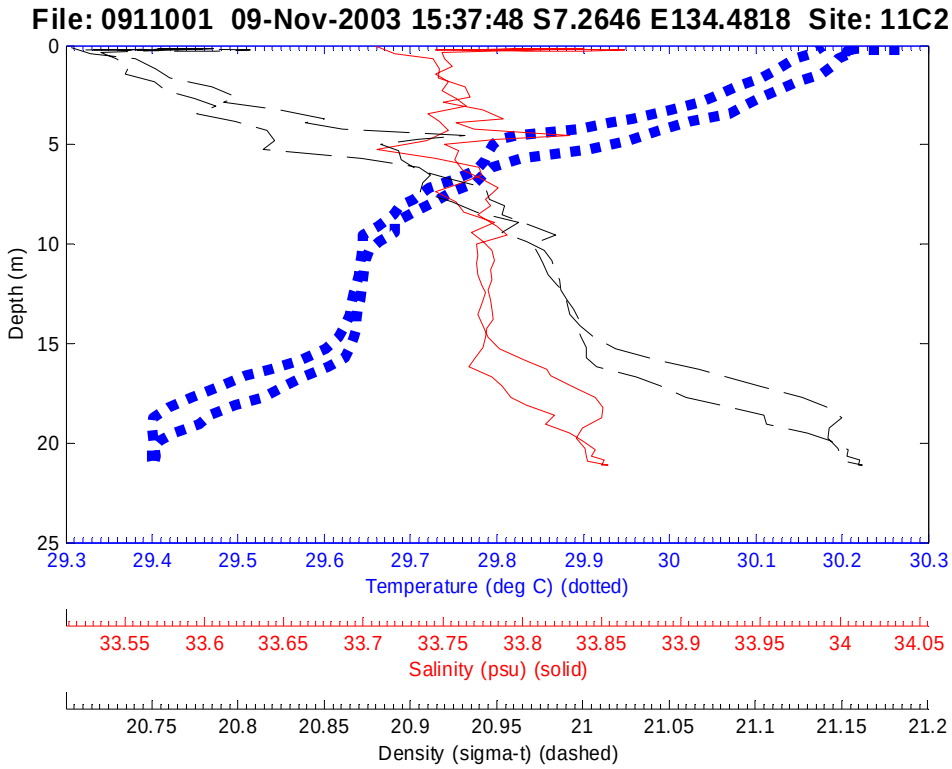

Temperature (C)
29.515
29.51
29.505
29.5
20.94
20.97
21
21.02
20.92
20.95
20.99
21.04
33.7
33.75
33.8
33.85
Salinity (psu)

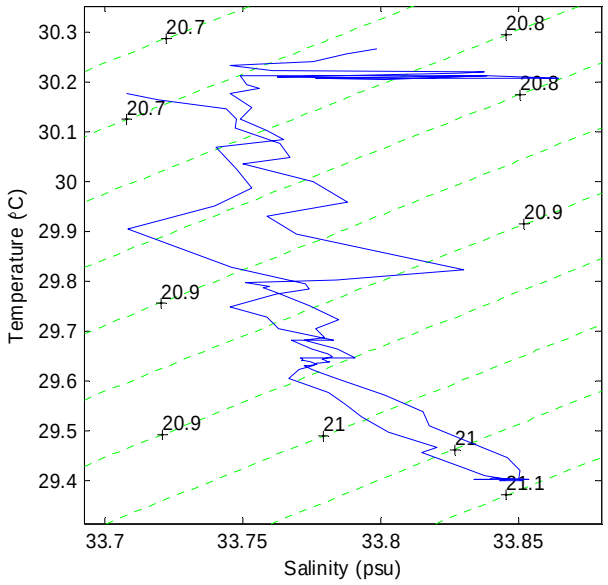

File: 0711011 07-Nov-2003 15:30:45 S7.7258 E134.5807 Site: CTD11
Depth (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
29.56
29.58
29.6
29.62
29.64
29.66
Temperature (deg C) (dotted)
33.55
33.6
33.65
33.7
33.75
Salinity (psu) (solid)
20.75
20.8
20.85
20.9
20.95
21
21.05
Density (sigma-t) (dashed)

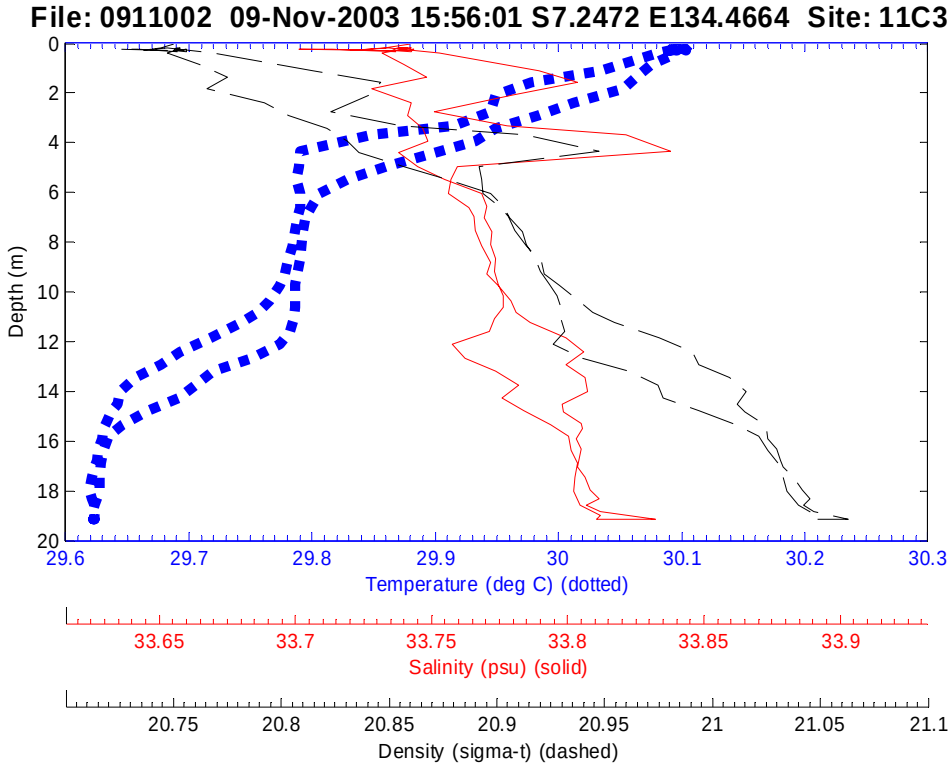

Temperature (C)
29.62
29.61
29.6
29.59
29.58
29.57
29.56
20.7
20.8
20.8
20.8
20.8
20.9
20.9
20.9
20.9
21
33.5
33.55
33.6
33.65
33.7
33.75
33.8
Salinity (psu)

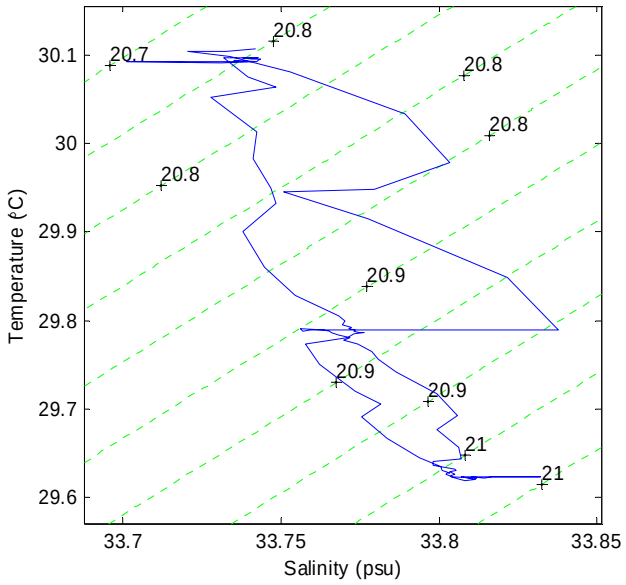

File: 0911000 09-Nov-2003 15:15:25 S7.2826 E134.5026 Site: 11C1
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

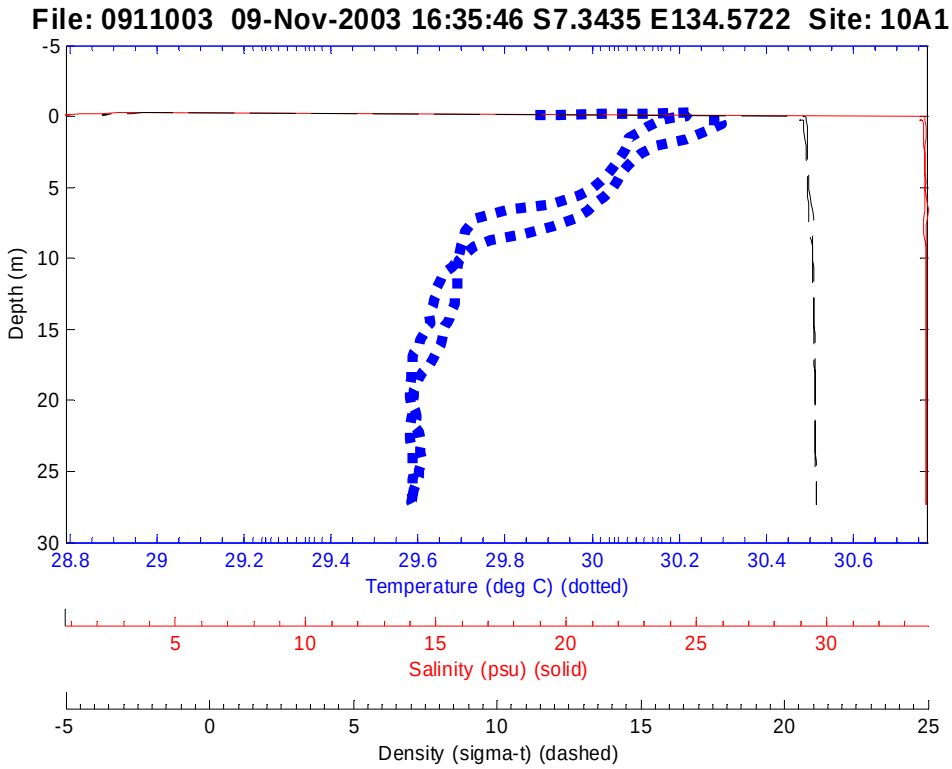

Temperature (C)
Salinity (psu)

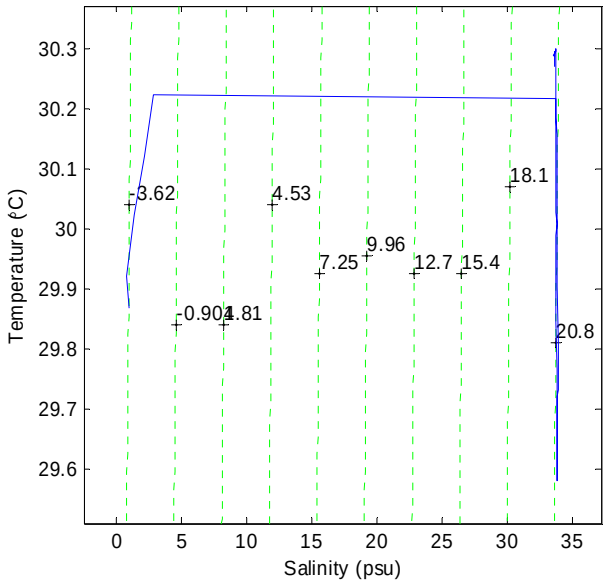

File: 0911001 09-Nov-2003 15:37:48 S7.2646 E134.4818 Site: 11C2
Depth (m)
0
5
10
15
20
25
29.3 29.4 29.5 29.6 29.7 29.8 29.9 30 30.1 30.2 30.3
Temperature (deg C) (dotted)
33.55 33.6 33.65 33.7 33.75 33.8 33.85 33.9 33.95 34 34.05
Salinity (psu) (solid)
20.75 20.8 20.85 20.9 20.95 21 21.05 21.1 21.15 21.2
Density (sigma-t) (dashed)

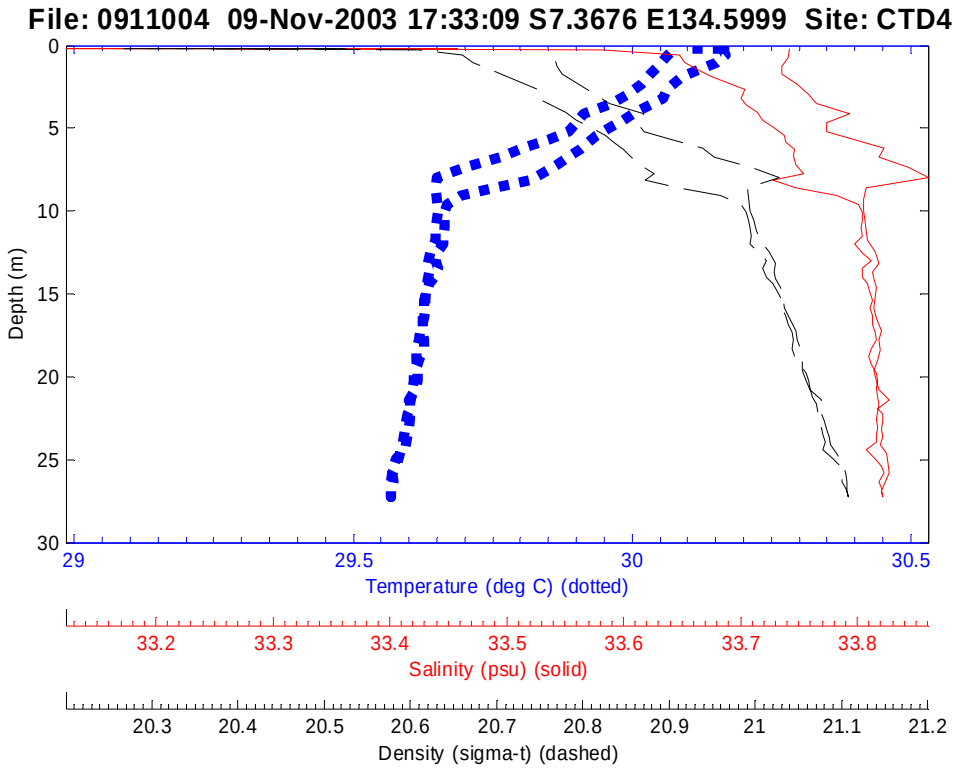

Temperature (C)
30.3
30.2
30.1
30
29.9
29.8
29.7
29.6
29.5
29.4
20.7
20.8
20.8
20.7
20.9
20.9
20.9
21
21
21.1
33.7 33.75 33.8 33.85
Salinity (psu)

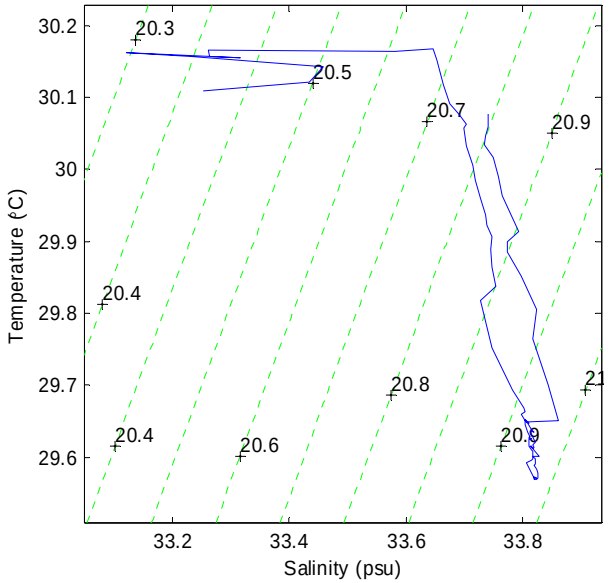

File: 0911002 09-Nov-2003 15:56:01 S7.2472 E134.4664 Site: 11C3
Depth (m)
0
2
4
6
8
10
12
14
16
18
20
29.6
29.7
29.8
29.9
30
30.1
30.2
30.3
Temperature (deg C) (dotted)
33.65
33.7
33.75
33.8
33.85
33.9
Salinity (psu) (solid)
20.75
20.8
20.85
20.9
20.95
21
21.05
21.1
Density (sigma-t) (dashed)

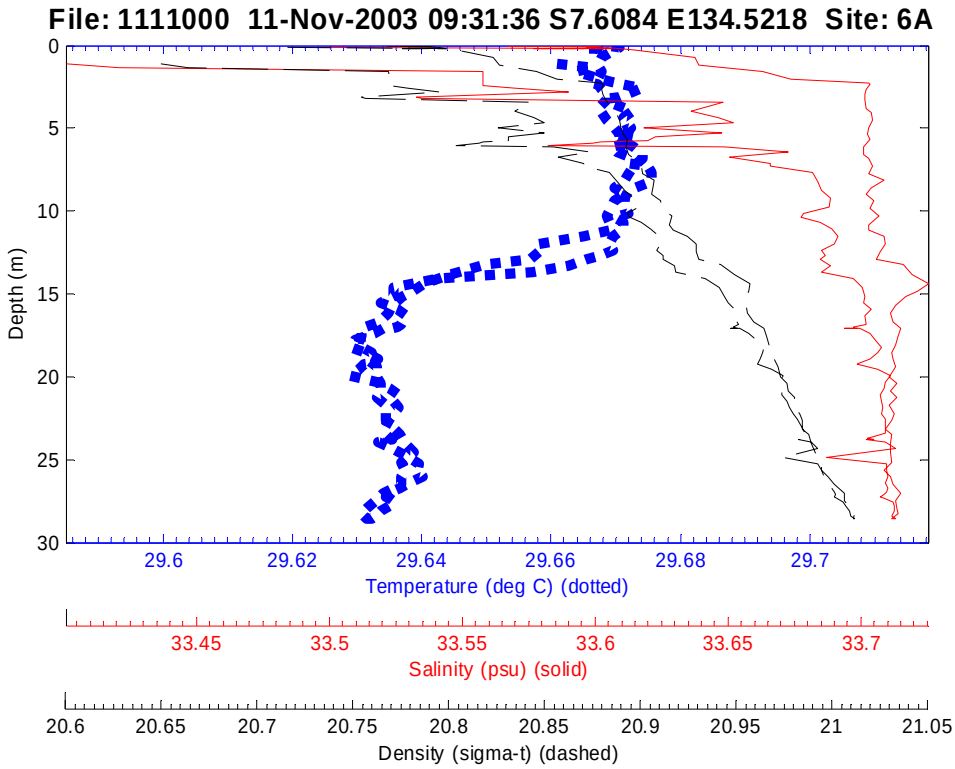

Temperature (C)
30.1
30
29.9
29.8
29.7
29.6
33.7
33.75
33.8
33.85
Salinity (psu)
20.7
20.8
20.8
20.8
20.8
20.9
20.9
20.9
21
21

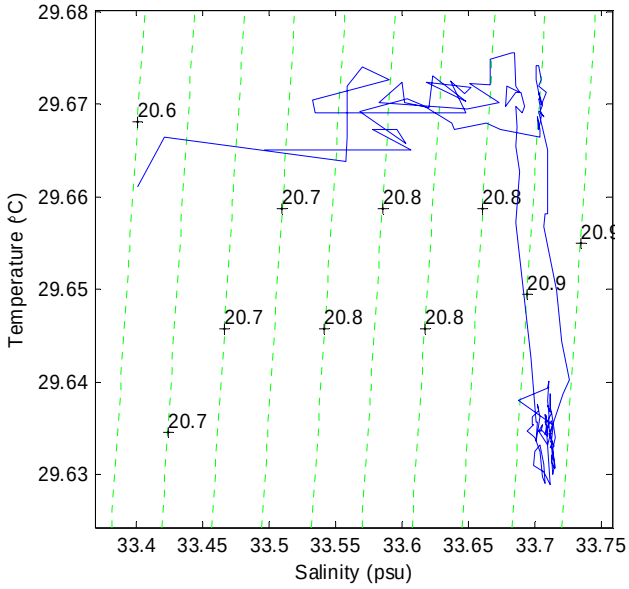

File: 0911003 09-Nov-2003 16:35:46 S7.3435 E134.5722 Site: 10A1
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

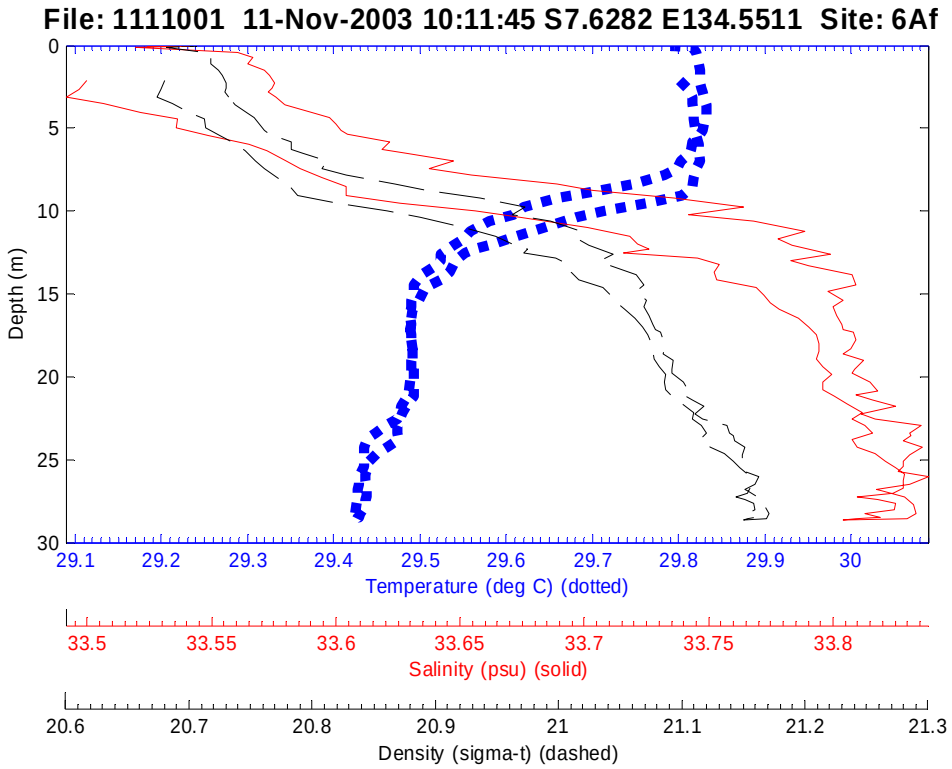

Temperature (C)
Salinity (psu)
3.62
4.53
18.1
9.96
7.25
12.7
15.4
0.904
1.81
20.8

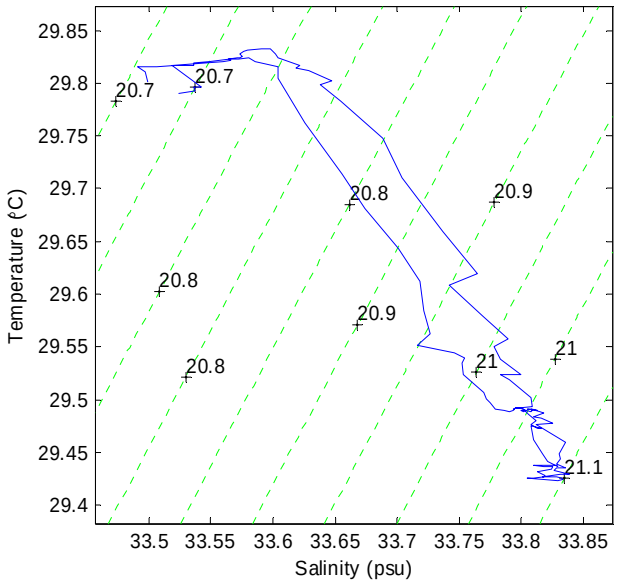

File: 0911004 09-Nov-2003 17:33:09 S7.3676 E134.5999 Site: CTD4
Depth (m)
Temperature (deg C) (dotted)
Salinity (psu) (solid)
Density (sigma-t) (dashed)

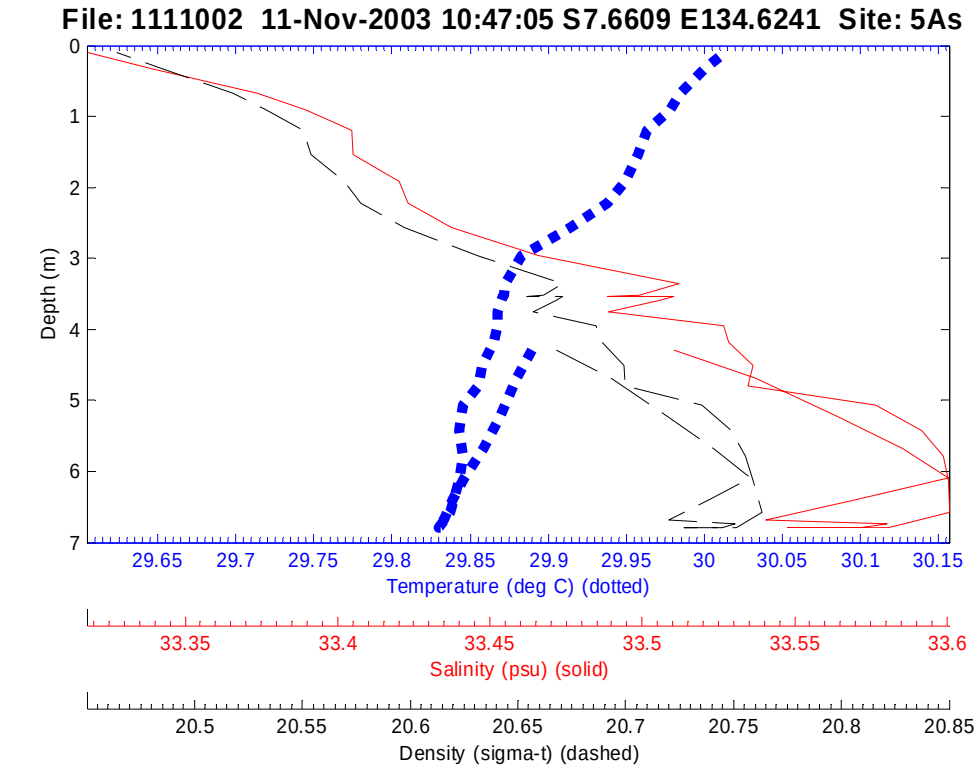

Temperature (C)
Salinity (psu)

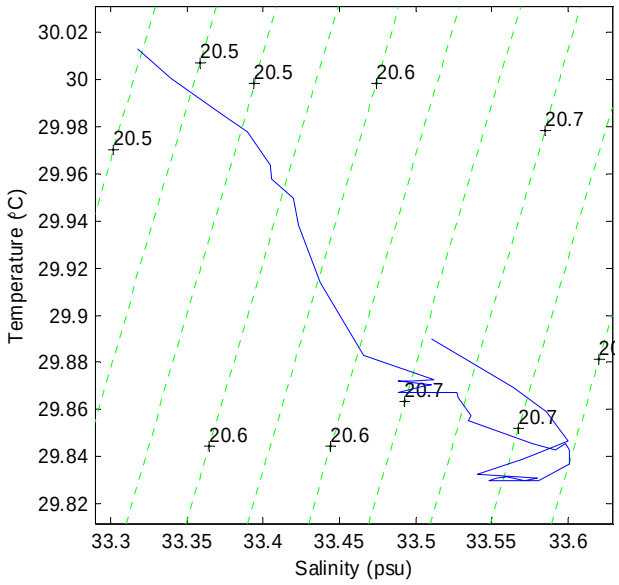

File: 1111000 11-Nov-2003 09:31:36 S7.6084 E134.5218 Site: 6A
Depth (m)
0
5
10
15
20
25
30
29.6
29.62
29.64
29.66
29.68
29.7
Temperature (deg C) (dotted)
33.45
33.5
33.55
33.6
33.65
33.7
Salinity (psu) (solid)
20.6
20.65
20.7
20.75
20.8
20.85
20.9
20.95
21
21.05
Density (sigma-t) (dashed)

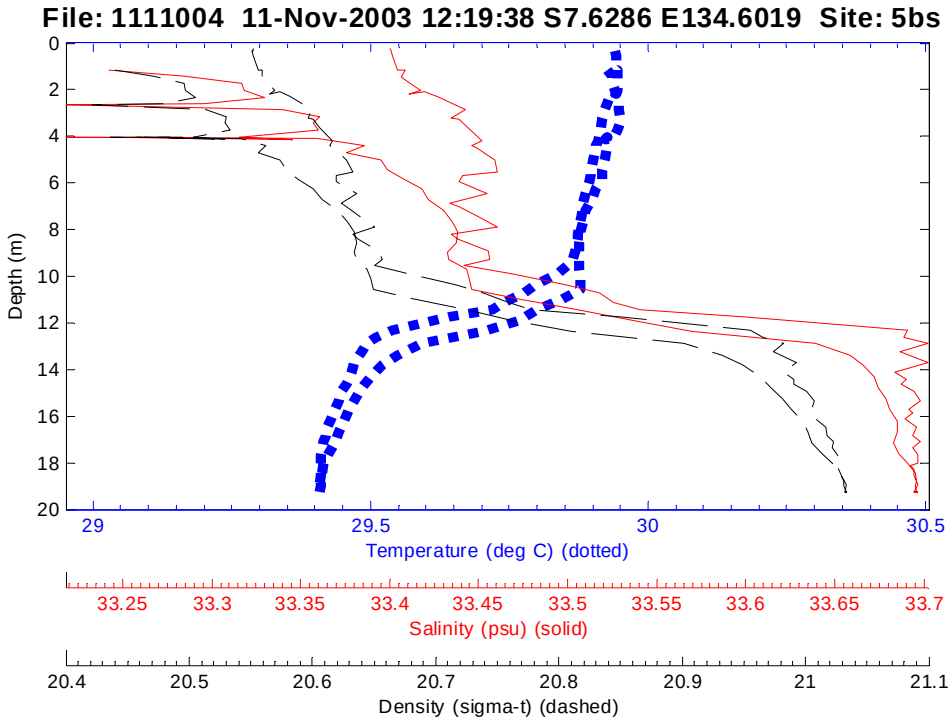

Temperature (C)
29.68
29.67
29.66
29.65
29.64
29.63
20.6
20.7
20.8
20.8
20.9
20.7
20.8
20.8
20.7
33.4
33.45
33.5
33.55
33.6
33.65
33.7
33.75
Salinity (psu)

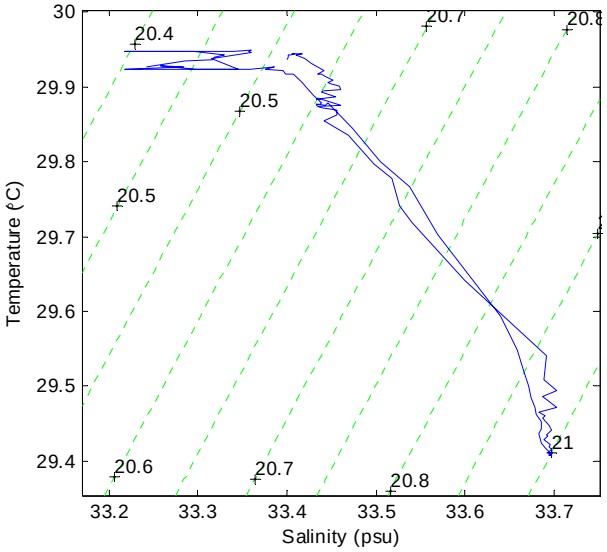

File: 1111001 11-Nov-2003 10:11:45 S7.6282 E134.5511 Site: 6Af
Depth (m)
0
5
10
15
20
25
30
29.1
29.2
29.3
29.4
29.5
29.6
29.7
29.8
29.9
30
Temperature (deg C) (dotted)
33.5
33.55
33.6
33.65
33.7
33.75
33.8
Salinity (psu) (solid)
20.6
20.7
20.8
20.9
21
21.1
21.2
21.3
Density (sigma-t) (dashed)

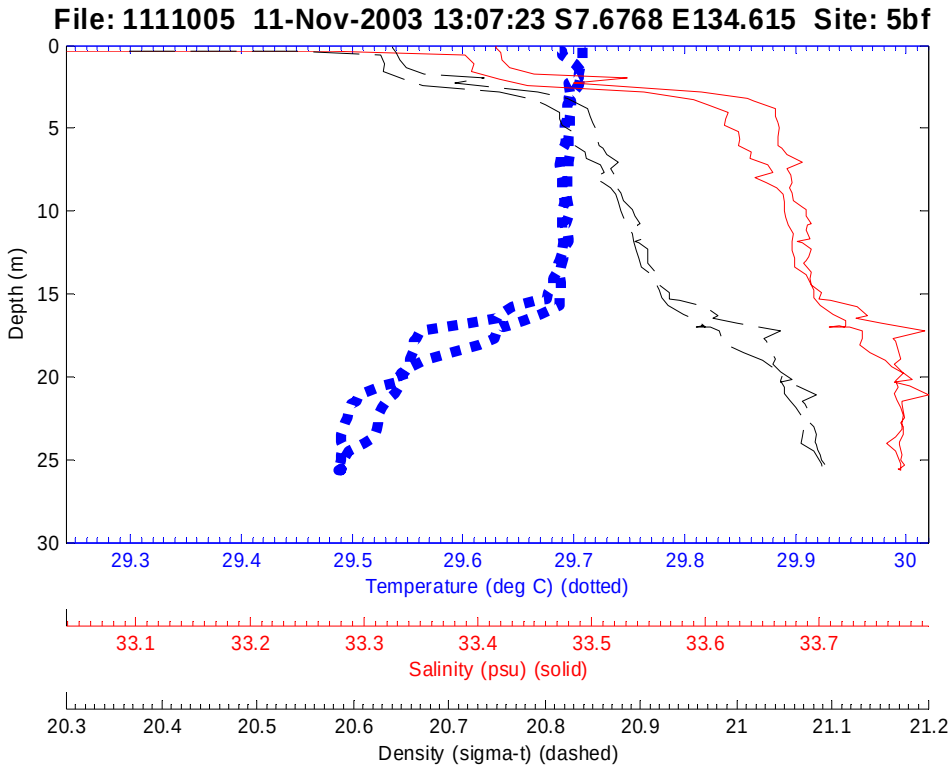

Temperature (C)
29.85
29.8
29.75
29.7
29.65
29.6
29.55
29.5
29.45
29.4
20.7
20.7
20.8
20.9
20.8
20.9
20.8
21
21
21.1
33.5
33.55
33.6
33.65
33.7
33.75
33.8
33.85
Salinity (psu)

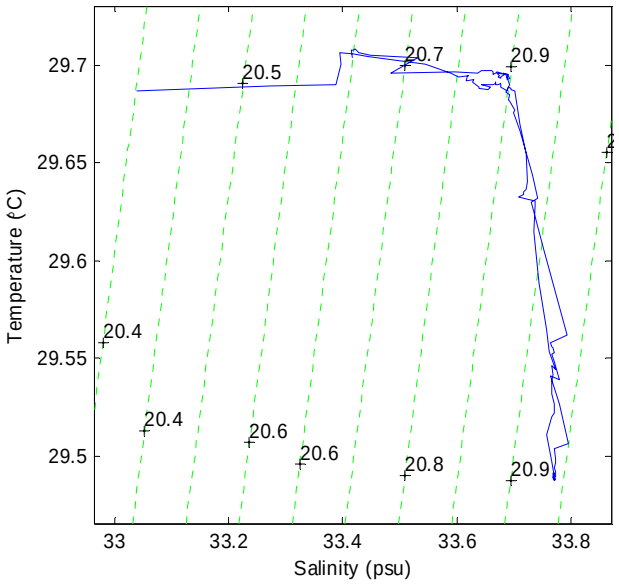

File: 1111002 11-Nov-2003 10:47:05 S7.6609 E134.6241 Site: 5As
Depth (m)
0
1
2
3
4
5
6
7
29.65 29.7 29.75 29.8 29.85 29.9 29.95 30 30.05 30.1 30.15
Temperature (deg C) (dotted)
33.35 33.4 33.45 33.5 33.55 33.6
Salinity (psu) (solid)
20.5 20.55 20.6 20.65 20.7 20.75 20.8 20.85
Density (sigma-t) (dashed)


Temperature (C)
30.02
30
29.98
29.96
29.94
29.92
29.9
29.88
29.86
29.84
29.82
20.5
20.5
20.5
20.6
20.7
20.7
20.7
20.6
20.6
33.3 33.35 33.4 33.45 33.5 33.55 33.6
Salinity (psu)


File: 1111004 11-Nov-2003 12:19:38 S7.6286 E134.6019 Site: 5bs
Depth (m)
0
2
4
6
8
10
12
14
16
18
20
29
29.5
30
30.5
Temperature (deg C) (dotted)
33.25
33.3
33.35
33.4
33.45
33.5
33.55
33.6
33.65
33.7
Salinity (psu) (solid)
20.4
20.5
20.6
20.7
20.8
20.9
21
21.1
Density (sigma-t) (dashed)


Temperature (C)
30
29.9
29.8
29.7
29.6
29.5
29.4
20.4
20.5
20.5
20.6
20.7
20.8
21
33.2
33.3
33.4
33.5
33.6
33.7
Salinity (psu)


File: 1111005 11-Nov-2003 13:07:23 S7.6768 E134.615 Site: 5bf
Depth (m)
0
5
10
15
20
25
30
29.3
29.4
29.5
29.6
29.7
29.8
29.9
30
Temperature (deg C) (dotted)
33.1
33.2
33.3
33.4
33.5
33.6
33.7
Salinity (psu) (solid)
20.3
20.4
20.5
20.6
20.7
20.8
20.9
21
21.1
21.2
Density (sigma-t) (dashed)

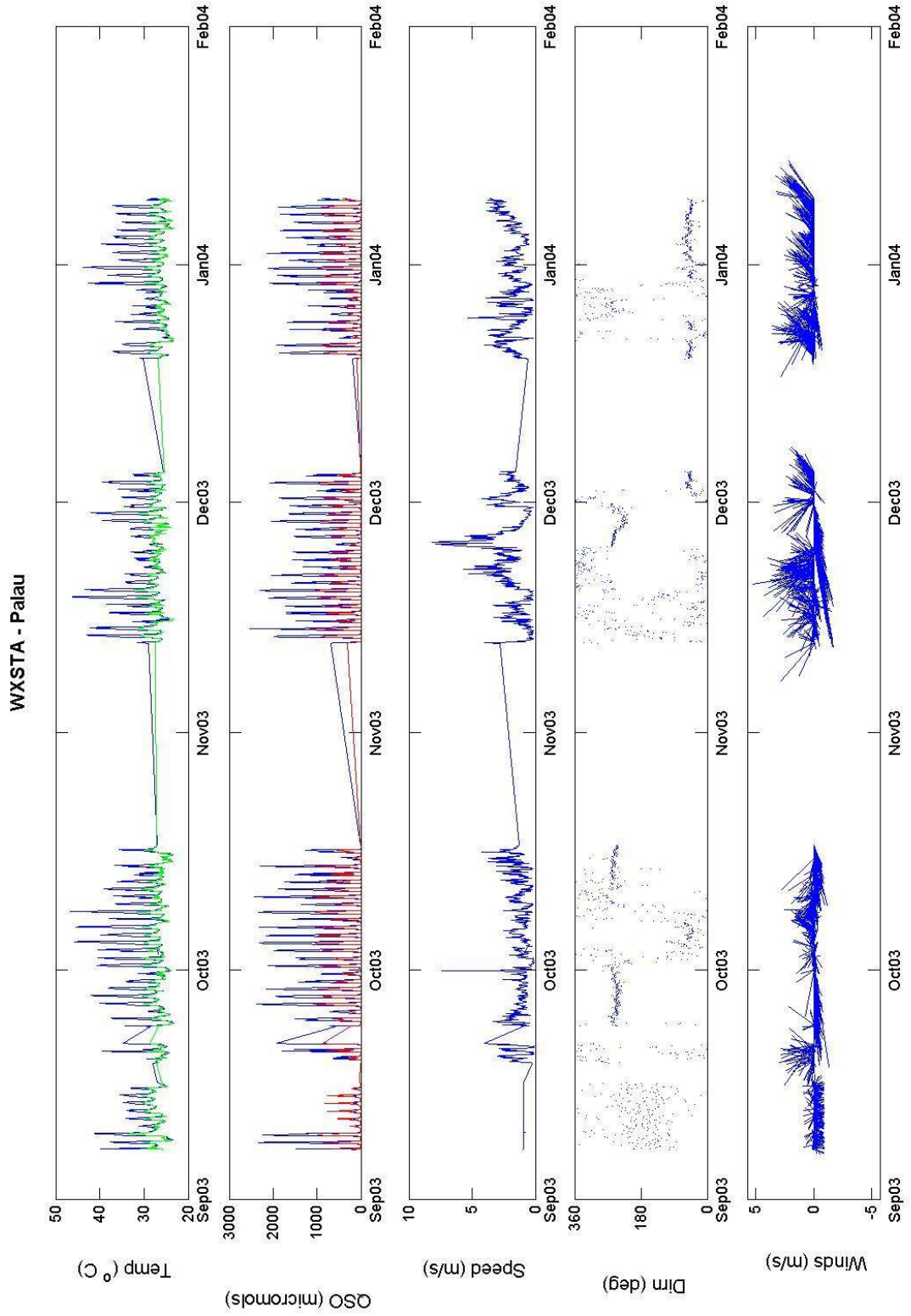

Temperature (C)
29.7
29.65
29.6
29.55
29.5
20.4
20.4
20.5
20.6
20.6
20.7
20.8
20.9
20.9
33
33.2
33.4
33.6
33.8
Salinity (psu)

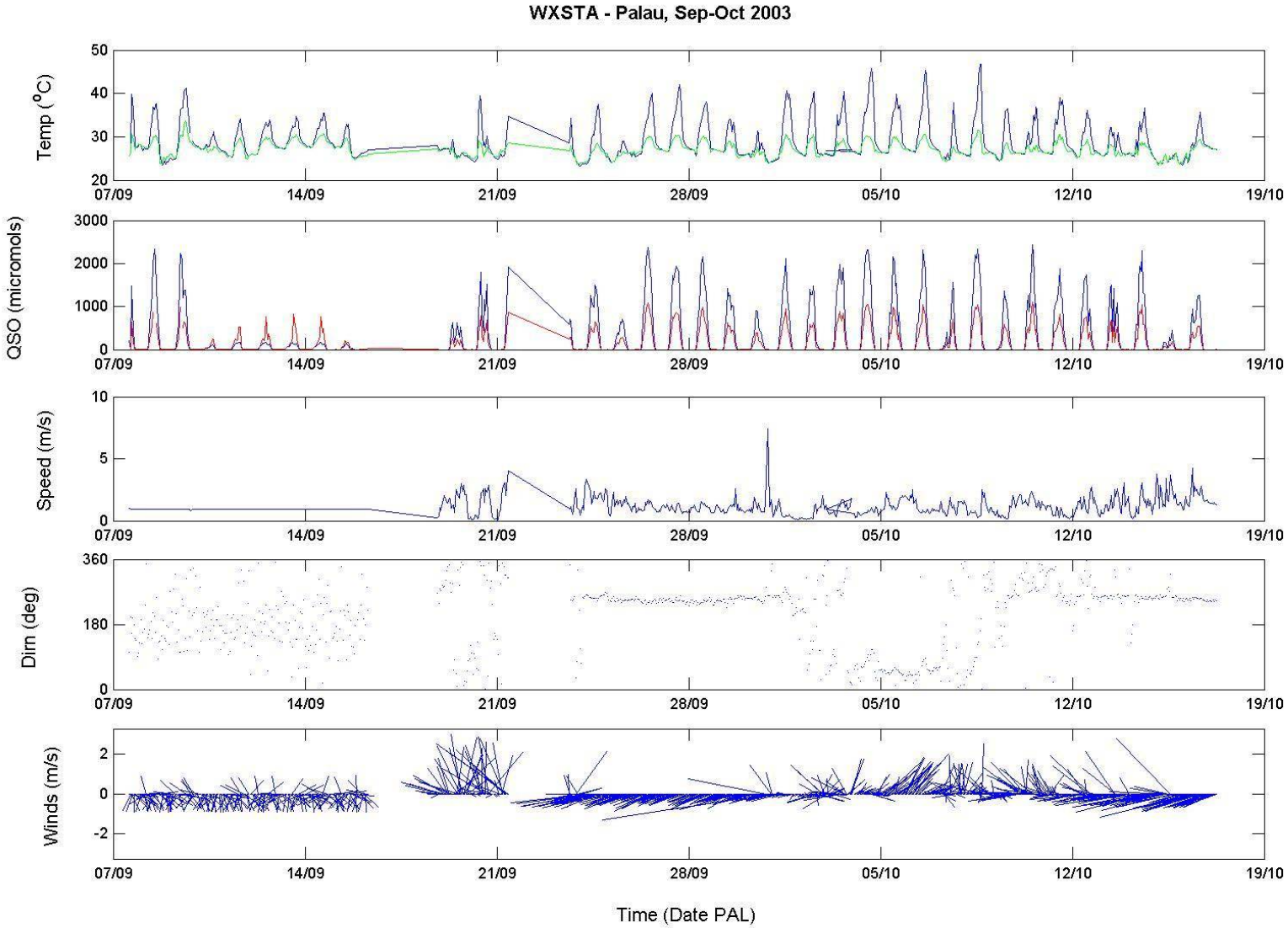
Appendix L – Time Series Plots of Weather Data

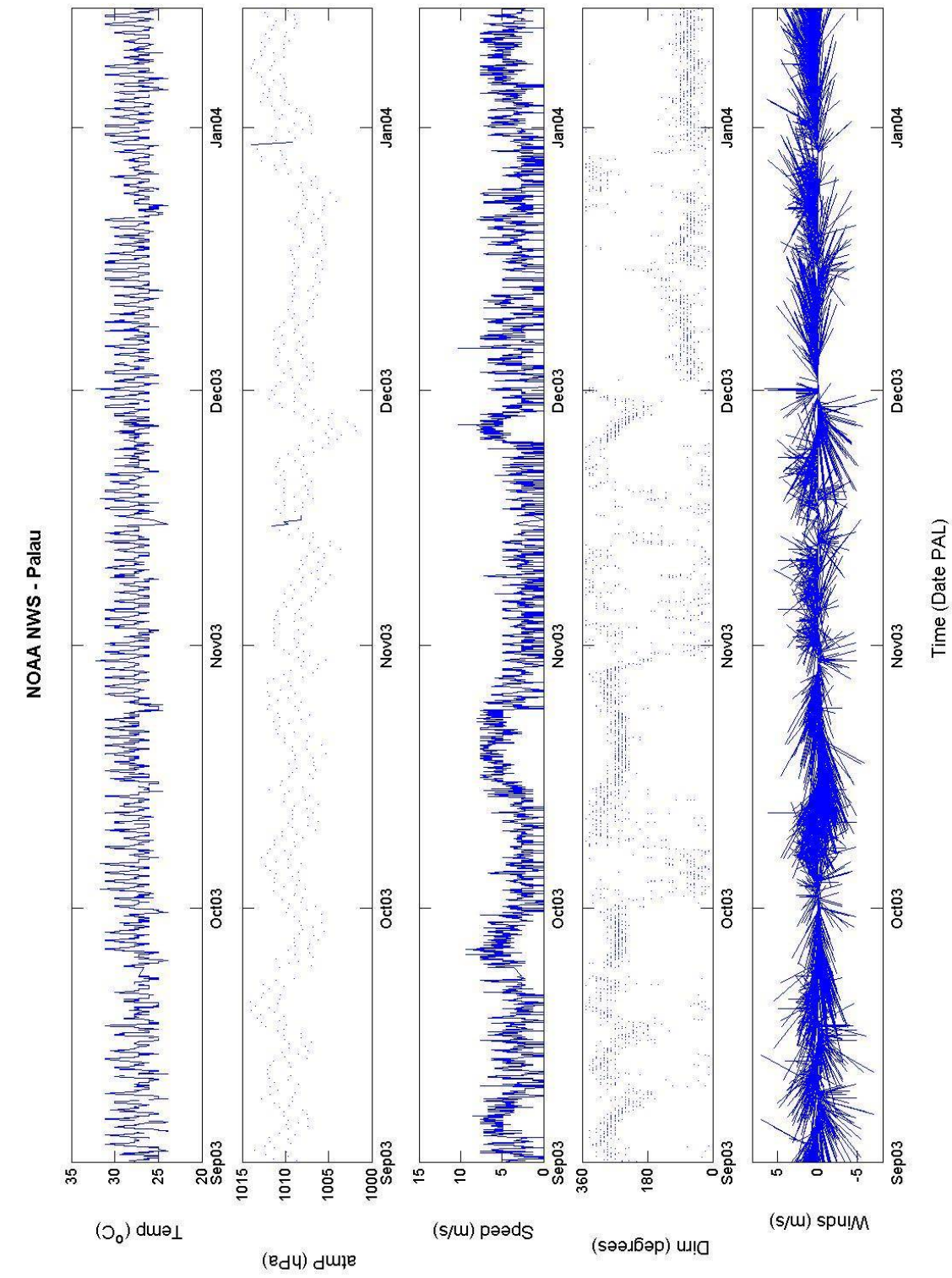
Two figures are presented for the portable weather station (WXSTA) data; the first shows the entire deployment and the second is zoomed to the Sep-Oct period. On each of these figures, two air temperatures (direct sunlight – blue; shaded – green) are presented together on the first plot, with axis label "Temp". The data from two radiation measurements (Short-Wave Radiation – red; Photosynthetically Active Radiation (PAR) – blue) are shown on the second plot; the axis label, QSO, stands for Quantum Sensor Output. The two radiation measurements, although plotted together, differ in their units. The PAR has units of $\mu mol.m^{-2}s^{-1}$, whereas short wave radiation is in units of Wm^{-2}. Wind speed and direction are shown on the third and fourth plots. The fifth plot represents the wind data as a quiver plot, as described in Appendix H for ocean currents.

The NOAA data are presented in a single figure with plots of temperature, atmospheric pressure, wind speed, wind direction and the quiver plot of winds.

Unit Conversions for PAR: 1 μEinstein = 6.02×10^{17} photons s^{-1} m^{-2} = 1 μmols m^{-2} s^{-1}


WXSTA - Palau
Temp (°C)
QSO (micromols)
Speed (m/s)
Dirn (deg)
Winds (m/s)
Time (Date PAL)
Sep03
Oct03
Nov03
Dec03
Jan04
Feb04


WXSTA - Palau, Sep-Oct 2003
Temp (°C)
QSO (micromols)
Speed (m/s)
Dirn (deg)
Winds (m/s)
07/09
14/09
21/09
28/09
05/10
12/10
19/10
Time (Date PAL)


NOAA NWS - Palau
Temp (°C)
35
30
25
20
atmP (hPa)
1015
1010
1005
1000
Speed (m/s)
15
10
5
0
Dirn (degrees)
360
180
0
Winds (m/s)
5
0
-5
Sep03
Oct03
Nov03
Dec03
Jan04
Time (Date PAL)

Appendix M – Data Format & File naming conventions

Each instrument's output data has its own, often manufacturer-specific, format when downloaded. From these, a standard file format is produced utilising MATLAB, a widely-used analysis package. The MATLAB data are binary; however, they can easily be reformatted to alternative formats, such as ASCII, from within the MATLAB environment.

File naming convention

File names are attributed according to the naming conventions associated with each particular project. The file prefix is made up of a 2 or 3 character instrument type and site number, and a 2 character position code, with further characters appended to help understand what type/s of data the file contains and what processing has been performed. The MATLAB files have a default filename extension '.mat'.

Example names are A10i1uvm.mat and T4i3t.mat

Table 7 Filename tags

Instrument Type Processing	Site Number	Position	Parameter
A – current meters p,r,o,l,h	1-14	i1-7	uv, uvw, uvm
B – tide gauges	1-6	i1	tl
C – salinity	1-5	i1	tc
T – Temperature transect	1-8	i1-7	t,tl

Instrument Type and ***Site Number*** codes can be found in the Instrument Array Summary section in the main part of this document. The tables in that section cross reference to actual location names, and a later table lists their geographic position coordinates.

Position codes indicate an instrument's vertical position, as listed in The Temperature Transect and Mooring Summary section. The letter "i" precedes a number where 1 is the deepest instrument at the site and each higher instrument is given a consecutively higher number. If two loggers are located at the same depth, they are given the same number. Therefore the deepest instrument position on mooring A10 would be A10i1 or for transect T4 – T4i1.

Parameter codes, the final tag/s, indicate what variables are being measured by the instrument. Multiple tags are used to classify loggers with more than one sensor. Thus the instrument at mooring A10, which measured current profiles, has the codename A10i1uvm. The "m" indicates a matrix of data instead of a vector from single point measurements. The temperature (t) and water level (l) are sometimes suppressed for the current meters.

Processing codes are used to indicate level of data processing, specifically:
p – prediction, r – residual, o – observed, l – low passed, h – high passed

CTD casts are named using the following naming convention: ddmmnnn, with dd being the day, mm the month and nnn being the cast number starting from zero. Data were processed from raw *.hex files to *.cnv using the manufacturer software. They were then edited to in-water values.

ASCII Data Format
Most data were downloaded from the instruments in a binary or hexadecimal format. Manufacturer's software was then used to convert to American Standard Code for Information Interchange (ASCII) prior to ingestion into MATLAB for visualisation and analysis. ASCII is potentially the most easily-read format for this data where MATLAB is not available. These files can simply be inspected in any common text file viewer and most are self-explanatory.

ASCII files for individual instruments are listed in the instrument deployment tables in Appendices B, C, D, E and F. For instruments deployed in transects or on moorings, the file names are summarised in the Temperature Transect and Mooring Summary section. The original instrument output files were archived by instrument type in the "Raw Data" folder (Appendix N). A description of the ASCII-output format from the RDI ADCP instruments is provided here due to the complexity of the data file.

RDI ADCP data were converted to ASCII using the manufacturer software package, WinADCP. Due to their size, these files were compressed (*.zip) for inclusion in the DVD archive. While the ASCII files are provided with this report, it is recommended that the manufacturer's software be obtained by individual users as it provides a method to view and export the data. The software is available at the RDInstruments website (http://www.rdinstruments.com/); while the package is free-of-charge, registration is required for download. To register, select "Customer Support" from the option column at the left of the screen and then follow the "Request Registration" link in the text. Fill in the required fields; for the type of ADCP, enter "300-kHz Workhorse Sentinel". After submitting the form, RDI will provide access information via email. Upon receipt of this information, the downloading process requires, as input, parameters from one instrument. The necessary parameters from the instrument deployed at location A5 are:

ADCP Serial number – WH 412
Frequency – 300 kHz
Type – Real time fixed

An example of the use of the WinADCP software is provided here. RDI ADCP binary data files for this study have a filename of the form "PAL02000.000". To open a binary file from WinADCP go to the "File" menu and select "Open". In the pop-up window select the data file to be opened and click "Open". Binary data files output by BroadBand and WorkHorse ADCP instruments may be accessed by this process. Figure 14 is a screen-capture of the WinADCP workspace displaying data from the file PAL02000.000. A summary of the setup of the instrument and logging parameters is

shown in the upper-left sub-window, labelled “WinADCP Information”; the full dataset is displayed in the upper-right sub-window, labelled “Whole Set”; and a zoomed image of data from the first 64-hours of the deployment is shown in the bottom sub-window, labelled “Sub Set”.

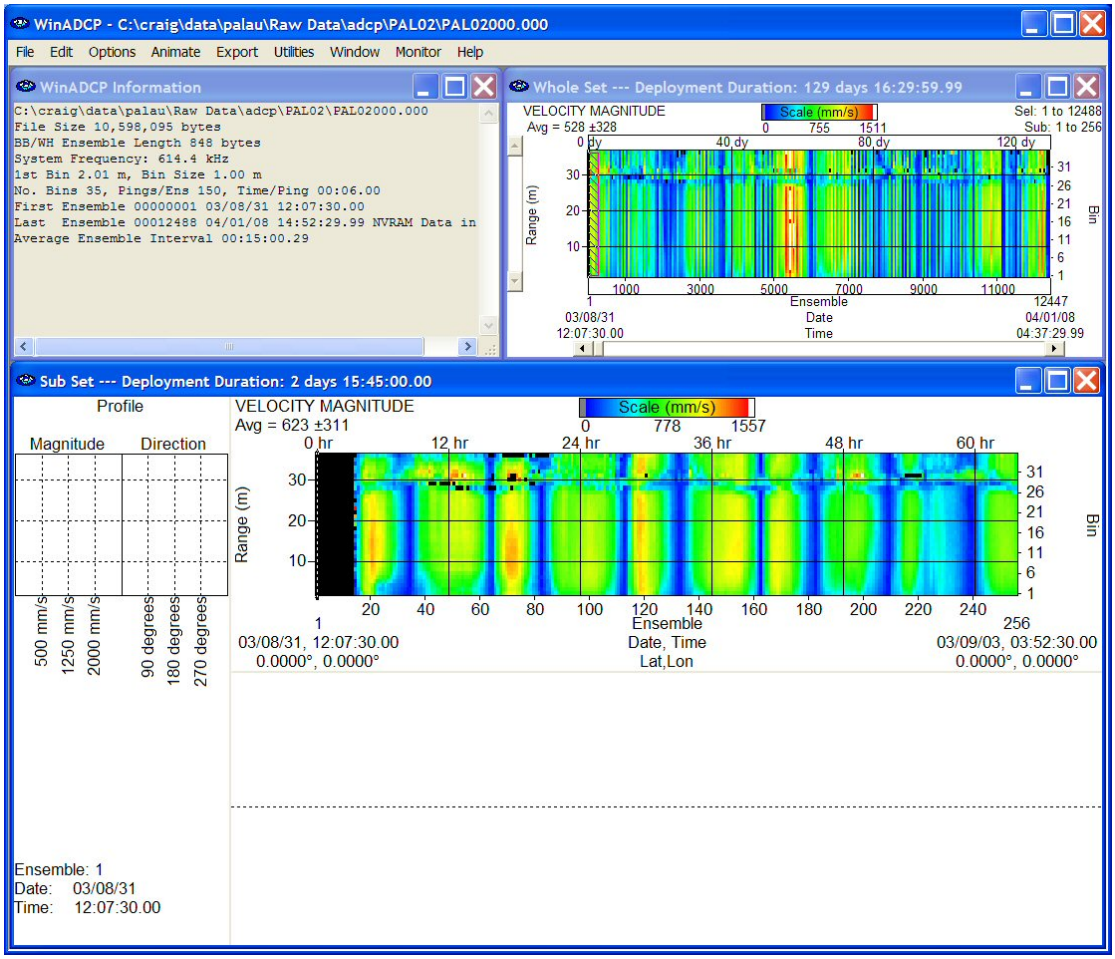


Figure 14 Screen-capture of the WinADCP data viewer

To export data from WinADCP click on the “Export” menu; this opens the Export Options control box (Figure 15). In the “Series/Ancillary” tab, select the output file type (text or MATLAB); the required bins; the time-series data desired; the ancillary data desired; and which ensembles (i.e., timesteps of data) are required for downloading.

Selecting the items as shown Figure 15 will replicate the ASCII data supplied on the accompanying DVD. The format for the text output is shown in Table 8. General header information is listed, followed by the matrix of data. The number of columns in the matrix depends on the export options chosen; each column header containing short-forms of the variable name and units. Each row in the matrix represents one ensemble average; i.e., one time period of measurement. For the deployment shown, a total of 12488

ensemble averages were made. The first column lists the ensemble number and the subsequent eight columns show the ancillary data (as selected from Figure 15). The remaining columns contain time series data for each selected variable, grouped by the number of bins in the vertical profile (thirty-five in this case). The first thirty-five of these columns contain data of the first variable; the second set of thirty-five columns contains data of the second variable; etc. For compactness, only the values from the first bin (nearest the instrument) are presented here. The variables shown in Table 8 reflect those selected in the export options window; i.e., the average of the 4-beam echo amplitudes (EAA); the correlations for each bin (C1); the east component of velocity; the north component of velocity; the vertical component of velocity; the error in the magnitude of velocity; the velocity magnitude; and the velocity direction.

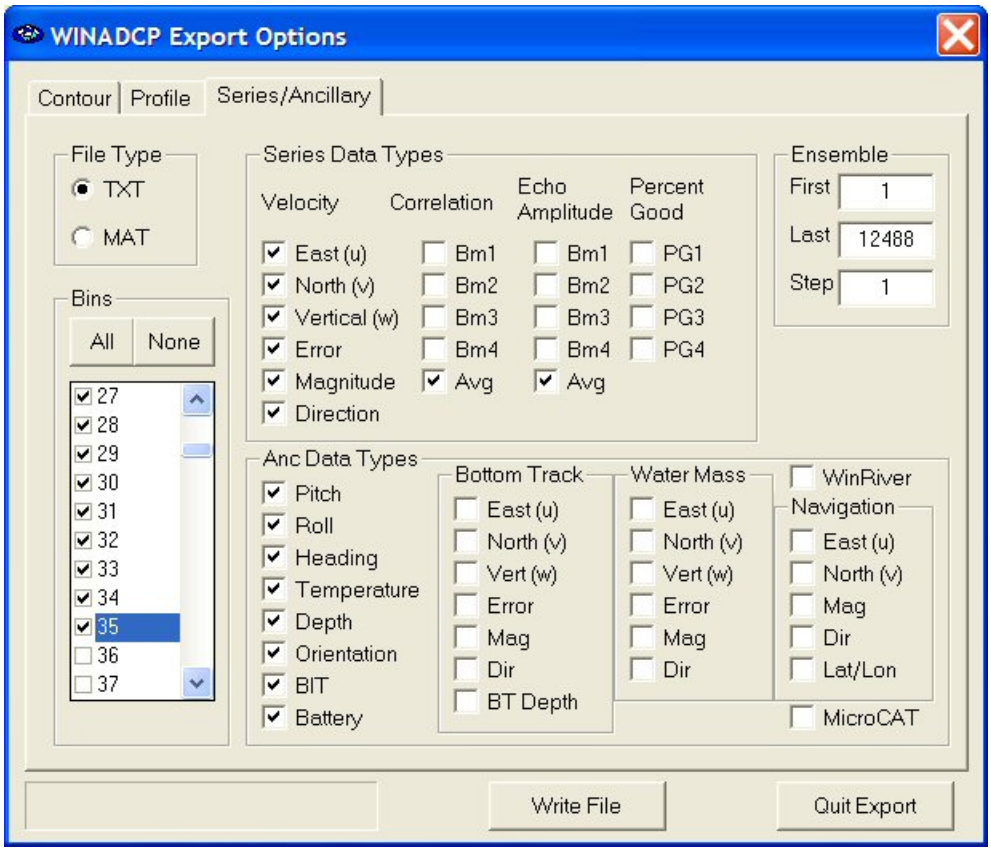


Figure 15 Screen-capture of the WinADCP export options

Table 8 ASCII output from Pal02000.txt, illustrating format.

```
Sample ADCP .ASCII txt file
"Series Data"
"C:\data\palauadcp\Pal02000.000"
"Broadband 614.4 kHz"
"Pings/Ens =" 150
"Time/Ping = 00:06.00"
"First Ensemble Date = 03/08/31"
"First Ensemble Time = 12:07:30.00"
"Ensemble Interval (s) = "   897.33
"1st Bin Range (m) = "       2.01
"Bin Size (m) ="     1.00

      "Pit"  "Rol"  "Hea"  "Tem"  "Dep"  "Ori"  "BIT"  "Bat"  "EAA"… "C1"…  "Eas"…  "Nor"…  "Ver"…  "Err"…  "Mag"…  "Dir"…
      "deg"  "deg"  "deg"  "deg"  "m"    ""     ""     "cnt"  "cnt"… "cnt"… "mm/s"… "mm/s"… "mm/s"… "mm/s"… "mm/s"… "deg"…
                                                              1      1      1       1       1       1       1       1

1     3.76   -1.88  226.49 27.49  0.00   1      0      160    45     17
2     4.37   -3.94  303.30 27.46  0.00   1      0      160    46     21
3     4.36   -3.88  303.35 27.42  0.00   1      0      160    46     20
.
.
.
5014  -4.66  0.54   188.07 29.42  30.20  1      0      140    130    124    228     -380    -20     16      443     149.0
5015  -4.66  0.54   188.05 29.49  30.20  1      0      140    133    124    222     -310    -1      9       381     144.
5016  -4.66  0.54   188.06 29.50  30.20  1      0      140    136    124    265     -351    -5      -5      440     142.9
.
.
.
12488 23.20  -25.79 214.26 23.97  0.20   1      0      133    192    75     -11     51      -35     -60     52      347.8
```

MATLAB Data Format

MATLAB is a commonly-used scientific programming language with high-level visualisation capabilities. For this reason, the data collected in this study have been archived using the MATLAB format. Metadata are contained within the MATLAB data files. After loading a data file, the program "hdrmat.m" displays a summary of the information. An example for the current profiler A5 is shown in Table 9.

Table 9 Example output for header from the current profiler, A5

```
>> load a5i1uvmt
>> hdrmat

Palau A5 RDI ADCP 412
Instrument Depth 215 m

start                finish               si     tz
17-Sep-2003 11:30:00 13-Jan-2004 14:45:00 15     -9

Time series statistics
Variable      Min             Max              Mean     Units

Temp          9.30000          13.27000          10.82724   deg C
Depth       210.00000         215.20000         210.58688   m
Dirn          0.00000         359.61467         140.72883   degrees
Speed         0.00000         293.48284           9.29600   cm/s
U           -98.20000         291.70000           3.24222   cm/s
V          -138.80000         193.30000           1.63225   cm/s

>> whos
  Name             Size                    Bytes  Class

  attributes       1x1                      2028  struct array
  depth            1x11342                 90736  double array
  dirn            23x11342              2086928  double array
  speed           23x11342              2086928  double array
  temp             1x11342                 90736  double array
  time             1x11342                 90736  double array
  u               23x11342              2086928  double array
  units            1x1                     1714  struct array
  v               23x11342              2086928  double array
  w               23x11342              2086928  double array
  z               23x1                      184  double array
```

Variables

The MATLAB file associated with each instrument contains the variable names listed in the adjacent table, as appropriate to the sensors. Each data point is placed into a vector based on its data type and sample number. In addition, the time when each data point is sampled is written to the time vector element with the corresponding sample number. Time, temperature (temp), instrument depth (depth), salinity (sal), and density (sigma_t) are always vectors.

Currents, however, can be measured at either a particular location (point current meter) or at several locations throughout the water column (current profiler). If the logger measures at only one location, as is the case with an S4 current meter, the velocity data are stored in four, one-dimensional vectors: eastward velocity (u), northward velocity (v), magnitude (speed), and direction (dirn). If several currents are measured at different depths, the data are stored in several matrices (or arrays). The currents are placed into bins (in accordance with the instrument setup) based on their depth. The data from each bin occupy a row of the matrix. Additionally, the column vector, z, identifies the height of the bins. Thus the depth of the fourth bin from the bottom is tabulated as the fourth element of column vector, z. The northward currents measured at this depth are recorded in the fourth row of the matrix, v. Current profiler instrument files have a vertical velocity (w) matrix in addition to the eastward velocity (u), northward velocity (v), magnitude (speed), and direction (dirn) matrices. For Nortek Aquadopp Current Profilers, the count of measured particles at each bin for each sampling interval is also recorded. These values are arranged in the matrices au, av, and aw and correspond to the matrices u, v, and w respectively.

time
temp
depth
speed
dirn
sal
sigma_t
z
u
v
w
au
av
aw
attributes
units

The final two parameters are attributes and units. Unlike the other variables which are all vector based, these are structure arrays. They contain pertinent information regarding the instrument and the units for each of the variables. Thus, every data file will contain both the *attributes* and *units* variables. Table 10 lists the *attributes* and *units* fields and values for the Uchelbeluu deepwater current profiler (A5).

Attributes
Information, such as the instrument make and serial number, are stored as fields in the *attributes* structure array. All instrument files have the same core of attributes listed in Table 10. A standard core of attributes allows MATLAB scripts to easily retrieve information among different instruments. Profiler data contain additional attribute fields which describe how the bins are set up.

Units
Like *attributes*, *units* are also structure arrays. The *units* field names are the same as *variable* and *attribute* names, such as temp and instrument_depth. However, the values are all strings describing the units of the named parameter. The number of fields in a *units* structure array vary from instrument to instrument and depend on which variables are measured.

Table 10 Example listing of attributes and units from the current profiler, A5

```
attributes =

               tz: 9
               si: 900
  ensemble_period: 900
          project: 'Palau'
              lat: 7.2653
              lon: 134.5566
             site: 'A5'
           serial: '412'
             make: 'RDI ADCP'
 instrument_depth: 215
        cell_size: 5
blanking_distance: 1.7600
        bin_depth: [1x23 double]
          top_bin: 23


units =

             time: 'serial date'
               si: 'seconds'
                u: 'cm/s'
                v: 'cm/s'
                w: 'cm/s'
             temp: 'deg C'
            depth: 'm'
 instrument_depth: 'm'
        cell_size: 'm'
blanking_distance: 'm'
            speed: 'cm/s'
             dirn: 'degrees'
                z: 'm'
```

Other computing languages

MATLAB binary files can be read directly into other programming languages (Fortran, C). Programs to access data are provided in each of these languages at the Mathworks web site: http://www.mathworks.com/access/helpdesk/help/techdoc/matlab_external/matlab_external.html.

Appendix N – Data Archive

Data are stored on a companion DVD-ROM and is structured as shown in Figure 16. This document, “Palau Oceanographic Array Data Report.doc”, is contained in the Documents subdirectory.

The Raw Data have been organised by instrument type; whereas, the processed data are organised by variable type – Currents, CTD, Salinity, Sealevels, Temperatures and Weather. Temperature mooring and transect data were consolidated and placed in the Tempprofiles subdirectory. The summary data plots can also be found under each of variable type as shown below for currents.

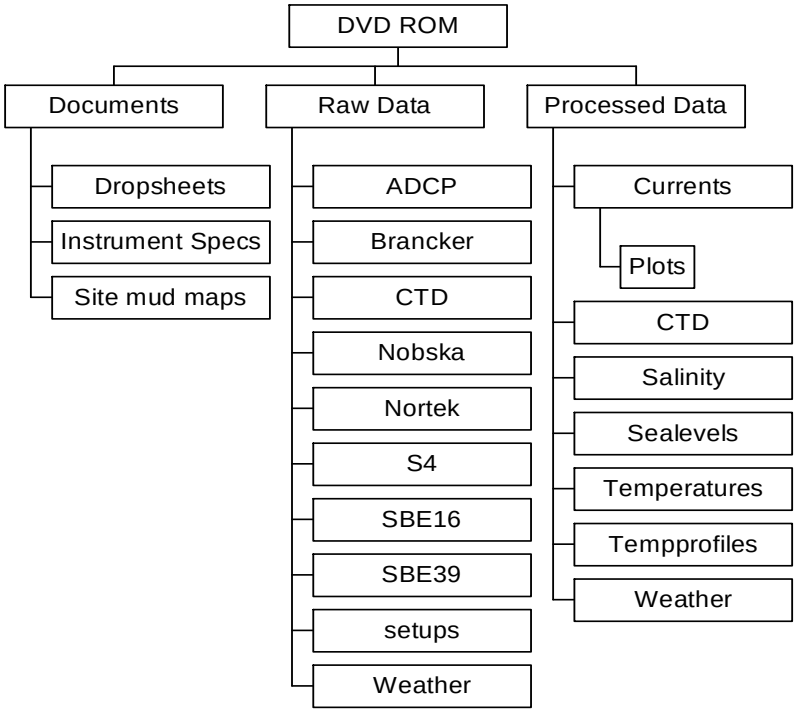


Figure 16 Archival DVD-ROM directory structure